UNITED STATES DEPARTMENT OF COMMERCE
The Deputy Under Secretary for
Oceans and Atmosphere
Washington, D.C. 20230

TO ALL INTERESTED GOVERNMENT AGENCIES AND PUBLIC GROUPS:

Under the National Environmental Policy Act, an Environmental Assessment (EA) has been performed on the following action:

TITLE: M/V KUROSHIMA Oil Spill

LOCATION: Summer Bay, Unalaska, Alaska

SUMMARY: The Trustees for the M/V KUROSHIMA oil spill have completed an Environmental Assessment (EA) to restore natural resources injured by the release of oil in Summer Bay, Unalaska, Alaska. The EA includes restoration projects for the following five identified categories of natural resources affected by the spill: birds; shoreline vegetation; shellfish and intertidal biota; salmonids and lake resources; and recreational uses. The following restoration projects have been identified: conducting predator removal and control measures to enhance nesting success for seabird populations affected by the spill; restoration of vegetation oiled by the spill and monitoring to evaluate the success and need for additional planting; testing of intertidal shellfish contamination and education on seafood safety; sediment control, lakeshore revegetation, limnological survey work and enumeration of salmon smolt outmigration and adult escapement; funding beach clean-up activities to compensate for lost or diminished human use during the oil spill and subsequent cleanup operations; purchase of tents and other facilities to be publicly available for use year round as well as for a summer environmental education camp; and a community-wide education program designed to reduce adverse impacts of recreation and other public uses that may impede recovery of natural resources or affect restoration efforts.

The public and other interested parties have participated in public meetings during the permitting process. The environmental review process has led us to conclude that these restoration actions will not have a significant effect on the human environment. Consequently, the National Oceanic and Atmospheric Administration submitted the plan for an issuance of a finding of no significant impact (FONSI) which was approved.

RESPONSIBLE OFFICIAL: William T. Hogarth, Ph.D.
Assistant Administrator for Fisheries
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, Maryland 20910
301/713-2239

Therefore, an environmental impact statement will not be prepared. A copy of the finding of no significant impact including the supporting EA is available upon request to the responsible Official.

Sincerely,

Margaret R. McCall
for Scott B. Gudes
Deputy Under Secretary for
Oceans and Atmosphere

Enclosure

FINAL
RESTORATION PLAN
and
ENVIRONMENTAL ASSESSMENT
for the
M/V Kuroshima Oil Spill
Summer Bay, Unalaska, Alaska

Prepared by:

National Oceanic and Atmospheric Administration
U.S. Fish and Wildlife Service, U.S. Department of the Interior
Alaska Department of Fish and Game
Alaska Department of Natural Resources
Alaska Department of Law
In consultation with the
Qawalangin Tribe of Unalaska

Cover Photo Courtesy of Jim Severns, Port of Dutch Harbor

FACT SHEET

FINAL RESTORATION PLAN and ENVIRONMENTAL ASSESSMENT for the *M/V Kuroshima* Oil Spill Summer Bay, Unalaska, Alaska

LEAD AGENCY FOR RP/EA:	National Oceanic and Atmospheric Administration
COOPERATING AGENCIES:	U.S. Fish and Wildlife Service, U.S. Department of the Interior Alaska Department of Fish and Game Alaska Department of Natural Resources Alaska Department of Law
ABSTRACT:	This Restoration Plan and Environmental Assessment (RP/EA) has been prepared by the State and Federal Natural Resource Trustees in consultation with the Qawalangin Tribe of Unalaska to address restoration of natural resources and resource services injured in the November 26, 1997, *M/V Kuroshima* Oil Spill, Summer Bay, Alaska.
CONTACT PERSON:	Douglas Helton NOAA Damage Assessment Center 7600 Sand Point Way, NE Seattle, WA, 98115 Phone: 206-526-4563 Fax: 206-526-6665 EMAIL: Doug.Helton@noaa.gov
COPIES:	Copies of the RP/EA are available by contacting the person listed above or available for download at www.darcnw.noaa.gov/kuro.htm
DATE:	April, 2002

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1.0 INTRODUCTION

1.0 INTRODUCTION: PURPOSE OF AND NEED FOR RESTORATION

1.1 Introduction

This Restoration Plan and Environmental Assessment (RP/EA) has been prepared as a proposal for the restoration of natural resources and public use services injured by the M/V *Kuroshima* Grounding and Oil Spill in Summer Bay, Unalaska, Alaska, that commenced on November 26, 1997. The objective of this proposal is to make the public whole for injuries to natural resources and natural resource services resulting from the *M/V Kuroshima* oil spill by returning the injured natural resources and natural resource services to their baseline conditions and compensating for interim losses of those resources and services.

Pursuant to the Oil Pollution Act of 1990 (33 U.S.C. §§ 2701, *et seq.*) ("OPA"), the natural resource trustees (Trustees) are authorized to determine the nature and extent of natural resource injuries, select appropriate restoration projects and implement or oversee restoration. The Trustees for the *M/V Kuroshima* oil spill include the National Oceanic and Atmospheric Administration, the U.S. Department of the Interior through the U.S. Fish and Wildlife Service, the Alaska Department of Fish and Game, the Alaska Department of Natural Resources, and the Alaska Department of Law. In recognition of the government-to-government relationship between the federal and state governments and federally recognized tribes, the Qawalangin Tribe of Unalaska was an active participant in the process of natural resource damage assessment and the formulation of restoration options. Unless otherwise specified, the actions and decisions of the Trustees referred to in this document were taken or made with the participation and input of the Tribe. This RP/EA documents the information and analyses that support the Trustees' evaluation of:

- Injuries to natural resources and natural resource services caused by the *M/V Kuroshima* spill;
- Restoration alternatives; and
- Rationale for the Trustees' preferred alternative.

This document also serves, in part, as the agencies' compliance with the National Environmental Policy Act (NEPA) (*see* Section 5 for additional information). The Trustees sought public review and comments on the proposed restoration alternatives and the Trustees' preferred alternative. In developing these restoration alternatives, the Trustees met with local entities and the Responsible Parties (RPs) and sought input from agency scientists and other restoration and oil spill experts.

The primary purpose of this RP/EA is to inform the public and guide restoration implementation of the Trustees' Preferred Alternative. The Trustees considered written comments received during the public hearing and during the comment period prior to their finalizing the RP/EA. As described in detail below, this Preferred Alternative includes:

- Conducting predator removal and control measures to enhance nesting success for seabird populations affected by the spill;
- Restoration of vegetation oiled by the spill and monitoring to evaluate the success and need for additional replanting;
- Funding beach cleanup activities to remove residual oil and to compensate for lost or diminished human use during the oil spill and subsequent cleanup operations;
- Additional testing of intertidal shellfish contamination and education on seafood safety;
- Salmonid and Lake restoration projects including sediment control, Lakeshore revegetation, limnological survey work and enumeration of salmon smolt outmigration and adult escapement.
- Purchase of tents and other facilities to be available for use by the public year round as well as for a summer environmental education camp; and:
- A community-wide education program designed to reduce adverse impacts of recreation and other public uses that may impede recovery of natural resources or affect restoration efforts.

1.2 Summary of Changes from the Draft RP/EA

On November 16, 2001, a draft RP/EA (AR# 133) was released for public review and comment. The Trustees received comments from the public (AR# 137, 139-143, 148) as well as the Responsible Parties (RP) (AR# 138). Comments and the response to comments are summarized in section 7 of this document. In general, comments were positive and supportive of the preferred alternatives to restore natural resources. No comments suggested additional categories of injuries or losses that should have been addressed during the restoration planning phase and no comments questioned the technical sufficiency of the Trustees' assessment and quantification of damages.

