



# **A SUMMARY OF EMERGENT VEGETATION HABITAT COVERAGE DATA FOR TAMPA BAY**

**FINAL REPORT**

**August 2000**



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Prepared for:

## **Tampa Bay Estuary Program**

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# 1 INTRODUCTION

The Comprehensive Conservation and Management Plan (CCMP) of the Tampa Bay National Estuary Program (TBNEP) established the plan to restore the bay-wide proportions of emergent vegetation habitat types to that present in the 1950's. Emergent vegetation habitats are critical for many of the bay's important biological resources, are important components of the nutrient cycle, and play a role in shoreline stabilization. The TBNEP plan includes restoration of the ratio of emergent vegetation habitat types and preservation of existing salt marshes and mangroves. Emergent vegetation habitat losses since 1950 are due to a variety of factors, including dredge and fill projects (Lewis, 1977; Estevez and Mosura, 1985; Lewis et al., 1985; Haddad, 1989). To address the issue of emergent vegetation habitat loss, an emergent habitat protection and restoration plan was developed (Lewis Environmental and Coastal Environmental, 1996). The target was to re-establish the relative proportions of the various emergent vegetation habitat types to those proportions observed in 1950. A secondary goal was to minimize the loss of 1990 emergent vegetation habitat.

## 1.1 Objectives

This report is an element of the data review and analysis performed by the Estuary Program to determine the status of emergent vegetation restoration as a result of management activities in Tampa Bay. This report examines the areal extents of emergent vegetation habitat types in Tampa Bay for 1990 and 1995, and compares these extents to those found in 1950. The specific objectives of this report are to provide an analysis of changes in emergent vegetation habitat areal extent, both bay-wide and by bay segment, and to assess progress towards the TBNEP emergent vegetation habitat goals. Figure 1 displays a location map for the bay, including the bay segments.

## 1.2 Importance of Emergent Vegetation Habitat in Tampa Bay

Emergent vegetation habitats are critical for recreationally and commercially important fish, shrimp, and shellfish, including pink shrimp, menhaden, blue crabs, mullet, red drum, tarpon, and snook (Haddad, 1989). These habitats are also important as feeding, nesting, and roosting areas for many avian species, including pelicans, cormorants, herons, ibises, roseate spoonbills, and reddish egrets. Emergent vegetation habitats also serve to improve water quality by filtering runoff and stabilizing shorelines, and are important components of the energy and nutrient cycling in coastal environments.

There are three functional emergent vegetation habitat types in Tampa Bay:

- Mangrove-Spartina Marsh,
- *Juncus* Marsh, and
- Salt Barrens.

Mangrove-Spartina Marshes contain a mix of mangrove species, including *Rhizophora mangle* L. (red mangrove), *Avicennia germinans* L. (black mangrove), *Laguncularia racemosa* Gaertn. f. (white mangrove), and *Conocarpus erecta* L. (buttonwood). This emergent vegetation habitat type includes the fringe of *Spartina alterniflora* (cordgrass) often found in association with mangroves. *Juncus* Marshes are dominated by *Juncus roemerianus* Scheele (black needlerush). Salt Barrens are normally found at higher elevations than Mangrove-Spartina Marshes and *Juncus* Marshes, and contain highly saline substrate.

Mangrove-Spartina Marshes in Tampa Bay are normally found within the 15-28 ppt salinity zone, classified as the polyhaline zone by Bulger et al. (1990). *Spartina alterniflora* often acts as the pioneer species of newly available substrates. The cordgrass reduces wave energy and encourages settling of sediments. The accumulation of sediments allows the establishment of mangroves, which eventually dominate the substrate (Davis 1940; Lewis and Dunstan, 1976; Lewis 1982a, 1982b). Functionally, Mangrove-Spartina Marshes stabilize shorelines, provide fisheries habitat, and are a source of detritus for estuarine food chains.

*Juncus* Marshes are found within the 2-19 ppt salinity zone in Tampa Bay, classified as oligohaline and mesohaline by Bulger et al. (1990). *Juncus roemerianus* is the major emergent vegetation component in this salinity zone. *Juncus* Marshes are in the transition zone between freshwater and high-salinity environments, and provide input to estuarine food chains and function as nursery areas for estuarine species (Haddad, 1989).

Salt Barrens are found at the upper limits of the tidal reach, and are only inundated during very high tidal events. When the tide recedes, salt water remains trapped in the barren. The water eventually evaporates, resulting in highly saline substrate. Salt Barrens are sparsely vegetated, but do provide habitat suitable for salt tolerant plants, such as glasswort (*Salicornia virginica*), saltwort (*Batis maritima*), keygrass (*Monanthocloe littoralis*), saltgrass (*Distichlis spicata*), sea purslane (*Sesuvium portulacastrum*), sea oxeye daisy (*Borrchia frutescens*), and sea lavender (*Limonium carolinianum*) (Schomer et al., 1990; Carlton, 1975).

### **1.3 Establishing the Emergent Vegetation Habitat Goal for Tampa Bay**

The Tampa Bay Master Plan for Habitat Protection and Restoration seeks to restore habitats important to the health of the Tampa Bay ecosystem, including emergent vegetation habitats (TBNEP, 1996). The Master Plan goals are based on the needs of key faunal guilds, each guild representing a group of animals with similar habitat requirements. Three of the habitats addressed in the plan are saltwater emergent wetland vegetation habitats: Mangrove-Spartina Marshes, *Juncus* Marshes, and Salt Barrens.

To restore the historical balance of the emergent wetland vegetation habitats in Tampa Bay, it was necessary to define a desirable, yet attainable, quantitative goal. Specifically, a benchmark condition was needed to define this goal. After review of a number of

alternatives, the 1950 time period was identified as representing a set of habitat conditions that were both desirable and attainable. The areal coverage of the 1950 emergent vegetation habitats was developed using data collected by the Florida Department of Natural Resources (FDNR) and the U.S. Fish and Wildlife Service (USFWS). Land cover, including emergent vegetation habitat, was mapped from 1:24,000-scale color photography, and obtained in digital form from the FDNR. Seagrass meadows were mapped from 1:24,000-scale color photography, and obtained in digital form from the FDNR. A GIS coverage of the data was created, and horizontally rectified to geographically coincide with mapped data for the time period (Janicki et al., 1995).

The 1950 land use coverage included several emergent habitat types, including:

- mangrove,
- marsh/mangrove,
- saltmarsh,
- flats/beach, and
- vegetated flats.

Three emergent vegetation types were defined from the 1950 habitat coverage: Mangrove-*Spartina* Marsh, *Juncus* Marsh, and Salt Barren. Mangrove-*Spartina* Marsh was defined as the 1950 mangrove emergent vegetation type. *Juncus* Marsh was defined as the sum of the marsh/mangrove and saltmarsh emergent vegetation types from the 1950 coverage. Salt Barren was defined as the sum of the flats/beach and vegetated flats emergent vegetation types from the 1950 coverage, with modifications to remove those areas not considered to be representative of Salt Barrens (Lewis Environmental and Coastal Environmental, 1996). The historical proportions of Mangrove-*Spartina* Marsh : *Juncus* Marsh : Salt Barren were 67:28:5 (Lewis Environmental and Coastal Environmental, 1996).

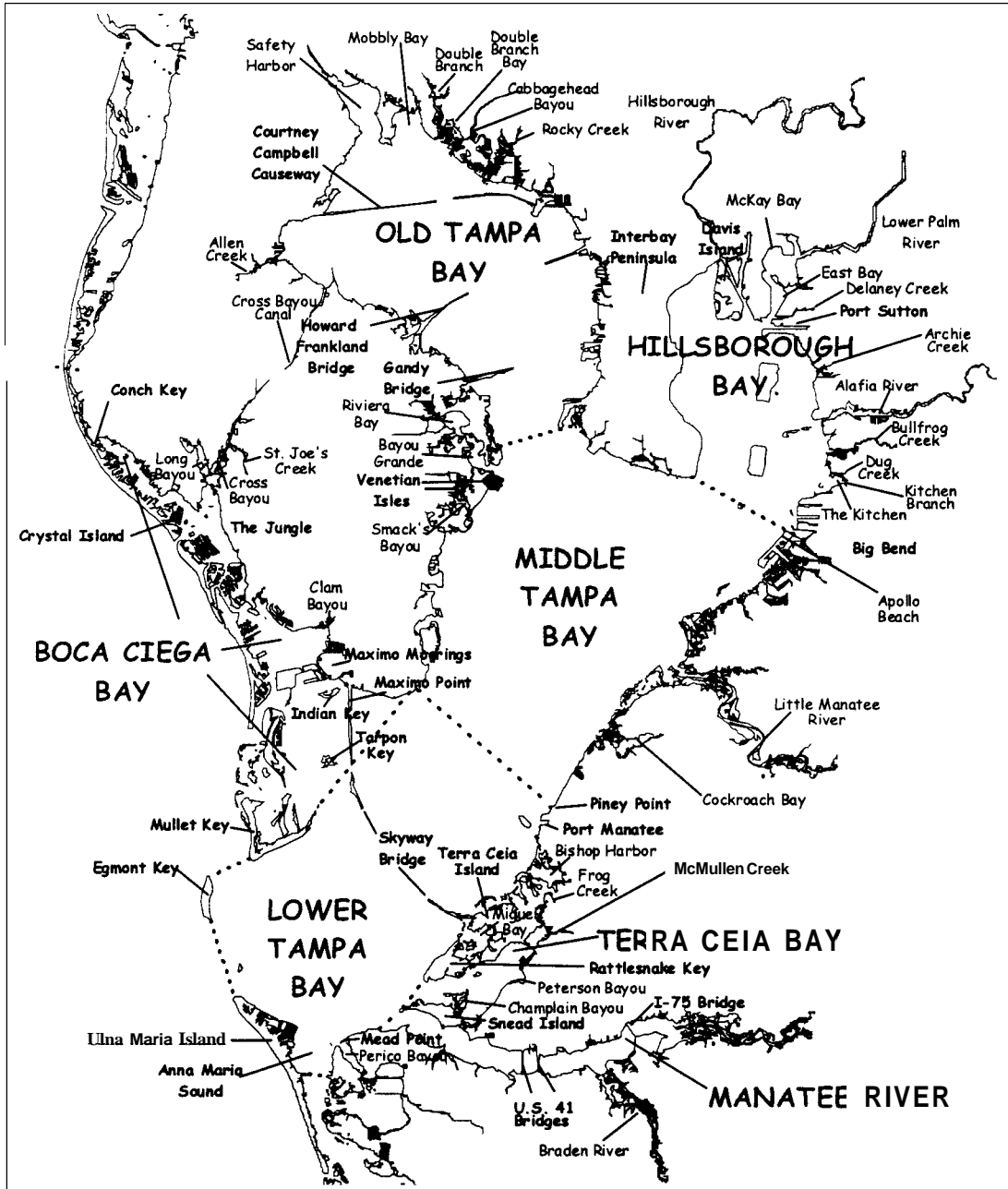


Figure 1. Tampa Bay segments and locations.



## 2 METHODS

The assessment of progress towards the emergent habitat goal for Tampa Bay requires coverages for the benchmark time period and for succeeding time periods. The 1950 emergent habitat coverage provides the benchmark against which comparisons are made (Lewis Environmental and Coastal Environmental, 1996), as described above. Aerial photography of land cover in the bay has been gathered every five years since 1990, resulting in land use coverages for 1990 and 1995. To develop GIS coverages from the aerial photography, the SWFWMD analyzed the photos using zoom transfer methodology registered to U.S. Geological Survey (USGS) 7.5-minute quadrangles. The minimum mapping unit for uplands was 5 meters, and for wetlands 0.5 meters.

For the 1990 time period, the Salt Barren habitat coverage was delineated using 1:24,000-scale color aerial photography produced under contract to SWFWMD for use in their bi-annual seagrass survey (Janicki et al., 1995). Hard-copy contact prints were interpreted and polygons representing possible Salt Barren habitat were manually drawn on velum overlays. Groundtruthing of a subset of the delineated polygons was conducted in February of 1993, and the velum overlays were subsequently amended, as appropriate (Janicki et al., 1995).

A GIS coverage of the Salt Barren polygons was created by scanning the velum overlay produced for each contact print, and then electronically merging the scanned images (Janicki et al., 1995). At least three match points were marked on each velum overlay and, once scanned, the match points were digitally aligned. The aligned images were then electronically merged into a single file resulting in a rectified composite of the numerous scanned velum overlays. This coverage was subsequently used to calculate acreage totals of Salt Barren habitat for the 1990 time period (Janicki et al., 1995).

The 1995 Salt Barren coverage was created using rectified digital photo ortho-quads for Tampa Bay obtained from the 1995 SWFWMD aerial photography used for development of the SWFWMD land use coverages. The 1995 land use coverage does not contain a land use category corresponding to Salt Barrens. The 1995 Salt Barren coverage was delineated by interpretation of signatures corresponding to Salt Barrens. The coverage was then field checked for accuracy, with modifications made to the coverage as a result of the field survey.

It should be noted that the method used to delineate the 1990 Salt Barren habitat had several limitations with regard to accuracy and precision. First, the 1990 aerial photography was only available in hard copy contact print format. Secondly, the 1:24,000-scale resolution was barely adequate to discern Salt Barren habitat polygons, given that the areas containing Salt Barrens are typically small and discontinuous. In addition, at this scale the manual delineation of polygons on velum overlays typically involved the lumping of numerous small polygons into a single larger polygon due to limitations of the line width of the pen used for the delineation. Thirdly, the scanned polygons typically needed to be

electronically “smoothed” to remove the irregularities associated with the pen line. Finally, the electronic merging of the numerous scanned images likely introduced some distortion to the composite file, resulting in a relatively crude horizontal rectification. For these reasons, the method employed for the 1995 Salt Barren habitat delineation is considered to be superior to the 1990 method.

Due to the difference in methods used to delineate Salt Barrens for 1990 and 1995, the Salt Barren coverages are not strictly comparable. This difference in methods also results in the other emergent wetland categories not being strictly comparable, since the Salt Barren polygons were normally found included as part of other emergent wetland categories.

The 1950, 1990, and 1995 coverages containing the emergent vegetation habitat types can be found on the CD accompanying this report. For the 1990 and 1995 coverages, the SWFWMD land use codes used to identify the emergent vegetation habitat types are 6120 for Mangrove-*Spartina* Marsh and 6420 for *Juncus* Marsh, corresponding to the SWFWMD designations for Mangrove Swamps and Saltwater Marshes, respectively. Salt Barrens delineated as part of this project are identified by the attribute “Saltb type”, which has a value of 6512 for Salt Barrens. Salt Barrens were delineated in some areas identified by the SWFWMD coverages by land use codes 6120 and 6420; where this occurs, the emergent vegetation habitat type is Salt Barrens. Groundtruthing of emergent vegetation habitat types was only performed for Salt Barrens delineated for the 1990 and 1995 emergent vegetative habitat coverages.

