SETTING PRIORITIES FOR TAMPA BAY HABITAT PROTECTION AND RESTORATION: RESTORING THE BALANCE

FINAL REPORT

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Setting Priorities for 
Tampa Bay Habitat Protection 
and Restoration: 
Restoring the Balance

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ACRONYMS
Used to Designate Bay Segments
(as described by Lewis and Whitman 1985)

BCB — Boca Ciega Bay
HB — Hillsborough Bay
LTB — Lower Tampa Bay
MR — Manatee River
MTB — Middle Tampa Bay
OTB — Old Tampa Bay
TCB — Terra Ceia Bay
EXECUTIVE SUMMARY

The Tampa Bay Habitat Protection and Restoration Masterplan project has analyzed trends in emergent marine and estuarine wetland loss and determined that there has been greater loss, on a percentage basis, of the shallow, lower salinity tidal marshes predominantly found in tidal streams, than of the higher salinity coastal mangrove and cordgrass marshes. In 1900, there were an estimated 16,200 acres of these oligohaline marshes; there are now 4,117 acres, for a decrease of almost 75%. In total area, the 1900 acreage of tidal marshes was nearly equivalent to that of mangroves, but mangroves have not decreased to the same extent, now totaling 13,764 acres (a loss of 17%). Salt barrens experienced the smallest decline of these coastal wetland habitats, decreasing from 1,012 acres in 1900 to 877 acres in 1990, for a 13% loss.

Estimated acreage of these three habitat types (tidal marshes, mangroves/cordgrass marshes, and salt barrens) in 1950 shows that nearly 80% of the loss of tidal marshes occurred during the first half of the century. But between 1950 and 1990, relative losses of both tidal marshes and salt barrens far exceeded that of mangroves. As a result of these differential losses, the relative proportions of each habitat type have changed dramatically since 1900. The ratio of mangroves : tidal marsh : salt barrens (based on percent of total emergent wetland acreage) in 1900 is estimated to have been 49.48.3, respectively. By 1950 this had changed to 67.28.5, and by 1990 had reached 73.22.5.

The basic premise of the proposed protection and restoration plan is that a combination of habitats is essential to the continued ecological viability of Tampa Bay, and that these habitats must be protected and restored with regard to historic proportions. From this premise and the trend analysis conducted, which clearly shows a differential loss of critical wetland habitats, comes an alternative for defining the living resource restoration target. The concept is to restore the predvelopment balance of “habitat ratios,” or the relative proportion of the different types of emergent tidal wetland that were present during a benchmark time period representative of a less impacted condition. This paradigm is termed “Restoring the Balance.”

The importance of habitat ratios is based on the assumption that combinations of habitat types, in certain proportions, are essential to the continued survival of groups of organisms with similar habitat needs (guilds). In addition to differential loss, this assumption provides additional justification for the targeting of tidal marshes for restoration. Based on the requirements of the guild of birds in which white ibis are included, tidal marshes are of particular significance as adult feeding areas. Not only do the multiple habitat needs of the white ibis illustrate the concept of habitat ratios directly, but this is also a locally abundant species in real need of the precise kind of habitat protection and restoration proposed by this plan.

Because these areas have also been characterized as critical nursery habitats for many important fish and invertebrate species of both commercial and recreational value, the proposed plan has recommended bay tidal stream habitats as the top priority for future restoration plans. This recommendation is made in order to restore the historical balance of
the key emergent wetland plant communities in the watershed. In determining restoration
target ratios and areas for the three habitat types, four options were considered: restoration to
c. 1900 area and proportions; restoration to c. 1950 area and proportions; restoration to
c. 1900 proportions; and restoration to c. 1950 proportions. For the latter two options, area
would be increased only as necessary to attain the proportions determined. For reasons of cost
and practicality, restoration to c. 1950 proportions was chosen as the preferred minimum
option. Annual estimated costs for the four options ranged from $350,000 to more than $3
million. These costs are based on 100-year projections assuming the current rate of
restoration, which is approximately 100 acres every five years.

An evaluation matrix was developed for application in this plan, using criteria that can be
scored and thus yield a relatively objective assessment of site rankings for protection. It is
recognized that this procedure is merely an example of an attempt toward objective
assessment, and that many other criteria can (and perhaps should) be used. Several
alternatives have been offered by reviewers of draft versions of this document, and have
either been incorporated or are included in the appendices.

All existing emergent marine and estuarine wetlands not currently under some form of
protection from development are identified as priority acquisition or negotiated protection
(i.e. conservation easement) areas. Twenty-eight specific areas are identified for protection,
including critical areas of existing or potentially restorable freshwater marshes essential for
the continued existence of healthy white ibis populations and other bay wildlife species.

Achieving the target levels proposed in this plan will require protection (through direct
acquisition or otherwise) of key parcels that are currently under private ownership. Protection
of publicly owned lands must also be assured into the future; it cannot be assumed that sites
now under regulatory protection will remain so in years to come.

The 40 proposed new habitat restoration projects outlined in the draft five-year SWIM plan
(FY 95–99) are suggested as a starting point for establishing priorities for future restoration.
Many of these already meet the priority criteria suggested from this project. A one-year
phase-in period is recommended during which ongoing restoration projects will continue and
a new list of priority restoration projects will be produced for SWIM and other entities to use
in future years. Because post-restoration/vegetation management is considered to be of critical
importance, it is included in the criteria suggested by this project.

Development of this plan resulted in an updated inventory of tidal streams tributary to Tampa
Bay. These results indicate that there is ample area available to attain the restoration target set
for tidal marshes. Furthermore, such restoration is likely to be highly effective in terms of cost
and practicality, as a major part of such restoration is proposed to be the control of exotic
invasive plant species, particularly Brazilian pepper and Australian pine. This has been
identified as a critical part of an overall Tampa Bay habitat restoration and protection plan.
Additional specific recommendations include:

- Conducting an Implementation Workshop
- Incorporation of upland protection and restoration in the overall Fish and Wildlife Service regional wildlife habitat plan
- Development and implementation of long-term management plans
- Implementation of monitoring

This is Technical Publication No. 09-95 of the Tampa Bay National Estuary Program.
INTRODUCTION

Emergent tidal wetlands occur primarily along a natural intertidal shelf which runs the bay and its tidal tributaries, and to a lesser extent along filled intertidal areas created by urban and port development. Three classes of emergent tidal wetlands are generally recognized in the Tampa Bay area: mangrove forests, salt marshes, and salt barrens (Lewis and Estevez 1988). Based upon the salinity regime in which they occur, and their species composition, salt marshes can be further subdivided into three categories. Polyhaline marshes coexist with mangroves along the shoreline of the bay; mesohaline and oligohaline marshes occur in rivers and tidal tributaries to the bay. Hypersaline plant communities or salt barrens typically occur in infrequently flooded tidal flats, usually at or above the spring high water line.

In the subtropical latitudes of Tampa Bay where infrequent freezing weather can occur, the assemblage of plant species which comprise tropical mangrove forests and temperate polyhaline marshes generally exist in a state of dynamic equilibrium, with the herbaceous marsh grasses serving a pioneer successional role and the woody mangrove trees representing the climax community (Lewis and Estevez 1988, Lewis 1990a). Furthermore, given the proper elevation, substrate and energy environment, these species are capable of naturally colonizing newly created intertidal areas, and existing intertidal areas which have been denuded by freeze damage or erosion. Therefore, the overall coverage and relative composition of the various types of emergent tidal wetlands in the bay are in a constant state of flux due to both natural and anthropogenic factors.

These emergent tidal wetlands collectively form an important habitat complex in Tampa Bay. They provide critical habitat for much of the bay’s wildlife, are an important component of nutrient cycles, stabilize submerged shoreline sediments and minimize shoreline erosion, and amassulate pollutants carried in runoff from upland urban areas. Emergent tidal wetlands provide attachment sites for algal and invertebrate communities, and provide habitat below the water surface for hundreds of recreational and commercially important species of fish, shrimp, and crabs, and other shellfish (Haddad 1989). These species include pink shrimp, menhaden, blue crabs, mullet, red drum, tarpon, and snook (Lewis et al. 1985, Edwards 1991). The marsh grasses and mangrove trees also provide critical feeding, nesting, and sheltering habitat for a variety of birds such as pelicans, cormorants, herons, ibises, spoonbills and egrets (Paul and Woolfenden 1985).

Similarly, adjacent upland plant communities such as coastal hydric hammocks buffer emergent tidal wetlands from urban and agricultural development, and provide important transitional habitat for reptiles such as the diamondback terrapin and the mangrove water snake. The status and ecological function of coastal upland habitats in Tampa Bay, however, have generally been poorly studied.

Despite the dynamic nature of emergent tidal wetlands, a substantial net loss of these critical living resources has occurred in Tampa Bay since 1950. The most significant losses occurred during the 1950s and early 1960s when dredge and fill activities associated with urban residential and port development were largely unregulated (Lewis 1977). With the passage of more stringent wetland protection laws during the mid-1970s and early 1980s, the rate of emergent
tidal wetland destruction from dredge and fill activities has been greatly reduced. Nonetheless, due to the substantial historic wetland losses that have been incurred, and the adverse impact of these losses on dependent animal species, measures are needed to restore previously impacted areas, and to better protect existing emergent tidal wetland and associated upland communities in Tampa Bay. Furthermore, although the existing stands of emergent tidal wetlands are protected from major impacts by federal, state and local regulatory programs, the swinging of the political pendulum does not guarantee this protection in the future.

The Emergent Tidal Wetland Communities of Tampa Bay

Both air temperature and salinity are critical factors in determining the distribution and species composition of emergent tidal wetlands. Defining the relevant salinity regimes as they relate to Tampa Bay is complicated. Hedgpeth (1951) was the first to develop a classification scheme for salinity zones within estuaries. The Venice System (Anonymous 1959) adopted in 1959 used a slightly modified system from that of Hedgpeth (1951), and Bulger et al. (1990) have recently proposed a third. The three systems are compared here:

<table>
<thead>
<tr>
<th></th>
<th>Hedgpeth</th>
<th>Venice</th>
<th>Bulger</th>
<th>component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater</td>
<td>&lt;0.5 ppt</td>
<td>0–0.5 ppt</td>
<td>0–4 ppt</td>
<td>1</td>
</tr>
<tr>
<td>Oligohaline</td>
<td>0.5–3.0</td>
<td>0.5–5</td>
<td>2–15</td>
<td>2</td>
</tr>
<tr>
<td>Mesohaline</td>
<td>3.0–16.5</td>
<td>5–18</td>
<td>11–19</td>
<td>3</td>
</tr>
<tr>
<td>Polyaline</td>
<td>16.5–30</td>
<td>18–30</td>
<td>15–28</td>
<td>4</td>
</tr>
<tr>
<td>Euhaline</td>
<td>&gt;30</td>
<td>&gt;30</td>
<td>23–35</td>
<td>5</td>
</tr>
</tbody>
</table>

Unfortunately, none of these classification schemes has been universally adopted by the scientific community. With respect to the species composition and community distribution of emergent tidal wetlands in Tampa Bay, the classification scheme developed by Bulger et al. (1990) generally corresponds with the vegetational zonation observed in the field. Mangrove forests and associated cordgrass fringe marshes typically occur within the polyaline zone, whereas mangroves and needlerush typically occur within the mesohaline zone. Oligohaline zones are the most diverse, often supporting six or more herbaceous species dominated by black needlerush and occasional black mangroves (Lewis 1990, p. 75). Salt barrens exist in a hypersaline regime caused by seawater ponding and evaporation.

