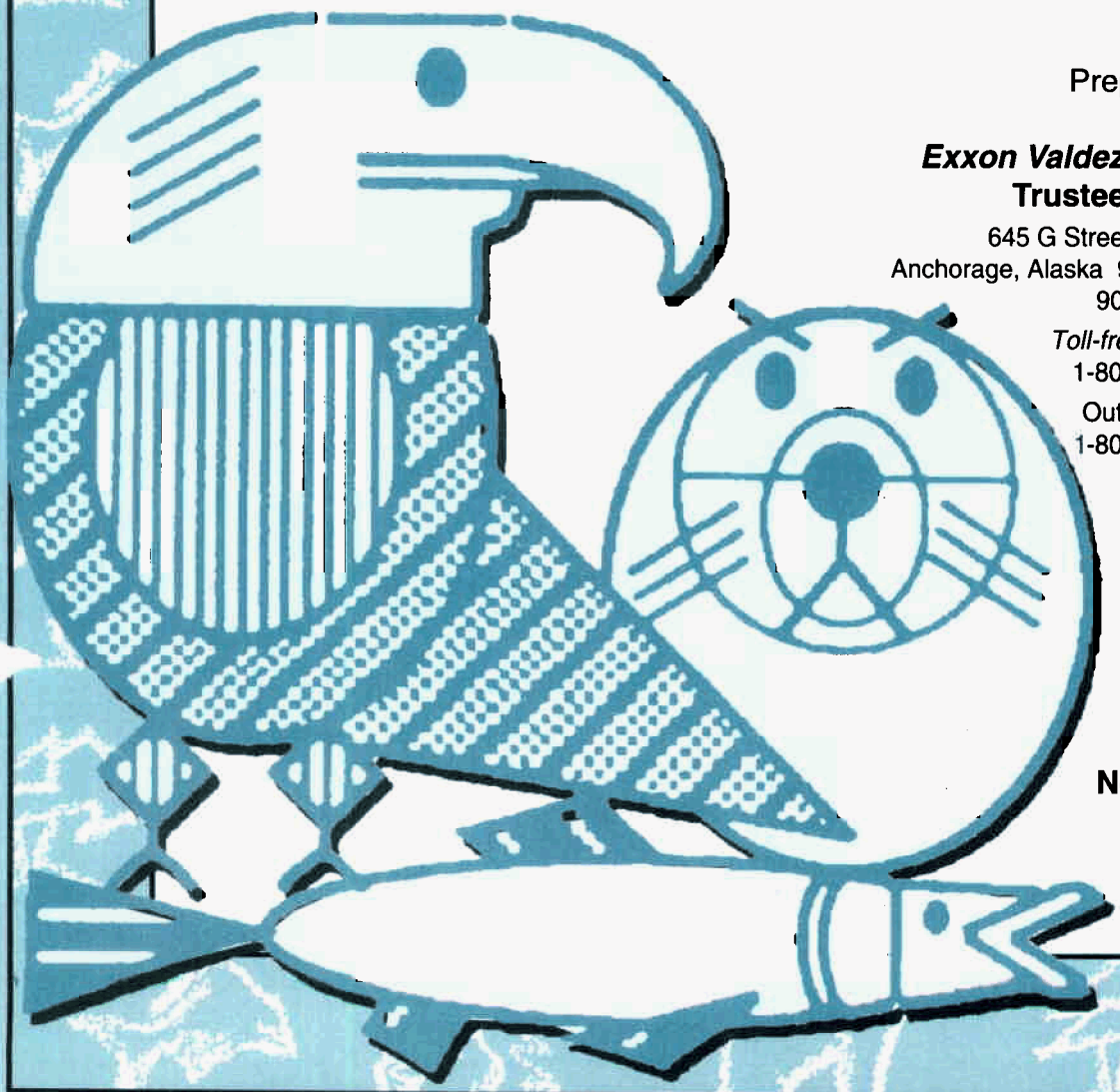
Exxon Valdez Oil Spill Restoration Plan



Prepared by:

***Exxon Valdez* Oil Spill Trustee Council**

645 G Street, Suite 401
Anchorage, Alaska 99501-3451
907/278-8012

Toll-free in Alaska
1-800-478-7745

Outside Alaska
1-800-283-7745

November 1994

Acknowledgements

The Trustee Council would like to acknowledge the many people who helped develop the Restoration Plan. Important contributors include Michael Barton, former Trustee Council representative and former Regional Forester for the U.S. Forest Service, Alaska Region; and Charles E. Cole, former Trustee Council representative and former Attorney General for the State of Alaska. We also recognize the important role played by the Public Advisory Group and wish to acknowledge their help in developing and clarifying the direction reflected in this plan, as well as other dedicated members of the public such as Arliss Sturgulewski who followed the process closely. There are many former and present staff who have left their mark on this plan: Mark Brodersen, Mark Fraker, Dave Gibbons, Carol Gorbics, Karen Klinge, Susan McMullin, Ken Rice, Brian Ross, Stan Senner, John Strand, Chris Swenson, Ray Thompson, and Art Weiner. We would like to thank the support staff who saw the project through, Barbara Wilson and Cherri Womac, and we extend apologies to anyone whom we have inadvertently overlooked. Finally, we would like to thank the staff who developed the final version: Veronica Gilbert, Bob Loeffler, and Sandy Rabinowitch.

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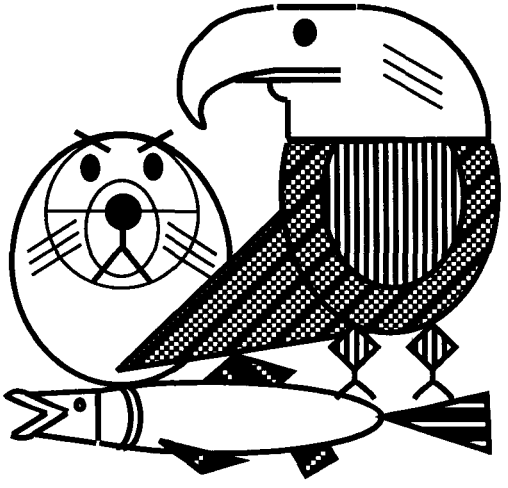

Exxon Valdez Oil Spill Restoration Plan

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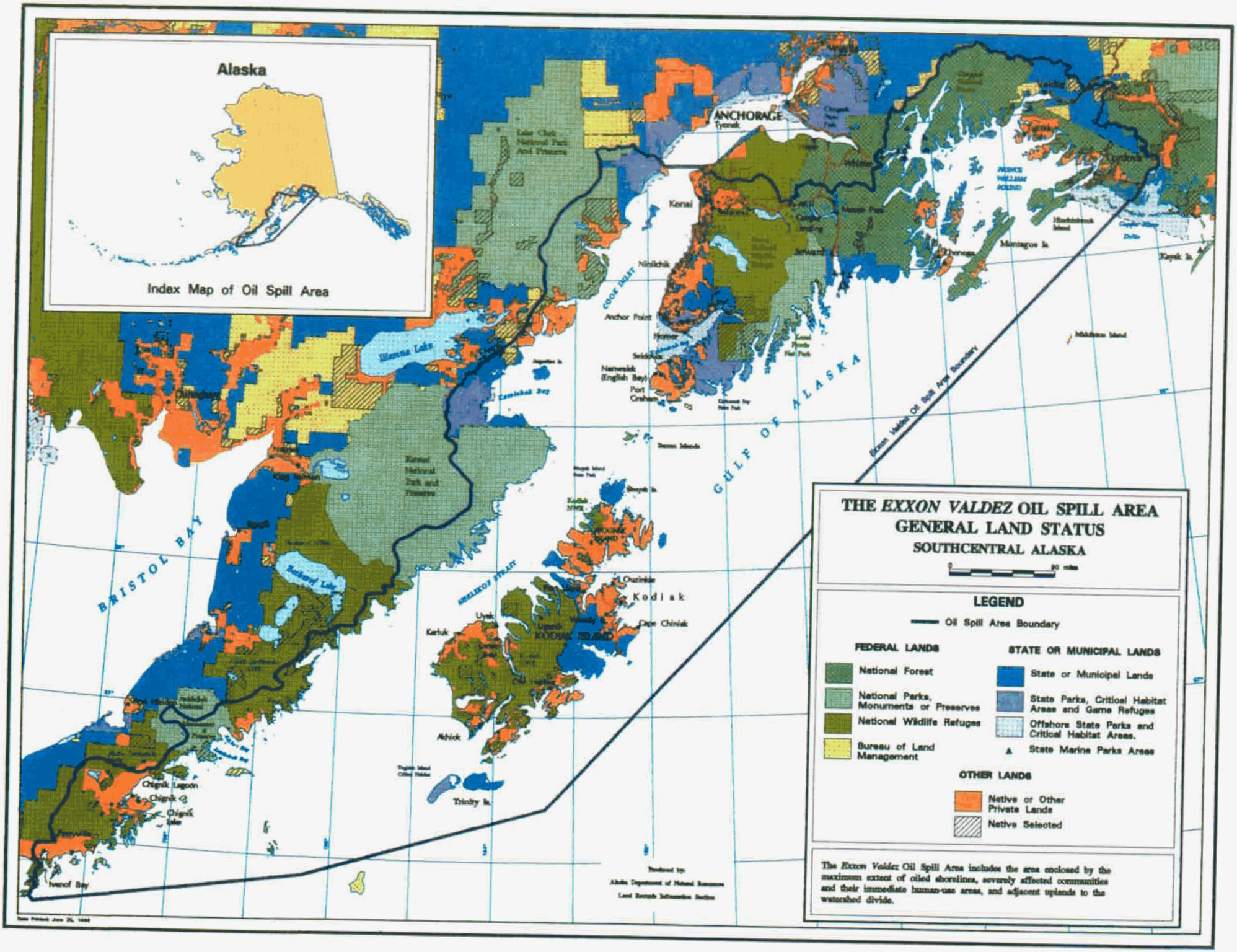
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The Exxon Valdez Oil Spill Area includes the area enclosed by the maximum extent of oiled shorelines, severely affected communities and their immediate human-use areas, and adjacent uplands to the watershed divide.
ANCHORAGE
Kenai
Seward
Valdez
Cordova
Kodiak
Homer
Seldovia
Dillingham
Iliamna Lake
Naknek
King Salmon
Katmai National Park and Preserve
Becharof Lake
Ugashik Lakes
Chignik Lagoon
Chignik
Chignik Lake
Ivanof Bay
Perryville
Ouzinkie
Cape Chiniak
Karluk
Uyak
Akhiok
Trinity Is.
Shuyak Is.
Middleton Island
Montague Is.
Kayak Is.
Hinchinbrook Island
Copper River Delta
Port Graham
Nanwalek (English Bay)
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Ninilchik
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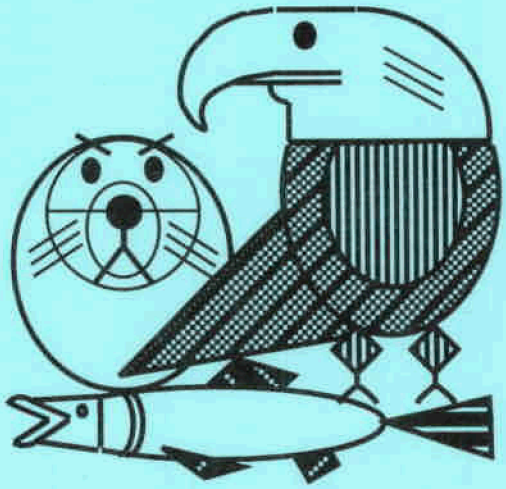
Prepared by
Alaska Department of Natural Resources
Land Records Information Section

CHAPTER 1 • INTRODUCTION



Chapter 1
Introduction

Purpose of the Document

In 1989, the *Exxon Valdez* oil spill contaminated about 1,500 miles of Alaska's coastline. It killed birds, mammals, and fish, and disrupted the ecosystem in the path of the oil. In 1991, Exxon agreed to pay the United States and the State of Alaska $900 million over ten years to restore the resources injured by the spill, and the reduced or lost services (human uses) they provide.

The *Exxon Valdez* Restoration Plan provides long-term guidance for restoring the resources and services injured by the oil spill. It contains policies for making restoration decisions and describes how restoration activities will be implemented.

Background

The Oil Spill. Shortly after midnight on March 24, 1989, the T/V *Exxon Valdez* ran aground on Bligh Reef in Prince William Sound, Alaska, spilling almost eleven million gallons of North Slope crude oil. It was the largest tanker spill in United States history. That spring the oil moved along the coastline of Alaska, contaminating portions of the shoreline of Prince William Sound, the Kenai Peninsula, lower Cook Inlet, the Kodiak Archipelago, and the Alaska Peninsula. Oiled areas include a National Forest, four National Wildlife Refuges, three National Parks, five State Parks, four State Critical Habitat Areas, and a State Game Sanctuary. Oil eventually reached shorelines nearly 600 miles southwest from Bligh Reef where the spill occurred. The map preceding the table of contents shows the spill area. The spill area includes all of the shoreline oiled by the spill, severely affected communities, and adjacent uplands to the watershed divide.

Response. During 1989, efforts focused on containing and cleaning up the spill, and rescuing oiled wildlife. Skimmers worked to remove oil from the water. Booms were positioned to keep oil from reaching salmon hatcheries in Prince William Sound and Kodiak. A fleet of private fishing vessels known as the "Mosquito Fleet" played an important role in protecting these hatcheries, assisting the skimmers, and capturing oiled wildlife and transporting them to rehabilitation centers. Exxon began to clean up beaches under the direction of the U.S. Coast Guard with advice from federal and state agencies and local communities. Several thousand workers cleaned shorelines, using techniques ranging from cleaning rocks by hand to high-pressure hot-water washing. Fertilizers were applied to some oiled shorelines to increase the activity of oil-metabolizing microbes, an activity known as bioremediation.

The 1989 shoreline assessment, completed after the summer cleanup ended, showed that a large amount of oil remained on the shorelines. In the spring of 1990, the shoreline was again surveyed in a joint effort by Exxon and the state and federal governments. The survey showed that much work remained to be done. The principal clean-up method used in 1990 was manually removing the remaining oil, but bioremediation and relocation of oiled beach material to the active surf zone were also used in some areas.

Shoreline surveys and limited clean-up work occurred in 1991, 1992, 1993, and 1994. In 1992, crews from Exxon and the state and federal governments visited eighty-one sites in Prince William Sound and the Kenai Peninsula. They reported that an estimated seven miles of the 21.4 miles of shoreline surveyed still showed some surface oiling. This number does not include oiling that may have remained on shorelines set aside for monitoring natural recovery. The surveys also indicated that subsurface oil remained at many sites that were heavily oiled in 1989. No sites were surveyed on Kodiak Island or the Alaska Peninsula in 1992. Earlier surveys suggested that most of the light oil (scattered tar balls and mousse) which remained on Kodiak Island and the Alaska Peninsula would degrade by 1992. While there may be a few exceptions, the surveys determined that the cost and potential environmental impact of further cleanup was greater than the problems caused by leaving the oil in place. The 1992 cleanup and the 1993 shoreline assessment were concentrated in those areas where oil remained to a greater degree — Prince William Sound and the Kenai Peninsula.

In 1994, restoration workers performed manual treatment to accelerate degradation of surface oil on approximately a dozen important subsistence and recreation beaches in western Prince William Sound. They also performed manual treatment to accelerate degradation of subsurface oil beneath approximately a dozen oiled mussel beds in protected areas of western Prince William Sound.

Natural Resource Damage Assessment. During the first summer after the spill, one state and three federal government agencies directed the Natural Resource Damage Assessment field studies to determine the nature and extent of the injuries as needed for litigation purposes. The federal agencies were the U.S. Department of the Interior, U.S. Department of Agriculture, and the National Oceanic and Atmospheric Administration. The state agency was the Alaska Department of Fish and Game. Expert peer reviewers provided independent scientific review of ongoing and planned studies and assisted with synthesis of results. Most damage assessment field studies were completed during 1991.

Settlements

On October 8, 1991, the U.S. District Court approved a plea agreement that resolved various criminal charges against Exxon, and a civil settlement that resolved the claims of the United States and the State of Alaska against Exxon for recovery of natural resource damages resulting from the oil spill.

The Criminal Plea Agreement. As part of the criminal plea agreement, the court fined Exxon $150 million — the largest fine ever imposed for an environmental crime. Of this amount, $125 million was remitted in recognition of Exxon's cooperation with the governments during the cleanup, timely payment of many private claims, and environmental precautions taken since the oil spill. Of the remaining $25 million, $12 million was paid to the North American Wetlands Conservation Fund for wetlands enhancement in the U.S., Canada and Mexico, and $13 million was paid to the federal treasury. As part of the plea agreement, Exxon also agreed to pay restitution of $50 million to the United States and $50 million to the State of Alaska. The state and federal governments separately manage these $50 million payments. Funds from the criminal plea agreement are *not* under the authority of the Trustee Council, and the use of these funds is not guided by this plan.