### 3 RESULTS

As described above, different methods were used to arrive at the 1950, 1990, and 1995 emergent vegetation habitat datasets. These differences can influence the comparability of the habitats among years. However, with this caveat expressed, comparisons are made among total bay-wide emergent vegetation habitat acreages for 1950, 1990, and 1995.

#### 3.1 Bay-wide Summary Of Trends

Emergent vegetation habitats covered approximately 23,890 acres in Tampa Bay during the 1950 baseline period. Of this total, approximately half was found in Old Tampa Bay and Middle Tampa Bay (5,280 acres and 7,740 acres, respectively). The remainder was found in Lower Tampa Bay (3,360 acres), Boca Ciega Bay (2,430 acres), the Manatee River (2,210 acres), Hillsborough Bay (1,910 acres), and Terra Ceia Bay (950 acres). The following figures present maps of the emergent habitat areas: Figure 2 – 1950, Figure 3 – 1990, and Figure 4 – 1995. ArcView coverages of emergent vegetation habitat for 1950, 1990, and 1995 are available on the accompanying CD.

The estimated emergent vegetation habitat acreage in Tampa Bay in 1990 was approximately 18,760 acres (Table 1). In 1995, emergent habitats covered approximately 19,520 acres (Table 1). The acreages presented in tabular format in this report are rounded to the nearest 10 acres.

Year	Emergent Habitat Acreage	Net Change Since 1950	Net Change Since 1990
1950	23,890	—	—
1990	18,760	-5,130	—
1995	19,520	-4,370	+760

The bay-wide acreages for each emergent vegetation type are shown by year in Table 2. The estimated proportions of Mangrove-*Spartina* Marsh : *Juncus* Marsh : Salt Barren are:

- 1950 - 67:28:5
- 1990 - 73:22:5
- 1995 - 76:22:2.

Year	Mangrove-Spartina Marsh (Net Change Since 1990)	Juncus Marsh (Net Change Since 1990)	Salt Barren (Net Change Since 1990)
1950	15,890	6,620	1,370
1990	13,760	4,120	880
1995	14,730 (+ 970)	4,340 (+ 220)	450 (-430)

### 3.2 Bay Segment Summary of Historical Trends

The greatest net declines in emergent vegetation habitat acreage between 1950 and 1990 occurred in Middle Tampa Bay (approximately 1,410 acres) and Boca Ciega Bay (approximately 1,220 acres). Emergent vegetation habitat acreage also experienced a net decline in all other bay segments, with estimated net decreases of 650 acres in Hillsborough Bay, 630 acres in Lower Tampa Bay, 530 acres in Old Tampa Bay, 450 acres in the Manatee River, and 230 acres in Terra Ceia Bay (Table 3).

**Table 3. Bay segment total emergent vegetation habitat acreage estimates for each period.**

	1950	1990	1995
Old Tampa Bay	5,280	4,750	4,790
Hillsborough Bay	1,910	1,260	1,360
Middle Tampa Bay	7,740	6,330	6,730
Lower Tampa Bay	3,360	2,730	2,730
Boca Ciega Bay	2,430	1,210	1,270
Terra Ceia Bay	950	720	850
Manatee River	2,210	1,760	1,790

Between 1990 and 1995, there was an estimated net increase in emergent vegetation habitat acreage in Tampa Bay (Table 3). Some of this net increase may be due to habitat restoration efforts, and some to natural increases in habitat extents. At the time of this report, the GIS coverages of existing and proposed habitat restoration sites are being revised and updated. The existing projects database is displayed in Appendix A and the proposed projects database in Appendix B. At this time, however, these data are not finalized for use in estimation of emergent vegetation habitat restoration acreage.

Many of the differences found between the 1990 and 1995 emergent vegetation habitat acreages may be due to the different measurement methods employed in the 1990 and 1995 emergent vegetation habitat estimations, as described above. However, as these data are the best available, they are utilized here to describe the trends in emergent vegetation habitat coverage by bay segment.

## Old Tampa Bay

1950 - Emergent habitat coverage in the Old Tampa Bay segment during the 1950 baseline period was extensive, covering the entire shoreline with the exception of some parts of the northwestern portions of the segment. Only small areas of emergent habitat were found in Safety Harbor, and along the shoreline between the mouth of Safety Harbor and the western end of the Courtney Campbell Causeway. The total emergent habitat acreage for the segment was approximately 5,280 acres in 1950.

Mangrove-Spartina Marsh - Most of this habitat type in the Old Tampa Bay segment was found along the southwestern shoreline of the bay, from Allen Creek southward to Riviera Bay. Mangrove-Spartina Marshes were almost continuous along the eastern side of Old Tampa Bay from Rocky Creek south to the eastern end of the Candy Bridge. This habitat type covered approximately 3,320 acres in Old Tampa Bay.

*Juncus* Marsh - Most of the *Juncus* Marshes in Old Tampa Bay were found in the northeastern portion of the bay, from Double Branch to Rocky Creek. Smaller *Juncus* Marshes were found at the head of Safety Harbor, in Allen Creek, and south of the Candy Bridge. *Juncus* Marsh acreage in Old Tampa Bay totaled approximately 1,450 acres.

Salt Barren - Most of the Salt Barrens in this segment were located inshore of the Mangrove-Spartina Marshes along the southwestern shore of the Old Tampa Bay, and inshore of the Mangrove-Spartina Marshes and *Juncus* Marshes along the northern and northeastern portions of Old Tampa Bay. Smaller Salt Barrens were found along the eastern shoreline, from the Courtney Campbell Causeway south to the mouth of Old Tampa Bay. Salt Barrens covered approximately 520 acres in the segment.

1990 - By 1990, estimated net decreases in emergent habitat areal extent of approximately 530 acres had occurred in Old Tampa Bay, leaving only 4,750 acres in the segment. Some of the areas showing the greatest net declines included the eastern shoreline of Old Tampa Bay, where dredging and filling had occurred. For similar reasons, emergent habitat areal extent had also decreased along the western shoreline of the segment, especially north of the Howard Frankland Bridge.

Mangrove-Spartina Marsh - The southwestern shore of Old Tampa Bay contained the majority of the 1990 Mangrove-Spartina Marsh habitat in the segment, although some 1950 habitat had been lost to filling for housing and for the Howard Frankland Bridge. North of the eastern end of the Courtney Campbell Causeway, the landward extent of the 1950 Mangrove-Spartina Marsh had been reduced due to filling as well. The 1950 Mangrove-Spartina Marsh habitat along the eastern shore of Old Tampa Bay, between the eastern end of the Courtney Campbell

Causeway and the Gandy Bridge, was almost entirely absent by 1990, probably as a result of fill activities. In 1990, Mangrove–Spartina Marsh covered an estimated 3,450 acres in Old Tampa Bay, a net decrease of 130 acres since 1950.

*Juncus* Marsh – As in 1950, the 1990 *Juncus* Marsh habitat in Old Tampa Bay was found primarily along the northeastern shoreline of the segment, between Double Branch and Rocky Creek. Since 1950, however, a large portion of the *Juncus* Marsh habitat between Cabbagehead Bayou and Rocky Creek had been converted to Mangrove–Spartina Marsh habitat. *Juncus* Marsh habitat covered an estimated 1,150 acres in 1990, a net decrease of 300 acres from the 1950 coverage.

Salt Barren – In 1990, areas of Salt Barren habitat were found in the northern portion of the Old Tampa Bay segment, landward of the Mangrove–Spartina Marsh habitat and *Juncus* Marsh habitat of Mobbly Bay and Double Branch Bay. There were no longer any Salt Barrens inshore of the large areas of Mangrove–Spartina Marsh in the southwestern part of the segment, or along the eastern shore. Salt Barren acreage had declined from an estimated 520 acres in 1950 to an estimated 150 acres by 1990.

1995 – Between 1990 and 1995, emergent habitat coverage in Old Tampa Bay showed a net increase of an estimated 40 acres, to a total of approximately 4,790 acres.

Mangrove–Spartina Marsh – Mangrove–Spartina marsh habitat acreage in the Old Tampa Bay segment experienced a net increase of an estimated 130 acres between 1990 and 1995. This net increase in acreage was most evident south of the eastern end of the Gandy Bridge, near the mouth of Old Tampa Bay. Mangrove–Spartina marsh habitat covered approximately 3,580 acres in the Old Tampa Bay segment.

*Juncus* Marsh – An estimated net decrease of 30 acres in *Juncus* Marsh habitat areal extent in the Old Tampa Bay segment occurred between 1990 and 1995. Some of the *Juncus* Marsh habitat between the eastern ends of the Courtney Campbell Causeway and the Howard Frankland Bridge had been converted to Mangrove–Spartina Marsh habitat. Along the eastern shore of Double Branch Bay, some 1990 Mangrove–Spartina Marsh habitat areas were classified as *Juncus* Marsh habitat in 1995. *Juncus* Marsh habitats covered an estimated 1,120 acres in 1995 in the Old Tampa Bay segment.

Salt Barren – In 1995, Salt Barrens as delineated from the SWFWMD photo orthoquads covered an estimated 60 acres less than those delineated from the 1990 aerial photography. Salt Barrens in 1995 were found inshore of the Mangrove–Spartina Marsh habitats between the western end of the Gandy Bridge and the Cross Bayou Canal, where no Salt Barrens were delineated in 1990. The Salt Barrens delineated for 1990 around Mobbly Bay and Double Branch Bay were also delineated from the 1995 photo orthoquads, but were greatly reduced in size compared to the 1990 Salt Barrens. In 1995, additional small Salt Barrens were found north and south of

the eastern end of the Courtney Campbell Causeway, and south of the eastern end of the Gandy Bridge.

Table 4 summarizes the emergent vegetation habitat acreage data for Old Tampa Bay. From 1950 to 1990, emergent habitat acreage in Old Tampa Bay experienced a net decline of approximately 530 acres. From 1990 to 1995, emergent habitat acreage in Old Tampa Bay showed a net increase of approximately 40 acres.

Year	Emergent Habitat Acreage	Net Change Since 1950	Net Change Since 1990
1950	5,280	---	---
1990	4,750	-530	---
1995	4,790	-490	+40

The Old Tampa Bay emergent habitat acreages for each category are shown by year in Table 5. The estimated proportions of Mangrove-Spartina Marsh : *Juncus* Marsh : Salt Barren in the segment are:

- 1950 - 63:27:10
- 1990 - 73:24:3
- 1995 - 75:23:2.

Year	Mangrove-spartina Marsh (Net Change Since 1990)	<i>Juncus</i> Marsh (Net Change Since 1990)	Salt Barren (Net Change Since 1990)
1950	3,320	1,450	520
1990	3,450	1,150	150
1995	3,580 (+130)	1,120 (-30)	90 (-60)

### Hillsborough Bay

1950 – Emergent vegetation habitats in the Hillsborough Bay segment during the 1950 baseline period were found primarily along the eastern shoreline, from McKay Bay southward to the mouth of Hillsborough Bay, including the estuarine portions of the Alafia River and the Palm River. Only a few emergent vegetation habitat areas were found along the western shore of Hillsborough Bay. The total emergent vegetation habitat acreage for the segment was approximately 1,910 acres in 1950.

*Mangrove-Spartina* Marsh – *Mangrove-Spartina* marshes were found around the northern and eastern shoreline of McKay Bay, along the shoreline north and south of Delaney Creek, around the mouth of Archie Creek, and south of the Alafia River

to the mouth of the bay. Mangrove–*Spartina* marshes covered approximately 1,110 acres in Hillsborough Bay in 1950.

*Juncus* Marsh – *Juncus* Marshes in Hillsborough Bay were likewise found mainly along the northern and eastern shoreline of the bay. *Juncus* Marsh in McKay Bay were primarily found in the northern reaches of McKay Bay, and extended to the Palm River. Smaller *Juncus* Marsh areas were found associated with Delaney Creek and Archie Creek. *Juncus* Marshes were also found along the shores of the Alafia River, and south of the mouth of the river and into Bullfrog Creek. Some small areas were found along the shore of The Kitchen, associated with Dug Creek and Kitchen Branch. *Juncus* Marshes covered approximately 600 acres in Hillsborough Bay in 1950.

Salt Barren – Salt Barrens were located near the mouth of the Palm River, north and south of the mouth of Delaney Creek, and on the peninsula that is now the Port Sutton peninsula. A small Salt Barren was found north of the mouth of Archie Creek, and also inshore of the Mangrove-*Spartina* Marshes along the shoreline that has since been filled in the Big Bend area. Salt Barrens totaled approximately 200 acres in Hillsborough Bay in 1950.

1990 - By 1990, emergent vegetation habitat net declines of approximately 650 acres had occurred in Hillsborough Bay, leaving only 1,260 acres of emergent habitat. Almost all the shoreline of the northeastern portion of Hillsborough Bay had been filled, as well as the southern shoreline in the Big Bend area.

Mangrove–*Spartina* Marsh – In McKay Bay, Mangrove-*Spartina* Marshes were found along the shoreline of the northernmost embayment, along the northern shoreline of the lower Palm River near its mouth, and along the southeastern shoreline of McKay Bay. Mangrove-*Spartina* marshes were also found just south of the Port Sutton peninsula. Small areas were found around the mouth of Archie Creek. From the mouth of the Alafia River, Mangrove-*Spartina* Marshes extended south to the northern portion of The Kitchen. In 1990, Mangrove-*Spartina* Marshes covered approximately 750 acres in Hillsborough Bay, a net decrease of 360 acres since 1950.

*Juncus* Marsh – The 1990 *Juncus* Marshes in Hillsborough Bay were found primarily along the eastern shoreline of the segment. *Juncus* Marshes were found in the northern embayment of McKay Bay, along the lower Palm River near its mouth, and along the southeastern shoreline of McKay Bay. South of the Port Sutton peninsula, inland of the Mangrove-*Spartina* Marshes present, were *Juncus* Marshes. Emergent habitat near the mouth of Archie Creek was dominated by *Juncus* Marshes, and *Juncus* Marshes were found in the Alafia River upstream of its mouth. *Juncus* Marshes were also found in Bullfrog Creek, and in the southern portions of The Kitchen. *Juncus* Marshes in Hillsborough Bay covered approximately 500 acres in 1990, a net decrease of 100 acres from the 1950 coverage.