Although mangrove and marsh communities often co-exist as complex assemblages, each is a distinct ecosystem with unique characteristics. The distribution and species composition of salt marsh, mangrove and salt barrens communities of Tampa Bay are discussed here.

Mangrove Forests

Mangrove forests in Florida are composed of four species of trees: Rhizophora mangle L. (red mangrove), Avicennia germinans (L.) L. (black mangrove), Laguncularia racemosa Gaertn. f.
(white mangrove) and Conocarpus erecta L. (buttonwood). The tree species are generally distributed along a gradient in the intertidal zone with the red mangrove at the lowest elevations and the buttonwood at the highest. Forest structure in Florida is, however, not uniform and many variations on the classic zonation pattern first described by Davis (1940) occur (Snedeker 1982, Lewis et al. 1985). In addition, due to factors such as local topography, time since the last freeze event, changes in freshwater discharge, and other periodic disturbances, a given intertidal plant community can include marsh species at elevations lower or higher than the forest itself, and within windfalls or lightning strike areas of the forest. Mangroves are cold-sensitive tropical plants, and for this reason exhibit tidal zonation dependent on their cold tolerance (Lot-Hergueras et al. 1975, McMillan 1975, Lugo and Patterson-Zucca 1988, McMillan and Sherrard 1986). The black mangrove is the most cold tolerant species and extends northward along the Gulf coast to Louisiana as scattered shrubs within the predominant tidal marsh vegetation. There are approximately 273,000 ha of mangrove forest remaining in Florida, a reduction of 23% since World War II (Lewis et al. 1985).

An important characteristic of all mangroves is that their reproduction includes seedling dispersal by water and by vivipary. Vivipary means that there is no true or independent "seed", but continuous development from embryo to seedling occurs while attached to the parent tree (Gill and Tomlinson 1969). For this reason the final reproductive unit released from the parent tree is often referred to as a "propagule" (Rabinowitz 1978).

Ecologically, mangroves are considered important as fisheries habitat (Lewis et al. 1985), as sources of detritus to support estuarine food chains (Odum et al. 1982), and as shoreline stabilizers (under limited conditions, Carlton 1974).

Tidal Marshes
Atlantic coastal marshes in Florida are dominated by Spartina alterniflora Loisel. (smooth cordgrass) while Gulf coast marshes are dominated by Juncus roemerianus Scheele (slack needlerush). Several other plant species are common minor components of the marshes including Spartina patens (Ait.) Muhl. (saltmeadow cordgrass), Distichlis spicata (L.) Greene (saltgrass) and Batr maritima L. (saltwort). Tidal marshes are widely distributed around the coast of Florida and often intermingle with mangrove communities (Durako et al. 1985). There are approximately 155,000 ha of tidal marsh in Florida (Lewis et al. 1985).

Reproduction takes place by waterborne seeds and asexually produced rhizomes. Due to their rhizomorous method of sexual propagation and ability to rapidly expand and anchor, some tidal marsh species such as smooth cordgrass are often pioneer colonizers of disturbed habitats and are replaced as other species such as mangroves naturally invade such habitats (Davis 1940, Lewis and Dunstan 1976, Lewis 1982a, 1982b).

Oligohaline Marshes
Though often not recognized as a distinct plant community (Durako et al. 1985), these marshes are unique in both their species composition and their ecological role, and are thus treated here as a distinct plant community. Oligohaline is defined by Cowardin et al. (1979) as
referring to “water with a salinity of 0.5 to 5.0 ppt due to ocean-derived salts” (p. 43). In Florida, oligohaline marshes are herbaceous wetlands located in tidally influenced rivers or streams where the plant community exhibits a mixture of true marine plants and typical freshwater taxa (Typha [cattails], Cladium [sawgrass]) that tolerate low salinities. The predominant plant species of oligohaline marshes include black needlerush, Acrostichum danaefolium Langsd. & Fisch. (leather fern), Typha domingensis Pers. (brackish water cattails), Cladium jamaicense Crantz (sawgrass), Scirpus robustus Parah. (bulrush) and Hymenocallis palmeri S. Wats. (spider lily).

Ecologically, oligohaline marshes (Rozas and Hackney 1983) and low salinity mangrove forests are becoming recognized as critical nursery habitat for such species as Callinectes sapidus (blue crab), Centroprum unidentemalis (snook), Megalops atlanticus (tarpon) and Elagrus saurus (ladyfish) (Odhun et al. 1982, Gilmore et al. 1983, Lewis et al. 1985). Because recognition of this key role in estuarine life cycles has come only recently, much of this habitat has been lost or highly modified. The reduced amount of this habitat type may represent a limiting factor in total population sizes of some estuarine-dependent species.

Salt Barrens
The salt barren represents the upper intertidal flat which is inundated typically only by spring tides once or twice a month. This results in hypersaline conditions with seasonal expansion of typically low-growing succulent salt-tolerant vegetation with lower interstitial salinities during the rainy season, and retreat with less frequent inundation and rainfall. This produces the characteristic open unvegetated patches of the salt barren substrate. These areas are also referred to as salt flats or salinas. The salt barren is typically located behind a mangrove forest or tidal marsh at a somewhat higher elevation and often occurs on exposed rock outcrops with shallow sand sediments. Although technically oligohaline marshes, salt barrens are treated here as a distinct plant community due to their unique flora and ecological value. Common plant species consist of saltwort, saltgrass, Salicornia bigelovii Torr. (annual grasswort), Salicornia virginica L. (perennial grasswort), Monoanchochloe littoralis Engelm. (key grass), Limonium carolinianum (Walt.) (sea lavender), Bluatparon vermiculare (L.) Kears (sapphire) and Sesuvium portulacastrum L. (sea purslane).

These areas have unique ecological values as seasonal feeding areas for wading birds when the lower elevation mudflats are more routinely inundated (Powell 1987), and as night feeding habitat on spring tides for snook, tarpon and ladyfish (G. Gilmore, pers. comm.). However, due to their low structural complexity and apparent lack of numerous fauna, these areas are often assumed to have low ecological value. Data now being generated strongly contradicts this assumption.

Impacts to Emergent Tidal Wetlands
Because they exist along the shoreline of the bay and its tributaries, emergent tidal wetlands have historically been very susceptible to encroachment from urban development. Physical impacts associated with dredge and fill activities have been, and continue to be, the primary cause of emergent tidal wetland losses in Tampa Bay.
Historic dredging and the disposal of the resulting dredged material have directly resulted in the loss of thousands of acres of intertidal and shallow bay-bottom habitat around Tampa Bay. The U.S. Geological Survey estimated that the total surface area of the bay has been reduced by approximately 8,320 acres or 3.6% (Goodwin 1984). Of this acreage, approximately 11% has been attributed to causeways, 29% to residential and commercial development, and 60% to industrial and port development, inclusive of the spoil disposal islands (Goodwin 1984).

More recent analyses inclusive of Boca Ciega Bay have shown that over 13,000 acres of intertidal and submerged habitats in Tampa Bay have been filled since the early 1900s (Coastal Environmental 1994).

Although shipping channels were historically constructed primarily in the naturally deeper areas of the bay, approximately 14,381 acres of bay bottom have been impacted by either dredging or filling for port development and spoil disposal (Coastal Environmental 1994). While some of this dredged material has been disposed of in shoreline areas historically occupied by emergent tidal wetlands, the majority of this spoil material was deposited on submerged bay bottom. This practice has resulted in the creation of numerous spoil islands and shallow intertidal areas that, in many cases, have been naturally recolonized by emergent tidal wetland vegetation. While these gains in emergent tidal wetland coverage have partially offset the associated losses, the net loss in Tampa Bay has been estimated to be greater than 5,000 acres since 1950 (Coastal Environmental 1995).

Another potential long-term threat to emergent tidal wetlands in Tampa Bay is rising sea level. Analysis of geological formations in Florida indicate that marsh and mangrove communities have always been closely tied to sea level (TBPRC 1993). Since the last ice age approximately 10,000 years ago, sea level has risen slowly, allowing the sediment load from rivers to maintain a relatively stable coverage of marsh and mangrove communities. Although emergent tidal wetlands are naturally dynamic communities capable of advancing and retreating with long-term changes in sea level, encroaching upland development (e.g., vertical seawalls and upland filling) has limited the ability of intertidal wetland communities to advance landward with rising sea level. Therefore, preservation of adjacent upland communities is needed not only to protect existing wetland and coastal upland habitats, but also to maintain the long-range viability of emergent tidal wetlands in the bay.

Review of Previous Habitat Restoration Plans

There has been only one previous effort to prepare a bayside habitat restoration plan. The Tampa Bay Regional Planning Council (TBPRC 1986a) prepared a combined wetland trend analysis (Table 1) and recommended restoration plan that included 39 specific emergent wetland (mangrove forest and tidal marsh) and seagrass restoration sites (Table 2), of which four have been completed and 22 are no longer under consideration. This listing of projects was prepared in response to the data generated from the study and previous reports of substantial loss of marine and estuarine habitats by Lewis (1977) and the associated declines in commercial fisheries harvests (Lombardo and Lewis 1985). TBPRC reported a substantial differential loss of emergent wetlands, with mangroves declining by 4% and tidal marshes declining by 50% between 1957 and 1982 (Table 1). Haddad (1989 Table 1, p. 116) reported the results of a port mitigation study (with the U.S. Fish and Wildlife Service) which
indicated that while only 7% of the mangroves in Tampa Bay were lost between 1950 and 1982, 30% of the saltmarshes were lost.

Table 1. Tampa bay area habitat gains and losses (TBPRC 1986a).