In response to public comments, the Trustees made several clarifications to the RP/EA. These changes include: inclusion of an estimate of restoration costs, a description of the Qawalangin Tribe's participation in the assessment and restoration planning process, clarification that subsistence losses are not included in the recreational lost use analysis, and inclusion of additional information that supports the Trustees' analysis of injuries resulting from the spill and the Trustees' restoration scaling analyses. The comments also included many practical ideas for project implementation. However, no substantial modifications have been made to the preferred restoration projects proposed by the Trustees in the November 16, 2001 Draft RP/EA. Because the modifications to the draft RP/EA are relatively minor and are descriptive or explanatory rather than substantive, the Trustees have determined that publication of an additional draft RP/EA for public review and comment is not necessary.

1.3 *M/V Kuroshima Incident* and Site Overview

On November 26, 1997, the M/V *Kuroshima*, a 370-foot refrigerated cargo vessel owned by *Kuroshima* Shipping, S.A., broke away from its anchorage in Summer Bay on Unalaska Island,

near Dutch Harbor, Alaska (Figure 1: Map of Greater Unalaska Bay). While the vessel was attempting to move to a safer anchorage, winds reported to be in excess of 100 knots blew the freighter into Second Priest Rock, damaging several of the vessel's fuel tanks[1]. The vessel subsequently ran aground on the shore of Summer Bay (Figures 2,3 Grounded Vessel). Two crewmen were killed in the incident and approximately 39,000 gallons of heavy fuel oil were spilled. Much of the oil was blown upstream into Summer Bay Lake, which borders Summer Bay, with the remainder stranding along the shoreline of Summer Bay Beach and nearby Humpy and Morris Coves (Figure 4: Detailed Map of Grounding Site). High winds also blew oil on to the dunes and contaminated vegetation and an archaeological site[2].

Immediate cleanup measures following the *M/V Kuroshima* incident were undertaken at the direction of a Unified Command which included representatives of the United States Coast Guard (USCG), State of Alaska and Kuroshima Shipping. Cleanup and vessel stabilization commenced immediately after the grounding and continued until late December when the response was curtailed because of poor weather conditions. Salvage activities began in January and after several attempts the vessel was finally refloated on March 1, 1998 and towed to Magone Marine in Dutch Harbor for temporary repairs. Throughout the winter the response agencies conducted a maintenance program to check for wildlife activity, remove any tar patties exposed during thaws and monitor the overall status of the impacted area. During the spring, a multi-agency Shoreline Cleanup Assessment Team (SCAT) surveyed the impacted areas and prepared detailed cleanup instructions. Actual cleanup resumed in April and was officially completed in July 1998 (AR# 101). However, shoreline oil continued to be a problem as buried and submerged oil re-stranded on area beaches. Consequently, additional cleanup was also conducted by the RPs during the summer of 1999 (Vanguard, 1999). This effort removed a quantity of oil, but residual contamination remains (see Figures 24, 25, 28, 29, 31, 32). The ADEC final response report, (AR #1), the USCG Pollution Reports (AR# 22) and the NOAA HAZMAT Scientific Support Team's Information Management Report (AR # 17) summarize and describe the chronology of events associated with response and cleanup activities. The results of the additional cleanup during the summer of 1999 are summarized in a report from Don Kane of Vanguard Environmental (AR # 25).

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[1] The sequence of events that led to the grounding and spill are summarized in the U.S. Coast Guard Polreps (AR# 22) and the NOAA Hazmat Scientific Support Team Information Management Report (AR# 17). General information on the incident and progress of the cleanup can also be found in newspaper coverage of the spill (AR # 77-93, 107).

[2] An archaeological site dating to approximately 2,500 years before present is located in the dunes between Summer Bay and Summer Bay Lake. Site restoration and excavation of the contaminated archaeological site was completed pursuant to an agreement among the owners of *the M/V Kuroshima*, the Qawalangin Tribe, the Ounalashka Corporation and the State of Alaska and is not formally part of this RP/EA. The results of the site work are summarized in a 1999 report by Rick Knecht and Richard Davis entitled: Oil Spill Response and Restoration at the Summer Bay Archaeological Site (UNL-92). See AR # 14 and 57.

1.4 Natural Resource Trustees and Authorities

Both Federal and State of Alaska laws establish liability for natural resource damages to compensate the public for the injury, destruction and loss of such resources and/or their services resulting from oil spills.

This RP/EA has been prepared jointly by the National Oceanic and Atmospheric Administration, the U.S. Department of the Interior through the U. S. Fish and Wildlife Service, the Alaska Department of Natural Resources, the Alaska Department of Fish and Game and the Alaska Department of Law, in consultation with the Qawalangin Tribe of Unalaska.

Natural Resource Trusteeship is defined in the Oil Pollution Act of 1990 (OPA) (33 USC §§ 2701 *et seq.*) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR § 300.600). Executive Order (EO) 12777 designates the Federal Trustees for oil spills while the Governor of Alaska designates the State Trustees for oil spills in Alaska. As a designated Trustee, each agency is authorized to act on behalf of the public under Federal law to assess and recover natural resource damages and to plan and implement actions to restore natural resources and resource services injured or lost as the result of a discharge of oil. The Trustees designated NOAA as Lead Administrative Trustee (LAT)(15 CFR § 990.14(a)) (AR# 100).

In addition to its authority to recover natural resource damages under Federal law, the State of Alaska may recover natural resource damages pursuant to Alaska Statutes 46.03.710, 46.03.760, 46.03.780 and 46.03.822.

1.5 Overview of Natural Resource Injuries

Unalaska Bay, Summer Bay and Summer Bay Lake support important natural resources. Fish and shellfish are harvested and grasses and other shoreline vegetation are collected for basket making and other traditional uses. Bird watching and wildlife viewing, hiking and beachcombing also rely on the natural resources of the region.

After a review of a variety of potential injuries, the Trustees have identified five categories of natural resources and services affected by the *M/V Kuroshima* spill that warrant restoration. The following is an overview of the injuries. These injury categories are described in more detail in Section Three. Preferred and alternative restoration proposals are discussed in Sections Four and Five.

Birds - Many bird species utilize the Summer Bay area, including bald eagle *(Haliaeetus leucocephalus)*, emperor goose *(Chen canagica),* the Federally listed Steller's eider (*Polysticta stelleri*) and numerous species of sea birds and waterfowl. Between November 1997 and May 1998, over 150 bird carcasses were collected (Figure 5: Oiled Bird at Summer Bay Beach). It is very likely that a large number of bird carcasses were not found due to sinking, predation, or adverse search conditions. Recorded sightings of live oiled birds were also made throughout the area. Between December 5 and December 23, 1997, fifteen oiled birds were captured and taken to a rehabilitation station in the town of Homer; however, only two of these birds survived. In

addition to mortality and sub-lethal effects of oiling, there may be further injury to bald eagles and other predators due to ingestion of oiled carrion (Figure 6: Scavenged Bird Carcass).

Shoreline Vegetation - Extensive oiling of shoreline vegetation, predominantly beach wildrye grass *(Leymus mollis)* resulted from the *M/V Kuroshima* spill. Wetland, riparian and dune vegetation were exposed to oil. Response activities also caused extensive damage to vegetation (Figure: 7: Cleanup of Oiled Vegetation). Elevated lake levels caused by a temporary response dam on the outlet of the lake resulted in the oiling of a band of terrestrial vegetation ringing Summer Bay Lake. Oiled vegetation was cut and other vegetation was trampled or otherwise impaired by cleanup and salvage operations (Figure 8: Temporary Tank Farm at Summer Bay Beach).

Shellfish and Intertidal Biota - A number of shellfish and other invertebrate species inhabit the intertidal areas of the marine shore. These species include mussels, limpets, chitons, clams, sea urchins, snails and other invertebrate species (Figure 9: Tide Pool at Humpy Cove). These species were exposed to dissolved and dispersed petroleum hydrocarbons (polycyclic aromatic hydrocarbons or PAHs) as well as smothering by gross oil accumulations. Dredging and salvage actions also crushed and smothered subtidal shellfish.

