DRAFT
SHELLFISH RESTORATION PLAN
AND
SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT
FOR THE *NORTH CAPE* OIL SPILL

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INTRODUCTION AND OVERVIEW CHAPTER 1

1.1 BACKGROUND

On January 19, 1996, the *North Cape* tank barge and tug *Scandia* grounded on Moonstone Beach in southern Rhode Island after the tug caught fire, spilling an estimated 828,000 gallons of home heating oil into Block Island Sound and surrounding tidal waters. Oil spread throughout a large area of Block Island Sound, including Trustom Pond National Wildlife Refuge, resulting in the closure of a 250-square mile area of the Sound for fishing. Hundreds of oiled birds were recovered in the weeks following the spill, and large numbers of dead and dying lobsters, surf clams, and other organisms were found on and collected from area beaches.

The National Contingency Plan (40 CFR Section 300.600) designates state and federal agencies as trustees for natural resources. The *North Cape* Trustees include the U.S. Department of Commerce through the National Oceanic and Atmospheric Administration (NOAA), Rhode Island Department of Environmental Management (RIDEM), and the U.S. Department of Interior through the U.S. Fish and Wildlife Service (USFWS). NOAA is the lead Trustee for case.

On September 15, 1998, the Trustees released for public review and comment a Draft Restoration Plan (RP) and Environmental Assessment (EA) which described the injuries caused by the spill and the proposed restoration actions to address those injuries. After incorporating public comments, a Revised Draft RP/EA was issued on March 31, 1999 and again, public comments were requested. The Final RP/EA was completed in October 1999, and a Finding of No Significant Impact (FONSI) was signed by the NOAA, Assistant Administrator for Fisheries on November 16, 1999. However, before that document could be published in its final form, the Trustees reached a settlement of the case with the Responsible Party. A Notice of Lodging of Consent Decree pursuant to the Oil Pollution Act of 1990 (OPA) was published in the Federal Register (65 FR 44808, July 19, 2000) seeking public comment on the proposed settlement of the *North Cape* case. This document included the details of that settlement, including plans for restoration. The previous EA and other case documents can be reviewed on the following web site: www.darp.noaa.gov/neregion/ncape.htm.

The *North Cape* Trustees reached a settlement with EW Holding Corp. and K-Sea Transportation Corp., the Responsible Parties (RP) and owner of the tank barge *North Cape*, on October 6, 2000. The settlement that is embodied in a Consent Decree entered in the case entitled *U.S. v. EW Holding Corp*, United States District Court for the District of Rhode Island, Civil Action Number 00-332T provides that $1.5 million are available for shellfish restoration. The Consent Decree further states that those funds are to be used for transplanting quahogs from Providence River ship channel, purchasing and transplanting adult quahogs, and implementing additional projects that include seeding of hatchery-reared quahogs and the remote setting of oysters. The Trustees have developed this draft RP/Supplemental EA to more thoroughly consider and evaluate potential shellfish project alternatives, and develop a preferred alternative for the shellfish restoration. The Trustees are now seeking public input in preparing and implementing the final shellfish restoration plan.

This RP/Supplemental EA document has been prepared to further describe the preferred shellfish restoration projects and alternatives, as well as fulfill the statutory requirements of the both the Oil Pollution Act and National Environmental Policy Act. The following materials provide an overview of the spill incident and resulting natural resource injuries, specifically impacts to shellfish, and discuss in greater detail the purpose and need for the project, the outcome of the case settlement, and legal requirements applicable to this proposed restoration.

1.2 OVERVIEW OF THE SPILL INCIDENT

On January 19, 1996, the tank barge *North Cape*, carrying 94,000 barrels (3.9 million gallons) of two blends of No. 2 home heating oil, struck ground off Moonstone Beach in South Kingstown, Rhode Island and began leaking oil into surrounding waters. Winds reaching 50 knots formed large, breaking waves that dispersed oil throughout the water column, into contact with bottom sediments, into the atmosphere, and onto the shoreline. Oil skimming and boom operations began on January 20, 1996 in an effort to control surface oil sheen, remove oil from the water column, and protect sensitive salt pond and offshore ecosystems. In total, an estimated 828,000 gallons of No. 2 fuel oil were released into the coastal and offshore environments.

1.3 NATURAL RESOURCE INJURIES

The Trustees and the Responsible Party worked together to determine the injuries caused by the *North Cape* oil spill. The Trustees recognize that there is some degree of uncertainty associated with any individual injury determination. In assessing the injuries caused by the spill, the Trustees used the most reliable sources of information and methodologies available, including field data, literature review, modeling, scientific reports, and expert analysis. The Trustees reviewed the results of over 30 studies of potential natural resource injuries caused by the *North Cape* spill and consulted with a number of experts in relevant scientific disciplines.

Losses in both numbers and biomass (direct kill and production foregone) were largest in the offshore environment. Approximately 150.6 million surf clams (364,000 kilograms (kg)) and 9.0 million lobsters (direct kill only, totaling 312,000 kg) were lost as a result of the spill (French 1999, Cobb and Clancy 1998, Cobb *et al.*, 1998). Large numbers (4.9 billion) of worms and amphipods died from spill effects, although their relatively small size (~0.01 grams each) resulted in a biomass loss of 80,000 kg (French 1998). Losses of rock and hermit crabs totaled 7.6 million animals, with a biomass of 97,000 kg. Fish losses including skates, cunner and Atlantic sea herring totaled 4.2 million animals and 111,000 kg.

In the salt ponds, injury to worms and amphipods via contaminated sediment pore water totaled approximately 6.6 billion organisms, with an associated biomass loss of 164,000 kg. In addition, approximately 7,100 kg of crabs and shrimp, 12,400 kg of soft-shelled clams and oysters, and 5,000 kg of forage fish also were lost due to the spill. Trustee analysis indicated that 1996 productivity of the piping plover, a federally listed threatened species, was reduced by approximately five to ten fledged chicks. Mortality to birds was estimated at 2,292 birds,

responsible for estimated interim losses of 6,274 bird-years. Losses of loons (414), eiders (354), and grebes (228) were the largest and responsible for 4,477 bird-years lost.

Boat-based recreational fishing was the only human use activity for which the Trustees assessment confirmed and quantified a loss. Trustee analysis indicated that 3,305 party and charterboat fishing trips were lost, but recreational activity returned to base levels approximately six months after the spill.

1.3.1 Shellfish Injuries

The Trustees' analysis indicated that 379,300 kg of bivalve biomass was lost as a result of the *North Cape* oil spill including both direct mortality and production foregone. The majority of the injury was to surf clams *(Spisula solidissima),* with young-of-the year suffering the greatest mortality, resulting in a loss of 364,000 kg in biomass (Refer to Table 1-1). Blue mussels *(Mytilus edulis),* quahogs/hard clams *(Mercenaria mercenaria),* soft-shelled clams *(Mya arenaria),* and bay scallops *(Argopecten irradians)* were also significantly affected by the oil spill. The area of impact was both within and outside the coastal salt ponds, although injury to surf clams and other bivalves was primarily in the offshore environment, in the Nebraska Shoal area from Point Judith to Charlestown Beach (French, 1998).

TABLE 1-1
SHELLFISH INJURIES FROM THE *NORTH CAPE* OIL SPILL

Shellfish Type	Total Wet Tissue Weight
Surf Clams	800,800 lbs/ 364,000 kg
Other Marine Bivalves	6380 lbs/ 2,900 kg
Salt Pond Shellfish	27,280 lbs/ 12,400 kg
Total	**834,460 lbs/ 379,300 kg**

The Trustees had projected that injured surf clam populations would naturally recover to baseline condition in three to five years. Natural recovery was therefore expected to be quicker and more cost-effective than active primary restoration alternatives.

1.3.3 Shellfish Restoration Consent Decree Requirements

On October 6, 2000, the federal district court entered a consent decree with the Responsible Parties (RP). The Consent Decree for the *North Cape* settlement stipulates project activities that the Trustees will implement for restoring injuries to surf clam (*Spisula solidissima*), quahog (*Mercenaria mercenaria*) and other shellfish species. To compensate for *North Cape* shellfish injuries, the restoration is focused on replacing the lost shellfish biomass (379,300 kg/834,460 lbs, wet tissue weight) due to the spill, including interim biomass losses. The Consent Decree stipulates that the Trustees shall use $1.5 million of the *North Cape* funds, plus any accrued interest, to implement a shellfish restoration program.

The goal of the shellfish restoration is to replace the lost shellfish biomass through a variety of projects. The Consent Decree establishes a tiered approach to meet this goal whereby the Trustees are to first consider transplanting 10.2 million adult quahogs from the area proposed for dredging in the Providence River navigational channel to designated sanctuaries in Narragansett Bay. If this goal cannot be met in a cost-effective manner, the Trustees are then to consider purchasing additional adult quahogs from the market for transplanting, provided the purchase would not adversely affect market conditions. Lastly, the Trustees are to implement other shellfish projects such as the remote setting of oysters and/or quahog seeding if the Providence River navigational dredge channel rescue and dockside market purchase alternatives cannot supply an adequate number of quahogs to meet the goal of restoring the lost biomass.

1.4 PROJECT PURPOSE AND NEED

This Shellfish RP and Supplemental EA has been prepared by the federal and state Trustees to evaluate preferred and alternative restoration projects for the shellfish resources lost or injured by the *North Cape* oil spill. The document also serves to fulfill the statutory requirements under the National Environmental Policy Act (NEPA) (42 USC § 4321 *et seq*.). This Shellfish RP/EA incorporates public comment, where appropriate, and information obtained by the Trustees during the earlier Draft RP/EA public comment periods.

The purpose of this restoration project, as discussed in this RP/EA, is to fully address the impacts to shellfish from the *North Cape* oil spill by returning injured natural resources to their pre-spill (*baseline*) conditions, as well as compensate for interim losses of the shellfish resources. Regulations for conducting natural resource damage assessments to address the resource restoration process have been promulgated (15 CFR Part 900 *et seq*.) pursuant to the Oil Pollution Act of 1990 (33 USC § 2701 *et seq.*). The regulations define a process for developing restoration plans with input from both the public and the parties responsible for the spill.

This RP/EA is intended to inform the public and solicit public comment on the proposed shellfish restoration actions. The shellfish restoration alternatives described herein are based on sound conceptual plans and estimated costs. The design, magnitude, and anticipated timeline of the shellfish restoration project and potential alternatives may change based on public input. The Trustees believe that public input at this stage is vital to the restoration process. Comments received by the Trustees will be fully considered, and where applicable, incorporated into the Final RP/EA.

1.5 OVERVIEW OF USE OF SETTLEMENT FUNDS TO ADDRESS NATURAL RESOURCE INJURIES

The *North Cape* Oil Spill Restoration Plan and Environmental Assessment identified various alternatives for restoring the natural resources injured by the *North Cape* spill, and two types of restoration were considered. Primary restoration includes any actions taken to enhance the return of injured natural resources and services to their baseline condition. In some situations, it may be preferable to rely on natural recovery rather than primary restoration where feasible if cost-

effective primary restoration actions are not possible, or where the injured resources will recover relatively quickly without human intervention. The second type, compensatory restoration, is any action taken to account for interim losses of natural resources and services. The scale of the required compensatory restoration depends both on the scale or magnitude of resource injury and how quickly each resource and associated services return to baseline conditions. Primary restoration expediting resource recovery reduces the requirement for compensatory restoration.