Civil Settlement and Restoration Fund. The Federal Water Pollution Control Act, 33 USC 1321(f)(5), provides the authority for the civil settlement. The use of monies provided by the civil settlement is governed by two documents: The first is a Consent Decree between Exxon, the State of Alaska and the United States that requires Exxon to pay the United States and the State of Alaska $900 million over a period of ten years. The second is the Memorandum of Agreement between the State of the Alaska and the United States. Both were approved by the U.S. District Court.

According to the Consent Decree between Exxon and the state and federal governments, Exxon must make ten annual payments totaling $900 million. The first payment was made in December 1991; the last payment is due in September 2001. As of December 1994, four payments totaling $410 million have been received. The payment schedule is provided in Table 1. The terms of the Consent Decree and Memorandum of Agreement require that funds paid by Exxon are to be used first to reimburse the federal and state governments for the costs of cleanup, damage assessment and litigation. Settlement funds remaining after the reimbursements are to be used for purposes of restoration. The use of the restoration fund is guided by this plan.

The Consent Decree with Exxon also has a reopener provision that allows the governments to claim up to an additional $100 million between September 1, 2002 and September 1, 2006 to restore one or more resources or habitats that suffered a substantial loss or decline as a result of the spill. Under the Consent Decree, the reopener is available only for any losses or declines that could not reasonably have been known or anticipated from information available at the time of the settlement.

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

- 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 Memorandum of Agreement and other settlement documents define a number of important terms.

Restore or **Restoration** means any action, in addition to response and clean-up activities required or authorized by state or federal law, that endeavors to restore to their prespill condition any natural resource injured, lost, or destroyed as a result of the Oil Spill and the services provided by the resource, or that replaces or substitutes for the injured, lost or destroyed resource and affected services. Restoration includes all phases of injury assessment, restoration, replacement, and enhancement of natural resources, and acquisition of equivalent resources and services.

Replacement or acquisition of the equivalent means compensation for an injured, lost or destroyed resource by substituting another resource that provides the same or substantially similar services as the injured resource.

Enhancement means any action that improves on or creates additional natural resources or services where the basis for improvement is the prespill condition, population, or use.

Natural resources means 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. Examples of natural resources include birds, fish, mammals, and subtidal plants and animals.

The Consent Decree also provides that funds may be used to restore archaeological sites and artifacts injured or destroyed by the spill.

In addition to restoring natural resources, funds may be used to restore reduced or lost *services* (including human uses) provided by injured natural resources. Humans use the services provided by resources injured by the spill in a variety of ways: subsistence,

commercial fishing, recreation (including sport fishing, sport hunting, camping, and boating), and tourism are services that were affected by injuries to fish and wildlife. Injured services also include the value derived from simply knowing that a resource exists. (This service is called "passive use.")

Restoration funds may not be used to compensate individuals for their own private losses. For example, the personal loss of income by individual fishermen or commercial guides must be settled through private lawsuits.

Post-settlement Trustee Organization

The Clean Water Act requires that the President and the Governor designate natural resource trustees to oversee natural resource damage claims and restoration. In the 1991 Memorandum of Agreement, three federal and three state trustees were designated to administer the restoration fund and to restore resources and services injured by the oil spill. They are:

State of Alaska Trustees

- Commissioner of the Department of Environmental Conservation
- Commissioner of the Department of Fish and Game
- Attorney General

Federal Trustees

- Secretary of the Interior
- Secretary of Agriculture
- Administrator of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce

The Trustees established the Trustee Council to administer the Restoration Fund. The State Trustees serve directly on the Trustee Council. The Federal Trustees have each appointed a representative in Alaska to serve on the Council.

The Trustee Council uses funds from the civil settlement for activities to restore injured resources and services. It *does not* manage fish and wildlife resources or manage land. Fish and game management decisions are made by fish and game boards, or by appropriate federal or state agencies. The Trustee Council may fund research to provide information to those agencies or other groups.

Past and Estimated Future Uses of Civil Settlement Funds

Table 1 shows past and estimated future uses of the civil settlement fund as of December 1994. It shows past deductions, and expenditures, as well as estimates of future expenditures. Estimated uses are just that. The Trustee Council has the authority and flexibility to make annual funding decisions, and will make those decisions based on their examination of what is necessary for restoration.

Table 1. Past and Estimated Future Uses of Civil Settlement Funds as of December 1994
Figures in Millions of Dollars

Payments by Exxon

Past . . . . . $410 million

December 1991, $ 90 million

December 1992, $150 million

September 1993, $100 million

September 1994, $ 70 million

Future . . . . . $490 million

September 1995, $ 70 million

September 1996, $ 70 million

September 1997, $ 70 million

September 1998, $ 70 million

September 1999, $ 70 million

September 2000, $ 70 million

September 2001, $ 70 million

TOTAL PAYMENTS . $900 million

Expenses, Estimates, and Adjustments

Work Plan Expenses Estimated at $192 - $222

Past Authorizations

$19.2 for the 1992 Work Plan
$15.5 for the 1993 Work Plan
$27.8 for the 1994 Work Plan
$22.8 for the 1995 Work Plan

Estimated Future Authorizations: $107 - $137[1]

Infrastructure Improvements — Institute of Marine Sciences (Alaska Sealife Center) $25[2]

Habitat Purchases . Estimated at $342 - $372

Past Purchases

$7.5 for inholdings in Kachemak Bay State Park;
$39.6 for Seal Bay on Afognak Island ($38.7 for purchase and $0.9 in estimated interest);
Fair market value for timber rights at Orca Narrows[3]

Estimated Future Purchases: $295 - $325[4]

Restoration Reserve . . . . . Estimated at $108 plus interest

Past Authorizations: $24 million

Estimated Future Authorizations: Anticipated at $12 million per year through fiscal year 2002 (a total of $84 million)

Reimbursements . . . . . Estimated at $177

Past Reimbursements: $150.4 for past reimbursements to the federal and state governments for past damage assessment, cleanup, response, restoration, and litigation expenses.

Estimated Future Reimbursements: an estimated $26.3 million remain to reimburse the governments for these expenses.[5]

Adjustments . . . . . $26[6]

TOTAL EXPENSES . . . . . $900 million

Notes to Table 1.

1. Estimated future work plan authorizations are calculated as the residual of $900 million less past and estimated future authorizations for other restoration purposes.

2. The actual authorization is "an amount up to $24,956,000."

3. Appraisal not yet complete.

4. On November 2, 1994, the Trustee Council resolved "...to pursue habitat protection and acquisition throughout the oil spill area so as to promote restoration of injured natural resources and services throughout the spill area and that $295 to $325 million is an initial, flexible placeholder for habitat protection and acquisition efforts (this amount is in addition to previous expenditures for habitat protection and acquisitions)..." In November and December 1994, the Trustee Council made offers to eight landowners: The Eyak Corporation, Tatitlek Corporation, Chenega Corporation, Kodiak Island Borough, Afognak Joint Venture, Akhiok-Kaguyak Inc., Koniag Inc., and Old Harbor Native Corporation. Purchase agreements are not complete with any of these landowners as of December 1994. Negotiations are also underway with Port Graham Corporation and English Bay Corporation.

5. More precise estimate is $26.3 million including an estimate of $23.3 to reimburse the state government, and an estimate of $3 million to reimburse the federal government, U.S. Department of Agriculture. (State of Alaska estimate made by Tucker Alan Inc., accounting firm on contract to the Alaska Department of Law; federal estimate made by U.S. Department of Agriculture.)

6. More precise estimate is $25.7 million including $39.9 million deducted by Exxon from the 1992 payment for the costs of cleanup completed after January 1, 1991; plus $0.6 million in court fees; minus a credit of $8.1 million for interest earned; and minus a credit for $6.7 million lapsed by agencies 1992.

Public Involvement and Information

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

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

In January 1992, public meetings were held and written comments requested for recommendations about establishing a Public Advisory Group. Comments addressed the role, structure, and operating procedures for the group. The Public Advisory Group was formed in October 1992 to advise the Trustee Council on all matters relating to the planning, evaluation, and allocation of funds, as well as the planning, evaluation, and conduct of injury assessments and restoration activities. This group consists of seventeen members who represent a cross-section of the interest groups and public affected by and concerned about the spill. There are also two ex-officio members chosen by the Alaska State House of Representatives and the Alaska State Senate.

Additional public meetings were held in May 1992 on the *Restoration Framework Volume I*, which outlined restoration issues and a general framework for restoration, and in April-May 1993 to discuss alternatives for the *Draft Restoration Plan.*

A draft restoration plan was adopted in November 1993 to guide restoration decisions until this final plan could be completed. The draft plan was available to the public during 1994. In addition, A *Draft Environmental Impact Statement* analyzed the potential environmental impacts of implementing the *Draft Restoration Plan,* and the two documents — the *Draft Environmental Impact Statement* and the *Draft Restoration Plan* — were distributed for public review from June 18, 1994 through August 1, 1994. Six public meetings were held to discuss these documents, and the comments were taken into account in the preparation of the Final Environmental Impact Statement. The Final Environmental Impact Statement was used by the Trustees in reaching their decisions as outlined in the Record of Decision signed on October 30, 1994, and in issuing this plan.

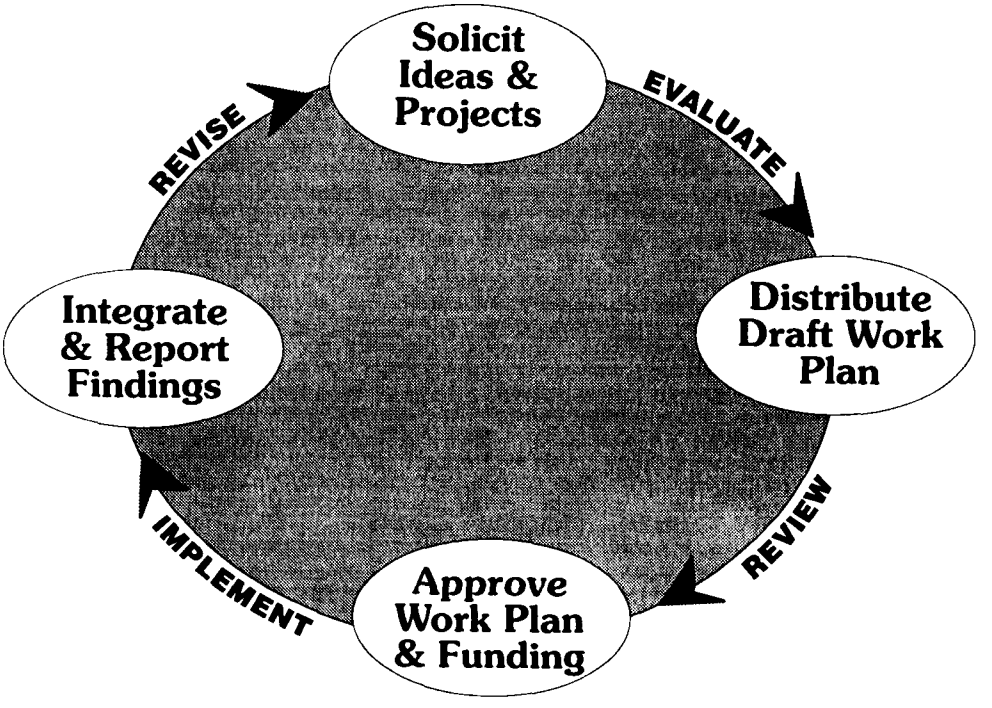
Most Trustee Council meetings include a public comment period that is teleconferenced to sites in the spill area. Verbatim transcripts of the meetings are available to the public a few days after the meeting. Documents such as those proposing projects for funding are distributed for public review before Trustee Council decisions. In addition, the public is invited to attend various workshops and work sessions sponsored by the Trustee Council.

Implementing the Restoration Plan: *The Adaptive Management Cycle*

The Restoration Plan provides long-term guidance for restoring the resources and services injured by the oil spill. It does not list individual restoration projects. Each year, the Restoration Plan will be implemented through an annual or multi-year work plan. The work plan describes the projects funded by the Trustee Council from the restoration fund. To be funded, projects must be consistent with the Consent Decree and Memorandum of Agreement, and with the policies, objectives, and restoration strategies of this Restoration Plan.

Figure 1 shows the Adaptive Management Cycle that is used to determine the work plans. The figure shows that restoration is a cyclical activity — that the restoration priorities and needs embody a long-term, ecosystem view that is continually updated as new information is acquired. Thus, the most current information is used to determine the needs of injured resources and services and the priorities for restoration. On the basis of those priorities, the Trustee Council annually invites proposals and ideas for restoration from government agencies, universities, private industry and the public. Submissions undergo scientific, policy, and legal review. Important projects that need additional work may be further developed. Following that review, a draft of that year's restoration program is distributed for public review. The Trustee Council uses information received from the public, scientists, the Trustee's Public Advisory Group, and agency staff to decide which restoration projects to fund that year.

Figure 1. The Trustee Council Adaptive Management Cycle



Following approval and funding, projects are implemented by trustee agencies, private industry, communities, and non-profit organizations. Each year, the results of that year's restoration activities are synthesized, integrated, and distributed so that scientists and the public have an up-to-date view of the condition of the injured resources and services and

know what has been learned during that year. The Trustee Council annually publishes a status report for the public describing the restoration program and the current condition of the resources and services injured by the spill. On the basis of the updated status, the cycle begins again.

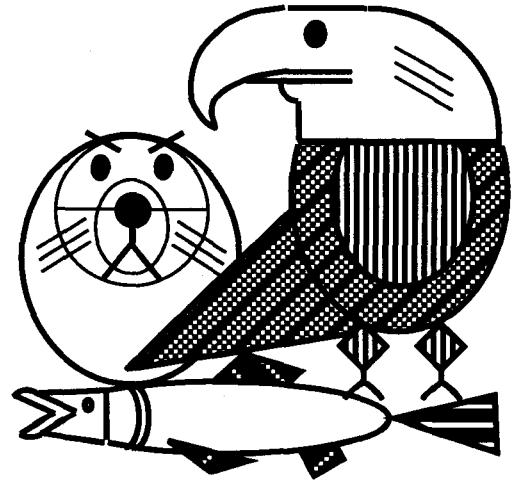
Within the adaptive management cycle, there are multiple opportunities for meaningful public participation at all levels — planning, project design, implementation and review — not just during the public comment period of officially distributed documents. These opportunities — group meetings, Public Advisory Group meetings, and project planning groups — involve the public in an on-going fashion.

The public and the scientific community will be provided timely access to all levels of restoration information. In addition to the status report, more detailed information will be made available to scientists and the interested public in a timely manner and in an easily usable form.

Changing the Restoration Plan. The Trustee Council may change the plan if the Council determines that the plan is no longer responsive to restoration needs. Changes may be made due to new scientific data, or to changing social and economic conditions. However, new scientific data will be incorporated into restoration decisions without the need to change the plan.

Legal Compliance. All projects will comply with state and federal laws and regulations before they are implemented.

CHAPTER 2 • MISSION & POLICIES



Chapter 2
Mission and Policies

Mission Statement

The mission of the Trustee Council 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 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

Policies

The policies below reflect a comprehensive, balanced approach to restoration. They give direction to the restoration program while allowing flexibility so that the Trustee Council can respond to changing restoration needs.

An Ecosystem Approach

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.**

These policies recognize that recovery from the oil spill involves restoring the ecosystem as well as restoring individual resources. An ecosystem includes the entire community of organisms, including people, that interact with one another and their physical surroundings. The ecosystem will have recovered when the population of flora and fauna are again present, healthy, and productive; there is a full complement of age classes; and people have the same opportunities for the use of public resources as they would have had if the oil spill had not occurred. Restoration proposals should, as much as practical, reflect an understanding of their impact on ecosystem relationships of related resources and services.

For General Restoration activities, preference is given to projects that benefit multiple species rather than to those that benefit a single species. However, effective projects for restoring individual resources will also be considered. This approach will maximize benefits to ecosystems and to injured resources and services.

Habitat Protection and Acquisition emphasizes protection of multiple species, ecosystem areas, such as entire watersheds, or areas around critical habitats. This approach will be more likely to ensure that the habitat supporting an injured resource or service is protected. In some cases, protection of a small area will benefit larger surrounding areas, or provide critical protection to a single resource or service.

