Table 4. Summary of injuries for the 23 cases. Sea turtle injuries are totals for in the water and on beach.

DEP Case No.	Region	ASA #	Case Volume	Wetland Oiled (m^2)	Birds Killed (#)	Sea Turtles Killed (#)*	Biomass of Fish and Invertebrates Lost (kg)
99-2A-2736	SE	7	II	0	0.11	0	0
99-2A-10373	SE	8	III	0	0.91	527	0
96-2A-3973	SE	9	IV	0	0.62	0	0
95-06-2276	SE	10	V	259	14.6	1,440	0
94-06-1608	SE	11	VI	259	81	4262	0
93-06-3566	SE	12	VII	775	1.70	951	0
99-2A-2927	SE	13	VIII	0	0.74	0	0
96-2A-0748	SE	14	IX	0	0.15	0	0
97-2A-2266	SE	15	X	0	1.16	0.4	0
92-10-1272	SE	16	XI	0	0.05	0	0
TOTAL				1293	101	7180	0

Table 4. Excerpted from Table E-3, ASA Final Report Volume I: Description of Approach and Methods ASA 01-138 May 2003

Based upon these modeled inputs, the Trustee chose to include sea turtles, wetlands and birds in the assessment underlying this Final DARP/EA. The Trustee judged that the injuries were significant and that procedures for assessing injury and scaling appropriate restoration for these categories would involve reasonable costs.

3.0 Restoration Planning

3.1 Injury Assessment, General

The goal of injury assessment is to determine the nature, degree, and extent of any injuries to natural resources and services. This information is necessary to provide a technical basis for evaluating the need, type, and scale of restoration actions. Specifically, the Trustee must determine that there is: (1) exposure, a pathway, and an adverse change to a natural resource or service as a result of an actual discharge; or (2) an injury to a natural resource or impairment of a natural resource service that resulted from the substantial threat of a discharge.

Injury determination and injury quantification are terms used to describe the two basic components of an injury assessment. Determination of injury requires that a Trustee demonstrate that the incident caused an adverse effect on the resources or services. Injury quantification involves determining the severity, extent and duration of the adverse effect. The Trustee has the option of quantifying the adverse effect directly and/or quantifying the reduction in services provided by a natural resource caused by the incident. The natural resource or service change is defined as the difference between post-incident conditions and baseline conditions. Injury

assessment techniques used for the natural resource categories chosen by the Trustee for inclusion in restoration planning are discussed later in this document.

3.2 Developing a Restoration Plan, General

3.2.1 Primary and Compensatory Restoration

In selecting restoration projects for each category of natural resource injury or loss, the Trustee identified feasible restoration actions to promote recovery of the resources to baseline (primary restoration) and/or to compensate for interim losses of resources or services pending recovery (compensatory restoration). Primary restoration actions include natural recovery and one or more active restoration actions designed to directly restore natural resources or services to baseline on an accelerated time frame. The Trustee selected active primary restoration for the sea turtle injury category and natural recovery for the wetland and birds.

Compensatory restoration actions compensate the public for the interim losses. The scale of the compensatory restoration action is based on knowledge of the interim losses associated with the selected primary restoration action. The OPA NRDA regulations identify a variety of methods that may be used for scaling compensatory restoration actions. When determining the scale of restoration actions that provides natural resources and/or services of the same type and quality, and of comparable value as those lost, the Trustee must consider using a service-to-service scaling approach. Under this approach the Trustee determines the scale of restoration actions that will provide a flow of natural resource services equivalent in quantity to the lost flow of services, taking into account the different time periods in which the services are provided through the use of discounting.

The Trustee may also consider the valuation scaling approach. With this approach, the Trustee explicitly measures the lost value associated with injured resources and/or services and then determines the scale of restoration actions necessary to produce natural resources and/or services of equivalent value to the public.

For compensatory restoration actions the Trustee chose the service-to-service approach as the most appropriate method for the selected sea turtle restoration actions and a valuation scaling approach for wetland and bird compensatory restoration actions.

3.2.2 Criteria for Evaluating Restoration Alternatives

The Trustee solicited for and received various project proposals (Appendix D and E). In accordance with the OPA NRDA regulations, only those alternatives considered technically feasible and capable of being implemented in accordance with applicable laws, regulations and/or permits may be considered for inclusion in a restoration plan. 15 CFR Section 990.53 (a)(2). The Trustee evaluated the feasible restoration alternatives for each category of injury or loss according to the following criteria as set forth in 15 CFR Section 990.54:

(1) the cost to carry out the alternative;

(2) the extent to which each alternative is expected to meet the Trustee' goals and objectives in returning the injured natural resources and services to baseline and/or compensating for interim losses;
(3) the likelihood of success of each alternative;
(4) the extent to which each alternative will prevent future injury as a result of the incident, and avoid collateral injury as a result of implementing the alternative;
(5) the extent to which each alternative benefits more than one natural resource and/or service; and
(6) the effect of each alternative on public health and safety.

Additionally based upon state grant program concerns and the need to expediate completion of the restoration projects, the Trustee added three additional criteria to be considered when evaluating the restoration alternatives:
(7) the extent to which each alternative is consistent with applicable management plans, including recovery plans for the threatened and endangered sea turtles.
(8) the capability of each alternative to be carried out in the timeframe provided and that all monitoring be addressed within the permitting requirements.
(9) The extent to which matching funds are available.

Further, since these incidents were moderate in size, the Trustee has combined the impacts so that whenever possible a larger multifaceted restoration project can be funded. These projects usually provide a greater cost/benefit ratio as overhead, planning, permitting and construction costs are shared and therefore greatly reduced.

3.2.3 Environmental Consequences (Indirect, Direct, and Cumulative)

To restore resources and/or services lost as a result of these incidents, the Trustee examined a variety of projects under the following restoration alternatives: (1) no action and natural recovery, and (2) ecological restoration. The Trustee intends to avoid or reduce negative impacts to existing natural resources and services to the greatest extent possible. However, in implementing or approving the implementation of restoration actions, the Trustee could undertake actions that may have short- or long-term effects upon existing habitats or non-injured species. This section addresses the potential overall cumulative, direct, and indirect impacts, and other factors to be considered in selecting suitable restoration projects.

The Trustee believes that the projects selected in this restoration plan will not cause significant impacts to natural resources or the services that they provide. Further, the Trustee does not believe the projects will affect the quality of the human environment in ways deemed "significant."

Cumulative Impacts: Since the Trustee chose the projects primarily to improve recovery of injured natural resources, the cumulative environmental consequences will be largely beneficial. These cumulative impacts include restoration of the injured ecosystem and by increasing the numbers of sea turtles and birds. Certain projects may also provide educational opportunities. Any unanticipated cumulative adverse effects on an area or other area program, plan, or regulatory regime from a selected project identified prior to implementation will result in

reconsideration of the project by the Trustee. Project monitoring will confirm that cumulative impacts will be beneficial rather than adverse.

Indirect Impacts: Environmental consequences will not be limited to the project locations. Indirect beneficial impacts will occur. Cumulative impacts at the project locations, and in the surrounding area, are expected.

Direct Impacts: Overall, the actions described in this Final DARP/EA will have no negative impact on the surrounding ecosystems. Nor should these projects have any short-term negative impacts.

Any project that requires a permit for implementation will integrate best management practices, other conditions, and consultations to ensure that the project will be constructed in accordance with federal, state, and local regulations.

3.2.4 Monitoring

The OPA NRDA regulations specify that a restoration plan must include a description of monitoring needed to document restoration progress, performance, and success. Monitoring is an essential component of any restoration project. Monitoring focuses on selected features of the restored systems at periodic intervals and ensures: 1) an objective assessment of performance criteria established in the restoration plan, and 2) permit compliance. Monitoring may include the collection of certain baseline information prior to any restoration activity. Most importantly, monitoring allows objective evaluation of the need for any mid-course corrections. The monitoring actions judged appropriate for the selected restoration alternatives are discussed in the injury-specific restoration sections below.

3.3 Sea Turtle Injury and Restoration Plan

3.3.1 Injury Determination and Quantification

3.3.1.1 Description of the Injury

The NRDAM/CME (French et al., 1996c) contains mean seasonal or monthly abundance for 77 biological provinces in US coastal and marine waters. The biological data for wildlife, fish, invertebrates and lower trophic levels in the province where the spill occurred is used for the SIMAP simulations of the spills. The model uses average number per unit area (#/km^2) in appropriate habitats for wildlife species. The species is assumed uniformly distributed across its preferred habitats. Thus, the habitat grid defines the habitat map, and so the abundance of each species.

For cases in the SE region involving the outer coast, these data were updated for sea turtles. Sea turtle abundance was based on the methodology and assumptions outlined in the report on the August 2000 Florida Mystery Spill (French McCay et al., 2001). For adults, the sea turtle abundance data in French et al. (1996c) was assumed. For hatchlings and juveniles, estimates were developed based on strandings and nesting density on shore (French McCay et al., 2003).