Salt Barren – In 1990, Salt Barrens were found only between the mouths of the Alafia River and Bullfrog Creek, and between Big Bend and Apollo Beach. Salt Barren acreage showed a net decline from 200 acres in 1950 to 10 acres by 1990.

1995 – Between 1990 and 1995, emergent habitat coverage in Hillsborough Bay showed a net increase of approximately 100 acres, to a total of approximately 1,360 acres.

Mangrove–Spartina Marsh – Mangrove-*Spartina* marsh acreage in Hillsborough Bay showed only small changes between 1990 and 1995, with a net increase of approximately 10 acres. Changes were found in the location of the habitat, however. Mangrove–Spartina marshes covered more area along the southern shore of McKay Bay in 1995 than in 1990. Mangrove-*Spartina* marshes were also found near the tip of the Port Sutton peninsula, and on the eastern shore of the northernmost spoil island in Hillsborough Bay. Mangrove–Spartina marshes covered approximately 760 acres in Hillsborough Bay.

*Juncus* Marsh – *Juncus* Marsh acreage experienced a net increase in Hillsborough Bay by approximately 90 acres between 1990 and 1995. *Juncus* Marshes expanded in the southeastern corner of McKay Bay, and along the shoreline between the Port Sutton peninsula and the mouth of Archie Creek. Additional *Juncus* Marshes were found inland of the Mangrove-*Spartina* Marshes south of the mouth of the Alafia River, and along the northeastern shore of Davis Island. *Juncus* Marshes covered approximately 590 acres in Hillsborough Bay.

Salt Barren – In 1995, Salt Barrens as delineated from the SWFWMD photo orthoquads covered approximately the same acreage as those delineated directly from the 1990 aerial photography. However, the locations of the Salt Barrens were not all the same as those found in 1990. Salt Barrens were found near the mouth of Bullfrog Creek and just south of Big Bend, as in 1990, but were smaller than those delineated for 1990. Additional Salt Barrens were found near the northern embayment of McKay Bay, along the southeastern shore of McKay Bay, and between the Port Sutton peninsula and Archie Creek.

Table 6 summarizes the emergent vegetation habitat acreage data for Hillsborough Bay. From 1950 to 1990, emergent vegetation habitat acreage in Hillsborough Bay experienced a net decline of approximately 650 acres. From 1990 to 1995, emergent habitat acreage in Hillsborough Bay showed a net increase of approximately 100 acres.

Year	Emergent Habitat Acreage	Net Change Since 1950	Net Change Since 1990
1950	1,910	---	---
1990	1,260	-650	---
1995	1,360	-550	+100

The Hillsborough Bay emergent vegetation habitat acreages for each category are shown by year in Table 7. The estimated proportions of Mangrove-Spartina Marsh : *Juncus* Marsh : Salt Barren in the segment are:

- 1950 - 58:32:10
- 1990 - 59:40:1
- 1995 - 55:44:1.

Year	Mangrove-Spartina Marsh (Net Change Since 1990)	<i>Juncus</i> Marsh (Net Change Since 1990)	Salt Barren (Net Change Since 1990)
1950	1,110	600	200
1995	760 (+ 10)	590 (+ 90)	10 (0)

### **Middle Tampa Bay**

1950 – Emergent vegetation habitats in the Middle Tampa Bay segment during the 1950 baseline period were found primarily along the northern and southeastern shoreline, with most of the western shoreline already developed as part of the St. Petersburg urban area. The total emergent vegetation habitat acreage for the segment was approximately 7,740 acres in 1950.

Mangrove-Spartina Marsh – Mangrove-Spartina Marshes in Middle Tampa Bay were found along almost the entire southeastern shore of the segment, from the area currently developed as Apollo Beach to Piney Point. The southern shore of the Interbay Peninsula was also almost completely lined with Mangrove-Spartina Marshes. Mangrove-Spartina Marshes were found along the western shore of Middle Tampa Bay in the Riviera Bay and Bayou Grande region, and in the Smack's Bayou area. Mangrove-Spartina Marshes also extended along most of the shoreline of Coquina Key. Mangrove-Spartina Marshes covered approximately 5,230 acres in Middle Tampa Bay in 1950.

*Juncus* Marsh – *Juncus* Marshes in Middle Tampa Bay were found inshore of the Mangrove-Spartina Marshes in the segment, and in the Little Manatee River. Most of the *Juncus* Marshes were found along the southeastern shoreline, with some

found on the Interbay Peninsula and others around Riviera Bay and Bayou Grande. *Juncus* Marshes covered approximately 2,080 acres in Middle Tampa Bay in 1950.

Salt Barren – Salt Barrens were located along the southeastern shore of the segment and on the Interbay Peninsula. The majority of the barrens were found from Cockroach Bay southward to the segment boundary at Piney Point. The Salt Barrens in Middle Tampa Bay covered approximately 440 acres in 1950.

1990 - By 1990, emergent vegetation habitat net decreases of approximately 1,410 acres had occurred in Middle Tampa Bay, leaving 6,330 acres of emergent habitat. The shoreline around Apollo Beach and north of the mouth of the Little Manatee River had been filled, as had the shoreline for Venetian Isles.

Mangrove-Spartina Marsh – In the northwestern part of the segment, Mangrove-Spartina Marshes around Riviera Bay and Bayou Grande had been reduced by development. Mangrove-Spartina Marsh acreage on the Interbay Peninsula portion of the segment had not varied significantly since 1950. Mangrove-Spartina Marsh acreage along the southeastern shore of the segment had been reduced in the area of Apollo Beach and north of the mouth of the Little Manatee River, but was relatively unchanged from Cockroach Bay southward. Mangrove-Spartina Marsh covered 5,060 acres in Middle Tampa Bay in 1990, a net decrease of 360 acres since 1950.

*Juncus* Marsh – The 1990 *Juncus* Marshes in Middle Tampa Bay were primarily found associated with the Little Manatee River. Small areas of *Juncus* Marsh were found around Riviera Bay, and the acreage of *Juncus* Marshes on the Interbay Peninsula portion of the segment had increased since 1950. Small *Juncus* Marshes were found north of Apollo Beach, from Apollo Beach southward to the mouth of the Little Manatee River, and from the mouth of the river southward to the bay segment boundary. *Juncus* Marshes were the predominant emergent vegetation habitat in the Little Manatee River. *Juncus* Marshes covered 740 acres in the Middle Tampa Bay segment in 1990, a net decrease of 1,340 acres from 1950.

Salt Barren – In 1990, Salt Barrens were found inshore of the Mangrove-Spartina Marshes between Apollo Beach and the mouth of the Little Manatee River, and inshore of the Mangrove-Spartina Marshes around Cockroach Bay southward to the segment boundary. Small patches of Salt Barren habitat were also found just south of the mouth of the Little Manatee River. Salt Barren acreage in the Middle Tampa Bay segment showed a net increase of 100 acres from 1950 to 1990, totaling 530 acres in 1990.

1995 - Between 1990 and 1995, emergent vegetation habitat coverage in Middle Tampa Bay experienced a net increase of approximately 400 acres, to a total of approximately 6,730 acres.

Mangrove-*Spartina* Marsh – Mangrove-*Spartina* Marsh acreage in Middle Tampa Bay showed a net increase of 400 acres between 1990 and 1995. This increase occurred primarily along the southeastern shore of the segment, south of the mouth of the Little Manatee River. Mangrove-*Spartina* Marsh covered several small islands near the mouth of Cockroach Bay that were not classified as containing emergent vegetation habitat in 1990. From the 1990 SWFWMD land use coverage, land uses were not assigned for these small islands. Mangrove-*Spartina* Marshes also extended inland south of Cockroach Bay, into areas that were classified as Salt Barrens in 1990. Mangrove-*Spartina* Marshes covered 5,460 acres in the Middle Tampa Bay segment in 1995.

*Juncus* Marsh – *Juncus* Marsh acreage experienced a net increase in Middle Tampa Bay of approximately 300 acres between 1990 and 1995. *Juncus* Marshes were found primarily in association with the Little Manatee River. Expansion of *Juncus* Marshes was found between Apollo Beach and the mouth of the Little Manatee River, and south of Cockroach Bay. Approximately 90 acres of the increase were in areas classified as Salt Barrens in 1990, possibly as a result of the higher resolution of the 1995 Salt Barren delineation. *Juncus* Marshes covered 1,040 acres in 1995 in Middle Tampa Bay.

Salt Barren – In 1995, Salt Barrens as delineated from the SWFWMD photo orthoquads covered approximately 230 acres in Middle Tampa Bay, 300 acres less than the Salt Barren coverage delineated directly from the 1990 aerial photography. The 1995 Salt Barrens were found in the same areas as those found in 1990, but were reduced in size. This reduction in the extent of the Salt Barrens from 1990 to 1995 was most evident south of Cockroach Bay.

Table 8 summarizes the emergent vegetation habitat acreage data for Middle Tampa Bay. From 1950 to 1990, emergent vegetation habitat acreage in Middle Tampa Bay experienced a net decrease of approximately 1,410 acres. From 1990 to 1995, emergent habitat acreage in Middle Tampa Bay showed a net increase of approximately 400 acres.

Year	Emergent Habitat Acreage	Net Change Since 1950	Net Change Since 1990
1950	7,740	---	---
1990	6,330	-1,410	---
1995	6,730	-1,010	+400

The Middle Tampa Bay emergent vegetation habitat acreages for each category are shown by year in Table 9. The estimated proportions of Mangrove-Spartina Marsh : *Juncus* Marsh : Salt Barren in the segment are:

- 1950 - 67:27:6
- 1990 - 80:12:8
- 1995 - 81:15:4.

Year	Mangrove-Spartina Marsh (Net Change Since 1990)	<i>Juncus</i> Marsh (Net Change Since 1990)	Salt Barren (Net Change Since 1990)
1950	5,230	2,080	440
1990	5,060	740	530
1995	5,460 (+400)	1,040 (+ 300)	230 (-300)

### Lower Tampa Bay

1950 – Emergent vegetation habitats in the Lower Tampa Bay segment during the 1950 baseline period were associated with Bishop Harbor, Miguel Bay, and Anna Maria Sound. The total emergent habitat acreage for the segment was approximately 3,360 acres in 1950.

*Mangrove-Spartina* Marsh – *Mangrove-Spartina* Marshes in Lower Tampa Bay were found along almost the entire shoreline of the segment. *Mangrove-Spartina* Marshes were found along almost the entire shoreline of Bishop Harbor, most of the shoreline of Miguel Bay, and from the mouth of the Manatee River westward into Perico Bayou to Mead Point. *Mangrove-Spartina* Marshes were also found along the eastern shoreline of Anna Maria Island, and small areas were found on Egmont Key. *Mangrove-Spartina* Marshes covered approximately 2,560 acres in Lower Tampa Bay in 1950.

*Juncus* Marsh – The largest expanses of *Juncus* Marsh in Lower Tampa Bay were found inshore of the *Mangrove-Spartina* Marshes along the northern shore of Bishop Harbor and north of the mouth of Terra Ceia Bay. Smaller areas were also found south of Bishop Harbor, north and east of Miguel Bay, and on Anna Maria Island. *Juncus* Marshes covered approximately 610 acres in Lower Tampa Bay in 1950.

Salt Barren – Salt Barrens were found in association with the *Juncus* Marshes north of Bishop Harbor, and between Bishop Harbor and the mouth of Terra Ceia Bay. The Salt Barrens in Lower Tampa Bay covered approximately 190 acres in 1950.

1990 - By 1990, emergent vegetation habitat acreage had experienced a net decline of approximately 630 acres in Lower Tampa Bay, leaving 2,730 acres of emergent

vegetation habitat. The shoreline near Piney Point and along the eastern shore of Anna Maria Island had been filled.

*Mangrove-Spartina* Marsh – In the Piney Point area, *Mangrove-Spartina* Marsh had been lost to filling for the Port Manatee facilities. *Mangrove-Spartina* Marsh had also been lost to filling for residential development along the eastern shoreline of Anna Maria Sound. *Mangrove-Spartina* Marsh acreage had declined along the northern shore of Bishop Harbor as well. *Mangrove-Spartina* Marshes covered 2,170 acres in Lower Tampa Bay in 1990, a net decrease of 390 acres since 1950.

*Juncus* Marsh – The 1990 *Juncus* Marshes in Lower Tampa Bay were primarily found along the northern shoreline of Bishop Harbor, inshore of the *Mangrove-Spartina* Marshes. Additional small areas of *Juncus* Marsh were found from south of Bishop Harbor to the Skyway Bridge. The *Juncus* Marshes found in 1950 on Anna Maria Island had been lost to fill activities, as had some of the *Juncus* Marshes near Port Manatee. The *Juncus* Marshes found between Miguel Bay and Terra Ceia Bay in 1950 were not delineated in the 1990 SWFWMD landuse coverage. *Juncus* Marshes covered 390 acres in the Lower Tampa Bay segment in 1990, a net decrease of 220 acres from 1950.

Salt Barren – In 1990, most Salt Barrens were found in the same areas in which they had been delineated for 1950. Salt Barrens were found from east of Bishop Harbor to north of Terra Ceia Bay. A relatively large new Salt Barren was found between the Skyway Bridge and Miguel Harbor, in an area that had been classified as *Juncus* Marsh and *Mangrove-Spartina* Marsh in 1950. Salt Barren acreage in the Lower Tampa Bay segment experienced a net decrease of 20 acres from 1950 to 1990, totaling 170 acres in 1990.

1995 – Between 1990 and 1995, emergent vegetation habitat coverage in Lower Tampa Bay did not change significantly, with a total of 2,730 acres in the segment in 1995.

*Mangrove-Spartina* Marsh – *Mangrove-Spartina* Marsh acreage in Lower Tampa Bay showed a net increase by 280 acres between 1990 and 1995. This increase occurred primarily along the northern shoreline of Bishop Harbor, where *Mangrove-Spartina* Marsh extended into areas that had been classified as *Juncus* Marsh in 1990. On Anna Maria Island, *Mangrove-Spartina* Marsh acreage increased as well. *Mangrove-Spartina* Marshes covered 2,450 acres in the Lower Tampa Bay segment in 1995.

*Juncus* Marsh – *Juncus* Marsh acreage experienced a net decrease in Lower Tampa Bay of approximately 210 acres between 1990 and 1995. The greatest decrease in acreage was found north of Bishop Harbor, where the 1995 SWFWMD land use coverage showed *Mangrove-Spartina* Marshes expanding into the 1990 *Juncus* Marsh areas. *Juncus* Marsh covered 180 acres in 1995 in Middle Tampa Bay.

