4.4 Birds

4.4.1 Overview and Preassessment Activities and Findings

Bird resources in the Tampa Bay area were injured by discharged oil and subsequent cleanup activities. Oil fouled more than 327 square miles of bay and Gulf waters and 13 miles of beaches, both important foraging grounds for the bird population of Tampa Bay. Further, oil impacted four important nesting areas.

The southern end of Egmont Key and Shell Island have large populations of nesting shorebirds. These birds were impacted by the presence of the oil on beaches adjacent to the colonies, which are important foraging and loafing areas for young of the year and breeding adults. These two colonies were also disrupted by response activities.

Two nesting islands within Johns Pass, Rookery and Bird Key, were also impacted. Oil washed through the islands at high tide. Oil adhered to the surfaces of mangrove trees used for nesting and roosting, and oil deposited within the sediments contaminating nearby foraging and loafing areas.

These islands have been documented rookeries since 1880 (Scott, 1887). An April 28, 1993, aerial survey of Rookery Key conducted by the Florida Game and Fresh Water Fish Commission (FGFWFC) estimated that 155 brown pelican nests were present at the island (Nesbitt, 1995). A survey of this colony immediately after the spill indicated that brown pelicans, double-crested cormorants, great blue herons and great egrets were still nesting. Although nesting of these species generally occurs from December through June or July, a few pairs of these species persist late in the season. Therefore, an undetermined number of fledged young, still being fed by their parents, were present. Some of these young were oiled while swimming and diving in waters adjacent to their natal colony. Additional response and NRDA activities on Rookery Key were limited to decrease the amount of impact due to human activities.

FGFWFC and USFWS carried out limited surveys of the islands in the 3 weeks following the spill. The National Audubon Society conducted surveys of all heavily utilized bird areas in the greater Tampa Bay area, including nesting colonies ranging from Cortez in Manatee County to Honeymoon Island in northern Pinellas County, from August 11 through September 5, 1993. These surveys are documented in a report dated September 7, 1993, by the National Audubon Society, Tampa Bay Sanctuaries, entitled "Impact of Tampa Bay Oil Spill on Local Bird Populations" (Paul, 1993). The number of oiled birds ranged from 16% at Johns Pass to 0% at Honeymoon Island. Further, two surveys were taken at Sand Key on January 8 and 13, 1994, when rough weather conditions mobilized sunken oil and deposited it back on the beaches. On January 8, 2,585 birds consisting of 41 species were observed, 74 were oiled (3%). On January 13, a secondary survey found 532 birds consisting of 17 species, 13 were oiled (2.4%).

On the day of the spill, Pinellas Seabird Rehabilitation Center (PSRC) and the FGFWFC set up a fully equipped facility at Ft. DeSoto Park with triage, veterinary, washing, and holding areas. A second triage center was set up at Johns Pass. Most oiled brown pelicans received by the facilities were young of the year and were recovered from Johns Pass. Small numbers were brought in from Ft. DeSoto, Anna Maria Island, and other local areas.

The Trustees worked closely with the PSRC, FGFWFC and USFWS to ensure documentation of bird recovery, mortality, and rehabilitation during the spill response. Bird rehabilitation statistics reflect only those birds so badly oiled that they could be easily captured and, therefore, are not directly comparable to the oiled bird counts reported from the Audubon surveys which included a wider range of oiling. The number of oiled birds received by the bird rescue and rehabilitation facility at Ft. DeSoto, as of October 18, 1993, was 366 individuals. Of these 366 birds, 283 survived to be released from the center. The number of birds brought in for rehabilitation and subsequently released is summarized by species in the table below.

Table 4. Bird Rehabilitation Statistics

Species	Number Received	Number Released
Brown Pelican	296	261
Laughing Gulls	17	4
Snowy Egret	14	3
Great Blue Heron	12	10
Cormorants	11	5
Miscellaneous	16	0
TOTAL	366	283

4.4.2 Definition of Injury

The Trustees have evaluated a number of possible injuries to birds caused by exposure to the discharged oil, including death and physiological malfunctions (such as reproductive impairment or failure and behavioral abnormalities), as well as indirect injury through habitat loss and disruption of nesting and foraging activities. These indirect injuries are dealt with in the assessment of injuries and loss of ecological services for other natural resources such as mangroves.

For the purpose of this assessment, the Trustees define bird injury by the number of individuals that were oiled to the extent that they could be captured and brought in for rehabilitation.

4.4.3 Key Factors in Assessing Injury

The Trustees are aware that more birds were likely affected than reported through the Pinellas Seabird Rehabilitation Center. In particular, the Trustees are aware that sublethal effects to individuals exposed to oil are inevitable, that a portion of rehabilitated birds may fail to rejoin the wild populations and breed after release, and that all bird mortalities were not accounted for in the rehabilitation facilities. The Audubon Report states that mortality reported at the Ft. DeSoto facility was incomplete in that it failed to account for oiled birds that were occupying areas south of Egmont Key, i.e., Passage Key and Cortez Harbor. It also discussed the lack of data on the sublethal effects that may have caused additional injury.

The inability of assessment activities after an oil spill to comprehensively account for all injury to birds and other wildlife is a problem common to all oil spills, especially when sea birds are affected. For example, bird injury determinations in the EXXON VALDEZ spill included uncertainty factors as high as 10 times the total recovered individuals to estimate total impact.

Despite the uncertainties discussed above, information available to the Trustees indicates that the effects of this spill were more limited than in other spills. Among other things, potential population impacts due to oiling were probably reduced because all species had almost completed nesting and fledging young. Therefore, oiled adults had a low probability of fouling eggs or hatchlings with oil. This conclusion is supported by the Audubon report, which despite the reservations discussed above, concluded: "I am cautiously confident that the August 10 spill did not cause serious damage to Pinellas County bird populations, resident and breeding or migrant and wintering."

In addition, the Trustees believe that there was a relatively high probability that oiled birds from this spill were recovered for rehabilitation due to the intense response efforts, the relatively populated area

affected, and the species involved. Each of these factors increased the likelihood of detection of oiled birds with subsequent recording of their species and condition, and possibility of rehabilitation.

4.4.4 Injury Assessment Method

The Trustees will determine injury to birds by estimating the number of injured birds based on the records of the rehabilitation centers. This is a simple and cost-effective method of assessing injury. After consultation with bird recovery facilities and the USFWS personnel, and based on the Audubon report, the Trustees estimate that 50% of the birds affected by the oil spill were found and brought to rehabilitation centers. This estimated recovery rate is high in comparison to other oil spills, however, the Trustees consider this rate appropriate for the Tampa Bay spill due to the factors discussed in Section 4.4.3. Accordingly, the Trustees estimate the total number of birds injured to be 2 times the number of oiled birds brought to the rehabilitation centers, or 732 birds.

The number of birds estimated to have been injured is small in relation to the total bird population in the Tampa Bay area, thus it would be difficult to detect a measurable adverse impact on population success. In fact, recent data suggests the overall trend of the brown pelican population in Tampa Bay has been increasing since 1992. Also, the latest aerial survey conducted by FGFWFC, in May 1995, estimated 225 brown pelican nests at Rookery Key (Nesbitt, 1995). This information suggests that the oil spill effect to local bird populations posed a short-term injury. Accordingly, additional efforts to detect population impacts or to determine the time required to recover from these short-term impacts could not have been obtained at a reasonable cost in comparison to the value of the information that would have been obtained in relation to the scale of the observed injury.

Studies to determine the sublethal effects of exposure of birds to the discharged oils could have been performed, such as studies to determine the sublethal injury to adult birds directly exposed to the oil, the nesting success of affected populations for the season following the spill, or abnormalities found in next season offspring in these populations. However, such studies would have been complex, lengthy, expensive and required suitable bird laboratory subjects resulting in additional bird injury. Accordingly, for these reasons and in view of the scope of the bird injury as discussed in Section 4.4.3, the Trustees considered additional studies to be unwarranted.

The Trustees are addressing the indirect effects on birds resulting from the oiling of bird habitats in the sections of this document dealing with injuries to mangroves, salt marshes, oyster reefs, and seagrasses.

4.4.5 Damage Assessment Method

The Trustees have evaluated several assessment strategies including: bird reproduction enhancement through habitat creation, restoration or protection, estimates of the number of birds lost in combination with literature values, and/or computer modeling of bird damages. The Trustees will quantify damages for bird injuries by calculating the cost to rehabilitate or protect from other types of injury the number of birds estimated to have been injured as a result of this discharge. For example, statistics from USFWS permits for the Tampa Bay area indicate that 6245 birds were treated in rehabilitation centers in 1991 and in 3974 were treated in 1992. The average of these two years is 5110. Using this average as the baseline number of birds rescued in one year against the estimated impact of the spill to birds in the Tampa Bay area (732 birds), the impact of the spill represents about 14% of the annual rehabilitation load. The latest available data will be used in performing the assessment. Using this data, the estimate of damages would be calculated as the cost of operating a rehabilitation center (per week) multiplied by the number of weeks required for normal rehabilitation efforts to replace the estimated injured birds. Data provided by Lee Fox of Pinellas Seabird Rehabilitation Center indicates that the costs for bird rehabilitation are $1100-$2000 per week. The estimated time required for normal rehabilitation efforts to replace the estimated injured birds is 7.3 weeks.

Accordingly, using this method, the estimated damages for injured birds ranges from $8,030 to $14,600. This method is simple and cost effective.

The Trustees will not assess any additional damages to compensate the public for the interim loss of services provided by the injured birds during the period from the spill through restoration action. As previously stated, studies to determine the period of recovery for all injured birds (a necessary parameter of calculating lost use) would not be cost-effective.

The Trustees are addressing the indirect effects on birds resulting from the oiling of bird habitats, in the sections of this document dealing with injuries to mangroves, salt marshes, oyster reefs, and seagrasses. In the unlikely event that most or all of the bird rookery located on Rookery Key is lost due to mangrove island erosion or other causes arising out of the oil spill the assessment strategy would need to be expanded to account for this additional injury.

4.4.6 Restoration Plan

As noted above, birds in Tampa Bay suffered both direct and indirect injuries as a result of this spill. The objective of restoration planning for birds is to determine what actions are necessary to replace and/or compensate for birds equivalent to those estimated to have been injured. The scale of such actions are determined through calculations assessing damages for injured bird resources, as discussed in Section 4.4.5 above.

A. Restoration Actions for Resource Recovery

This section considers actions that may be appropriate to restore or facilitate the recovery of the injured birds.

Alternatives Considered

1 - No action - This alternative would involve no direct intervention to restore the resource. While existing management programs, cleanup activities, and natural processes may assist or provide for the natural recovery of this resource, no additional actions are proposed under this alternative.

2 - Reduce or prevent predation on affected bird species - This alternative would involve selective elimination of non-native or over abundant and nuisance predatory species, or fencing of nesting areas to exclude predators.

3 - Enhance habitat availability and quality - This alternative would increase the probability of reproductive success and survival by enhancing nesting and feeding areas. Actions could include removal of refuse, planting of appropriate nesting habitat, or decreasing human access to prevent trampling and avoidance behavior.

4 - Conduct captive breeding to enhance recruitment - This alternative would take eggs from unaffected populations, and hatch and rear birds for eventual release in affected areas.

5 - Provide grant funds to augment existing bird rehabilitation organizations and network for Tampa Bay - Several organizations were actively involved during the oil spill that would benefit from funding to enhance ongoing rehabilitation facilities and prepare for future catastrophic spill incidents.

6 - Maintain existing wildlife rescue equipment - This alternative would ensure that emergency equipment is available in working condition for future bird rescue efforts.

7 - Acquire and maintain additional equipment for small response support, including disposable items - This alternative would make bird rescue equipment available to response agencies in the event of future spills. By stocking these items in advance, the delay associated with procurement of these needed supplies would be eliminated.

8 - Reduce mortality resulting from fishing line entanglements - This alternative could involve physical removal of fishing lines from identified rookeries and other habitats used by birds, or by regulating fishing activities in sensitive areas.

Evaluation of Alternatives

The Trustees have determined that direct injury to birds and bird populations did occur. To address this direct injury, the Trustees will restore birds to the environment by funding cost-effective proposals to increase the number of birds in the Tampa Bay area or decrease the number of injuries to birds which might remove them from the environment. Implementation of each of the above listed actions would yield this result, but all are not equally acceptable for the reasons discussed below. The "no action" alternative is not acceptable because birds were actually lost from the environment due to oiling. The no action alternative would not directly impact the environment.