The number of hatchlings that would emerge from nests over 30 days was estimated, and these hatchlings were assumed to be distributed across the area between shore and the Gulf Stream western front. The 30-day estimate is used because hatchlings emerge, go to sea, and remain in the area between the shore and the Gulf Stream for 0-60 days, after which they enter the Gulf Stream and are carried north and out of the area (French McCay et al., 2003).

In addition to hatchling abundance in the water, eggs and hatchlings would be impacted on oiled beaches where nests are present. Numbers of nests per length of beach were estimated from nest count data during the time around each spill date. Nest abundance on beaches was only estimated for those cases oiling the outer coast during the nesting season (French McCay et al., 2003). The abundance assumed was as in Table 5.

Table 5. Sea turtle abundance assumed in the calculations of injury for cases in the SE region involving the outer coast.

Species	**Size**	**#/km^2**
Loggerhead	Hatchling	221.62
Green	Hatchling	35.46
Leatherback	Hatchling	0.29
Kemp's	Hatchling	0
Total	Hatchling	257.37
Loggerhead	Juvenile	0.2888
Green	Juvenile	0.3234
Leatherback	Juvenile	0
Kemp's	Juvenile	0
Total	Juvenile	0.6122
Loggerhead	Adult	0.076
Green	Adult	0.049
Leatherback	Adult	0.02
Kemp's	Adult	0.0024
Total	Adult	0.1474

Table 5. Excerpted from Table 3-3, ASA Final Report Volume I: Description of Approach and Methods ASA 01-138 May 2003.

3.3.1.2 Injury Quantification

Injury to the sea turtle resources was calculated using the computer based Spill Impact Model Analysis Package (SIMAP), modified with site- and incident-specific information about turtle presence and abundance, and environmental conditions during the incident. The SIMAP calculated the number of hatchlings, adults, and juveniles killed as a result of exposure to the spilled oil (4 coastal cases) at the ocean surface as the slicks transited through the area before stranding on the beaches. For the hatchlings in the water, SIMAP estimated that mortality would occur to 50% of the hatchlings in the area swept by the slick (Jeansonne, 2001b; French McCay et al., 2003). The estimated mortality represents a combined factor that includes both the high

likelihood of contact with the oil by hatchlings, and, if contacted by the oil, a high mortality rate from smothering and/or toxic oil effects. For the older age classes of sea turtles, benthic juveniles and adults, a 1% mortality factor is estimated since the older turtles spend a majority of their time below the sea surface. Older age classes would also be more resistant to smothering and toxicity than hatchlings due to their larger size (Jeansonne, 2001b). For areas where the beach was oiled, hatchling sea turtles would be lost where nests were present. The threshold for injury to sea turtle hatchlings was assumed using 10% cover, and an average oil thickness of 0.01 mm (10 microns, about 10 g/m^2) on the beach (French McCay et al., 2003).

The SIMAP estimate for hatchling mortality is 7,180 individuals (see Table 4). Appendices B and C of this Draft DARP/EA contain copies of the wildlife injury quantification of the SIMAP report, which details the calculated sea turtle injuries by age class. The proportion of injury by species as calculated by the SIMAP, is directly proportional to their relative population densities in the area (86% loggerheads, 14% greens, and 0.1% leatherbacks).

3.3.2 Sea Turtle Restoration Planning

3.3.2.1 Selected Primary Restoration Alternatives

The goal of primary restoration is to accelerate the return of sea turtles to their baseline levels quicker than the natural recovery rate. In this context, the restoration goal is to replace the 7,180 sea turtle hatchlings and the juveniles and adults killed by this incident as quickly as possible and ideally in a single hatching season.

1. Beach Dune Restoration: The Trustee investigated the restoration of 4 beach dune systems within Martin County. These projects would result in the removal of existing exotic vegetation and replacement with native dune vegetation. The project locations are documented sea turtle nesting sites and the dune restoration would greatly enhance the beach dune environment thereby enhancing the quantity of nesting sea turtles in the county. The proposed projects are part of a larger plan to preserve, protect and enhance the natural resources occurring on the sites. Removal of exotics from sensitive coastal dune community will enhance vital nesting habitat for endangered and threatened sea turtles.

2. Enforcement of Turtle-Friendly Lighting Ordinances: The Trustee investigated opportunities to augment lighting ordinance enforcement activities that comprise restoration by preventing mortality of turtles. Disorientation upon nest emergence is the greatest source of mortality for sea turtle hatchlings and is primarily caused by hatchlings crawling towards artificial lights and not towards the moon and the ocean. Thus, actions to correct beach lighting problems are an appropriate restoration alternative in that they will prevent future mortality of turtle hatchlings that crawl toward these artificial light sources, instead of toward the ocean.

Palm Beach County has the potential for augmented turtle-friendly lighting ordinance enforcement. This County has high concentrations of nesting loggerhead turtles and they have well-established mandatory lighting ordinances requiring conversion of residential and commercial beachfront lighting to lighting that cannot be seen on the adjacent beaches. County commissioners and their representatives report that they are stretched to their limit in terms of

funds to pay for enforcement of turtle lighting ordinances during the nesting season. Palm Beach County is enthusiastic for enhanced funding for 2 additional employees to augment existing code enforcement. What enforcement capabilities that do exist, document the success of lighting enforcement as a means to prevent disorientation of hatchlings.

3.3.2.2 Non-Selected Primary Restoration Alternatives

1. Natural Recovery: The Trustee does not expect natural recovery of sea turtles because of their status as threatened and endangered. This alternative does not involve any direct human intervention to restore, or cause accelerated recovery of, the injured resources. Natural recovery will not necessarily occur for this injury, however. Sea turtle reproductive potential will not naturally replace the killed individuals, as numbers of these species are critically low, and currently require extensive and ongoing efforts to assist them in recovering to a more stable and resilient reproductive status.

2. Beach Acquisition: Acquisition for public ownership of privately owned land to protect turtle nesting beaches is a restoration alternative that could protect turtle nests and hatchlings. The extent to which purchasing private property would result in the production of new hatchlings (directly or through prevention of mortality) is not certain. Turtles already nest on private property that has been identified for purchase, thus new hatchlings would be produced only to the extent that the addition would create better conditions for nesting, or prevent conditions that would reduce nesting and hatching success in the future. The acquisition of property is consistent with the Endangered Species Act recovery plan for the loggerhead sea turtle. Beach acquisition can be successfully implemented as willing sellers of beachfront property have been identified. The acquisition of beachfront property is not expected to cause collateral injury; in fact, the acquisition of beachfront will benefit all wildlife that uses such lands. Beach acquisition is not expected to have any effect on public health and safety. The Trustee identified a parcel of property in Martin County of 5.5 acres. The proposed acquisition could cost $1.5 million. The Trustee did not select beach acquisition because the additional benefits to hatchlings is uncertain and acquisition is not cost-effective compared to the dune restoration and lighting alternatives.

3. Artificial Reef: The development of an artificial reef 7 miles offshore from Martin County. The reefs are to be composed of concrete railroad ties donated by FEC. This project did not meet all of the goals and objectives of the Trustee. The project does have the potential to impact public health and safety. The project does not prevent collateral damages. The additional benefits to hatchlings are uncertain.

3.3.2.3 Evaluation of Primary Restoration Alternatives and Environmental Consequences

Losses to species in danger of extinction, such as sea turtles, will not likely be restored through natural recovery; thus this injury must be restored through active primary restoration.

Beach Dune Restoration is consistent with the Endangered Species Act recovery plan. The US Fish and Wildlife Service Ecosystem Plan highlights the importance of beach communities in promoting sea turtle recovery. Task 1142 (loggerhead recovery plan) and Task 1132 (green turtle recovery plan) promote the need to “Evaluate the status of high density

nesting beaches on Hutchinson Island, Florida, and develop a plan to ensure its long-term protection." The proposed projects are part of a larger plan to preserve, protect and enhance the natural resources occurring on the sites by the removal of exotic species and the restoration of coastal dune/coastal strand communities. Removal of exotics from sensitive coastal dune community will enhance important habitat for endangered and threatened sea turtles that nest on these beaches. Additionally, a portion of the selected project will compensate for hatchling productivity not obtainable through the service-to-service augmented lighting enforcement project.

Augmenting lighting ordinance enforcement has been documented as effective in reducing turtle hatchling mortality. By saving hatchlings that otherwise would have died, new hatchlings are added to the environment and the resource can be brought back to baseline. Lighting enforcement is consistent with the Endangered Species Act recovery plan for the loggerhead sea turtle, which comprised the vast majority of the hatchlings killed by the incidents. The Trustee expects lighting enforcement to succeed as they would augment existing lighting ordinance enforcement programs and practices. There are no detrimental effects to other wildlife by eliminating artificial lights that illuminate turtle nesting beaches at night. If anything, the results of these actions have incidental benefits to other nocturnal wildlife (e.g., bats, insects, and raccoons). Except as noted above, the lighting enforcement is not expected to benefit other natural resources or services injured as a result of the incident. The Trustee judged this alternative to have a neutral effect on public health and safety, because the project only involves the expanded enforcement of an existing ordinance. Palm Beach County estimates that $24,063 is required to effectively augment its turtle lighting code enforcement (Barker, 2002), covering the costs of 2 new personnel, and 1,000 additional man-hours during the turtle nesting season.[1] The total cost of $24,063 for this alternative is conservatively expected to save approximately 1,100 hatchlings from disorientation for the year (Barker, 2002).