Salt Barren – In 1995, Salt Barrens as delineated from the SWFWMD photo orthoquads covered approximately 100 acres in Lower Tampa Bay, 70 acres less than the Salt Barren coverage delineated directly from the 1990 aerial photography. Most of the 1995 Salt Barrens were found in the same areas as those found in 1990, but were reduced in size. This reduction in the extent of the Salt Barrens from 1990 to 1995 was most evident north of Bishop Harbor. Additional Salt Barrens were found in 1995 between the mouth of the Manatee River and Perico Bayou, where no Salt Barrens had been delineated for the 1950 or 1990 time periods.

Table 10 summarizes the emergent vegetation habitat acreage data for Lower Tampa Bay. From 1950 to 1990, emergent vegetation habitat acreage in Lower Tampa Bay experienced a net decrease of approximately 630 acres. From 1990 to 1995, emergent habitat acreage in Lower Tampa Bay did not change.

Year	Emergent Habitat Acreage	Net Change Since 1950	Net Change Since 1990
1950	3,360	—	—
1990	2,730	-630	—
1995	2,730	-630	0

The Lower Tampa Bay emergent vegetation habitat acreages for each category are shown by year in Table 11. The estimated proportions of Mangrove-*Spartina* Marsh : *Juncus* Marsh : Salt Barren in the segment are:

- 1950 - 76:18:6
- 1990 - 80:14:6
- 1995 - 90:6:4.

Year	Mangrove- <i>Spartina</i> Marsh (Net Change Since 1990)	<i>Juncus</i> Marsh (Net Change Since 1990)	Salt Barren (Net Change Since 1990)
1950	2,560	610	190
1990	2,170	390	170
1995	2,450 (+280)	180 (-210)	100 (-70)

### Boca Ciega Bay

1950 – Emergent vegetation habitats in Boca Ciega Bay during the 1950 baseline period were found from Mullet Key in the south to Conch Key in the north along both the eastern and western shores of Boca Ciega Bay. The total emergent vegetation habitat acreage for the segment was approximately 2,430 acres in 1950.

Mangrove-*Spartina* Marsh – Mangrove-*Spartina* Marshes in Boca Ciega Bay were found along the western shoreline of the segment from Mullet Key to Crystal island, and from Conch Key to the northern limit of the segment. On the eastern shore of the segment, Mangrove-*Spartina* Marshes were found from Maximo Point to Clam Bayou, in the jungle area, and from the western shore of Long Bayou to the northern limit of the segment. Mangrove-*Spartina* Marshes were also found on Tarpon Key and Indian Key in the southern part of Boca Ciega Bay. Mangrove-*Spartina* Marshes covered approximately 2,140 acres in Boca Ciega Bay in 1950.

*Juncus* Marsh – *Juncus* Marshes in Boca Ciega Bay were found on St. Christopher Key, St. Joan Key, Bonne Fortune Key, Tarpon Key, Cunningham Key, and Pine Key in the southern portions of the segment. *Juncus* Marshes were also found on Long Key, in the 1950 embayment where Maximo Moorings now exists, and in the jungle area in the central portion of the segment. In the northern part of Boca Ciega Bay, only small areas were found. *Juncus* Marsh covered approximately 270 acres in Boca Ciega Bay in 1950.

Salt Barren – Salt Barrens were found only along the eastern side of Cross Bayou, near the mouth of St. Joe's Creek. These Salt Barrens covered approximately 10 acres in 1950.

1990 - By 1990, emergent vegetation habitat acreage net declines of approximately 1,230 acres had occurred in Boca Ciega Bay, leaving 1,210 acres of emergent habitat. The western shoreline of Boca Ciega Bay had been filled from Cabbage Key in the south to the northern limit of the segment. Along the eastern shoreline, Maximo Moorings had been filled, the shoreline of the jungle area had been filled, and some of the shoreline south of Conch Key had been filled.

Mangrove-*Spartina* Marsh – Mangrove-*Spartina* Marshes had been lost to fill activities throughout most of central Boca Ciega Bay. Mangrove-*Spartina* Marshes were found on Mullet Key, Tarpon Key, Indian Key, and many smaller keys in the southern portion of the segment, around Cat's Point and in Clam Bayou in the central portion along the eastern shore, and in Long Bayou and Cross Bayou. Small areas extended from the mouth of Long Bayou to the northern extent of the segment along the eastern shore. Mangrove-*Spartina* Marshes covered 1,120 acres in Boca Ciega Bay in 1990, a net decrease of 1,020 acres since 1950.

*Juncus* Marsh – The 1990 *Juncus* Marshes in Boca Ciega Bay were found on Mullet Key and in Clam Bayou in the southern and central portions of the segment. Additional *Juncus* Marshes were found in Long Bayou near the Lake Seminole outfall, and in Cross Bayou around the mouth of St. Joe's Creek, in the northern portion of the segment. *Juncus* Marsh covered 80 acres in the Boca Ciega Bay segment in 1990, a net decrease of 190 acres from 1950.



Salt Barren – No Salt Barrens were delineated from the 1990 aerial photography in Boca Ciega Bay, resulting in a net decrease of approximately 10 acres of this habitat type from 1950 to 1990.

1995 – Between 1990 and 1995, emergent vegetation habitat coverage in Boca Ciega Bay experienced a net increase of approximately 70 acres, to a total of 1,270 acres in the segment in 1995.

Mangrove-Spartina Marsh – Mangrove-Spartina Marsh acreage in Boca Ciega Bay showed a net increase of 40 acres between 1990 and 1995. This relatively small increase resulted from expansion of Mangrove-*Spartina* Marsh extent throughout the segment, with most of the increases occurring in the Mullet Key and Cross Bayou areas. Mangrove-Spartina Marsh covered 1,160 acres in the Boca Ciega Bay segment in 1995.

*Juncus* Marsh – *Juncus* Marsh acreage showed a net increase in Boca Ciega Bay of approximately 20 acres between 1990 and 1995. This small acreage increase was for the most part confined to the Cross Bayou area, near the mouth of St. Joe's Creek. *Juncus* Marshes covered 100 acres in 1995 in Boca Ciega Bay.

Salt Barren – In 1995, Salt Barrens as delineated from the SWFWMD photo orthoquads covered approximately 10 acres in Boca Ciega Bay. No Salt Barrens were found in the Salt Barren coverage delineated directly from the 1990 aerial photography. In 1995, Salt Barrens were found on Mullet Key, along the shoreline of Cross Bayou, and on Conch Key.

Table 12 summarizes the emergent vegetation habitat acreage data for Boca Ciega Bay. From 1950 to 1990, emergent vegetation habitat acreage in Boca Ciega Bay experienced a net decrease of approximately 1,230 acres. From 1990 to 1995, emergent habitat acreage in Boca Ciega Bay showed a net increase of 70 acres.

Year	Emergent Habitat Acreage	Net Change Since 1950	Net Change Since 1990
1950	2,430	—	—
1990	1,210	-1,230	—
1995	1,270	-1,160	+ 70

The Boca Ciega Bay emergent vegetation habitat acreages for each category are shown by year in Table 13. The estimated proportions of Mangrove-Spartina Marsh : *Juncus* Marsh : Salt Barren in the segment are:

- o 1950 - 88:11:1
- o 1990 - 93:7:0
- o 1995 - 91:8:1.

Year	Mangrove-Spartina Marsh (Net Change Since 1990)	<i>Juncus</i> Marsh (Net Change Since 1990)	Salt Barren (Net Change Since 1990)
1950	2,140	270	10
1990	1,120	80	0
1995	1,160 (+40)	100 (+20)	10 (+10)

### Terra Ceia Bay

1950 – Emergent vegetation habitats in the Terra Ceia Bay segment during the 1950 baseline period were found along almost the entire shoreline of Terra Ceia Bay. Emergent habitats covered Rattlesnake Key and the southern shoreline of Terra Ceia Bay, and were associated with McMullen Creek and Frog Creek near the northern extent of the bay, as well as scattered along the eastern shore. The total emergent habitat acreage for the segment was approximately 950 acres in 1950.

*Mangrove-Spartina* Marsh – *Mangrove-Spartina* Marshes in Terra Ceia Bay were found on Rattlesnake Key, at the southern end of Terra Ceia Island, along the shores of Frog Creek and McMullen Creek, and south of what is now Palmetto Point to the southern shore of Peterson Bayou. *Mangrove-Spartina* Marshes were also found along the southern shore of Terra Ceia Bay from the mouth of the bay to the northern shore of Snead Island. *Mangrove-Spartina* Marshes covered approximately 940 acres in Terra Ceia Bay in 1950.

*Juncus* Marsh – *Juncus* Marshes in the Terra Ceia Bay segment were only found north of the mouth of the bay on Rattlesnake Key, as part of the *Juncus* Marshes that extend into the Lower Tampa Bay segment. *Juncus* Marshes covered approximately 10 acres in Terra Ceia Bay in 1950.

Salt Barren – Less than 10 acres of Salt Barrens were found in the Terra Ceia Bay segment in 1950. The only Salt Barrens were on Rattlesnake Key, associated with the *Mangrove-Spartina* Marsh and *Juncus* Marsh habitat covering the key.

1990 - By 1990, emergent vegetation habitat net decreases of approximately 230 acres had occurred in Terra Ceia Bay, leaving 720 acres of emergent habitat. The area of

Palmetto Point had been filled, and reductions in emergent vegetation habitat acreage were found along the shoreline of Peterson Bayou. Emergent vegetation habitat had also been lost to fill activities on Snead Island south of Champlain Bayou, and east of the Snead Island Cutoff along the southern shore of Terra Ceia Bay.

Mangrove-Spartina Marsh – Mangrove-*Spartina* Marshes had been lost to fill activities in the Palmetto Point area, on Snead Island south of Champlain Bayou, and east of the Snead Island Cutoff. Mangrove-*Spartina* Marsh acreage had also declined along the shores of Peterson Bayou, McMullen Creek, and Frog Creek. Mangrove-Spartina Marshes covered 710 acres in Terra Ceia Bay in 1990, a net decrease of 230 acres since 1950.

*Juncus* Marsh – There were no changes in *Juncus* Marsh acreage in Terra Ceia Bay between 1950 and 1990, with the only *Juncus* Marshes found on Rattlesnake Key. *Juncus* Marshes covered less than 10 acres in the Terra Ceia Bay segment in 1990.

Salt Barren – There were no changes in Salt Barren acreage in Terra Ceia Bay between 1950 and 1990, with the only Salt Barrens found on Rattlesnake Key. Salt Barrens covered less than 10 acres in the Terra Ceia Bay segment in 1990.

1995 – Between 1990 and 1995, emergent vegetation habitat coverage in Terra Ceia Bay showed a net increase of approximately 130 acres, to a total of 850 acres in the segment in 1995.

Mangrove-Spartina Marsh – Mangrove-Spartina Marsh acreage in Terra Ceia Bay experienced a net increase of 120 acres between 1990 and 1995. This increase resulted from expansion of 1990 Mangrove-Spartina Marshes along Frog Creek and McMullen Creek, and new Mangrove-Spartina Marshes along the southeastern shore of Terra Ceia Bay from Peterson Bayou southward. Mangrove-Spartina Marshes covered 830 acres in the Terra Ceia Bay segment in 1995.

*Juncus* Marsh – *Juncus* Marsh acreage experienced a net increase in Terra Ceia Bay of less than 10 acres between 1990 and 1995. This small acreage increase was found in two areas, just south of Peterson Bayou, and on Snead Island. *Juncus* Marshes covered approximately 10 acres in 1995 in Terra Ceia Bay.

Salt Barren – Salt Barren acreage did not change in Terra Ceia Bay between 1990 and 1995. The only Salt Barrens were on Rattlesnake Key.

Table 14 summarizes the emergent vegetation habitat acreage data for Terra Ceia Bay. From 1950 to 1990, emergent vegetation habitat acreage in Terra Ceia Bay showed a net decrease of approximately 230 acres. From 1990 to 1995, emergent vegetation habitat acreage in Terra Ceia Bay experienced a net increase of 130 acres.

Year	Emergent Habitat Acreage	Net Change Since 1950	Net Change Since 1990
1950	950	---	---
-1990	720	-230	---
1995	850	-100	+130

The Terra Ceia Bay emergent vegetation habitat acreages for each category are shown by year in Table 14. The estimated proportions of Mangrove-Spartina Marsh : *Juncus* Marsh : Salt Barren in the segment are:

- 1950 - 99:1 :0
- 1990 - 98:1:1
- 1995 - 97:2:1.

Year	Mangrove-Spartina Marsh (Net Change Since 1990)	<i>Juncus</i> Marsh (Net Change Since 1990)	Salt Barren (Net Change Since 1990)
1950	940	10	<10
1990	710	<10	<10
1995	830 (+120)	10 (+10)	<10 (0)

### **Manatee River**

1950 - Emergent vegetation habitats in the Manatee River segment during the 1950 baseline period were found from near the mouth of the river to the upstream boundary of the segment. More emergent vegetation habitat acreage was found along the northern shoreline than along the southern shoreline from the mouth of the Manatee River to the Braden River. Emergent vegetation habitat was found on the islands and along both shores of the river upstream of the Braden River. The total emergent vegetation habitat acreage for the segment was approximately 2,210 acres in 1950.

*Mangrove-Spartina* Marsh - *Mangrove-Spartina* Marshes in the Manatee River segment were found from the mouth of the river to just past the mouth of the Braden River. The largest expanse of *Mangrove-Spartina* Marsh was found on the northern shore of the river, from near the US 41 Bridge to where I-75 now crosses the Manatee River. *Mangrove-Spartina* Marsh covered approximately 590 acres in the Manatee River Segment in 1950.

*Juncus* Marsh - *Juncus* Marshes in the Manatee River segment were primarily found upstream of the mouth of the Braden River. *Juncus* Marshes covered the islands in

the Manatee River, and were found along both shorelines of the river. *Juncus* Marshes covered approximately 1,600 acres in Terra Ceia Bay in 1950.

Salt Barren – Approximately 20 acres of Salt Barrens were found in the Manatee River segment in 1950. The Salt Barrens were found near the eastern limit of the segment, in association with the *Juncus* Marshes upstream of the mouth of the Braden River mouth.

1990 - By 1990, emergent vegetation habitat net declines of approximately 460 acres had occurred in the Manatee River segment, leaving 1,760 acres of emergent vegetation habitat. From the mouth of the Manatee River to just upstream of the mouth of the Braden River, fill activities had reduced the acreage of emergent vegetation habitat significantly.