Salmonids and Lake Resources - A substantial fraction of the oil that migrated into Summer Bay Lake was deposited on the Lake bottom. Oil particles, tar mats, tar patties accumulated on the Lake bottom, and have contaminated Lake sediments. In addition, the Lake water column was exposed to dissolved PAHs (Figure 10: Shoreline Cleanup along Summer Bay Lake).

Summer Bay Lake provides habitat and spawning grounds for a number of anadromous fish species, including pink (*Oncorhynchus gorbuscha*), coho *(O. kisutch)* and sockeye *(O. nerka)* salmon and Dolly Varden (*Salvelinus malma*). Fish were exposed to *M/V Kuroshima* oil through ingestion and skin and gill contact with dissolved PAHs in the Lake water column. Spawning and rearing habitats were also exposed to oil contamination in the Lake waters and sediments (Figure 11: Map of Shoreline Oiling).

Recreational Uses - The Summer Bay area is one of the most important recreational sites on Unalaska Island (Figure 12: Summer Bay Beach). The beach is the only sandy shoreline on the island that can be accessed by road. Island residents use the lake, beach and surrounding lands for beach-combing, clamming, camping, swimming, picnicking, day hiking, mountain biking, sport fishing and wildlife watching. There are no similar alternative sites on Unalaska Island that are accessible by road.

1.6 Summary of the Natural Resource Damage Assessment

OPA provides for the recovery by Trustees of the cost of restoring, rehabilitating, replacing or acquiring the equivalent of the injured natural resources ("primary restoration"); the diminution in value of those injured natural resources pending restoration ("compensatory restoration"); and reasonable assessment costs. NOAA promulgated regulations for the conduct of damage assessments for oil spills at 15 CFR Part 990 (OPA regulations). In conjunction with this rule-

making process, NOAA also developed a series of technical guidance documents on how to structure and conduct oil spill damage assessments. The following provides a summary of the steps taken by the Trustees to develop a restoration plan to address the natural resource injuries associated with this spill. Sections 2.0, 3.0, 4.0 and 5.0 of the RP/EA provide a more detailed analysis.

In compliance with OPA and the OPA regulations, the Trustees determined that legal jurisdiction to pursue restoration under OPA exists for this Incident. The grounding and oil spill constitute an "Incident" pursuant to OPA Section 1001 (14). Because the discharge was not authorized by a permit issued under Federal, state, or local law and did not originate from a public vessel or from an onshore facility subject to the Trans - Alaska Pipeline Authorization Act, the Incident is not an "excluded discharge" within the meaning of OPA Section 1002 (c). Finally, natural resources under the authority of the Trustees have been injured as a result of the Incident. These factors establish jurisdiction to proceed with a natural resource damage assessment (NRDA) under the OPA regulations (See Section 10.2 of the Appendix).

Natural resources are defined as "land, fish, wildlife, biota, air, water, ground water, drinking water supplies and other such resources belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the United States, any State or local government or Indian tribe, or any foreign government" (33 U.S.C. § 2701.20). Injury is defined as "an observable or measurable adverse change in a natural resource or impairment of a natural resource service" (15 CFR § 990.30). As described in the OPA regulations, a NRDA consists of three phases -- preassessment, restoration planning and restoration implementation.

Based on information collected during the preassessment phase, the Trustees make a preliminary determination as to whether natural resources and/or services have been injured and/or are likely to be injured by the release. Through coordination with response agencies (*e.g.*, the USCG), the Trustees next determine whether the oil spill response actions will eliminate the injury or the threat of injury to natural resources. Because this spill occurred during the winter, response efforts by the response authorities continued on and off through the summer of 1998 resulting in an extended pre-assessment. During this time, the Trustees worked actively with the response authorities to evaluate the cleanup, the potential for ongoing injury and the potential for feasible restoration. Upon conclusion of the cleanup, the Trustees determined that injuries and associated interim losses to natural resources and/or their services would continue and that feasible restoration alternatives existed to address these injuries (See Trustee determinations in Section 10.2). Based upon these findings, the Trustees proceeded with restoration planning.

The purpose of the restoration-planning phase is to evaluate the potential injuries to natural resources and services and to use that information to determine the need for and scale of associated restoration actions to address those injuries. This phase provides the link between injury and restoration and has two basic components -- injury assessment and restoration selection. The goal of injury assessment is to determine the nature and extent of injuries to natural resources and services thus providing a factual basis for evaluating the need for, type of and scale of restoration actions. The Trustees must identify a reasonable range of restoration

alternatives, evaluate and select the preferred alternative(s), develop a draft restoration plan presenting the alternative(s) to the public, solicit public comment on the draft restoration plan and incorporate comments into a final restoration plan.

The Trustees investigated a variety of resource injuries associated with the *M/V Kuroshima* oil spill. In accordance with the OPA regulations the Trustees considered a range of assessment procedures and selected methods for injury assessment and restoration planning that are technically reliable and valid and were cost effective for the Incident (15 CFR § 990.27). The Trustees consulted with a variety of experts in relevant scientific and technical disciplines, reviewed existing literature, participated in field assessments and performed focused studies to support their restoration planning decisions. The Trustees complied with the general requirements for determining and quantifying injuries to natural resources, including establishing exposure and pathway, determining the degree, spatial and temporal extent of injury and selection of injuries to include in the assessment. Although the Trustees could have conducted additional studies to refine the injury estimates and restoration alternatives, in the Trustees' judgment, the information presently available is more than sufficient to provide a technical basis for evaluating the need for, type of and scale of restoration actions and to develop a fair and reasonable restoration plan to achieve timely restoration consistent with the OPA regulations.

In selecting preferred restoration projects for each category of natural resource injury or loss, the Trustees identified and considered a reasonable range of restoration alternatives including natural recovery, primary restoration and compensatory restoration. Primary restoration actions are designed to directly restore natural resources or services to baseline on an accelerated time frame. Compensatory restoration actions seek to compensate the public for interim losses. The OPA regulations identify a variety of methods that may be used for scaling compensatory restoration actions that provide natural resources and /or services of the same type and quality and of comparable value as those lost. In response to this incident, the Trustees identified six categories of natural resources that warrant restoration. For a variety of reasons discussed in more detail later in this document, the Trustees determined that the injured resources would recover over time. However, this recovery, depending on the injury category, may take years. Therefore, the Trustees focused their review of restoration alternatives on compensating for the interim losses resulting from the spill. Consistent with the OPA regulations in scaling the restoration actions the Trustees evaluated both the service-to-service scaling approach and the valuation scaling approach. The scaling, description and evaluation of restoration alternatives in this plan are based upon the technical expertise, judgments and restoration knowledge of the Trustees and other consulting scientific and technical experts.

The OPA regulations authorize the settlement of claims at any time provided that the settlement is adequate to satisfy the goals of OPA and is fair, reasonable, and in the public interest[3]. In other words, the Trustees must ensure that a settlement is adequate to restore, replace, rehabilitate or acquire the equivalent of the injured natural resources and services. The Trustees, acting on

[3] 15 CFR Part 990.25.

behalf of the public, have to weigh the benefits of early settlement vs. delayed recovery of natural resources that might result from long-term studies and protracted litigation[4]. However sums recovered in settlement of NRDA claims may only be expended in accordance with a restoration plan that is made available for public review and comment[5]. For the *M/V Kuroshima* incident, sufficient information on the nature and severity of injuries was collected during the preassessment phase to allow the Trustees to proceed directly to the evaluation of restoration alternatives and selection of a preferred alternative.

1.7 Coordination with the Responsible Parties (RPs)

Under section 1002 of OPA each party responsible (RPs) for a vessel from which oil is discharged, or which poses a substantial threat of a discharge of oil, is liable for natural resource damages resulting from the incident involving such discharge or threat. The RPs for this spill are Kuroshima Shipping, S.A. and Unique Trading Co[6].