Monitoring and Research activities require more than resource-specific investigations to understand the factors affecting recovery from the oil spill. Restoration issues are complex, and research must often take a long-term approach to understand the physical and biological interactions that affect an injured resource or service, and may be constraining its recovery. The results of these efforts could have important implications for restoration, for how fish and wildlife resources are managed, and for the communities and people who depend upon the injured resources.

Injuries Addressed by Restoration

3. **Restoration activities may be considered for any injured resource or service.**

4. **Restoration will focus upon injured resources and services and will emphasize resources and services that have not recovered. Resources and services may 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.**

5. **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.**

6. **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 policies.**

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

As required by the Consent Decrees, restoration must benefit the resources and services injured by the spill. Table 2 in Chapter 4 lists resources and services injured by the spill. The table is based on the best available information but may be amended if new information demonstrates additional spill-related injuries. The process for amending the list is described in Chapter 4. In addition, an ecosystem approach to restoring injured resources and services may require restoration activities that address a resource's prey or predators, or the other biota and physical surroundings on which it depends.

Continuing injuries to resources and services with important economic, cultural and subsistence value to people living in or using the oil spill area cause continuing hardship. For example, subsistence users say that maintaining a subsistence culture depends upon uninterrupted use of subsistence resources. The more time users spend away from subsistence activities, the less likely they will return to it. Continuing injury to natural resources used for subsistence may affect the way of life of entire communities. Similarly, each year that commercial fish runs remain below prespill levels compounds the injury to the fishermen and, in many instances, the communities in which they live or work.

The policies recognize that waiting for natural recovery may be the most effective approach in many instances, but that the time required for natural recovery can have important adverse consequences for resources and services upon which the people of the spill area rely.

Finally, restoring one resource or service should not come at the cost of injuring another. An assessment of possible negative effects on non-target resources or services will be part of the project proposal evaluation process.

Location of Restoration Actions

8. **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.

The vast majority of restoration funds will be focused on the spill area, where the most serious injury occurred and the need for restoration is greatest. At the same time, the policy provides the flexibility to restore and monitor outside the spill area under limited circumstances. Examples include some restoration and monitoring activities for migratory seabirds and marine mammals.

Restoring a Service

9. **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.

The restoration fund may be used to restore reduced or lost services provided by injured resources. The relationship between the proposed activity and the injured resource which caused the reduced or lost service is the subject of the first part of this policy. The policy requires that a project to restore or enhance an injured service must be sufficiently related to a natural resource. The project can be related to a natural resource in various ways: it could directly restore a resource, provide an alternative resource, or restore people's access to or use of the resource. The strength of the required relationship has not been defined by law, regulation, or the courts. However, a clear connection with an injured resource is necessary. In determining whether to fund a project to restore services, the strength of the project's relationship to injured resources will be considered.

A few examples may help explain this relationship. One way to aid commercial fishing is to restore injured salmon runs or to provide alternative runs. However, the restoration fund cannot be used to give cash grants to fishermen to cover spill-related losses. This latter idea is unrelated to an injured resource.

As a second example, subsistence was injured, in part, because the resources it relies on were injured. Habitat may be purchased to provide alternative areas for subsistence where uninjured resources exist. The restoration fund may also be used to enhance or establish alternate subsistence resources, or provide information about the safety and availability of subsistence resources, or even to provide facilities such as a shelter cabin that provides for easier access to alternate resources. In these cases, the restoration activity has a relationship to injured resources — it provides replacement resources, allows users to make better judgement about use of the resources, or provides easier access to alternative resources. However, the restoration fund could not be used to help subsistence users in general, such as providing a warehouse or generator in a subsistence community, because there is no relationship to an injured resource.

The second part of the principle ensures that the injured user groups are the beneficiaries of restoration. If the justification for an action is to restore a service, it is important that the user group that was injured be helped.

The last part of the principle addresses a public concern about possible changes in the use of the spill area. It allows improvements in the services without producing major changes in use patterns. For example, a mooring buoy may improve boating safety without changing patterns of use. Projects to be avoided are those that create incompatible uses for an area, such as constructing a small-boat servicing facility in an area that is wild and undeveloped.

Competition and Efficiency

10. Competitive proposals for restoration projects will be encouraged.

Most restoration projects to date have been undertaken by state or federal agencies. However, the number of competitive contracts awarded to nongovernmental agencies has increased each year and will continue to increase.

This policy encourages active participation from individuals and groups in addition to the trustee agencies and may generate innovation and cost savings. This approach may be inappropriate for some restoration projects, but, where appropriate, competitive proposals will be sought for new project ideas and to implement the projects themselves.

11. Restoration will take advantage of cost sharing opportunities where effective.

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

Activities should be coordinated to decrease project costs and be designed to assess and incorporate available and late-breaking information to ensure the most effective restoration program.

13. Proposed restoration strategies should state a clear, measurable and achievable endpoint.

A clear, measurable, and achievable endpoint is necessary to determine whether a strategy is successful.

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

This policy reflects the important fact that there is not sufficient money available to complete all useful restoration activities. Implementation of this policy will not be based on a quantified cost/benefit analysis, but on a broad consideration of the activity's direct and indirect costs, and the primary and secondary benefits. It will also take into account whether there is a less expensive method of achieving substantially similar results.

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

Projects that use this type of approach are more likely to take advantage of diversity in viewpoints, skills, and strengths and will be more likely to result in cost-effective restoration.

Scientific Review

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

This policy continues an existing practice. Independent scientific review gives an objective evaluation of the scientific merits of the project. It also assures the public that scientific judgements are without bias.

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

The ability to complete projects in a timely and effective manner is essential to the restoration effort.

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

To the extent possible, all restoration actions will take into account other relevant activities to help the Trustee Council conduct an integrated research program. In addition, a synthesis of findings and results will be available for the public, scientists, and agency staff to help understand the status of injured resources and services, and to plan for future restoration.

Public Participation

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

Public participation is not a once-a-year government activity limited to commenting on draft documents. Rather, to the greatest extent possible, individual projects should integrate the affected and knowledgeable public in planning, design, implementation, and review. Some projects have a more easily identifiable public, for example those designed to affect services or the resources that support them. However, incorporating public preferences and information into any project is likely to improve its cost-effectiveness, take advantage of available knowledge, and help ensure that the restoration program is understood and accepted by the public.

The Trustee Council has emphasized its commitment to involve the public in all phases of restoration activities. Evidence of meaningful public involvement will be sought as part of the project evaluation process.

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

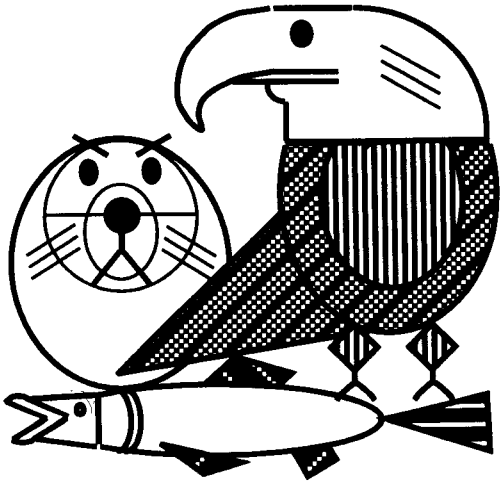
Information from restoration projects must be available to other scientists and to the general public in a form that can be easily used and understood. An effective restoration program requires the timely release of such information. This policy underscores the fact that since the restoration program is funded by public money, the public owns the results.

Normal Agency Activities

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

This policy addresses the concern that restoration funds should not support activities that government agencies would do anyway. It also affirms the practice that has been in effect since the beginning of the restoration process. To determine whether work would have been conducted had the spill not occurred, the Trustee Council will consider agency authorities and the historic level of agency activity.

Chapter 3 • Categories of Restoration Actions



Chapter 3
Categories of Restoration Actions

The restoration program includes five categories of restoration activities:

- General Restoration,
- Habitat Protection and Acquisition,
- Monitoring and Research,
- Restoration Reserve, and
- Public Information, Science Management, and Administration.

This chapter describes activities within each category. It also describes how decisions are made about projects and presents policies that apply to each category.

The alternatives described in the *Draft Restoration Plan* asked the public to indicate the emphasis they would place on each restoration category. Although it was useful to ask the public about the relative importance of each category, this plan does not prescribe a fixed allocation of the restoration fund. The restoration program must be able to respond to changing conditions and new information about injury, recovery, and the cost and effectiveness of restoration projects. When making annual funding decisions, the Trustee Council will use public comments received on the restoration alternatives as well as comments that may be received in the future.

General Restoration

General Restoration activities are a principal tool used to focus on the restoration of individual injured resources and services. General Restoration includes a wide variety of restoration activities. This plan uses the term to include all activities that are not Habitat Protection and Acquisition; Monitoring and Research; Public Information, Science Management, and Administration; or the Restoration Reserve. General Restoration activities fall into one of the following three types:

- Manipulation of the Environment;
- Management of Human Use; or
- Reduction of Marine Pollution.

A few General Restoration activities will improve the rate of natural recovery. Most of these activities involve manipulation of the environment. Other activities protect natural recovery by managing human uses or reducing marine pollution. A few General Restoration activities may involve facilities. Facilities may direct human use away from sensitive areas,

support other restoration activities, or replace facilities needed for access and damaged by the spill.

Manipulation of the Environment. Some General Restoration techniques restore injured resources and services by directly manipulating the environment. Examples include building fish passes to restore fish populations, or replanting seaweed to restore the intertidal zone to prespill conditions.

When evaluating projects that manipulate the environment, the potential for adverse effects on the ecosystem will be considered. Those projects that will effectively accomplish an important restoration objective without adversely affecting the ecosystem are more likely to be funded.

Management of Human Use. Some General Restoration projects involve managing human use to aid restoration. Examples include redirecting hunting and fishing harvest, or reducing human disturbance around sensitive bird colonies. Many projects that manage human use do so to protect injured resources, services, or their habitat.

Reduction of Marine Pollution. Reducing marine pollution can remove a source of stress that may delay natural recovery. The public frequently recommended preventive actions to stop ongoing marine pollution. However, expenditures for most activities designed to prevent catastrophic oil spills or to plan for their cleanup are not allowed by the terms of the civil settlement.

Restoration projects whose primary emphasis is to reduce marine pollution may be considered:

- where the marine pollution is likely to affect the recovery of a part of the injured marine ecosystem, or of injured resources or services; and
- where the project will not duplicate existing agency activities.

Making Decisions About General Restoration Projects

Deciding which General Restoration projects deserve funding involves deciding which restoration tasks are most important, and which projects best accomplish those tasks. When assessing the importance of a General Restoration project, at least the following factors will be considered:

- *Natural recovery*. Is the resource or service recovering? Is it likely to recover even if the General Restoration project is not funded? Will recovery take a very long time? Will the project significantly decrease the time to recovery?

- *The value of an injured resource to the ecosystem and to the public.* Is the resource an endangered or threatened species? What is its ecological significance? To what extent is it used for human purposes such as commercial fishing, recreation, or subsistence?

- *Duration of benefits.* Will the benefits be recognized twenty or thirty years from now?

- *Technical feasibility.* Are the technology and the management skills available to successfully implement the project? Projects of unproven feasibility may be funded if demonstrating the feasibility and then carrying out the project is likely to be an effective method of achieving restoration.

- *Likelihood of success.* If a project is successfully implemented, how likely is it to accomplish its objective? Is it possible to tell whether a project has an effect on recovery?

- *Will the project cause harmful side effects?* Restoration projects should neither adversely affect ecosystem relationships nor adversely affect any injured or noninjured resource or service.

- *Will operation and maintenance support be required?* The Trustee Council will be more favorable to facilities or programs that demonstrate an ability to meet operation and maintenance needs from other than Joint Trustee Funds.

- *Will the project help a single resource or benefit multiple resources?* Preference will be given to projects that benefit multiple resources rather than to those that benefit a single resource. However, appropriate single-resource projects will be considered when they provide effective restoration. This approach will maximize benefits to the ecosystem and to injured resources and services.

- *Effects on health and human safety.* Are there any potential health or safety hazards to the general public?

- *Consistency with applicable laws and policies.* Is the project consistent with federal and state laws and regulations, and with the policies of this plan?

- *Duplication.* Does a project duplicate the actions of another agency or group?

Habitat Protection and Acquisition

Habitat protection and acquisition is one of the principal tools of restoration. It is important in ensuring continued recovery in the spill area.

Resource development, such as harvesting timber or building subdivisions, may alter habitat that supports injured resources or services. Protecting and acquiring land may minimize further injury to resources and services already injured by the spill, and allow recovery to continue with the least interference. For example, the recovery of harlequin ducks might be helped by protecting nesting habitat from future changes that may hamper recovery.

Habitat protection and acquisition may include purchase of private land or interests in land such as conservation easements, mineral rights, or timber rights. Different payment options are possible, including multi-year payment schedules to a landowner. Acquired lands would be managed to protect injured resources and services. In addition, cooperative agreements with private owners to provide increased habitat protection are possible.

Most public comments on the restoration alternatives favored using habitat protection and acquisition as a means of restoration. In addition, most of those who commented also asked that habitat protection and acquisition receive a majority of the remaining settlement fund.

If restoration funds are used to protect a parcel, it must contain habitat important to an injured resource or service. The following injured resources might benefit from the purchase of private land or property rights: pink and sockeye salmon, Dolly Varden and cutthroat trout, Pacific herring, bald eagle, black oystercatcher, common murre, harbor seal, harlequin duck, marbled murrelet, pigeon guillemot, river otter, sea otter, intertidal organisms, and archaeological sites.

Habitat protection and acquisition is a means of restoring not only injured resources, but also the services (human uses) dependent on those resources. Subsistence, recreation, and tourism, benefit from the protection of important fish and wildlife habitats, scenic areas, such as those viewed from important recreation or tourist routes, or important subsistence harvest areas. For example, protecting salmon spawning streams benefits not only the salmon, but also commercial, subsistence, and recreational fishermen.

Habitat protection on existing public land and water may include recommendations for changing agency management practices. The purpose, in appropriate situations, is to increase the level of protection for recovering resources and services above that provided by existing management practices. The Trustee Council may conduct studies within the spill area to determine if changes to public land and water management would help restore injured resources and services. If appropriate, changes will be recommended to state and federal management agencies. Recommendations for special designations, such as parks, critical

habitat areas, or recreation areas, may be made to the Alaska legislature or the U.S. Congress.

Habitat and Acquisition Protection Policies

In addition to the policies of Chapter 2, the following specific policies apply to Habitat Protection and Acquisition.

- *Ranking habitat.* Private land considered for purchase will be ranked according to the potential benefits that purchase and protection would provide to injured resources and services. Those parcels that greatly benefit the injured resources and services will be highly ranked.

- *Willing seller and buyer.* State and federal governments will purchase lands on the basis of a willing seller and a willing buyer.

- *Appraisal process and fair market value.* Land or interests in land shall be acquired in accordance with applicable federal and state laws. In approving the use of joint trustee funds for an acquisition, the Trustee Council will use a standardized appraisal process and specifically consider the restoration benefits to the injured natural resources, services, and the ecosystem relative to the appraised fair market value of the land or interests in land.

- *Ecosystem approach.* Habitat protection will follow an ecosystem approach by emphasizing acquisition of large parcels, such as watersheds, which support multiple injured species and ecologically linked groups of species. Protecting and acquiring small parcels may benefit larger surrounding areas, provide access to public land, or provide critical benefits to a single resource or service.

- *Public comments.* Public comments will be considered when determining habitat protection priorities. Many comments about specific parcels have already been received.

- *Management of acquired land.* Acquired land will be managed by the most appropriate state or federal agency based on the resources to be protected, management needs, and ownership of surrounding and nearby lands.

- *Normal agency management.* Except where specific restoration activities for acquired land exceed normal agency efforts, land management costs will be met from existing agency budgets.

- *Management to benefit injured resources and services.* Lands acquired with restoration funds will be managed in a manner benefitting injured resources and services.

Covenants that outline management objectives will be determined by the time of purchase.

- *Subsistence use.* Subsistence use should not be displaced through acquisition or protection of land or changing management practices.

Making Decisions About Habitat Protection and Acquisition

The Restoration Plan provides general guidance for Habitat Protection and Acquisition activities. More detailed guidance is given in the *Comprehensive Habitat Protection and Acquisition Process: Large Parcel Evaluation and Ranking* (November 1993). This document outlines criteria and procedures for evaluating and ranking large parcels of private lands for protection and acquisition. Further Trustee Council policy is provided in the *Trustee Council Resolution to Proceed with Habitat Protection Program* (January 31, 1993). That short resolution is contained in Appendix B.