<table>
<thead>
<tr>
<th>HABITAT TYPE</th>
<th>1957 INVENTORY</th>
<th>1982 INVENTORY</th>
<th>GAINS/LOSSES</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>acres</td>
<td>percent of total</td>
<td>acres</td>
</tr>
<tr>
<td>Marine open water</td>
<td>199,737.81</td>
<td>18.94</td>
<td>201,289.02</td>
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<tr>
<td>Estuarine open water</td>
<td>213,067.52</td>
<td>20.11</td>
<td>226,732.86</td>
</tr>
<tr>
<td>Benthic, flat beds and bars</td>
<td>17,712.41</td>
<td>1.68</td>
<td>23,052.81</td>
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<tr>
<td>Dredged spoil area</td>
<td>120.34</td>
<td>0.01</td>
<td>233.69</td>
</tr>
<tr>
<td>Marine aquatic</td>
<td>1,305.03</td>
<td>0.12</td>
<td>75.62</td>
</tr>
<tr>
<td>Estuarine vascular aquatic</td>
<td>59,336.83</td>
<td>5.63</td>
<td>31,240.20</td>
</tr>
<tr>
<td>Mangrove</td>
<td>20,826.65</td>
<td>1.97</td>
<td>19,944.40</td>
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<tr>
<td>Estuarine emergent</td>
<td>7,903.57</td>
<td>0.75</td>
<td>3,475.63</td>
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<td>Fresh open water</td>
<td>6,166.64</td>
<td>0.58</td>
<td>14,396.18</td>
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<td>Palustrine emergent</td>
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<td>8,288.98</td>
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<td>Palustrine forested wetland</td>
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<td>2.86</td>
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<td>Upland developed</td>
<td>79,992.66</td>
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<td>Other upland classes</td>
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<td>36.81</td>
<td>228,093.47</td>
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<tr>
<td>Unknown data</td>
<td>12,263.01</td>
<td>1.16</td>
<td>17,370.15</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,054,754.30</td>
<td>100.00</td>
<td>1,054,829.30</td>
</tr>
</tbody>
</table>

TBPRC (1986b) and Clark (1991) provided the first listing of the minor tidal tributaries or creeks entering Tampa Bay and made specific recommendations regarding tidal creek restoration. Although specific restoration sites were not identified, the importance of tidal creeks for flood storage and attenuation, water quality maintenance, and critical fishery habitat was emphasized and a framework for management of tidal creeks suggested (Table 3).

Dial and Deis (1986) identified 27 possible port mitigation sites (Table 4) of which 14 were eventually rejected and 13 subjected to further review. One of these has been completed and four have been partially completed, although none of these were done for mitigation of port activities.

Beever et al. (1992) made 12 specific recommendations regarding both upland and wetland habitat management for MacDill Air Force Base, pending its closure. One of these included the removal of spoil mounds associated with mosquito control ditching of the Coon Hammock Creek system and recontouring "to simulate the meander of natural creeks."

HDR Engineering, Inc. (1994) recommended seven restoration sites in the Palm River / McKay Bay complex (Table 5), emphasizing exotic plant removal, tidal circulation restoration to historical tidal creek areas, and replanting with native species (Figure 1).
<table>
<thead>
<tr>
<th>SITE</th>
<th>TYPE*</th>
<th>STATUS**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pinellas County</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Dog Leg Key</td>
<td>i</td>
<td>UC</td>
</tr>
<tr>
<td>2. Skyway Bridge</td>
<td>i</td>
<td>NUC</td>
</tr>
<tr>
<td>3. Skyway Bridge Artificial Reef</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td>4. Pinellas Point, intertidal</td>
<td>i</td>
<td>PC, NUC</td>
</tr>
<tr>
<td>5. Pinellas Point, subtidal</td>
<td>S</td>
<td>NUC</td>
</tr>
<tr>
<td>6. Lassing Park</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td>7. Salt Creek</td>
<td>i</td>
<td>NUC</td>
</tr>
<tr>
<td>8. Coffee Pot Bayou</td>
<td>i</td>
<td>NUC</td>
</tr>
<tr>
<td>9. Gandy Causeway</td>
<td>i</td>
<td>UC</td>
</tr>
<tr>
<td>10. West end, Howard Frankland Causeway</td>
<td>S</td>
<td>NUC</td>
</tr>
<tr>
<td>11. St. Petersburg/Clearwater Intl. Airport</td>
<td>LS</td>
<td>NUC</td>
</tr>
<tr>
<td>12. Booth Point</td>
<td>i</td>
<td>UC</td>
</tr>
<tr>
<td>Hillsborough County</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Channel A</td>
<td>i</td>
<td>PC</td>
</tr>
<tr>
<td>14. Fish Creek</td>
<td>i</td>
<td>UC</td>
</tr>
<tr>
<td>15. East end, Howard Frankland Causeway</td>
<td>LS</td>
<td>PC</td>
</tr>
<tr>
<td>16. Kaul Fill site</td>
<td>LS</td>
<td>UC</td>
</tr>
<tr>
<td>17. Rattlesnake Spool Island</td>
<td>LS</td>
<td>NUC</td>
</tr>
<tr>
<td>18. MacDill site, intertidal</td>
<td>i</td>
<td>NUC</td>
</tr>
<tr>
<td>19. MacDill site, subtidal</td>
<td>S</td>
<td>NUC</td>
</tr>
<tr>
<td>20. Broad Creek</td>
<td>i</td>
<td>UC</td>
</tr>
<tr>
<td>21. Bayshore Boulevard</td>
<td>i</td>
<td>NUC</td>
</tr>
<tr>
<td>22. McKee Bay</td>
<td>i</td>
<td>NUC</td>
</tr>
<tr>
<td>23. Palm River / Tampa Bypass Canal</td>
<td>i</td>
<td>UC</td>
</tr>
<tr>
<td>24. Delaney Creek Pop-off Canal</td>
<td>i</td>
<td>C</td>
</tr>
<tr>
<td>25. Delaney Creek Pop-off Canal to Alafia River</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
<td>26. Spool Island 2-D</td>
<td>i</td>
<td>NUC</td>
</tr>
<tr>
<td>27. Spool Island 3-D</td>
<td>i</td>
<td>NUC</td>
</tr>
<tr>
<td>28. Fort Redwing</td>
<td>LS</td>
<td>UC</td>
</tr>
<tr>
<td>29. Newman Branch site</td>
<td>S</td>
<td>NUC</td>
</tr>
<tr>
<td>30. E.G. Simmons Park</td>
<td>i</td>
<td>PC</td>
</tr>
<tr>
<td>31. E.G. Simmons Park to Apollo Beach</td>
<td>S</td>
<td>NUC</td>
</tr>
<tr>
<td>Manatee County</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Piney Point</td>
<td>LS</td>
<td>NUC</td>
</tr>
<tr>
<td>33. Hendry site, intertidal</td>
<td>i</td>
<td>PC</td>
</tr>
<tr>
<td>34. Hendry site, subtidal</td>
<td>S</td>
<td>NUC</td>
</tr>
<tr>
<td>35. Bishop Harbor</td>
<td>S</td>
<td>NUC</td>
</tr>
<tr>
<td>36. Palmetto Point</td>
<td>i</td>
<td>NUC</td>
</tr>
<tr>
<td>37. Perico Bayou</td>
<td>i</td>
<td>NUC</td>
</tr>
<tr>
<td>38. Anna Maria Island</td>
<td>i</td>
<td>NUC</td>
</tr>
<tr>
<td>39. Okee Lantillid / Gap Creek</td>
<td>i</td>
<td>UC</td>
</tr>
</tbody>
</table>

* = intertidal, S = subtidal
** = C = completed; PC = partially completed; UC = still under consideration; NUC = no longer under consideration
<table>
<thead>
<tr>
<th>Table 3. Framework for management/restoration plans for Tampa Bay tidal creeks (from TBRPC 1980b)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OBJECTIVE:</strong> Maintenance / Restoration of Natural Function</td>
</tr>
<tr>
<td><strong>CONSIDERATION:</strong> Water Quality and Quantity</td>
</tr>
<tr>
<td><strong>POLICY:</strong> Water quality improvement through control of nonpoint source pollutant loadings</td>
</tr>
<tr>
<td>A. Identify problem areas</td>
</tr>
<tr>
<td>B. Prioritize improvements*</td>
</tr>
<tr>
<td>C. Coordination of agencies for improvements</td>
</tr>
<tr>
<td><strong>POLICY:</strong> Minimize point source pollutants</td>
</tr>
<tr>
<td>A. Develop ecological criteria for all discharges</td>
</tr>
<tr>
<td>B. Promote water recycling</td>
</tr>
<tr>
<td>C. Promote efficient disposal alternatives for problematic septic tank and package plant systems</td>
</tr>
<tr>
<td><strong>POLICY:</strong> Protect natural fresh water inputs</td>
</tr>
<tr>
<td>A. Groundwater</td>
</tr>
<tr>
<td>B. Surface water</td>
</tr>
<tr>
<td><strong>POLICY:</strong> Develop consistent tidal creek monitoring and enforcement program</td>
</tr>
<tr>
<td>A. Water quality</td>
</tr>
<tr>
<td>B. Habitat and species utilization</td>
</tr>
<tr>
<td><strong>CONSIDERATION:</strong> Habitat Utilization</td>
</tr>
<tr>
<td><strong>POLICY:</strong> Protect or improve natural channel alignment and elevation requirements for maintenance of productivity</td>
</tr>
<tr>
<td><strong>POLICY:</strong> Preserve natural vegetation and fish and wildlife resources</td>
</tr>
<tr>
<td>A. Removal of exotic species</td>
</tr>
<tr>
<td>B. Encourage wetland creation</td>
</tr>
<tr>
<td>C. Restore impacted areas</td>
</tr>
<tr>
<td><strong>POLICY:</strong> Identification of sites in all areas before development</td>
</tr>
<tr>
<td>A. Identification of sites in all areas before development</td>
</tr>
<tr>
<td>B. Preservation or excavation prior to destruction</td>
</tr>
<tr>
<td><strong>OBJECTIVE:</strong> Develop consistent and compatible land use standards</td>
</tr>
<tr>
<td><strong>POLICY:</strong> Promote public land acquisition and conservation easements for environmentally sensitive lands</td>
</tr>
<tr>
<td><strong>POLICY:</strong> Encourage compatible low density development on adjacent upland areas</td>
</tr>
<tr>
<td>A. Minimize development within the 25-year floodplain</td>
</tr>
<tr>
<td><strong>POLICY:</strong> Encourage clustering of water-oriented land uses</td>
</tr>
<tr>
<td><strong>OBJECTIVE:</strong> Management of tidal creeks as an important public asset</td>
</tr>
<tr>
<td><strong>POLICY:</strong> Promote public education</td>
</tr>
<tr>
<td>A. Value of tidal tributaries</td>
</tr>
<tr>
<td>B. Prevent public degradation</td>
</tr>
<tr>
<td>C. Minimize user conflicts</td>
</tr>
<tr>
<td><strong>POLICY:</strong> Promote compatible public access</td>
</tr>
</tbody>
</table>

---
Table 4. Possible port mitigation/habitat restoration sites identified by Dial and Dens (1986)