Mangrove-Spartina Marsh – Mangrove-Spartina Marshes had been lost to fill activities along both the southern and northern shorelines of the Manatee River from near the mouth of the river to the mouth of the Braden River. Along the southern shoreline, much of this decline was due to fill activities for the expansion of Bradenton. Along the northern shoreline, decreases in acreage occurred near the US 41 bridges and in Ellenton. Mangrove-Spartina Marsh coverage increased on the islands in the Manatee River upstream of the mouth of the Braden River. Mangrove-Spartina Marshes covered 490 acres in the Manatee River segment in 1990, a net decrease of 100 acres since 1950.

*Juncus* Marsh – *Juncus* Marsh acreage experienced a net decline in the Manatee River segment between 1950 and 1990 of 350 acres, with 1,250 acres present in the segment in 1990. *Juncus* Marsh habitat was lost just east of the mouth of the Braden River. Some of the *Juncus* Marshes on the islands in the Manatee River upstream of the Braden River mouth in 1950 were identified as Mangrove-Spartina Marshes in 1990.

Salt Barren – Salt Barren acreage showed a net decrease of approximately 10 acres in the Manatee River segment between 1950 and 1990, with 10 acres found in the segment in 1990. Salt Barren habitat was found associated with the islands in the Manatee River upstream of the mouth of the Braden River.

1995 – Between 1990 and 1995, emergent vegetation habitat coverage in the Manatee River segment experienced a net increase of approximately 30 acres, to a total of 1,790 acres in 1995.

Mangrove-Spartina Marsh – Mangrove-Spartina Marsh acreage in the Manatee River segment showed a net decrease of less than 10 acres between 1990 and 1995, leaving approximately 490 acres in the segment. The largest Mangrove-Spartina Marsh acreage decline occurred along the southern shore of the Manatee River near

the eastern segment boundary, with smaller losses and gains scattered throughout the emergent wetland habitats.

*Juncus* Marsh - *Juncus* Marsh acreage showed a net increase of 50 acres in the Manatee River segment between 1990 and 1995, with approximately 1,300 acres found in 1995. The acreage increase was primarily found near the eastern boundary of the segment, where Mangrove-*Spartina* Marsh habitat was converted to *Juncus* Marsh habitat.

Salt Barren - Salt Barren acreage experienced a net decrease of approximately 10 acres between 1990 and 1995 in the Manatee River segment, leaving less than 10 acres of Salt Barren habitat in the segment. The 1995 Salt Barrens were found along the northern shoreline of the Manatee River, between the US 41/301 Bridge and Ellenton.

Table 16 summarizes the emergent vegetation habitat acreage data for the Manatee River segment. From 1950 to 1990, emergent vegetation habitat acreage in the segment experienced a net decrease of approximately 450 acres. From 1990 to 1995, emergent habitat acreage in the Manatee River segment showed a net increase of 30 acres.

Year	Emergent Habitat Acreage	Net Change Since 1950	Net Change Since 1990
1950	2,210	---	---
1990	1,760	-450	
1995	1,790	-420	+30

The Manatee River segment emergent vegetation habitat acreages for each category are shown by year in Table 17. The estimated proportions of Mangrove-*Spartina* Marsh : *Juncus* Marsh : Salt Barren in the segment are:

- 1950 - 27:72:1
- 1990 - 28:71:1
- 1995 - 27:73:0.

Year	Mangrove- <i>Spartina</i> Marsh (Net Change Since 1990)	<i>juncus</i> Marsh (Net Change Since 1990)	Salt Barren (Net Change Since 1990)
1950	590	1,600	20
1990	490	1,250	10
1995	490 (0)	1,300 (+50)	<10 (0)

### **3.3 Additional Methods for Tracking Emergent Vegetation Habitat Restoration**

The tracking of progress toward the TBEP target is hindered by the problem of data comparability. The delineation of 1990 Salt Barrens involved manual delineation of very small polygons from hard-copy photographic prints, and creation of a Salt Barren polygon coverage from the drawings. The 1995 Salt Barrens were delineated directly from rectified digital photo ortho-quads of the land use photography. The coverages resulting from these two methods differ substantially in resolution and accuracy, as discussed previously.

To improve data comparability, the Emergent and Submerged Habitat Subcommittee of the TBEP has recommended that the same methodologies for developing estimates of emergent vegetation habitat acreages be applied to the aerial photography for each time period. The Subcommittee recommended that the feasibility of utilizing electronic files of the 1950 and 1990 aerial photography be examined for more accurate delineation of habitats, as had already been done for the 1995 photography. The recommended region of the bay for initial examination has been selected as the area around the mouth of the Little Manatee River, which contains a high proportion of emergent vegetation habitats along the shoreline.

An additional method of tracking progress toward the TBEP target makes use of a "Habitat Loss/Gain Tracking Form". This tracking form can provide estimates of emergent and submerged habitat changes due to restoration and/or mitigation activities. The form allows estimation of changes in emergent and submerged habitat acreage at a greater frequency and at smaller spatial scales than does examination of the five-year land use updates. A draft "Habitat Loss/Gain Tracking Form" is presented on the following page.

As part of the Tampa Bay Master Plan for Habitat Restoration and Protection, specific strategies and goals were set to increase certain habitats. The plan seeks to restore low-salinity tidal streams, salt barrens, upland forests, and mud flats (TBNEP, 1996). Tampa Baywatch is currently revising and updating the GIS coverages of existing and proposed habitat restoration sites, including emergent vegetation restoration sites. The coverages, still being revised, are shown in Figure 5, with the locations of existing and proposed emergent and submerged habitat restoration projects shown. The existing projects database is displayed in Appendix A, and the proposed projects database in Appendix B.

# Tampa Bay Estuary Program

## -Habitat Loss/Gain Tracking Form-

The purpose of this form is to allow for the quantitative tracking of gains and losses in emergent and submerged tidal wetland habitats occurring specifically within the Tampa Bay watershed. The information obtained with this form will be entered into a database and used to produce an annual summary of tidal wetland gains and losses. Your cooperation in this effort is greatly appreciated.

Permit No: \_\_\_\_\_

Permit Type: \_\_\_\_\_

Project Name: \_\_\_\_\_

Project Type: \_\_\_\_\_

Project Lat/Long: \_\_\_\_\_

Bay Segment: \_\_\_\_\_

Completion Date: \_\_\_\_\_

Success Acknowledged by Agency: \_\_\_\_\_

**Wetland Loss/Gain Table:**

Wetland Type	Acreage Lost*	Acreage Gained**	Net Gain or Loss
Mangrove-Spartina Marsh			
Juncus Marsh			
Salt Barren			
Seagrass			
Hard Bottom			
Other			
Totals			

\*

Permitted losses through dredge and/or fill activities.

\*\*

Gains through required mitigation or habitat restoration activities.



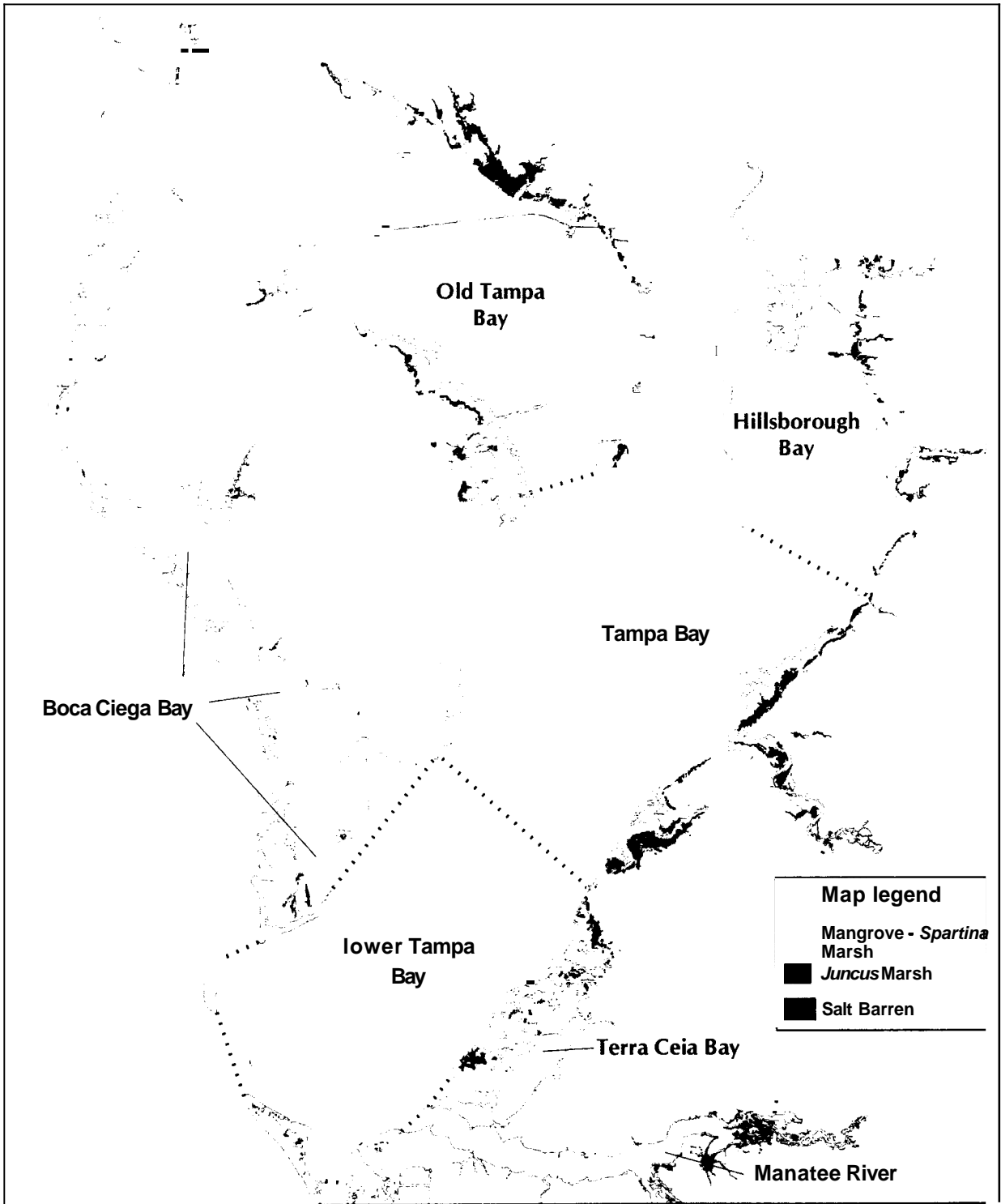


Figure 2. 1950 emergent habitat (Florida Department of Natural Resources and U.S. Fish and Wildlife Service [TBRPC, 1986]).

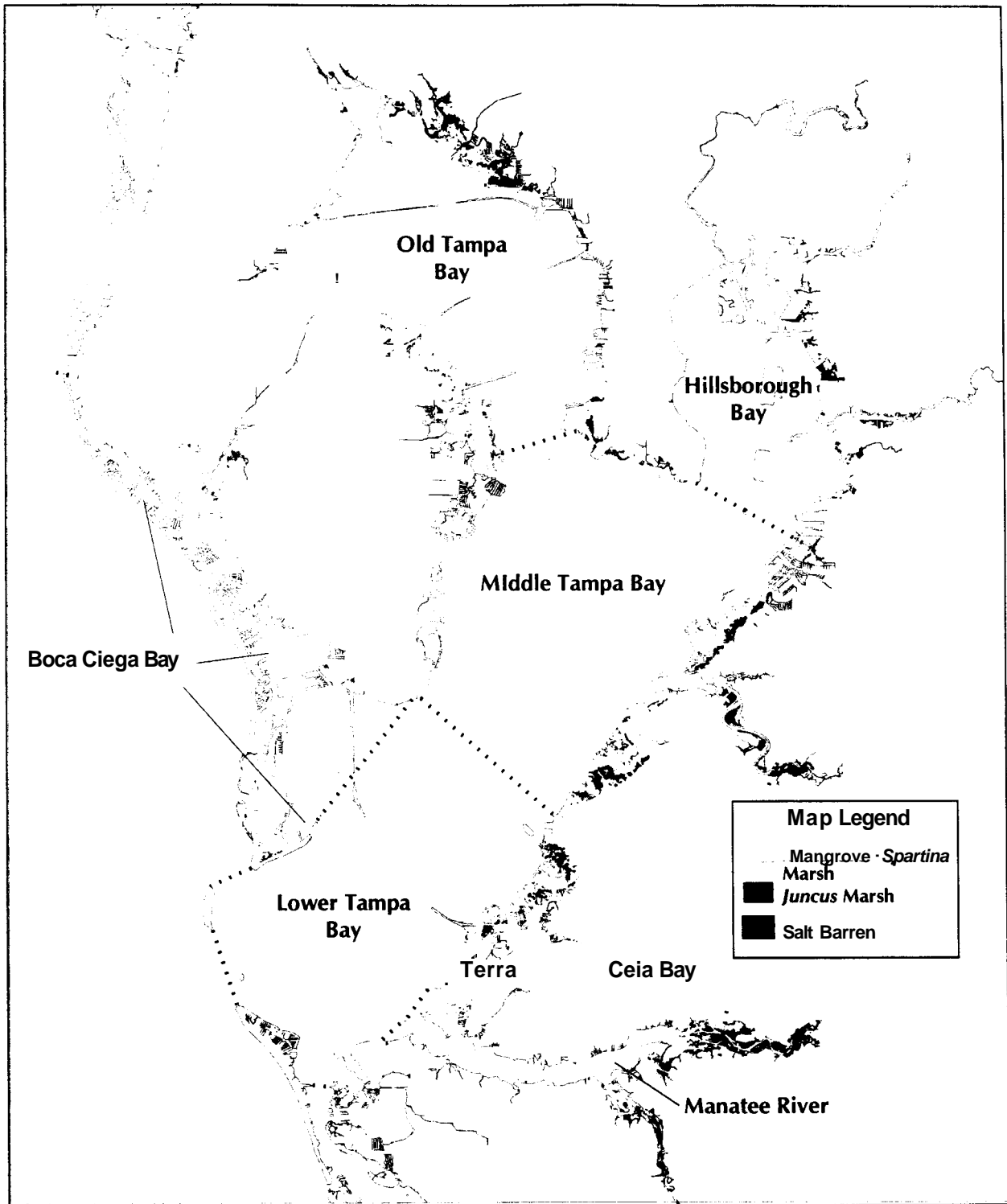


Figure 3. 1990 emergent habitat (SWFWMD and TBNEP).