The large parcel analysis addresses private property parcels larger than 1,000 acres that are within the spill area and whose owners have indicated an interest in having their lands evaluated for the protection and acquisition program. For each parcel of land, the Trustee Council will decide the type of protection or ownership rights needed for restoration, and how it will be managed. In addition, for each parcel the Council will decide whether and when to begin negotiations with the landowner. The type of protection and management will also be the subject of negotiation with the landowner.

At this writing, Trustee Council staff is analyzing small parcels in the spill area whose owners have indicated a wish to participate in the process. These and similar processes will continue to provide more detailed guidance and information for habitat protection and acquisition activities.

Monitoring and Research

The Monitoring and Research program provides important information to help guide restoration activities. This information includes the status and condition of resources and services: whether they are recovering, whether restoration activities are successful, and what factors may be constraining recovery.

A lack of long-term research into ecosystem relationships and problems may result in less effective restoration and possibly continued injury. Inadequate information may require managers to unduly restrict human use of the resources, and could compound the injury to services, such as commercial fishing and subsistence. Inadequate information may also lead to management actions that inadvertently reduce the productivity and health of a resource, inappropriate restoration actions, or restoration opportunities missed for lack of knowledge.

Monitoring. Monitoring the recovery of injured resources and services has been an important part of the restoration process since the spill occurred. Information about recovery is important in designing restoration activities, and for determining which activities deserve funding. An eligible recovery monitoring project tracks the rate and degree of recovery of the resources and services injured by the spill. It may also determine when recovery has occurred. For resources that are already recovering, it may detect reversals or problems with recovery. For resources that are not recovering, monitoring may determine the status of the injury, whether it is worsening, and when the population stabilizes or recovery begins.

Monitoring is needed periodically at least until a resource recovers. Monitoring will be accomplished according to a monitoring schedule that will forecast monitoring needs and frequency. The schedule will be updated, as needed, to reflect information gained from monitoring and other restoration activities.

Research. An eligible research project provides information needed to restore an injured resource or service. This may include information about key relationships in the ecosystem that are important for one or more injured resource or service. For example, understanding problems with food sources, habitat requirements, and other ecosystem relationships of an injured resource or service will provide information for more effective restoration and management. A project may include research to determine why an injured resource is not recovering. It may also include long-term monitoring of an ecosystem relationship that provides an understanding important for restoration of one or more injured resources. However, all research must be intended to further restoration objectives — to find out why resources are not recovering, or to understand how to accomplish restoration more effectively. The restoration program cannot fund basic research that does not further restoration.

Other Monitoring and Research Policies

In addition to the policies of Chapter 2, the following specific policies apply to Monitoring and Research.

- *Trustee Council responsibility.* The Trustee Council will make or approve funding decisions about monitoring and research activities. The Council is responsible for the restoration of resources and services, including the monitoring and research component of restoration, and cannot assign that responsibility elsewhere.

- *Independent scientific review.* Monitoring and research proposals, as well as the overall program design, will be subject to independent scientific review. Without independent review, the Trustee Council and the public cannot be assured that scientific judgements are free of bias.

- *Integrating local advice.* Local advice about problems and priorities will be integrated into the decision process. The spill area is over 600 miles long. The ecological conditions and problems of the Kodiak Area are different from those of Prince William Sound. For the program to be responsive to local conditions, local advice must be integrated into the annual and long-term decisions about problems, projects, and priorities.

- *An integrated program.* To ensure the maximum benefit from a Monitoring and Research program, all parts of the program must be integrated, and techniques and protocols should be consistent where appropriate.

- *Existing monitoring and research activities.* The Monitoring and Research program will be integrated with existing monitoring and research activities by agencies and other groups, but it will not duplicate or replace them.

Restoration Reserve

Complete recovery from the *Exxon Valdez* oil spill will not occur for decades. For example, some salmon return in cycles of four to six years. To obtain meaningful information about the effect of the oil spill on those runs, fishery biologists may need to examine several cycles. Actions to restore injured salmon runs and monitoring of their recovery could take yet additional cycles. Restoration of this resource is thus likely to span several decades into the future. Similarly, many other resources such as common murres, harlequin ducks, harbor seals, sea otters, and herring appear to be recovering slowly, if at all. Only through long-term observation and, if necessary, restoration actions, can these resources be restored. Moreover, to understand the effect of these injuries on the ecosystem and to take appropriate restoration actions on an ecosystem basis will require actions well into the future.

Annual payments by Exxon Corporation to the Restoration Fund end September 2001. To prepare for that time, and to ensure restoration activities which need to be accomplished after that time have a source of funding, the Trustee Council will place a portion of the annual payments into the Restoration Reserve.

The exact amount placed into the Reserve each year will be determined by the Trustee Council after considering the funding needs for restoration for that year. It is anticipated that $12 million will be allocated to the Reserve each year, subject to the Trustee Council's annual restoration funding process. The Trustee Council intends these funds to be available for restoration in the years following the last payment into the trust fund by Exxon in the year 2001. However, because all restoration needs through the year 2001 are not yet known, the Trustees must have the flexibility to use the reserve to fund restoration projects that are clearly needed and cannot be funded by other means. Therefore, while the Council expects the principal and interest from the reserve to be available following Exxon's last payment, the Trustee Council may, following a finding of need, use the principal or interest retained within the fund before that time.

As part of the 1994 Work Plan, the Council made an initial allocation of $12 million. At this writing, an additional $12 million is proposed in the Draft 1995 Work Plan. If at least $12 million is placed into the reserve each year through 2001, $108 million or more plus interest would be available for funding restoration after Exxon payments end. Funds from the Restoration Reserve could potentially benefit any resource or service injured by the oil spill. All expenditures from the Restoration Reserve must be consistent with the requirements of the Court Settlement.

Public Information, Science Management, and Administration

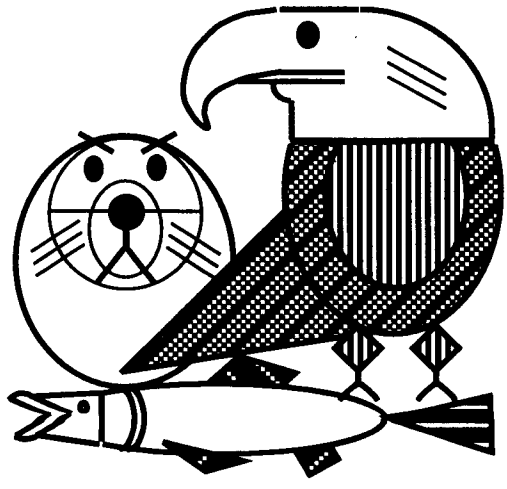
Funding is required to prepare work plans, negotiate for habitat purchases, provide independent scientific review, involve the public, and operate the restoration program. These are necessary administrative expenses that are not attributable to a particular project. The Public Information, Science Management, and Administration category includes these and other public information and outreach functions, including the Public Advisory Group.

The public has voiced concern that too much money is being spent on administration. Administrative expenses averaged 26% of the 1992 Work Plan, 8% of the 1993 Work Plan, and 7% of the 1994 Work Plan. As more restoration activities occur, and as initial planning and implementation expenses finish, administrative expenses will decrease both in absolute terms and as a percentage of the work plan.

Public Information and Administration Policy

The Trustee Council will seek to minimize the administrative cost of the restoration program. The goal is for administrative costs to average no more than 5 percent of overall restoration expenditures over the remainder of the settlement period (through October 2001).

CHAPTER 4 • INJURY



Chapter 4
Injury

Background

The *Exxon Valdez* struck Bligh Reef in March, just before the most biologically active season of the year. The resulting oil spill occurred during the seaward migration of salmon fry, major migrations of birds, and the primary breeding season of most species of birds, mammals, fish, and marine invertebrates in the spill's path. Many animals, such as sea otters and marine birds, were killed by the oil in open water. Approximately 1,500 miles of southcentral Alaska's coastline were oiled (about 350 miles were heavily oiled), frequently with devastating impact to the upper intertidal zone. Direct oiling killed many organisms, and beach cleaning, particularly high-pressure, hot-water washing, had a devastating effect on some intertidal communities. The spill also affected services (human uses), including subsistence, recreation, commercial fishing, and other uses. Some resources and services remain vulnerable to persistent oil in intertidal areas.

Injury to Biological Resources

Natural resource injuries from exposure to oil spilled by the *Exxon Valdez* or due to the cleanup include:

(1) **Mortality**. Death caused immediately or after a period of time by contact with oil, cleanup activities, reductions in critical food sources caused by the spill, or other causes.

(2) **Sublethal Effects**. Injuries that affect the health and physical condition of organisms (including eggs and larvae), but do not result in the death of juvenile or adult organisms. However, injuries that initially appear to be sublethal can, over time, be fatal. Also, some sublethal effects, such as reproductive impairment, can eventually result in population reductions.

(3) **Degradation of Habitat**. Alteration or contamination of flora, fauna, and the physical components of the habitat.

Due to the large geographical area, multiple habitat types, and many species impacted by the spill, it is highly unlikely that all injuries to natural resources will be studied or fully documented.

Injuries Resulting in a Population Decline. The most serious injuries result in large population declines. In these cases, injury may persist for more than one generation. For example, the common murre was the most severely impacted bird species. Several large

colonies in the Gulf of Alaska may have lost 35 to 70 percent of their breeding adults, a loss that may not be restored for many generations. Another example is in intertidal areas where populations of many species of plants and invertebrates declined as a result of oiling and cleanup.

If serious enough, mortality, sublethal injuries, or degradation of habitat may result in measurable population declines. For example, sublethal injuries that impair reproductive ability in a large portion of a population could result in a population decline.

Injuries Not Resulting in a Measurable Population Decline. There are several reasons why population declines were not measured in some species.

(1) The injury may not have been severe enough to cause mortality or a population decline.

(2) Spill-related population declines may have been impossible to distinguish from natural variations in population levels. Population census techniques are usually able to detect only relatively large population changes.

(3) Population declines may have occurred initially but some species may have compensated by increasing productivity. The net effect would be no reduction in population.

(4) Some species were not studied or were studied insufficiently to determine any injury, including population declines.

Injury to Other Resources

The cleanup increased public knowledge of archaeological site locations, which resulted in looting and vandalism of archaeological resources. Also, archaeological sites may have been damaged by oiling. Archaeological resources could be irretrievably lost if looting and vandalism continue. Since archaeological resources, such as sites and artifacts, are not living, renewable resources, they have no capacity to heal themselves.

The spilled oil also contaminated waters adjacent to designated Wilderness Areas, and was deposited above the high tide line in many cases. The intense cleanup resulted in an unprecedented disturbance of the area's undeveloped and normally uninhabited landscape. The massive intrusion of people and equipment associated with cleanup has ended, but direct injury to wilderness and intrinsic values lingers.

Reduced or Lost Services

The oil spill affected a wide range of services (human uses), including commercial fishing, subsistence (hunting, fishing, and gathering), passive use, recreation and tourism. Examples of recreation include sea kayaking, backcountry camping, sport fishing, and hunting.

Services were reduced or lost if the *Exxon Valdez* oil spill or cleanup:

(1) reduced the physical or biological functions performed by natural resources that support services; or
(2) reduced aesthetic and intrinsic values, or other indirect uses provided by natural resources; or
(3) reduced the desire of people to use a natural resource or area.

Resources and Services Injured by the Spill

Table 1 lists the resources and services injured by the spill. The table breaks down biological resources into those that are recovering and not recovering, and those for which the recovery status is unknown. It includes only those biological resources for which scientific research has demonstrated a population-level injury, or continuing chronic effects. A complete list of injuries demonstrated from damage assessment or restoration studies is provided in Appendix A.

Because restoration funds must be used to restore resources and services injured by the spill, information about injuries has considerable importance in determining restoration activities. The injury information in this plan is based on the best available information to date, but it is not necessarily a final summarization of resources that have been injured. Because of the large geographical area, multiple habitat types, and many species impacted by the oil spill, it is likely that not all injuries to natural resources were studied or fully documented. If new information or research demonstrates spill-induced population declines or continued sublethal impacts in other biological resources, then the injury information in the plan must be amended to include additional resources as appropriate.

Restoration actions may address resources that are not listed as injured if these activities will benefit an injured resource or service. For example, it may be permissible to focus activities on an uninjured resource if aiding the resource will help a service such as subsistence or commercial fishing, or if it is a necessary part of a research project designed to help understand the injuries of an injured resource. (See Policy 4 in Chapter 2).

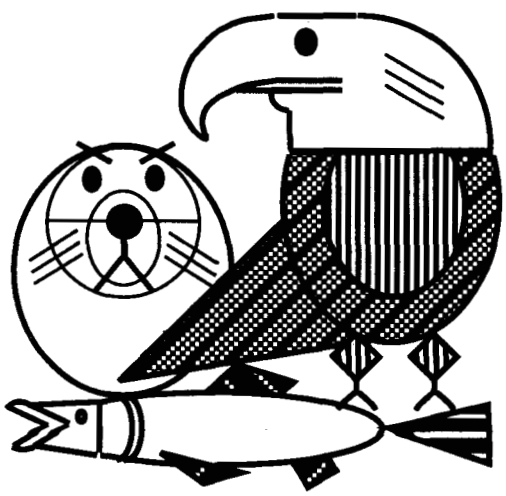
Table 2. Resources and Services Injured by the Spill

Biological resources in the table experienced population-level or continuing sublethal injuries.

INJURED RESOURCES			Lost or Reduced SERVICES
Biological Resources		**Other**	
Recovering Bald eagle Black oystercatcher Intertidal organisms (some) Killer whale Mussels Sockeye salmon (Red Lake) Subtidal organisms (some)	**Not Recovering** Common murre Harbor seal Harlequin duck Intertidal org. (some) Marbled murrelet Pacific herring Pigeon guillemot Pink salmon Sea otter Sockeye salmon (Kenai & Akalura systems) Subtidal organisms (some)	Archaeological resources Designated wilderness areas Sediment	Commercial fishing Passive uses Recreation and Tourism including sport fishing, sport hunting, and other recreation uses Subsistence
Recovery Unknown Clams Cutthroat trout Dolly Varden River otter Rockfish			

Amending the List of Injured Resources and Services. The list of injured resources and services will be reviewed as new information is obtained. For example, research and monitoring will hopefully show that recovery is beginning for many of the resources which currently show little or no signs of recovery. In addition, information may be submitted to add resources to the list. This information can include research results, assessment of population trends, ethnographic and historic data, and supportive rationale. Information that has been through an appropriate scientific review process is preferable. If data have not been peer reviewed, they should be presented in a format that permits and facilitates peer review. Information to change the list will be reviewed through the Trustee Council's scientific review process.

CHAPTER 5 • GOALS, OBJECTIVES, & STRATEGIES



Chapter 5
Goals, Objectives, and Strategies

This chapter presents goals, objectives, and strategies for restoration. The first part of this chapter discusses goals, objectives, and strategies in general. The second part describes the nature and extent of injury and recovery, the recovery objective, and the restoration strategy for each injured resource and service discussed in Table 2 in Chapter 4. Detailed information on injury, objectives, and strategies can be found on the following pages:

Overview

The first part of this chapter discusses goals, objectives, and strategies in general. A goal is the end toward which an endeavor is directed; objectives are descriptions of measurable outcomes; and strategies are plans of action. Taken together, goals, objectives, and strategies produce a blueprint for restoring the spill area. To be funded, a project must be consistent with the goals and policies of the Restoration Plan and with restoration objectives and strategies as they change over time.

GOAL: *The end toward which restoration is directed*

The goal of restoration is recovery of all injured resources and services. Recovery is to be sustained by healthy, productive ecosystems that maintain naturally occurring biodiversity. All restoration actions must be directed toward this goal.

OBJECTIVES: *Measurable outcomes of restoration*

The objectives of the restoration program are measurable conditions that signal the recovery of individual resources or services. They are the yardsticks against which the success of the program is measured.

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. For some resources, little is known about their injury and recovery, so it is difficult to define recovery.

Where little prespill data exist, 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 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.

Full ecological recovery will have been achieved when the population of flora and fauna are again present at former or prespill abundances, healthy and productive, and there is a full complement of age classes at the level that would have been present had the spill not occurred. A recovered ecosystem provides the same functions and services as would have been provided had the spill not occurred.

STRATEGIES: *Plans of action*

A restoration strategy is a plan of action for achieving objectives. Each year, the Trustee Council decides, through its annual or multiyear work plan, which strategies to implement. Restoration strategies reflect consideration of ecosystem relationships. For example, the strategy for some injured resources includes research into why they are not recovering, such as declining or contaminated food sources or disruption of ecosystem relationships.

In this section, restoration strategies are presented under three headings: Biological Resources, Other Resources, and Services.

Biological Resources

Because restoration strategies for biological resources depend on whether the resource is recovering, strategies are subdivided into those for recovering resources, resources that are not recovering, and resources whose recovery is unknown.