3.3.2.4 Selected Compensatory Restoration Alternatives

Under any of the primary restoration actions considered, there is a period when turtles are below their baseline level and there is an interim loss. Thus, compensatory restoration is necessary. The Trustee evaluated compensatory restoration alternatives to compensate for the lost turtles pending their recovery to baseline.

The actions the Trustee selected for primary restoration are also appropriate to provide compensatory turtle resources and services. The primary restoration alternatives support sea turtle resources and services, which are what are lost in the interim period. So, the Trustee evaluated the same alternatives – as described under "Primary Restoration Alternatives Considered" – for compensatory restoration.

Based upon the alternative evaluation analysis above, the Trustee selected both beach dune restoration projects and the lighting enforcement projects as the alternatives to replace the turtles killed as a result of these incidents and to compensate for the interim losses.

[1] Officials estimate that 22,000 hatchlings a year are at risk of disorientation.

3.3.2.5 Project Selection

The Trustee's first preference is to fund the ordinance enforcement actions in Palm Beach County. Palm Beach County supports some of the highest sea turtle nesting density in the state (~400 nests/mile), and usually has the highest leatherback nest counts and the second highest loggerhead and green turtle nest counts in the United States. The county also leads the state in the number of reported disorientation events. Resource managers in the county advised the Trustee that additional enforcement was by far their preferred approach to conserving sea turtle resources, based upon their judgments and experience about the need for and the success of enforcement actions. Scaling shows that 1,100 replacement and compensatory hatchlings are produced in a one-year time period (a more detailed discussion can be found in the next section) so the Trustee will have to implement additional restoration projects to compensate for the turtle injury.

The Trustee's second preference is to fund the beach dune restoration projects proposed by Martin County. The US Fish and Wildlife Service Ecosystem Plan highlights the importance of beach communities in promoting sea turtle recovery. Task 1142 (loggerhead recovery plan) and Task 1132 (green turtle recovery plan) promote the need to "Evaluate the status of high density nesting beaches on Hutchinson Island, Florida, and develop a plan to ensure its long-term protection." The proposed projects are part of a larger plan to preserve, protect and enhance the natural resources occurring on the sites by the removal of exotic species and the restoration of coastal dune/coastal strand communities. Removal of exotics from sensitive coastal dune community will enhance important habitat for endangered and threatened sea turtles that nest on these beaches.

3.3.2.6 Restoration Project Scaling

Sea turtle populations are considered limited by the production of hatchlings. A direct method of increasing hatchling survivorship would be a reliable and cost-effective compensation. Thus, scaling was performed to estimate the number of hatchlings needed to compensate for the sea turtle injuries.

Jeansonne and Bernhart (2002) have estimated the number of loggerhead hatchlings required to replace one juvenile and one adult turtle of average age of animals in the southeast Florida area. The estimations are made assuming age-specific mortality rates and durations of pelagic juvenile, benthic juvenile and adult stages provided by Epperly et al. (2001). Based on their most protective assumptions (since loggerhead turtles are threatened species, "model 3"), hatchling survival to a benthic juvenile stage (average 17 years old) is 0.017715 and hatchling survival to an adult (average 42 years old) is 0.000354. Thus, 28 hatchlings are required per juvenile killed, and 329 hatchlings are required per adult killed.

These assumptions were used to scale the number of hatchlings required in compensation for the injuries in each of the cases. The results are in Table 6. The total is 8,894 hatchlings for the southeast regional cases.

Table 6. Summary of sea turtle compensatory restoration requirements for the 10 southeastern cases for injuries in the water and on the beach.

DEP Case No.	Region	Hatchlings (#)	Juveniles (#)	Adults (#)	Equivalent # of Hatchlings (#)
99-2A-2736	SE	0.00	0.00	0.00	0.00
99-2A-10373	SE	527	5.9	84.7	618
96-2A-3973	SE	0.00	0.00	0.00	0.00
95-06-2276	SE	1,440	17.6	198	1,655
94-06-1608	SE	4,262	94.5	1,130	5,486
93-06-3566	SE	951	13.9	169	1,134
99-2A-2927	SE	0.0	0.0	0.0	0.0
96-2A-0748	SE	0.0	0.0	0.0	0.0
97-2A-2266	SE	0.4	0.0	0.0	0.4
92-10-1272	SE	0.0	0.0	0.0	0.0
Regional total	SE	7,180	132	1,582	8,894

Table 6. Excerpted from Table E-5, ASA Final Report Volume I: Description of Approach and Methods ASA 01-138 May 2003.

The Trustee used a service-to-service scaling approach to determine how many additional hatchlings must be saved to compensate the public for the interim sea turtle losses that occur from the time of the incident until primary restoration is completed and the turtles are back to baseline. The principal concept underlying the service-to-service approach is that the public can be compensated for past losses of natural resources and services through projects that provide additional resources of the same type and quality and of comparable value. To accomplish this, the method takes into account the amount of services lost over time and the amount of replacement services to be provided in the future. The size of the replacement project is selected so that the quantity of services provided is equivalent to the quantity of services lost due to the injury. The quantities are calculated in discounted terms, where the discounting reflects the observation that people place greater value on having resources available in the present than on having availability delayed to a future point in time.

The Trustee determined the interim loss of turtle services using information on the sea turtle injury and the primary restoration requirement. The loss of an equivalent of 8,894 hatchlings occurred. Primary restoration has to produce 7,180 hatchlings in 1 year to get back to baseline. The interim loss that occurs from the time of the injury until recovery to baseline in 2004 totals 8,894 discounted hatchling-years, where a hatchling-year is defined as the flow of services from a hatchling for one year.[2] [3] The scale of compensatory restoration is the additional number of hatchlings to save each year that provides the 8,894 hatchling-years that were lost. In this instance due to funding/program constraints the projects have to be completed within one year and therefore the compensation has to be for the full amount within one year.

[2] Services are discounted at three percent, the social rate of time preference or the rate at which society is willing to substitute between present and past consumption of natural resources and services.

[3] For further information on the quantification of interim losses, see Penn, 2002.

In the areas of Palm Beach County under the jurisdiction of the County lighting ordinance, officials estimate that 22,100 hatchlings a year are at risk of disorientation.[4] In Palm Beach County, it is expected that enforcement will reduce hatchling disorientation by 5%. Turtle hatchlings saved per year will total 1,100. Implementing the enforcement project in Palm Beach County for one year does not save quite enough hatchlings, but it compensates for a portion of the required compensation.

In addition to the enforcement project, the completion of a Martin County Parks and Recreation's proposals would remove nesting obstacles and improve habitat in a critical nesting habitat for three federally listed sea turtles. From a global perspective, the southeastern U.S. nesting aggregation of loggerhead sea turtles is of paramount importance to the survival of the species and is second in size only to that which nest in Oman. About 80% of the loggerhead nesting in the southeastern U.S. occur along the south Atlantic coast of Florida, where the 4 projects are located. The Florida leatherback nesting aggregation is small, but it accounts for the only regular nesting by this species in the continental United States. Nesting in Florida is concentrated along the southeast coast, particularly in St. Lucie, Martin and Palm Beach Counties. There is a shared value of dune restoration for the turtle compensation obtained with the Martin County Beach projects as well as compensation for seabird and wetland compensation as discussed further in this document.

Table 7. Nesting Data and Clutch Size for Sea Turtles Nesting in Martin County.

	Loggerhead (Average clutch size 116)	Green (Average clutch size 130)	Leatherback (Average clutch size 80)
Total Nesting Survey Area 3 Year Average	1830	77.3	72
Project Size (4 sites) 25% of Area Surveyed (# nests)	457.5	19.32	18
Eggs Produced in Total Project Area (3 Yr Mean)	53,070	2,511.6	1,440
55% hatchling success (Total Hatchling Produced per year)	29,188.5	1,381.38	792

Table 7. Excerpted from Table 5-2, ASA Final Report Volume I: Description of Approach and Methods ASA 01-138 May 2003.

The four beaches proposed for restoration now produce approximately 31,362 hatchlings per year. B. Witherington (2003) estimates that restoration work on the beach will improve marginal habitat to high quality habitat, increasing nesting densities by 10-20% (3,136 - 6,272 hatchlings) (Witherington pers com.).

The combination of the Palm Beach County's Lighting Enforcement project and the four Martin County Parks and Recreation's restoration projects will compensate for 4,236 – 7,372 hatchlings in one year.

[4] This is based on 9,191 nests in the enforcement area with 80 hatchlings per nest and a 3 percent hatchling disorientation rate (Davis, 2002b).