The problem of predation would require the control of potential predators and their habitat, which would not be cost-effective nor enhance long-term recruitment of relevant bird populations. Additionally, the control of one species for the benefit of another can result in unforeseen ecosystem disruptions. The predation control alternative would impact site specific components of animal populations which prey and/or compete with birds. A species focused control program would change the ecological composition and dynamics of the target area during the period the program was implemented, however, the system would be expected to revert to pre-control conditions once the control program was terminated. There would be some minor disturbance to vegetation/sediment and bird populations from periodic human access into the mangrove forest associated with the tending of animal control devices. However, these impacts could be minimized by scheduling access times and using marked access routes. Since no artifacts or historical use have been reported in association with the mangrove islands, there are no cultural impacts anticipated to the environment as a result of actions associated with this alternative.

Enhancing habitat availability and quality to increase reproductive success and survival is partially being addressed by habitat creation under other assessment categories and the emergency restoration activities undertaken on Elnor Island. A short term disturbance to resident bird populations could be expected during the implementation of habitat enhancement actions. However, these can be minimized by scheduling access times relative to the pattern of bird use of these sites. The sites proposed for bird habitat enhancement are subject to little or no routine human use, and any modifications or access restrictions to improve their habitat values for bird use would have little or no impact on cultural values.

Captive breeding projects are not known to increase wild bird populations effectively. State and Federal captive breeding permits would require demonstration of need and effectiveness. If this alternative were implemented, there would be the potential for impacts on the wild stock gene pool from captive breeding but only if the target species was limited in numbers or isolated from a larger breeding population, which is not the case in Tampa Bay. Local bird populations seem to be limited by a complex interaction of overfishing, reduced nutrient loading in the Bay, climatic factors, including a long-term drought and freeze damage to nesting sites (Paul and Johansson, 1996). Direct supplements to the bird populations would only have a

short-term impact and not solve the long-term limiting factors. No adverse environmental impacts would be expected from this alternative.

The other listed actions would directly enhance bird rehabilitation and protection, thereby decreasing future mortality. Funding of such projects is not expected to impact the physical, biological, or cultural environment. Augmenting the funds available for existing bird rehabilitation organizations to expand facilities, training programs or equipment allows for the enhancement of bird rescue capabilities within the community, which prevents decreases in bird populations. Rehabilitation of oiled pelicans (the primary species affected) appears to be a feasible restoration approach in the Tampa Bay area even though information from other oil spills shows that survival rates of rehabilitated and released birds have been low (Anderson, Newman, and Kelly, 1996). Results from pelican banding conducted in association with the Tampa Bay spill suggests a higher survival rate. In an effort to document survival rates one hundred of 261 rehabilitated brown pelicans were banded before their release. Of the 100 banded birds, six have been recaptured (Table 5). One bird was recovered dead in the Keys; one was euthanized due to non-related spill injuries; and four were received at PSRC for rehabilitation of injuries not associated with the spill. The low rate of band recovery indicates that high rates of mortality soon after rehabilitation did not occur (Fox and Urquhart-Donnelly, 1996). If restoration efforts focus on rehabilitating birds from physical injury (e.g., line entanglement, fish hook wounds) it is likely that rehabilitation success will be even higher because oil toxicity effects are not a factor.

Table 5. Banded Oil Spill Birds That Have Been Subsequently Recovered

Band No.	Capture Date	Release Date	Re-Capture Date	Disposition
599-46404	8/11/93	8/25/93	6/22/94	hook & line injury rel 6/24/94
599-46464	8/12/93	9/2/93	5/4/94	cmpnd fracture euthanized 5/4/94
599-46494	8/19/93	9/2/93	5/9/94	external wound, rel 5/19/94
599-46463	8/15/93	9/2/93	5/9/94	external laceration, transferred to Suncoast for care 5/14/94
599-46411	8/11/93	8/25/93	4/30/95	hook & line injury, rel 5/1/95
Tag #295	8/13/93	11/18/93	3/94	recovered in Florida Keys, died in rehab.

Decrease in bird mortality is also accomplished through education of sport fishermen and the public. Increased public awareness can result in voluntary efforts to prevent bird mortalities and generate additional opportunities for bird recoveries. There are already routine volunteer coastal cleanups currently removing old monofilament fishing line and other injurious garbage from bird habitat throughout Tampa Bay. A cooperative pilot program by the Tampa Chapter of the National Audubon Society and Tampa Baywatch has targeted the removal of fishing line from islands throughout the Tampa Bay area in 1994 and 1995. Their results suggest that twice yearly fishing line removal from nesting areas could significantly reduce bird mortality in those areas. This project currently does not have permanent funding and could be expanded to cover more sites in the Tampa Bay area.

Section 2.2 above provides a general discussion of the Tampa Bay physical, biological and cultural environment. Sections 4.4.1 and 4.4.2 provide a specific discussion of bird impacts. There are no known historical or archaeological resources present on these sites.

Selected Alternative(s):

The Trustees have determined that injuries to the Tampa and Boca Ciega Bay bird populations will be restored by using damages assessed to augment the operations of existing bird rehabilitation organizations and network (Alternative 5), to ensure existing bird and wildlife rescue equipment is maintained (Alternative 6), to acquire equipment for small spill response support, including disposable items (Alternative 7), and/or to support removal of monofilament fishing line from bird habitats in Boca Ciega Bay (Alternative 8). Implementation will be restricted to the area impacted by the spill. This action will address the injuries to the bird populations of the Tampa and Boca Ciega Bay systems, by ensuring that more birds will be rehabilitated and returned to the environment and/or ensuring that fewer birds will be removed from the environment by directly reducing sources of bird mortality. There should be no environmental or cultural impacts associated with implementing these alternatives.

B. Compensatory Restorative Alternatives

This section considers alternatives to provide compensation for the interim losses to bird populations.

Alternatives Considered:

1 - Use equivalent dollar contributions to fund general water quality improvement project - This alternative addresses community infrastructure which influences human impacts on water quality, which in turn impacts the ecological community in the entire Tampa/Boca Ciega Bay system. This alternative would improve the overall ecosystem water quality, resulting in greater feeding and nesting opportunities for birds.

2 - No action or compensation for the injuries to birds - This alternative focuses primarily on the impacted bird populations and the associated services. This alternative would be appropriate where bird injuries caused by the spill were not measurable, were not significant or where the cost to assess compensation for the injuries is not cost-effective.

Evaluation of Alternatives:

The assessment evidence indicated that interim bird population losses were relatively small, and that limited information existed to quantify the interim loss. Primary actions to be implemented by the Trustees will facilitate the future return of birds to local wild populations. Neither of the two alternatives would impact the physical, biological, or cultural environment.

Selected Alternative(s):

The Trustees have selected the "no action" alternative for interim bird population losses.

4.5 Sea Turtles

4.5.1 Overview and Preassessment Activities and Findings

Sea turtles were injured as a result of this oil spill, including the Federally endangered green sea turtle (*Chelonia mydas*) and threatened loggerhead sea turtle (*Caretta caretta*). Nesting beaches and foraging areas were oiled and disrupted by cleanup operations. Because of the sensitivity of these species, special spill response efforts were directed toward their protection.. Offshore skimming operations were directed to monitor for any sign of sea turtles in the spill area or the trajectory of the spill. One Green Sea Turtle was recovered offshore in an oil windrow. Pinellas County has low density sea turtle nesting, approximately 0.2% of statewide activity. At the time of the spill, the Pinellas County Sea Turtle Stranding Network had 115 marked loggerhead nests which were identified as being at risk. Each known turtle nest was carefully monitored for oiling, hatching success, and disturbance. Ninety-six nests were on beaches that were oiled. Fourteen of these nests had to be specifically protected from oil by booms or trenches. Two nests were inundated with oil. One unmarked nest was run over by a bulldozer, which destroyed 5 eggs.

Green Sea Turtles - One juvenile green sea turtle (25 centimeters carapace length) was recovered offshore covered with oil, cleaned and released. This subadult size class is very important to sea turtles because turtles that reach this size have escaped most causes of mortality (large predators and human-induced mortalities being the exceptions). It is estimated that its potential to contribute to species reproductive success is between 1,000 to 10,000 times greater than that of a hatchling (Hirth and Schaffer, 1997). The extent to which this year class of turtles of all species use the Tampa Bay area is unknown but information from the Stranding Network and other observers indicate it is probably substantial.

Loggerhead Sea Turtles - Four loggerhead hatchlings were recovered dead, 12 loggerhead hatchlings were recovered oiled, but were cleaned, rehabilitated and released. Two loggerhead nests were oiled. Subsequent evaluation of the oiled loggerhead nests revealed 176 unhatched and 9 hatched eggs (5% hatching rate) , a decrease of the normal hatching success range of 50 to 90% (Foley, 1995, DEP-FMRI, Pers. Comm. to George Henderson, 1995). A nest on Egmont Key State Park emerged behind containment booms which trapped 28 loggerhead hatchlings, 27 of which were likely taken by predatory birds (Mosier, 1993). Five loggerhead eggs were destroyed by crushing as a result of response activities and the hatchling rate for the remainder of the transplanted eggs from this nest was only 32.1%. Twenty-nine other loggerhead nests on the oiled beaches hatched during the spill. Approximately 1,530 loggerhead hatchlings from 23 of these nests were restrained after nest emergence and released into the water at a site free of oil. About 413 loggerhead hatchlings from the 6 remaining nests were not restrained and entered the water at sites where surface waters may have contained oil.

Preassessment observations determined that a total of 212 loggerhead hatchlings were killed, and 2177 were potentially injured due to exposure to the oil. The breakdown of Loggerhead turtle injury is shown in Table 6.

4.5.2 Definition of Injury

The Trustees have evaluated a number of possible injuries to sea turtles caused by exposure to the discharged oil including death, physiological malfunctions, reproductive impairment, and behavioral abnormalities. Injuries resulting from oiling of important feeding, nesting, and breeding habitats are being addressed elsewhere in the assessment. In addition, the Trustees evaluated cleanup and mitigation activities that may have injured or reduced the viability of turtles.

Table 6. Loggerhead Turtle Injury

Turtle Injuries	Number Injured	Observed Mortalities
Hatchlings Restrained	1530	0
Dead Hatchlings	31	31
Crushed Eggs	5	5
Live Hatchlings - Rehabilitated	13	0
Oil covered nest (eggs)	185	176
Hatchlings - Emerged in oily water	413	0
TOTAL	2177	212

Due to the status of these species under the Endangered Species Act, the Trustees define as injured any turtle, at any life stage, that was exposed to oil or disturbed by response activities.

4.5.3 Key Factors in Assessing Injury

Because both species of sea turtles are given special status by the Endangered Species Act, careful consideration has been given in injury assessment and restoration planning to ensure that any injuries are adequately addressed.

Preassessment activities documented directly observable exposures and injuries. Additional injury is likely to have occurred from sublethal effects to hatchlings and adults as a result of being trapped behind booms, entangled in oil snares, exposed to oil on beaches or in the water, and disorientation due to response activities. Further, hatchlings that were restrained were released on beaches other then their natal beaches, thus potentially losing them from the local nesting population. These additional injuries were difficult to document and quantify; the duration of these injuries was difficult to establish as well. Another factor making the injury assessment for turtles difficult is that aspects of sea turtle life cycles are poorly understood, especially for local populations. It is technically difficult and expensive to conduct investigations to determine sublethal effects to nesting and breeding adult sea turtles and hatchlings. Surveys and testing of adult sea turtles could not have taken place until the summer of 1996 or 1997 depending on the nesting frequency of the area's sea turtle populations and were complicated by the special status of these species. Hatchling health surveys are also technically very difficult. Impacts to hatchlings could only be determined either through controlled laboratory oil dosing experiments or nesting surveys, which would need to be done when the 1993 hatchlings would be expected to enter the nesting population, the years 2011 to 2013.

4.5.4 Injury Assessment Method

The data required to fully document the types, levels and duration of injuries caused by the spill to affected sea turtle populations would be substantial. The lack of basic information as to the population dynamics, relative nesting success, and biotic and abiotic factors affecting sea turtle survival makes it difficult to assess the level of injury. In order to determine the impact of the spill on the local population, Trustees would have to conduct extensive studies in basic sea turtle biology and population dynamics. The Trustees have determined that such studies would not be reasonable and that the resulting information would not offer a cost-effective approach to either injury determination or restoration planning.

The difficulties discussed above left few cost-effective and technically rigorous injury assessment methods available to the Trustees. Therefore, the Trustees will characterize injuries as the number and type of sea turtle resources exposed to oil or disrupted by response activities, including the known injury to juveniles and eggs.

4.5.5 Damage Assessment Method

The Trustees will quantify damages for sea turtle injuries by calculating the cost to improve or augment appropriate programs in the area of the spill that would generally replace the number and type of sea turtle resources injured as a result of this incident, by increasing hatchling survival or assisting in effective management of sea turtles so as to rebuild sea turtle populations. The Trustees have considered several possible damage assessment methods for use in such an approach, including using costs to implement turtle captive breeding programs, the Turtle Excluder program, expanding one or more existing programs that monitor and protect turtle nests from disturbances such as human activity, street and house lighting and predators. These types of activities are consistent with Priority 1 Tasks in the Recovery Plan for the U.S. Population of the Loggerhead Turtle *Caretta caretta* (USFWS and NMFS, 1993) and priorities in the Green Turtle recovery plan (NMFS and USFWS, 1991).