Recovering Resources. The fact that a resource is recovering suggests that nature will restore it without intervention. Consequently, restoration of recovering resources will rely primarily on natural recovery.

Because these resources are recovering, research into factors limiting recovery and general restoration projects to accelerate recovery may not be warranted. However, if a resource is not expected to recover fully on its own or if waiting for natural recovery will cause long-term harm to a community or service, appropriate alternative means of restoration would be undertaken. Habitat protection and monitoring are encouraged, as are general restoration projects that protect the resource from other sources of potential injury. (Restoration strategies under "Services" also apply to these resources.)

The restoration strategy for recovering resources has three parts:

- Rely on natural recovery
- Monitor recovery
- Protect injured resources and their habitats

Resources Not Recovering. Except for certain protective measures, attempts to restore these resources without knowing why they are not recovering may be ineffectual or even detrimental. For this reason, the restoration strategy for these resources emphasizes determining why they are not recovering and eliminating threats to the remaining populations.

Where sufficient knowledge about the nature of injury exists, the restoration strategy also encourages actions to promote recovery. The populations of some of these resources are in a steep decline and may not recover without help. Furthermore, some of these resources have subsistence or economic importance and their recovery is linked to the recovery of these services. (Restoration strategies under "Services" also apply to these resources.)

Research is encouraged, provided it helps explain why a resource is not recovering. Habitat protection and monitoring are also encouraged. General restoration projects are allowed if they address factors limiting recovery or if they protect the resource from other sources of potential injury.

The restoration strategy for resources that are not recovering has four parts:

- Conduct research to find out why these resources are not recovering
- Initiate, sustain, or accelerate recovery
- Monitor recovery
- Protect injured resources and their habitats

Recovery Unknown. If specialists do not know whether a resource is recovering, it will be treated in much the same way as a recovering resource. Until more is known about the nature and extent of injuries and the degree of recovery of these resources, restoration will rely primarily on natural recovery, aided by monitoring and protective measures.

Because the recovery of these resources is unknown and, in some cases, the injury poorly understood, research into factors limiting recovery and general restoration projects to accelerate recovery may not be warranted. Habitat protection and monitoring are encouraged, as are general restoration projects that protect these resources from other sources of potential injury.

The restoration strategy for resources whose recovery is unknown has three parts:

- Rely on natural recovery
- Monitor recovery
- Protect injured resources and their habitats

Other Resources

Other injured resources include archaeological resources, designated wilderness areas and oiled sediment. The strategy for restoring archaeological resources seeks to repair and protect injured sites and artifacts. The strategy for sediment includes removal or reduction of residual oil and monitoring. Any restoration strategy that aids recovery of injured resources, or prevents further injuries, will assist recovery of designated wilderness areas or wilderness study areas.

Services

Commercial fishing, passive use, recreation and tourism (including sport fishing) and subsistence are services that were reduced or lost because of the spill. Injured resources that support these services include clams, harbor seals, Pacific herring, pink salmon, sea otters, and sockeye salmon. The primary way to restore services is to restore the resources on which they depend.

Additional restoration strategies for commercial fishing, recreation and tourism, and subsistence include promoting recovery of the service as soon as possible through such

means as increasing the availability, reliability, or quality of the resource on which the service depends. For some resources, this may take the form of increasing availability in the long run through improved resource management or providing replacement resources. Strategies for recreation and tourism and subsistence also include removing or reducing residual oil if treatment is cost effective and less harmful than leaving the oil in place.

Objectives and Strategies by Resource and Service

This section describes the nature and extent of injury and recovery, the recovery objective, and the restoration strategy for each injured resource and service. The information in this section is expected to change over time as the restoration program adapts to new information. For example, population decline or sublethal effects may be documented for new resources, some resources may begin to recover, and objectives and strategies may change in response to new conditions. Hypotheses for why resources are not recovering are particularly susceptible to change as prevailing hypotheses are tested and new ones are formed.

New scientific data will be incorporated into restoration decisions without the need to change the plan. However, changes will be reported in the Trustee Council's annual status report.

ARCHAEOLOGICAL RESOURCES

Injury and Recovery

Twenty-four archaeological sites are known to have been adversely affected by cleanup activities, or looting and vandalism linked to the oil spill. Injuries include theft of surface artifacts, masking of subtle clues used to identify and classify sites, violation of ancient burial sites, and destruction of evidence in layered sediments. In addition, vegetation has been disturbed, which has exposed sites to accelerated erosion. The effect of oil on soil chemistry and organic remains may reduce or eliminate the utility of radiocarbon dating in some sites.

Assessments of 14 sites in 1993 suggest that most of the archaeological vandalism that can be linked to the *Exxon Valdez* oil spill occurred in 1989 before adequate constraints were put into place over the activities of oil spill cleanup personnel. Most vandalism took the form of "prospecting" for high yield sites. In 1993, only two of the 14 sites visited showed signs of continued vandalism and the link between this recent vandalism and the *Exxon Valdez* oil spill remains highly problematical. Oil samples have not yet been analyzed, but oil was visible in the intertidal zones of two of the 14 sites.

Recovery Objective

Archaeological resources are nonrenewable: they cannot recover in the same sense as biological resources. Archaeological resources will be considered recovered when spill-related injury ends, looting and vandalism are at or below prespill levels, and the artifacts and scientific data which remain in vandalized sites are preserved. Artifacts and data are

typically preserved through excavation or other forms of documentation, or through site stabilization, depending on the nature of the injury and the characteristics of the site.

Restoration Strategy

Repair spill-related injury to archaeological sites and artifacts. Injuries may be repaired to some extent through stabilizing eroding sites, or removing and restoring artifacts.

Protect sites and artifacts from further injury and store them in appropriate facilities. Archaeological sites and artifacts could be protected from further injury through the reduction of looting and vandalism, or the removal of artifacts from sites and storage in appropriate facilities. Opportunity for people to view or learn about the cultural heritage of people in the spill area would also provide protection by increasing awareness and appreciation of cultural heritage and would replace services lost as a result of irretrievable damage to some artifacts.

Monitor recovery. Monitor a small number of sites vulnerable to serious, commercial looting.

BALD EAGLES

Injury and Recovery

Two hundred to 300 bald eagles may have been killed in the spill. However, population estimates made in 1989, 1990, and 1991 indicate that there may have been an increase in the Prince William Sound bald eagle population since the previous survey conducted in 1984. Productivity decreased in 1989, but appeared to have recovered by 1990. Because population and productivity appear to have returned to prespill levels, bald eagles may have already recovered from the effects of the spill.

Recovery Objective

Bald eagles will have recovered when their population **and** productivity return to prespill levels.

Restoration Strategy

Rely on natural recovery. Natural processes aided by protective measures will be the main agents of restoration.

Monitor recovery. Monitor the population and productivity of bald eagles in Prince William Sound until full recovery is confirmed and perhaps at intervals thereafter. The eagle population in Prince William Sound is expected to increase to its prespill level in 1994. There are not enough prespill data on eagle populations in other parts of the spill area to warrant surveys outside Prince William Sound.

Protect bald eagles and their habitat. With regard to bald eagles, the objective of habitat protection is to ensure maintenance of adequate nesting habitat and reduce disturbance in feeding and roosting areas.

BLACK OYSTERCATCHERS

Injury and Recovery

Within Prince William Sound, an estimated 120 to 150 black oystercatchers, representing 12 to 15 percent of the total estimated population, died as a result of the spill. Mortality outside of Prince William Sound is unknown. Black oystercatchers are recovering, although they may still be exposed to hydrocarbons when feeding in intertidal areas.

Recovery Objective

Black oystercatchers will have recovered when Prince William Sound populations attain prespill levels and when reproductive success of nests and growth rates of chicks raised in oiled areas are comparable to those in unoiled areas.

Restoration Strategy

Rely on natural recovery. Natural processes aided by protective measures will be the main agents of restoration.

Monitor recovery. Monitor population abundance and distribution and the growth rates of chicks.

Protect black oystercatchers and their habitat. With regard to black oystercatchers, the objective of habitat protection is to reduce disturbance to feeding and nesting sites.

CLAMS

Injury and Recovery

Littleneck clams and butter clams on sheltered beaches were killed by oiling and cleanup activities. In addition, growth appeared to be reduced by oil, but determination of sublethal or chronic effects is awaiting final analyses.

Recovery Objective

Clams will have recovered when populations and productivity have returned to levels that would have prevailed in the absence of the oil spill (prespill data or unoiled control sites).

Restoration Strategy

Clams are important for subsistence use and also serve as prey for sea otters and sea ducks such as harlequin ducks and pigeon guillemots. For additional restoration strategies, see *Subsistence, Sea Otters, Harlequin Ducks* and *Pigeon Guillemots.*

Rely on natural recovery. Natural processes aided by protective measures will be the main agents of restoration.

Monitor recovery. Monitor the density and size of clams in select clam beds.

Protect injured clam beds. With regard to intertidal biota like clams, the objective of habitat protection is to maintain water quality along the shoreline and reduce disturbance in nearshore areas. Clams can also be protected by reducing marine pollution.

COMMERCIAL FISHING

Injury and Recovery

Commercial fishing was injured through injury to commercial fish species and also through fishing closures. Continuing injuries to commercial fishing may cause hardships for fishermen and related businesses. Each year that commercial fishing remains below prespill levels compounds the injury to the fishermen and, in many instances, the communities in which they live or work.

The Trustee Council recognizes the impact to communities and people of the Prince William Sound region resulting from the sharp decline in pink salmon and herring fisheries in past years. In 1994, the Trustee Council committed over six million dollars to help address these issues through the development of an ecosystem-based study for Prince William Sound. Some of the pink salmon and herring problems may be unrelated to the spill. However, the Council will continue to address these important problems.

Recovery Objective

Commercial fishing will have recovered when the 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.

Restoration Strategy

The primary method for restoring commercial fishing is to restore the species that are fished commercially, such as pink salmon, Pacific herring, and sockeye salmon. These species are discussed elsewhere in this chapter. Three additional parts of the strategy for restoring commercial fishing are the following:

Promote recovery of commercial fishing as soon as possible. Many communities that rely on commercial fishing will be significantly harmed while waiting for commercial fish resources to recover through natural recovery alone. Therefore, an objective of restoration is to accelerate recovery of commercial fishing. This objective may be accomplished through increasing availability, reliability, or quality of commercial fish resources, depending on the nature of the injury. For resources that have sharply declined since the spill, such as pink salmon, and Pacific herring in Prince William Sound, this objective may take the form of increasing availability in the long run through improved fisheries management. Another example is providing replacement fish for harvest.

Protect commercial fish resources from further degradation. Further stress on commercial fish resources could impede recovery. Appropriate protection can take the form of habitat

protection and acquisition if a resource faces loss of habitat. The Trustee Council can also contribute to the protection of commercial fish species by providing information needed to improve their management.

Monitor recovery. Monitoring the recovery of commercial fishing will track the progress of recovery, detect major reversals, and identify problems with the resources and resource management that may affect the rate or degree of recovery. Inadequate information may require managers to unduly restrict use of the injured resources, compounding the injury to commercial fishing.

COMMON MURRES

Injury and Recovery

Productivity of common murres shows signs of recovery at some injured colonies (Barren Islands, Puale Bay) but postspill population counts are still lower than prespill estimates and show no sign of recovery.

Recovery Objective

Common murres will have recovered when population trends are increasing significantly at index colonies in the spill area and when reproductive timing and success are within normal bounds. (Normal bounds will be determined by comparing productivity data with information from other murre colonies in the Gulf of Alaska and elsewhere.)

Restoration Strategy

Conduct research to find out why common murres are not recovering. Suspected causes include avian predation and behavioral change which inhibits breeding productivity at some colonies.

Initiate, sustain, or accelerate recovery. Once scientists determine why common murres are not recovering, efforts may be undertaken to accelerate recovery.

Monitor recovery. Monitor populations at index colonies such as the Chiswell Islands, Barren Islands, Triplets, Ungaiushak Island and Puale Bay. In addition, monitor the productivity of common murres at the Barren Islands.

Protect common murres and their habitat. With regard to common murres, the objective of habitat protection is to reduce disturbance in nearshore feeding areas and near nesting colonies.

CUTTHROAT TROUT

Injury and Recovery

Cutthroat trout have grown more slowly in oiled areas than in unoiled areas. Insufficient data are available to determine whether they are recovering.

Recovery Objective

Cutthroat trout will have recovered when growth rates within oiled areas are comparable to those for unoiled areas.

Restoration Strategy

Cutthroat trout is one of the species on which sport fishing in the spill area depends. For additional restoration strategies, see *Recreation and Tourism.*

Rely on natural recovery. Natural processes aided by protective measures will be the main agents of restoration.

Monitor recovery. Monitor growth rates in injured populations.

Protect cutthroat trout and their habitat. With regard to cutthroat trout, the objective of habitat protection is to ensure maintenance of adequate water quality, riparian habitat, and intertidal habitat for spawning. The Trustee Council can also contribute to the protection of cutthroat trout by providing information needed to improve their management. Examples of protective management practices are the conservative limits on sport-fish harvests that have been adopted by the Alaska Board of Fisheries for parts of Prince William Sound.

DESIGNATED WILDERNESS AREAS

Injury and Recovery

The oil spill delivered oil in varying quantities to the waters adjoining the seven areas within the spill area designated as wilderness areas and wilderness study areas. Oil was also deposited above the mean high tide line in these areas. During the intense cleanup seasons of 1989 to 1990, thousands of workers and hundreds of pieces of equipment were at work in the spill area. This activity was an unprecedented imposition of people, noise, and activity on the area's undeveloped and normally sparsely occupied landscape.

Recovery Objective

Designated wilderness areas will have recovered when oil is no longer encountered in these areas and the public perceives them to be recovered from the spill.

Restoration Strategy

Any restoration strategy that aids recovery of injured resources, or prevents further injuries, will assist recovery of designated wilderness areas. No strategies have been identified that benefit only designated wilderness areas without also addressing injured resources.

DOLLY VARDEN

Injury and Recovery

Dolly Varden have grown more slowly in oiled areas than in unoiled areas. Insufficient data are available to determine whether they are recovering.

Recovery Objective

Dolly Varden will have recovered when growth rates within oiled areas are comparable to those for unoiled areas.

Restoration Strategy

Dolly Varden is one of the species on which sport fishing in the spill area depends. For additional restoration strategies, see *Recreation and Tourism.*

Rely on natural recovery. Natural processes aided by protective measures will be the main agents of restoration.

Monitor recovery. Monitor growth rates in injured populations.

Protect Dolly Varden and their habitat. With regard to Dolly Varden, the objective of habitat protection is to ensure maintenance of adequate water quality, riparian habitat, and intertidal habitat for spawning and rearing. The Trustee Council can also contribute to the protection of Dolly Varden by providing information needed to improve their management. Examples of protective management practices are the conservative limits on sport-fish harvests that have been adopted by the Alaska Board of Fisheries for parts of Prince William Sound.

HARBOR SEALS

Injury and Recovery

Harbor seal numbers were declining in Prince William Sound before the spill. Following the spill, seals in the oiled area had declined 43 percent, compared to 11 percent in the unoiled area. Counts made during the molt at trend count sites in Prince William Sound from 1990 to 1993 indicate that numbers may have stabilized. However, counts during pupping have continued to decline. It is not known which counts are the best indicator of population status. If the conditions that were causing the population to decline before the spill have improved, normal growth may replace the animals that were lost. However, if conditions continue to be unfavorable, the affected population may continue to decline. Harbor seals are a key subsistence resource in Prince William Sound and subsistence hunting is both affected by and may be affecting harbor seal status.

Recovery Objective

Recovery will have occurred when harbor seal population trends are stable or increasing.

Restoration Strategy

Harbor seals are important for subsistence use. For additional restoration strategies, see *Subsistence.*

Conduct research to find out why harbor seals are not recovering. Suspected causes include limited or changing availability of prey, particularly forage fishes; predation by killer whales; and resource exploitation through subsistence take or incidental take associated with fisheries.

Initiate, sustain, or accelerate recovery of harbor seals. Once scientists determine why harbor seals are not recovering, efforts may be undertaken to accelerate recovery.

Monitor recovery. Monitor trends in Prince William Sound during pupping and molting for comparison with previous years' data.

Protect harbor seals and their habitat. With regard to harbor seals, the objective of habitat protection is to reduce disturbance at haulout sites and pupping sites, and in nearshore feeding areas. Another way of protecting harbor seals is to provide information that will help subsistence hunters assess the effects of their harvest.

HARLEQUIN DUCKS

Injury and Recovery

There are indications of reduced densities of harlequin ducks in the breeding season; a declining trend in the summer, postbreeding population; and very poor production of young in western Prince William Sound.