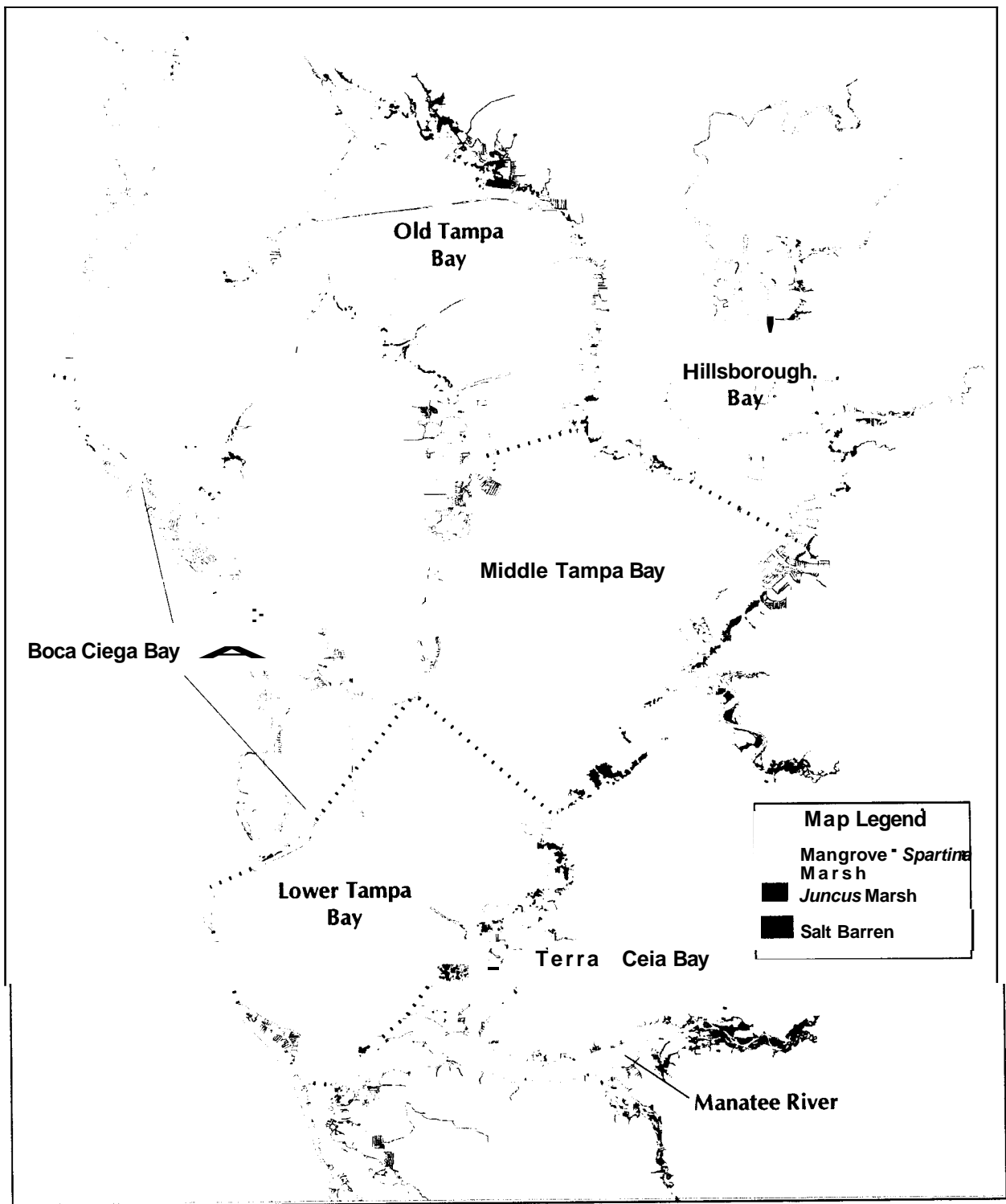


Figure 4. 1995 emergent habitat (SWFWMD and TBEP).

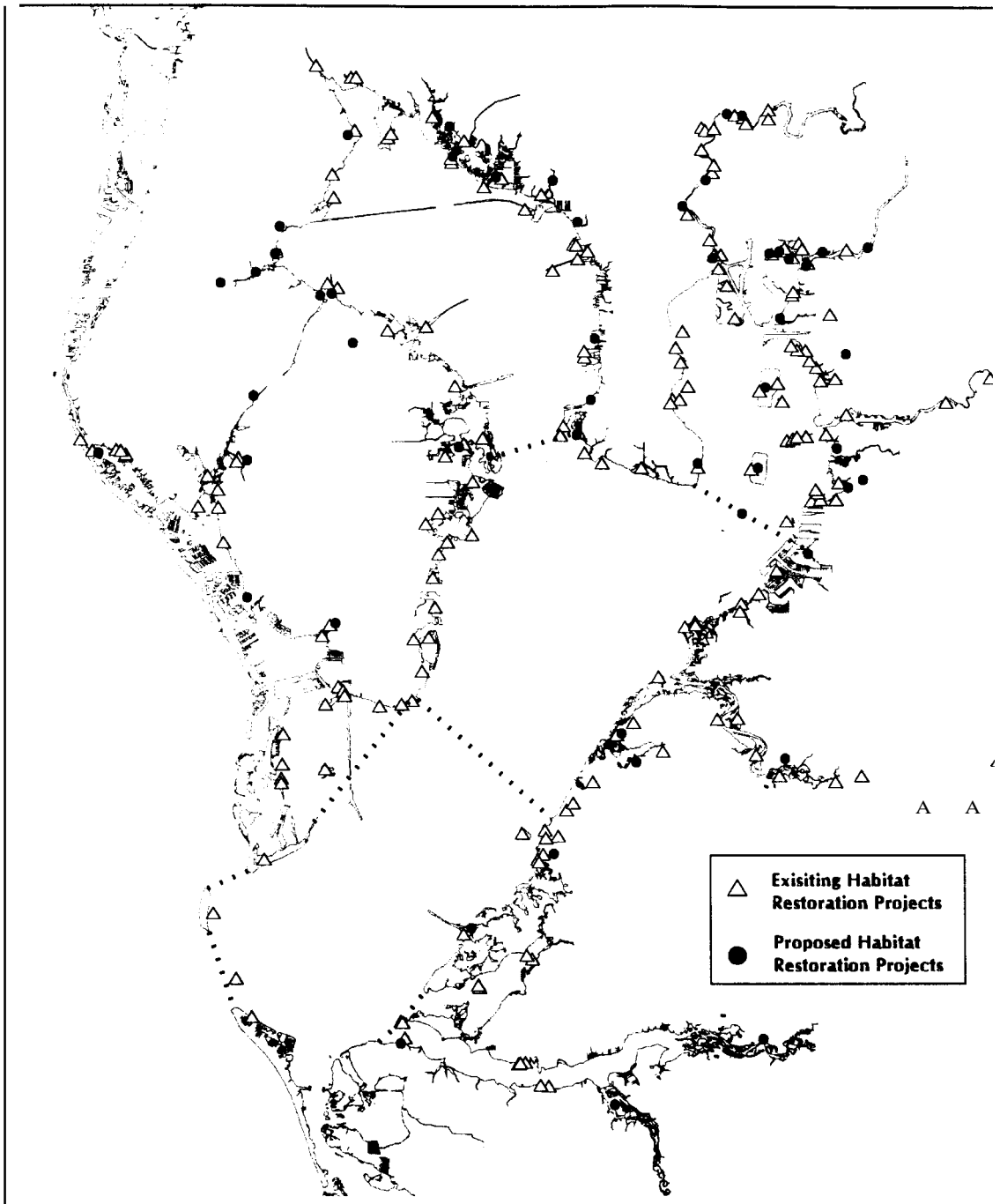


Figure 5. Existing and proposed habitat restoration sites.

## 4 CONCLUSIONS

Losses of emergent vegetation habitat have occurred in Tampa Bay since 1950. These losses have totaled 4,370 acres from 1950 to 1995. Much of these losses have been caused by shoreline development, with filling of emergent habitat. These losses have occurred at disproportionate rates for the different emergent habitat types. The bay-wide emergent habitat proportions of Mangrove-*Spartina* Marsh : *Juncus* Marsh : Salt Barren have changed from 67:28:5 in 1950 to 76:22:2 in 1995.

Emergent habitat losses were not spatially similar among the bay segments. The greatest absolute losses from 1950 to 1995 were found in Boca Ciega Bay (1,160 acres) and Middle Tampa Bay (1,010 acres). The greatest relative losses were found in Boca Ciega Bay (48% of 1950 acreage lost) and Hillsborough Bay (29% of 1950 acreage lost). In contrast, there was relatively little change in emergent vegetation acreage in Old Tampa Bay (490 acres lost, 9% of 1950 acreage) and Terra Ceia Bay (100 acres lost, 11% of 1950 acreage).

It is noted in the text, and reiterated here, that the emergent vegetation habitat GIS coverages used for this analysis were not created using the same methods. Other sources of errors exist as well in the estimate of emergent vegetation habitat acreage. The assumption was made for the purposes of this study that the SWFWMD land use categories for Mangrove Swamps and Saltwater Marshes correspond to the emergent vegetation habitat types of Mangrove-*Spartina* Marsh and *Juncus* Marsh, respectively, utilized in the 1950 coverage. Groundtruthing of emergent vegetation habitat types was only performed for Salt Barrens delineated for the 1990 and 1995 emergent vegetative habitat coverages, so that errors may well exist in the classification of emergent vegetation habitat types. However, these data are currently the best available for use in this analysis.

The TBEP has stated that restoration of an optimum balance of emergent vegetation habitats is of great importance in achieving the program's habitat restoration goal. In addition, the TBEP seeks to protect and enhance existing habitats. Further effort may be necessary to eliminate sources of error in emergent vegetation habitat acreage estimates, such as applying the same method to estimates for 1950, 1990, and 1995, to more accurately reflect the changes in emergent vegetation habitat occurring in Tampa Bay.

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# APPENDIX A

Existing Restoration Projects Database



PJT_NAME	BAY-SEC	OWNER	LOCATION	FLUCS CURR	FLUCS POTE	TOT AREA	UPL AREA	WET AREA	PURPOSE
L. MANATEE RIVER CORRIDOR	MTB	PRIVATE		741	642				
SAFFOLD SITE	MTB	H.CNTY ELAPP	L.M.RIV. E OF 301	741	642	300.0	250.0	50.0	
UPPER L.MANATEE RIVER	MTB	PRIVATE		741	642	500.0			
DUG CREEK	MTB		TRIBUTARY TO LITTLE MANATEE RI						to make OLIGOHA
L.M.R. STATE PARK	MTB	STATE OF FLORIDA	DOWNSTREAM FROM USHWY 301	185	185				
LITTLE MANATEE RIVER	MTB	HILLSBOROUGH COUNTY							to make ESTUARI
LITTLE MANATEE RIVER	MTB	H.CNTY ELAPP	E. 1-75 UPRIVER	741	642		500.0	600.0	
WILDCAT CREEK PARK	MTB	HILLSBOROUGH COUNTY	S L. MANRIV,E.US41	184	184	2.0	2.0		
DOMINO BOAT RAMP	MTB	HILLSBOROUGH COUNTY	NL. MAN RIV,E. US41	184	184	1.0	1.0		
SUN CITY HERITAGE PARK	MTB	HILLSBOROUGH COUNTY	S L. MANRIV,E.US41	184	184	1.0	1.0		
FULKERSON ROAD	MTB	PRIVATE							
TECO ROCK PONDS	MTB	TECO	NORTH OF PORT MANATEE						to make ESTUARI
TECO PORT MANATEE PPTY	MTB	TECO	PINEY POINT NORTH TO COCKROACH						
PINEY POINT/COCKROACH BAY	MTB	TAMPA ELECTRIC COMPANY	S. HILLS COUNTY	8311	642			100.0	
COCKROACH BAY	MTB	TAMPA PORT AUTHORITY		0		0.0			RESTORATION
COCKROACH BAY ADDITION	MTB	ELAPP	S. HILLS COUNTY	163	642	700.0			
SIMONS PARK PHASE II	MTB	HILLSBOROUGH COUNTY							to make
E.G.SIMMONS PARK	MTB	HILLSBOROUGH COUNTY	19TH ST. NW. RUSKIN	185	185	469.0			
E.G. SIMMONS PARK	MTB	HILLSBOROUGH COUNTY	19th AVE., RUSKIN,NORTH OF LIT PARKS	185		14.0			RESTORATION
SIMMONS PARK	MTB			0		0.0			RESTORATION
WOLF BRANCH	MTB	HILLSBOROUGH COUNTY,ELAP							to make
WOLF BRANCH SITE	MTB	ELAPP	S. OF APOLLO BEACH	163	642	980.0	450.0	530.0	
APOLLO BEACH	MTB	FRANDORSON	SHORELINE SOUTH OF APOLLO BEAC	612		270.0			MITIGATION
APOLLO BEACH	MTB	TAMPA PORT AUTHORITY		0		0.0			RESTORATION
WHISKEY STUMP KEY	HB	NATIONAL AUDUBON SOCIETY	SE. HILLS. BAY	191	191	6.0	5.0	1.0	
FISHHOOK SPOIL	HB	TAMPA PORT AUTHORITY	SPOIL ISLAND SOUTH OF THE BIG	0		0.0			EXPERIMENTAL
RIVERVIEW CENTER	HB	HILLSBOROUGH COUNTY	PARK DR.,RUVERVUEW	184	184	10.0	10.0		
ALAFIA RIVER BOAT RAMP	HB	HILLSBOROUGH COUNTY	BRANDON	184	184	1.0	1.0		
LITHIA SPRINGS PARK	HB	HILLSBOROUGH COUNTY	LITHIA SPS RD.	185	185	160.0			
KITCHEN AREA PROPERTY	HB	BIRD PROPERTY	N. PORT REDWING	254	642	40.0	40.0		
PORT REDWING BORROW SITE	HB	TAMPA PORT AUTHORITY	E & W OF WHISKEY STUMP KE	651	911	20.0	0.0	20.0	
PORT REDWING BORROW SITE	HB	TAMPA PORT AUTHORITY	E & W OF WHISKEY STUMP KE	651	911	20.0	0.0	20.0	
GREEN KEY	HB	NATIONAL AUDUBON SOCIETY	SE. HILLS. BAY	191	191	8.0	6.0	2.0	
GREEN KEY	HB	TAMPA PORT AUTHORITY	SUB-TIDAL AREA WEST OF GREEN K	0		0.0			EXPERIMENTATION
BULLFROG CREEK	HB	DAVIS PROPERTY	N. PORT REDWING	835	642	320.0	90.0	230.0	
SUNKEN ISLAND	HB	CARGILL, INC.	WESTERN ISLAND OF THE ALAFIA B	0		0.0			RESTORATION
SUNKEN ISLAND	HB	CARGILL, INC.	WESTERN ISLAND OF THE ALAFIA B	0		0.0			RESTORATION
ALAFIA RIVER SOUTH PARCEL	HB	CARGILL, INC.	SOUTH SIDE OF ALAFIA RIVER AT			300.0			to make RIVER C
22ND ST CAUSEWAY SITE	HB	PRIVATE	NE.22ND STCAUSEWAY	193	642	45.0	44.0	1.0	
ALAFIA BANKS	HB	CARGILL,INC.	SPOIL DISOSAL ISLANDS ON THE S	0		0.0			RESTORATION