3.3.2.7 Monitoring Plan for Sea Turtle Restoration

Specific monitoring actions will not be required for the sea turtle projects. However, in order to measure the success of the project, Palm Beach County will be required to prepare a report at the end of the nesting season that details the enforcement actions undertaken and presents the results to the Trustee. The report will also include a comparison of the number of disorientation events for that season compared to events from previous seasons in order to measure the effect of lighting enforcement project.

Martin County will be required to prepare a report at the end of the nesting season that details the actions undertaken and documents the numbers of sea turtle nests present in the restored areas. The report will also include a comparison of the number of nesting events for that season compared to events from previous seasons in order to measure the effect of dune restoration project.

The Trustee will perform project oversight and administration of the selected restoration project.

3.4 Wetland Injury and Restoration Plan

3.4.1 Injury Determination and Quantification

3.4.1.1 Description of the Injury

The incidents, based on hindcasting of the timing and path of the oil, resulted in shoreline impacts and wetland injury. Concentrations of polycyclic aromatic hydrocarbons (PAH) in the water column are known to be toxic to wetland and mudflat habitat. The SIMAP model calculated exposure of wetlands, mudflats and associated fauna. The injured fauna (predominantly small fishes and invertebrates) are not readily observed or measured due to their size and extremely ephemeral nature. Fauna could be eaten by foraging fishes and seabirds, decompose rapidly, or transported out of the area. Thus, direct observation of the associated fauna is unlikely.

3.4.1.2 Injury Quantification

Injury to wetlands, mudflats and associated faunal injuries, primarily fishes and invertebrates, was calculated using the SIMAP model. Based on biological resources in the area of the incidents, current data, water depth, wind speed and direction and toxicity data, SIMAP calculated the direct impacts to wetlands, mudflats and associated fauna (fish and invertebrates). In addition, there is a loss of future productivity from the wetland and fish and invertebrates that were killed.[5] Appendices B and C presents the fish and invertebrate injury quantification information from the SIMAP report.

[5] The impact on each species is relatively small compared to the total population so changes in natural and fishing mortality of surviving animals are assumed not to compensate for the killed animals during the natural lifespan of the animals killed (French-McCay et al., 2001).

Table 8. Wetland and Mudflat Injuries for SE Region.

DEP Case No.	ASA #	Volume	Wetland and Mudflat Injury (m^2-years)
99-2A-2736	7	II	-
99-2A-10373	8	III	-
96-2A-3973	9	IV	-
95-06-2276	10	V	259
94-06-1608	11	VI	
93-06-3566	12	VII	259
99-2A-2927	13	VIII	775
96-2A-0748	14	IX	-
97-2A-2266	15	X	-
92-10-1272	16	XI	-
SE Regional Total			1,293

Table 8. Excerpted from Table E-3, ASA Final Report Volume I: Description of Approach and Methods ASA 01-138 May 2003.

3.4.2 Wetland and Mudflat Restoration Planning

3.4.2.1 Selected Primary Restoration Alternative

While, mortality of vegetation in wetlands occurs above about 14 mm of oil, according to literature review in French et al. (1996a), fortunately, none of the wetland exposures exceeded this threshold dose. Shoreline habitats, however, were oiled by more than 0.1 mm (>100 g/m^2) of oil, which is the minimum (dose) in the model for impact to wildlife in the intertidal areas.

Wetland, mudflat and associated faunal injuries are expected to recover rapidly. In the wetland, the amount of oiling was not enough to be lethal to the plants such that the entire habitat would be destroyed. Therefore recovery was estimated to be 1 year. The associated faunal injuries are also expected to recover rapidly and naturally due to fish and invertebrate reproductive recruitment potential. The Trustee believes that production from unaffected organisms and recruitment from tributaries and other areas of the Atlantic Ocean will provide sufficient egg and young production to sustain the populations of fish and invertebrates injured by these incidents, Therefore, the Trustee selected natural recovery as the primary restoration alternative.

3.4.2.2 Selected Compensatory Restoration Alternatives

The Trustees selected wetland restoration as the alternative to produce compensatory wetland, mudflat and faunal compensation.

1. Wetland Restoration: Wetland restoration can compensate for the loss of the injured wetlands and support seabird, fish and invertebrate production. Through the restoration of this habitat, the Trustee can provide the fish and invertebrate biomass that was lost. The amount of restoration required to offset the fish biomass losses is determined based on literature estimates of secondary productivity.

3.4.2.3 Non-Selected Compensatory Restoration Alternatives

1. Natural Recovery: There is an interim loss associated with the wetland and mudflat injury: the habitat and associated fauna that were lost and their future production will not be restored through natural recovery. Compensatory restoration is necessary to provide the biomass that was lost.

2. Reef Restoration: Another way to provide fisheries biomass is to create or restore reefs and reef communities that support fisheries production. Martin County has an established artificial reef program; reefs are made of materials including limestone and engineered concrete modules, which are deployed, offshore of Martin County at various ocean depths. The Trustees considered something similar in this case for fish biomass restoration. There are studies in the literature that documents the fish productivity value of such actions. Therefore, this type of restoration can be implemented and it is consistent with County management plans. Because of the numerous reefs offshore of Martin County, there is some question whether additional reef would be beneficial in this area. Artificial reef construction converts sandy or silty ocean bottom habitat; however, the Trustee do not consider this conversion to be a collateral injury; the ocean bottom offshore is not a limited resource. An artificial reef, depending on placement, could provide recreational diving or snorkeling opportunities. While these opportunities are an added benefit of reef restoration, artificial reefs do pose some risk of injury to humans who swim, dive, or snorkel on them. This proposal is already partially funded for $ 50,000, the county is asking for $35,000. The Trustee estimates the costs of artificial reef to be about $200,000 per acre based on past restoration experience.

3.4.2.4. Evaluation of Compensatory Restoration Options and Environmental Consequences

It is well recognized in the ecological sciences that wetland habitat contributes to the production of fish and invertebrate biomass, which satisfies the goal of compensatory restoration. Wetland habitat creation is likely to succeed as it has been successfully implemented throughout Florida. Wetlands are created by scraping down unproductive upland habitat or disturbed wetlands, which are dominated by exotics, to appropriate elevations for wetland growth.

The focus of the Martin County projects is the restoration of coastal dune systems, three of which contain a component that include wetland restoration in the intracoastal waterway. While these projects involve habitat conversion the Trustees does not believe that this conversion causes collateral injury. In fact, wetland creation benefits other resources injured by these incidents by providing foraging, roosting and nesting habitat for seabirds. Wetland restoration is not expected to have any effects, positive or negative, on public health and safety; however the alternative is consistent with natural resource management plans, including plans for exotic plant removal, shoreline erosion protection, and shoreline habitat restoration. Based upon past Trustee restoration experience, average mangrove habitat creation costs are estimated at approximately $30,000 per acre, excluding oversight and monitoring costs.

Table 9. Martin County Parks and Recreation Projects Habitat for Restoration

	Mangrove (acres)	Coastal Strand (acres)	Coastal Dune (acres)	Ocean Frontage (ft)	Acres Total
Alex Beach	1	1	1	750	3
Bob Graham	8	5.5	5.5	1,500	19/10 reveg
Curtis Beach	1	2	2	750	7
Sea Turtle Beach	0	1	1	225	2
Total Habitat	10	10.5	10.5	3,225	31

3.4.2.5. Project Selection

Based upon the above analysis, the Trustee selected wetland habitat creation as the restoration alternative to compensate for wetland, mudflat and associated faunal biomass and production lost as a result of these incidents. The wetlands portion of the Martin County Projects (See Table 9) most closely restores the natural resource damage from these incidents. Wetland habitat creation is much more certain to be successful than artificial reef habitat creation, and is a cost-effective alternative. The wetland alternative will also benefit other resources, and would provide the incidental benefit of removal of problematic exotic plant species.

3.4.2.6. Restoration Scaling

The Trustees used a service-to-service scaling method or Habitat Equivalency Analysis (HEA) to determine the wetland compensatory restoration project scale. The same concepts of service-to-service scaling that were described earlier apply here as well. In this case, the size of the wetland habitat project is selected so that the restored habitat leads to a net gain in wetland, mudflat, fish and invertebrates production over and above that produced by the location before the restoration. The size of the habitat (acreage) is scaled to compensate for the injury (interim loss). The wetland compensatory restoration requirements are $100m^2$.

Table 10. Wetland compensatory restoration requirements for faunal injuries in intertidal wetlands and mudflats (mangrove for SE).