Recovery Objective

Harlequin ducks will have recovered when breeding and postbreeding season densities and production of young return to estimated prespill levels, or when there are no differences in these parameters between oiled and unoiled areas.

Restoration Strategy

Harlequin ducks are hunted for subsistence and sport. For additional restoration strategies, see *Subsistence* and *Recreation and Tourism*.

Conduct research to find out why harlequin ducks are not recovering. Although the exact cause of reproductive failure among resident birds is unknown, it is believed to be related to ingestion of oil-contaminated prey from foraging in oiled mussel beds.

Initiate, sustain, or accelerate recovery. Once scientists determine why harlequin ducks are not recovering, efforts may be undertaken to accelerate recovery. If ingestion of oiled mussels is found to limit the recovery of harlequin ducks, cleaning oiled mussel beds may hasten recovery.

Monitor recovery. Monitor the breeding-age population in Prince William Sound, as well as numbers of young, brood distribution, and abundance of postbreeding harlequins.

Protect harlequin ducks and their habitat. With regard to harlequin ducks, the objective of habitat protection is to ensure maintenance of adequate riparian habitat for nesting and brood rearing, and reduce disturbance to nearshore feeding, molting, brood-rearing habitats. The Trustee Council can also contribute to the protection of harlequin ducks by providing information needed to improve their management. An example of protective management practices is the restriction on sport hunting of harlequin ducks imposed by the Alaska Board of Game in 1991.

INTERTIDAL ORGANISMS

Injury and Recovery

The lower intertidal zone and, to some extent, the middle intertidal zone are recovering. However, injuries persist in the upper intertidal zone, especially on rocky sheltered shores. Recovery of this zone appears to depend, in part, on the return of adult *Fucus* in large numbers.

Recovery Objective

Each intertidal elevation (lower, middle, or upper) will have recovered when community composition, population abundance of component species, age-class distribution, and ecosystem functions and services in each injured intertidal habitat have returned to levels that would have prevailed in the absence of the oil spill.

Restoration Strategy

Conduct research to find out why some intertidal organisms are not recovering. Possible explanations include changes in the community structure resulting from spill-induced changes in predators; changes in the population of benthic prey; and limitations in recruitment processes (the availability of new organisms to repopulate the area).

Initiate, sustain, or accelerate recovery. Once scientists determine why some intertidal organisms are not recovering, efforts may be undertaken to accelerate recovery.

Monitor recovery. Monitor matched oiled and unoiled intertidal sites, incorporating a variety of habitat types.

Protect intertidal organisms and their habitat. With regard to intertidal biota, the objective of habitat protection is to maintain water quality along the shoreline and reduce disturbance in nearshore areas. Intertidal organisms can also be protected by reducing marine pollution.

KILLER WHALES

Injury and Recovery

Thirteen whales disappeared from one killer whale pod in Prince William Sound between 1988 and 1990. The injured pod is growing again.

Recovery Objective

Killer whales will have recovered when the injured pod grows to at least 36 individuals (1988 level).

Restoration Strategy

Rely on natural recovery. Natural processes aided by protective measures will be the main agents of restoration.

Monitor recovery. Monitor the injured pod (AB pod) of killer whales in Prince William Sound.

MARBLED MURRELETS

Injury and Recovery

Marbled murrelet populations in Prince William Sound were in decline before the spill. The causes of the prespill decline are unknown. The oil spill probably increased the prespill rate of decline for this species in the spill area, although the incremental injury is difficult to estimate. The population of marbled murrelets may be stabilizing or even increasing since the spill.

Recovery Objective

Marbled murrelets will have recovered when population trends are increasing.

Restoration Strategy

Conduct research to find out why marbled murrelets are not recovering. Likely causes include avian and mammalian predation, climatic/oceanographic features and prey limitation. Also of concern are the effects of resource exploitation (incidental gillnet catch) and upland development.

Initiate, sustain, or accelerate recovery. Once scientists determine why marbled murrelets are not recovering, efforts may be undertaken to accelerate recovery.

Monitor recovery. Monitor the marbled murrelet population in Prince William Sound.

Protect marbled murrelets and their habitat. With regard to marbled murrelets, the objective of habitat protection is to ensure maintenance of adequate nesting habitat and reduce disturbance to nearshore feeding and broodrearing habitats.

MUSSELS

Injury and Recovery

In 1991, relatively high concentrations of oil were found in mussels and in the dense underlying mat (byssal substrate) of certain oiled mussel beds. These beds were not cleaned nor was oil removed after the spill. The oiled mussel beds are potential sources of fresh (unweathered) oil for harlequin ducks, black oystercatchers, river otters, and juvenile sea otters, all of which feed on mussels and show signs of continuing injury. The extent and magnitude of oiled mussel beds are unknown.

Recovery Objective

Mussels will have recovered when their populations and productivity are at prespill levels and they do not contain oil that contaminates higher trophic levels.

Restoration Strategy

Initiate, sustain, or accelerate recovery. Cleaning oiled mussel beds hastens their recovery and that of species that feed on them, such as harlequin ducks and juvenile sea otters.

Monitor recovery. Monitor the health of mussels and the concentration and degradation of oil in mussel beds identified as contaminated.

Protect mussels and their habitat. With regard to intertidal biota like mussels, the objective of habitat protection is to maintain water quality along the shoreline and reduce disturbance in nearshore areas. Mussels can also be protected by reducing marine pollution.

PACIFIC HERRING

Injury and Recovery

Pacific herring studies have demonstrated egg mortality and larval deformities. Populations may have declined, but there is uncertainty as to the full extent and mechanism of injury. However, the stocks and dependent fisheries in Prince William Sound are not healthy, as indicated by the low spawning biomass in 1993 and 1994 and the resultant elimination of the fisheries in those years.

Recovery Objective

Pacific herring will have recovered when populations are healthy and productive and exist at prespill abundances.

Restoration Strategy

Pacific herring are important for subsistence use and commercial fishing. For additional restoration strategies, see *Subsistence* and *Commercial Fishing*.

Conduct research to find out why Pacific herring are not recovering. A leading hypothesis is that when the abundance of zooplankton is low, predatory fish and birds switch from a zooplankton diet to juvenile salmon and herring, thereby reducing survival of the juveniles. Other possible causes are disease, heritable genetic damage, oil toxicity, the impact of winter conditions on herring survival and reproductive success, and the advective transport of herring larvae from rearing areas in Prince William Sound.

Initiate, sustain, or accelerate recovery of Pacific herring. Once scientists determine why Pacific herring are not recovering, efforts may be undertaken to accelerate recovery.

Monitor recovery. Monitor fish health and spawning biomass.

Protect Pacific herring and their habitat. With regard to Pacific herring, the objective of habitat protection is to ensure maintenance of adequate water quality, riparian habitat and intertidal habitat for spawning and rearing. The Trustee Council can also contribute to the protection of Pacific herring by providing information needed to improve their management. An example of protective management practices is the closure of the fishery by the Alaska Department of Fish and Game due to the failure of the herring run in Prince William Sound in 1993 and 1994.

PASSIVE USE

Injury and Recovery

Passive use of resources includes the appreciation of the aesthetic and intrinsic values of undisturbed areas, the value derived from simply knowing that a resource exists, and other nonuse values. Injuries to passive uses are tied to public perceptions of injured resources.

Recovery Objective

Passive uses will have recovered when people perceive that aesthetic and intrinsic values associated with the spill area are no longer diminished by the oil spill.

Restoration Strategy

Any restoration strategy that aids recovery of injured resources, or prevents further injuries, will assist recovery of passive use values. No strategies have been identified that benefit only passive uses, without also addressing injured resources. Since recovery of passive uses requires that people know when recovery has occurred, the availability to the public of the latest scientific information will continue to play an important role in the restoration of passive uses.

PIGEON GUILLEMOT

Injury and Recovery

The pigeon guillemot population in Prince William Sound was in decline before the spill. The causes of the prespill decline are unknown.

Recovery Objective

Pigeon guillemots will have recovered when populations are stable or increasing.

Restoration Strategy

Conduct research to find out why pigeon guillemots are not recovering. Likely causes include climatic/oceanographic features, prey limitation, and predation.

Initiate, sustain, or accelerate recovery. Once scientists determine why pigeon guillemots are not recovering, efforts may be undertaken to accelerate recovery.

Monitor recovery. Monitor the pigeon guillemot population in Prince William Sound.

Protect pigeon guillemots and their habitat. With regard to pigeon guillemots, the objective of habitat protection is to ensure maintenance of adequate nesting habitat and reduce disturbance to nearshore feeding and broodrearing habitats.

PINK SALMON

Injury and Recovery

Pink salmon studies have demonstrated egg mortality, fry deformities, and reduced growth in juveniles. Populations may have declined, but there is uncertainty as to the full extent and

mechanism of injury. However, there is evidence of continued damage in some stocks from exposure to oil, and there were unexpectedly poor runs of both wild and hatchery stocks of pink salmon in Prince William Sound in 1992 and 1993. In 1994, runs were still depressed but exceeded forecasts.

Recovery Objective

Pink salmon will have recovered when populations are healthy and productive and exist at prespill abundance. An indication of recovery is when egg mortalities in oiled areas match prespill levels or levels in unoiled areas.

Restoration Strategy

Pink salmon is important for subsistence use and commercial fishing. For additional restoration strategies, see *Subsistence* and *Commercial Fishing*.

Conduct research to find out why pink salmon are not recovering. A leading hypothesis is that when the abundance of zooplankton is low, predatory fish and birds switch from a zooplankton diet to juvenile salmon and herring, thereby reducing survival of the juveniles. Other possible causes are heritable genetic damage and oil toxicity.

Initiate, sustain, or accelerate recovery of pink salmon. Once scientists determine why pink salmon are not recovering, efforts may be undertaken to accelerate recovery.

Monitor recovery. Monitor egg mortality, escapement, and return-per-spawner productivity.

Protect pink salmon and their habitat. With regard to pink salmon, the objective of habitat protection is to ensure maintenance of adequate water quality, riparian habitat and intertidal habitat for spawning and rearing. The Trustee Council can also contribute to the protection of pink salmon by providing information needed to improve their management. An example of protective management practices is restriction of the fishery by the Alaska Department of Fish and Game due to poor returns of pink salmon to Prince William Sound in 1992 and 1993.

RECREATION AND TOURISM

Injury and Recovery

The spill disrupted use of the spill area for recreation and tourism. Resources important for wildlife viewing include killer whale, sea otter, harbor seal, bald eagle, and various seabirds. Residual oil exists on some beaches with high value for recreation and may decrease the quality of recreational experiences and discourage recreational use of these beaches.

Closures on sport hunting and fishing also affected use of the spill area for recreation and tourism. Sport fishing resources include salmon, rockfish, Dolly Varden, and cutthroat trout. Harlequin ducks are hunted in the spill area.

Recreation was also affected by changes in human use in response to the spill. For example, displacement of use from oiled areas to unoiled areas increased management problems and

facility use in unoiled areas. Some facilities, such as the Green Island cabin and the Fleming Spit camp area, were injured by cleanup workers.

Recovery Objective

Recreation and tourism will have recovered, in large part, when the fish and wildlife resources on which they depend have recovered, recreation use of oiled beaches is no longer impaired, and facilities and management capabilities can accommodate changes in human use.

Restoration Strategy

Preserve or improve the recreational and tourism values of the spill area. Habitat protection and acquisition are important means of preserving and enhancing the opportunities offered by the spill area. Facilities damaged during cleanup may be repaired if they are still needed. New facilities may restore or enhance opportunities for recreational use of natural resources. Improved or intensified public recreation management may be warranted in some circumstances. Projects that restore or enhance recreation and tourism would be considered only if they are consistent with the character and public uses of the area. However, all projects to preserve and improve recreation and tourism values must be related to an injured natural resource. See Policy 9 in Chapter 2.

Remove or reduce residual oil if treatment is cost effective and less harmful than leaving the oil in place. Removal of residual oil from beaches with high value for recreation and tourism may restore these services for some users. However, this benefit would have to be balanced against cost and the potential for further disruption to intertidal communities.

Monitor recovery. Monitor the recovery of resources used for recreation and tourism. Also monitor changes in recreation and tourism in the spill area.

RIVER OTTERS

Injury and Recovery

River otters in Prince William Sound have suffered sublethal effects from the spill and may continue to be exposed to hydrocarbons.

Recovery Objective

Indications of recovery are when habitat use, food habitats and physiological indices have returned to prespill conditions.

Restoration Strategy

Rely on natural recovery. Natural processes aided by protective measures will be the main agents of restoration.

Monitor recovery. Monitor the health and habitat use of river otters in Prince William Sound.

Protect river otters and their habitat. With regard to river otters, the objective of habitat protection is to ensure maintenance of adequate riparian and shoreline habitats for feeding and denning.

ROCKFISH

Injury and Recovery

Dead adult rockfish were recovered following the oil spill. Other rockfish were exposed to hydrocarbons and showed sublethal effects. Furthermore, closures to salmon fisheries increased fishing pressures on rockfish which may be affecting their population. However, the extent and mechanism of injury to this species are unknown.

Recovery Objective

Without further study, recovery cannot be defined.

Restoration Strategy

Rely on natural recovery. Natural processes aided by protective measures will be the main agents of restoration.

Determine if restoration is needed. Synthesize Natural Resource Damage Assessment studies and other data on rockfish in Prince William Sound to define a restoration objective and develop strategies to monitor and protect the recovery of the species.

Monitor recovery. Once a recovery objective is defined, monitor the progress of natural recovery toward that objective.

SEA OTTERS

Injury and Recovery

Sea otters do not appear to be recovering, but are expected to eventually recover to their prespill population. Exactly what population increases would constitute recovery is very uncertain, as there are no population data from 1986 to 1989, and the population may have been increasing in Eastern Prince William Sound during that time. In addition, only large changes in the population can be reliably detected with current measuring techniques. However, there are recent indications that the patterns of juvenile and mid-aged mortalities are returning to prespill conditions.

Recovery Objective

Sea otters will be considered recovered when population abundance and distribution are comparable to prespill abundance and distribution, and when all ages appear healthy.

Restoration Strategy

Sea otters are harvested for subsistence. For additional restoration strategies, see *Subsistence.*

Conduct research to find out why sea otters are not recovering. One hypothesis is that exposure to hydrocarbons and ingestion of contaminated prey affected survival and reproductive success of sea otters in Prince William Sound. Another hypothesis is that the oil spill induced changes in the population of benthic prey species that have limited reoccupation of sea otter habitat and the recovery of sea otters in oiled areas.

Initiate, sustain, or accelerate recovery of sea otters. Once scientists determine why sea otters are not recovering, efforts may be undertaken to accelerate recovery.

Monitor recovery. Monitor abundance and mortality of sea otters in oiled areas.

Protect sea otters and their habitats. With regard to sea otters, the objective of habitat protection is to reduce disturbance at haulout sites and pupping sites and in nearshore feeding areas.

SEDIMENTS

Injury and Recovery

With tidal action, oil penetrated deeply into cobble and boulder beaches that are relatively common on the rocky islands of the spill area. Cleaning removed much of the oil from the intertidal zone but subsurface oil persisted in many heavily oiled beaches and in mussel beds, which were avoided during the cleanup. Chemical analyses show that *Exxon Valdez* oil apparently did not reach deeper than 20 to 40 meters, although elevated activities of hydrocarbon-degrading bacteria were seen somewhat deeper in some cases.

Recovery Objective

Sediments will have recovered when contamination causes no negative effects to the spill ecosystem.

Restoration Strategy

Monitor recovery. Monitor concentrations of hydrocarbons in sediments and indices of petroleum exposure in flatfish.

Remove or reduce residual oil if treatment is cost effective and less harmful than leaving the oil in place. Removal of residual oil may accelerate recovery of sediment where natural recovery is insufficient. However, this benefit would have to be balanced against cost and the potential for further disruption to intertidal communities.

SOCKEYE SALMON

Injury and Recovery

Sockeye salmon in Red Lake, Akalura Lake, and lakes in the Kenai River system declined in population because of adult overescapement in 1989. The Red Lake system may be recovering because the plankton has recovered and fry survival improved in 1993. However, Akalura Lake and the Kenai River lakes have not recovered: smolt production has continued to decline from these lakes. In the Kenai River lakes, for example, smolt production has

declined from 30 million in 1989 to 6 million in 1990 and to less than 1 million in 1992 and 1993.

Recovery Objective

Sockeye salmon in the affected lakes will have recovered when populations are able to support overwinter survival rates and smolt outmigrations comparable to prespill levels.