The Trustees evaluated ~25 restoration alternatives with the potential to enhance the recovery of natural resources injured by the spill and compensate for the losses pending recovery. Besides the potential shellfish restoration projects, the focus of this RP/EA, the Trustees have implemented restoration projects for American lobster, piping plover, common loon, and sea ducks (Refer to Table 1-2 and Appendix A). A plan is also underway to restore alewife runs in the salt pond watersheds as compensation for lost recreational fishing opportunities due to the spill. The Trustees have also protected open space lands to compensate for losses to other marine and salt pond organisms.

TABLE 1-2
USE OF *NORTH CAPE* OIL SPILL FUNDS FOR RESTORING INJURIES

Injured Resource	Project Types	Project Status
Shellfish	Shellfish Restoration, Stock and Habitat Enhancement	*Subject of this document*; proposed restoration of bay scallops, enhancement of quahog through adult transplants and seeding; and oyster remote setting projects
American Lobster	Adult Lobster Restocking through v-notching	Trustees are monitoring RP-implemented project and working with fishermen to monitor release of adult female v-notched lobster, now in Year 3
Salt Ponds	Land and Water Quality Protection	In 2001, secured conservation easement on 50 acres of land bordering Ninigret Pond as a measure to sustain salt pond water quality
Common Loon	Nesting Habitat Protection and Monitoring	Funds used to secure conservation easement in 2001 on lands in northern Maine to protect nesting habitat on 110 lakes and ponds, and funds for monitoring and management
Sea Birds	Nesting Habitat Protection and Monitoring	Allocated funds for purchase of island to protect 600 nesting pairs off the Maine coast with purchase expected by summer 2002
Piping Plover	Nesting Habitat Protection and Monitoring	Funds allocated to hiring staff to coordinate, manage, and monitor fledgling success on NWR and non-NWR shore habitats
Recreational Fishing	Anadromous Fish Run Restoration	Restore alewife access to spawning habitats in Factory Brook (Green Hill Pond) and Saugatucket River (Pt Judith Pond) watersheds; alewife serve as forage fish to sport fish such as striped bass and bluefish

1.6 LEGAL REQUIREMENTS

This RP/EA has been prepared jointly by the National Oceanic and Atmospheric Administration (NOAA), the Rhode Island Department of Environmental Management (RIDEM), and the U.S. Department of the Interior (DOI) (represented by the U.S. Fish and Wildlife Services (USFWS)). Each of these agencies is a designated natural resource Trustee under the Oil Pollution Act of 1990 (OPA), 33 USC§2706(b), and the National Contingency Plan, 40 CFR Section 300.600, for natural resources injured by the *North Cape* oil spill. As a designated Trustee, each agency is authorized to act on behalf of the public under the state and/or federal law to plan and implement actions to restore natural resources and resource services injured or lost as the result of a spill.

1.6.1 National Environmental Policy Act (NEPA) Compliance

Any restoration of natural resources under OPA must comply with the National Environmental Policy Act (NEPA) (40 CFR 1500, *et seq*.) and the Council on Environmental Quality (CEQ) regulations implementing NEPA. In compliance with NEPA and the CEQ regulations, this RP/EA discusses the affected environment, describes the purpose and need for the proposed action, identifies alternatives, assesses their applicability and environmental consequences, and summarizes opportunities for public participation in the decision process.

1.6.2 Essential Fish Habitat (EFH)

Pursuant to Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996, any federal agency which authorizes, funds, or undertakes any activity that may adversely affect Essential Fish Habitat (EFH) must consult with the National Marine Fisheries Service (NMFS). EFH is broadly defined a "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity." The areas proposed for shellfish restoration through this plan have been designated EFH for a variety of federally managed species including winter flounder and other groundfish and pelagic species. In compliance with EFH regulations, this RP/EA addresses the potential impact that the shellfish restoration activities may have on federally managed species designated as EFH in Narragansett Bay and the South County coastal salt ponds.

1.6.3 Federal and State Endangered or Threatened Species

The Endangered Species Act of 1973, as amended, requires any federal agency which authorizes, funds, or undertakes any activity that may adversely affect federal or state endangered or threatened species to consult with NMFS and the USFWS, and state agencies to identify any species in the vicinity of a project. In the State of Rhode Island, RIDEM's Natural Heritage Program identifies and lists species that are of special concern to the state. Numerous endangered and threatened species are seasonal or occasional visitors to Rhode Island waters. Although these species are members of ecosystems encompassing the proposed restoration project area, available information indicates that no species will be adversely affected.

1.6.4 Clean Water Act

The Federal Water Pollution Control Act as amended (33 U.S.C. 12511 et seq.) protects surface waters from significant adverse impacts. Under Section 404 of the CWA, the Army Corps of Engineers (ACOE) is responsible for authorizing permits for discharging dredge and fill into waters of the U.S. including coastal waters. As part of this project, the Trustees will submit materials to the ACOE for review, although it is anticipated that the proposed work will qualify under the ACOE's Programmatic General Permit in Rhode Island. Additionally, an application will be submitted to Rhode Island's Coastal Resources Management Council (CRMC) for authorization, and Section 401 Water Quality Certification may be required by RIDEM for the proposed work activities.

1.6.5 Coastal Zone Management Act

The CZMA of 1972, as amended (16 U.S.C. 1431 et seq)requires that federal actions in state coastal waters be consistent with the state's federally-approved coastal management plan. A CZM consistency determination will be provided to CRMC for review and concurrence that the proposed project is consistent with Rhode Island's CZM program to maximum extent practicable.

1.7 PUBLIC PARTICIPATION

The original Draft RP/EA was placed in the Administrative Record (AR) on September 14, 1998 and the revised draft was entered in the AR on March 31, 1999. The Trustees previously received various comments from the public on the original *North Cape* RP/EA, and modifications were made to the RP/EA document where appropriate. Public review of the Draft and Revised Draft RP/EA was an integral component of the restoration planning process. Through the review process, the Trustees sought public comment on the analyses used to define and quantify natural resource injuries and the measures proposed to restore injured natural resources or replace lost resource services. The Draft and Revised Draft RP/EA provided the public with information on the nature and extent of resources injuries and restoration alternative evaluated.

This Draft Shellfish Restoration Plan/Supplemental Environmental Assessment for the North Cape oil spill is a means for seeking public review and soliciting comment on the preferred and other project alternatives. A legal notice indicating the release of the document and seeking public comment has been published in the *Providence Journal*. Additionally, the Trustees have scheduled two public meetings, to be held in two locations in relatively close proximity to the proposed shellfish restoration. Announcements of the meetings have been posted in various local newspapers and public office buildings. The Trustees will compile all public comments provided at the meetings and incorporate them into the final Shellfish RP/EA.

1.8 CONTENTS OF THE REMAINDER OF DOCUMENT

The remainder of this document presents further information about the shellfish resource injuries, the environment that may be affected by the project actions, and the proposed shellfish restoration alternatives for the *North Cape* oil spill.

- ***Chapter 2*** briefly summarizes the physical and biological environments that may be affected by the project, as required by the NEPA, and describes the cultural and economic importance of Narragansett Bay and coastal salt pond natural resources.

- ***Chapter 3*** describes the various shellfish restoration alternatives including the preferred alternative, and evaluates the positive and negative environmental and socio-economic impacts of each of the of the restoration alternatives.

- ***Chapter 4*** is the Findings of No Significant Impact (FONSI) as it pertains to the proposed shellfish restoration actions.

AFFECTED ENVIRONMENT CHAPTER 2

2.1 PHYSICAL ENVIRONMENT

This Chapter presents a brief description of the physical and biological environment potentially affected by the *North Cape* oil spill shellfish restoration. The physical environment includes the South County coastal salt ponds and Narragansett Bay.

Rhode Island's coastal shoreline encompasses 420 miles and the watershed to Narragansett Bay is 1,647 square miles. Over 2 million people live in this watershed comprised of 100 cities and towns, with 60 percent of the watershed in Massachusetts and 40 percent in Rhode Island. The three major tributaries to the bay are the Taunton, Blackstone, and Pawtuxet Rivers. The bay receives 2,400 million gallons of freshwater daily from rivers, streams, rainfall events, winter storms, sewage treatment facilities and combined sewer outfalls (CSOs). Narragansett Bay's average salinity is between 29 to 31 parts per thousand (ppt), and its average depth is 26 feet with the deepest point of 184 feet located in the East Passage near Castle Light. The tidal range for the Bay is 3 to 5 feet with an average tidal current of 1.5 knots, and water temperature ranges between 32° and 70° F. Narragansett Bay was formed from retreating glaciers over 10,000 years ago and is composed of three drowned river valleys now known as the East and West Passages of the Bay and the Sakonnet River. Most of the Narragansett Bay shoreline consists of cobble and gravel deposited by glaciers. The shoreline landscape is influenced by the high frequency of hurricanes, which strike, on average, once in every seven years (Olsen and Lee, 1985).

A band of nine coastal ponds and contiguous marshes lies along the southern coast of Rhode Island (Refer to Figure 1). The salt ponds located within the *North Cape* spill area and are a key focus of this restoration plan and are described in Table 2-2. The *North Cape* barge grounded immediately south of Trustom and Cards Ponds. Point Judith and Potters Ponds lie to the east and Ninigret and Green Hill Ponds to the west, with Quonochontaug and Winnapaug Ponds situated farther west. Of the nine salt ponds, five have permanent armored breachways constructed in the 1900s. Permanent breachways were constructed in Point Judith Pond in 1910 and in Ninigret Pond in 1952. Winnapaug and Quonochontaug Pond breachways were constructed in the late 1950s. A permanent tidal connection was established for Green Hill Pond in 1962 by connecting channel with Ninigret Pond (ACOE, 2002). These ponds are affected by the ocean and influenced by tides, currents, and sedimentation processes. Only Cards and Trustom Ponds are closed to the ocean most of the year resulting in lower water salinity.

The physical environment of southern Rhode Island has been affected by land development in the watersheds of the coastal salt ponds in the towns of Charlestown, South Kingstown, Narragansett, and Westerly. These communities generate pollution to the ponds through release

of road runoff, fertilizers, fish processing waste, and individual sewage disposal systems (ISDS) contamination of surface and ground waters. These contaminants have caused bacterial contamination and elevated nitrogen levels in some of the coastal salt pond waters. High nitrogen levels have led to increased eutrophication, decreased eelgrass beds, increased sediment hypoxia, and other detrimental effects of fish and wildlife habitats (Olsen and Lee 1985; Short *et al* 1996). Storm-water runoff containing gasoline and fuel oils has also been identified as a potential threat to the salt pond ecosystems (Olsen and Lee 1985). The port of Galilee, situated at the entry to Pt Judith Pond, supports a fleet of commercial fishing vessels. Fishing pressure has reduced once-abundant harvests of fish and shellfish in the salt ponds, as has habitat alteration caused by such activities as release of excess nutrients, dredge and fill operations, sediment transport, and damming of brooks and rivers.