4.5.6 Restoration Plan

As noted above, sea turtle resources in Tampa Bay were injured as a result of exposure to oil from this spill. The objective of restoration planning for sea turtles is to determine what actions will increase hatchling survival or assist in effective management of sea turtles so as to rebuild sea turtle populations.

A. Restoration Actions for Resource Recovery

This section considers actions that may be appropriate to restore or facilitate the recovery of injured sea turtles.

Alternatives Considered:

1 - No action - This alternative would not involve any direct intervention to restore the resource. While ongoing management programs, cleanup activities, and natural processes may assist or provide for the natural recovery of this resource, no additional actions are proposed under this alternative.

2 - Head Starting, captive rearing and release, using eggs collected from wild nests.

3 - Nest monitoring and protection efforts (Task Numbers 211 and 212 in the Loggerhead Turtle Recovery Plan, USFWS and NMFS, 1993). Examples of these include efforts in Pinellas County to implement additional lighting controls, nest location marking, human and animal predator exclusion fencing, and hatchling guarding from nest to beach.

4 - Priority unfunded activities in the sea turtle recovery plans directly related to Pinellas area sea turtle enhancement.

Evaluation of Alternatives:

The "no action" alternative is not appropriate because a documented injury to sea turtles occurred. The status of these animals as endangered or threatened species makes restoration actions especially important. This alternative would not directly impact the environment.

Head Start rearing and release and captive-breeding programs are no longer permitted in the United States because they are not considered an effective management tool. Therefore, this alternative has been rejected. There are no adverse environmental impacts.

Nest protection techniques are known to increase hatchling survival between the nest and first entry into the water, a critical time in the life history of a marine turtle. Nest monitoring and protection programs in the St. Petersburg area are an effective way to augment turtle reproductive success. Such programs are considered to be a high priority in the Loggerhead Recovery Plan. Opportunities to expand these programs are limited along Pinellas County beaches because there is an extensive network of agencies and volunteers already monitoring Pinellas beaches. However, expanding these programs to include studies on turtle nesting success and false crawl activity in Pinellas County (Task 212, $31,000) would generate information critical to improving the overall management of threatened stocks and benefit the species in the long term. These nest protection projects will have a site specific focus, consequently, any impact on the physical or biological environment would be of limited scope and duration. Where nesting sites are located on beach areas subject to heavy human use, there is the potential for some access restrictions during the nesting period. Since these beacnes have been subject to periodic renourishment and other physical disturbances, there are no anticipated impacts to the cultural environment.

Turtle recovery plans also point out the need for critical information that will assist the effective management of sea turtles to rebuild their populations. Such high priority projects in the Federal Turtle Recovery Plan include: 1) The Gulf Coast of Florida portion of the Sea Turtle Stranding network (Task 2223, $20,000) and 2) Studies on sea turtle distribution and seasonal movements (Task 2211, $49,000). All of these projects would generate critical information to improve the overall management of threatened stocks and benefit the species in the long term. Funding of such projects is not expected to impact the physical, biological, or cultural environment.

Section 2.2 above provides a general discussion of the Tampa Bay physical, biological and cultural environment. Sections 4.5.1 and 4.5.2 provide a specific discussion of sea turtle impacts, and describe the endangered or threatened status of impacted turtles.

Selected Alternative(s):

The Trustees will implement one or more projects based on a combination of the third alternative, nest monitoring and protection, and the fourth alternative, unfunded sea turtle recovery priorities directly related to sea turtle enhancement to restore the turtle injury.

B. Compensatory Restoration Alternatives

This section considers alternatives to provide compensation for the interim losses to the sea turtle population.

Alternatives Considered:

1 - Management Information - This alternative would implement priority project(s) in the impact area from the Federal Turtle Recovery Plan. This alternative would compensate for sea turtle injuries by (1) supporting the West Florida portion of the Sea Turtle Stranding Network (Task 2223), (2) funding the study on sea turtle distribution and seasonal movements (Task 2211), and (3) funding a study on sea turtle nesting and false crawl activity in Pinellas County (Task 212).

2 - Nesting Beach Improvement Projects - This alternative would include actions to provide properly sloped beaches that contain adequate areas for sea turtles to nest. This would require beachfront properties to remove any obstructions to sea turtle movement on the beach (Task 212).

3 - Beach Lighting Controls - Nesting, adult sea turtles are adversely affected by lights (they avoid lighted areas) while hatchling sea turtles are attracted by light. In either case, artificial light has the ability to negatively impact sea turtle behavior. This alternative would include actions to promote the most natural conditions for sea turtle nesting (several Tasks e.g. 32, 2143, etc.).

4 - Enhancement of Mortality Controls for Shrimp Trawls and Traps (e.g., TED programs) - A documented source of adult sea turtle mortality is from entanglement in nets used in shrimp harvesting and buoy lines associated with fish traps. Current Federal and State laws mandate the use of devices to prevent fouling of marine turtles in shrimp nets. This alternative would involve actions to augment or increase enforcement of shrimp trawl excluder device rules or education of commercial fishermen on the risks that nets and trap buoy lines pose to sea turtles (Task 2221).

5 - Enhance Plastic and Nesting Area Debris Reduction Program - Plastic containers and bags can be mistaken as food items by some turtles and ingested, causing mortality. Debris on nesting beaches can cause adult turtles to abort nesting on that beach or turtles may become entangled in the debris and die. Debris on beaches when hatchlings emerge from the nest can trap these animals, causing increased predation or death due to dehydration (Task 2251, 2252, 2253).

6 - Funding a General Water Quality Improvement Project - This alternative would fund or contribute to a water quality improvement project in the Tampa Bay ecosystem. Water quality improvement refers to actions that will significantly reduce nutrient loading, contaminant runoff, sediment inputs, and other ecological stresses to the bay, actions that indirectly benefit sea turtles using that environment.

7 - No action or compensation for the interim losses to sea turtles - This alternative would be appropriate where there were no measurable or significant injuries to sea turtles as a result of the spill.

Evaluation of Alternatives:

These alternatives involve diverse environmental elements associated with sea turtle life history and sea turtle habitat. The actions range from physically adjusting beach contours, to controlling human activities from directly or indirectly impacting turtle habitat and behavior. The consequences of the alternatives would be to reduce negative human impacts on sea turtle habitat, returning conditions to a more natural state. The primary negative impacts of the proposed alternatives are restrictions on human activities which have modified or presently utilize the sea turtle's habitat.

The Trustees did not conduct any further evaluation of compensatory restoration alternatives because insufficient information exists to determine the appropriate scale of compensatory restoration. As discussed above, the Trustees concluded that adequate information could not be acquired at a reasonable cost.

Selected Alternative(s):

Given the actions selected for resource recovery and the limitations of existing information, the Trustees have selected the no action alternative for compensatory restoration.

4.6 Salt Marshes

4.6.1 Overview of Preassessment Activities and Findings

Salt marshes dominated by smooth cord grass *(Spartina alterniflora)* are common in Tampa and Boca Ciega Bays. These emergent intertidal marine grasses form both narrow fringing marshes along the shorelines and more extensive marsh habitat in protected embayments within the estuary. Salt marshes are known to be sensitive to oiling. Feasible assessment and restoration techniques exist for this habitat.

Oil entering Boca Ciega Bay through John's Pass reached several high areas of fringing salt marsh vegetation. These areas were readily accessible from shore and small enough to be directly evaluated by field biologists from the Trustee agencies. Field observations of these areas found either no oil or oil present in thick, continuous bands. The Genesis Group (previously described in Section 4.1, Mangroves) also surveyed and documented areas of salt marsh oiling. The following oiled salt-marsh areas were delineated by the survey:

Turtle Crawl Pt. (at Veterans Mem. Park)	7,566 square feet
Jungle Prada Area	18,485 square feet
29th Street marsh	3,262 square feet
Blind Pass area	7,496 square feet
Total	36,809 square feet
	= 0.85 acres

The color infrared aerial photography by I.F.Rooks (previously described in Section 4.1, Mangroves) also provided a means of detecting and documenting vegetation changes over time for the areas of oiled salt marsh.

4.6.2 Definition of Injury

The Trustees have evaluated a number of possible injuries to salt marsh resources caused by exposure to the discharged oil, including mortality to salt-marsh plants, reproductive impairment, and mortality or population reduction of the associated plant and animal community. These injuries result in loss of ecological services such as photosynthetic production, marsh or shoreline physical stability, bird feeding, nesting, or roosting area, and nursery services for fisheries.

Based on field observations and the considerations described below, the Trustees define injury to salt marshes as the number of acres of marsh exposed to oiling sufficient to cause injury or loss of ecological services as described above. The Trustees will estimate acres oiled and losses in ecological services using the methods described in Section 4.6.4.

4.6.3 Key Factors in Assessing Injury

The key factors in assessing injury to salt marsh are:

Area, duration and degree of exposure - Under the conditions of exposure present here, this is provided by the Genesis Group's survey of delineated oiled salt-marsh areas.

Identification and duration of ecological services lost - An understanding of the ecological impact of the oiling considers the amount of salt marsh loss, the types of services affected and the length of time losses persist.

4.6.4 Injury Assessment Method

Current information indicates that a small portion of the oiled 0.85 acres did not appear to suffer any injury as the oil was quickly removed by cleanup crews or tidal flushing. Approximately 0.75 acres of oiled salt marshes sustained some initial injury. Observed injury included loss of the above-ground portions of the marsh vegetation and mortality of associated algae, invertebrates and resident marsh fishes. Follow-up surveys by the Genesis Group in November 1994 found all but 2,200 square feet of the injured marshes at Turtle Crawl Point had recovered within one year of the spill. Normal winter vegetation die-back, detritus washout, and spring regrowth is a natural cycle that facilitates oil removal and recovery within this habitat.

On the basis of this information, the Trustees will assess the injury to salt marsh as the total loss of ecological services normally provided by 0.75 acres of salt marsh for one year. This approach to quantifying the injury is appropriate due to the relatively small area impacted, early indications of relatively rapid recovery for oiled sites, and the cost of doing additional, more detailed assessments of remaining salt marsh injuries.

4.6.5 Damage Assessment Method

The Trustees will assess damages based on the costs of restoring or replacing one year of ecological services provided by 0.75 acres of salt marsh.

Salt marsh that is created or enhanced through restoration projects typically does not provide the same magnitude of ecological services as natural, long-established salt marsh. To adjust for this, the Trustees will use a conversion factor of two times (2X) be used in calculating the amount of additional salt marsh acreage needed to replace the lost services. The 2X factor is consistent with the Comprehensive Regional Policy Plan (1991), Policy 10.1.3, for salt marsh mitigation approved by the Tampa Bay Regional Planning Council (TBRPC 1991). Compensation assessed for interim losses will be the costs to create the additional acres of salt marsh needed to compensate for interim loss.

4.6.6 Restoration Plan

As noted above, certain areas of fringing intertidal salt marsh vegetation within Boca Ciega Bay were injured as a result of exposure to oil from the spill. The objectives of restoration planning for injured salt marsh areas are to:

(1) determine what actions, if any, are necessary or appropriate to enable or facilitate recovery of the injured salt marsh vegetation at the site of injury, and

(2) determine what actions, if any, are appropriate to replace or acquire equivalent ecological services lost due to exposure of these fringing salt marshes to oil from the Tampa Bay spill, and to restore these services or compensate the lower Tampa and Boca Ciega Bay ecosystems for this loss.

A. Restoration Actions for Resource Recovery

This section considers actions that may be appropriate to restore or facilitate the recovery of the injured salt marshes.

Alternatives Considered:

1 - No action - This alternative would involve no direct intervention to restore the resource. While ongoing management programs, cleanup activities, and natural processes may assist or provide for the natural recovery of this resource, no additional actions are proposed under this alternative. Natural recovery should occur unless conditions at the impact site inhibit or constrain the natural recruitment and recolonization of marsh grasses. Inhibiting conditions could include residual oil mats, residual oil toxicity, changes in site elevation, or exotic species invasion.

2 - Removal of residual oil - Actions to remove additional oil from a site would be appropriate for consideration where residual oil is inhibiting the natural recovery of injured grasses.

3 - On-site maintenance actions during natural recovery - Maintenance actions may by appropriate where the natural recovery process on-site is physically limited, inhibited or threatened by debris movement, exotic species encroachment or other conditions. Under such circumstances, actions to maintain and protect the site, such as removal of debris or exotic species, may be needed to eliminate risks or impacts to the site or to the recruitment and recovery process.