Restoration Strategy

Sockeye salmon is important for subsistence use, commercial fishing, and sport fishing. For additional restoration strategies, see *Subsistence, Commercial Fishing* and *Recreation and Tourism.*

Rely on natural recovery for sockeye salmon in Red Lake. Natural processes aided by protective measures will be the main agents of restoration for sockeye salmon in Red Lake. This population of sockeye salmon is expected to fully recover by 1996.

Conduct research to find out why other populations of sockeye salmon are not recovering. The most likely explanation is that overescapement of adults changed the community structure of sockeye lake rearing habitat. Possible changes in community structure include a reduction in zooplankton biomass; conversion of the zooplankton community structure to a predation-resistant form; or a change in composition of zooplankton that demands increased foraging time for juvenile salmon and thereby makes them susceptible to increased predation.

Initiate, sustain, or accelerate recovery of sockeye salmon. Once scientists determine why sockeye salmon are not recovering, efforts may be undertaken to accelerate recovery.

Monitor recovery. Monitor outmigrations of smolt from Red Lake and Akalura Lake. In Kenai River lakes, monitor fall fry abundance and smolt abundance to estimate overwinter survival and smolt production.

Protect sockeye salmon and their habitats. With regard to sockeye salmon, the objective of habitat protection is to ensure maintenance of adequate water quality, riparian habitat, and intertidal habitat for spawning and rearing. The Trustee Council can also contribute to the protection of sockeye salmon by providing information needed to improve their management.

SUBSISTENCE

Injury and Recovery

Subsistence users say that maintaining their subsistence culture depends on uninterrupted use of resources used for subsistence. The more time users spend away from subsistence activities, the less likely they will return to the activities. Continuing injury to natural resources used for subsistence may affect the way of life of entire communities.

Residual oil exists on some beaches with high value for subsistence. Continued presence of hydrocarbons may contaminate resources used for subsistence or, at a minimum, create uncertainty about the safety of resources. Uncertainty about the safety of resources may reduce their use and value for subsistence.

Recovery Objective

Subsistence will have recovered when injured resources used for subsistence are healthy and productive and exist at prespill levels, and when people 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.

Restoration Strategy

The primary way of restoring subsistence is to restore injured resources used for subsistence, such as clams, harbor seals, Pacific herring, pink salmon, sea otters, and sockeye salmon. These are discussed elsewhere in this chapter. Four additional parts of the strategy to restore subsistence are the following:

Promote recovery of subsistence as soon as possible. Many subsistence communities will be significantly harmed while waiting for resources used for subsistence to recover through natural recovery alone. Therefore, an objective of restoration is to accelerate recovery of subsistence use. This objective may be accomplished through increasing availability, reliability, or quality of resources used for subsistence, or increasing the confidence of subsistence users. Specifically, if subsistence harvest has not returned to prespill levels because users doubt the safety of particular resources, this objective may take the form of increasing the reliability of the resource through food safety testing. Other examples are the acquisition of alternative food sources and improved use of existing resources. However, all projects to promote subsistence must be related to an injured natural resource. See Policy 9 in Chapter 2.

Remove or reduce residual oil if treatment is cost effective and less harmful than leaving the oil in place. Removing residual oil from beaches with high value for subsistence may improve the safety of foods found on these beaches. This benefit would have to be balanced against cost and the potential for further disruption to intertidal communities.

Protect subsistence resources from further degradation. Further stress on subsistence resources could impede recovery. Appropriate protection can take the form of habitat protection and acquisition if important subsistence areas are threatened. Protective action could also include protective management practices if a resource or service faces further injury from human use or marine pollution.

Monitor recovery. Monitor the recovery of resources used for subsistence. Also monitor subsistence harvest.

SUBTIDAL ORGANISMS

Injury and Recovery

Certain subtidal organisms, like eelgrass and some species of algae, appear to be recovering. Other subtidal organisms, like leather stars and helmet crabs, showed little signs of recovery through 1991.

Recovery Objective

Subtidal communities will have recovered when the community composition, age-class distribution, population abundance of component species, and ecosystem functions and services in each injured subtidal habitat have returned to levels that would have prevailed in the absence of the oil spill.

Restoration Strategy

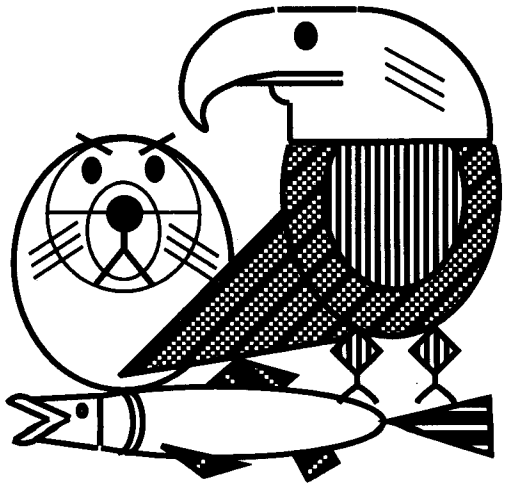
Conduct research to find out why some subtidal organisms are not recovering. Possible explanations include changes in the community structure resulting from spill-induced changes in predators; changes in the population of benthic prey; and limitations in recruitment processes (the availability of new organisms to repopulate the area).

Initiate, sustain, or accelerate recovery. Once scientists determine why some subtidal organisms are not recovering, efforts may be undertaken to accelerate recovery.

Monitor recovery. Monitor subtidal organisms in Prince William Sound.

Protect subtidal organisms and their habitats. With regard to subtidal biota, the objective of habitat protection is to maintain water quality along the shoreline and reduce disturbance in nearshore areas. Subtidal organisms can also be protected by reducing marine pollution.

APPENDICES



Appendix A
Summary of Results of Injury Assessment Studies

This appendix summarizes the results of the injury assessment studies completed after the *Exxon Valdez* oil spill. It has three parts:

- biological resources,
- other resources (air, water, sediment, and archaeology), and
- services.

The information has not been updated since the *Draft Restoration Plan* was published in Fall 1993. It is expected to be updated in 1995.

For all biological resources, **Table A-1** summarizes injury assessment studies completed after the *Exxon Valdez* oil spill. It shows whether there was initial mortality caused by the spill, whether the spill caused a measured population decline, and whether there is evidence of sublethal injury. For some resources, an estimate is available for the total number of animals initially killed by the spill. If available, that estimate is shown in parentheses under the initial mortality column. For many resources, the total number killed will never be known.

The "Status of Recovery" columns show the best estimate of recovery using the most recent information available. The columns show resources' progress toward recovery to the condition and population levels that scientists estimate would have occurred in the absence of the spill. The "Current Population Status" column shows a resource's progress from any "Decline in Population after the Spill." Similarly, the column labeled "Continuing Sublethal Effects" shows whether a sublethal injury is ongoing.

Similar information is shown in **Table A-2** for other resources. Other injured resources include air, sediment, water, archaeological sites and artifacts, and designated wilderness areas.

Table A-3 summarizes information concerning services injured by the spill. Much of the injury to services and the information about those injuries is not quantitative. The table reflects the qualitative content of the information. The "Description of Reduction or Loss" column recounts the impacts of the spill on each service. The "Status of Recovery" shows the most recent information on recovery. The information for Table A-3 is taken from injury assessment studies, agency managers, and, for recreation, a key informant interviews conducted in December 1992.

TABLE A-1. Biological Resources: Summary of Results of Injury Assessment Studies

Resource	Description of Injury			Status of Recovery (a)		Geographic Extent of Injury (b)				Comments/Discussion
	Oil Spill Mortality (total mortality estimate) (c)	Measured Decline in Population after the spill	Sublethal or Chronic Effects	Current Population Status	Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
MARINE MAMMALS										
Harbor Seals (d)	Yes (300)	Yes	Yes	Possibly stable, but not recovering (b)	Unknown	Yes	Yes (e)	Unknown	Unknown	Many seals were directly oiled. There was a greater decline in population indices in oiled areas compared to unoiled areas in PWS in 1989 and 1990. Population was declining prior to the spill and no recovery evident in 1992. Oil residues found in seal bile were 5 to 6 times higher in oiled areas than uoiled areas in 1990.
Humpback Whales	No	No	No	(f)	(f)	(f)	(f)	(f)	(f)	Other than fewer animals being observed in Knight Island Passage in summer 1989, which did not persist in 1990, the oil spill did not have a measurable impact on the north Pacific population of humpback whales.
Killer Whales	Yes (13)	Yes (h)	Unknown	Recovering	Unknown	Yes	Unknown	Unknown	Unknown	13 adult whales of the 36 in AB pod are missing and presumed dead. The AB pod has grown by 4 whales since 1990. Some experts think that the loss of 13 whales in 1989, and 1990 is unrelated to oil spill.

(a) 1993 field reports are not yet finalized.
(b) There may have been an unequal distribution of injury within each region.
(c) Adjusted for carcasses not found, not reported, scavenged, or otherwise lost.
(d) Population may have been declining prior to the spill.
(e) Based on recovery of dead animals from this region of the spill zone.
(f) If no injury was detected or known, no assessment of recovery could be made.
(g) Total body count, not including carcasses not found.
(h) It is unknown if declines are due to the oil spill.

Resource	Description of Injury			Status of Recovery (a)		Geographic Extent of Injury (b)				Comments/Discussion
	Oil Spill Mortality (total mortality estimate) (c)	Measured Decline in Population after the spill	Sublethal or Chronic Effects	Current Population Status	Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Sea Lions (d)	Unknown	Yes (h)	No	Continuing decline	(f)	(f)	(f)	(f)	(f)	Several sea lions were observed with oiled pelts and oil residues were found in some tissues. It was not possible to determine population effects or cause of death of carcasses recovered. Sea lion populations were declining prior to the oil spill.
Sea Otters	Yes (3,500 to 5,500)	Yes	Yes	Stable, but not recovering	Yes, possibly	Yes	Yes	Yes (e)	Yes (e)	Postspill surveys showed measurable difference in populations and survival between oiled and unoiled areas in 1989, 1990, and 1991. Survey data have not established a significant recovery. Prime-age animals were still found on beaches in 1989, 1990, and 1991. Sea otters feed in the lower intertidal and subtidal areas and may still be exposed to hydrocarbons in the environment.
TERRESTRIAL MAMMALS										
Brown Bear	No	No	No	(f)	(f)	(f)	(f)	(f)	(f)	Hydrocarbon exposure was documented on Alaska Peninsula in 1989 including high hydrocarbon levels in the bile of one dead cub. Brown bear feed in the intertidal zone and may still be exposed to hydrocarbons in the environment.
Black Bear	No	No	No	(f)	(f)	(f)	(f)	(f)	(f)	No field studies were done.

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(d) Population may have been declining prior to the spill.
(e) Based on recovery of dead animals from this region of the spill zone.
(f) If no injury was detected or known, no assessment of recovery could be made.
(g) Total body count, not including carcasses not found.
(h) It is unknown if declines are due to the oil spill.

Resource	Description of Injury			Status of Recovery (a)		Geographic Extent of Injury (b)				Comments/Discussion
	Oil Spill Mortality (total mortality estimate) (c)	Measured Decline in Population after the spill	Sublethal or Chronic Effects	Current Population Status	Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
River Otters	Yes (total number unknown)	No	Yes, possibly	Unknown	Unknown	Yes	Unknown	Unknown	Unknown	Exposure to hydrocarbons and possible sublethal effects were determined, but no effects were established on population. Sublethal indicators of possible oil exposure remained in 1991. River otters feed in the intertidal and shallow subtidal areas and may still be exposed to hydrocarbons in the environment.
Sitka Black-tailed Deer	No	No	No	(f)	(f)	(f)	(f)	(f)	(f)	Elevated hydrocarbons were found in tissues in some deer in 1989.
Mink	No	No	No	(f)	(f)	(f)	(f)	(f)	(f)	Studies limited to laboratory toxicity studies.
BIRDS										
Bald Eagles	Yes (200 or more)	No	Yes	Possibly recovered	No	Yes	Yes	Yes (e)	Yes(e)	Productivity in PWS was disrupted in 1989, but returned to normal in 1990. Exposure to hydrocarbons and some sublethal effects were found in 1989, but no continuing effects were observed on populations.

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(d) Population may have been declining prior to the spill.
(e) Based on recovery of dead animals from this region of the spill zone.
(f) If no injury was detected or known, no assessment of recovery could be made.
(g) Total body count, not including carcasses not found.
(h) It is unknown if declines are due to the oil spill.

Resource	Description of Injury			Status of Recovery (a)		Geographic Extent of Injury (b)				Comments/Discussion
	Oil Spill Mortality (total mortality estimate) (c)	Measured Decline in Population after the spill	Sublethal or Chronic Effects	Current Population Status	Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Black-legged Kittiwakes	Yes (number unknown)	No	No	No Change	No	Yes	Yes (e)	Yes (e)	Yes (e)	Total reproductive success in oiled and unoiled areas of PWS has declined since 1989. Hydrocarbon contaminated stomach contents were detected in 1989 and 1990. This species is known for great natural variation and reproductive failure may be unrelated to the oil spill.
Black Oyster-catchers	Yes (120 to 50' adults; unknown for chicks	Yes	Yes	Recovering	Yes	Yes	Yes (e)	Yes (e)	Yes (e)	Differences in egg size between oiled and unoiled areas were found in 1989. Exposure to hydrocarbons and some sublethal effects were determined. Populations declined more in oiled areas than unoiled areas in postspill surveys in 1989, 1990, and 1991. Black oystercatchers feed in the intertidal areas and may still be exposed to hydrocarbons in the environment.
Common Murres	Yes (170,000 to 300,000)	Yes	Yes	Degree of recovery varies in colony	Yes	No	Yes	Yes	Yes	Measurable impacts on populations were recorded in 1989, 1990, and 1991. Breeding is still inhibited in some colonies in the Gulf of Alaska.
Glaucous-winged Gulls	Yes (number unknown)	No	No	No change	No	Yes (e)	Yes (e)	Yes (e)	Yes (e)	While dead birds were recovered in 1989, there is no evidence of a population-level impact when compared to historic (1972, 1973) population levels.

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(d) Population may have been declining prior to the spill.
(e) Based on recovery of dead animals from this region of the spill zone.
(f) If no injury was detected or known, no assessment of recovery could be made.
(g) Total body count, not including carcasses not found.
(h) It is unknown if declines are due to the oil spill.

Resource	Description of Injury			Status of Recovery (a)		Geographic Extent of Injury (b)				Comments/Discussion
	Oil Spill Mortality (total mortality estimate) (c)	Measured Decline in Population after the spill	Sublethal or Chronic Effects	Current Population Status	Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Harlequin Ducks	Yes (approx. 1000)	Yes	Yes, possibly	Unknown	Yes	Yes	Yes (e)	Yes (e)	Yes (e)	Postspill samples showed hydrocarbon contamination. Surveys in 1990-1992 indicated population declines and possibly reproductive failure. Harlequin ducks feed in the intertidal and shallow subtidal areas and may still be exposed to hydrocarbons in the environment.
Marbled Murrelets (d)	Yes (8,000 to 12,000)	Yes	No	Stable or continuing decline	Unknown	Yes	Yes (e)	Yes (e)	Yes (e)	Measurable population effects were recorded in 1989, 1990, and 1991. Marbled murrelet populations were declining prior to the spill.
Peale's Peregrine Falcons	Unknown	Yes (h)	No	(f)	(f)	(f)	(f)	(f)	(f)	When compared to 1985 surveys a reduction in population and lower than expected productivity was measured in 1989 in the PWS. Cause of these changes are unknown.
Pigeon Guillemots (d)	Yes (1,500 to 3,000)	Yes	No	Stable or continuing decline	Unknown	Yes	Yes (e)	Yes (e)	Yes (e)	Pigeon guillemot populations were declining prior to the spill. Hydrocarbon contamination was found externally on eggs.
Storm Petrels	Yes (number unknown)	No	No	No change	Unknown	Yes (e)	Yes (e)	Yes (e)	Yes (e)	Few carcasses were recovered in 1989 although petrels ingested oil and transferred oil to their eggs. Reproduction was normal in 1989.

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(d) Population may have been declining prior to the spill.
(e) Based on recovery of dead animals from this region of the spill zone.
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(g) Total body count, not including carcasses not found.
(h) It is unknown if declines are due to the oil spill.