TABLE 2-1
CHARACTERISTICS OF RHODE ISLAND'S COASTAL SALT PONDS

Coastal Pond	Area (Acres)	Average Depth (Feet)	Tidal Connection	Salinity Modifier
Point Judith	1,530	6	Permanent, wide breachway opening	Euhaline
Potters	329	2.5	Permanent, narrow connection to Pt. Judith Pond	Euhaline
Cards	43	1.5	Intermittent opening to Block Island Sound	Oligohaline
Trustom	160	1.5	Intermittent opening to Block Island Sound	Oligohaline
Green Hill	431	2.5	Permanent, narrow connection to Ninigret Pond	Polyhaline
Ninigret	1,711	4	Permanent, wide breachway opening	Mesohaline to Polyhaline
Quonochontaug	732	6	Permanent, wide breachway opening	Euhaline
Winnapaug	446	5	Permanent, long, curved breachway opening	Euhaline

2.2 BIOLOGICAL ENVIRONMENT

There are 13 coastal habitat types of Narragansett Bay (~123,006 acres) comprised of salt marshes, sandy beaches, rocky shores, tidal flats, freshwater streams and rivers, steambeds, sand dunes, *Phragmities*-dominated and brackish marshes, eelgrass beds, oyster reefs and shellfish

beds. These areas play host to a wide assortment of marine mammals, plants, finfish, shellfish and birds. There are about 252 fish species in Narragansett Bay representing 95 families which are commercially and recreationally fished such as striped bass, summer and winter flounder, tautog, and bluefish. Bivalves typically found in the bay include quahogs, oysters, blue mussels, and bay scallops. The lobster is also another economically important shellfish species found in Bay and fished commercially for over 150 years. Harbor seals are a common winter visitor to the region. Common marine birds such as herring gulls, cormorants, terns also inhabit the Bay.

Rhode Island's salt ponds are a critical part of the coastal ecosystem, serving as essential spawning, nursery, and growth areas for coastal fish and shellfish, including the commercially and recreationally important winter flounder (Baczenski *et al*. 1979, Crawford and Carey 1985, Ganz e*t al* 1992, Crawford 1990). Like most estuaries, the coastal salt ponds are also important links between terrestrial and marine environments, converting terrestrial inputs into marine biological production. Silversides, striped killifish, mummichogs, sheepshead minnows, polychaetes and amphipods are important forage items of the complex food web of the salt ponds. The salt ponds also provide valuable habitat for a host of resident and migratory bird species. During the winter months, marine waters support seabirds and waterfowl populations including loons and grebes, sea ducks, and diving ducks. Winter diving ducks and dabbling ducks; include scaup, American black duck and mallard also inhabitants of the salt ponds. Over 200 species of migratory birds use the coastal pond area during the spring and autumn months. Seals and sea turtles are also occasional visitors to the salt ponds.

2.2.1 Summary of Salt Pond Baseline Shellfish Survey - 2001

The existing shellfish resources of the coastal ponds are of particular importance to this *North Cape* Shellfish Restoration Plan. In summer 2001, Ninigret, Quonochontaug, and Winnapaug Ponds were surveyed by RIDEM with assistance from the University of Rhode Island's Graduate School of Oceanography (URI-GSO) to collect baseline information on the shellfish populations. This survey was the initial phase of the *North Cape* Shellfish Restoration project and was funded by both settlement monies and a private grant to URI-GSO. To complete the study, RIDEM first established a 100-square meter (m^2) grid overlay for each pond. For each grid selected for surveying, three 1 m^2 substrate plots were sampled to a depth of one foot to determine sediment characteristics and shellfish species and their abundance and size.

This survey involved sampling 176 stations covering 1,711 acres in Ninigret Pond, 125 stations covering 632 acres in Quonochontaug Pond, and 118 stations covering 446 acres in Winnapaug Pond (Ganz, pers. comm.). Preliminary results indicate that theses salt ponds are dominated by quahogs. Soft-shell clams were locally very abundant and very few oysters or bay scallops were observed in the ponds. This survey established quahog densities of .058/m^2 in Winnapaug, 2.26/m^2 in Ninigret, and 2.43/m^2 in Quonochontaug, averaging 25.4 mm in width, and soft-shell clam densities of .023/m^2 in Winnapaug, 1.04/m^2 in Ninigret, and 1.25/m^2 in Quonochontaug. Survey results are similar to previous shellfish surveys conducted by RIDEM (Ganz, pers. comm.). The Trustees will thoroughly evaluate the survey results as part of selecting potential shellfish restoration sites in these coastal salt ponds. Additional baseline surveys are anticipated for Pt. Judith Pond and possibly other coastal salt ponds during the summer of 2002.

2.3 ESSENTIAL FISH HABITAT

Pursuant to Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and Essential Fish Habitat (EFH) regulations as amended on January 17, 2002, all federal agencies are required to conduct a consultation with the Secretary of Commerce on any actions that may adversely affect EFH. Consultations are required through the National Marine Fisheries Service (NMFS). Relative to this RP/EA, NOAA's Restoration Center conducted a Programmatic EFH consultation with NMFS for its Community-Based Restoration Program (CRP) EA in August 2001 (The Programmatic EA can be reviewed at www.nmfs.noaa.gov/habitat/restoration). NOAA, through its CRP, implements projects similar in scope to the shellfish restoration proposed for the *North Cape* project, and many of the guidelines and conservation measures identified in the CRP consultation apply to this project. NMFS' Northeast Regional Office specifically reviewed and contributed to the programmatic consultation. The outcome of this consultation process identified potential impacts that community-based restoration in general and shellfish restoration specifically may have on the EFH environments in Narragansett Bay and Rhode Island's coastal salt ponds.

Rhode Island waters encompass a wide variety of marine habitats within Narragansett Bay and the coastal salt ponds including estuaries, salt marshes, rocky and sandy shorelines. Specific marine environments of the Bay and salt ponds harbor several benthic organisms, shellfish beds, oyster reefs and submerged aquatic vegetation such as eelgrass beds and widgeon grass. The restoration project will be implementing the EFH conservation recommendations provided in the CRP programmatic consultation to avoid and minimize any potential adverse affects on the EFH. Conservation measures will include avoiding work activity during critical fish spawning and nursery periods, employing Fishery Management Plan (FMP) conservation measures where applicable, provide training for project staff and volunteers, conducting performance monitoring throughout the project, and restoring habitat impacts should they occur.

The proposed shellfish restoration projects will incorporate BMPs for protecting fish species and their habitats including species addressed by the FMPs. Field restoration techniques will be employed to minimize direct and secondary disturbances to the species and habitats. For example, work activities and equipment and material staging areas will be prohibited or limited in areas containing sensitive habitats such as submerged aquatic vegetation (SAVs) and tidal marshes. Project staff and volunteers will be instructed and trained to avoid SAVs and marshes, and if in the vicinity of these habitats, will adhere to designated pathways and work areas avoiding these habitats. Shellfish relays and seeding will have negligible impacts on EFH other than minor, temporary and localized substrate disturbances. Oyster restoration will involve placing a thin veneer of shell material at specific, localized sites, that may result in short term, minor impact to benthic organisms. The proposed remote setting for oyster restoration would include clean shell from a shucking facility and hand placement into restoration sites to minimize turbidity to the water column and direct smothering of benthic organisms.

The Trustees will incorporate monitoring and assessment into the shellfish restoration work activities to properly evaluate the projects for potential impacts to EFH. Through the state and federal regulatory programs, NMFS NER staff will be consulted once the specific project

locations and activities have been developed to ensure all proper BMPs are employed to avoid or minimize potential adverse effects to EFH.

2.4 ENDANGERED AND THREATENED SPECIES

The Endangered Species Act of 1973 instructs federal agencies to carry out programs for the protection of endangered and threatened species and to conserve the ecosystems upon which these species depend. The Rhode Island Natural Heritage Program also identifies species that are of special concern to the state.

The Block Island Sound ecosystem provides particularly valuable habitat for the piping plover, a bird included on the federal list of threatened species. The southern beaches of Rhode Island contain the largest piping plover nesting area in the state. The birds feed on invertebrates in intertidal pools, washover areas, mudflats, sandflats, wracklines, and shorelines of coastal ponds, lagoons and salt marches. Special management activities at Trustom Pond National Wildlife Refuge (NWR) enhance the nesting success of piping plovers.

Management programs also exist to reduce disturbances to roseate terns at Trustom Pond. Roseate terns, federally recognized as an endangered species, are frequently found resting and feeding around Trustom and Cards Ponds. Migrating bald eagles, a federally listed threatened species, occasionally utilize the salt ponds of southern Rhode Island as a migration stopover.

Other endangered and threatened species are seasonal or occasional visitors to Rhode Island's southern shore and Narragansett Bay. Several species of sea turtles may be present from June through November. These include the threatened Atlantic loggerhead and the green sea turtle, and the endangered Atlantic leatherback and Atlantic Kemp's ridley (Gould and Gould 1992).

State and federal agencies have been contacted for identifying endangered or threatened species that are located within the proposed project area or may be affected by the project. The RINHP, USFWS, and NMFS were consulted and it is expected that no adverse impacts to endangered or threatened species will result from the proposed projects.

2.5 FEDERAL LANDS

Trustom Pond and Ninigret Pond NWRs are located on the south coast of Rhode Island in the Towns of South Kingstown and Charlestown, Rhode Island. They are two of over 500 NWRs in the United States comprising the National Wildlife Refuge system. Trustom Pond NWR was established in 1974 and encompasses ~1000 acres of wildlife habitat. Ninigret NWR was established in 1970 and encompasses 407 acres (Figure 1). In addition to providing important nesting and foraging habitat for resident and migratory waterfowl, shorebirds and songbirds, the NWRs provide valuable services to other flora and fauna of the region. Management objectives include maintaining a natural diversity and abundance of fauna and flora on refuge lands and preserving organisms and ecosystems represented on the refuge which are rare or threatened in the region.

In Narragansett Bay, Hope, Patience and Prudence Islands are part of NOAA's Narragansett Bay National Estuarine Research Reserve (NBNERR) encompassing 2,478 acres with 1,781 acres of tidal waters surrounding the islands to the 18-foot isobath (Figure 2). The land area includes 2,182 acres on Prudence Island, 205 acres on Patience Island and 91 acres on Hope Island. The Jenny's Creek area of Prudence Island is in the vicinity of the NBNERR site and conservation lands.

2.6 CULTURAL ENVIRONMENT AND HUMAN USES

Rhode Island waters including the coastal salt ponds and Narragansett Bay, support both substantial commercial and recreational harvesting of finfish and shellfish. These fisheries support a wide range of fishermen utilizing various gear types. Lobsters, quahog, and winter flounder comprise a sizable portion of the annual catch. These species are harvested extensively in the Block Island Sound and Rhode Island's salt ponds (Olsen and Seavey, 1983). In 2000, Rhode Island's commercial landings were valued at $73 million dollars. The recreational industry comprised of saltwater anglers, tackle shops, marinas and charter boats was valued at $150 million. As a whole, Rhode Island 's seafood industry has been valued in excess of $700 million. These values include domestic market landings and sales to restaurants and fish markets, $146 million; sales to other states, $95 million; and transportation and storage of seafood, $132 million. This information is based on the *Stock Status of Marine Resources and Summary of Fisheries Management in Rhode Island, A Report to the Rhode Island General Assembly*. In 2000, the state's commercial landings for shellfish were dominated by quahog with landings of 845,467 pounds valued at $4.9 million, followed by the Eastern oyster with landings of 95,000 pounds valued at $607,515, and the soft-shell clam with landings of 33,809 pounds generating a value of $199,544.

The Rhode Island economy is heavily dependent on summer tourism as a source of revenue. Travel and tourism is the second largest industry in the state, generating 38,931 jobs and $3.26 billion in total sales in 2000 (Tyrell, 2001). The coastline along Block Island Sound harbors an extensive network of town and state beaches to cater to seasonal visitors. Recreational dive trips and charter boat fishing also contributes to the local economy. All of these human activities are dependent on the condition of the coastal and offshore living marine resources and their habitats.