<table>
<thead>
<tr>
<th>REGION</th>
<th>SITE</th>
<th>TYPE*</th>
<th>1995 STATUS**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillsborough Bay</td>
<td>Pendola Point to Alafia River</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>3-D Spool Island</td>
<td>I</td>
<td>NUC</td>
</tr>
<tr>
<td></td>
<td>2-D Spool Island</td>
<td>I</td>
<td>NUC</td>
</tr>
<tr>
<td></td>
<td>Fort Redwing Basin</td>
<td>LS</td>
<td>NUC</td>
</tr>
<tr>
<td></td>
<td>McKay Bay</td>
<td>I</td>
<td>UC</td>
</tr>
<tr>
<td></td>
<td>MausDill area</td>
<td>LS</td>
<td>NUC</td>
</tr>
<tr>
<td></td>
<td>Delancy Creek</td>
<td>I</td>
<td>U'C</td>
</tr>
<tr>
<td></td>
<td>Bayshore area</td>
<td>I</td>
<td>NUC</td>
</tr>
<tr>
<td>Old Tampa Bay</td>
<td>Channel A</td>
<td>I</td>
<td>PC</td>
</tr>
<tr>
<td></td>
<td>North Point</td>
<td>I</td>
<td>UC</td>
</tr>
<tr>
<td></td>
<td>St. Petersburg/Clearwater Airport</td>
<td>LS</td>
<td>NUC</td>
</tr>
<tr>
<td></td>
<td>Weedon Island</td>
<td>I</td>
<td>NUC</td>
</tr>
<tr>
<td></td>
<td>West end, Howard Frankland Causeway</td>
<td>S</td>
<td>NUC</td>
</tr>
<tr>
<td></td>
<td>Kaul fill site</td>
<td>LS</td>
<td>NUC</td>
</tr>
<tr>
<td></td>
<td>Sheldon fill site and borrow pit</td>
<td>LS</td>
<td>NUC</td>
</tr>
<tr>
<td></td>
<td>Port Tampa to Candy Blvd.</td>
<td>LS</td>
<td>NUC</td>
</tr>
<tr>
<td></td>
<td>Largo Inlet</td>
<td>LS</td>
<td>NUC</td>
</tr>
<tr>
<td></td>
<td>Lake Tarpon Channel</td>
<td>I</td>
<td>PC</td>
</tr>
<tr>
<td></td>
<td>Alligator Lake</td>
<td>I</td>
<td>NUC</td>
</tr>
<tr>
<td>Lower Tampa Bay,</td>
<td>Maximo Channel</td>
<td>I</td>
<td>NUC</td>
</tr>
<tr>
<td>north side</td>
<td>Coffee Pot Bayou</td>
<td>I</td>
<td>NUC</td>
</tr>
<tr>
<td>Lower Tampa Bay,</td>
<td>E.G. Simmons Park</td>
<td>I</td>
<td>PC</td>
</tr>
<tr>
<td>south side</td>
<td>Cockroach Bay</td>
<td>I</td>
<td>UC</td>
</tr>
<tr>
<td>Port Manatee and</td>
<td>Port Manatee area</td>
<td>I</td>
<td>U'C</td>
</tr>
<tr>
<td>Manatee River area</td>
<td>Perico Bayou</td>
<td>I</td>
<td>NUC</td>
</tr>
<tr>
<td></td>
<td>Bishop Harbor</td>
<td>S</td>
<td>NUC</td>
</tr>
<tr>
<td></td>
<td>Manatee River — Palmetto, Ellenton</td>
<td>I</td>
<td>NUC</td>
</tr>
</tbody>
</table>

*Type: I — intertidal, S — subtidal
**Status: C — completed, PC — partially completed, UC — still under consideration, NUC — no longer under consideration.
### Table 5: Potential habitat restoration sites along Palm River and eastern McKay Bay (HOB, 1994)

<table>
<thead>
<tr>
<th>SITE (OWNERSHIP)</th>
<th>RECOMMENDED RESTORATION MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palm River / McKay Bay (public)</td>
<td>• backfill dredged channels in Palm River and McKay Bay (to the extent possible so as not to interfere with flood control functions of the Tampa Bypass Canal system) and use spoil materials to create subtidal and intertidal habitats</td>
</tr>
<tr>
<td>Washington Street (Tampa Expressway Authority)</td>
<td>• wetland creation / restoration</td>
</tr>
<tr>
<td>S.R. 60 Marsh (CSX Transportation; NCNB National Bank of Florida)</td>
<td>• exotic vegetation removal and replanting with native species</td>
</tr>
<tr>
<td></td>
<td>• upland enhancement</td>
</tr>
<tr>
<td>Tampa Welding Co. site (3A)</td>
<td>• acquire site</td>
</tr>
<tr>
<td></td>
<td>• wetland creation / restoration and enhancement</td>
</tr>
<tr>
<td></td>
<td>• exotic vegetation removal and replanting with native upland vegetation</td>
</tr>
<tr>
<td></td>
<td>• tidal circulation improvement</td>
</tr>
<tr>
<td>McGinty / Torque Quip Co. site (3B)</td>
<td>• acquire site</td>
</tr>
<tr>
<td></td>
<td>• wetland creation</td>
</tr>
<tr>
<td></td>
<td>• tidal circulation improvement</td>
</tr>
<tr>
<td>Lyles Parcel (ELAPP Parcel)</td>
<td>• exotic and nuisance plant species removal and replanting with native species</td>
</tr>
<tr>
<td></td>
<td>• spoil mound removal and regrading</td>
</tr>
<tr>
<td></td>
<td>• evaluate selective backfilling of mosquito control ditches to restore historical tidal flow patterns</td>
</tr>
<tr>
<td></td>
<td>• excavate and/or re-establish shallow pond network</td>
</tr>
<tr>
<td>TECO Easement (Tampa Electric Co.)</td>
<td>• restoration alternatives similar to and/or in concert with site 4 above (Lyles Parcel) as appropriate without interference with utility operations</td>
</tr>
<tr>
<td>SWFWMD Dredged Material Disposal Areas (SWFWMD)</td>
<td>• exotic vegetation removal from adjacent lands and replanting with native vegetation</td>
</tr>
<tr>
<td></td>
<td>• wetland restoration / enhancement</td>
</tr>
<tr>
<td>City Incinerator Fly Ash Pond Site (Tampa Port Authority)</td>
<td>• exotic plant species removal and replanting with native species</td>
</tr>
<tr>
<td></td>
<td>• wetland / upland creation / enhancement</td>
</tr>
</tbody>
</table>

-10-
Figure 1. Potential habitat restoration sites in the McKay Bay / Palm River portion of Tampa Bay (from HDR 1994).
Finally, the Surface Water Improvement and Management (SWIM) Program within the Southwest Florida Water Management District has had several annual reports and preliminary site assessment reports that are being combined into a summary document and five-year plan (1995–1999). The SWIM Program has provided a draft of *SWIM Potential Restoration Sites Five-Year Plan FY 95–FY 96* from which the information here has been abstracted. Table 6 lists the 24 completed habitat restoration projects which total 85.6 acres of restored wetlands. Table 7 lists the 40 preliminary proposed habitat restoration sites for implementation between 1995 and 1999. Based upon responses and review comments received from the SWIM Program (Appendix A), the selection criteria used in selecting these sites are listed in order of importance in Table 8.
Table 6. Restoration projects, completed and in progress, by SWIM and FDEP, protected land acquisition, Hillsborough and Manatee Counties.