The OPA regulations authorize the Trustees to invite the RPs to participate in the damage assessment and restoration process. By working together, restoration of injured resources and services may be achieved rapidly and cost-effectively. Although the RPs may contribute to the process in many ways, final authority to make determinations regarding injury and restoration rests solely with the Trustees.

Within a few weeks of the spill, the RPs proposed a conceptual restoration plan to the Trustees to address natural resource injuries resulting from incident. The Trustees welcomed the RPs' desire to move forward with timely restoration but after reviewing the proposal the Trustees determined that the information available at the time was insufficient to fully evaluate the plan. Furthermore, the response phase of the incident was ongoing and there was a great deal of uncertainty about what would be revealed during the spring thaw and renewed cleanup. However, the proposal began a dialogue between the Trustees and the RPs with the goal of achieving timely and appropriate restoration for the injured natural resources. As part of that dialogue, the Trustees and RPs have shared information with each other in an attempt to present known or potential injuries or losses of natural resources and services and to identify appropriate restoration actions. Coordination between the Trustees and the RPs helped to reduce duplication of studies, increase the cost-effectiveness of the assessment process, increase sharing of information and decrease

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[4] Early settlement is discussed in several sections of 15 CFR Part 990. The preamble to the Natural Resource Damage Assessment Final Rule, 61 Fed. Reg. Page 446 (Jan 5, 1996) states that "Trustees may settle claims for natural resource damages under this rule at any time .....In determining the sufficiency of settlements to meet the public interest test under other statutes, reviewing courts have afforded broad deference to the judgment of federal agencies recommending such settlements. Courts have looked to whether the agencies have considered such factors as the benefits of early settlement as opposed to delayed recovery through litigation, litigation risk, certainty in the claim, and attitude of the parties toward the settlement, among other factors".

[5] Excluding reimbursement of Trustees' costs.

[6] AR # 75.

the likelihood of litigation. The Trustees sought input from the RPs and considered such information, when provided, throughout the NRDA process.

The RPs have evaluated the preferred alternatives proposed in this RP/EA and support the implementation of the alternatives.

1.8 Public Participation

Public review of the Draft RP/EA is an integral component of the restoration planning process. Through the public review process, the Trustees seek public comment on the approaches used to define and estimate natural resource injuries and the projects being proposed to restore injured natural resources or replace services provided by those resources.

Public review of the Draft RP/EA is a standard element of Federal and state laws and regulations that apply to the NRDA process, including Section 1006 of OPA, the OPA regulations (15 CFR Part 990), NEPA, as amended (42 USC §§ 4371 *et seq.*) and its implementing regulations (40 CFR Parts 1500-1508). Following a public notice in the Federal Register (AR# 147), the Anchorage Daily News (AR# 135, 136), and the Dutch Harbor Fisherman (AR# 144), the Draft RP/EA (AR# 133) was made available to the public for a 34-day comment period. As part of the public review process, the Trustees conducted a public meeting on November 26, 2001, at the Unalaska City Hall (AR# 145, 146, 148).

Written comments received during the public comment period were considered by the Trustees in preparing the Final RP/EA. Those comments are summarized in Section 7 of this document. The complete comments are included in the Administrative Record (AR# 137-143).

1.9 Administrative Record

The Trustees have compiled an Administrative Record to support their restoration planning and inform the public of the basis of their decisions. The Administrative Record index is provided in Appendix A.2 of this RP/EA.

The Administrative Record facilitates public participation in the NRDA process. Additional information and documents, including public comments received on the Draft RP/EA, the Final RP/EA and other related restoration planning documents, have been added to the Administrative Record. Upon release of this final RP/EA, the trustees will close the Administrative Record for the assessment and open a new record for restoration implementation.

The documents comprising the Administrative Record can be viewed at the following location:

NOAA DANW 7600 Sand Point Way, NE Seattle, Washington 98115.
Contact: Doug Helton, (206) 526-4563, Doug.Helton@noaa.gov

Arrangements should be made in advance to review the record.

1.10 Summary of the Natural Resource Damage Claim

The goal of the NRDA process is to make the public whole for injuries to natural resources and their services resulting from the release of oil. The natural resource damages claim for the *M/V Kuroshima* incident seeks restoration of the following natural resources and services:

- Seabirds
- Vegetation
- Shellfish/Intertidal Biota
- Salmonids and Lake resources
- Recreation

The proposed compensatory restoration actions include:

- Conducting predator removal and control measures to enhance nesting success for seabird populations affected by the spill;
- Restoration of vegetation oiled by the spill and monitoring to evaluate the success and need for additional replanting;
- Additional testing of intertidal shellfish contamination and education on seafood safety;
- Sediment control, Lakeshore revegetation, Limnological survey work and Enumeration of salmon smolt outmigration and adult escapement;
- Funding beach cleanup activities to compensate for lost or diminished human use during the oil spill and subsequent cleanup operations;
- Purchase of tents and other facilities to be publicly available for use year around as well as for a summer environmental education camp; and
- A community-wide education program designed to reduce adverse impacts of recreation and other public uses that may impede recovery of natural resources or affect restoration efforts.

2.0 AFFECTED ENVIRONMENT

2.0 AFFECTED ENVIRONMENT

The purpose of this section is to provide a general description of the environment that encompasses the geographic area where the spill occurred and where restoration will be implemented.

2.1 Physical Environment

The Aleutian Islands stretch more than 1100 miles west from the Alaska Peninsula forming the world's longest archipelago. These windblown, rugged and treeless islands are the peaks of a submarine volcanic mountain range that separates the Bering Sea from the North Pacific Ocean. Weather is harsh and very unpredictable. The Aleutian climate is characterized by precipitation, fog, high winds and frequent, often violent, cyclonic storms. Clear, sunny days are rare. Temperatures are mild relative to mainland Alaska and sea ice is rare.

Unalaska Island is the one of the largest of the Fox Islands that forms the eastern group of the Aleutian Island chain. The Island is mountainous and during the greater part of the year, the higher elevations are covered with snow. Much of the shoreline is composed of precipitous rocky cliffs, with extensive wave-cut platforms and cobble beaches. The irregular shoreline of the Island is broken by several large embayments. The City of Unalaska and Port of Dutch Harbor sit at the head of Unalaska Bay. The Bay opens into the Bering Sea between Cape Kalekta and Cape Cheerful. Amaknak Island is in the center of Unalaska Bay, the south side of which forms Iliuliuk Harbor, Iliuliuk Bay and Dutch Harbor.

Many small rivers and creeks flow into Unalaska Bay, but strong winds and moderate tidal currents keep the outer bay well-mixed with the marine waters of the Bering Sea. Tides are diurnal and typical tide range is 1.5 meters.

Summer Bay is a wide, shallow and unprotected sandy bay on the Eastern Shore of Unalaska Bay. The head of the Bay has a broad sand beach backed by sand dunes. Second Priest Rock, a dominant rocky headland, demarks the western edge of the bay. Extensive wave-cut rocky platforms and reefs extend from the headlands on both sides of the Bay. The Bay is open to the Bering Sea from the north and often receives high wave energy. The eastern end of Summer Bay includes two shallow coves, Humpy Cove and Morris Cove (Figure 13: Morris Cove). At the head of Summer Bay is a broad valley that includes Summer Bay Lake (Figure 14: Summer Bay Lake and Summer Bay). A small lake also lies above Morris Cove and anadromous fish streams drain into Morris and Humpy Coves and Constantine Bay.

Summer Bay Lake is small, slightly more than a mile long and half a mile wide and shallow, with a maximum depth of 15 meters. The Lake is only a few meters above sea level and the outlet stream is less than 75 meters long. The Lake is typically ice-covered from December through March (Figure 15: Summer Bay Lake).