Narragansett Bay, Block Island Sound and the coastal salt ponds are favorite centers for recreational boating and other water-based activities. Rhode Island's Coastal Resources Management Plan designates most of the coastal salt ponds as Type 2 waters, referring to their high scenic value and significant recreational boating and residential uses including seasonal mooring areas, fish and wildlife habitat, and good water quality. Winnapaug, Quonochontaug, Ninigret, Green Hill, Potters, and Point Judith Ponds are all designated Type 2 waters. Cards and Trustom Ponds are the only salt ponds designated Type 1 waters, defined as conservation areas, and include waters within and adjacent to the NWRs and conservation areas and waters of significant, unique scenic value. Tidal waters around Prudence Island have been designated as Type 1 or 2 with waters in the NBNERR categorized as Type 1 due to their significant conservation value. Much of the remainder of Narragansett Bay is classified as multi-purpose (Type 4) or high-intensity boating (Type 3) waters.

DESCRIPTION AND ENVIRONMENTAL CONSEQUENCES OF RESTORATION ALTERNATIVES — CHAPTER 3

3.1 SUMMARY OF SHELLFISH RESTORATION ALTERNATIVES

The Trustees have considered and evaluated a full suite of restoration alternatives for compensating shellfish injuries from the *North Cape* oil spill. This included seeding and transplanting surf clam that were the shellfish species most adversely affected by the spill. Quahog, bay scallop, and oyster provide ecological services (*e.g.*, water filtration, benthic-pelagic coupling from feeding activity; food for fish and invertebrates that prey upon molluscan larvae and seed, benthic biomass; and habitat value) similar to those functions lost due to the *North Cape* shellfish injuries. Since these shellfish species have declined relative to their historic populations due to heavy fishing pressure and habitat loss and degradation, it is reasonably certain that their restoration would result in enhanced ecological services in the area of spill impact. Thus a net ecological benefit to compensate for the oil spill injuries to natural resources is expected. Finally, shellfish restoration in the salt ponds and adjacent waters of Narragansett Bay is a feasible and proven technique, since restoration of shellfish has a long history in Northeast estuaries, with well-developed grow-out methods and reasonably well documented results. These results have provided important lessons on successes as well as failures.

The following discusses various alternatives that were considered for the *North Cape* Shellfish Restoration Plan/Supplemental Environmental Assessment (RP/EA). The restoration and stock enhancement project alternatives focus primarily on quahog, bay scallop, and oyster resources. Table 3-1 is a summary of the anticipated costs for the preferred shellfish restoration and enhancement programs.

TABLE 3-1
SUMMARY OF SHELLFISH RESTORATION PROJECTS AND ESTIMATED COSTS

Restoration Project Elements	Projected Costs
Quahog Projects	$290,000.00
Bay Scallop Projects	$365,000.00
Oyster Projects	$305,000.00
Project Oversight	$300,000.00
Contingency	$240,000.00
Total for All Shellfish Projects	**$1,500,000.00**

The reader will note that funds are proposed to allocate relatively evenly to the three shellfish species. These cost projections are based on a 4-year program for each species. Additionally, project oversight costs have been projected and would be required for the *North Cape* project. The oversight costs are based on funds required to contract and dedicate a shellfish restoration specialist full-time for the 4-year project period, and includes salary and benefits. The oversight costs also include an assumed hiring of two or three seasonal (summer) field technicians each of the project years to assist the restoration specialist. This staff would be required to fully develop, implement and monitor the preferred project, as well as work with the public and volunteers involved in the community-based project activities. A contingency cost was also added at $60,000 per year to address work activities, materials and equipment that may be required beyond the conceptual preferred work scope for adaptive management purposes and based on results of the project. A more detailed discussion of the preferred shellfish restoration alternative for the coastal salt ponds and Narragansett Bay is provided in Section 3.8. The remaining RP/EA sections discuss each of the other restoration alternatives thoroughly considered and evaluated by the Trustees including a No-action alternative and those addressed in the previous RP/EA including surf clam stock enhancement to address the *North Cape* oil spill injuries to shellfish resources.

3.2 NO ACTION ALTERNATIVE

The National Environmental Policy Act (NEPA) requires that the Trustees evaluate a "No-action" alternative, and is also an option that can be selected under the Oil Pollution Act. With this alternative the Trustees would take no direct action to restore the natural resource injuries or compensate for lost services pending environmental recovery, and so would rely only on natural recovery and resource management conditions to occur. While natural recovery would occur over varying time scales for the various injured shellfish resources, the interim losses incurred would not be compensated for under the No-action alternative.

The Trustees' responsibility to seek compensation for interim losses pending environmental recovery is clearly set forth in the OPA, and cannot be addressed through a No-action alternative. While the Trustees have determined that natural recovery was appropriate as primary restoration for the surf clam injuries, the No-action alternative is rejected for compensatory restoration since substantial interim losses occurred during the period of recovery of the *North Cape* spill. Technically feasible and cost-effective alternatives exist to compensate for these losses, and have been addressed through other project alternatives as discussed in the following sections.

3.3 PROVIDENCE RIVER QUAHOG RESCUE AND TRANSPLANT

The *North Cape* Consent Decree indicates that the Trustees shall use settlement monies to implement a shellfish restoration project. It specifically indicates that an adult quahog transplant of 10.2 million quahogs (an equivalent to the total shellfish biomass loss) be considered for designated spawning sanctuaries in Narragansett Bay and the coastal salt ponds. A source of quahogs to be considered is the Providence River, which is scheduled for dredging by the U.S. Army Corps of Engineers (ACOE) as part of its Federal Providence River and Harbor

Maintenance Dredging Project. The ACOE's Providence River dredging is to restore navigation efficiency and safety of its shipping channel for deep draft vessel traffic by restoring the authorized depth to 40 feet (12 meters) and width to 600 feet (180 meters) (ACOE, 2001). The dredging project is slated to begin in November 2002 (Oliver, pers. comm.). It is anticipated that quahogs dredged from the channel area would not survive the dredging and disposal. Further, channel edge slumping is suspected after the dredging is completed, and which may cause additional quahog mortality due to smothering by sediment overburden.

Because of the shellfish closures of the Providence River, quahogs found in this area are primarily adults and contribute to the overall recruitment of quahogs in upper Narragansett Bay. Rescue of the quahogs from the planned dredge area and subsequent transplanting to sanctuaries would save them from premature death and lost recruitment, and therefore, provide ecological and resource services otherwise lost as a result of the ACOE's proposed dredging plan.

The Trustees assessed the quahog densities in the proposed dredging location to determine potential cost-effectiveness of quahog harvesting and transplanting. Most of the proposed channel dredge area is characterized by low to very low quahog densities. Sabin and Bullock Point Reaches were identified as having the highest quahog densities along the side slopes of the Providence River, ranging from 0.03 to 14.4 individuals/m^2 (Battelle, 2000; RIDEM 1997-2001). Density of quahogs appears to be highly variable and very patchy in these reaches. Other river dredge channel areas sampled for density of quahogs revealed even lower quahog densities, and therefore, quahog rescue in these areas would result in substantially higher costs to harvest potentially fewer quahogs. The Trustees concluded that harvest of the slide slopes of the entire Providence River dredge channel would not likely achieve a harvest of 10.2 million quahogs, nor would it be cost-effective, and therefore, the alternative was eliminated from further consideration.

The Trustees then focused on a Providence River dredge channel quahog rescue at the Sabin Point and Bullock Point Reaches where the highest quahog densities along the side slopes of the channel are present. While quahog densities might prove to be cost-effective for harvesting in these areas, there are regulatory restrictions presently implemented that affect this rescue alternative. Regulations set forth by the Rhode Island Department of Health (RIDOH) and RIDEM Water Resources (promulgating federal shellfish sanitation regulations and laws) would result in costs to address public health concerns for this geographically restricted quahog rescue alternative. Under current regulations, the dredge channel area north of Gaspee Point, including the Sabin Point Reach, is not available as a source area for transplanting quahogs due to industrial and sewage pollution. Transplants from this area would require a sanitary survey. This would involve a shoreline survey and contaminant analysis, and this would require significant time and costs for state and federal agencies to complete this work. RIDOH would require a determination as to which areas, if any, north of Gaspee Point could be opened for transplanting purposes. While RIDEM has previously conducted quahog transplants, the agency has not transplanted quahogs from this region. RIDEM and RIDOH indicated that transplanting quahogs from this region is not prudent. Therefore, the Trustees eliminated the alternative of harvesting and transplanting quahogs from any dredge channel areas north of Gaspee Point including the Sabin Point Reach.

The Trustees then considered potential locations for relaying and transplanting quahogs that could be rescued from the Providence River dredge channel south of Gaspee Point. Two transplant areas were considered: coastal salt pond sanctuaries and Narragansett Bay sanctuaries. Each are discussed in the following sections.

3.3.1 Coastal Salt Pond Sanctuary Transplants

Rhode Island tidal waters including Narragansett Bay and the coastal salt ponds are managed by RIDEM supported by input from the Rhode Island Marine Fisheries Council (RIMFC). These organizations promulgate the management area designations pertaining to shellfish activities and conservation strategies. There are two types of shellfish management areas that have been designated for the coastal ponds - shellfish closures (permanently and/or conditionally due to pollution) and spawning sanctuaries. Of the eight coastal salt ponds, Ninigret, Quonochontaug, and Winnapaug Ponds have shellfish spawning sanctuaries (Refer to Figures 3 through 5).

The Trustees evaluated the feasibility of transplanting quahogs from the Providence River dredge channel to one or more of these salt pond sanctuaries as compensatory shellfish restoration for the *North Cape* oil spill. The estimated cost to remove quahogs from the Bullocks Point Reach and transplant them to the salt ponds was estimated to cost between $136,000 and $170,000. Much of the cost for this transplant project would be expended on transportation of quahogs to the salt ponds and requisite enforcement. The Trustees concluded that the alternative in using *North Cape* funds to harvest quahogs from the entire channel dredge area south of Gaspee Point would not be cost-effective due to high transportation costs, and therefore, this transplant was considered a non-preferred alternative. Further, transplanting quahogs from a prohibited shellfish harvesting area (*i.e.*, permanently closed to shellfishing due to pollution) to uncontaminated, potential harvest locations could generate a significant amount of adverse public sentiment due to the stigma associated with polluted shellfish.

3.3.2 Narragansett Bay Sanctuary Transplants

RIDEM has designated 21 shellfish management areas for the state, nine of which are in Narragansett Bay. Of these areas, RIDEM and RIMFC have designated the High Banks and Sakonnet River Areas as shellfish spawning sanctuaries. All other designated areas such as Bissel Cove, Bristol Harbor, Greenwich Bay, Mt. Hope Bay/Kickamuit River, and Potowomut are considered shellfish management areas. These areas have specific management protocols restricting shellfishing activity. These areas are subject to restricted openings and closures depending upon RIDEM quahog transplanting programs or rainfall events or seasonal pollution high fecal coliform bacteria levels.

Of the shellfish management and spawning sanctuary areas, the Trustees identified the Potowomut Shellfish Management Area as the most feasible location to transplant quahogs from the Providence River (Refer to Figure 6). This area was considered due to its relatively close proximity to the dredge channel and the scheduled RIDEM fishery management restrictions for the area. The Potowomut designated area will be closed to shellfishing for a 2-year period beginning in the 2002 fishing period. This will allow the rescued quahogs to depurate (purge themselves of potentially harmful fecal coliform bacteria) and also provide potential recruitment

prior to opening the area to fishing. Other RIDEM shellfish management areas (*e.g.*, High Banks, Sakonnet River) were not considered feasible because of the scheduled immediate re-opening of commercial shellfishing in these areas in 2002.