<table>
<thead>
<tr>
<th>LEAD AGENCY</th>
<th>SITE NAME</th>
<th>STATUS</th>
<th>BAY SEGMENT</th>
<th>SIZE (ac)</th>
<th>HABITAT</th>
<th>COOP AGENCIES</th>
<th>MANAGEMENT RESPONSIBILITY</th>
<th>MANAGEMENT PLAN EXISTS</th>
<th>MANAGEMENT PLAN IS FUNDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDEP</td>
<td>Ongood Point</td>
<td>C</td>
<td>BCB</td>
<td>9.0</td>
<td>salt marsh, mangroves, dunes</td>
<td>SWIM, City of Gulfport</td>
<td>City of Gulfport</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>South Parrot</td>
<td>C</td>
<td>HB</td>
<td>25.0 wetland, 300 total</td>
<td>wetland</td>
<td>SWIM, Cargill Fertilizer, Inc.</td>
<td>Cargill Fertilizer, Inc.</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Fosfield Lake</td>
<td>C</td>
<td>Pinellas Co.</td>
<td>4.0</td>
<td>tidal pond</td>
<td>City of St. Petersburg</td>
<td>City of St. Petersburg</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Gandy North</td>
<td>C</td>
<td>GTB</td>
<td>1.0</td>
<td>wetland</td>
<td>Marine Corps</td>
<td>not specified</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Gandy South</td>
<td>C</td>
<td>GTB</td>
<td>2.0</td>
<td>wetland</td>
<td>FDEP, SWIM, TEP, FASAT</td>
<td>not specified</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Pecan Lake / Hernandy site</td>
<td>C</td>
<td>LTB</td>
<td>10.0</td>
<td>tidal lagoon, creeks</td>
<td>SWIM, Port Manatee</td>
<td>potentially by FDEP Bureau of Coastal &amp; Aquatic Managed Areas</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Cullerchach Bay EVC</td>
<td>C</td>
<td>MTB</td>
<td>80.0</td>
<td>ditches, abandoned farm fields, cleared savanna, hardwood</td>
<td>EPCC, HCC, HCELA, APP</td>
<td>HCELA, APP</td>
<td>UD</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Joe's Creek</td>
<td>C</td>
<td>BCB</td>
<td>60.0 remow, 10.0 created</td>
<td>tidal creeks, wetlands</td>
<td>Pinellas County</td>
<td>not specified</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>SWIM</td>
<td>Hernandy Delta</td>
<td>C</td>
<td>LTB</td>
<td>3.0</td>
<td>saltmarsh</td>
<td>DNR</td>
<td>not specified</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>South Bayshore</td>
<td>C</td>
<td>HB</td>
<td>1.5</td>
<td>marsh &amp; upland plantings</td>
<td>City of Tampa</td>
<td>not specified</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>E.G. Simmons Park 1</td>
<td>C</td>
<td>MTB</td>
<td>14.0</td>
<td>13.0 wetlands, 1.0 hardwood</td>
<td>Hillsborough County</td>
<td>Hillsborough County Parks Dept.</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Polaris Park 1</td>
<td>C</td>
<td>OTB</td>
<td>1.0</td>
<td>tidal ponds, wetlands, upland</td>
<td>15 others, public and private</td>
<td>Tampa Parks Dept.</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>NE McKay Bay</td>
<td>C</td>
<td>E8</td>
<td>4.0</td>
<td>tidal streams, marsh</td>
<td>HCELA, APP</td>
<td>HCELA, APP</td>
<td>Y</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Mangrove Bay</td>
<td>C</td>
<td>OTB</td>
<td>13.5</td>
<td>intertidal creeks, 0.5 ac salt marsh</td>
<td>City of St. Petersburg</td>
<td>City of St. Petersburg</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Boca Cega 1</td>
<td>C</td>
<td>BCB</td>
<td>3.5</td>
<td>freshwater wetlands</td>
<td>Pinellas County</td>
<td>Pinellas County?</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Little Bayou</td>
<td>C</td>
<td>MTB</td>
<td>3.0 of 13.4 total</td>
<td>seagrass, tidal creek</td>
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NOTE (added in proof): Suggestions revisions to this table were suggested by T. Courtney and are included here >> Appendix K.
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*Distiller's Trust Fund*
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<th>SITE NAME</th>
<th>BAY SEGMENT</th>
<th>SIZE</th>
<th>HABITAT/PROPOSED ACTIVITY</th>
<th>COOP AGENCIES</th>
<th>MANAGEMENT RESPONSIBILITY</th>
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<tr>
<td>(SWIM FY 95)</td>
<td>Mobley Bay</td>
<td>OTB</td>
<td>15 acres</td>
<td>tidal creeks &amp; marsh platforms, EVC</td>
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<td>Cooper's Point</td>
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<td>EVC, regrade; plant</td>
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<td></td>
<td>Allen's Creek I</td>
<td>OTB</td>
<td>2 acres</td>
<td>regrade to create tidal marsh</td>
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<td>SWIM FY 96</td>
<td>Boca Ciega II</td>
<td>BCB</td>
<td>3–4 acres</td>
<td>flood control; stormwater treatment</td>
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<td>Peanut Lake II</td>
<td>MTB or LTB</td>
<td>5 acres</td>
<td>phosphate processing wastewater treatment</td>
<td>Port Manatee</td>
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<td></td>
<td>South Skyway</td>
<td>LTB</td>
<td>5–6 acres</td>
<td>mangroves; EVC, regrade</td>
<td>FDOT, possibly Manatee Co.</td>
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<td>Bartlett Park</td>
<td>OTB</td>
<td>3-acre site</td>
<td>marsh restoration</td>
<td>City of St. Petersburg</td>
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<td></td>
<td>Howard Frankland W</td>
<td>OTB</td>
<td>50–200 acres</td>
<td>tidal creek restoration; freshwater marsh creation. (in private borrow pit)</td>
<td>FDOT, FDEP, Pinellas County</td>
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<td>SE McKay Bay (silt)</td>
<td>HB</td>
<td>8–10 acres</td>
<td>EVC, regrade to transitional marsh</td>
<td>Tampa Audubon Society, TECO</td>
<td>owned by District (except TECO easement)</td>
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<td>Wolf Branch Creek</td>
<td>MTB</td>
<td>80–500 acres</td>
<td>fill pits, restore tidal connections to bay</td>
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<td>S.R. 580</td>
<td>OTB</td>
<td>2 acres</td>
<td>regrade to tidal marsh</td>
<td>FDOT</td>
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<td>Cypress Point</td>
<td>OTB</td>
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<td>regrade, create tidal creeks</td>
<td>City of Tampa</td>
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<th>HABITAT/PROPOSED ACTIVITY</th>
<th>COOP AGENCIES</th>
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<tr>
<td>SWIM FY '97</td>
<td>Dug Creek</td>
<td>HB</td>
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<td>remove berm to de-channelize, salt marsh planting</td>
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<td>Port Manatee Isle</td>
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<td>56 acres</td>
<td>plant; possible creation of a tidal creek</td>
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<td>30 acres</td>
<td>EVC, regrade to transitional marsh</td>
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<td>Little Manatee River</td>
<td>MTH</td>
<td>200 acres</td>
<td>upland, transitional and wetland restoration</td>
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<td>20 acres</td>
<td>EVC, regrade to tidal marsh</td>
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<tr>
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<td>Cockroach Bay 1C and 1D</td>
<td>MTH</td>
<td>200 acres</td>
<td>$0 ac. EVC; littoral shelf creation; oligohaline habitat</td>
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<td>Allen’s Creek II</td>
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<td>4 acres</td>
<td>create tidal marsh</td>
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<td>Cross Bayou / Joe’s Creek</td>
<td>BCD</td>
<td>5 acres</td>
<td>4-5 ac EVC; create intertidal &amp; high marsh</td>
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<td>Port Redwing</td>
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<td>30-40 acres</td>
<td>enhance marsh, upland restoration</td>
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<td>SWIM FY '98</td>
<td>Apollo Beach</td>
<td>MTH</td>
<td>12 acres</td>
<td>create wetlands, EVC, manatee habitat</td>
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<td>Del Oro Tract</td>
<td>OTB</td>
<td>2-ac site</td>
<td>create 1-ac pond, stormwater treatment; marsh platforms</td>
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<th>CORP AGENCIES</th>
<th>MANAGER RESPONSIBILITY</th>
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<td>Graoter Light</td>
<td>LTB</td>
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<td>Hillsborough County</td>
<td>Terra Ceia Inlet</td>
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<td>US 41 Fish Farm</td>
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<td>Tarpon Bay</td>
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<td>Carri Property</td>
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<td>MANATEE COUNTY</td>
<td>Emerson Point Addition</td>
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<td>Perico Island</td>
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<td>Riverbay</td>
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<th>BAY SEGMENT</th>
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<th>COOP AGENCIES</th>
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<th>SITE NAME</th>
<th>BAY SEGMENT</th>
<th>SIZE</th>
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<th>COOP AGENCIES</th>
<th>MANAGEMENT RESPONSIBILITY</th>
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</table>
Table 8. Recommended SWIM criteria for selection of emergent wetland habitat protection and restoration projects, in order of priority (Hemingsen, letter dated August 22, 1995; Appendix B). Items 1–5 are “most important.”

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Habitat diversity / complexity</td>
</tr>
<tr>
<td>2</td>
<td>Cost / benefit ratios</td>
</tr>
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<td>3</td>
<td>Size of parcel</td>
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<td>Freshwater source</td>
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<td>Cooperative involvement</td>
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<td>9</td>
<td>Permittability</td>
</tr>
<tr>
<td>10</td>
<td>Location with Tampa Bay ecosystem</td>
</tr>
<tr>
<td>11</td>
<td>Public visibility</td>
</tr>
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</table>
SETTING PRIORITIES FOR HABITAT RESTORATION AND PROTECTION:
RESTORING THE BALANCE

The Tampa Bay National Estuary Program (TBNEP) includes a number of projects designed to guide the development of a Comprehensive Conservation and Management Plan (CCMP) for the bay. One of these is the preparation of a Habitat Protection and Restoration Masterplan.

The plan is centered around the habitat needs of ten faunal guilds (groups of animals with similar habitat requirements) which contain 38 species selected by the Habitat Protection and Management Advisory Committee as important indicators of bay health (Table 9). Nine of these species are listed by the Florida Game and Fresh Water Fish Commission and/or the U.S. Fish and Wildlife Service as species of special concern, threatened or endangered. The list was derived from a similar, although shorter, listing of species chosen by Killam et al. (1992) as "important fisheries and wildlife species" for life history descriptions by TBNEP (Table 10). The concept of using fish and wildlife guilds to guide and evaluate restoration plans has also been recently proposed for the Kissimmee River restoration (Weller 1995).

The goal of this plan is to ensure the existence of healthy, self-maintaining populations of these species and others associated with their guilds for the foreseeable future (50–100 years). Achieving this goal requires an understanding of the life history needs of these species, the historical habitat modifications or loss within the bay proper and its watershed, and the concept of multiple habitat needs by the members of a guild.

Although the life history features of all species within the guilds may not be completely known, it is assumed that the species have evolved to be adapted to relative proportions of different, often complementary, habitats. The five habitats addressed in this plan are:

- Coastal uplands
- Mangrove forests and *Spartina* (smooth cordgrass) marshes
- Oligohaline and mesohaline tidal marshes, dominated by *Juncus* (needlerush)
- Salt barsrens
- Freshwater foraging habitats

The Concept of Multiple Habitat Requirements

Habitat is defined as "any part of the earth where [a] species can live, either temporarily or permanently" (Krebs 1985, pp. 64–65). Traditionally, the habitat needs of a species have been characterized by a given area of adult habitat, or home range, requirements (Cox et al. 1994). For example, the home range requirement of the Florida panther is given as 135,800 acres for males and 74,100 acres for females (Cox et al. 1994). Thus to support 10 independent free-living adult panthers (assuming equal numbers of males and females) would require 50 times 74,100+135,800 or 8,495,000 acres, assuming no overlap of home ranges. In reality, overlap does occur and thus the average density is one per 27,000 acres.

The home range requirements of a single, nonherding land mammal are relatively easily determined by radio-tagging several members of the population and plotting their travels over a period of time. When researchers look at herd-forming species, particularly those that
<table>
<thead>
<tr>
<th>GUILD NO.</th>
<th>TYPE</th>
<th>LIFE HISTORY STAGE</th>
<th>COMMON NAME</th>
<th>SCIENTIFIC NAME</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>open water filter feeder</td>
<td>adult</td>
<td>bry anchovy</td>
<td>Anchoa mitchilli</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Atlantic menhaden</td>
<td>Brevoortia tyrannus</td>
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<td>Atlantic thread herring</td>
<td>Ophiomorus olivaceus</td>
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<td>shallow water forage fish</td>
<td>adult</td>
<td>striped killifish</td>
<td>Fundulus majalis</td>
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<td>sheepshead killifish</td>
<td>Cyprinodon variegatus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>silver perch</td>
<td>Bodianus brevimanus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>spotted sea trout</td>
<td>Leiostomus monostigma</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>lined sole</td>
<td>Lepidotrigla pleurotaenia</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>hogfish</td>
<td>Bodianus pleurotaenia</td>
</tr>
<tr>
<td>3</td>
<td>recreationally and commercially important fish and shellfish</td>
<td>juvenile</td>
<td>tarpon</td>
<td>Megalopra atlantica</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>red drum</td>
<td>Sciaenops ocellatus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>snook</td>
<td>Centropomus undecimalis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>spotted seatrout</td>
<td>Cynoscion nebulosus</td>
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<tr>
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<td></td>
<td></td>
<td>striped mullet</td>
<td>Mugil cephalus</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>blue crab</td>
<td>Callinectes sapidus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>pink shrimp</td>
<td>Penaeus duorarum</td>
</tr>
<tr>
<td>4</td>
<td>subtidal invertebrates</td>
<td>adult</td>
<td>soft-bottom deposit feeders</td>
<td>Uca spp.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>various shrimp</td>
<td>Cerithidium</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>marsh snails</td>
<td>Molegma laevis</td>
</tr>
<tr>
<td>5</td>
<td>intertidal invertebrates</td>
<td>adult</td>
<td>fiddler crab</td>
<td>Uca spp.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>barnacles</td>
<td>Cerithidium</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>marsh snails</td>
<td>Molegma laevis</td>
</tr>
<tr>
<td>6</td>
<td>estuarine molluscs</td>
<td>adult</td>
<td>marsh clams</td>
<td>Rangia spp.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>clams</td>
<td>Molegma corona</td>
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<tr>
<td>7</td>
<td>estuarine-dependent birds</td>
<td>adult</td>
<td>brown pelican*</td>
<td>Pelecanus occidentalis</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>least tern**</td>
<td>Sterna antillarum</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>reddish egret*</td>
<td>Egretta rufescens</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>American oystercatcher*</td>
<td>Haematopus palliatus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>roseate spoonbill*</td>
<td>Ajaia ajaja</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>willet</td>
<td>Carpodopoma semipalmata</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>laughing gull</td>
<td>Larus canus</td>
</tr>
<tr>
<td>8</td>
<td>estuarine-dependent birds requiring freshwater foraging habitat (during nesting season)</td>
<td>adult</td>
<td>white ibis*</td>
<td>Eudocimus albus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>snowy egret*</td>
<td>Egretta thula</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>little blue heron*</td>
<td>Egretta caerulea</td>
</tr>
<tr>
<td>9</td>
<td>estuarine reptiles</td>
<td>adult</td>
<td>diamondback terrapin</td>
<td>Malaclemmys terrapin macropus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>mangrove water snake</td>
<td>Nerodia clarkii compressicauda</td>
</tr>
<tr>
<td>10</td>
<td>marine mammals</td>
<td>adult</td>
<td>manatee***</td>
<td>Trichechus manatus</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>bottlenose dolphin</td>
<td>Tursiops truncatus</td>
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</tbody>
</table>

*Species of Special Concern, FGFWPFC  
**Listed by FGFWPFC as Threatened  
***Listed as Endangered, FGFWPFC and USFWS
Table 10. List of species chosen for synthesis of life history information (from Killam et al. 1992).