4 - On-site planting of marsh plants - Direct plantings of salt marsh vegetation may be appropriate to ensure that salt marsh is replaced or to accelerate the recovery period.

Evaluation of Alternatives:

The "no action" alternative is acceptable since available field monitoring evidence and expert opinion indicates that natural recovery of salt-marsh vegetation is occurring at the oiled sites. Indeed, recovery appears complete at this time for most of the oiled sites. The few areas where recovery to date is not evident or has been patchy will need trial planting studies to provide additional information on residual sediment toxicity, and site receptivity for planting or natural recolonization. Since salt-marsh grasses previously existed in these areas, direct plantings of marsh grasses may be an effective approach. The no action alternative would not impact the physical, biological, or cultural environment since natural recovery is occurring.

The removal of residual oil would be an appropriate alternative for those sites where vegetative recovery is significantly inhibited or where productivity levels are suppressed by continued presence of oil in the substrate. Technical limitations in the methods available and the likelihood that this action would risk further stress to, or require the removal of, any surviving marsh components would limit the conditions under which this alternative would be considered acceptable. In most instances the cost of this alternative would be relatively high, as it would likely require removal of any surviving marsh along with the contaminated sediments, sediment replacement and regrading, and direct marsh planting to stabilize the site and facilitate recovery. The predicted impacts to the physical and biological environment would be interim effects during the construction phase, in the form of decreased water quality, disturbance of sediment and benthos, and impacts to the surrounding areas.

On-site maintenance (debris and exotic plant removal) does not appear to be necessary since neither have been observed to be a significant factor in limiting salt-marsh development in most of the oil-impacted areas. The predicted impacts to the physical and biological environment would be interim effects during the construction phase, in the form of decreased water quality, disturbance of sediment and benthos, and impacts to the surrounding areas.

Direct planting of salt-marsh vegetation would be considered where substrate stabilization is required or where natural recovery processes are not providing timely or effective recolonization of an oil-impacted site. This alternative might be appropriate for higher-energy sites where natural recruitment is highly variable or fortuitous in nature. This alternative assumes that residual oil contamination is sufficiently low as to not be a constraining factor. Some contouring or elevation adjustment may be necessary to ensure or enhance planting success. The predicted impacts to the physical and biological environment would be interim effects during the construction phase, in the form of decreased water quality, disturbance of sediment and benthos, and impacts to the surrounding areas.

Since many affected salt marsh areas previously have been subject to modification resulting from coastal development and dredging, the impacts of each alternative are not expected to result in damage to the cultural environment. Additionally, there are no known historical or archaeological resources present on these sites.

Section 2.2 above provides a general discussion of the Tampa Bay physical, biological and cultural environment. Sections 4.6.1 and 4.6.2 provide a specific discussion of salt marsh impacts.

Selected Alternative(s):

The Trustees have selected the "no action" alternative for the majority of injured salt-marsh areas since current evidence and expert opinion indicating that natural recovery is occurring at an acceptable rate. Where natural recovery is occurring, on-site intervention is unnecessary.

For the few sites where the natural recovery process has not been effective, the Trustees will decide the appropriate course of action during restoration implementation planning. The action will be based on an evaluation of factors influencing or causing the lack of progress toward recovery. Direct plantings of marsh vegetation will be given consideration, along with other alternatives for intervention, as well as the "no action" alternative.

B. Compensatory Restoration Actions

Available information indicates that ecological services provided by the injured salt marsh have been lost or reduced for at least one year due to exposure to oil from the Tampa Bay spill. This section considers alternatives for replacing or acquiring the equivalent of those lost services. Restoration actions to compensate for this interim loss of ecological services will be provided through creation of the same or ecologically equivalent habitat at a site near the injured salt-marsh communities.

Alternatives Considered:

1 - Create a new or enhance an existing salt-marsh community - This alternative would focus on salt marshes which have been stressed/constricted by human activities such as cutting or changes in elevation and water flow which have allowed invasion of exotic competitors or resulted in depressed productivity. This alternative would expand the size of, or improve conditions in, an existing marsh community, or create a new area of salt marsh at a suitable site, either through natural recruitment or direct planting of marsh grasses. Actions to adjust elevation or slope at a site, to control exotic or invasive species, or to acquire shoreline or upland property for this purpose may be included in this alternative.

2 - Incorporate additional acreage for salt marsh creation into a restoration project addressing other natural resource injury categories - Enhancing or implementing other habitat restoration projects may encourage the growth of additional salt-marsh vegetation. This alternative, as part of an approved

habitat restoration project, would contribute to converting degraded/developed sites back to productive native salt marsh habitat. This may occur through direct plantings or through other project features that facilitate the natural recruitment of marsh vegetation to project sites. The planting of a salt marsh as a precursor for natural successional development of a mangrove community is an example of such an alternative.

3 - General water quality improvement project - This alternative addresses community infrastructure which influences human impacts on water quality, which in turn impact the ecological community in the entire Tampa/Boca Ciega Bay system. This alternative would use the monetary equivalent of costs to create an appropriate acreage of salt marsh to fund or contribute to a water quality improvement project in the Boca Ciega or lower Tampa Bay watersheds. Such projects would improve the overall health of the bay ecosystems and promote natural improvements in the size and ecological quality of the areas of salt marsh in Boca Ciega and lower Tampa Bay. Possible water quality improvement projects were described in Section 4.1.6 (Mangroves).

4 - No action to compensate for the interim losses to salt marsh - This alternative focuses primarily on the impacted salt marshes and their associated services. This alternative would be appropriate where there were no measurable or significant interim losses incurred as a result of the oil spill, or where actions to assess compensation for those losses are not cost-effective.

Evaluation of Alternatives:

The "no action" alternative is not acceptable since a quantifiable injury to salt marshes did occur, and compensation for those losses can be assessed at reasonable cost.

A suitably scaled project based on any of the identified actions could replace lost salt-marsh services. Projects that include an in-kind component to enhance or create salt marsh, however, represent the most direct or equivalent means for replacing lost services. Actions of this type will contribute to the overall recovery of many of the natural resources that were injured by the oil spill.

The alternative of creating or enhancing an existing salt-marsh community would provide the biological basis for augmenting ecological services similar to those impacted by the spill. This could be accomplished by adjusting the site elevation and slope of areas upland or adjacent to existing salt marsh to facilitate their expansion. This alternative is technically feasible and consistent with ongoing activities in the Boca Ciega watershed. The impacts from this alternative would potentially include decreased water quality, disturbance of sediment and benthos, and physical impacts to the surrounding areas associated with access to the project site. These project related impacts would be incurred in an area already impacted by exposure to oil and/or related response activities, and would have little incremental impact. These project related impacts could be limited to the immediate project site through the use of appropriate control procedures during project implementation. There are no impacts expected on the cultural environment. The practicality of this approach will need to be evaluated on a site-by-site basis.

Incorporating the creation of salt marsh into a restoration project addressing other natural resource injury categories would encompass the types of actions identified for successional creation of a mangrove community. This alternative would provide a period of salt-marsh services to be eventually superseded by a climax level community. If properly designed, the project could retain a residual fringing salt-marsh community. This alternative is consistent with the types of restoration projects being undertaken by state and local habitat improvement projects (e.g., SWIM and related programs) in the Tampa Bay and Boca Ciega Bay watershed. This alternative, as part of a larger habitat restoration project, could potentially impact local water quality and damage adjoining areas during the construction phase, but could be minimized and contained through the use of booms, designated access routes, and other

controls. There are no negative impacts anticipated to the cultural environment as a result of this action, since these marsh areas receive little human use.

Support for an out-of-kind water quality improvement project would provide an indirect contribution to the replacement of lost salt-marsh services. Improved water quality in the Boca Ciega Bay system would support increased biological productivity from existing salt marshes. It would also contribute to enhanced productivity of other coastal systems and facilitate the continued recovery of seagrasses. The direct relationship of these types of projects to salt-marsh productivity would be difficult to measure unless the project was narrowly targeted on a specific salt-marsh site. The on-site consequences associated with this alternative would be addressed through the state permitting process. Most of these projects would be located in coastal and upland areas which include standard construction control requirements such as run-off controls to prevent short term impacts from siltation and water quality degradation. These types of projects improve the overall health of the bay ecosystem and indirectly promote natural improvements in the health and productivity of salt marsh communities. There are no anticipated negative cultural impacts associated with this alternative.

Selected Alternative(s):

The Trustees' selected action is to compensate for lost salt-marsh services by including the creation or enhancement of salt-marsh vegetation within a mangrove community enhancement or creation project, contingent upon site suitability for salt-marsh vegetation. The scale of the restoration action identified in Section 4.1.6 for mangroves is capable of providing sufficient salt-marsh services during the period until mangrove establishment to replace salt-marsh services equivalent to those lost by the fringing intertidal salt marsh in Boca Ciega Bay. This action also contributes to improving the overall water quality in Boca Ciega Bay, the health of which supports the process for natural recruitment and colonization of salt marshes throughout that system. Both natural resource and community restoration objectives are served by this approach. This approach will also minimize costs associated with project planning, design and implementation.

4.7 Shellfish Beds (Biological)

4.7.1 Overview of Preassessment Activities and Findings

As noted previously, shellfish bed injuries caused by the Tampa Bay oil spill are of two types - biological injuries and recreational lost use. The biologically injured shellfish beds are the intertidal oyster reefs fringing the mangrove islands in Boca Ciega Bay inside John's Pass and approximately 20 linear miles of seawall communities. The only recreationally accessible shellfish beds known to be affected by the spill are claming areas located in lower Tampa Bay. After the oil spill, these recreational claming beds were closed by the State due to actual and threatened oil contamination. The lost recreational use of these claming areas will be addressed in Volume II of the DARP/EA.

Areas of oiled oyster reef were delineated in the professional field survey conducted by the Genesis Group (described previously in Section 4.1, Mangroves). The survey documented oiling in 9,477 square feet (0.22 acres) of the intertidal oyster reefs. Although this area is relatively small, all of the intertidal oyster reef areas with visible oil were heavily oiled. Further, due to the viscous nature of oil as it washed ashore, these areas were covered and smothered in continuous bands of about 1 centimeter in thickness. As a result of this heavy degree of oiling, the entire 0.22 acres. of oyster reefs suffered total mortality. Field evaluations of the oiled reefs in the weeks following the spill detected no viable oysters in the oiled areas.

During response, cleanup of oil in these intertidal oyster reefs was very difficult. Oil penetrated into the sediments between the oyster clumps. This oil could not be effectively removed without removing portions of the reef and associated sediments. Further, it was recognized in evaluating this situation during response efforts that removal of the oiled oyster shell would threaten the physical integrity of the mangrove islands by exposing them to additional erosion. While the ecological value of these reefs as oyster habitat is important, the short-term loss of the area oiled did not pose an immediate threat to the overall ecology of the surrounding area. Response officials decided, with concurrence of the Trustee representatives, not to undertake actions to remove the contaminated oyster shell at that time. The Trustees remained concerned, however, about the shoreline protection services these reefs provided to the associated mangrove islands and the potential for residual oil to remobilize in the reefs.

Approximately 20 linear miles of seawall in Boca Ciega Bay were oiled over a one (1) ft. vertical range. These seawalls normally provide a substrate for the attachment of shellfish and encrusting invertebrates, which serve as forage for estuarine fish. These ecosystems were injured as a direct result of smothering by the spilled oil and the physical disruption caused by oil removal and cleanup activities.

The oiled intertidal oyster reef and seawall areas have been monitored over time to determine the extent and persistence of the residual oil. Field studies in June 1994 by a USF/Mote team (previously described in Section 4.1, Mangroves) included analyses of seep water samples collected from coring holes in the oyster beds on the east and west sides of Elnor Island to determine the amount of residual hydrocarbons present. On the east side, 2 of the 3 seep water samples had 59 and 32 micrograms hydrocarbons per liter. The 3 seep water samples on the west side all had hydrocarbons in the range of 12-97 micrograms per liter. Live oysters and shell hash were also sampled to determine the level of oil contamination within live tissue and the oyster shell. Both shell (up to 2 micrograms per gram dry weight) and live oyster tissues (up to 12 micrograms per gram wet tissue weight) showed elevated hydrocarbons in some samples.

4.7.2 Definition of Injury

The Trustees have evaluated a number of possible injuries to shellfish beds caused by exposure to the discharged oil, including shellfish mortality or sublethal injury such as increased susceptibility to disease, reproductive impairment, inability of new shellfish larvae (spat) to settle and grow, mortality or sublethal injury to the associated animal community, and loss or destabilization of fringing oyster reef structure. These injuries result in loss of ecological services such as the ability of the fringing oyster reef to provide erosion protection to the associated mangrove islands, and foraging for fish, birds and other animals associated with the shellfish community ecosystems.