2.2 Biological Environment

Unalaska Island and Unalaska Bay are home for many species of finfish, shellfish, marine mammals, seabirds, waterfowl, land mammals and other wildlife. Sea lions *(Eumetopias jubatus)*, sea otters *(Enhydra lutris)* and harbor seals *(Phoca vitulina)* inhabit the Bay. Large seabird colonies are found on the Island and nearby islets and the area supports a large population of bald eagles and other raptors. Lush vegetation covers the hillsides and extensive kelp beds exist along the nearshore area. Several species of pacific salmon and Dolly Varden spawn and rear in the lakes and streams that flow into the Bay. The rocky intertidal zone is encrusted with barnacles, mussels, chitons, sea urchins and other marine invertebrates. The sandy shorelines of Summer Bay provide habitat for several species of clams. Crab, halibut, herring, cod and many other species are common in the nearshore waters of Summer Bay.

The Summer Bay area is an important recreational resource for the residents of Unalaska. Clams are harvested on the beach and limpets, urchins, chitons and other invertebrates are harvested from the rocky intertidal. Pink, coho and sockeye salmon and Dolly Varden spawn in the Lake and streams above Summer Bay (Figure 16: Spawned-out pink salmon). Vegetation along the beach and lakeshore is also harvested.

2.3 Unique and Protected Natural Resources

Unalaska Island and Unalaska Bay are utilized by a number of threatened or endangered species, including the Steller sea lion, the Aleutian Canada goose *(Branta canadensis leucopareia)*, the Steller's eider, the spectacled eider *(Somateria fischeri)* and the Northern fur seal *(Callorhinus ursinus)*. Sea otters are also common in Unalaska Bay.

2.4 National Wildlife Refuge Lands

Nearly all the islands in the Aleutian Island chain, including large portions of Unalaska Island, are part of the Alaska Maritime National Wildlife Refuge, managed by the U.S. Fish and Wildlife Service. These islands exhibit extensive biological diversity closely tied with the surrounding marine environment. The Refuge is managed to conserve, protect and enhance these islands for seabirds, marine mammals, fish, other wildlife, Aleut archaeological resources and World War II historic sites for the benefit of the public. Fortunately, despite the proximity of the Refuge, Refuge lands on Unalaska Island were not significantly affected by the *M/V Kuroshima* spill. However, fish and wildlife species that reside in or utilize the Refuge may have been impacted.

2.5 Cultural Environment and Human Uses

The City of Unalaska is the largest settlement in the Aleutian Islands with approximately 5000 year-round residents. A large seasonal influx in the fishing and seafood processing industries may triple the population. Unalaska has long been the center of Aleut culture and continues to be the largest of the Aleut communities. The native Aleuts or Unangans are believed to have settled the area approximately 8000 years ago. They built villages along the seacoasts and lived on the abundant marine mammals, fish, seabirds, marine invertebrates and seaweed. Evidence of these villages still exists on nearly every island. In the 1740's, Russian explorers were the first European visitors to Unalaska and its excellent natural harbor led the Russians to establish their

first permanent settlement in North America at the head of Iliuliuk Bay. One of the most famous landmarks in Unalaska is the Russian Orthodox Cathedral. In 1867, the U.S. Government purchased Alaska from the Russians and Unalaska became an important regional settlement supporting the lucrative Bering Sea fisheries and fur seal industries. World War II was fought on these islands, with over 10,000 Army and Navy personnel stationed in the area. All of the Aleuts were forced to evacuate and many residents of other Aleut communities moved back to Unalaska after the war. Following World War II, Unalaska subsisted as a relatively minor fishing community until the King Crab fisheries in the 1970's and Americanization of the North Pacific and Bering Sea trawl fisheries in the 1980's led to massive booms in construction and employment. Today, Unalaska is the largest U.S. commercial fishing port, both in terms of pounds landed and in terms of value.

3.0 INJURY DETERMINATION & QUANTIFICATION

3.0 INJURY DETERMINATION & QUANTIFICATION

This chapter describes and quantifies the injuries resulting from the *M/V Kuroshima* oil spill. The chapter begins with an overview of the types of information and data collected during the preassessment phase of the damage assessment process, followed by a description of the Trustees' strategy to identify and quantify specific injuries to natural resources. The OPA NRDA regulations (15 CFR § 990.30) define "injury" as an "observable or measurable adverse change in a natural resource or impairment of a natural resource service." The regulations define "services" as "the functions performed by a natural resource for the benefit of another natural resource and/or the public."

3.1 Assessment Approach

The assessment process occurs in two stages -- injury determination and then injury quantification. The first stage involves evaluating which injuries are the most important; the second stage involves determining the scale or magnitude of the loss. As discussed in section 1.5, the Trustees may expedite this process if sufficient information is collected during the preassessment phase. Conceptually, however, the Trustees still need to determine the nature and extent of injuries to natural resources and services which will provide a basis for evaluating the need for, type and scale of restoration actions.

Injury determination begins with the identification and selection of potential injuries to investigate. The Trustees considered several factors when making this determination including, but not limited to, the following:

- The natural resources and services of concern;
- The evidence indicating exposure, pathway and injury;
- The mechanism by which injury occurred;
- The type, degree and spatial and temporal extent of injury;
- The adverse change or impairment that constitutes injury;
- Availability of assessment procedures and their time and cost requirements;
- The potential duration of the natural recovery period; and
- The kinds of restoration actions that are feasible.

The Trustees considered a range of assessment procedures and selected methods for injury assessment and restoration planning that were technically reliable and valid and were cost effective for the incident. These included site investigations, field surveys, sampling and surveys of the relevant scientific and economic literature. The Trustees also consulted with academic and other experts.

3.2 Summary of Preassessment Activities

The first responders to the *M/V Kuroshima* incident focused on rescuing the crew, stabilizing the vessel and removing the remaining fuel oil, surveying and protecting sensitive areas, collecting injured wildlife and recovering the spilled oil. These activities were conducted under the direction of the U.S. Coast Guard and the Alaska Department of Environmental Conservation (ADEC). The ADEC final response report, the NOAA HAZMAT Scientific Support Team report and the USCG Polreps summarize the response activities, oil fates and preliminary impacts resulting from the *M/V Kuroshima* spill (AR # 1, 17, 22). Where possible, the Trustees utilized information generated by the response rather than implementing duplicative surveys.

Within a few days after the grounding of the *M/V Kuroshima*, the Trustee agencies initiated a preliminary investigation of the potential impacts of the spill on the natural resources in the area. These activities were coordinated with and complemented information and data collected by the response agencies. The preliminary results of the preassessment evaluation are summarized in NOAA's Preassessment Scoping Report dated August 28, 1998 (AR# 18).

The preliminary assessment focused on collecting perishable or ephemeral information necessary to demonstrate the fate of the oil and exposure and potential injuries to natural resources. Resources and services potentially impacted by the discharged oil included:

- Birds;
- Intertidal and subtidal habitats and the biota in those habitats;
- Salmonids and Lake resources;
- Dune and lakeshore vegetation and
- Lost use of recreation.

Various sources of information collected by the Trustees, the Responsible Parties (RPs) and the response agencies was used to help evaluate the potential impacts of the spill on natural resources, identify the need for restoration actions, or determine the need for additional studies. Specific sources of information included:

1. Photo and Video documentation: The Trustees reviewed the photographs and videotapes generated by the Unified Command and collected their own set of images documenting the incident. These images clearly illustrate the range of affected natural resources and the severity of contamination. A database of photographs has been developed. Many of the NOAA, ADEC and USCG images are digitally available in the compact disk version of the 1998 NOAA HAZMAT Scientific Support Team Information Management Report (AR# 17).

2. Oil Trajectory and Overflight Information: During the early days of the response, the Unified Command conducted multiple helicopter overflights to determine the location and quantity of

floating oil. Computer trajectories were also developed to predict the spread of the oil. The Trustees gathered and evaluated this information to understand the geographic extent of the spill's impacts. These maps and predictions are summarized in the 1998 NOAA HAZMAT Scientific Support Team Information Management Report (AR# 17).