DEP Case No.	**ASA #**	**Case Volume**	**Wetland and Mudflat Injury (m^2-years)**	**Compensatory Wetland Area (m^2)**
99-2A-2736	7	II	-	-
99-2A-10373	8	III	-	-
96-2A-3973	9	IV	-	-
95-06-2276	10	V	259	19
94-06-1608	11	VI	-	-
93-06-3566	12	VII	259	20
99-2A-2927	13	VIII	775	61
96-2A-0748	14	IX	-	-
97-2A-2266	15	X	-	-
92-10-1272	16	XI	-	-
SE Regional Total			1,293	100

Table 10. Excerpted from Table E-6, ASA Final Report Volume I: Description of Approach and Methods ASA 01-138 May 2003

3.4.2.7 Monitoring Plan for Wetland Restoration

Project monitoring to evaluate the success of the wetland restoration will be conducted as part of the permitting process related to the project. The Trustee will perform project oversight and administration of the selected restoration project.

3.5 Bird Injury and Restoration Plan

3.5.1 Injury Determination and Quantification

3.5.1.1 Description of the Injury

The SIMAP indicates that seabirds, mostly cormorants, egrets and scaups, were exposed to a surface oil slick. Birds that were exposed were expected to suffer sub-lethal injury or death due to a combination of smothering and toxicity. The number of birds calculated to have been exposed and killed was estimated as 101 birds (range from <1 bird, a probability, to 81 birds). This small number would be expected to go largely unobserved (Ford et al., 2001).

3.5.1.2 Injury Quantification

The Trustee used SIMAP to quantify the injury to birds. SIMAP calculated the number of exposed birds based on the area affected by the incidents and the number and type of birds expected within that area. The model converts sub-lethal injury to a smaller number of birds killed. The calculated injury for birds is primarily cormorants, egrets and scaups (French-McCay et al., 2003). See Appendices B and C for further information. The impact on local bird abundance is relatively small compared to the total population, so changes in mortality of surviving birds are assumed not to compensate for the killed animals during the natural lifespan of the animals killed. It is assumed that these birds were fully-grown so there would have been no additional production from weight gain over their lifetime; thus, there is not a production foregone injury component.[6]

3.5.2 Bird Restoration Planning

3.5.2.1 Selected Primary Restoration Alternative

The Trustee expects the natural reproductive potential of unaffected organisms to support the species of birds injured by these incidents. In other words, it is expected that the birds will be back to baseline in one generation through natural reproductive processes. Therefore, the Trustee selected natural recovery as the primary restoration alternative.

3.5.2.2 Selected Compensatory Restoration Alternative

[6] There is also no reproductive loss component.

What is not replaced through natural recovery are the birds that were killed. So, there is an interim loss and compensatory restoration is necessary to replace the birds that were lost. The Trustee selected the following alternatives as compensatory restoration for the bird injury.

1. Wetland Restoration: The Trustee considered a wetland marsh restoration as a way to restore the birds that were lost due to the incident. In addition to supporting fish and invertebrate production, wetland habitat supports bird productivity through provision of nest sites, foraging areas and other services. Restored habitat leads to a net gain in wildlife production over and above that produced by the location before the restoration. The size of the habitat (acreage) is scaled to just compensate for the injury. Wetland habitat creation is likely to succeed as it has been successfully implemented throughout Florida. Wetlands are created by scraping down unproductive upland habitat or disturbed wetlands, which are dominated by exotics, to appropriate elevations for wetland growth. While the focus of the four projects in Martin County are the restoration of coastal dune systems there are smaller component of each project that includes wetlands (mangroves) in the intracoastal waterway, see Table 9. Wetland restoration is not expected to have any effects, positive or negative, on public health and safety; however the alternative is consistent with natural resource management plans, including plans for exotic plant removal, shoreline erosion protection, and shoreline habitat restoration.

3.5.2.3 Non-Selected Compensatory Restoration Alternative

1. Natural Recovery: There is an interim loss associated with the bird injury. However, the birds that were lost are not replaced through natural recovery. Therefore, the Trustee could not select natural recovery as the compensatory restoration alternative.

3.5.2.4 Evaluation of Compensatory Restoration Options and Environmental Consequences

It is well recognized in the ecological sciences that wetland habitat contributes to the production of bird, fish and invertebrate biomass, which satisfies the goal of compensatory restoration. Wetland habitat restoration is likely to succeed as it has been successfully implemented throughout Florida. Wetlands, which are dominated by exotics, have less habitat value then those which are dominated by native species. While this project involves habitat restoration, the Trustee does not believe that this will cause collateral injury. Wetland restoration will benefit birds by providing higher quality and safer foraging, roosting and nesting habitat for seabirds. Wetland restoration is not expected to have any effects, positive or negative, on public health and safety.

Mangrove habitat creation can produce bird services by providing a source of bird food and nest sites; this alternative meets the restoration goals by providing the bird biomass that was lost.[7] As discussed under the water column injury, mangrove habitat creation is a well-developed,

[7] The amount of mangrove required to compensate for the bird impacts would be based on mangrove primary production that supports birds. Because a unit of primary production energy cannot support both birds and fish at the same time, mangrove restoration for the bird injury would be in addition to that required for the wetland injuries.

successful restoration technology. In addition, mangroves benefit a variety of resources without causing any collateral natural resource injury or impacting public health and safety. Also, mangrove creation is consistent with a variety of natural resource management plans, as mentioned above. To reiterate, mangrove creation generally costs around $30,000 per acre.

Based upon the above analysis, the Trustee selected further funding of the Martin County restoration projects.

3.5.2.5. Project Selection

Based upon the above analysis, the Trustee selected mangrove restoration as the compensatory restoration alternative. The wetlands component of the Martin County projects will compensate for the damaged natural resources from these incidents. This alternative has a documented record of success, is cost-effective, would replace the lost birds relatively quickly, and could indirectly benefit a range of other injured wildlife.

3.5.2.6. Restoration Scale

The Trustee used a service-to-service scaling method or Habitat Equivalency Analysis (HEA) to determine the bird compensatory restoration project scale. The same concepts of service-to-service scaling that were described earlier apply here as well. In this case, the size of the habitat project is selected so that the quantity of birds provided by the project is equivalent to the quantity of birds lost due to the injury (101 birds). The wetland project has to be 5,779 m^2 in size to compensate for the 101 birds lost in these incidents. This amount will be combined together with the wetlands injuries.

Conclusion. The enforcement program will have beneficial impacts on hatchling sea turtles. By removing artificial light sources that cause hatchlings to crawl away from the ocean upon emergence from their nests, usually to their deaths. The project will have collateral benefits on other nocturnal species that are hampered in their behavior, foraging or biorhythms by overly bright nighttime lights. The project is designed to replace approximately 1,100 hatchlings over a one year period.

The project is designed to replace approximately 1,100 hatchlings over one year, which is a fraction of a year's total hatchling production on southeast Florida beaches. Thus, though wholly beneficial, the impacts of these projects are not judged to be significant, as defined by NEPA.

4.1.3 Wetland, Bird, Fish and Invertebrate Injury: Mangrove Creation

Nature of likely impacts. These projects will result in restoration of intertidal areas heavily impacted by invasive species, into native mangrove habitat. Mangrove habitats are known for their support of fishery production (Yanez-Arancibia et al., 1980), and their importance to birds as foraging, roosting and nesting areas. The projects can also be implemented so as to avoid any adverse environmental impacts to surrounding aquatic habitats, through control of any runoff of sediments during removal of soil to convert uplands into intertidal habitat. Thus, these projects will result in a net improvement in natural resource services provision once implemented.

Effects on public health and safety. These projects will have no effects on public health and safety, adverse or beneficial.

Unique characteristics of the geographic area. The area of Hutchinson Island that will be affected by the mangrove project is not unique.

Controversial aspects of the project or its effects. The Trustee knows of no controversial aspects of the selected project. Removal of exotic species is a priority throughout the State of Florida, and mangrove habitats are appreciated for their contribution to recreational fisheries. Moreover, these projects will be implemented in a location where the only controversial aspect of mangrove habitats – blocking of residential views – will not be at issue.

Uncertain effects or unknown risks. There are no uncertain adverse effects or unknown adverse risks associated with these projects. Mangrove habitat creation is a long-established and successful technology and the Trustees have overseen several such projects in Florida.

Precedential effects of implementing the project. There are no precedential effects of implementing the project, as mangrove habitat restoration is commonly implemented throughout Florida.

Possible significant, cumulative impacts. There are no adverse impacts expected from this project. The project size is small in scale relative to the extent of mangrove habitat in the area and in the region, thus no significant cumulative impacts are foreseen.

Effects on National Historic Sites or nationally significant cultural, scientific or historic resources. There are no discovered National Historic Sites, or nationally significant cultural, scientific, or historic resources in the areas in which the project will be implemented. However, from historic preservation experts from south Florida advise that coastal zones can be rich in undiscovered artifacts and sites. The Federal Clean Water Act and State environmental permits required for this project will entail consulting with historic preservation experts to ensure that the digging involved in implementing these projects will ensure the protection and preservation of any historic or cultural resources found.

Effects on endangered or threatened species. The mangrove projects on Hutchinson Island will have no adverse impacts on endangered or threatened species except possibly to support endangered and threatened fish and bird species.

Violation of environmental protection laws. No environmental protection laws will be violated during the implementation of these projects. It is a requirement of the OPA NRDA regulations that restoration alternatives considered be capable of being implemented in compliance with all applicable laws and regulations.