Based on field observations and the considerations described below, the Trustees define injury to shellfish beds as the area of beds exposed to oiling sufficient to cause injury or loss of ecological services as described above. The Trustees will estimate area oiled and losses in ecological services using the methods described below.

4.7.3 Key Factors in Assessing Injury

The key factors in assessing injury to shellfish beds are:

Area, duration and degree of exposure - This information is needed to define the extent of the shellfish biological injury.

Importance of erosion protection for associated mangrove islands - This ecological service provided to another natural resource adds to the ecological value of the intertidal oyster reefs.

Technical feasibility and advantages/disadvantages of contaminated shell removal operations - As previously discussed, oil removal from the intertidal oyster habitat would also remove the reef structure itself. Because these actions may affect the type and amount of injury, consideration must be given to available cleanup methods and the relative merits of each.

The ecological significance of the seawall community and the degree of disruption from oiling and cleaning - These areas are mostly man-made, vertical concrete and wood structures. They represent a shoreline type of least ecological importance. Cleaning of the seawalls was conducted to remove the contamination from shoreline property to prevent additional damages.

4.7.4 Injury Assessment Method

The area of intertidal oyster reef that was oiled was relatively small and accessible for direct observation by Trustee technical personnel. Upon the response decision to leave the oiled reef intact, Trustee technical representatives elected to monitor the condition of the oiled reefs for evidence of natural recovery, including recruitment, for indications that the oiled reefs were a source of recontamination of organisms or nearby habitats, and for indications of physical deterioration of the reef structure that would indicate a loss of erosion protection for the adjacent mangrove islands.

Over time, this monitoring indicated that some of the oiled reef areas, about 1200 square feet total, were structurally deteriorating due to wave action, were continuing to be a source of recontamination to other natural resources, or both. Trustee technical representatives determined that these areas could and should be removed and replaced with clean shell at the earliest opportunity. On June 2, 1995, the Trustees, acting through the Trustee Council established under their MOU, approved emergency restoration actions for this portion of the injured intertidal oyster reef (Resolution of the Trustee Council

No. 95-01, Appendix D). These emergency restoration actions are outlined and explained in Section 4.7.6, the Restoration Plan section for this resource.

For the remaining portions of the oiled shellfish beds, monitoring information indicates that natural recovery is likely, although some minor areas may be permanently lost. The oiled and cleaned seawalls have recovered quickly without additional assistance. Other than the conditions that gave rise to the emergency restoration actions, the injuries to the intertidal oyster reef were confined to a small area and/or were of short duration. The Trustees determined that these residual impacts did not warrant undertaking additional studies to further assess injuries. The Trustees will assess the injury to shellfish beds as the total area documented by previous methods to have been oiled.

4.7.5 Damage Assessment Method

The Trustees will assess damages based on (1) the costs of any on-site restoration activities determined necessary, plus (2) the costs of restoring or replacing the ecological services lost from the shellfish beds from the time of oiling until full recovery. For (2), damages will be based on the area of shellfish beds to be created to replace ecological services lost and will be expressed as the costs to develop and implement a restoration plan to create the required area.

Benthic oyster reef habitat is routinely created in the Apalachicola Bay area of Florida. However, reef habitat that is created or enhanced through restoration projects often does not provide the same magnitude of ecological services as natural, long-established reef. To adjust for this, the Trustees will compensate for the shellfish bed ecological service losses using a 2-to-1 ratio. This ratio is consistent with the Tampa Bay Regional Planning Council - Comprehensive Regional Policy Plan (1991) for oyster reef mitigation (Policy 10.3.2).

4.7.6 Restoration Plan

The objectives of restoration planning for shellfish resources are to:

(1) determine what actions, if any, are necessary or appropriate to enable or facilitate the recovery of the injured shellfish beds;

(2) determine what actions, if any, are necessary or appropriate to stabilize the oyster community at the site of injury to prevent additional losses of mangrove resources on adjacent islands; and

(3) determine what actions, if any, are appropriate to replace or acquire equivalent ecological services lost due to exposure of shellfish resources to oil from the Tampa Bay spill, and to restore these services or compensate the Boca Ciega Bay ecosystem for this loss.

A. Restoration Actions for Resource Recovery

The first two objectives address actions that may be required or appropriate to effect direct restoration of injured resources. With respect to oyster reefs fringing the mangrove islands in Boca Ciega Bay, available information indicated that a significant portion suffered complete mortality and a loss of important ecological services. Further, residual contamination from the oil spill inhibited recruitment and natural recovery. As a result, actions necessary to restore portions of these intertidal oyster reefs were implemented on an emergency basis on July 17, 1995 by the RPs under Trustee oversight following approval of an emergency restoration work plan (included in Appendix D). The restoration actions required both the removal of contaminated shell and sediment and the immediate placement of fossil

shell material to provide new reef structure and continue the protection of the physical stability of the adjacent mangrove islands. The condition of the remaining oysters, integrity of the cultch (consolidated hard substrate) and recruitment of spat have been monitored to determine if conditions warranted additional intervention to facilitate recovery or prevent additional losses, including impacts on the adjacent mangrove community.

Alternatives Considered:

1 - No action - This alternative would involve no direct intervention to restore the resource. While ongoing management programs, cleanup activities, and natural processes may assist or provide for the natural recovery of this resource, no additional actions are proposed under this alternative.

2 - Predation control - This alternative encompasses actions to control or reduce the predation of shellfish beds by marine invertebrates, birds, and small animals as a means of assisting natural recovery. Such actions may involve the manual collection of marine predators or fencing, netting, or other means to restrict predator access to the impact sites. The utility of such actions would depend on whether predators were determined to be factors limiting oyster spat recruitment or community recovery.

3 - Substrate replacement with new cultch - The removal of contaminated or paved cultch and replacement of cultch and spat were required to facilitate a positive recovery of this resource. Substrate removal and replacement has been accomplished as part of the emergency restoration work conducted by an RP contractor. The natural recruitment of oysters on-site have been monitored, and recovery is taking place as evidenced by settlement of oyster spat and other oyster reef biota.

4 - Replacement of injured oyster reef with artificial wave dampening structures - This alternative would involve simple, easily maintained structures situated in the intertidal zone fringing the islands which would be designed to dampen wave action. Such structures would prevent further erosion of the associated mangrove islands until the oyster community is reestablished to fulfill that function.

Evaluation of Alternatives:

The "no action" alternative is appropriate if paving, residual toxicity, and substrate cultch loss have not occurred or are minimal. However, as noted previously, the evidence indicated total oyster mortality in oil-impacted areas and the presence of residual asphalting within the oyster cultch framework. Successful spat set, which would indicate that natural recovery had occurred, was not observed in these areas after the spill. Furthermore, cultch substrate began breaking up and washing into the mangrove forest. The "no action" alternative did not address these conditions and created a risk of further injury at and adjacent to the impacted reef sites. The "no action" alternative has an ecological impact on the physical and biological components of this system. The failure to remove the asphalted oil would have resulted in the continuing death and recruitment failure of shellfish and associated benthic organisms, and also in the physical breakup of the oyster cultch substrate, resulting in further damage to the mangroves. There are no negative impacts anticipated to the cultural environment, since these islands and the fringing oyster community have no known historically significant cultural uses.

The presence of predators assumes the presence of "prey," i.e., viable and healthy shellfish. To date, site observations have not indicated predation as a limiting factor in oyster recovery at the impact site. Predatory species for oysters are diverse, ranging from particular oyster parasites, oyster drills, starfish and crabs to fish, birds, and small mammals. The technical and economic feasibility of actions to

control predators can be effectively evaluated only on a need-specific basis. This predation control alternative would impact site specific components of animal populations which prey upon the shellfish community. A species focused control program would change the ecological composition and dynamics of the target area during the period of program implementation, but would be expected to revert to pre-control conditions once the shellfish community was re-established and the control program terminated. There would be some minor disturbance of sediments, vegetation, and possibly bird populations from periodic human access associated with the control program. These impacts could be minimized by scheduling access times and using marked access routes. Since no artifacts or historical use have been reported in association with the fringing shellfish community or mangrove islands, there should be no impacts anticipated to the cultural environment as a result of actions associated with this alternative.

Substrate replacement at a portion of the affected reef site has been accomplished as an emergency action. This alternative considers that many of the oiled areas were deeply saturated and needed to be removed and replaced as a means of removing remaining contamination in order to facilitate recovery of the impacted site and to maintain the integrity of the reef structure. Replacing shell material with fresh consolidated shell material assisted in establishing replacement ecosystems and in providing quick and effective restoration, with the natural recruitment of oyster spat. Expedited replacement of the shell material eliminated the risk of further degradation of the associated mangrove islands. The environmental consequences of replacing the oiled shell substrate was given a detailed analysis in an Environmental Assessment prepared for the emergency oyster reef/mangrove restoration project. There were no impacts expected to the cultural environment as a result of actions associated with this alternative.

Replacement of damaged oyster beds with artificial wave dampening structures would prevent further erosion of the associated mangrove islands but would not restore the biological functions of the oyster beds. While erosion protection is a very important part of the ecological function of the fringing reef, its contribution to the biological community in Boca Ciega Bay is also ecologically significant. This alternative would require the transport and placement of pre-fabricated concrete/shell structures adjacent to the shoreline in the intertidal zone. The potential for impacts to the physical and biological environment would be limited to the immediate site and occur primarily during the construction phase. This damage would be in the form of decreased water quality, and disturbance of sediment, seagrass and benthos. Minimal incidental impacts would incur on the surrounding shallow water areas and mangrove island. These impacts would need to be constrained through the use of booms, limited access routes and times, and other control as necessary during construction and monitoring. There are no impacts expected to the cultural environment as a result of actions associated with this alternative.

Section 2.2 above provides a general discussion of the Tampa Bay physical, biological and cultural environment. Sections 4.7.1 and 4.7.2 provide a specific discussion of shellfish bed impacts.

Selected Alternative(s):

The Trustees considered on-site restoration actions to be necessary since available evidence indicated that direct intervention was required to facilitate natural recovery of the injured reef areas, to eliminate ongoing risks to other natural resources from exposure to residual oil in these areas, and to prevent further erosion of these reefs and the loss of erosion protection for the adjacent mangroves. The observed total mortality, cultch loss and dispersal, and the degree of residual asphalting in these areas contributed to that determination.

As noted above, oyster cultch removal and replacement was implemented on an expedited basis as emergency restoration actions pursuant to the plan approved by the Trustees (Appendix D). These actions were initiated by the RPs on July 17, 1995, with Trustee oversight and were considered fully

complete as of September 1996. Where contaminated shell and sediment was removed, new reef structure was provided by the immediate placement of fossil shell material to protect the island's physical stability. Because these oyster reefs are located in sensitive intertidal areas, manual labor was used to implement these actions to prevent additional injury.

B. Compensatory Restoration Alternatives:

Available information indicates that as a result of exposure to oil, the fringing oyster community has and will suffer some period of reduced ecological functioning until the community recovers. Compensation for this interim loss of ecological services can be provided through the creation of the same or ecologically equivalent habitat at a site near, or of ecological benefit to, the impacted communities.

Alternatives Considered:

1 - Incorporating an appropriate acreage of created shellfish beds (e.g., adjusting substrate and water depth and providing cultch or spat) into a restoration project addressing other natural resource injury categories - This alternative, as part of an approved habitat restoration project, would contribute to converting degraded shellfish substrate back to productive habitat or creating new substrate to facilitate recruitment. This alternative could include projects to provide a natural revetment for wave energy reduction and attachment sites for filter-feeding organisms that would improve water quality by reducing the high nutrient load to the bay. This could also include adjusting substrate and water depth and providing cultch or spat to facilitate natural oyster recruitment. This alternative would incorporate shellfish project actions with compensatory action for other loss categories (e.g., salt marsh, mangrove) at a common restoration site, providing economies of scale and minimizing the scope of impacts and controls required to address potential ecological impacts associated with project construction.

2 - Predator control to facilitate natural recruitment or enhance the productivity of existing shellfish beds in the bay system - This alternative focuses on existing shellfish beds being subject to natural predatory impact problems (over-grazing) limiting recruitment/growth. This alternative assumes that natural predation is a problem for existing oyster populations in the bay. Projects to accomplish this objective could include actions targeted to specific pests and may include physical exclusion through use of wire mesh covers, chemical repellent, or removal by hand. The costs and technical feasibility of such actions would be assessed on a site-specific basis.

3 - Replanting or creating additional oyster beds in lower Tampa or Boca Ciega Bay - This alternative assumes oyster services in the Tampa and Boca Ciega Bay system could be enhanced by providing cultch to create additional or expanded oyster communities. This alternative would involve placement of cultch in soft sand bottom areas to facilitate successful spat set and shellfish community development. Ecological services resulting from such actions could include food for predator species, recreational harvest, water filtration and quality improvement, and wave energy reduction.