ALAFIA BANKS	HB	CARGILL,INC.	SPOIL DISOSAL ISLANDS ON THE S	0		0.0				RESTORATION
ALAFIA BANKS	HB	CARGILL, INC	S. MOUTH OF ALAFIA	191		15.0	10.0	5.0		
ALAFIA BANKS	HB	CARGILL, INC	S. MOUTH OF ALAFIA	191		15.0	10.0	5.0		
WILLIAMS PARK	HB	HILLSBOROUGH COUNTY	N ALAFIA R. AT US41	184	184	10.0	10.0			
DELANEY CREEK,POPOFF SITE	HB	CSX	S,POP-OFF,E. USHWY 41	741	642					
ARCHIE CREEK	HB	GARDINIER	EAST SHORE OF HILLSBOROUGH BAY	642.1		4.5				MITIGATION
DELANEY POP-OFF CANAL	HB	CARGILL INC.	BETWEEN ARCHIE CREEK AND PORT	642		0.0				MITIGATION
CARGILL NORTH PARCEL	HB	CARGILL, INC.	NORTH OF DELANEY POP-OFF CANAL			200.0				to make EXOTIC
PENDOLA POINT MITIGATION	HB	TAMPA PORT AUTHORITY	US HWY 41 AND PENDOLA PT. RD.	0		0.0				
HILLSBOROUGH BAY	HB	TAMPA PORT AUTHORITY	SUB-TIDAL AREAS ALONG THE PERI	645		0.0				EXPERIMENTATION
HILLSBOROUGH BAY	HB	TAMPA PORT AUTHORITY	SUB-TIDAL AREAS ALONG THE PERI	645		0.0				EXPERIMENTATION
DELANEY CREEK SITE	HB	PRIVATE	S.CAUSWAY BLVD,E US41	741	642					
22ND ST CAUSEWAY SITE	HB	PRIVATE	NE.22ND ST CAUSEWAY	193	642	45.0	44.0	1.0		
S.E. McKAY BAY	HB	CITY OF TAMPA								to make
McCAY BAY SPOIL SITE	HB	TAMPA PORT AUTHORITY	E OF C.O.T. INCINERATOR	743	642	50.0	25.0	25.0		
PALM RIVER	HB			0		0.0				RESTORATION
DESOTO PARK	HB	TAMPA	NW MCKAY BAY	1851	1851	9.0	9.0			
DESOTO PARK ADDITION	HB	CSX	E. DESOTO PARK	193	642	18.0	8.0	10.0		
DAVIS ISLAND BEACH	HB	TAMPA	S DAVIS ISLAND	184	184	8.0	8.0			
MARJORIE PARK YACHT BASIN	HB	TAMPA	E DAVIS ISLAND	184	184	6.0				
BAYSHORE BOAT DOCKS	HB	TAMPA	MOUTH HILLS RIVER	184	184	0.5				
SR 60 MARSH	HB	PRIVATE								to make
MCKAY BAY	HB	CITY OF TAMPA	NORTH EAST CORNER OF MCKAY BAY	185		0.0				RESTORATION
NE MCKAY BAY	HB	H. CNTY ELAPP								
NORTH EAST MCKAY BAY	HB	HILLSBOROUGH COUNTY	NORTH EAST CORNER OF MCKAY BAY	642		4.0				RESTORATION
MCKAY BAY NATURE PARK	HB	TAMPA	N MCKAY BAY	1851	1851	36.0				
NCNB PARK PLAZA	HB	TAMPA		1851	1851					
PLANT PARK	HB	TAMPA	UNIV. TAMPA	1851	1851	7.0	7.0			
RIVERFRONT PARK	HB	TAMPA	1111 NORTH BLVD	1851	1851		22.0	22.0		
RIVER GARDEN	HB	TAMPA								
HILLSBOROUGH BAY	HB	TAMPA PORT AUTHORITY	SUB-TIDAL AREAS ALONG THE PERI	645		0.0				EXPERIMENTATION
HILLSBOROUGH BAY	HB	TAMPA PORT AUTHORITY	SUB-TIDAL AREAS ALONG THE PERI	645		0.0				EXPERIMENTATION
BAYSHORE BLVD.	HB	TAMPA PORT AUTHORITY		0		1.1				RESTORATION
BALLAST POINT PARK	HB	TAMPA	E MCDILL PENINSULA	1851	1851	7.0				
HILLSBOROUGH BAY	HB	TAMPA PORT AUTHORITY	SUB-TIDAL AREA OFF-SHORE OF TH	645		0.0				EXPERIMENTATION
MACDILL AFB	HB	TAMPA PORT AUTHORITY	SUBTIDAL AREA OFF-SHORE OF EAS	9111		0.0				EXPERIMENTAL
SOUTH BAYSHORE DR.	HB	CITY OF TAMPA/TPA	WEST SHORE OF HILLSBOROUGH BAY	642		1.0				RESTORATION
MacDILL AIR FORCE BASE I	HB	MacDILL AIR FORCE BASE	SOUTH EAST CORNER OF MacDILL P	642		17.0				RESTORATION
MACDILL AFB II	MTB	U.S. AIR FORCE	END OF MCDILL PENNINSULA							to make
MacDILL BORROW SITE	MTB	TAMPA PORT AUTHORITY	NW & SE OF END OF RUNWAY	651	911	40.0	0.0	40.0		
MacDILL BORROW SITE	MTB	TAMPA PORT AUTHORITY	NW & SE OF END OF RUNWAY	651	911	40.0	0.0	40.0		
PICNIC ISLAND	OTB	CITY OF TAMPA	PENNINSULA OF LAND AT THE SOOU	743		0.0				RESTORATION

PICNIC ISLAND PARK	OTB	TAMPA	SW MCDILL PENINSULA	1851	1851	86.0			
CANDY PARK	OTB	TAMPA	E GANDY BRIDGE	1851	1851	25.0			
GANDY PARK	OTB	TAMPA	E CANDY BRIDGE	1851	1851	25.0			
HOWARD FRANKLIN EAST	OTB	FDOT	SOUTH EAST SIDE OF APPROACH TO			3.0			to make MARSH,M
BRACKINS TRACT	OTB	ELAPP	NE. GANDY BRIDGE	746	1851	11.0	1.0	10.0	
CYPRESS ST. REST. PARK	OTB	ELAPP,H.CNTY AV.	NE. CANDY BRIDGE	743	1851	65.0	60.0	5.0	
CYPRESS ST.	OTB	AUTHORIT							
		HILLSBOROUGH							to make MARSH,
		COUNTY,ELAP							
PEPPERMOUND CREEK	OTB	FDIC	W. OF SWATR CREEK			140.0	50.0	90.0	
BEN T. DAVIS BEACH	OTB	TAMPA	SE C.C.CAUSEWAY	1851	1851	20.0			
TROYDALE ROAD	OTB	ELAPP	BET. SWATR & ROC CRK	191	185	300.0	300.0		
ROCKY CREEK	OTB								to make
MARINA POINT	OTB	PRIVATE							
CHANNEL A	OTB	SWFWMD		642		23.0			RESTORATION
CABBAGEHEAD BAYOU	OTB	SWFWMD	CHANNELA, NORTH OLD TAMPA			0.1			to make CHANGE
			BAY						
UPPER TAMPA BAY PARK	OTB	HILLSBOROUGH COUNTY	8001 DBLE. BR. RD.	185	185				
HIXON MEMORIAL PARK	HB	TAMPA	RIVER BLVD	1851	1851	6.0	6.0		
RIVER BLVD PARK	HB	TAMPA							
EPPS PARK	HB	CITY OF TAMPA	HILLSBOROUGH RIVER						to make
EPPS PARK	HB	TAMPA	N RIVER BLVD & LAMB	1851	1851	2.0	2.0		
LOWRY PARK	HB	TAMPA	7525NORTH BLVD	1851	1851	117.0	110.0		
HAMILTON CREEK-LOWRY PARK	HB	CITY OF TAMPA	SPRING RUN TO HILLSBOROUGH						to make FRESH W
			RIV						
LOWRY PARK SHORELINE	HB	CITY OF TAMPA	HILLSBOROUGH RIVER SHORELINE I	652		1.0			EROSION/REST
SULFER SPRINGS PARK	HB	TAMPA PARKS DEPARTMENT	8108N NEBRASKA	1851	1851	5.0	3.0	2.0	
RIVERCOVE PARK	HB	TAMPA	RIVERCOVE ST	1851	1851	0.5	0.5		
PATTERSON ST PARK	HB	TAMPA	PATTERSON ST	1851	1851	1.0	1.0		
ROWLETT PARK	HB	TAMPA PARKS DEPARTMENT	2401 E. YUKON ST.	1851	1851	67.0	67.0	0.0	
ROWLETT PARK	HB	TAMPA PARKS DEPARTMENT	2401 E. YUKON ST.	1851	1851	67.0	67.0	0.0	
ALDERMAN'S FORD PARK	HB	HILLSBOROUGH COUNTY	SR 39 S OF SR 60	185	185	596.0			
COOPERS POINT	OTB	P. CNTY/CLEARWATER	N W COURTNEY CAMPBEL	191	185	136.0			
CYPRESS ST. REST. PARK	OTB	ELAPP,H.CNTY AV.	NE. CANDY BRIDGE	743	1851	65.0	60.0	5.0	
		AUTHORIT							
MOBLEY BAY TRACT	OTB	PRIVATE	MOUTH SAFETY HARBOR	191	185	309.0			
FANTASY ISLAND/CMDA-2D	HB	TAMPA PORT AUTHORITY	EASTERN SHORE OF DISPOSAL ISLA	6421		0.0			MITIGATION
FANTASY ISLAND/CMDA-2D	HB	TAMPA PORT AUTHORITY	EASTERN SHORE OF DISPOSAL ISLA	6421		0.0			MITIGATION
SPOIL ISLAND CMDA-2D	HB	TAMPA PORT AUTHORITY	N HILLS BAY, W OF CHANNEL	743	743	550.0	500.0		
SPOIL ISLAND CMDA-3D	HB	TAMPA PORT AUTHORITY	S HILLS BAY, W OF CHANNEL	743	743	400.0	400.0		
PORT MANATEE	LTB	MANATEE PORT AUTHORITY	EAST LOWER TAMPA BAY	815	815	200.0	200.0		
PORT MANATEE	LTB	MANATEE PORT AUTHORITY	EAST LOWER TAMPA BAY	815	815	550.0	550.0		
PORT MANATEE SPOIL	LTB	STATE OF FLORIDA,TIITF	EAST LOWER TAMPA BAY	743	642	75.0	75.0		
PORT MANATEE ISLE	MTB	T.I.I.F.	DISPOSAL ISLAND SOUTH OF PORT						to make MARSH,
PORT MANATEE	LTB	MANATEE PORT AUTHORITY	EAST LOWER TAMPA BAY	815	815	200.0	200.0		
CROSS BAYOU	BCB	PINELLAS COUNTY							to make ESTUARI
ABERCROMBIE PARK	BCB	ST. PETERSBURG	LONG BAYOU,S38 AVE N	1851	1851				
JUNGLE PRADA PARK	BCB	ST. PETERSBURG	E. BCB,S. JOHNSPASS	185	185	3.0			