Conclusion. These projects will beneficially restore intertidal habitat and convert upland habitat populated with invasive species into native intertidal mangrove habitat, thus enhancing the habitat's value for fishery and bird species. The project is small in scale, and thus its impacts are not judged to be significant, as defined by NEPA.

4.2 Coastal Zone Management Act

The broad purpose of the Coastal Zone Management Act, 16 U.S.C. § 1451 *et seq.* (CZMA), which is administered by NOAA, is to preserve, protect, develop, and where possible, to restore or enhance the resources of the Nation's coastal zone for this and succeeding generations. States that produce acceptable coastal zone management plans are provided with financial assistance and authorized to review Federal activities within the State's coastal zone to ensure that these actions are consistent with the State's program. The States' plans identify permissible land and water uses, and their associated impacts on the regulated coastal zone.

Activities funded, approved, or implemented by Federal agencies and which will have an impact on State coastal zones must be consistent with the State's Coastal Zone Management Program and in particular with "enforceable policies" identified in their management plans. A certification of consistency by the Federal project proponent, and a concurrence from the affected State is required, in general no later than 90 days before final Federal approval of the activity. Florida's Final Coastal Management Program Plan was approved by NOAA in 1981. The Department of Environmental Protection is the agency designated to conduct consistency reviews for the State of Florida; the Department of Community Affairs was designated agency until July 1, 2002.

The Trustee reviewed the Florida Coastal Management Program Plan and identified several enforceable policies that are applicable to some or all of the restoration actions. In analyzing these policies, consisting of chapters of the Florida Statutes, the Trustees will determine that the

restoration projects proposed in the Final DARP/EA are consistent with the FCMP. The Draft DARP/EA was submitted to various DEP programs for review and concurrence.

The Trustee's consistency analysis was related to the following relevant FCMP enforceable policies and their general purposes:

Chapter 161 FS – Beach and Shore Preservation: these provisions regulate construction, reconstruction, and other physical activity in the coastal zone, and regulate actions for protection and preservation of the coastal zone, particularly from erosion.

Chapter 253 FS – State Lands: these provisions regulate the acquisition of land by the State, and the management, conservation, protection, disposition, and use of State-owned lands. Florida DEP is mandated to regulate land use in order to assure the maximum benefit and use for the general public. The wetland project will be implemented on, or will affect the use of, State-owned lands. The project will remove invasive species and create habitat that is supportive of recreational fisheries production.

Chapter 258 FS – State Parks and Preserves: these provisions require the Division of Recreation and Parks to promote the State park system for the use, enjoyment and benefit of the people of Florida and for visitors.

Chapter 370 FS – Saltwater Fisheries: these provisions require Florida Fish and Wildlife Conservation Commission to administer, develop and conserve marine fishery resources of the State, including through the protection and enhancement of the marine and estuarine environments and water quality. These provisions recognize the importance of marine commercial and recreational fishing, and the importance of protecting and conserving sea turtles and their habitat. The wetland project was specifically selected to replace fishery resource production lost due to this incident.

Chapter 372 FS – Wildlife: these provisions implement the State policy of conservation and wise use of freshwater fish and wildlife species, with particular emphasis on endangered and threatened species. The wetland project, will further the policies of this chapter.

Chapter 375 FS – Outdoor Recreation and Conservation: the applicable provisions of this chapter concern public use and benefit, now and into the future, pertaining to public beaches.

Chapter 376 FS – Pollutant Discharge Prevention and Removal: the policies and goals of this chapter are highly similar to those of the Federal Oil Pollution Act under which this restoration plan was developed. These provisions prohibit the discharge of pollutants, including oil, into or upon any coastal water, estuary, tidal flat, beach or lands adjoining the seacoast. Among other things DEP is directed to recover damages resulting from pollution discharges, for use to restore damaged natural resources to pre-discharge conditions. These provisions authorize basing the measure of damages on the cost of

actions to restore injured resources when restoration is feasible. This Final DARP/EA is fully consistent with the provisions of this chapter.

Chapter 403 FS – Environmental Control: these provisions regulate routine or expected discharges of pollution into the air and waters of the State. Permits may be issued for discharges that do not unacceptably degrade water quality and if the project is in the public interest. These provisions regulate dredge and fill projects, which includes the wetland habitat creation project. Provisions of this chapter also recognize the importance of wetlands resources in the State, for their ecological, shore stabilization, and water quality functions.

Chapter 582 FS – Soil and Water Conservation: like other chapters of the Florida Statutes, these provisions are concerned with erosion and loss of soil resources in the State, and the impacts of soil erosion on water quality.

4.3 Endangered Species Act

The purpose of the Endangered Species Act, 16 U.S.C. § 1531 *et seq.*, is to achieve conservation of endangered and threatened species, and the ecosystems upon which such species depend. All projects funded by Federal agencies are required to insure that those activities are not likely to jeopardize the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of habitat designated as critical for such species, unless the agency is granted an exemption for the action. The Department of the Interior, through the Fish and Wildlife Service, has been delegated primary authority to oversee Federal compliance with the Endangered Species Act, though NOAA is delegated this responsibility for certain species including sea turtles when they are at sea.

If it is determined that a Federal threatened or endangered species may be in the action area of the project, the Trustee must consult with the Fish and Wildlife Service to ensure that implementing the project will not jeopardize the listed species. If the action agency demonstrates that the project does not constitute a "major construction activity," and the project will not adversely affect a listed species or its critical habitat, it submits a "no effect determination" to the Fish and Wildlife Service for its concurrence. If the project constitutes a major construction activity, then the action agency must prepare a biological assessment with a more in-depth evaluation of the potential effects of the project on the listed species, which may still lead to a no effect determination. If the project is likely to adversely affect either a listed species or its critical habitat, then more formal consultation procedures are required.

The Federally endangered West Indian manatee may occur in waters around the location of the wetland habitat creation project. Several species of threatened or endangered birds may use habitats adjacent to the location of the wetland restoration project. The wetland habitat creation project will create new habitat available for use by birds. The project can also be implemented outside of the nesting seasons of any of the listed species. The project is not expected to impact the West Indian Manatee, in that no measurable discharges of pollutants, including sediments, are anticipated in implementing the project.

The Trustee does not believe that any of its projects constitute major construction activities, and thus does not believe that a biological assessment is required to complete its Endangered Species Act consultation requirements. The Trustee believes that implementation of any of its restoration projects is not likely to have adverse effects on any Federal endangered or threatened species. Compliance with the provisions of this law will be addressed in the permitting process for the selected project.

4.4 Marine Mammal Protection Act

The Marine Mammal Protection Act, 16 U.S.C. § 1361 *et seq.*, is the principal Federal legislation for the protection of marine mammals. The Act recognizes the important role that marine mammals play in the ecosystem as well as their recreational and aesthetic value. The Act prohibits, with few exceptions, the taking or importing into the United States of marine mammals or their products. The Act defines "take" as "to harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill any marine mammal." The U.S. Fish and Wildlife Service and NOAA share responsibility for the management and conservation of these species. In order to comply with this Act, the Trustee will ensure that implementation of the mangrove habitat restoration project will not result in the take of West Indian manatees, by avoiding any measureable discharge of pollutants or sediments into adjacent waters that may be occupied or used by manatees.

4.5 Federal Water Pollution Control Act (Clean Water Act)

The FWPCA, 33 U.S.C. § 1251 *et seq*., was established to restore and maintain the chemical, physical and biological integrity of the Nation's waters. The Act sets a long-term goal of eliminating the discharge of pollutants into navigable waters, and an interim goal of attaining water quality that provides for the protection and propagation of fish, shellfish, and wildlife, as well as opportunities for water recreation. The FWPCA and its amendments comprise a complex set of programs and regulations for accomplishing the purposes of the Act, including, among other things, permit programs for discharges from facilities and other "point sources," specific discharge limitations for certain identified pollutants or categories of pollutants, provision for qualitative and quantitative water quality standards to be set by the States for their water bodies, and regulation of dredge and fill operations.

The Act's definitions of "pollutant," "discharge," and "fill" are so broad as to make the Act applicable to the wetland habitat creation project. In general terms, the Trustee or their contractor will be required to apply for a permit to discharge pollutants into the marine environment in order to implement this project. The permit will need to include a certification that the discharges involved will not violate any of the State's applicable water quality standards. Further, to comply with the Act's guidelines for dredge and fill projects, the Trustee will have to demonstrate that there is no practicable alternative to the project that will have less adverse impact on the aquatic ecosystem, that the discharges will not contribute to the significant degradation of the marine environment, and that the project will be performed to minimize potential adverse impacts.

Given their previous experience with implementing mangrove habitat creation projects, the trustee is confident that the restoration alternatives can be implemented in compliance with the FWPCA.