Rescuing quahogs from Bullock Point Reach and transplanting to the Potowomut Spawning Sanctuary is a more cost-effective approach to the rescue and transplanting. The projected cost of this project is $60,000. Further, RIDEM has previously transplanted quahogs to the Potowomut Spawning Sanctuary as part of its Quahog Management Plan. RIDEM considers this area as a feasible transplant site for the Providence River quahogs. Based on these conditions, the Trustees considered this project alternative further as a part of the preferred alternative.

The transplant of adult quahogs would have minimal adverse impacts on Narragansett Bay. RIDEM has been transplanting quahogs from closed waters to sanctuary locations for many years with no apparent adverse impacts. Sanctuaries are periodically opened to harvest on a rotating basis and it is anticipated that after approximately two years of protection, harvest of the transplanted quahogs will be allowed, thereby benefiting the local fishery. The transplant from the Providence River would occur in accordance with state health regulations and the Interstate Shellfish Sanitation Conference guidelines. The quahogs would be placed in closed sanctuaries where they would be allowed to depurate and, therefore, pose no public health concerns.

3.4 QUAHOG DOCKSIDE PURCHASES

A quahog dockside purchase and release alternative was evaluated by the Trustees to address lost shellfish injuries. The Trustees evaluated the effects of such a program on the state market supply and demand, public health, enforcement, and shellfish disease transfer and costs of disease screening. The Trustees determined that the Rhode Island quahog market could supply 10.2 million chowder-sized (>77mm) quahogs to a dockside purchase program, although this project alternative would have to be implemented over an extended, multiple year period to prevent over-stimulating a "run" on the chowder market (Gates, pers. comm). This program would need to implement substantial market controls to prevent potential fraud, human health concerns, shellfish disease transfer and other shellfishery-related impacts. Specifically, the Trustees would need to control the origin of shellfish to ensure that only Rhode Island quahogs were utilized and to verify that quahogs would be harvested from approved, open waters for shellfish consumption. Additionally prior to transplanting, quahogs would need to be tested for shellfish diseases, requiring available lab staff and additional costs.

This alternative would require control at the point of purchase (*e.g.*, buy directly from the harvesters or pass all sales through wholesale dealers). Presently, Rhode Island General Law (RIGL) indicates that shellfish must be bought and sold to a certified shellfish dealer. If such a program were implemented, it would require that a purchase location be designated on-water or at a designated pier, and account for additional handling fees for the wholesale dealers. By controlling the point of sale, there would be greater likelihood that the shellfish harvested would be from approved waters. The program would need to prevent illegal harvesting behind closure lines, particularly at night, and such a program would require a significant enforcement cost.

This program would require coordination of activities with RIDEM's Enforcement Division, commercial shellfishermen, wholesale dealers, RIDEM fishery scientists, and the RIDOH. An annual dockside purchase season would need to be designated by RIDEM. Since quahogs purchased under this program would need to be transported to designated spawning sanctuaries or shellfish management areas in Narragansett Bay and/or coastal salt ponds, the time of purchasing would need to take into account the sanctuary transplanting needs. This alternative would need to incorporate long-range planning along with consideration given to the natural spawning of quahogs to minimize impacting the recruitment potential for each designated harvest region.

The market controls that would need to be implemented would be very costly, and cannot be underestimated since they could directly affect human health and scientifically based shellfish management. Based on the analysis of these factors, the Trustees considered the dockside purchase alternative to have a substantial risk. The Trustees concluded that other more cost-effective shellfish restoration alternatives are available and eliminated this alternative from further consideration.

3.5 SURF CLAM RESTORATION

In the September 15, 1998 Draft *North Cape* Restoration Plan and Environmental Assessment and the March 31, 1999 Revised Draft RP/EA, the Trustees evaluated two alternatives for surf clam restoration to address the shellfish injuries caused by the oil spill. These alternatives included the stocking of hatchery-reared juvenile surf clams and transplanting of adult surf clams into Block Island Sound. The Trustees rejected these alternatives from further consideration for a number of reasons including the likely natural recovery of surf clams within several years of the oil spill without any enhancement of the Block Island Sound stocks, cost-ineffectiveness, and the lack of proven success implementing such techniques. The reader is referred to the two prior draft documents for a more detailed discussion of these alternatives. These documents are located in the *North Cape* administrative record at RIDEM, 235 Promenade Street, Providence, RI 02908, attention Grace Smith, 401-222-6607, or at the following web site address: www.darp.noaa.gov/neregion/ncape.htm.

3.6 QUAHOG SEEDING

Stocking of hatchery-reared quahogs in Rhode Island waters has been identified as a potential restoration alternative to provide compensation for the shellfish injuries. This project alternative was identified in the original Draft *North Cape* Restoration Plan. Assuming adequate habitat area is available, stocking of large quahog seed (>20mm) could increase populations in Narragansett Bay and/or the coastal salt ponds. While such a project could potentially succeed in increasing the number of quahogs in state waters, the Trustees believe that utilizing 100 percent of restoration funds on purchasing large quahog seed from commercial hatcheries and releasing to Rhode Island's coastal waters would not necessarily result in the best ecologically-based conditions. Rather, a thorough, assessment is required to determine the scientifically based number of seed for needed for release and the costs associated with different sizes of

commercially available quahog seed. The Trustees considered a variation of this alternative as one of the components of the preferred alternative discussed in Section 3.7.

The alternative would require use of local broodstock for the production of quahog seed to ensure genetic populations are sustained and potential for disease transfer is minimized. The addition of hatchery-reared quahog seed should have minimal adverse impacts on the waters of Rhode Island. With proper management and monitoring, quahog populations would increase as a result from the seed stocking. Since commercial quahogging is a major industry with significant economic value to Rhode Island, this alternative with managed conditions would likely result in benefits to commercial and recreational fisheries of the state.

The Trustees noted that targeting seeding efforts on only a single shellfish species would pose a greater potential risk of project failure with limited success due primarily to unpredictable environmental and industry supply factors. The Trustees concluded that release of multiple species would other restoration alternatives are available and eliminated the quahog seeding alternative from further consideration.

3.7 MULTI-SPECIES STOCK ENHANCEMENT AND RESTORATION

The Trustees identified the enhancement and/or restoration of multi-species as an alternative that addressing not only quahog, but other bivalves including bay scallop (*Argopecten irradians*), blue mussel (*Mytilus edulis*), soft-shelled clam (*Mya arenaria*) and surf clam (*Spisula solidissima*) affected by the *North Cape* oil spill. Eastern oyster (*Crassostrea virginica*) was also identified as another potential species targeted for restoration even though this species was not significantly affected by the *North Cape* spill. This alternative would be to restore or enhance all of these species by employing various aquaculture technologies and proven on-the-ground seeding and grow-out practices now available. RIDEM staff would conduct these projects with support of contractors and oversight by the Trustees.

Several issues have been identified that would need to be addressed in selecting this multi-species alternative. First, the potential source of substantial numbers of larval or juvenile seed or adults for each species would need to be addressed. Some species are not readily commercially available such as surf clams or blue mussels. One option would be to establish or fund a shellfish hatchery or hatcheries to sustain requisite seed production for multiple species or very large numbers of a single species. Secondly, nursery, grow-out and final planting or release areas would need to be identified and designated as project areas. This would require identifying and selecting candidate shellfish restoration work sites and obtaining regulatory approvals to implement the projects. Thirdly, some culturing techniques may involve using suspension or bottom gear that may affect other uses of Narragansett Bay and salt pond waters. Relatively small tidal water areas would likely have to be restricted from boating or other uses at least on a seasonal basis and possibly for as long as several years. Lastly, local broodstock should be used for the production of shellfish seed to sustain the genetic make-up of existing stocks and minimize the potential for shellfish disease transfer.

The Trustees concluded that multi-species stock restoration and enhancement using seeding, grow-out, and/or aquaculture hatchery techniques is a desirable alternative, but concluded that this alternative is considered only one component of a more comprehensive approach that also includes a quahog rescue. This alternative is thus combined with the rescue alternative described in Section 3.3 and the Narragansett Bay transplant alternative discussed in Section 3.3.2.

The release of hatchery-reared quahog, bay scallop, oyster, surf clam, and soft-shelled clam seed would have minimal adverse impact on Rhode Island coastal waters. Some culturing techniques may have minor adverse localized effects on other water-based uses and would require full assessment and approval by Rhode Island's Coastal Resources Management Council (CRMC) and ACOE 404/10 regulatory programs. A shellfish hatchery-rearing alternative targeting on multiple species would likely have a positive impact on enhancing existing shellfish populations, restoring bay scallop populations, and benefiting Rhode Island's commercial and recreational fisheries. Should a hatchery facility be established, its siting and construction would be conducted to avoid any adverse impacts to salt marsh and other sensitive and regulated habitats.

3.8 PREFERRED ALTERNATIVE: LIMITED QUAHOG RESCUE AND MULTI-SPECIES RESTORATION

The Trustees' preferred alternative is a combination and variation of previously identified alternatives: (1) conduct a limited quahog rescue from the planned Providence River Federal Navigational Channel dredge area; and (2) implement multiple stock enhancement and restoration projects targeting quahogs, bay scallops, and oysters. This alternative is similar to the preferred alternative identified in the 1999 *North Cape* Restoration Plan.

The multi-species stock enhancement and restoration project approach will be conducted in conjunction with other shellfish programs implemented in the state. The preferred restoration alternative addressing multiple shellfish species has been conceptually developed so that the plan would be executed expeditiously within a 3 to 5-year time frame and at a funding level that is available through the *North Cape* shellfish settlement funds. These projects are expected to provide substantial ecological and economic benefits to the shellfish resource of the state and provide sufficient compensatory restoration for the spill shellfish injuries. Additionally, the Trustees anticipate that these enhancement and restoration projects will provide opportunity for greater public involvement in the projects thereby generating public support and promoting community-based restoration activities. The following sections discuss in greater detail the specific types of projects for each of the target species.

3.8.1 Quahog Stock Enhancement

There is strong evidence that numbers of quahogs in Narragansett Bay and the coastal salt ponds have been substantially reduced from historic levels due primarily to overfishing (Baczenski *et al*., 1979; Boyd, 1991; Crawford, 1984; Ganz *et al*., 1992; Rice, 1989). RIDEM, as part of its shellfish management program, has designated quahog transplant and sanctuary areas in Narragansett Bay and the coastal salt ponds, and has a track record of transplanting quahogs from restricted waters into these areas for purposes of increasing population size and benefiting

local fisheries. The Rhode Island Shellfishermen's Association is also interested and engaged in quahog stock enhancement programs by working with the University of Rhode Island and Roger Williams University. These collaborative programs are aimed at reseeding quahogs in test sites to assess predation, survival, growth rate factors to help evaluate the potential for conducting large-scale reseeding efforts in Narragansett Bay (Scott, pers. comm.). Further, with the success of commercial shellfish hatcheries and advancing, cost-effective nursery techniques, quahog reseeding programs have flourished throughout the Atlantic and Gulf coasts of the United States (Flimlin, 2000). Many states and municipalities have successful quahog management programs that include transplanting as well as reseeding to enhance their quahog stocks.