OSGOOD POINT	BCB	CITY OF GULF PORT								to make ESTUARI
CLAM BAYOU	BCB	ST. PETERSBURG,GULF PORT								to make ESTUARI
MAXIMO PARK	BCB	ST. PETERSBURG	E.FRENCHMAN'S CREEK	185	185	65.0				
BAY VISTA	LTB	ST. PETERSBURG	SE. PINELLAS PT.DR.	1851	1851	4.4				
LITTLE BAYOU	MTB	CITY OF ST. PETERSBURG	SOUTH EAST END OF PINELLAS PEN	642		3.0				RESTORATION
COQUINA KEY PARK	MTB	ST. PETERSBURG	SE. BIG BAYOU	1851	1851	18.0				
GRANDVIEW PARK	MTB	ST. PETERSBURG	S.W. BIG BAYOU	1851	1851	7.9				
LASSING PARK	MTB	STATE OF FLORIDA,TIITF	SUB-TIDAL AREA OFF-SHORE OF LA	9111		0.0				RESTORATION
LASSING PARK	MTB	STATE OF FLORIDA,TIITF	SUB-TIDAL AREA OFF-SHORE OF LA	9111		0.0				RESTORATION
LASSING PARK	MTB	CITY OF ST. PETERSBURG	DREDGED HOLES OFF-SHORE OF LAS	0		0.0				RESTORATION
DEMENS LANDING	MTB	ST. PETERSBURG	N. OF ALBERT WHITTED	1851	1851	9.1				
NORTHSHORE PARK	MTB	ST. PETERSBURG	E. OF BAYSHORE DR.	1851	1851	29.0				
COFFEEPOT BAYOU	MTB	STATE OF FLORIDA,TIITF	SUB-TIDAL AREA OFF-SHORE THE S	9111		0.0				RESTORATION
COFFEEPOT BAYOU	MTB	STATE OF FLORIDA,TIITF	SUB-TIDAL AREA OFF-SHORE THE S	9111		0.0				RESTORATION
COFFEEPOT BAYOU	MTB	STATE OF FLORIDA,TIITF	SUB-TIDAL AREA OFF-SHORE THE S	9111		0.0				RESTORATION
COFFEEPOT BAYOU PARK	MTB	ST. PETERSBURG	N.W. COFFEEPOT BAYOU	1851	1851	1.6				
SHORE ACRES	MTB	STATE OF FLORIDA,TIITF	SUB-TIDAL AREA OFF-SHORE NORTH	9111		0.0				RESTORATION
CRISP PARK	MTB	ST. PETERSBURG	W. PLACIDO BAYOU	1851	1851	4.0				
SHORE ACRES MINIPARK	MTB	ST. PETERSBURG	S. PAPYS BAYOU	1851	1851	1.6				
WEEDON ISLAND STATE PARK	OTB	STATE OF FLORIDA	S GANDY BLVD. W OTB	185	185	680.0				
MANGROVE BAY	MTB	CITY OF ST. PETERSBURG	EAST SHORE OF OLD TAMPA BAY, S	182		14.0				RESTORATION
MANGROVE BAY III	MTB	ST. PETERSBURG	MANGROVE BAY GOLF COURSE							to make ESTUARI
HOWARD FRANKLIN WEST	OTB	FDOT	NORTH WEST SIDE OF APPROACH TO			8.0				to make MARSH,
BOCA CEIGA TRACT, PHASE I	BCB	PINELLAS COUNTY	NORTH EAST SHORE OF BOCA CEIGA	743		3.5				RESTORATION
BOCA CEIGA TRACT	BCB	PINELLAS COUNTY		0		0.0				RESTORATION
BOCA CIEGA II	BCB	PINELLAS COUNTY								to make ESTUARI
BOCA CEIGA TRACT	BCB	PINELLAS COUNTY	S. PARK BLVD.	185	185	188.0				
TRAVATINE ISLAND	BCB	PINELLAS COUNTY	E OF THE NARROWS	743	185	38.0	19.0	19.0		
LARGO NARROWS NATURE PARK	BCB	PINELLAS COUNTY	LARGO NARROWS	185	185	33.0				
JOES CREEK	BCB	PINELLAS COUNTY	TIDAL CREEK ENTERING N.E. CROS	0		0.0				RESTORATION
JOES CREEK	BCB	PINELLAS COUNTY	TIDAL CREEK ENTERING N.E. CROS	0		0.0				RESTORATION
JOES CREEK	BCB	PINELLAS COUNTY	TIDAL CREEK ENTERING N.E. CROS	0		0.0				RESTORATION
JOES CREEK	BCB	PINELLAS COUNTY	TIDAL CREEK ENTERING N.E. CROS	0		0.0				RESTORATION
JOES CREEK	BCB	PINELLAS COUNTY	TIDAL CREEK ENTERING N.E. CROS	0		0.0				RESTORATION
JOES CREEK	BCB	PINELLAS COUNTY	TIDAL CREEK ENTERING N.E. CROS	0		0.0				RESTORATION
LONG BAYOU	BCB	PINELLAS COUNTY								to make ESTUARI
VETRANS MEMORIAL PARK	BCB	PINELLAS COUNTY	W MOUTH CROSS BAYOU	185	185	122.0				
FT. DESOTO PARK	LTB	PINELLAS COUNTY	N MOUTH OF T BAY	185	185	900.0				
PINELLAS NTL. WL. REFUGE	LTB	U.S.DEPT.OF INTERIOR	N MOUTH OF TAMPA BAY	185	185					
PINELLAS NTL. WL. REFUGE	LTB	U.S.DEPT.OF INTERIOR	N MOUTH OF TAMPA BAY	185	185					
PINELLAS NTL. WL. REFUGE	LTB	U.S.DEPT.OF INTERIOR	N MOUTH OF TAMPA BAY	185	185					
PINELLAS NTL. WL. REFUGE	LTB	U.S.DEPT.OF INTERIOR	N MOUTH OF TAMPA BAY	185	185					
PINELLAS NTL. WL. REFUGE	LTB	U.S.DEPT.OF INTERIOR	N MOUTH OF TAMPA BAY	185	185					
PINELLAS NTL. WL. REFUGE	LTB	U.S.DEPT.OF INTERIOR	N MOUTH OF TAMPA BAY	185	185					
MAXIMO PARK	BCB	CITY OF ST. PETERSBURG	SOUTH OF FRENCHMAN'S CREEK ON	6421		10.0				RESTORATION
MAXIMO PARK	BCB	CITY OF ST. PETERSBURG	SOUTH OF FRENCHMAN'S CREEK ON	6421		10.0				RESTORATION

SKYWAY JACKS	BCB	STATE OF FLORIDA, TIITF		0		0.0			RESTORATION
SKYWAY JACKS	BCB	STATE OF FLORIDA, TIITF		0		0.0			RESTORATION
ANNA MARIA BAYFRONT	LTB	MANATEE COUNTY	BAY BLVD., ANNA MAR1	185	185				
BAY VISTA	LTB	ST. PETERSBURG	SE. PINELLAS PT.DR.	1851	1851	4.4			
EGMONT KEY	LTB	U.S.DEPT.OF INTERIOR	MOUTH OF TAMPA BAY	185	185	400.0	350.0	50.0	
EMERSON POINT	LTB	MANATEE COUNTY	10TH ST. PALMETTO	193	642	360.0			
GATEWAY TRACT	OTB	PINELLAS COUNTY		191	191	205.0			
FEATHER COVE	OTB	TIITF	WEST SHORE OF OLD TAMPA BAY, N	0		9.9			MITIGATION
ST. PETERSBURG AIRPORT	OTB	STATE OF FLORIDA TIITF	NW & E OF END OF RUNWAY	651	911	25.0	0.0	25.0	
ST. PETERSBURG AIRPORT	OTB	STATE OF FLORIDA TIITF	NW & E OF END OF RUNWAY	651	911	25.0	0.0	25.0	
COOPERS POINT	OTB	P. CNTY/CLEARWATER	N W COURTNEY CAMPBEL	191	185	136.0			
DEL ORO TRACT	OTB	CITY OF CLEARWATER		0		0.5			RESTORATION
MOBLEY BAY TRACT	OTB	PRIVATE	MOUTH SAFETY HARBOR	191	185	309.0			
PHILIPPE PARK	OTB	PINELLAS COUNTY	SAFETY HARBOR, OTB	185	185	122.0			
LAKE TARPON	OTB	PINELLAS COUNTY	CANAL CONNECTING LAKE TARPON A	6421		1.0			RESTORATION
HARBOR PALMS	OTB	CITY OF OLDSMAR							to make OLIGOHA
MOCCASIN CREEK	OTB	CITY OF OLDSMAR				2.0			to make MARSH, to make
MOBBLY BAY	OTB								
ANNA MARIA BAYFRONT	LTB	MANATEE COUNTY	BAY BLVD., ANNA MAR1	185	185				
PASSAGE KEY	LTB	U.S.DEPT.OF INTERIOR	S MOUTH OF TAMPA BAY	185	185	20.0	20.0		
EGMONT KEY	LTB	U.S.DEPT.OF INTERIOR	MOUTH OF TAMPA BAY	185	185	400.0	350.0	50.0	
HENDRY DELTA	LTB	STATE OF FLORIDA, TIITF	IMMEDIATLY SOUTH OF PORT MANAT	0		0.0			RESTORATION
HENDRY DELTA	LTB	STATE OF FLORIDA, TIITF	IMMEDIATLY SOUTH OF PORT MANAT	0		0.0			RESTORATION
HENDRY DELTA	LTB	STATE OF FLORIDA, TIITF	IMMEDIATLY SOUTH OF PORT MANAT	0		0.0			RESTORATION
HENDRY DELTA	LTB	STATE OF FLORIDA, TIITF	IMMEDIATLY SOUTH OF PORT MANAT	0		0.0			RESTORATION
HENDRY DELTA	LTB	STATE OF FLORIDA, TIITF	IMMEDIATLY SOUTH OF PORT MANAT	0		0.0			RESTORATION
HENDRY DELTA	LTB	STATE OF FLORIDA, TIITF	IMMEDIATLY SOUTH OF PORT MANAT	0		0.0			RESTORATION
HENDRY DELTA	LTB	STATE OF FLORIDA, TIITF	IMMEDIATLY SOUTH OF PORT MANAT	0		0.0			RESTORATION
HENDRY DELTA	LTB	STATE OF FLORIDA, TIITF	IMMEDIATLY SOUTH OF PORT MANAT	0		0.0			RESTORATION
PEANUT LAKE	LTB	STATE OF FLORIDA	SOUTH OF PORT MANATEE	651		10.0			RESTORATION
PEANUT LAKE II	MTB	HENDRY	SOUTH OF PORT MANATEE, EAST SI						to make ESTUARI
TERRA CEIA CAUSEWAY	LTB	FDOT	APPROACHES OF US HWY 19 CROSS1						to make HIGH SA
TERRA CEIA CAUSEWAY	LTB	FDOT	APPROACHES OF US HWY 19 CROSS1						to make HIGH SA
TERRA CEIA BIRD KEY	LTB	STATE OF FLORIDA, TIITF		0		0.0			RESTORATION
CEIA BIRD KEY	LTB	NATIONAL AUDUBON SOCIETY	TERRA CEIA BAY	743	193	16.0	15.0	1.0	
DESOTO PARK	LTB	MANATEE COUNTY							to make ESTUARI
EMERSON POINT	MR	MANATEE COUNTY							to make ESTUARI
EMERSON POINT	LTB	MANATEE COUNTY	10TH ST. PALMETTO	193	642	360.0			

REGATTA POINT	MR	STATE OF FLORIDA, TIIF		0		0.0			RESTORATION
REGATTA POINT	MR	STATE OF FLORIDA, TIIF		0		0.0			RESTORATION
REGATTA POINT	MR	STATE OF FLORIDA, TIIF		0		0.0			RESTORATION
7TH ST EAST PROPERTY	MR	CITY OF BRADENTON	7TH ST E AT MAN.RIV.	835	1851	3.0			
ANTHONY T. ROSSI PARK	MR	CITY OF BRADENTON	9TH ST W & 1ST ST.	1851	1851	10.0			
RIVERSIDE PARK EAST	MR	CITY OF PALMETTO	E. US41 AT MAN. RIV.	1851	1851		1.0	1.0	
RIVERSIDE PARK WEST	MR	CITY OF PALMETTO	W.US41 AT MAN RIV.	184	184	3.0	3.0		
RATTLESNAKE KEY	LTB	STATE OF FLORIDA, TIIF		0		0.0			RESTORATION

# APPENDIX B

Proposed Restoration Projects Database

<b>SITE</b>	<b>PARCEL-ACR</b>	<b>PROJECT-AC</b>	<b>SPONSOR</b>	<b>OWNERSHIP</b>
KAUL FISH SITE AT OLD TAMPA BAY	10	10	SWFWMDSWIM	PRIVATE
PEANUT LAKE II & TERRA CEIA ISLES	1610	535		
FT. HAMMER BOAT RAMP AND PARK	7	2	MANATEE COUNTY	FEDERAL
JOE'S CREEK NORTH (58TH ST AT WHITNEY ROAD)	100	10-20	PINELLAS COUNTY	
PINE ST. AT BAY ST. (COUNTRYSIDE AREA)	8.4	8.4	PINELLAS COUNTY	?
BIOLOGY CREEK ON HILLSBOROUGH RIVER AT UT HILLSBOROUGH COUNTY PARKS, TAMPA BAYWATCH	1-2	1-2	SWFWMD-SWIM	
CSX PARCEL HABITAT RESTORATION	54	54	CITY OF TAMPA	PRIVATE
SULFUR SPRINGS LINEAR PARK			SWFWMD-SWIM	
SUNSHINE SKYWAY CAUSEWAY AND APPROACHES			GFC	FDOT
DOT & DASH KEYS			TBNEP	
BRODERICK TRACT	100	100	PINELLAS COUNTY	?
CROSS BAYOU CANAL	100	100	PINELLAS COUNTY	PRIVATE/PUBLIC
HARBOR ISLES	80	50	TAMPA BAYWATCH	PRIVATE/PUBLIC
LONG BRANCH BASIN	20.6	20.6	PINELLAS COUNTY	?
LONG BRANCH NORTH (58TH ST. AT WHITNEY RD.)	9.3	9.3	PINELLAS COUNTY	?
ST. PETERSBURG AIRPORT (OLD TAMPA BAY)	5-10	5-10	SWFWMD-SWIM	
TRAVETINE ISLAND	38.5		PINELLAS COUNTY	
CARGILL PROPERTY	230	60		
COCKROACH BAY 1C, 1D	600	200		
CRACKER ROAD FISH FARM	<b>40</b>	<b>40</b>		
BOWLER TRACT			FDEP	
LITTLE MANATEE RIVER	1200	200-4		
DICK CREEK	50	10-20		
UPPER DELANEY CREEK POP-OFF CANAL	290	<b>40</b>		
US 41 FISH FARM	10	10		
ALLEN'S CREEK II	7	5		
CLAM BAYOU II	23	15		
TAMPA POLICE ACADEMY IN NW MCKAY BAY	< - 5	<b>&lt; = 5</b>	SWFWMD-SWIM	
DESOTO PARK AND TRAILER PARK IN NW MCKAY BAY	< - 15	<b>&lt; = 15</b>	SWFWMD-SWIM	
RIVERCREST HABITAT RESTORATION PROJECT	9	4-5	CITY OF TAMPA	
DESOTO PARK ON MANATEE RIVER	< - 10		SWFWMD-SWIM	FEDERAL
EPPS PARK SHORELINE RESTORATION	2	0.70	STEVE GRAHAM	
MCKAY BAY GREENWAY HABITAT RESTORATION (GLOVER)	34	18-22	CITY OF TAMPA	PRIVATE
NEWMANS BRANCH	50+	50+		
PICNIC ISLAND CREEK AND CANAL STREET CORRIDOR HABITAT RESTORATION	171	25	CITY OF TAMPA	PRIVATE
PINE ISLAND	1-3	1-3	SWFWMD-SWIM	PRIVATE
SPOIL ISLANDS 1 - 2D AND 3D	706		SWFWMD-SWIM	
SPOIL ISLANDS 1 - 2D AND 3D	706		SWFWMDSWIM	
TAPPAN HABITAT RESTORATION PROJECT	61+-	17+-	CITY OF TAMPA	
PALM RIVER	< = 100	< = 100	TAMPA BAYWATCH, SWFWMD-SWIM, EPC OF HC	
TIDAL TRIBUTARIES TO THE LOWER PALM RIVER			TAMPA BAYWATCH, EPC OF HC	
TOWER AND KEY BANK HABITAT RESTORATION	15+-	15	CITY OF TAMPA	
ALLEN'S CREEK AND LANCASTER DR. E	<b>4.8</b>	<b>4.8</b>	PINELLAS COUNTY	
BAYSIDE BRIDGE SITE (49TH ST. AT 182ND AVE.)	9.3	9.3	PINELLAS COUNTY	
CHATEAU TOWER LAGOON RESTORATION PROJECT	5	2	CITY OF SOUTH PASADENA	



MACDILL AFB III  
DICK CREEK  
SE MCKAY BAY  
FISH CREEK  
SWEETWATER CREEK

15  
30  
10  
<=10

6  
10-25  
5-6  
<=10

SWFWMD-SWIM  
SWFWMD-SWIM