Resource	Description of Injury			Status of Recovery (a)		Geographic Extent of Injury (b)				Comments/Discussion
	Oil Spill Mortality (total mortality estimate) (c)	Measured Decline in Population after the spill	Sublethal or Chronic Effects	Current Population Status	Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Other Seabirds	Yes (number unknown)	Varies by species	Unknown	Varies by species	Unknown	Yes (e)	Yes (e)	Yes (e)	Yes (e)	Seabird recovery has not been studied. Species collected dead in 1989 include common, yellow-billed, Pacific, red-throated loon; red-necked and horned grebe; northern fulmar; sooty and short-tailed shearwater; double-crested, pelagic, and red-faced cormorant; herring and mew gull; Arctic and Aleutian tern; Kittlitz's and ancient murrelet; Cassin's, least, parakeet, and rhinoceros auklet; and horned and tufted puffin.
Other Sea Ducks	Yes (875)	No	Unknown	Unknown	Unknown	Yes	Yes (e)	Yes (e)	Yes (e)	Species collected dead in 1989 include Stellar's, king and common eider; white-winged, surf and black scoter; oldsquaw; bufflehead; common and Barrow's goldeneye; and common and red-breasted merganser. Sea ducks tend to feed in the intertidal and shallow subtidal areas which were most heavily impacted by oil.
Other Shorebirds	Yes (number unknown)	Varies by species	Unknown	Unknown	Unknown	Yes	Yes (e)	Yes (e)	Yes (e)	Species collected dead in 1989 include golden plover; lesser yellowlegs; semipalmated, western, least and Baird's sandpipers; surfbird; short-billed dowitcher; common snipe; red and red-necked phalarope.

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	Oil Spill Mortality (total mortality estimate) (c)	Measured Decline in Population after the spill	Sublethal or Chronic Effects	Current Population Status	Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Other Birds	Yes (number unknown)	No (not studied)	Unknown	Unknown	Unknown	Yes (e)	Yes (e)	Yes (e)	Yes (e)	Species collected dead in 1989 include emperor and Canada goose; brant; mallard; northern pintail; green-winged teal; greater and lesser scaup; ruddy duck; great blue heron; long-tailed jaeger; willow ptarmigan; great-horned owl; Stellar's jay; magpie; common raven; northwestern crow; robin; varied and hermit thrush; yellow warbler; pine grosbeak; savannah and golden-crowned sparrow; white-winged crossbill.
FISH										
Cutthroat Trout	No	No	Yes	Unknown	Unknown	Unknown	No	No	No	Differences in survival between anadromous adult populations in the oiled and unoiled areas were not statistically different; however, differences in growth between adult populations in the oiled and unoiled areas were found in 1989, 1990, and 1991.
Dolly Varden	No	No	Yes	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Differences in survival between anadromous adult populations in the oiled and unoiled areas were not statistically different. Growth rates between 1989 and 1990 were reduced.

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Resource	Description of Injury			Status of Recovery (a)		Geographic Extent of Injury (b)				Comments/Discussion
	Oil Spill Mortality (total mortality estimate) (c)	Measured Decline in Population after the spill	Sublethal or Chronic Effects	Current Population Status	Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Pacific Herring	Yes, to eggs and larvae	Yes (h)	Yes	See comments	No	Yes	Unknown	Unknown	Unknown	Measurable difference in egg counts between oiled and unoiled areas were found in 1989 and 1990. Lethal and sublethal effects on eggs and larvae were evident in 1989 and to a lesser extent in 1990; in 1991, there were no differences between oiled and unoiled areas. Herring exposed as eggs or larvae in 1989 were under-represented in 1992 and 1993 returns. It is unknown whether 1993 disease outbreaks were due to the spill.
Pink Salmon (Wild) (d)	Yes, to eggs	Yes (h)	Yes	See comments	Yes	Yes	Unknown	Unknown	Unknown	There was initial egg mortality in 1989. Egg mortality continued to be high in 1991 and 1992. Abnormal fry were observed in 1989. Reduced growth of juveniles was found in the marine environment, which can be correlated with reduced survival to adulthood. It is unknown whether poor returns in 1993 are linked to the spill.
Rockfish	Yes (20) (g)	No	Yes	Unknown	Unknown	Yes	Yes	Unknown	Unknown	Few dead rockfish were found in 1989 in condition to be analyzed. Exposure to hydrocarbons with some sublethal effects were determined in those fish, but no effects established on the population. Closures to salmon fisheries increased fishing pressures on rockfish which may be impacting population.

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(b) There may have been an unequal distribution of injury within each region.
(c) Adjusted for carcasses not found, not reported, scavenged, or otherwise lost.
(d) Population may have been declining prior to the spill.
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Resource	Description of Injury			Status of Recovery (a)		Geographic Extent of Injury (b)				Comments/Discussion
	Oil Spill Mortality (total mortality estimate) (c)	Measured Decline in Population after the spill	Sublethal or Chronic Effects	Current Population Status	Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Sockeye Salmon	Unknown	Yes	Yes	See comments	See c'omments	Unknown	Yes	Yes	Unknown	Fry survival continues to be poor in the Kenai River systems due to overescapements to the Kenai River in 1987, 1988, 1989. As a result, adult returns are expected to be low in 1994 and successive years. Trophic structures of Kenai and Skilak Lakes have been altered by overescapement. Red Lake may be recovering since plankton have recovered and fry survival improved in 1993.
SHELLFISH										
Clam	Yes (number unknown)	Yes	Possibly, final analyses pending	Unknown	Unknown	Yes	Yes	Yes	Yes	Marginal declines in clam populations were noted in 1989. Native littleneck and butter clams were impacted by both oiling and cleanup, particularly high-pressure, hot-water washing. Littleneck clams transplanted to oiled areas in 1990 grew significantly less than those transplanted to unoiled sites. Reduced growth recorded at oiled sites in 1989 but not 1991.
Crab (Dungeness)	No	No	No	(f)	(f)	(f)	(f)	(f)	(f)	Crabs collected from oil areas were not found to have accumulated petroleum hydrocarbons.
Oyster	No	No	No	(f)	(f)	(f)	(f)	(f)	(f)	Although studies were initiated in 1989, they were not completed because they were determined to be of limited value.

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Resource	Description of Injury			Status of Recovery (a)		Geographic Extent of Injury (b)				Comments/Discussion
	Oil Spill Mortality (total mortality estimate) (c)	Measured Decline in Population after the spill	Sublethal or Chronic Effects	Current Population Status	Continuing Sublethal or Chronic Effects	PWS	Kenai	Kodiak	Alaska Penin.	
Sea Urchin	No	No	No	(f)	(f)	(f)	(f)	(f)	(f)	Studies limited to laboratory toxicity studies.
Shrimp	No	No	No	(f)	(f)	(f)	(f)	(f)	(f)	No conclusive evidence presented for injury linked to oil spill.
INTERTIDAL/SUBTIDAL COMMUNITIES										
Intertidal Organisms/ Communities	Yes	Yes	Yes	Variable by species, see comments	Yes	Yes	Yes	Yes	Yes	Measurable impacts on populations of plants and animals were determined. The lower intertidal and, to some extent, the mid-intertidal is recovering. Some species (*Fucus*) in the upper intertidal zone have not recovered, and oil may persist in mussel beds.
Subtidal Communities	Yes	Yes	Yes	Variable by species, see comments	Yes	Yes	Unknown	Unknown	Unknown	Measurable impacts on population of plants and animals were determined in 1989. Eelgrass and some species of algae appear to be recovering. Amphipods in eelgrass beds recovered to prespill densities in 1991. Leather stars and helmet crabs show little sign of recovery through 1991.

(a) 1993 field reports are not yet finalized.
(b) There may have been an unequal distribution of injury within each region.
(c) Adjusted for carcasses not found, not reported, scavenged, or otherwise lost.
(d) Population may have been declining prior to the spill.
(e) Based on recovery of dead animals from this region of the spill zone.
(f) If no injury was detected or known, no assessment of recovery could be made.
(g) Total body count, not including carcasses not found.
(h) It is unknown if declines are due to the oil spill.

TABLE A-2. Other Resources: Summary of Results of Injury Assessment Studies

Resource	Description of Injury	Status of Recovery	Geographic Extent of Injury (a)				Comments/Discussion
			PWS	Kenai	Kodiak	Alaska Penin.	
Air	Air quality standards for aromatic hydrocarbons were exceeded in portions of PWS. Health and safety standards for permissible exposure levels were exceeded up to 400 times.	Recovered	Yes	No	No	No	Impacts diminished rapidly as oil weathered and lighter factions evaporated.
Sediments	Oil coated beaches and became buried in beach sediments. Oil-laden sediments were transported off beaches and deposited on subtidal marine sediments.	Patches of oil residue remain intertidally on rocks and beaches and buried beneath the surface at other beach locations. Oil remains in some subtidal marine sediments and has spread to depths greater than 20 meters.	Yes	Yes	Yes	Yes	Unweathered buried oil will persist for many years in protected low-energy sites.
Water	State of Alaska water quality standards may have been exceeded in portions of PWS. Federal and State oil discharge standards of no visible sheen were exceeded.	Recovered	Yes	Yes	Yes	Yes	Impacts diminished as oil weathered and lighter fractions evaporated.
Archaeological sites/artifacts	Currently, 24 sites are known to have been adversely affected by oiling, clean-up activities, or looting and vandalism linked to the oil spill. One hundred thirteen sites are estimated to have been similarly affected. Injuries attributed to looting and vandalism (linked to the oil spill) are still occurring.	Archaeological sites and artifacts cannot recover; they are finite, nonrenewable resources.	Yes	Yes	Yes	Yes	

(a) There may have been an unequal distribution of injury within each region.

Resource	Description of Injury	Status of Recovery	Geographic Extent of Injury (a)				Comments/Discussion
			PWS	Kenai	Kodiak	Alaska Penin.	
Designated Wilderness Areas	Many miles of Federal and State Wilderness and Wilderness Study Area coastlines were affected by oil. Some oil remains buried in the sediments of these areas.	Oil has degraded in many areas but remains in others. Until the remaining oil degrades, injury to Wilderness Areas will continue.	Yes	Yes	Yes	Yes	

(a) There may have been an unequal distribution of injury within each region.

TABLE A-3. Services: Summary of Results of Injury Assessment Studies

Service	Description of Reduction or Loss	Status of Recovery	Geographic Extent of Injury (a)				Comments/Discussion
			PWS	Kenai	Kodiak	Alaska Penin.	
Commercial Fishing	During 1989, emergency commercial fishery closures were ordered in PWS, Cook Inlet, Kodiak and the Alaska Peninsula. This affected salmon, herring, crab, shrimp, rockfish, and sablefish. The 1989 closures resulted in sockeye over-escapement in the Kenai River and in the Red Lake system (Kodiak Island). In 1990, portions of PWS were closed to shrimp and salmon fishing.	Currently there are no area-wide oil spill-related commercial closures in effect. Management actions to try to compensate for the spill are still in effect. Oil spill-related sockeye over-escapement in the Kenai River system is anticipated to result in low adult returns in 1994 and beyond. Over-escapements may result in closure or harvest restrictions during these and perhaps in subsequent years. Returns of pink salmon and herring to Prince William Sound were very low in 1993. It is uncertain to what degree this is linked to the spill.	Yes	Yes	Yes	Yes	Injuries and recovery status of rockfish, pink salmon, shellfish, and herring are uncertain. Therefore, future impacts on these fisheries are unknown.
Passive Use	The areas of Alaska impacted by the oil spill supported a large diverse ecosystem that was valued by large numbers of the American public who did not visit the area. The spill killed substantial numbers of different bird species and marine mammals as well as oiling much of the coastline in the impacted areas. The spill also had substantial effects on the fish, bird, and wildlife populations. While some of these effects may be of relatively short duration, others such as recovery of various bird populations are likely to take decades.	The animals initially killed are irreplaceable. Fish and wildlife populations are recovering at different rates. Much of the oil in shoreline areas has been removed or has weathered to varying degrees.	Yes	Yes	Yes	Yes	A contingent valuation study of the American public done in 1991 found that approximately 95% were still aware of the *Exxon Valdez* oil spill, and that over 50% spontaneously named the spill as one of the worst environmental accidents to occur in the world during their lifetime. The median household was willing to pay $31 to prevent a spill similar to the *Exxon Valdez* in the future. Multiplied by the number of U.S. households, this results in an estimate of spill damages of $2.8 billion.

(a) There may have been an unequal distribution of injury within each region.

Service	Description of Reduction or Loss	Status of Recovery	Geographic Extent of Injury (a)				Comments/Discussion
			PWS	Kenai	Kodiak	Alaska Penin.	
Recreation and Tourism (e.g., hunting, sportfishing, camping, kayaking, sailboating, motorboating and environ. education)	The nature and extent of any reduction or loss of services varied by user group and by area. Some commercial recreation and tourism businesses were injured by the reduction in visitors and visitor spending as a result of the spill. Non-commercial recreation also decreased in some parts of the spill area. The quality of recreation experiences decreased as a result of the spill due to crowding, residual oil, and fewer fish and wildlife. The oil spill caused injury to the way people perceive recreation opportunities in the spill area. The location of recreation use was altered by changed use patterns and displaced use. A few recreation facilities were impacted by the spill, most from overuse or misuse during 1989 and 1990. Overall, recreation use declined significantly in 1989. Between 1989 and 1990, a decline in sport fishing (number of anglers, fishing trips, and fishing days) were recorded for PWS, Cook Inlet and the Kenai Peninsula.	Public comment shows persisting oil, crowding, diminished aesthetics, reduction of wilderness character, reduction of wildlife sightings, tainted food sources, disturbance of cultural sites, and evidence of clean-up activities all to be continuing injuries to recreation. Some displaced users are returning to parts of the spill area, while others still avoid the heavier oiled areas. Recovery of recreation, especially sport hunting and fishing, is largely dependent on the recovery of injured species. As species recover, recreational experiences will improve. The projected decrease in the Kenai River sockeye salmon returns could cause additional injury to recreation on the Kenai Peninsula. Use patterns continue to change in relation to the recovery of the resources, perceptions, and restoration projects.	Yes	Yes	Yes	Yes	Survey respondents also reported changes in their perception of recreation opportunity in terms of increased vulnerability to future oil spills, erosion of wilderness, a sense of permanent change, concern about long-term ecological effects, and, in some, a sense of optimism.

(a) There may have been an unequal distribution of injury within each region.

Service	Description of Reduction or Loss	Status of Recovery	Geographic Extent of Injury (a)				Comments/Discussion
			PWS	Kenai	Kodiak	Alaska Penin.	
Subsistence	Subsistence harvests of fish and wildlife in 11 of 15 villages surveyed declined from 4 - 77% in 1989 when compared to prespill levels. At least 4 of the 11 villages showed continued lower than average levels of use in the period 1990-1991; this decline is particularly noticeable in the Prince William Sound villages of Chenega and Tatitlek. In 1989-1991, chemical analysis indicated that most resources tested, including fish, marine mammals, deer, and ducks, were safe to eat. Starting in 1989, health advisories were issued indicating that shellfish from oiled beaches should not be eaten.	Many subsistence users believe that continued contamination to subsistence food sources is dangerous to their health. In addition, village residents believe that subsistence species continue to decline or have not recovered from the oil spill. Health advisories against eating clams from obviously oiled beaches are still in effect.	Yes	Yes	Yes	Yes	

(a) There may have been an unequal distribution of injury within each region.

Appendix B
Trustee Council Resolution to Proceed with the Habitat Protection Program

The resolution in this appendix was adopted by the Trustee Council on January 31, 1994. It sets important direction for the Trustee Council's habitat protection and acquisition program.

Trustee Council Resolution to Proceed with the Habitat Protection Program

1. Habitat Protection needs to move forward as part of an overall restoration strategy.

2. The Executive Director shall work with lead negotiators to develop a standardized appraisal process, including standardized appraisal instructions, which shall be used to appraise the parcels under consideration.

3. The Executive Director shall start negotiations with the landowners of the parcels ranked high in the Comprehensive Large Parcel Evaluation and Ranking. The Executive Director may include additional large parcels as necessary to facilitate development of the list in step 6. These negotiations are to be conducted for the purpose of providing the Trustee Council with proposed terms and conditions for acquisition. Agreement to proposed terms and conditions are discretionary with the Trustee Council. No promises or representations to the landowners to the contrary shall be made.

4. The Executive Director shall review the Comprehensive Large Parcel Evaluation and Ranking based on public comment and Public Advisory Group comment. The document shall also be reviewed to take into account our understanding of where injury actually occurred and the benefits to accrue to the populations actually injured.

5. The Executive Director will develop a rationale for acquisition for each parcel under consideration.

6. Based upon all of the information developed above, the Executive Director will provide the Trustee Council with a recommended list of large parcels to be protected. The recommendation will include considerations such as: 1) the degree of benefit afforded injured resources and services, 2) the need to have a balanced program throughout the spill area, 3) the cost and terms available from the landowner for individual parcels, 4) the adequacy of protection measures available from the landowner, and 5) the adequacy of funds to carry out other restoration activities.

7. Small parcel negotiations will proceed once an evaluation and ranking of small parcels has been completed and approved by the Trustee Council.