4 - General water quality improvement project - This alternative addresses community infrastructure which influences human impacts on water quality, which in turn impact the ecological community in the entire Tampa/Boca Ciega Bay system. This alternative would use the monetary equivalent of costs to create an appropriate area of shellfish beds to fund or contribute to a water quality improvement project in the Boca Ciega or lower Tampa Bay watershed. Possible water quality improvement projects were described in Section 4.1.6 (Mangroves).

5 - No action or compensation for the interim losses to shellfish - This alternative focuses primarily on the impacted mangrove island and seawall shellfish communities and their associated services. This

alternative would be appropriate where there were no measurable interim losses as a result of the oil spill, or where actions to assess compensation for resource injuries are not cost-effective.

Evaluation of Alternatives:

A suitably scaled project based on any of the alternatives would be acceptable to compensate for service losses remaining; however, projects that include an in-kind component to enhance shellfish community services or improve water quality within the Boca Ciega or lower Tampa Bay ecosystem satisfy more of the identified criteria for restoration. Sites for incorporating created shellfish beds within other restoration projects could be designed as a component of a successional scheme of restoration that would allow for the development of a more complete ecosystem. In nature, adjacent habitats are interdependent, each conferring a service that benefits the overall ecosystem. Stand-alone project sites have a decreased probability of success due to the lack of services that would be provided by adjoining habitats. Created shellfish beds as part of a larger habitat restoration project could potentially impact local water quality and the benthic community at the reef site, as well as damage adjoining areas during the construction phase. These potential impacts would need to be constrained through the use of booms to contain disturbed bottom sediment, use of designated access routes and times, and other controls necessary during construction and monitoring phases. The required environmental impact controls would need to be addressed in the engineering design requirements, and addressed as part of the dredge and fill permitting process.

Projects for predator control, while often necessary during early stages, would need to be closely evaluated in terms of the nature of the problem, technical feasibility and effectiveness, and cost-effectiveness before being approved. Depending upon the nature and level of work performed, the impacts to surrounding communities could be expected to be minimal for predatory species removal. There could be a short duration decrease in water quality if the control required the use of approved chemical repellents or physical damage due to manual removal methods. These potential ecological impacts would be expected to be limited in scope and duration.

The creation of additional or enlarged oyster beds would increase the presence of this community type within the Tampa/Boca Ciega Bay system. The criteria for shellfish/oyster reef and techniques for construction are well proven and are part of the State of Florida marine resources management program. Impacts from replacing or creating additional beds would be short term water quality decreases during the construction phase, with long term improvements associated with shellfish filtering actions. Other impacts would include loss or damage to existing seagrass substrate and the associated biota in the footprint of the created bed, and potentially increased recreational fishing boat traffic.

Funding an out-of-kind water quality improvement would meet the goal of improving the ecosystem water quality, but does not directly address the loss of shellfish services. The on-site consequences associated with water quality improvement projects would be addressed through the state permitting process. These types of projects are usually focused on a specific site/source in a limited geographic area, but they contribute to the overall health of the bay ecosystem, thus increasing the health and productivity of the shellfish communities.

The "no action" alternative is not acceptable since a notable, quantifiable injury did occur and compensation for that injury can be assessed at a reasonable cost.

Selected Alternative(s):

04630

The Trustees will compensate for lost shellfish services, to the extent not addressed by on-site actions, including the creation of oyster beds within a mangrove or water quality improvement project,

contingent upon site suitability for oysters. This action will address service losses and injuries to the shellfish communities caused by the Tampa Bay spill and contribute to the improvement of overall water quality in Boca Ciega or lower Tampa Bay. Such action is consistent with both natural resource and community restoration objectives.

4.8 Bottom Sediments

4.8.1 Overview of Preassessment Activities and Findings

Several types of oils were released during this spill, including approximately 330,000 gallons of #6 fuel oil. This class of oil is composed of the residual products of crude oil refining, but may have additives to assist in pumping, transportation, and burning. The #6 fuel oil discharged during this incident was heavy (a density of 0.995 at 68 degrees F compared to fresh water = 1.000), viscous, and persistent. After several days of weathering and evaporation while floating offshore in the warm Gulf waters, some of the lighter volatile fractions of the oil had evaporated. When it was blown ashore, this oil picked up sediments as it grounded, becoming heavier than seawater. As a result, significant amounts of the oil sank and came to rest on the bottom sediments in low areas (Henry and Roberts, 1994).

Submerged oil was found in the subtidal sandy sediments just off Pinellas County beaches, as well as in seagrasses, mud flats and deeper areas of Boca Ciega Bay. Observations of subtidal organisms, including several species of crustaceans, indicate that this oil was a potential source of continuing injury. In addition, the oil has periodically recontaminated recreational beaches and other shorelines.

Surveys conducted for the U.S. Coast Guard by contractors during and after response operations located submerged oil patties or mats covering at least 58,540 square feet (1.34 acre) of subtidal sediments. The surveys were conducted by Ocean Systems, Inc., using a specialized SONAR detector and on-site confirmation by divers. The area of submerged oil off Treasure Island was approximately 250 feet long and 10-20 feet wide, ranging in thickness from 1 to 2 inches. Patches of submerged oil were also found in Blind Pass and John's Pass. While other areas of submerged oil were likely present, neither response officials nor the Trustees were able to locate them as they moved or were buried in sediments.

The bottom sediment injuries discussed and assessed in this category are distinct from the injuries being addressed for the water column, seagrasses, mangroves, and oyster reefs in other sections of this assessment plan.

4.8.2 Definition of Injury

The Trustees have evaluated physical disruption of sediments and a number of possible injuries to biota living in the subtidal sandy, silty and muddy sediments of the Gulf of Mexico and the Tampa Bay estuary. Such injuries include lethal and sublethal effects to biota resulting from exposure to the discharged oil. These injuries result in loss of ecological services such as food supply to higher trophic levels.

Based on field observations and the considerations described below, the Trustees define injury to bottom sediments as the number of acres of sediments exposed to oiling sufficient to cause injury or loss in ecological services as described above. The Trustees will estimate acres of bottom sediments oiled and losses in ecological services using the methods described below.

4.8.3 Key Factors in Assessing Injury

Determination of area of exposure: This information is needed to define or quantify the extent of the injury to the bottom sediment community. Methods routinely used to document the area of exposure for surface slicks or shoreline oiling depend on visual observations and are not usable for locating submerged oil. Even where oil was suspected to be submerged in shallower, relatively transparent water areas, experienced observers could not reliably distinguish submerged oil from dark detrital material (mostly decomposing algae and seagrasses) without direct confirmation by divers. Recently

developed SONAR and computer technology was used to conduct surveys during response operations, but this technology was experimental and expensive. Because of the patchy nature of the submerged oil, the results from these surveys did not prove to be an effective method for locating or quantifying the submerged oil. Additional surveys to define any remaining areas of submerged oil were determined to have a low probability of success.

Effect of submerged oil on biota: This information is needed to determine the level of biological injury per area of sediment exposed. Observations of viscosity and stickiness of submerged oil in known areas of subtidal sediment oiling support the conclusion that any sediment biota in direct contact with the oil would likely die. The total mortality of sediment associated biota is reasonably assumed for all areas known to be in contact with the submerged oil.

Time to natural recovery: This information is needed to determine the duration of injury as well as the need and feasibility of intervention to assist in the recovery of sediments and their associated biological community. Natural recovery of sediments can occur when the oil is buried below the biologically active zone or when storms move it ashore, where it can be effectively removed. Once oil exposure ends, sediment biota are expected to reestablish relatively quickly, but the exact amount of time is not known.

Potential for overlap in consideration of injuries in the assessment: There is a potential in assessing injury to bottom sediments to address some resource impacts more than once in the assessment plan. The assessment method selected for bottom sediments must provide a means to distinguish injuries associated with bottom sediments from those being addressed in the water column, seagrass, mangrove and oyster reef injury categories. To avoid this, only areas of submerged sediment oiling not included in the assessment for other injury categories are included for assessment in the bottom sediment category.

4.8.4 Injury Assessment Method

Although injury to bottom sediments occurred, a major resource injury was not indicated by the information available from preassessment activities. Additional site-specific studies to provide more detailed information for use in the assessment would have been expensive and of marginal utility and, consequently, were not justified. After consideration of the factors discussed above, particularly the cost and feasibility of locating any remaining submerged oil, the Trustees will quantify this injury as the complete, but short-term mortality of the sediment biota in the area of subtidal sediments which is known to have had direct contact with submerged oil. This area will be delineated based on the data collected by the U.S. Coast Guard during spill response operations and is determined to be 58,540 square feet.

4.8.5 Damage Assessment Method

The Trustees will determine the damages for this injury category by multiplying the exposure area (58,540 square feet) by a monetary value per square foot based on sediment restoration costs associated with typical, feasible sediment restoration scenarios. The NRDAM/CME, Version 2.4, uses a cost of $9.64 per square meter ($0.90 per square foot) for typical sediment restoration. This cost is for the Florida Gulf coast and includes estimated costs for project planning, mobilization, limited sediment transport, and disposal of contaminated sediments at offshore sites with clean sediment capping. This cost figure will be used for this portion of the assessment.

4.8.6 Restoration Plan

Restoration planning for injured bottom sediments has the following objectives:

(1) determine what actions, if any, are necessary to facilitate the removal of residual oil contamination and recovery of sediment biota; and

(2) determine what actions, if any, would appropriately replace or represent an acquisition by the Tampa Bay ecosystem of ecological services equivalent to those lost as a result of the exposure of bottom sediments to oil from the Tampa Bay spill.

A. Restoration Actions for Resource Recovery

Direct restoration of bottom sediments would involve actions to restore or facilitate recovery of the oil-impacted sediments. This would require locating remaining areas of contaminated bottom sediments, evaluating the residual sediment contamination for toxicity and receptivity for restoration, and employing feasible technology to locate these sediment areas and conduct on-site restoration.

Alternatives Considered:

1 - No action - This alternative would involve no direct intervention to restore the resource. While ongoing management programs, cleanup activities, and natural processes may assist or provide for the natural recovery of this resource, no additional actions are proposed under this alternative.

2 - Remove and/or replace contaminated sediments - Intervention of this nature may be appropriate where field assessments indicate that the presence of residual oil in or on bottom sediments will inhibit or retard the natural recovery process without human intervention. Implementing this alternative requires access to technology that allows areas of contaminated sediments or residual oiling to be effectively identified and remediated.

Evaluation of Alternatives:

The "no action" alternative is appropriate where oiled sediments are likely to restore themselves over a reasonable time period. This can occur through natural mechanisms such as the movement of submerged oil onto adjacent shorelines by storms, natural burying of oil in the sediments, and eventual weathering and biodegradation. Studies in the scientific literature indicate that once the toxic fractions from the oil have dissipated, natural recovery of biota will occur. Evidence in this case suggests that such natural processes have occurred. Since the incident, residual submerged oil has periodically been mobilized by storms and deposited on sand beaches, where it has been removed. There are no adverse environmental impacts expected from this alternative.

Data and field experiences during response operations and preassessment activities indicated that current techniques for locating and removing submerged oil or contaminated sediments are technically complex, costly, and not well suited to effectively locating and removing widely dispersed and patchy areas of contaminated sediments. The removal and/or replacement of contaminated sediments, if they could be located, would change the nature of the bottom community at the project site by directly eliminating the biota and its habitat. The period required for sediment community recovery to pre-impact conditions is not known, and would likely vary by sediment type. The predicted impacts to the physical and biological environment from sediment removal would consist of decreased water quality during field operations, direct disturbance of sediment and benthos, and potential incidental impacts to the surrounding areas resulting from equipment deployment, siltation, and resuspension of hydrocarbons. The lack of a practical technology for restoration of injured sediments renders on-site actions to aid the recovery of these sediments technically and financially infeasible at this time. The impacted sediment areas have no known cultural values and the secondary human use impacts expected would be limited to the potential loss of recreational productivity from this area until the impacted site recovers.

Section 2.2 above provides a general discussion of the Tampa Bay physical, biological and cultural environment.

Selected Alternative(s):

The Trustees have selected the "no action" alternative relative to direct sediment restoration. Based on discussions with oil pollution experts, the bottom sediment community injured by exposure to submerged oil will recruit back into the area as oil concentrations drop below species specific toxic or avoidance levels. This natural recovery and the lack of any technically feasible, cost-effective alternative for direct intervention to aid resource recovery make the "no action" alternative the best option. The Trustees recommend that actions to remove oil which remobilizes and strands on shorelines continue as needed as part of the ongoing cleanup actions.