4.6 Rivers and Harbors Act

Provisions of the Rivers and Harbors Act (33 U.S.C. § 401 *et seq.*) that are applicable to the Trustee's restoration projects prohibit the creation of any obstruction not affirmatively authorized by Congress, to the navigable capacity of any of the waters of the United States. During permit application consultations with the Army Corps of Engineers required for compliance with the Clean Water Act, the Trustee will verify compliance with the requirements of the Rivers and Harbors Act.

4.7 Archaeological Resources Protection Act

The Archaeological Resources Protection Act, 16 U.S.C. § 470aa *et seq.*, was established for the purpose of protecting, for present and future generations of the American people, archaeological resources and sites on public lands, which include lands owned by the Federal government or Indian tribes. The Act prohibits any person, without a permit, from excavating, removing, damaging, altering, or defacing archaeological resources on or from public lands. The Act is administered by the Department of the Interior (DOI). The Trustee will verify compliance with the Act during the permitting process.

4.8 Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) - Essential Fish Habitat Assessment for Wetland Habitat Creation Project

The Magnuson-Stevens Act (16 U.S.C. § 1801 *et seq*.) as amended and reauthorized by the Sustainable Fisheries Act (Public Law 104-297) established a program to promote the protection of essential fish habitat (EFH) through the review of projects conducted under Federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. After EFH has been described and identified in fishery management plans by the respective regional fishery management councils, Federal agencies are obligated to consult with the Secretary of Commerce, acting through the National Marine Fisheries Service, with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that *may* adversely affect any EFH.

The South Atlantic Fishery Management Council ("SAFMC") is responsible for issuing fishery management plans and identifying EFH for areas including southeast Florida. Mangrove habitat is the only identifiable EFH that is relevant to the restoration project. The SAFMC has identified the following managed species that utilize mangrove habitat during one or more of their lifestages: sub-adult red drum, juvenile goliath grouper, post larval and juvenile gray snapper, juvenile mutton snapper, and adult white grunt.

The Trustee believes that there will be no adverse effects on mangrove EFH resulting from implementation of the wetland restoration project. This project will comprise removing invasive species, so as to recreate native mangrove. Thus, this project will result in only beneficial impacts, by creating additional essential fishery habitat.

4.9 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act, 16 USC § 661 *et seq.*, requires that agencies receiving Federal funds consult with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and State wildlife agencies for activities that result in the impoundment, diversion, channel deepening, or control or modification of any stream or water body, to minimize and mitigate any adverse effects on fish and wildlife resources and habitats. Impoundments of less than 10 acres of surface water are exempted from the consultation requirements. The wetland habitat creation project involves physical construction activity near surface waters, and this project will consist mainly of scraping down an upland area to create intertidal habitat elevations. Thus, it is unlikely that this project will involve impounding, diverting or other control or modification to surface waters. Even if temporary impounding surface waters were required in order to implement this project, it would likely involve far less than 10 acres of surface waters.

4.10 Fish and Wildlife Conservation Act

The Fish and Wildlife Conservation Act, 16 USC § 2901 et seq., encourages all agencies receiving Federal funds to use their statutory and administrative authorities to the maximum extent practicable and consistent with the agency's statutory responsibilities, to conserve and to promote the conservation of nongame fish and wildlife species and their habitats. The Trustee's wetland habitat creation project is expected to fully comply with this Act.

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Appendix A: **Florida Threatened and Endangered Species**

Species	**Federal Status**	**Habitat**
Florida panther Puma (=Felis) concolor coryi	E	High pine, Tropical hardwood hammock, Scrub, Maritime hammock, Mesic temperate hammock, Pine rockland, Scrubby flatwoods, Mesic pine flatwoods, Hydric pine flatwoods, Dry prairie, Wet prairie, Freshwater marsh, Seepage swamp, Pond swamp, Mangrove
Key deer *Odocoileus virginianus clavium*	E	Tropical hardwood hammock, Mesic temperate hammock, Pine rockland, Mesic pine flatwoods, Hydric pine flatwoods, Freshwater marsh, Mangrove, Saltmarsh
Key Largo cotton mouse *Peromyscus gossypinus allapaticola*	E	Tropical hardwood hammock
Key Largo woodrat *Neotoma floridana smalli*	E	Tropical hardwood hammock
Lower Keys rabbit *Sylvilagus palustris hefneri*	E	Beach dune/Coastal strand, Freshwater marsh, Mangrove, Saltmarsh
Puma (=Mountain lion) *Puma (=Felis) concolor*	T (S/A)	High pine, Tropical hardwood hammock, Scrub, Maritime hammock, Mesic temperate hammock, Pine rockland, Scrubby flatwoods, Mesic pine flatwoods, Hydric pine flatwoods, Dry prairie, Wet prairie, Freshwater marsh, Seepage swamp, Flowing water swamp, Pond swamp, Mangrove
Rice rat (=silver rice rat) *Oryzomys palustris natator (=O. argentatus)*	E (CH)	Freshwater marsh, Mangrove, Saltmarsh
Southeastern beach mouse *Peromyscus polionotus niveiventris*	T	Beach dune/Coastal strand
West Indian manatee *Trichechus manatus*	E (CH)	Mangrove, Seagrass, Nearshore reef
Audubon's crested caracara Polyborus plancus audubonii	T	Mesic temperate hammock, Mesic pine flatwoods, Hydric pine flatwoods, Dry prairie, Wet prairie
Bachman's warbler *Vermivora bachmanii*	E	Mesic temperate hammock, Flowing water swamp
Bald eagle *Haliaeetus leucocephalus*	T	High pine, Scrubby high pine, Maritime hammock, Mesic temperate hammock, Pine rockland, Scrubby flatwoods, Mesic pine flatwoods, Hydric pine flatwoods, Dry prairie, Wet prairie, Freshwater marsh, Seepage swamp, Flowing water swamp, Pond swamp, Mangrove, Saltmarsh
Cape Sable seaside sparrow *Ammodramus(=Ammospiza) maritimus mirabilis*	E (CH)	Wet prairie, Freshwater marsh
Everglade snail kite *Rostrhamus sociabilis plumbeus*	E (CH)	Hydric pine flatwoods, Freshwater marsh, Pond swamp

Florida grasshopper sparrow *Ammodramus savannarum floridanus*	E	Dry prairie, Wet prairie
Florida scrub-jay *Aphelocoma coerulescens*	T	Scrub, Scrubby flatwoods
Ivory-billed woodpecker *Campephilus principalis*	E	Mesic temperate hammock, Seepage swamp, Flowing water swamp, Pond swamp
Kirtland's warbler *Dendroica kirtlandii*	E	Tropical hardwood hammock, Scrub, Scrubby high pine, Beach dune/Coastal strand, Maritime hammock, Mesic temperate hammock, Pine rockland, Scrubby flatwoods, Mesic pine flatwoods, Hydric pine flatwoods, Seepage swamp, Flowing water swamp, Pond swamp
Piping plover *Charadrius melodus*	T	Beach dune/Coastal strand, Nearshore reef
Red-cockaded woodpecker *Picoides (= Dendrocopos) borealis*	E	High pine, Mesic pine flatwoods, Hydric pine flatwoods
Roseate tern *Sterna dougallii dougallii*	T	Beach dune/Coastal strand, Saltmarsh, Seagrass, Nearshore reef
Whooping crane *Grus americana*	XN	Dry prairie, Wet prairie, Freshwater marsh
Wood stork *Mycteria americana*	E	Hydric pine flatwoods, Wet prairie, Freshwater marsh, Seepage swamp, Flowing water swamp, Pond swamp, Mangrove, Saltmarsh, Seagrass
American alligator *Alligator mississippiensis*	T (S/A)	Hydric pine flatwoods, Wet Prairie, Freshwater marsh, Seepage swamp, Pond Swamp, Mangrove, Hydric pine flatwoods, Wet prairie, Seepage swamp, Flowing water swamp, Pond swamp
American crocodile *Crocodylus acutus*	E (CH)	Mangrove, Seagrass
Atlantic salt marsh snake *Nerodia clarkii (=fasciata) taeniata*	T	Saltmarsh
Bluetail (=blue-tailed) mole skink *Eumeces egregius lividus*	T	High pine, Scrub
Eastern indigo snake *Drymarchon corais couperi*	T	High pine, Tropical hardwood hammock, Scrubby high pine, Beach dune/Coastal strand, Maritime hammock, Mesic temperate hammock, Pine rockland, Scrubby flatwoods, Mesic pine flatwoods, Hydric pine flatwoods, Dry prairie, Cutthroat grass, Freshwater marsh, Seepage swamp, Flowing water swamp, Pond swamp, Mangrove
Green sea turtle *Chelonia mydas (incl. Agassizi)*	E	Beach dune/Coastal strand, Seagrass, Nearshore reef
Hawksbill (=carey) sea turtle *Eretmochelys imbricata*	E	Beach dune/Coastal strand, Seagrass, Nearshore reef