3. Fingerprinting of Oil Contamination: Samples of oil collected from the *M/V Kuroshima*'s fuel tanks and samples collected immediately adjacent to the grounded ship were chemically analyzed. The results of these analyses were compared to analytical results from biota, sediment and water samples collected throughout Summer Bay and Lake to confirm that the contamination of these resources came from the *M/V Kuroshima* (AR #17, 94, 103).

4. Evaluation of Oil Fates and Weathering: Samples of *M/V Kuroshima* oil collected over time in the environment were analyzed to better understand the potential toxicity, rate of degradation, fates and persistence of the oil. These analyses showed that the oil would degrade slowly in the environment (AR# 18, 94).

5. Collection of Response information, Baseline data and Literature: The Trustees collected and evaluated reports and documentation generated as part of the operational response. A search was also conducted to collect relevant historical research, management plans and other information regarding the Summer Bay and Unalaska region. Baseline data on salmon (AR# 12, 121) and birds was collected (AR# 43, 116). Additionally, a literature search was conducted to collect information on the fate and effects of similar spills (AR# 13, 29, 31, 36, 37, 38, 62, 108, 122).

6. Shoreline Cleanup Assessment Team (SCAT) Surveys: Periodic and comprehensive shoreline surveys of Summer Bay Lake and Summer Bay were undertaken at the direction of the Unified Command. Trustee Agency representatives participated in these SCAT surveys and conducted annual follow-up surveys after the completion of the response. The Trustees used this information to determine the geographic extent, severity and persistence of stranded oil on shorelines. The survey information also was evaluated to help understand the efficacy of the response and to identify areas that suffered collateral harm because of the cleanup operations. These results are summarized in the 1998 NOAA HAZMAT Scientific Support Team Information Management Report (AR# 17) and the 1998 NOAA Damage Assessment Center Preassessment Scoping Report (AR# 18).

7. Dive Survey of Summer Bay Lake: The Trustees reviewed the videotapes and reports generated by the underwater survey of Summer Bay Lake conducted during April 1998 to evaluate the severity of visible oiling and the efficacy of the underwater cleanup operations (AR# 19). This work was contracted by the Responsible Party under the supervision of the Unified Command. The dive operations resulted in the removal of some but not all of the submerged oil. The results of the dive surveys and underwater cleanup operations are summarized in the July 28, 1998 report entitled "Summer Bay Lake Bottom Survey and Cleanup Report, *M/V Kuroshima* Oil Spill", prepared by Polaris Consultants (AR# 19).

8. Documentation of Wildlife Recovery and Rehabilitation: Collection and recording of dead and injured wildlife began immediately after the incident. This work was contracted by the Responsible Party under the supervision of the Unified Command. Trustee representatives collected data on the total number of dead and injured wildlife. Wildlife Teams also documented predation by foxes and eagles, as well as a number of oiled birds that could not be captured. The Trustees also reviewed information on the fate of the treated animals. The wildlife data clearly demonstrates that a large number of birds were killed by the incident. The results of the Wildlife Operations are summarized in a 1998 report prepared by the Wildlife Rapid Response Team (WRRT) for the U.S. Fish and Wildlife Service (AR# 28).

9. Vegetation Surveys: In addition to the SCAT surveys, the Trustees conducted surveys of injured and restored vegetation and reviewed reports generated by the RPs on the status of their revegetation efforts. The vegetation data shows that vegetation was contaminated by the spill and that recovery of the vegetation has begun. The results of the vegetation surveys are summarized in the November 1998 report entitled "Vegetation Restoration Project, *M/V Kuroshima* Oil Spill", prepared by Vanguard Environmental (AR# 24).

10. Summer Bay Lake Sediments and Water Quality Studies: Samples of Lake waters and sediments were collected at several intervals during the response phase of the incident. The data clearly demonstrates that the waters and sediments of Summer Bay Lake were contaminated by the incident. The results of the water and sediment sampling are summarized in the 1998 report entitled " *M/V Kuroshima* Incident: Preassessment Scoping Report" prepared for NOAA by Industrial Economics, Inc. (AR# 18). The detailed analytical results and quality assurance reports are in AR# 99 and 103. NOAA (Rice, 1999) also prepared a summary interpretation of sediment contamination on persistence, toxicity, risk to fisheries resources in Summer Bay Lake (AR # 117).

11. Invertebrate Studies: The Trustees worked with the RPs and the unified command to evaluate the severity of oil contamination of shellfish in Summer Bay. Samples of shellfish commonly harvested by recreational users were collected on three occasions. The shellfish tissues were analyzed for PAHs (AR# 103) and the analytical results clearly show that shellfish in Summer Bay and Humpy Cove were contaminated by *M/V Kuroshima* oil (AR# 104). The results of the shellfish sampling are summarized in the 1998 Health Consultation prepared by the Alaska Department of Health and Social Services and the U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (AR# 4).

12. Salmonid enumeration: The Trustees established a fish weir at the outlet of Summer Bay Lake and enumerated juvenile outmigrants and adult returns. Surveys of spawning areas were also conducted. This information was used to determine the approximate numbers of salmon spawning in the lake and to help evaluate post-spill population changes. Annual

reports of the weir operation have been prepared by the Alaska Department of Fish and Game (AR # 2, 3[7], 126, 127).

3.3 Summary of Preassessment Findings

This section discusses the fates and behavior of the spilled oil and describes the natural resources, resource services, and habitats injured as the result of the *M/V Kuroshima* incident including birds, shoreline vegetation, shellfish and intertidal biota, salmonids and lake resources, and recreational uses.

3.4.1 Oil Fates and Behavior[8]

Oil Fates - The *M/V Kuroshima* contained approximately 122,000 gallons of Bunker C fuel oil when it struck Second Priest Rock. Lightering operations conducted in early December removed 97,000 gallons of mixed Bunker C, diesel oil and seawater. The Unified Command estimates that about 39,000 gallons of Bunker C fuel oil spilled from the freighter (Figure 17: Oil Sheens in Summer Bay). Oil was blown onto Summer Bay Beach and stranded oil was observed along the shore in Morris and Humpy Coves and Constantine Bay (Figure 18: Cumulative Footprint of *M/V Kuroshima* Oiling). In addition, a substantial amount of oil flowed into Summer Bay Lake. Over 80% of the lakeshore was impacted by oil and there was substantial accumulation of oil on the Lake bottom.

Oil Characteristics - The oil released from *M/V Kuroshima* was Bunker C fuel oil. This oil is very viscous and persistent in the environment. Oil samples were analyzed for saturated/total petroleum hydrocarbons by Gas Chromatography/Flame Ionization Detection (GC/FID) and individual Polynuclear Aromatic Hydrocarbons (PAHs) by Gas Chromatography/Mass Spectrometry (GC/MS). The analysis showed the presence of substantial fraction of a lighter weight petroleum hydrocarbons suggesting that the bunker oil was cut or blended with a lighter fuel oil.

Oil Weathering – Based on its physical and chemical properties, the oil spilled during the *M/V Kuroshima* incident was expected to undergo a variety of weathering processes. These weathering processes result in dispersion and the physical and biological degradation of the oil.

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[7] ADF&G Regional Information Reports No. 4K99-62 and 4K00-63.