3.8.1.1 Project Objectives

The Trustees have identified objectives for the quahog stock enhancement component of the preferred alternative that are designed to increase quahog resources in the South County coastal salt ponds and Narragansett Bay.

- Implement a limited, cost-effective quahog rescue from the Providence River channel dredge area that will result in transplanting quahogs to spawning sanctuaries and quahog recruitment that otherwise would be lost due to the dredging;

- Establish a nursery as part of RIDEM's Quahog Management Plan;

- Conduct releases of hatchery-reared native Rhode Island quahogs to the coastal salt ponds and possibly Narragansett Bay;

- Establish a Rhode Island community-based program by recruiting citizens to be actively involved in the enhancement projects to help foster interest and awareness of Rhode Island's premier shellfish industry; and

- Monitor the survival and growth of the releases and overall benefits to the quahog stocks and managed shellfishery.

3.8.1.2 Quahog Rescue and Spawning Sanctuary

The Providence River quahog rescue would be geographically restricted to the area south of Gaspee Point. It would target the higher density quahog areas associated with the channel slopes in the Bullock Point Reach, a rescue area totaling approximately 37 acres (Refer to Figure 7). This alternative was discussed above in Section 3.3. This limited quahog rescue would result in the most cost-effective and expeditious approach to harvesting and transplanting the quahogs prior to the ACOE's channel dredging, scheduled to begin in November 2002. Based on previous RIDEM transplant programs, this project is expected to require about 30-field days to complete and will relay approximately 250,000 pounds of quahogs in the topneck commercial size category. This quahog rescue addresses the stipulation of the *North Cape* Consent Decree that the Trustees are to transplant quahogs from the Providence River ship channel. The quahog rescue will result in ecological benefits similar to those provided by surf clams, the shellfish most adversely affected by the spill.

As previously discussed, the rescue and transplant of adult quahogs would have minimal adverse impact to Narragansett Bay tidal waters of the Providence River and at the in the vicinity of the proposed Potowomut Shellfish Management area transplant site. The substrate of the Bullock Point Reach channel slopes would be affected by clam rescue dredging, although these areas will also be altered by the anticipated ACOE channel dredging. The channel dredging for navigational improvements will encompass substrate disturbances in the same location as the proposed quahog dredge rescue and will result in substantially greater substrate alteration than the rescue project. The rescue would occur using a small dredge towed behind a vessel to collect quahogs at or near the substrate surface. Minor, localized temporary turbidity would occur, but would be negligible to the navigational dredging that is scheduled to begin November 2002. To add, RIDEM has been transplanting quahogs from closed waters to spawning sanctuary locations for many years with no apparent adverse impacts.

The RIDEM shellfish sanctuaries are periodically opened to harvest on a rotating basis, and it is anticipated that after approximately two years of protection, managed harvest of the quahogs will be allowed, thereby benefiting not only the quahog stocks, but also the local fishery. The rescue from the Providence River would occur in conformance with state health regulations and the Interstate Shellfish Sanitation Conference guidelines. The quahogs would be placed in a closed sanctuary area where they would be allowed to depurate and, therefore, pose no public health concerns.

3.8.1.3 Quahog Reseeding

States and towns typically implement reseeding programs by either purchasing larger sized (>10 mm) quahog seed for direct placement in open fishery areas or greater quantities of smaller sized (~1mm) quahog seed for placement in shellfish nursery growing facilities (Damery, 2000; Flimlin, 2000). The option of purchasing large quantities of small quahog seed (~1 mm) from commercial suppliers requires that the seed be grown for period of time before release. In many of the existing programs, agencies employ both types of propagation methods to better ensure a reasonable seed survival for commercial and recreational shellfish activities (Marcotti, pers. comm.). It has been demonstrated that agencies able to implement diverse propagation programs that include nurseries can grow quahog seed to a size at a lower cost in comparison to purchasing similar size seed directly from the commercial hatchery. The cost for purchasing only large size seed (10+ mm) from commercial hatcheries for broadcasting directly to the shellfish grounds ranged between $38 to $63 per 1000 seed. In contrast, the cost of purchasing small seed (1-2 mm) for nursery grow-out, ranged between $11 to $33 per 1000 seed (Damery, 2000). Labor, equipment and operational costs were included within these cost estimates.

For the *North Cape* project, the Trustees propose to use Rhode Island "white" quahogs as adult broodstock for the production of quahog seed for planting over a 4-year period. Selected broodstock will be transported to a commercial shellfish hatchery for larval production. After settlement, small quahogs (500 u to 1 mm) will be transported to a field-based upweller nursery system at the RIDEM Coastal Fisheries Lab on Pt. Judith Pond. Approximately one million seed will be purchased annually from commercial hatcheries for this program and raised in upwellers for four to six months, depending on growth rates for planting in the fall. The project also calls for annually purchasing 1 million large size seed (~20 mm) for direct field planting in the fall.

As part of the evaluation process, the Trustees will prepare regulatory application materials describing the proposed projects, their locations, and potential impacts for review and approval by the Coastal Resources Management Council (CRMC). The CRMC permitting process involves a public review. The proposed project plan will also be submitted to the ACOE for review under their regulatory program. The Trustees will work with volunteers and citizens groups to complete the project. Follow-up monitoring of seeded beds will determine growth and survival rates.

3.8.1.4 Quahog Program Environmental and Socio-Economic Impacts

The release of seed quahogs should have negligible adverse effects on the coastal salt ponds and Narragansett Bay waters. Quahog seeding programs have been previously conducted in Rhode Island waters by RIDEM with no adverse impacts. All shellfish propagated by commercial hatcheries for use in this project will be rigorously tested for potential shellfish disease, and any seed found to be diseased shall be rejected. These designations typically occur with extensive coordination with the shellfishing industry. The seed releases should have positive effects on the existing quahog stocks, and the projects will involve and cooperatively work with shellfishing industry and local communities to place quahogs in designated areas that will have minimal adverse consequences for existing uses. The Trustees will consult with all potentially affected stakeholders to minimize conflicts with navigation, dredging, commercial or recreational fisheries, local residents, and other users of the salt ponds and adjacent waters of Narragansett Bay.

3.8.1.5 Projected Quahog Stock Enhancement Program Costs

Table 3-2 summarizes the projected cost for these projects and is based on a 4-year program. These costs include three major elements: the quahog rescue, quahog small seed and nursery project, and large quahog direct seeding project. Monitoring and assessment are integral, additional costs for assessing the progress and performance of the projects.

TABLE 3-2
SUMMARY OF QUAHOG ENHANCEMENT PROJECTED COSTS

Cost Element	Projected Costs
Quahog Rescue and Transplant Program	$60,000.00
Quahog Nursery and Small Seeding Program	$75,000.00
Quahog Large Seeding Program	$125,000.00
Monitoring, Assessment, and Evaluation	$30,000.00
Total for Quahog Projects	**$290,000.00**

3.8.2 Bay Scallop Restoration

Historically, Rhode Island salt ponds produced substantial amounts of bay scallops usually in a "boom-or-bust" fashion. Of the salt ponds targeted for shellfish restoration actions, Point Judith, Ninigret, and Quonochontaug have had a long history of producing bountiful crops of bay scallops. During the 1950s, bay scallop landings steadily averaged 81,160 pounds for the decade

but declined drastically in the 1960s. During the 1960s, landings only totaled 11,100 pounds valued at $13,390. However, the 1970s fetched 634,800 pounds, and 1978 was the "last great" bay scallop season when 448,700 pounds were harvested and valued at $1,265,128 (National Marine Fisheries Service data). During the 1980s and 1990s, bay scalloping failed to produce any significant landings. In 1983, Rhode Island harvested only 44,150 lbs. with a value of $282,325. For the past four years, Rhode Island has not experienced a recreational or commercial harvest, suggesting that bay scallop stocks have been severely reduced.

The Trustees propose to implement measures for purposes of restoring the salt pond bay scallop stocks and achieve a sustainable resource.

3.8.2.1 Restoration Objectives

The Trustees have identified objectives for the bay scallop projects to restore resources in the South County coastal salt ponds.

- Implement a multi-year program to restore coastal pond(s) bay scallop stocks;
- Establish bay scallop spawning sanctuaries and nursery in Point Judith Salt Pond;
- Employ artificial spat collectors to monitor larval recruitment;
- Seed and restore bay scallops into multiple coastal salt ponds;
- Establish a community-based bay scallop program recruiting local organizations and other volunteers to assist in project implementation; and
- Monitor the survival, growth, and recruitment to evaluate the progress and performance of the scallop projects.

3.8.2.2 Overview of Project Types

The bay scallop restoration will involve implementing spawning sanctuaries, spat collection and reseeding as methods to restore scallop populations in the coastal salt ponds. This effort is intended to involve the community in project implementation. The reseeding program will be designed to include multiple salt ponds impacted by the *North Cape* oil spill. Additionally, this program will establish a bay scallop nursery program using land-based and field-based techniques at the RIDEM Coastal Fisheries Lab in Point Judith Salt Pond. Although a majority of the bay scallop seed will be planted in coastal salt ponds, some seed will also be utilized in establishing temporary spawning sanctuaries using transient gear (spat collectors) as in Point Judith Salt Pond.

The Trustees propose to conduct this program over four years. Initially the program will be focused on demonstrating the application methods and determining the merits of using various scallop restoration techniques. . Assuming initial success, the Trustees then intend to scale-up the techniques and expand the reseeding program. The bay scallop nursery, spat collection,

spawning sanctuary, and reseeding projects will allow opportunity for community volunteer and educational institution involvement. There will also be opportunities to assist in monitoring growth, survival, and recruitment. This community-based restoration effort will promote a stewardship interest in the bay scallop resource and foster greater regard for following and enforcing fishery regulations and improving salt pond water quality.

3.8.2.3 Bay Scallop Reseeding

Over the last decade, bay scallop recruitment failures have been widespread. The reasons for these failures are unknown, but evidence suggests multiple factors such as nuisance algal blooms, poor water quality, industrial waste, fishing pressure, anomalous environmental conditions, habitat loss and predation are causes. A factor causing fluctuations in bay scallop populations is the short life span of the species, typically living only 20 to 24 months in New England waters. The short life span coupled with the other factors previously mentioned is presumably responsible for the decline in scallop harvests. The most common restoration practice is to release seed scallops to natural beds. Tettelbach and Wenczel (1993) reported using hatchery-reared scallops for reseeding efforts in Long Island waters. Their extensive reseeding since 1985 has helped the native bay scallop population decimated by brown tide blooms. Recently, researchers from Long Island have incorporated spawning sanctuaries and over-wintering and spring seed transplanting projects as part of their reseeding projects (Tettelbach, pers. comm.).

The objective of this program is to re-seed multiple coastal ponds with large (25mm) juvenile bay scallop seed. Approximately 1.5 million seed will be purchased annually from commercial hatcheries for this program. Under the direction of the Trustees, the scallops will then be seeded in designated locations with the help of volunteers and citizens groups. Follow-up monitoring of seeded beds will determine growth and survival estimates.

3.8.2.4 Spawning Sanctuaries and Spat Collection

Another common method utilized to enhance scallop stocks is artificial spat collectors. The collection of natural larval seed with artificial spat collectors supplemented by reseeding has been effective in stabilizing scallop fisheries elsewhere including New England (Tettelbach and Wenczel, 1993; Tammi, K. A., 1996). The bay scallop restoration program proposed by the Trustees will employ spat collectors and sanctuaries to restore bay scallop populations in the coastal salt ponds. This program will establish manageable populations of adult broodstock. Bay scallop spawning sanctuaries will be established at various locations in Point Judith Salt Pond. Specific locations have not been identified, but several sites will be evaluated based upon historic scalloping activity, presence of eelgrass beds, estuarine flow dynamics, and potential water user conflict. In general, bay scallop spawning sanctuaries will consist of multiple floating cages containing adult scallops and a series of artificial spat collectors at each site.