B. Compensatory Restoration Alternatives

The exposure of bottom sediments to oil from the Tampa Bay spill injured sediment biota and resulted in a loss of ecological services of the sediments until natural recovery restores the sediments to pre-spill conditions. This section considers restoration actions which may be implemented to compensate for the interim loss of sediment services. The scale of such actions is determined by the calculations assessing damages for injured bottom sediments, as discussed in Section 4.8.5 above.

Alternatives Considered:

1 - Create or enhance clean bottom sediments in an alternative location in the affected ecosystem - This alternative would involve addressing sediment restoration/enhancement in other areas of the Tampa Bay system to facilitate benthic community development; potentially in association with other wetland habitat creation projects.

2 - Create or enhance another type of habitat (e.g. salt marsh) in the affected ecosystem to provide ecological services - This alternative focuses on the salt marsh/mangrove communities in the Tampa Bay system.

3 - Fund or contribute to a general water quality improvement project to benefit the affected ecosystem - This alternative focuses primarily on the impacted bottom sediment communities and their associated services.

4 - No action or compensation for the interim losses to bottom sediments - This alternative would be appropriate where there were no measurable or significant interim losses incurred as a result of the oil spill, or where actions to assess compensation for sediment injuries are not cost-effective.

Evaluation of Alternatives:

Restoration, replacement, or creation involving another habitat is a viable alternative to compensate for services lost from bottom sediments, especially if the alternative habitat is known to assist in improving water quality as well. Funding of a combined coastal wetlands creation or water quality improvement project provides multiple benefits to the overall water quality of the coastal ecosystem. Such an action would be of direct and long-term benefit to the condition and productivity of bay and coastal bottom sediments influenced by the Tampa Bay system. This alternative is of greater benefit to the sediments that were actually affected by the oil than the option of creating or replacing clean sediments in an alternative habitat.

The predicted impacts of creating/enhancing bottom sediments to the physical and biological environment would be interim effects during the construction phase, in the form of decreased water quality, disturbance of sediment and benthos, and impacts to the surrounding areas from project operations. Longer term effects would depend on the resulting post-construction sediment conditions at the project site and natural recovery patterns of the benthic species. The period required for sediment community recovery to pre-impact conditions is not known, and would vary by sediment type.

Bottom sediment habitat enhancement could be undertaken as a component of an off-site compensatory action for other loss categories at a common restoration site, providing economies of scale and minimizing the scope of impacts and controls required to address potential ecological impacts associated with project construction. This alternative would minimize potential impacts to local water quality and to adjoining areas during the construction phase.

Since the type and quality of bottom sediments is a direct reflection of the quality, sediment load, and energy level of overlying water, projects that improve water quality have a direct effect on sediment quality, composition, and health of associated benthic communities. These types of projects are usually focused on a specific site/source in a limited geographical area, but the actions contribute to improving the overall health of the bay ecosystem and indirectly promote natural improvements in the health and productivity of the shellfish communities. Most of these projects would be located in coastal and upland areas which would include standard construction control requirements, such as run-off controls to prevent short-term water quality degradation. The on-site consequences associated with specific water quality improvement projects would be addressed through the state permitting process.

There are no negative cultural impacts anticipated from any of these alternatives.

Selected Alternative(s):

The "no action" alternative is not acceptable since a notable, quantifiable injury to sediments did occur and compensation can be assessed at reasonable cost.

The Trustees will compensate for lost ecological services associated with bottom sediment injuries by funding a water quality improvement project(s) that will benefit the ecosystem in the vicinity of the oiled bottom areas, i.e., Boca Ciega Bay and lower Tampa Bay. The projects being conducted by the Florida Surface Water Improvement Program (SWIM) or similar salt marsh planting sponsored by local governments or community organizations, provide appropriate opportunities for addressing water quality and sediment enhancement. Other projects would include modifications to stormwater and sewage outfalls, construction of surface water runoff diversions, catchment and settling basins, and culvert enlargements. These types of projects would facilitate water exchange, reduce siltation and nutrient loading from stormwater runoff, and generally improve the water quality which would directly contribute to the overall health of the sediments. This action is consistent with community objectives to restore this bay system because it directly increases the productivity and health of the ecosystem.

4.9 Beach Physical (Sand Loss)

4.9.1 Overview of Preassessment Activities and Findings

Public beaches from Redington Shores in central Pinellas County to Fort DeSoto Park at the southern tip of Pinellas County and at Egmont Key were oiled as a result of this spill. Detailed ground surveys immediately after the spill conducted by the Genesis Group (described previously in Section 4.1, Mangroves) documented moderate to heavy beach oiling. Beach areas were flagged by the field group for survey wherever the beaches were observed to be oiled in continuous thick bands. The Genesis Group survey documented oil exposure of these beach areas as a linear measure:

Egmont Key	5,731 linear feet
Redington Shores to John's Pass	24,521 linear feet
John's Pass to Blind Pass	18,083 linear feet
Blind Pass to Retention Wall*	423 linear feet
Retention Wall* to Pass-a-Grille	20,519 linear feet
Total	69,277 linear feet
	= 13.12 statute miles

(*Just south of Blind Pass)

Additional stretches of beach were oiled to a lesser degree, with the total length of oiled beaches estimated by response agencies during the cleanup as 14 to 16 linear miles. Aerial and ground photography and video recordings provide additional evidence documenting the nature and extent of the oiling of these public beaches.

All oiled beaches were cleaned of oil during initial response operations. As a result of these cleanup activities, at least 39,900 cubic yards of sand were removed from the beaches. The volume of sand removed is documented in RP records relating to the transportation and disposal of contaminated sand. Since the spill and initial cleanup, periodic re-cleaning of the beaches has been necessary as storm events have remobilized submerged oil and deposited it on shore. These subsequent cleanup activities have resulted in an undetermined amount of additional sand being removed.

4.9.2 Definition of Injury

In this assessment, beach physical injury is defined as the volume of sand removed from the Pinellas County beaches as the result of this incident. Ecological impacts associated with oiling of sandy shorelines other than the physical loss of sand are being addressed as part of other injury categories in this plan. These include impacts to surf zone biota, which are included within the water-column injury category, and injuries to shorebirds and sea turtles, which are being assessed as separate injury categories. The lost recreational use of these beaches is also a separate injury category to be included in Volume II.

4.9.3 Key Factors in Assessing Injury

The key factor in assessing the physical loss of beaches is the amount of sand removed from the beaches during cleanup operations. One additional consideration is whether the known volume of sand removed is likely to result in loss of beach ecological services or in accelerated erosion rates.

4.9.4 Injury Assessment Method

The Trustees will characterize the injury in terms of the amount of sand lost to physical removal as a result of the spill and base the determination of that amount on an evaluation of available documents and information relating to the removal, transport and disposal of such sand.

4.9.5 Damage Assessment Method

The renourishment of sandy beaches is a routine restoration practice along beaches in Pinellas County. Although beach renourishment is usually done to offset sand erosion and loss caused by wave action and currents, it is an equally suitable means of replacing sand lost due to other causes. Therefore, the Trustees will determine damages for the physical loss of beach sand based on the costs to replace the volume of beach sand that is documented to have been removed as a result of this oil spill.

Beach cleanup operations removed sand from at least 13 linear miles of beach. While it is important to restore the beach profile to baseline by returning beach elevations to pre-spill levels, it would be difficult and costly to survey this area for elevation changes and then direct replacement sand to restore the exact baseline profile. Periodic beach renourishment efforts are designed to achieve an effective beach profile. Thus, the Trustees will use the costs of routine beach renourishment efforts as the basis for damage calculations.

The Trustees will use a simple 1-for-1 volume replacement factor to assess the cost of replacing the sand removed and to determine these costs based on available information concerning the costs of routine public sand renourishment projects. DEP estimates this cost as $10 per cubic yard when sand is replaced as part of a routine sand replacement project. This cost would result in a damage assessment of $399,000 for the volume of sand known to have been removed as a result of the spill.

4.9.6 Restoration Plan

Under the definition of injury used above, injury to the beach resource is limited to the physical loss of beach sand associated with the cleanup of oil from the Tampa Bay spill. Consistent with this narrow definition of injury, restoration planning for beaches considers actions necessary to replace the lost sand and actions necessary to compensate for interim loss of physical services (e.g. erosion control) pending sand replacement.

The goal of restoration planning for the physical injury to the oiled beaches is:

(1) To determine what actions, if any, are appropriate to replace and recontour the volume of sand removed from beaches incident to the cleanup of oil from the Tampa Bay spill.

(2) To determine what actions, if any, are needed to replace interim lost services such as erosion control and storm protection lost from the time of sand removal to the time of replacement.

A. Restoration Actions for Resource Recovery

This section considers actions that may be appropriate to restore or facilitate the recovery of the injured beaches.

Alternatives Considered:

1 - No action - This alternative would involve no direct intervention to restore the resource. While ongoing management programs, cleanup activities, and natural processes may assist or provide for the natural recovery of this resource, no additional actions are proposed under this alternative. Natural recovery requires sand loss to be offset by sand returned to the beaches in natural accretion processes. Such processes would need to be sufficient to offset both the volume of sand removed during initial cleanup efforts as well as any additional sand removed during periodic cleanups to address re-oiling of the beaches since the spill.

2 - Replacement of beach with land-side quarried sand - This alternative involves trucking in a volume of beach sand equivalent to that removed by response actions from a land-based sand quarry and placing it directly on the injured beaches. It assumes that natural coastal processes alone are insufficient to rebuild the impacted beaches.

3 - Replacement of beach with offshore dredged sand - This alternative is similar to the previous alternative except that the sand for direct placement on the impacted beaches is obtained by augmenting current or future, local and permitted beach renourishment projects.

4 - Restore beach profile to baseline - This alternative would be in conjunction with alternative 2 or 3 above, and would involve the extra step of attempting to restore the affected beaches to pre-spill profiles.

Evaluation of Alternatives:

Most of the oil-impacted beach areas have historically been subject to erosion, requiring periodic beach renourishment to maintain them for recreation and as coastal erosion barriers or buffers. Under these circumstances, the replacement of lost sand is unlikely to occur except by supplemental action. If analysis of erosion rates and processes indicates that the spill-related sand removal caused accelerated erosion of the beaches, then action to return the beach size and profile to pre-spill conditions would be warranted. Sand replacement under alternatives 2 and 3 requires evaluation of coastal dynamics to provide the information necessary to plan, design and implement an effective project. Alternative 3 is the least costly alternative as local, permitted renourishment projects will have already addressed these planning and design considerations. These projects also routinely use offshore dredged sand as the least costly source of renourishment material. Planning, implementing, and administering a separate, unique sand replacement project would be very costly. The alternative to augment an existing beach replenishment project would be the most cost-effective. Alternative 4 would not be practical since the changes in the affected beach profiles were insignificant.

No adverse environmental impacts would be expected to develop from the no action alternative, since the natural coastal processes of sand erosion and deposition would mask the impacts of the sand removal during cleanup. In most instances, only several inches of surface sand were removed and this is within the dynamic range of natural sand movement.

Replacement of the beach sand removed during cleanup with land quarried sand would have potential impacts on the physical and biological environment, at both the sand quarry and at the beach. These effects could result in increased erosion, loss of habitat for animals in the quarry or covered with sand, and increased air pollution involved in transporting the sand. The cultural impacts would be increased road wear and traffic during transportation.

Replacement of beach sand with dredged sand would have impacts on the physical and biological environment, at both the offshore dredging site and at the beach. However, since this alternative is a supplement to a permitted "periodic" beach renourishment program, the potential ecological effects of damage to benthos, loss of fish habitat, beach animal habitat lost due to sand coverage, and potential disturbance of sea turtle nesting areas, have been addressed through state and federal permitting processes, which specifically address the sand borrow and placement locations.

The beaches targeted for renourishment have been previously disturbed by construction and renourishment projects, and there are no known historical or archaeological resources present on these sites, so there are no cultural impacts anticipated.

Section 2.2 above provides a general discussion of the Tampa Bay physical, biological and cultural environment.

Selected Alternative(s):

The Trustees will replace a volume of beach sand equivalent to that removed during response actions by augmenting a local, permitted beach renourishment project using offshore sources of dredged sand. The selection of this alternative is based on current information and expert opinion, which indicate that the erosional nature of the impacted beaches will not result in natural replacement of sand to restore the injured beaches to pre-spill conditions. Augmentation of local, permitted beach renourishment projects is considered the most cost-effective alternative for effecting direct sand replacement. This action is consistent with community objectives for this resource because it restores the beach to the pre-spill condition. The potential ecological and cultural impacts for this project have been addressed through the State and Corps of Engineers permitting process for the beach renourishment program.

The Trustees have considered the additional cleanup actions due to the periodic re-oiling of these beaches in determining the final volume of sand for replacement. The frequency and magnitude of these events was determined to have removed only minor amounts of sand.