<table>
<thead>
<tr>
<th>Fish</th>
<th>Megalops atlanticus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tarpon</td>
<td>Anchusa michilli</td>
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<tr>
<td>Bay anchovy</td>
<td>Fundulus majalis</td>
</tr>
<tr>
<td>Striped killifish</td>
<td>Centroprunus undescribed</td>
</tr>
<tr>
<td>Snook</td>
<td>Cynoscion nebulosus</td>
</tr>
<tr>
<td>Spotted seatrout</td>
<td>Sciaenops ocellata</td>
</tr>
<tr>
<td>Red drum</td>
<td>Bairdiella chrysoura</td>
</tr>
<tr>
<td>Silver perch</td>
<td>Lestiostoma saxicola</td>
</tr>
<tr>
<td>Spot</td>
<td>Mugil cephalus</td>
</tr>
<tr>
<td>Striped mullet</td>
<td>Mierogolus gulosus</td>
</tr>
<tr>
<td>Clown goby</td>
<td>Atherina lineolata</td>
</tr>
<tr>
<td>Lined sole</td>
<td>Trinches maculatus</td>
</tr>
<tr>
<td>Hogfish</td>
<td>Calinecetes sapidus</td>
</tr>
<tr>
<td>Invertebrates</td>
<td>Pterosaurus dorctorum</td>
</tr>
<tr>
<td>Blue crab</td>
<td>Creccostraea virginica</td>
</tr>
<tr>
<td>Pink shrimp</td>
<td>Mercenaria mercenaria</td>
</tr>
<tr>
<td>American oyster</td>
<td>M. hirsuta symbiosa</td>
</tr>
<tr>
<td>Hard clam</td>
<td>Palemonidae spp.</td>
</tr>
<tr>
<td>Grass shrimp</td>
<td>Benthic Community</td>
</tr>
<tr>
<td>Polychaete</td>
<td>Disoptera caprea</td>
</tr>
<tr>
<td>Marine Mammals</td>
<td>Florida manatee</td>
</tr>
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</table>

The concept originated with Esteevez (1982) in considering how to manage cumulative impacts to Florida's coastal wetlands. This method has been specifically rejected by DeFreese in looking at biodiversity protection for the Indian River Lagoon (IRL) (DeFreese 1995, p. 18–19) because while "identification of appropriate indicator species represents an ongoing resource management goal to evaluate ecosystem health and sustainability ... the identification of appropriate indicator species or specific associations continues to represent a
significant scientific challenge". Instead, a "landscape [ecosystem] approach" is suggested as providing the most appropriate method of protecting biodiversity and emphasizes land acquisition and restoration (if needed). It is unclear how various parcels are prioritized without specific species goals, which DeFreese characterizes as having "inherent risks" (p. 19).

**Habitat Ratios**

This study is limited to looking at target habitat protection and restoration goals for five habitat types needed by estuarine-dependent species: 1) coastal uplands; 2) mangrove forests and eutrophic marshes; 3) oligohaline and mesohaline tidal marshes, dominated by needle rush (Juncus); 4) salt barrens, and 5) critical freshwater foraging habitats for guild 8 (estuarine-dependent birds). Habitat types 1 and 5 represent special cases to be discussed later.

For the remaining three habitats, the concept of target habitat ratios is illustrated in Figure 2. If we assume that the ten guilds developed successful life history strategies during the evolution of the species in that guild that included the optimum use of various habitats in quantities available for use in the undisturbed (c. 1900) Tampa Bay (Figure 2), then the recent modification or loss of habitats in an unequal manner (i.e., 10% loss of some habitats, 90% loss of others) has produced an abundance of some habitats while others have become more rare due to differences in the recent rate of loss. Day and Yáñez-Arancibia (1985, p. 28), in support of the importance of specific habitat requirements, state that:

...utilization of the lagoon-estuarine environments by marine and freshwater organisms is not random. Many species have evolved adaptations that optimize the use of estuarine richness during juvenile stages by the timing of reproduction and migration patterns.

Following the modified Leibig's Law of the Minimum, if a more rare habitat is essential as part of the life history requirements of a species, then it could represent a "choke point" or limiting factor for the overall population size in the Tampa Bay ecosystem. It is reasonable to assume that the development of successful life history strategies by estuarine-dependent species (e.g., the semi-permanently reproductive strategy of redfish and snook) was driven by the optimal use of the relative proportion of various critical habitat types that were present during their evolution. Therefore, the rationale for "restoring the balance" is this concept of the relative proportions of various critical habitat types. Addressing the question of critical habitat is only part of the necessary overall ecosystem management plan needed for Tampa Bay (Lewis et al. [1985] describe factors other than habitat availability that could also represent "choke points," including specific water quality parameters or reduced availability of specific food items), but providing the proper balance of critical habitats is essential to the long-term stability of estuarine-dependent animal populations.

Returning to Figure 2, we have used the best available information (published data, aerial photography, soil maps; see also pp. 43-48) to illustrate the approximate percentages that each of three critical habitat types contributed to the total "marine emergent wetland mosaic" of Tampa Bay at three periods of time (c.1900, c. 1950 and 1995). These habitat types are
Figure 2. Conceptual differential habitat loss (modified from data from Lewis 1977, Haddad 1989, Janicki et al. 1994).

often linked together, as illustrated in Figures 3 and 4, as critical habitat components needed by certain marine and estuarine fish and invertebrate species, including many listed in Table 1, to complete their life cycles. These species, in turn, are important food items for other species such as those in guilds 7, 8, 9 and 10. The role of nursery habitats for juvenile and early juvenile stages of many fish species of commercial and recreational importance has, in particular, received a lot of interest in recent years (Gilmore et al. 1982, 1983; Lewis et al. 1985; Peters and McMichael 1987; Day et al. 1989; Edwards 1991; Peebles et al. 1991; Lewis 1992). Day et al. (1989) critically examined the classic fisheries management methods as illustrated by the "Ricker analyses" and termed them a failure when it came to managing estuarine-dependent fisheries. Instead these authors suggested (p. 501) that

...there appears to be an emerging consensus among fisheries researchers that the key to understanding and predicting fish stocks for any given year is to determine the events that produce high or low survival during the critical days, weeks or months after the fish are born ... it is important for young fishes to grow out of the stages in which they are very vulnerable to predation as rapidly as possible and ... food availability and habitat greatly affect growth rates... The
Figure 3. Life cycle of the snook, *Centropomus undecimalis*. 
Figure 4. Life cycle of the tarpon, *Megalops atlanticus.*
question then becomes whether or not we can predict such things as plankton abundance and habitat area [emphasis added].

Figure 2 is intended to illustrate the hypothesis that differential loss of certain habitat types (i.e., mesohaline and oligohaline tidal marshes) could produce an imbalance in the historic percentages of the total "marine emergent wetland mosaic". If this is in fact the case, then restoration might be directed towards preferentially restoring certain habitat types in order to attempt to achieve an historical balance, rather than the random or "sites of opportunity"-based restoration planning programs that currently operate. This is based upon the fact that none of the previously discussed habitat restoration programs for the bay has derived from or has been directed toward a defined ecological goal.

The key, then, is to determine as accurately as possible what changes have occurred in both the acreage and distribution of the "marine emergent wetland mosaic" of Tampa Bay. This effort, as illustrated by the previous efforts of Lewis (1977), Lewis and Estvez (1988), Haddad (1989), Estvez et al. (1991), and Janicki et al. (1994) has suffered from differences in the total area of study, differences in photographic interpretation, and differences in which classification system is used. The results to date have not allowed an accurate determination of differential habitat losses, particularly for the rarer habitat types such as oligohaline to mesohaline tidal marshes. This is best illustrated by the attempt by TBNEP (1992) to quantify the existing areas of oligohaline wetlands in Tampa Bay on the basis of salinity data. Because salinity data was used for only the larger rivers, the maps produced did not identify smaller, but no less important, low salinity wetlands. The more recent efforts of Janicki et al. (1994) did not specifically define tidal creek wetlands as part of their study, although the mapping efforts did extend up most tributaries to Tampa Bay. These smaller tributaries like Fish Creek in Old Tampa Bay and the Delaney Pop-off canal in Hillsborough Bay have been shown to be important fish nursery habitats (Roberts 1989; TBRPC 1989; Clark 1991, Whitman and Gilmore 1995), but their generally smaller size and the scale of most mapping efforts to date have meant that they have "fallen through the cracks" in most habitat management efforts to date. Because of this, the scope of this study was expanded to include three new mapping efforts in an attempt to more accurately map lower salinity wetlands.

Methods and Results

The first of these was a field verification of the location and plant community composition of tidal streams. Between July 17 and August 1, 1995, five tidal stream systems (Bullfrog Creek, Little Manatee River, Alafia River, Delaney Creek, and Ironhead Creek) were inspected, mapped and photographed to confirm the location of the critical mesohaline to oligohaline tidal marshes dominated by needle rush (Juncus roemerianus), often with leather fern (Acrostichum danaeifolium) as a key indicator of low salinity. (Previous field work had concentrated on the Manatee River.) This information was compared with 1:24,000-scale National Wetland Inventory maps and the previous map products used by Janicki et al. (1994) in an attempt to confirm tidal marsh signatures.

The second new effort, using the c. 1950 data set, involved the classification of land cover pursuant to a customized classification scheme. Five classification codes were determined to
be relevant to the temporal trend analyses of emergent tidal wetlands: mangrove (04), marsh/mangrove (05), saltmarsh (06), flats/beach (08), and vegetated flats (09). In the 1990 data set, land cover was classified using the Florida Dept. of Transportation Florida Land Use, Cover and Farm Classification System (FLUCCS) Level III protocol (FDOT 1985). Only two classification codes were determined to be relevant to emergent tidal wetlands, mangrove swamps (615) and saltwater marshes (642). Because salt barsrens were poorly represented in this data set, a project-specific coverage for this wetland type was developed. From the signature interpretation of 1990 1:24,000-scale infrared aerial photography obtained from SWFWMD, salt barren polygons were identified and digitized into a separate coverage, which was then rectified and merged into the coverages for mangroves and saltwater marshes.