[8] Information in this section is summarized from a number of response and assessment documents and technical reports cited in the Administrative Record including the ADEC Response Report (AR#1), Shoreline contamination survey data (AR #74), USCG Polreps (AR# 22), the NOAA HAZMAT Information Management Report (AR# 17), the NOAA Damage Assessment Center Preassessment Scoping Report (AR# 18), the Polaris Consultants Lake Bottom Survey Report (AR #19), the Vanguard Consultants Shoreline Cleanup Report (AR #25), NOAA technical reports on Group V (Heavy) Oils (AR # 36,37), NOAA technical reports on cold-water (AR# 38,39, 60, 61, and 62)) and inland spills (AR# 54), literature on persistence of oil in subtidal sediments (AR # 48), Oceanographic characteristics of Unalaska Bay (AR # 52), Survey results of fuel oil on the M/V Kuroshima (AR # 56), chemistry results (AR #94, 99,103, 104) and literature on oil fates from the Exxon Valdez spill (AR# 50, 65, 66, 67, and 122).

Under moderate weathering conditions, the lower-molecular-weight hydrocarbons are rapidly lost by a combination of evaporation and dissolution processes such that their lifetime in a spilled-oil slick is generally only a matter of hours to days. The middle-molecular- weight hydrocarbons such as naphthalene are more persistent, but generally can be lost from a surface slick by evaporation and dissolution processes over the time frame of days to weeks. The high-molecular-weight constituents are generally more persistent and can remain in a surface oil slick or stranded on shorelines for months or years.

However, the climatic conditions associated with the *M/V Kuroshima* Spill, while not unusual for the location and season, retarded the weathering process. Instead of floating and spreading on calm seas, the high winds, wave energy and ice conditions are thought to have appreciably retarded the weathering of the oil. In the days and weeks immediately following the *M/V Kuroshima* spill, the winds reached hurricane force and massive quantities of the spilled oil were physically dispersed by turbulence into the waters of Summer Bay Lake. Thus, the storms that occurred during the spill event led to substantial quantities of relatively fresh oil being buried within the shoreline sediments and deposited in mats and tarballs along the bottom of the Lake. Once buried in shoreline sediments or entrained in the water column, the resulting oil would not be subject to extensive weathering by evaporation and only slow dissolution of aromatics would continue. Some moderate evaporation of dissolved constituents from the Lake surface would have occurred initially; however, this too would have been terminated with the formation of a continuous ice cover. Under these conditions, the oil would then be encapsulated or trapped within the ice and/or between the ice and bottom sediments. The oil-phase chemical composition would remain essentially unchanged over the winter months. Bunker C is capable of yielding substantial dissolved concentrations of aromatics when exposed to water under equilibrium conditions, as would have been encountered in the Lake. The *M/V Kuroshima* Bunker C fuel oil contained a very high proportion of dissolved naphthalene and other aromatics and it had an unusually large fraction of lighter-molecular-weight alkyl-substituted benzene. These components have substantial water solubilities and they would have persisted as dissolved constituents in the cold water under the ice cover for the 4-month period between December and ice breakup in the March/April time frame.

Water samples collected five months after the spill confirmed that persistent low level concentrations persisted through the winter. Although the concentrations were not acutely toxic, they were suggestive that chronic exposure is a highly probable risk (Rice, 1999). Over time, the oil is expected to degrade and concentrations of hydrocarbons are expected to decline, but the persistence of oil on the lake bottom is expected to provide a long-term source of contaminants.

3.4.2 Birds:

The Trustees worked with the Unified Command to survey and enumerate oiled and dead seabirds. Wildlife operations during the spill were directed by the Unified Command, under permits from the State and Federal wildlife agencies. The Bird Treatment Center in Homer, Alaska was chosen to handle, treat, and release cleaned birds. The Wildlife Rapid Response Team worked with State and Federal wildlife scientists and local hires to conduct hazing and collect carcasses. Despite the adverse search conditions, approximately 200 dead or extensively

oiled birds were observed. Affected species included red-breasted merganser (*Mergus serrator*), common murre *(Uria aalge),* crested auklet *(Aethia cristatella*), least auklet *(Aethia pusilla*), black scoter (*Melanitta nigra),* storm-petrel (*Oceanodroma sp.*), glaucous-winged gull *(Larus glaucescens)*, long-tail duck (*Clangula hyemalis*), harlequin duck (*Histrionicus histrionicus*), Steller's eider, common loon (*Gavia immer*), red-necked grebe (*Podiceps grisegena*), horned grebe (*Podiceps auritus)*, cormorant *(Phalacrocorax sp.)*, emperor goose, and other birds that were not positively identified. These data are summarized in the USFWS carcass collection report (AR # 42) and Wildlife Rapid Response Team Report prepared for the USFWS (AR# 28)[9]. The preassessment data clearly demonstrates that birds were exposed to and injured by oil from the *M/V Kuroshima.*

In addition to the observed acute mortality, the oil spill literature suggests that the actual mortality would be considerably greater because not all areas could be surveyed and many dead birds would sink, be scavenged or suffer delayed mortality[10]. Oiling of the bird feathers resulted in loss of water-repellency and hypothermia. Oil ingestion, either because of predation on oiled carcasses, or through preening behavior, may also have resulted in mortality. Few of the rescued birds survived the cold temperatures. Most of the birds were recovered dead and few of the live birds survived the cleaning and rehabilitation process. Birds that were observed oiled but were not captured likely did not survive the winter. As a consequence of the bird mortality described above, future bird productivity was likely also lost due to the spill. Because of these concerns, the Trustees concluded that a more thorough quantification of injury and evaluation of restoration alternatives were warranted. These analyses are summarized below in Section 5.2.

3.4.3 Shoreline Vegetation:

Information in this section is summarized from a number of response and assessment documents and technical reports[11]. Shoreline vegetation was oiled to various degrees throughout the spill area. The extent of oiling ranged from a light stain to thick tar mats. Vegetation oiling occurred primarily in the upper-intertidal, supratidal and dune areas. The heaviest oiling of the dunes occurred near the outlet of Summer Bay Lake where wind-blown oil formed a thick tar mat along

[9] The wildlife operations were contracted by the Responsible Parties under the direction of the Unified Command. The contractor has a requirement to report its activities and findings to the Alaska Department of Fish of Game and the U.S. Fish and Wildlife Service.

[10] The Trustees relied on a number of literature sources in their preassessment evaluation of bird injury including a synthesis of issues in the assessment of mortality of seabirds from oil spills (AR #115), Exxon Valdez seabird injury methods and results (AR# 70), the effects of oil pollution on seabirds in British Columbia (AR# 116), methods for conducting beached-bird surveys (AR # 7), baseline winter bird densities in Unalaska (AR # 43 and 106) and the seabird assessment methodology used for the North Cape Oil Spill (AR# 16).

[11] Documents relied upon for the preassessment evaluation of vegetation impacts include the ADEC Response Report (AR # 1), a shoreline plant restoration guidebook for Alaska (AR# 15), the NOAA HAZMAT response report (AR# 17), NOAA Preassessment Scoping Report (AR# 18), the RP's report on the restoration of vegetation impacted by the M/V Kuroshima (AR # 24), Shoreline Cleanup Report (AR # 25), Summary of the effects of oil on Tundra Vegetation (AR #35), the Shoreline contamination survey data (AR #74), and surveys of the replanted areas (AR # 124).

the base of the dunes. Vegetation was also oiled along the shoreline of Summer Bay Lake. The outlet stream of the Lake was blocked during the initial response to prevent additional oil from entering. This resulted in unusually high lake levels for over a week after the spill. Ultimately, the water rose approximately 0.5 meters. Depending on the slope of the shoreline, the slowly increasing water levels resulting in a nearly continuous band of Lakeshore vegetation 1-15 meters wide being oiled (AR# 24).

Vegetation injury resulted from a combination of direct smothering by the oil and trampling, cutting and erosion resulting from the associated response efforts. Because the vegetation was largely dormant at the time of the spill, the primary injury pathway was physical disturbance of the vegetation during response and cleanup, rather than a toxicological response (Figure 19: Trampled Vegetation). The injured vegetation provides habitat for birds, provides shoreline and dune stabilization and provides recreational services. Overhanging and emergent vegetation provides cover/shade and a food source for fish (insects). Preliminary surveys of the area show that 5.9 miles of shoreline were lightly to heavily oiled on Summer Bay and Summer Bay Lake. An estimated 4,719 square meters of vegetation were injured as a result of the response and cleanup activities and an additional 14,281 square meters of vegetation was lightly oiled or impacted by response and cleanup activities (AR# 24).