B. Compensatory Restoration Actions

This section considers alternatives to provide compensation for the interim service losses caused by the removal of sand from the beach .

Alternatives Considered:

1 - Provide compensation for lost services by enhancing services provided by the oiled beaches or at other beach locations. - This alternative would focus on sand beach areas which have been stressed by human activities or which can be enhanced to provide greater level and diversity of ecological and/or human services. Enhanced services might be provided by creating additional beach elevation or constructing other methods of erosion control or storm protection.

2 - No action to compensate for the interim service losses from removal of beach sand. - This alternative focuses primarily on the impacted sand beaches and their associated services. This alternative would be appropriate where there were no measurable interim losses incurred as a result of the oil spill, or the cost to assess damages for this resource is determined not to be cost-effective.

Evaluation of Alternatives:

Although 39,900 cubic yards of sand were removed during cleanup, based on consultations with coastal engineering experts (Devereaux, 1996), the Trustees have determined that significant effects on erosion control and storm protection were unlikely. Studies to design and evaluate effects of these modifications in a dynamic beach environment would have been difficult and costly to conduct. The predicted impacts to the physical and biological environment during beach renourishment would be interim effects during the construction phase, in the form of decreased water quality, disturbance of sediment and benthos, and impacts to the surrounding areas. The site limited impacts on both shoreline dependent ecological community and beach recreational users could be minimized through operational scheduling. There are no anticipated impacts on the cultural environment, since these projects would be located in previously disturbed beach areas.

No adverse environmental or cultural effects are anticipated due to the "no action" alternative.

Selected Alternative(s):

The Trustees have selected the "no action" alternative. No adverse ecological or cultural impacts are anticipated with this alternative. Compensation for lost beach use services and associated environmental and cultural impacts of this action will be addressed in the Beach Recreational category in Volume 2 of the Tampa Bay DARP/EA.

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6.0 Preparers/List of Agencies and Persons Consulted

6.1 List of Preparers

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6.2 Persons/Agencies Consulted

The following agencies and/or individuals were consulted by the Trustees in preparation of the Damage Assessment and Restoration Plan / Environmental Assessment for the August 10, 1993 Tampa Bay oil spill -Volume I:

Applied Science Associates, Deborah French/Henry Rines, Narragansett, RI

Beak Consultants, Inc. , Gary Mauseth, Kirkland, WA

Coastal Zone Analysis, Inc., Sopchoppy, FL

Lane Cameron, Environmental Consultant. Seattle, WA

Center for Marine Conservation, St. Petersburg, FL

Egmont Key State Park, Robert Baker, St. Petersburg, FL

Entrix, Inc., Ralph Markarian, Wilmington, DE

Florida Game & Fresh Water Fish Commission, Tallahassee, FL (and Field Offices)

Florida Marine Fisheries Commission, Tallahassee, FL

Florida Marine Patrol, Major Jenna Venero, Tampa, FL

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Fort DeSoto Park, Robert Browning, Mgr. Tierra Verde, FL

Hillsborough County Environmental Protection Commission, Roger Stewart, Eric Lesnett Tampa, FL

Hillsborough County Parks, Ed Radice, Tampa, FL

Industrial Economics, Inc., Mike Huguenin. Cambridge, MA

Lewis Environmental Services, Inc., Robin Lewis, Tampa, FL

Manatee County Port Authority, Dr. Bill Tiffany, Port Manatee (Tampa Bay), Palmetto, FL

National Audubon Society, Rich Paul, Manager, Florida Coastal Islands Sanctuaries, Tampa, FL

National Biological Service (USDOI), Dr. Tom Smith III, Miami, FL

National Marine Fisheries Service, Southeast Regional Office, Habitat Protection (David Dale/Andy Mager), St. Petersburg, FL

National Pollution Funds Center (USCG), Arlington, VA

Pinellas County Environmental Protection, Clearwater, FL

Pinellas Seabird Rehabilitation Center, Lee Fox, Tierra Verde, FL

Research Planning, Inc., Dr. Jacqueline Michel, Columbia, SC

Southern Offshore Fisherman's Association, Madeira Beach, FL

St. Pete Audubon Society, Paul Blair, Seminole, FL

Southwest Florida Water Management Division, S.W.I.M. Program, Brandt Henningson, Tampa, FL

Tampa Bay Regional Planning Commission / Agency on Bay Management, Susan Cooper, St. Petersburg, FL

Tampa Baywatch, Peter Clark, St. Petersburg, FL

Tampa Port Authority, Tampa, FL

U.S. Fish & Wildlife Service, Cameron Shaw, Crystal River, FL

U.S. Coast Guard, Capt. Richard W. Harbert, Federal On-Scene Coordinator (for spill), Tampa, FL

U.S. Department of the Interior, Hart Hodges, Portland, OR

USF Biology Department, Dr. Susan Bell, Tampa, FL

USF Department of Marine Science, Dr. Ted Van Vleet, St. Petersburg, FL

7.0 Summary and Responses to Public Comments on Volume I

The following comments were received from the Florida Game and Fresh Water Fish Commission (FGFWFC), Division of Wildlife. The FGFWFC had two comments relating to restoration planning for bird injury.

Comment: FGFWFC strongly supports alternative 4, which provides for training of (permitted wildlife rehabilitation) facility staff and volunteers. Specifically, they recommend using recovered funds to hire a professional oiled wildlife organization to train local wildlife rehabilitators, and their volunteers, in the latest techniques.

Trustee Response: The list of restoration alternative actions considered for bird resource recovery has been expanded to 8, and the above recommended alternative (4) is now included within Alternative 5 (see below). The Trustee selected preferred alternatives include using funds recovered to augment the operations of existing bird rehabilitation organizations and network (Alternative 5), to ensure existing bird and wildlife rescue equipment is maintained (Alternative 6), to acquire equipment for small spill response support, including disposable items (Alternative 7), and/or to support removal of monofilament fishing line from bird habitats in Boca Ciega Bay (Alternative 8).

Comment: FGFWFC requests that the National Audubon Society of Tampa be eligible for funding, to continue establishing baseline data on bird species distribution in the area.

Trustee Response: The detailed plan to implement restoration has not been prepared. However, as stated in the final DARP/EA Volume 1, the Trustees intend to use recovered damages for the acquisition and maintenance of bird rescue and rehabilitation facilities, equipment, and fishing line removal. Restoration actions will be restricted to the area impacted by the spill.

The following comments were received from the California Department of Fish and Game, Office of Oil Spill Prevention and Response (OSPR). These comments addressed four areas of concern relating to assessment and restoration planning for bird injury.

Procedures Used to Assess Spill Impacts to Birds

Comment: OSPR disagreed with the proposed correction factor of two times the number of birds documented by rehabilitation centers to have been treated as the means of assessing injury to unrecovered oiled birds.

Trustee Response: The Trustees are aware that more birds were likely affected than reported through the Pinellas Seabird Rehabilitation Center. Sublethal effects to individual birds exposed to oil are inevitable and a portion of rehabilitated birds may fail to rejoin the wild populations and breed after release. The Trustees recognize that all bird mortalities were not accounted for by the rehabilitation centers. The inability of assessment activities after an oil spill to comprehensively account for all injury to birds is a problem common to all oil spills, especially when sea birds are affected. The correction or uncertainty factor of two times the total recovered birds to estimate bird injury is based in part on experience gained from the Exxon Valdez Oil Spill. It was found during that spill that reliable calculations of estimated bird carcass loss rates could be made based on spill trajectories, wind and current speeds, various bird species attributes, the distribution and abundance of birds in the affected area, level of response effort, and urbanization/remoteness of the affected area.

Effects of this spill may be more limited than in other spills. Potential population impacts due to oiling were probably reduced because bird species had all but completed nesting and fledging young. Oiled adults had a low probability of fouling eggs or hatchlings with oil.

The Trustees believe that there was a high probability that birds oiled from this spill were recovered due to the intense response efforts, the population density and human use patterns, and the species involved. Each of these factors increases the likelihood of detection of oiled birds with subsequent recording of their species and condition, and opportunity for rehabilitation.

Comment: OSPR pointed out that the survival rates of rehabilitated oiled birds are not specifically addressed in the DARP.

Trustee Response: This was an oversight and has been corrected. In an effort to document survival rates, 100 of 261 rehabilitated brown pelicans were banded before their release and return rates have been documented. Of the 100 banded birds, six have been recaptured with only two mortalities. Of the two mortalities, only one could be linked to oil related injuries. The low rate of band recovery suggests that high rates of mortality soon after rehabilitation most likely did not occur.

Habitat Rehabilitation as Primary Bird Restoration

Comment: OSPR expressed reservations concerning the selection of the no action alternative for primary restoration of bird impacts.

Trustee Response: The DARP has been revised to reflect the Trustee position that primary restoration actions have been selected over compensatory alternatives to address direct injury to natural resources. Primary restoration actions now consist of alternatives that address the direct injuries to birds. Restoration of birds to the environment is to be accomplished by actions to increase the number of birds in the Tampa Bay area, or to decrease the number of injuries to birds which might remove them from the environment. Because the bird injury from the spill was determined to be of short duration, the Trustees have selected the "no action" alternative for compensatory restoration. The Trustees believe the indirect injury to birds resulting from the oiling of bird habitats is addressed by selected restoration actions discussed in sections of the DARP dealing with injuries to mangroves, salt marshes, oyster reefs, and seagrasses.

Evaluation of Primary Restoration Alternatives

Comment: OSPR observed that primary restoration alternatives for sea and shore birds are available to Trustee agencies.

Trustee Response: As mentioned above, the DARP was revised to reflect that the primary objective is restoration of the injured bird resources. The Trustees have selected to restore birds to the environment by implementing one or more alternative actions. Implementation of each alternative would yield the desired result, that of increasing the number of birds in the area or of decreasing the number of injuries to birds which might remove them from the environment; however, not all of the alternatives offer equal results.

Comment: OSPR believes that predator control actions can be a most effective tool used in bird management programs.

Trustee Response: Although some predator control is already practiced in the Tampa Bay area, the Trustees believe that predator control in the vicinity of the islands in question is not cost-effective, nor

would it enhance long-term recruitment of relevant bird populations. The control of one species for the benefit of another often results in unforeseen ecosystem disruptions (e.g., Yellowstone) and could change the ecological composition and dynamics of the target area.

Comment: OSPR does not agree that captive breeding projects are costly and ineffective.

Trustee Response: Captive breeding projects are costly and ineffective in this instance if one weighs the post-spill increase in local bird populations affected by this spill against the significant start-up costs. In addition, the species affected are not endangered. There would be the potential for impacts on the wild stock gene pool from captive breeding, but only if the target species was limited in numbers or isolated from a larger breeding population, which is not the case in Tampa Bay. Local bird populations seem to be limited by a complex interaction of over fishing, reduced nutrient loading in the Bay, and climatic factors, including a long-term drought and freeze damage to nesting sites. Direct supplements to the bird populations would only have a short-term impact and would not solve the long-term limiting factors.

Rehabilitation of Birds as Compensatory Restoration

As mentioned above, the DARP was revised to reflect that the primary objective is the restoration of the natural resources injured; and the indirect injury to birds from habitat injury are addressed in other sections of the DARP.

Comment: OSPR viewed actions such as Alternative #6 (support endangered bird species recovery projects) as restoration.

Trustee Response: The Trustees do not dispute this view; however, Alternative #6 has been dropped from consideration due to the fact that the spill had no apparent direct or indirect impacts to endangered bird species in the Tampa Bay area.

Comment: OSPR questioned the degree to which rehabilitation will accomplish direct benefits to bird populations.

Trustee Response: Augmenting the funds available for existing bird rehabilitation organizations and associated equipment allows the enhancement of bird rescue capabilities within the community, which prevents decreases in bird populations. Rehabilitation of brown pelicans (the primary species affected) is a feasible restoration approach in the Tampa Bay area even though information from other oil spills shows that survival rates of rehabilitated and released birds have been low. Results from pelican banding conducted in association with the Tampa Bay oil spill suggests a higher survival rate. Restoration efforts focusing on rehabilitating birds from physical injury is likely to result in higher rehabilitation success because oil toxicity effects are not a factor.

8.0 Finding of No Significant Impact

Having reviewed the attached environmental assessment and the available information relative to the proposed action in Boca Ciega Bay, St. Petersburg, Florida, I have determined that there will be no significant environmental impacts from the proposed action. Accordingly, preparation of an environmental impact statement on these issues is not required by Section 102 (2) (c) of the National Environmental Policy Act or its implementing regulations.

Rolland A. Schmitten
Assistant Administrator for Fisheries
National Marine Fisheries Service
National Oceanic and Atmospheric Administration

JUN 19 1997
Date

Noreen Clough
Regional Director
U.S. Fish and Wildlife Service, Southeast Region

July 1, 1997
Date