Due to cover classification differences between the two time periods it was necessary to combine certain emergent tidal wetland categories in the c.1950 data set to maximize comparability with the 1990 data set. The Marsh/Mangrove and Saltmarsh categories from the c.1950 data set were combined into a single category to be comparable to the Saltwater Marshes category of the 1990 dataset. The decision to merge these two categories was based on the signature interpretation of c.1950 aerial photography contained in historic Soil Conservation Service Soils Atlases for Hillsborough and Manatee Counties. The Marsh/Mangrove category appeared to encompass transitional marsh communities characterized by a mix of herbaceous and woody species, probably Spartina alterniflora, Juncus roemerianus, and low-growing Avicennia germinans. The Saltmarsh category appeared to encompass mesohaline/oligohaline marshes characterized by monospecific stands of Juncus roemerianus and other associated species such as Acerstichum. Combined, these two categories were considered to be comparable in description to the Saltwater Marsh category in the 1990 dataset.

In addition, the Flats/Beach and Vegetated Flats categories of the c.1950 datasets were combined in order to be comparable to the project-specific salt barren coverage developed for the 1990 time period. Based on the signature interpretation of c.1950 aerial photography contained in historic Soil Conservation Service Soils Atlases for Hillsborough and Manatee Counties, the Vegetated Flats category appeared to correspond well with the 1990 salt barren signature. The Flats/Beach coverage, on the other hand, appeared to include both sandy beaches along estuarine shorelines as well as sparsely vegetated tidal flats landward of the mangrove coverage. Therefore, it was necessary to edit the c.1950 Flats/Beach coverage, this was done by plotting the Flats/Beach coverage onto vellum and physically overlying the coverage onto c.1950 aerial photography obtained from the Soil Conservation Service for Manatee and Hillsborough Counties. Those signature polygons that were indicative of salt barsrens were retained, whereas those that were indicative of estuarine shoreline beaches or intertidal mud flats were deleted. The resultant coverage was merged with the Vegetated Flats coverage to create the final c.1950 salt barren coverage.

The Mangrove Swamps category of the 1990 dataset, and the Mangrove category of the 1950 dataset were considered to be comparable. Both of these categories encompass mangrove forest canopy as well as the fringe polyhaline Spartina alterniflora marshes which are often successionally associated with mangrove forests.
Table 11 shows how the classification codes between the two datasets were consolidated for the temporal trend analyses. The edited 1990 and c.1950 datasets were overlaid by using a geometric union operation of the Arc/Info GIS software package (ESRI 1993). Because mangrove forests and polyhaline marshes typically represent different successional stages of the same plant community, the acreages of both habitats were combined, and are herein referred to as “mangrove/Spartina.” Similarly, the species which characterize mesohaline and oligohaline marshes were combined into the single category of “tidal marsh” or “Juncus marsh.”

<table>
<thead>
<tr>
<th>SWFWMD 1990</th>
<th>FDNR c.1950</th>
<th>DESCRIPTION</th>
<th>TREND ANALYSIS DESIGNATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mangrove Swamps</td>
<td>Mangrove</td>
<td>Mangrove forests with fringe polyhaline marshes of Spartina alterniflora</td>
<td>Mangrove/Spartina marsh</td>
</tr>
<tr>
<td>(612)</td>
<td>(04)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saltwater Marshes</td>
<td>Marsh/Mangrove</td>
<td>Transitional mesohaline marshes characterized by mixtures of Spartina, Juncus roemerianus, and Avicennia germinans</td>
<td>Tidal or Juncus marsh</td>
</tr>
<tr>
<td>(642)</td>
<td>(05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saltmarsh1</td>
<td>Saltmarsh</td>
<td>Mesohaline/oligohaline marshes characterized by Juncus roemerianus</td>
<td>Salt barren</td>
</tr>
<tr>
<td>(06)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Salt Barren2</td>
<td>Flats/Beaches</td>
<td>Sparsely vegetated tidal flats characterized by Suaeda maritima and Salicornia spp.</td>
<td>Salt barren</td>
</tr>
<tr>
<td>(digitized from aerial photointerpretation)</td>
<td>(08)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vegetated Flats</td>
<td>Vegetated tidal flats characterized by succulents as well as Drizoides spicata and Paspalum vaginatum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(09)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 This classification code is not well represented in the SWFWMD 1990 data set.
2 This classification code is not well represented in the SWFWMD 1990 data set. Therefore, a project-specific coverage was developed by photointerpretation of the original 1:24,000-scale aerial photography followed by digitization of the delineated polygons.
3 This classification code includes both shoreline beaches and tidal flats. Therefore, the coverage for this code was plotted and edited via aerial photointerpretation to include only high marsh tidal flats indicative of salt barrens.

As summarized in Table 12, approximately 18,758 acres of emergent tidal wetlands existed in Tampa Bay in 1990. Of this total, mangrove/Spartina made up 13,764 acres (73%), tidal marshes made up 4,117 acres (22%), and salt barrens made up 877 acres (5%). During the
c.1950 time period, there were approximately 23,886 acres of emergent tidal wetlands. Of this total, 15,894 acres (67%) were mangrove/Spartina, 6,621 acres (28%) were tidal marshes, and salt barrens made up 1,371 acres (5%). This analysis indicates that there has been a baywide net loss of approximately 5,128 acres (-21%) of emergent tidal wetlands between 1950 and 1990. Table 13 shows the trend analysis by bay segment.

Table 12. Baywide emergent tidal wetland temporal trends for the period c.1950 to 1990.

<table>
<thead>
<tr>
<th>HABITAT TYPE</th>
<th>1950</th>
<th>1990</th>
<th>NET CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>acres</td>
<td>percent</td>
<td>acres</td>
</tr>
<tr>
<td>Mangroves / Spartina marsh¹</td>
<td>15,894</td>
<td>67%</td>
<td>13,764</td>
</tr>
<tr>
<td>Juncus marsh²</td>
<td>6,621</td>
<td>28%</td>
<td>4,117</td>
</tr>
<tr>
<td>Salt barrens²</td>
<td>1,371</td>
<td>5%</td>
<td>877</td>
</tr>
<tr>
<td>TOTAL</td>
<td>23,886</td>
<td></td>
<td>18,758</td>
</tr>
</tbody>
</table>

¹ Includes mangrove forests represented by Rhizophora, Avicennia and Laguncularia, and successional polyhaline marshes represented predominantly by cordgrass (Spartina).
² Includes monochasial and oligohaline marshes represented predominantly by needlenash (Juncus), leather fern (Acorustichum), arrow grass (Calamia) and cattails (Typha) with a mix of black mangroves (Avicennia) and cordgrass.
³ Includes hypersaline salt barrens represented predominantly by saltwort (Batis), glasswort (Salicornia) and saltgrass (Distichlis).

The third mapping effort was a more detailed analysis of trends in wetland loss back as far as maps and aerial photography would allow. Two test areas were chosen (Figure 5) based upon the known availability of vertical aerial photography and maps illustrating these areas back to c. 1900, or before most major losses of marine habitats had occurred. As far as can be determined, the test areas are representative of the bay in general, based on a comparison with the available older aerial photography for other areas of the bay. Urban impacts to these wetlands were similar to the combined impacts of rural development and agriculture.

Figures 6-9 illustrate "before-and-after" conditions generated from very detailed mapping of these two areas. Table 14 summarizes the areal cover data. These data again confirm the greater loss of tidal marshes and degradation of tidal streams, and also allow the analysis in Table 15.

The combined data and percentages by marine habitat type shown in Table 14 were used to generate a "best professional estimate" of the areal relationships of habitats prior to man’s major impact on the bay. Surprisingly, it indicates that tidal stream marshes may have been as extensive as shoreline mangroves (48% v. 49%, respectively). These data were used to finalize the c. 1900 areal cover estimates and ratios of the three marine habitat mosaic wetland types in Figure 2. This was done by assuming the current acreage represents 56% of the historical cover (as determined by Lewis 1979) which means the c. 1900 coverage was
approximately 33,750 acres. Applying the percentages in Table 15 gives the acreages shown in Figure 2 for the c.1900 and c. 1950 marine emergent wetland acreage.

<table>
<thead>
<tr>
<th>BAY SEGMENT</th>
<th>MANGROVES/SPARTINA</th>
<th>JUNCUSMARSH</th>
<th>SALT BARREN</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Tampa Bay</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td>3,321</td>
<td>1,446</td>
<td>516</td>
<td>5,283</td>
</tr>
<tr>
<td>1990</td>
<td>3,452</td>
<td>1,150</td>
<td>147</td>
<td>4,749</td>
</tr>
<tr>
<td>Percent gain / (loss)</td>
<td>4% (20%)</td>
<td>(72%)</td>
<td>(10%)</td>
<td></td>
</tr>
<tr>
<td>Hillsborough Bay</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td>1,112</td>
<td>603</td>
<td>195</td>
<td>1,910</td>
</tr>
<tr>
<td>1990</td>
<td>751</td>
<td>499</td>
<td>13</td>
<td>1,263</td>
</tr>
<tr>
<td>Net change</td>
<td>-361</td>
<td>-104</td>
<td>-182</td>
<td>-647</td>
</tr>
<tr>
<td>Percent gain / (loss)</td>
<td>(32%) (17%)</td>
<td>(93%)</td>
<td>(34%)</td>
<td></td>
</tr>
<tr>
<td>Middle Tampa Bay</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td>5,225</td>
<td>2,075(^5)</td>
<td>436(^6)</td>
<td>7,736</td>
</tr>
<tr>
<td>1990</td>
<td>5,061</td>
<td>737(^7)</td>
<td>533(^8)</td>
<td>6,331</td>
</tr>
<tr>
<td>Net change</td>
<td>-164</td>
<td>-1,338(^9)</td>
<td>+97(^10)</td>
<td>-1,405</td>
</tr>
<tr>
<td>Percent gain / (loss)</td>
<td>(3%) (64%)</td>
<td>(22%)</td>
<td>(18%)</td>
<td></td>
</tr>
<tr>
<td>Lower Tampa Bay</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td>2,563</td>
<td>606</td>
<td>194</td>
<td>3,363</td>
</tr>
<tr>
<td>1990</td>
<td>2,174</td>
<td>389</td>
<td>168</td>
<td>2,731</td>
</tr>
<tr>
<td>Net change</td>
<td>-389</td>
<td>-217</td>
<td>-26</td>
<td>-632</td>
</tr>
<tr>
<td>Percent gain / (loss)</td>
<td>(15%) (36%)</td>
<td>(13%)</td>
<td>(19%)</td>
<td></td>
</tr>
<tr>
<td>Boca Ciega Bay</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td>2,143</td>
<td>274</td>
<td>14</td>
<td>2,431</td>
</tr>
<tr>
<td>1990</td>
<td>1,121</td>
<td>84</td>
<td>0</td>
<td>1,205</td>
</tr>
<tr>
<td>Net change</td>
<td>-1,022</td>
<td>-190</td>
<td>-14</td>
<td>-1,226</td>
</tr>
<tr>
<td>Percent gain / (loss)</td>
<td>(48%) (69%)</td>
<td>(100%)</td>
<td>(50%)</td>
<td></td>
</tr>
<tr>
<td>Terra Ciega Bay</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td>937</td>
<td>13</td>
<td>1</td>
<td>951</td>
</tr>
<tr>
<td>1990</td>
<td>711</td>
<td>6</td>
<td>6</td>
<td>723</td>
</tr>
<tr>
<td>Net change</td>
<td>-226</td>
<td>-7</td>
<td>+5</td>
<td>-228</td>
</tr>
<tr>
<td>Percent gain / (loss)</td>
<td>(24%) (54%)</td>
<td>(500%)</td>
<td>(24%)</td>
<td></td>
</tr>
<tr>
<td>Manatee River</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td>592</td>
<td>1,604</td>
<td>15</td>
<td>2,211</td>
</tr>
<tr>
<td>1990</td>
<td>494</td>
<td>1,252</td>
<td>10</td>
<td>1,756</td>
</tr>
<tr>
<td>Net change</td>
<td>-98</td>
<td>-352</td>
<td>-5</td>
<td>-555</td>
</tr>
<tr>
<td>Percent gain / (loss)</td>
<td>(17%) (22%)</td>
<td>(33%)</td>
<td>(21%)</td>
<td></td>
</tr>
</tbody>
</table>