To evaluate the impacts on vegetation the Trustees consulted with vegetation experts familiar with the flora of Unalaska, reviewed reports prepared by the RPs technical experts and reviewed literature on the recovery of vegetation after oil spills and physical disturbance. Based on this preliminary evaluation, the Trustees concluded that the injured vegetation would likely recover, but that a more thorough quantification of injury and evaluation of restoration alternatives were warranted. These analyses are summarized below in Section 5.3.

3.4.4 Shellfish and Intertidal Biota:

The affected intertidal areas provide important ecological and recreational services, including shellfish harvest, beach combing and other uses. The Trustees conducted shoreline surveys and utilized surveys conducted by the Unified Command to determine the areal extent of contamination (AR # 1, 17, 18, 25, and 74). Shellfish tissues and samples of oil on the shoreline were also collected and chemically analyzed (AR # 4, 94, 99, 102, 103, 104). The chemistry results, combined with professional judgment of the Trustees based on experience and literature on spills involving similar oils (AR # 31, 39, 48, 50, 59, 60, 65, 66, 111), were used to predict the likely persistence of oil in the intertidal zone. Based on these observations and analytical results, the Trustees determined that shoreline oiling extended from the north shoreline of Morris Cove south to Summer Bay Beach and Second Priest Rock in Summer Bay. The degree of oiling ranged from a light stain to a heavy coat on the marine shoreline. In some areas, the oil will likely persist for years. The spill resulted in smothering and tainting of intertidal biota and resulted in low-level, but chronic oiling of area shorelines. Chemical testing confirmed that the oil was from the *M/V Kuroshima* (AR# # 94, 99, 103, 104).

Approximately 3.4 miles of marine shoreline were exposed to oil from the *M/V Kuroshima* spill. Tainting of shellfish persisted for at least 6 months after the spill and low-level chronic oiling of cobble beaches is expected to persist for at least the next 5-10 years until winter storms and microbial activity fully degrade the oil. Annual site visits to affected shorelines in the years since the spill reveal a decline in the level of oiling, but oil is still visible as stains and tar among the cobble (Doug Helton, Pers. Obs., AR# 112). Sunken oil from the Lake bottom is expected to continue to slowly remobilize and provide a low level but chronic source of contamination of the marine shoreline (Rice, 1999).

One of the primary concerns raised in public meetings by tribal members, city leaders, and other residents was the wholesomeness and safety of the oiled seafood (ADEC Sit. Rep.22 in AR# 18). Based on these concerns, the Unified Command arranged to have shellfish tissues collected for human health investigation, and recommended that shellfish in the spill area not be harvested pending completion of the cleanup and finalization of the health risk analysis (ADEC Sit Rep 26, in AR# 18). The Alaska DEC and Alaska Fish and Game requested assistance from the Alaska Department of Health and Social Services and the U.S. Department of Health and Human Services regarding the public health implications of the seafood contamination in Summer Bay (AR #4). The risk analysis concluded that PAH levels in the mussels and other sampled shellfish resources were at levels below human health concern, but recommended that users avoid consumption of foods on which oil can be seen, smelled or tasted.

The results of the health studies gave some confidence to some local users, but created uncertainty and lingering suspicions among others (Dan Duame, Pers. Comm.). The Department of Heath and Social Services guidance said to avoid oiled shellfish. Although shellfish beds are not visibly oiled, the persistence of nearby oil in the Lake and along the intertidal and supratidal areas of Summer Bay provides a continued visual reminder of the spill and raises questions about whether that residual oil is a source of low-level exposure to intertidal shellfish. Reports from tribal members during the summer of 2001 indicate that local users still find oil along the Lake and Bay and have questions about exposure risks through direct contact with the oil and through consumption of nearby shellfish (AR# 131, Dan Duame, Pers. Comm.). These concerns are further intensified by the well publicized persistence of *Exxon Valdez* oil in Prince William Sound (AR# 65, 69, 122) and the long-lasting impacts of that spill on Native communities (AR # 73).

Based on the preliminary surveys and concerns about the loss of use of the intertidal, the Trustees concluded that evaluation of impacts and restoration alternatives was warranted. These analyses are summarized below in Section 5.4.

3.4.5 Salmonids and Lake Resources:

The Summer Bay Lake system supports at least three species of pacific salmon (pink, coho and sockeye) and Dolly Varden. The salmonids that return to Summer Bay Lake are harvested recreationally. Harvests have been curtailed during recent years because of concerns about stock size. The Trustees have conducted preliminary surveys on the population of salmonids in

Summer Bay Lake and have operated a fish weir (Figure 20: Salmon Weir at Outlet of Summer Bay Lake) annually since the spill (AR # 2,3).

Several lines of evidence suggest that anadromous and resident fish in Summer Bay Lake have been exposed to oil and were injured by the *M/V Kuroshima* spill. Underwater surveys showed mats of oil that, on a localized basis, smother spawning and rearing habitats (AR# 19). This submerged oil, as well as oil contamination in Lake water and sediments, were chemically fingerprinted and determined to be *M/V Kuroshima* oil (AR # 117). In addition to direct exposure to oil, these fish may also have been injured through physical disruption of spawning habitats resulting from cleanup workers trampling the nearshore areas and increased sedimentation due to response-related erosion, and starvation or reduced growth as a result of injury to their planktonic forage base. The oil spill literature strongly suggests that trace levels of oil left in the Lake may cause low-level injuries, including reduced spawning success, reduced growth and other sub-lethal injuries (AR# 44, 47, 49, 58, 68, 69). The spill occurred in late fall. Consequently, juvenile salmon in Summer Bay Lake may have been exposed as eggs, fry and juveniles. The Trustees considered Sockeye and coho salmon to be at the greatest risk from the oil spill because of their long freshwater residency both in spawning gravels within the Lake and in rearing habitats along the Lakeshore.

Based on the run size information derived from the smolt and adult weir surveys, existing exposure data, oil weathering information and literature on the subject, the Trustees expect salmon runs in Summer Bay Lake to recover, but have concluded that further assessment and evaluation of restoration alternatives are warranted. These analyses are summarized below in Section 5.5.

3.4.6 Recreational Uses:

The *M/V Kuroshima* spill occurred on the prime recreational beach for the City of Unalaska (Figure 21: Sport Fishing at Summer Bay). The Summer Bay area is an important location for picnicking, fishing, beach combing, swimming, day hiking, wildlife viewing and shellfish harvesting. The beach, Lake and surrounding areas are unique in that they are readily accessible, but relatively undeveloped. The Summer Bay area has the only sand beach on the Island that can be reached via road. The limited number of roads and the steep terrain on the Island severely limit the number of alternative recreation sites. The presence of oil and response operations reduced the number of recreation trips, and residual oil and subsequent response operations diminished the value of the trips taken to the area.

The Trustees conducted a preliminary analysis to evaluate the impacts of the spill on human uses including the number and value of lost user-days and diminished trips to the Summer Bay area (AR# 97). Information on local use patterns was collected from local residents, the Qawalangin Tribe and the City of Unalaska. Data collected by the ADF&G fish weir crew on recreational use of the Summer Bay area was also evaluated (AR # 123). Beach closure and contamination information was derived from reports and information generated by the Unified Command and from the RP's report on the July 1999 cleanup (AR# 25). Values for the affected recreational

activities were derived from State of Alaska and national outdoor recreation surveys. Based on this information, the Trustees concluded that there was a recreational lost use of the Summer Bay region and that evaluation of restoration alternatives was warranted. These analyses are summarized below in Section 5.6.