3.8.2.5 Bay Scallop Program Environmental and Socio-Economic Impacts

Growing and releasing sscallops will have minimal impact to the coastal salt ponds. Bay scallop mortality is mostly affected by predation, habitat degradation, climatic changes, and harmful algal blooms; potentially harmful pathogens have not been significant issues with bay scallops as

have been with quahogs. The Trustees will submit regulatory application materials to CRMC and the ACOE for full consideration of potential impacts. The Trustees will develop specific projects to minimize minor habitat disturbances and potential conflicts with navigation, commercial or recreational fisheries, local residential activities, and other users of the salt ponds.

3.8.2.6 Projected Bay Scallop Program Costs

Table 3-3 summarizes the cost for these projects based upon the program extending for 4 years. The cost for the bay scallop restoration program includes three major elements: the reseeding program, spawning and spat collection projects, and bay scallop nursery program. Purchasing scallop seed and nursery and grow-out equipment are the primary costs. Additional costs are associated with performance monitoring.

TABLE 3-3
SUMMARY OF BAY SCALLOP PROJECTS AND PROJECTED COSTS

Project Type	Projected Cost
Reseeding Program	$230,000.00
Spawning Sanctuaries and Spat Program	$30,000.00
Scallop Nursery Program	$75,000.00
Monitoring, Assessment and Evaluation	$30,000.00
Total for Bay Scallop Projects	**$365,000.00**

3.8.3 Oyster Stock Enhancement

Another important Rhode Island shellfish is the eastern oyster. Goode (1884) reported that oysters were once prevalent in Rhode Island's coastal salt ponds, but populations have declined in recent years (Ganz 1997). The Narragansett Bay oyster fishery thrived between the 1800s and 1930s. In Rhode Island, the Oyster Act of 1864 set forth a requirement for oyster companies to comply with a mandatory cultch program stating that all disposal of oyster shell material must go to leased oyster grounds. At the height of Rhode Island's oyster industry in 1910, 8100 hectares of Narragansett Bay was farmed, producing 7000 metric tons of oysters with the shell cultch recycled back into the bay (Rice *et al*, 2000). In addition to providing jobs, the Rhode Island Shellfish Commission (1880-1920) reported that the state received revenues from the oyster ground leases valued at over $700,000. By the 1920s, the oyster industry slowly declined for a number of reasons including industrial pollution, increased eutrophication from sewage disposal, increased sedimentation from land development, and the Great Hurricane of 1938 (Rice *et al*, 2000). In the late 1990s, Narragansett Bay oyster population rebounded in some locations, but recent decreases are probably due to fishing pressure, lack of successful sets and the effects of the shellfish parasite, Dermo (*Perkinsus marinus*) (Valliere, pers. comm. 1999; Gomez-Chiarri 2002). The economic importance and historical value of the state's oyster industry is well recognized with the recent passage of the Narragansett Bay Oyster Restoration Act, RIGL 20-2-45, enacted in 2001. This act declares the importance and need for the state to continue, "restoring and maintaining both the oyster population and oyster habitat."

3.8.3.1 Summary of Objectives of the Oyster Restoration Program

The Trustees have identified several objectives for the oyster restoration project:

- Implement remote setting project to restore oysters;
- Establish oyster nurseries in Point Judith Salt Pond and at the Jenny's Creek Shellfish Management area on Prudence Island. These nurseries will be devoted to sustainable shellfish enhancement and propagation projects;
- Complete bed cultch projects to enhance oyster bed habitat before planting spat;
- Implement oyster plantings in one or more coastal salt ponds and Narragansett Bay;
- Apply oyster gardening techniques as part of community-based program for establishing oyster spawning sanctuaries in Narragansett Bay and coastal salt ponds;
- Minimize site conditions adversely affecting other recreational fisheries; and
- Improve the water quality in Narragansett Bay and the coastal salt ponds by increasing populations of oysters.

3.8.3.2 Overview of the Project Types

This project proposes to restore oyster populations in Rhode Island waters by using the remote setting technique. Remote setting is a proven cost effective method of producing large numbers oysters for public enhancement projects along the Atlantic and Gulf coasts of the United States (Bohn *et al*., 1995; Marcotti, pers. comm; Meritt and Leffler, 2000). Remote setting is a method that produces large numbers of oyster seed from the eyed-larval stage. Adult oysters are conditioned and spawned at a hatchery in a controlled environment to produce millions of eyed larvae. The larvae are introduced to large setting tanks filled with shell known as cultch. Cultch consists of oyster, surf clam or ocean quahog shell material loosely bagged in plastic mesh. Within 24 hours, eyed larvae settle onto the cultch, and the shell bags are then moved to field nurseries to continue growing before final planting.

Natural oysters commonly grow on large clusters attaching to hard substrates and other shells, forming large oyster beds and reef structures providing a suitable substrate for oyster larvae settlement (Bahr and Lanier, 1981). Often oyster beds can experience sedimentation that may result in the suffocation of adult oysters as well as reduce the availability of suitable habitat for the settlement of larval oysters. Planted cultch material provides a clean surface for the larvae to settle, attach to and grow on and improves the overall health and condition of the oyster bed (Loosanoff, 1961).

Oyster gardening is the process of culturing a population of oysters in aquaculture gear called Taylor Floats for educational and ecological purposes. Oyster gardening was developed in the Chesapeake Bay along the shores of Maryland and Virginia as a means to augment the natural

oyster population impacted by shellfish diseases (Leffler, 1999). These programs have received overwhelming public support involving more than 300 gardener families, 40 classes graduating more than 200 students. In Maryland, with the help of NMFS and local non-profit organizations, a "Master Gardeners" program was initiated. Citizens enrolled in this program receive training and education on such topics as basic oyster biology, oyster reef habitats, shellfish diseases, monitoring equipment and growth. Once completed, the Master Gardeners become the point persons and link with the research scientists and data collection (Leffler, 1999). Oysters monitored through these programs are eventually planted on the public shellfishing grounds to rehabilitate the oyster reefs.

3.8.3.3 Remote Setting and Oyster Nursery Projects

Rhode Island oysters will be collected and held in tanks as adult broodstock for the production of oyster larvae. Weathered cultch material will be purchased from local suppliers. The most common cultch material for the larval oysters is clean oyster shell. However, if abundant sources of oyster cultch are not available, clamshell will be used and which are readily available in the Rhode Island. The shell material will be screened to retain large shell fragments for use as setting cultch. Shells will be placed into tubular extrusion netting and sealed at both ends. Shell bags with weathered shell will be transported to a commercial shellfish hatchery for setting eyed-larvae. After settlement, the shell bags will be transported to designated nursery sites at Jenny's Creek on Prudence Island (Figure 2) and in Pt. Judith Pond near the RIDEM Coastal Fisheries Lab (Figure 7). Trustom Pond, situated on a National Wildlife Refuge (Figure 8), may also serve as an oyster nursery site. Each nursery site will require a small area, approximately 1000 square feet. Shell bags will be placed on racks and/or wooden pallets within the intertidal zone region. It is expected that the oyster spat will grow to planting size (~20mm) in these nurseries within three months.

Once the oysters reach this size, the spatted cultch material will be transported to designated areas, likely 3/4 to 1 acre in area, with the material spread in a thin layer (~1-inch thick) on top of the bed cultch material. Planted sites will be monitored to determine long-term survival, growth, and recruitment in evaluating the performance of the project. These sites will also be monitored for the effects of predation and presence of any disease. Bed cultch will be monitored to assess long-term stability, effects of sedimentation, and ecological characteristics.

3.8.3.4 Habitat Enhancement Project

This program proposes to stabilize designated oyster planting sites by utilizing shell material to harden the bottom substrate prior to planting. Free-planting locations will be designated under the guidance of RIDEM. These locations will be in close proximity to the oyster nurseries in the coastal salt ponds and Narragansett Bay. Shell fragments remaining from shell bag production will be used for the bed cultch. Bed cultch material will provide a firm foundation for the spatted cultch to minimize sedimentation and suffocation. Approximately 20 to 30 cubic yards will be dispersed to a depth of no more than several inches over designated planting grounds approximately 1 acre in size. Bed cultch will be loaded from the staging areas onto trucks, boats or barges for dispersal. Components of this project will be developed to involve community groups, volunteers, local universities and colleges, agencies, and non-governmental

organizations. As part of this habitat enhancement component, monitoring will evaluate the rates of spat settlement and growth, as well as sedimentation or other adverse effects.

3.8.3.5 Oyster Gardening

This small-scale oyster gardening component is expected to provide a source of oyster stocking material as well as generate increased public awareness for restoring oysters in Rhode Island waters. The Trustees anticipate that the oyster gardening projects will provide substantial educational opportunities. Public and private marinas, educational institutions, non-governmental organizations, and private citizens will participate in gardening by hosting (using private docks to hang oyster baskets for grow-out) and monitoring survival and growth of seed oysters for eventual planting on the public grounds. This program could be incorporated into RIDEM's aquatic outreach educational programs.

3.8.3.6 Oyster Program Environmental and Socio-Economic Impacts

The placement of remotely set oyster spat and/or seed should have minimal impacts on the coastal salt ponds or Narragansett Bay. Oysters will reach harvest size in two to three years, thereby benefiting the local fishery.

The proposed nursery sites at Jenny's Creek and in Pt. Judith Pond can be managed effectively to ensure the success of the remote setting project. These sites were chosen because recreational and commercial shellfishing activities are presently prohibited at these locations. The Jenny's Creek Shellfish Management Area (Figure 2) was established by the Rhode Island Marine Fisheries Council and RIDEM in 2001 to specifically allow for shellfish restoration. Implementing the oyster restoration projects will not add any additional shellfish restrictions at the existing recreational and commercial shellfish areas in Rhode Island waters.

The placement of cultch on the bottom to enhance and stabilize oyster habitats in the coastal salt ponds and Narragansett Bay should have positive environmental effects. Although this practice may have minor negative impact by temporarily displacing organisms on some bottom types, these areas are expected to rapidly colonize with various oyster reef biota. In most cases, oyster rehabilitation areas will be determined from analyzing the historical oyster regions, shellfishing activity, present or recent oyster habitat and potential user conflicts. Habitat enhancement projects will be properly sited to minimize the potential for obstructions to navigation, and any areas constructed would be properly marked with buoys. The positive effects of cultched bottoms include an increase in habitat diversity, species richness, and overall biomass. Cultched areas tend to attract benthic invertebrates as well as various finfish species such as striped bass (Dame 1979, Dame *et al*., 1984).

The impact of mixing genetically distinct shellfish populations is a potential concern, but can be obviated by using local oysters as broodstock. Moreover, shellfish seed of other species have been transplanted into the salt ponds and Narragansett Bay in the past, with no apparent adverse affects on the native populations. These projects are subject to adhering to BMPs for shellfish disease prevention established by the Biosecurity Board and promulgated under Rhode Island General Laws Section 20-10. These projects will go through a public review through the CRMC

regulatory process and possibly RIDEM Division of Water Resources and ACOE 10/404 regulatory programs. In regulatory processing, potential environmental impacts and conflicts to commercial and recreational fisheries, local residents, and other water-based users of the salt ponds and Narragansett Bay will be fully evaluated.