Kemp's (=Atlantic) ridley sea turtle *Lepidochelys kempii*	E	Beach dune/Coastal strand, Seagrass, Nearshore reef
Leatherback sea turtle *Dermochelys coriacea*	E	Beach dune/Coastal strand, Seagrass, Nearshore reef
Loggerhead sea turtle *Caretta caretta*	T	Beach dune/Coastal strand, Seagrass, Nearshore reef
Sand skink *Neoseps reynoldsi*	T	High pine, Scrub
Highlands tiger beetle *Cicindela highlandensis*	C	Scrub
Schaus swallowtail butterfly Heraclides (= Papilio) aristodemus ponceanus	E	Tropical hardwood hammock
Stock Island tree snail *Orthalicus reses* (not incl. *nesodryas*)	T	Tropical hardwood hammock
Avon Park harebells *Crotalaria avonensis*	E	Scrub
Beach jacquemontia *Jacquemontia reclinata*	E	Beach dune/Coastal strand
Beautiful pawpaw *Deeringothamnus pulchellus*	E	Mesic pine flatwoods, Hydric pine flatwoods
Big Pine partridge pea *Chamaecrista lineata var. keyensis*	C	Pine rockland
Blodgett's silverbush *Arygythamnia blodgettii*	C	Tropical hardwood hammock, Pine rockland
Britton's beargrass *Nolina brittoniana*	E	High pine, Scrub, Scrubby high pine, Scrubby flatwoods
Cape Sable thoroughwort *Chromolaena frustrata*	C	Tropical hardwood hammock, Pine rockland
Carter's mustard *Warea carteri*	E	High pine, Scrub, Scrubby high pine, Scrubby flatwoods, Mesic pine
Crenulate lead-plant *Amorpha crenulata*	E	Pine rockland
Deltoid spurge *Chamaesyce(=Euphorbia) deltoidea ssp. deltoidea*	E	Beach dune/Coastal strand, Pine rockland
Florida bonamia *Bonamia grandiflora*	T	High pine, Scrub, Scrubby high pine

Florida brickell-bush *Brickellia mosieri*	C	Pine rockland
Florida golden aster *Chrysopsis (=Heterotheca) floridana*	E	Scrub
Florida perforate cladonia *Cladonia perforata*	E	Scrub
Florida pineland crabgrass *Digitaria pauciflora*	C	Pine rockland, Freshwater marsh, Seepage swamp
Florida ziziphus *Ziziphus celata*	E	High pine, Scrub
Florida's semaphore cactus *Opuntia corallicola*	C	Tropical hardwood hammock, Beach dune/Coastal strand
Four-petal pawpaw *Asimina tetramera*	E	Scrub
Fragrant prickly-apple *Cereus eriophorus var. fragrans*	E	Scrub, Scrubby flatwoods
Garber's spurge *Chamaesyce(=Euphorbia) garberi*	T	Pine rockland
Garrett's mint *Dicerandra christmanii*	E	High pine, Scrub, Scrubby high pine
Highlands scrub hypericum *Hypericum cumulicola*	E	Scrub
Johnson's seagrass Halophila johnsonii	T	Seagrass
Key tree-cactus *Pilosocereus (=Cereus) robinii*	E	Tropical hardwood hammock
Lakela's mint *Dicerandra immaculata*	E	Scrub
Lewton's polygala *Polygala lewtonii*	E	High pine, Scrub, Scrubby high pine
Okeechobee gourd *Cucurbita okeechobeensis ssp. Okeechobeensis*	E	Freshwater marsh, Pond swamp
Papery whitlow-wort *Paronychia chartacea(=Nyachia pulvinata)*	T	High pine, Scrub
Pigeon wings *Clitoria fragrans*	T	High pine, Scrub, Scrubby high pine, Scrubby flatwoods

Pineland sandmat *Chamaesyce ssp. pinetorum*	C	Pine rockland
Pygmy fringe-tree *Chionanthus pygmaeus*	E	Scrub, Scrubby high pine
Sand Flax *Linum arenicola*	C	Pine rockland
Sandlace *Polygonella myriophylla*	E	Scrub, Scrubby high pine
Scrub blazing star *Liatris ohlingerae*	E	High pine, Scrub, Scrubby flatwoods
Scrub buckwheat *Eriogonum longifolium var. gnaphalifolium*	T	High pine, Scrub, Scrubby high pine
Scrub lupine *Lupinus aridorum*	E	Scrub
Scrub mint *Dicerandra frutescens*	E	High pine, Scrub, Scrubby high pine
Scrub plum *Prunus geniculata*	E	High pine, Scrub, Scrubby high pine
Short-leaved rosemary *Conradina brevifolia*	E	High pine, Scrub
Small's milkpea *Galactia smallii*	E	Pine rockland
Snakeroot *Eryngium cuneifolium*	E	Scrub
Tiny polygala *Polygala smallii*	E	High pine, Scrub, Pine rockland, Scrubby flatwoods
Wedge spurge *Chamaesyce deltoidea ssp. serpyllum*	C	Pine rockland
Wide-leaf warea *Warea amplexifolia*	E	High pine
Wireweed *Polygonella basiramia(=ciliata var. b.)*	E	Scrub

E = Endangered
T = Threatened
T (S/A) = Similarity of Appearance to a Threatened Taxon
E (CH) = Endangered, Critical Habitat Designated
XN = Experimental Population, Non-Essential
C = Candidate Taxon, Ready for Proposal

Appendix B: Estimation of Natural Resource Damages for 23 Florida Cases Using Modeling of Physical Fates and Biological Injuries; Volume I: Description of Approach and Methods (French-McCay, et al., 2003). See Section 1.6

Appendix C: Estimation of Natural Resource Damages for 23 Florida Cases Using Modeling of Physical Fates and Biological Injuries; DEP Volumes XII - XVIII (French-McCay, et al., 2003). See Section 1.6

APPENDIX D: SE Project Solicitation List (SE Region for NPFC Claim)

South Florida Water Management District

St Lucie County
Fran Worth 772-288-5502.

Martin County
Gina Paduano PhD Environmental Lands Administrator. 772-288-5476

Kathy Fitzpatrick, P.E Coastal Engineer. 772-288-5927.

Palm Beach County
Carly Pfistner Environmental Coordinator. 561-233-2519.

Paul Davis 561-233-2509
Palm Beach County.

David Carson Environmental Analyst 561-233-2442.
Lake Worth Lagoon

Broward County
Lou Fisher. Environmental Manager (Coastal Resources). 954-519-1255

Jenny Walsh
City of Deerfield Beach
954-480-4236.

Appendix E: List of Proposals

Martin County
Artificial reef construction using railroad ties.
Proposal 2 sets of patch reef
Status Cost of Project $85,000
Funded $25,00 by FWC
Matching funds $25,000
Funds needed from NRDA $35,000
Complete grant proposal partially funded NRDA funds would be used for second reef.

Turtle lighting in public parks
Proposal Install turtle friendly lighting to reduce disorientation of hatchlings
Status: Cost estimates for lighting in place complete proposal available
This project has been funded however since costs are known NRDA funds could be used to install lighting at other turtle habitats using template and cost estimates.

Proposal: Hutchinson Island Exotic Removal Project: Removal of exotics, most notably Australian pine and Brazilian Pepper, from approximately 117 acres on Hutchinson Island bordering the Indian River Lagoon. The original estimate of the project cost was $100,000, but after securing cost estimates this figure is too low and $200,000 would be more appropriate. We would match these funds with re-vegetation of the area. The area consists largely of mangrove forest habitat and disturbed uplands. Removal of the exotics would significantly improve wading and migratory bird habitat, in addition to benefiting other native plants and wildlife.
Status Cost of Project: $200,000
Funding: Not Funded

Palm Beach County
Lighting Enforcement
Status Cost $72,190 (for 3 years) $24,063
Restoration funds will be used to create two new positions for Palm Beach County, which are above and beyond current staffing levels for conducting sea turtle compliant lighting surveys along the county's sea turtle nesting beach shoreline. At present, these positions do not exist in the county's staff, and the creation of such positions will allow for increased sea turtle hatchling protection during the nesting seasons for the duration of the project's funding (three years). Palm Beach County will accept one year funding for positions and provide supporting documentation of project effectiveness.
Funding Status: Proposed for Mystery Spill not funded.

Broward County
In water turtle surveys
Proposal study the abundance and distribution of marine turtles in near shore reef habitats before and after beach re-nourishment.
Status: cost of project $28,000
Funding: Proposal sent to FWC not funded at this time
Complete grant proposal in hand since focus is on beach re-nourishment NRDA funds may not apply except in the cases of beach enjoyment

Deerfield Beach Turtle Lighting
Proposal, Install turtle friendly street lighting for Deerfield Beach to reduce hatchling disorientation.
Status: Cost of Project unknown Deerfield currently working out numbers should have proposal out mid December. Project was being put together for grant funding but missed NOV 15 deadline.
Currently not funded

Other Broward. Turtle lighting for Pompano
Status: Still in planning stages may not be ready before deadline.

Dune Restoration. Ft Lauderdale currently restoring dunes NRDA funds could sponsor additional projects.

Appendix F: Project Selection Spreadsheet