The occurrence of high mortality due to disease has been observed in both cultured and wild populations of oysters since the early part of the twentieth century (Ford and Tripp, 1996). Principle infectious diseases of the eastern oyster include Dermo (*Perkinsus marinus*) and MSX (*Haplosporidium nelsoni)*, both protozoan parasites. These parasites are ubiquitous, and outbreaks of diseases are potentially related to environmental conditions (Ford and Tripp 1996). Juvenile Oyster disease (JOD) is another disease thought to be the causal agent for high mortality of larval and juvenile oysters (Bricelji *et al.*, 1992).

MSX appears to be restricted to only a few locations in Rhode Island, whereas, Dermo is widespread and established in wild Rhode Island oysters present in some of the coastal salt ponds and portions of Narragansett Bay (Gomez-Chiarri, 2002). The intensity and prevalence of Dermo in wild oysters ranges from moderate to high, or has remained unchanged or increased from the initial surveys conducted in 1998. To help reduce the impact of disease, only certified disease-free oyster stocks will be used for the oyster restoration projects. The likelihood of project success can be improved by diversifying the projects among several locations. With careful site selection, proper project design and monitoring, it is highly probable that shellfish restoration using disease-tested oysters will succeed in meeting the restoration objectives for the coastal salt pond and Narragansett Bay projects.

3.8.3.7 Projected Oyster Program Costs

Table 3-4 summarizes the cost for the oyster program based on a 4-year program. Cost for the oyster restoration program includes three major elements: remote setting projects, habitat enhancement projects, and oyster gardening activities. Additional cost elements include shellfish disease monitoring, baseline surveys and field assessments, and performance monitoring. The major cost of the remote setting is the cost of the eyed larvae and nursery and grow-out equipment. The major cost for the oyster habitat enhancement is transporting cultch material to staging area(s) and planting grounds. The major cost element for the oyster gardening program is related to purchasing equipment and materials for the spawning sanctuaries.

TABLE 3-4
SUMMARY OF OYSTER PROGRAM AND PROJECTED COSTS

Project Type	Projected Costs
Remote Setting Program	$215,000.00
Oyster Gardening Program	$15,000.00
Habitat Enhancement Program	$5,000.00
Baseline Survey and Assessment	$30,000.00
Monitoring, Assessment and Evaluation	$40,000.00
Total for Oyster Projects	**$305,000.00**

FINDINGS OF NO SIGNIFICANT IMPACT CHAPTER 4

4.1 DISCUSSION AND STATEMENT

The National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service is the lead Trustee for the North Cape Case, and is the lead federal agency for this Shellfish Restoration Plan and Supplemental Environmental Assessment. The NOAA Administrative Order (NAO) 216-6 (revised May 20, 1999) defines nine criteria for determining the significance of the impacts of a proposed federal action. These criteria are discussed below as they pertain to the *North Cape* Shellfish Restoration Project:

1. *Can the proposed action be reasonably expected to jeopardize the sustainability of any target species that may be affected by the action?*

The proposed action is not expected to jeopardize the sustainability or adversely affect any target species. The proposed shellfish restoration is to enhance existing quahog stocks and restore bay scallop and oysters by seeding and habitat enhancement projects having negligible effects on living marine resources and their habitats.

2. *Can the proposed action be reasonably expected to allow substantial damage to the ocean and coastal habitats and/or EFH as defined under the Magnuson-Stevens Act and identified in Fishery Management Plans (FMPs)?*

The proposed action is not expected to result in substantial damage to the ocean, coastal habitats and/or EFH as defined under the Magnuson-Stevens Act and identified in the FMPs for the Northwest Atlantic. The area affected by this action has been identified as EFH for species managed by the NMFS in Narragansett Bay and the coastal salt ponds. The only species addressed by an FMP that could be affected by this proposed shellfish restoration is winter flounder. Winter flounder are found seasonally in the project area, but the proposed restoration will have minimal area and disturbance effect on benthic habitat which winter flounder are known to use. This project is not expected to have an adverse impact on EFH.

3. *Can the proposed action be reasonably expected to have a substantial adverse impact on public health or safety?*

The proposed action is not expected to have a substantial adverse impact on public health or safety. The quahogs that would be rescued from the Providence River dredge channel are in fecal coliform contaminated waters, but will be transplanted to spawning sanctuaries closed to shellfishing for at least two years to allow for depuration. All shellfish seed purchased from

commercial growers is required to be grown in non-contaminated waters for release as potentially harvestable shellfish.

4. *Can the proposed action be reasonably expected to have an adverse impact on endangered or threatened species, marine mammals, or critical habitat of these species?*

The proposed action is not expected to have an adverse impact on any federal or state endangered or threatened species, marine mammals, or critical habitat for these species. The project activities and location under this restoration effort will not impact threatened or endangered species in Rhode Island on the basis for the formal agency determinations made in previous consultations with the U.S. Fish and Wildlife Service or Rhode Island's Natural Heritage Program.

5. *Can the proposed action be reasonably expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?*

The proposed action is not expected to result in cumulative adverse effects that would have a substantial effect on target or non-target species. The proposed shellfish restoration will result in minimal disturbances to marine and estuarine waters, and have negligible cumulative effects on any target or non-target species. The proposed projects may have a cumulative positive effect on one or more of the shellfish species targeted for restoration or enhancement.

6. *Can the proposed action be reasonably expected to jeopardize the sustainability of any non-target species?*

The proposed action is not expected to jeopardize the sustainability of any non-target species. Positive effects may result in enhancing the sustainability of quahogs, bay scallops and oysters in the project area within Rhode Island coastal waters.

7. *Can the proposed action be expected to have a substantial impact on biodiversity and ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?*

The proposed action is not expected to have a substantial impact on biodiversity or ecosystem function within the affected area. Shellfish restoration efforts are expected to improve the health of the ecosystem by providing more filtration to reduce phytoplankton and zooplankton levels. Improved shellfish habitat would enhance existing finfish and shellfish habitats and likely increase biodiversity.

8. *Are significant social or economic impacts interrelated with significant natural or physical environmental effects?*

The shellfish restoration effort is not expected to result in significant negative social or economic impacts, nor significant natural or physical environmental effects. The proposed shellfish restoration should result in positive social and economic benefits by increasing shellfish stocks

supporting recreational and commercial fisheries. The projects are also expected to have community involvement in helping to restore quahog, bay scallop and oyster stocks.

9. *To what degree are the effects on the quality of the human environment expected to be highly controversial?*

The measures contained in this action are not expected to adversely affect the quality of human environment, and therefore, the projects should not be controversial. Shellfish restoration implementation will require regulatory review and approval by state and federal agencies that includes public review and input.

Findings of No Significant Impact Statement: Based on the analysis presented in this document, the *North Cape* shellfish restoration will not significantly affect the quality of the human environment. The proposed projects will include a quahog rescue and multi-species stock restoration and enhancement using seeding, habitat enhancement and other techniques in Rhode Island's coastal salt ponds and Narragansett Bay. This conclusion is specifically in reference to criteria of Section 6.02 of NOAA Administrative Order NAO 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act.

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APPENDIX A
OVERVIEW OF NORTH CAPE RESTORATION PROJECTS

Lobsters- Restoration is designed to address the 9 million lobsters killed by the oil spill. The Responsible Party (RP) has implemented a lobster restoration project involving the purchase, v-notch marking and release of 1.25 million adult female lobsters. This project is expected to increase egg production and eventually replace the 9 million lobsters killed by the oil spill. Through a cooperative project with the University of Rhode Island, the Trustees are monitoring survival and egg production of the v-notched lobsters over the life of the project. The first two years of the project have been completed with approximately 340,000 lobsters purchased, v-notched, and released into Block Island and Rhode Island Sounds and Narragansett Bay. After a number of unanticipated problems developed in the first year of the project which caused adverse impacts on the lobster fishery, the Trustees and RP's representatives implemented a pilot program in Year 2 which incorporated the direct participation of the commercial lobster harvesters into the project. Based on the successful implementation of the pilot program, the RP and Trustees will be expanding the effort in Year 3, that is from May through November 2002.

Salt Ponds- In 2001, approximately 50 acres of land bordering Ninigret Pond was protected through a conservation easement. By protecting this open space, the lands will remain undeveloped, thereby eliminating the potential water quality and habitat impacts that may have resulted from developing the 42 residential lots on this land parcel.

Birds- Actions have been implemented or are proposed that will aid in the protection of bird species injured by the spill. Funds totaling $140,000 have been set aside to distribute equally over five years for implementation of management measures to help protect piping plover (*Charadrius melodus*). These monies help to fund U.S. Fish and Wildlife Service (USFWS) staff to coordinate piping plover work both on the Ninigret and Trustom Pond National Wildlife Refuges (NWRs) as well as other non-NWR South County shore areas. Activities include installing and maintaining predator exclusion structures and symbolic fences, locating new nesting habitat, and monitoring fledgling survival. The goal of the Trustees is to increase piping plover productivity. To address sea bird injuries, USFWS is working with the State of Maine to purchase an offshore island in Maine to help protect ~600 nesting pairs of common eider (*Somateria mollissima*), a species that seasonally overwinters along the Rhode Island coast but nests in northern latitudes. Funds totaling $300,000 have been set aside for this land purchase to meet or exceed the goal of protecting at least 315 nesting common eider pairs. An additional $100,000 in *North Cape* settlement funds have been allocated for managing and monitoring this nesting eider population. Lastly, $500,000 in *North Cape* funds were allocated as part of a $30 million conservation easement on the 750,000-acre (1,172-square mile) Pingree property in northern Maine to help protect nesting habitat for common loon (*Gavia immer*). The loon is a species that also overwinters along the Rhode Island coast but nests in more northerly latitudes. At least 24 known nesting pairs will be protected on 110 lakes and ponds on this large Maine parcel. Another $200,000 in *North Cape* funds have been dedicated to loon monitoring and management (floating nest platforms) at the Pingree property, and $50,000 was used in 2001 to complete habitat assessments on three large potential land purchases. Remaining funds may be used to help purchase nesting habitat in New Hampshire and/or Maine.

Recreational Fishing- To address impacts to recreational fisheries adversely affected by the oil spill, the projects being pursued focus on restoration of anadromous fish runs to the South County salt pond watersheds. Anadromous fish are species that spend most of their lives in the ocean but return as adults to spawn in freshwater streams and rivers. Juveniles anadromous fish typically spend a portion of their lives in freshwaters before outmigrating to the marine environment. Alewife (*Alosa pseudoharengus*), an important forage species to various sportfishes such as striped bass and bluefish, is the target species for this restoration effort. The projects planned for alewife run restoration include installing an Alaskan steep pass fishway on a 5-foot high dam on Factory Pond Brook that drains to Green Hill Pond in South Kingstown. By constructing the fishway, adult alewife will have access to high quality spawning habitat in the stream and Factory Pond above the dam. Alewife run restoration is also planned for the Saugatucket River that discharges to Pt. Judith Pond in South Kingstown. One project in this watershed is to retrofit a spillway on an earthen dam to provide access to the 220-acre Indian Lake that is characterized by high quality spawning and nursery habitat. Both the Factory Pond Brook and Indian Lake dam retrofit projects are scheduled for completion by late fall 2002. Other alewife passage projects are being considered in the Saugatucket River and Cross Mills Brook watersheds. Approximately $160,000 is available in settlement funds for the herring run restoration projects.