\(^5\) Probably an overestimate due to photointerpretation errors in both the USFWS and SFWFMD data sets.
\(^6\) Probably an underestimate due to photointerpretation errors in both the USFWS and SFWFMD data sets.
\(^7\) Probably not correct due to artifacts of classification (Haddad 1989)

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Figure 5. Location map, Allen's Creek and Delaney / Archie Creeks, test mapping sites.
Figure 6: Historical distribution of wetlands, Delaney and Archie Creek (Hillsborough County).
Figure 7. Current distribution of wetlands, Delaney and Archie Creek (Hillsborough County), c. 1990.
Figure 8. Historical distribution of wetlands based on 1926 aerial photography, Allen’s Creek watershed (from Reynolds Smith & Hills 1992).
Figure 9. Current distribution of wetlands, Allen's Creek watershed (from Reynolds Smith & Hills 1992).
### Table 14. Test mapping data, historic vs. existing dominant wetland systems, Delaney and Archie Creek watersheds and Allen’s Creek watershed (Figures 6–9).

<table>
<thead>
<tr>
<th>WETLAND TYPE</th>
<th>HISTORIC ACREAGE (c. 1900)</th>
<th>EXISTING ACREAGE (1995)</th>
<th>CHANGE (acres)</th>
<th>PERCENT CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DELANEY &amp; ARCHIE CREEK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshwater</td>
<td>372.0</td>
<td>55.0</td>
<td>-317.0</td>
<td>-85.2</td>
</tr>
<tr>
<td>Tidal Marsh</td>
<td>149.0</td>
<td>51.0</td>
<td>-98.0</td>
<td>-65.8</td>
</tr>
<tr>
<td>Mangrove/Spartina</td>
<td>185.0</td>
<td>155.0</td>
<td>-30.0</td>
<td>-16.2</td>
</tr>
<tr>
<td>Salt Barren</td>
<td>24.0</td>
<td>3.0</td>
<td>-21.0</td>
<td>-87.5</td>
</tr>
<tr>
<td>Hydric Hammock</td>
<td>1.2</td>
<td>1.0</td>
<td>-0.2</td>
<td>-16.7</td>
</tr>
<tr>
<td>Total</td>
<td>731.2</td>
<td>265.0</td>
<td>-466.2</td>
<td>-63.8</td>
</tr>
</tbody>
</table>

| ALLEN’S CREEK | | | | |
| Freshwater    | 1,840                      | 96.7                     | -1,743.3       | -94.7          |
| Tidal Marsh   | 295                        | 97.5                     | -197.5         | -67.0          |
| Mangrove/Spartina | 268                  | 176.5                    | -91.5          | -34.1          |
| Total         | 2,403                      | 371.7                    | -2,032.3       | -84.6          |

### Table 15. Combined data from Table 14, marine habitats only.

<table>
<thead>
<tr>
<th>WETLAND TYPE</th>
<th>ACREAGE c. 1900</th>
<th>PERCENT OF TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mangrove</td>
<td>453</td>
<td>49</td>
</tr>
<tr>
<td>Tidal marsh</td>
<td>444</td>
<td>48</td>
</tr>
<tr>
<td>Salt Barren</td>
<td>24</td>
<td>3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>921</td>
<td>100</td>
</tr>
</tbody>
</table>

The initial hypothesis that tidal stream habitats, including mesohaline and oligohaline plant communities that serve as fish and invertebrate nursery areas, have been differentially lost to a higher degree than the other studied habitats has been confirmed with these specific case studies. Therefore, the concept of targeting restoration to attempt to “restore the balance” to historical (i.e. c. 1900) percentages has been proposed for consideration by the Haast Protection and Restoration Masterplan Review Committee and was approved at their meeting on June 22, 1995.
ESTABLISHMENT OF PROTECTION AND RESTORATION TARGETS

The acreage of emergent tidal wetlands present in 1990 has been identified by the TBNEP as the living resource protection target, and a baywide protection target of 18,750 acres has been determined for these important habitats. In addition, distinct habitat types that are known to be essential to a guild—specifically, freshwater foraging habitat for ibises and other members of guild 8—are also included as protection targets under this Plan. Uplands associated with coastal wetlands (e.g., hydric hammocks, surrounding metasequoia dominated forests) are targeted for protection as a consequence of their rarity and ecological value. An extended discussion of these special habitats follows in this section (p. 50).

As indicated in Table 12, a net loss of mangrove and salt marsh habitat of 5,128 acres occurred in Tampa Bay between 1950 and 1990. This is a revised figure from that of 5,600 acres reported by Janicki et al. (1994, p. 26). It has been estimated that the cost of restoring mangrove/marsh habitat typically ranges from $25,000 to $50,000 per acre (Appendix B). Therefore, if the 5,128-acre restoration target were to be addressed solely by publicly funded habitat restoration projects the total cost would range from $128 million to $256 million, not including land costs. Applying the new information provided here (Figure 2 and Table 15), the loss since 1900 has been 14,992 acres, and restoration costs could therefore approach $750 million. These alternatives are illustrated as Options A and B in Figure 10; two other options (D and E) are also diagrammed (Figure 11). The lower cost option was rejected by the Management Committee as we expect the highest cost option would be as well.

An alternative for defining a living resource restoration target for emergent tidal wetlands involves the concept of restoring the predevelopment balance of “habitat ratios,” or the relative proportion of the different types of emergent tidal wetlands that were present during a benchmark time period representative of a less impacted condition. This paradigm is termed “Restoring the Balance”.

Based upon the trend analyses summarized in Tables 12–15, it is clear that disproportionate losses have occurred among the three classifications of emergent tidal wetlands, both on a baywide scale and within bay segments. On a baywide scale, tidal marshes and salt bars have suffered substantially greater losses than have mangrove/marsh communities. These disproportionate losses can be explained by the fact that lower salinity tidal marshes and salt bars occur upstream and landward, respectively, of mangrove forests and polyhaline marshes. As a result, these habitats have been most impacted by urban and agricultural development which has encroached into the bay from the headwaters and uplands. In addition, these marshes (e.g., black needlegrass) and salt bars are typically not as resilient as polyhaline marshes (e.g., smooth cordgrass) and mangrove forests, and do not exhibit the same ability to naturally re-establish along denuded shorelines. Their more tidal stream shoreline habitat is also more easily shaded by exotic invasive species like Brazilian pepper. For these reasons, mesohaline oligohaline marshes and salt bars are in need of maximum protection from future impacts and should be a high priority for future restoration efforts.
Setting Priorities:

Option A

1995 (18,758 acres total)

Restore to c. 1900 area and proportions (total area 33,750 acres)

Option B

1995 (18,758 acres total)

Restore to c. 1950 area and proportions (total area 23,886 acres)

Figure 10. Diagram of restoration options A and B.
Option D

1995 (18,758 acres total)

Restore to c. 1900 proportions (29,233 acres total area required)

Option E

1995 (18,758 acres total)

Restore to c. 1950 proportions (20,544 acres total area required)

Figure 11. Diagram of restoration options D and E.
Setting Priorities:

The establishment of restoration targets under the "Restoring the Balance" paradigm involves attempting to restore the relative proportions, or ratios, of the three wetland classifications present in the benchmark period (c. 1900) within a total coverage area greater than that present in current period. This can be done by holding constant the acreage of the least impacted wetland type on a percentage basis, and raising the acreage of the other two wetland types to attempt to restore a benchmark ratio. Options D and E (Table 16, Figure 11) illustrate these options, with the 1950s ratio used only as a recommended minimum restoration target due to projected costs.

<table>
<thead>
<tr>
<th></th>
<th>CURRENT</th>
<th>TARGET</th>
<th>CHANGE IN ACREAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ac.</td>
<td>%</td>
<td>ac.</td>
</tr>
<tr>
<td>Option A:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. 1900 area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangroves</td>
<td>13,764</td>
<td>73</td>
<td>16,538</td>
</tr>
<tr>
<td>Tidal Marsh</td>
<td>4,117</td>
<td>22</td>
<td>16,200</td>
</tr>
<tr>
<td>Salt Barren</td>
<td>877</td>
<td>5</td>
<td>1,012</td>
</tr>
<tr>
<td>Total</td>
<td>18,758</td>
<td></td>
<td>33,750</td>
</tr>
<tr>
<td>Option B:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. 1950 area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangroves</td>
<td>13,764</td>
<td>73</td>
<td>15,894</td>
</tr>
<tr>
<td>Tidal Marsh</td>
<td>4,117</td>
<td>22</td>
<td>6,621</td>
</tr>
<tr>
<td>Salt Barren</td>
<td>877</td>
<td>5</td>
<td>1,371</td>
</tr>
<tr>
<td>Total</td>
<td>18,758</td>
<td></td>
<td>23,886</td>
</tr>
<tr>
<td>Option D:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. 1900 proportions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangroves</td>
<td>13,764</td>
<td>73</td>
<td>14,324</td>
</tr>
<tr>
<td>Tidal Marsh</td>
<td>4,117</td>
<td>22</td>
<td>14,032</td>
</tr>
<tr>
<td>Salt Barren</td>
<td>877</td>
<td>5</td>
<td>877</td>
</tr>
<tr>
<td>Total</td>
<td>18,758</td>
<td></td>
<td>29,233</td>
</tr>
<tr>
<td>Option E:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. 1950 proportions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangroves</td>
<td>13,764</td>
<td>73</td>
<td>13,564</td>
</tr>
<tr>
<td>Tidal Marsh</td>
<td>4,117</td>
<td>22</td>
<td>5,753</td>
</tr>
<tr>
<td>Salt Barren</td>
<td>877</td>
<td>5</td>
<td>1,027</td>
</tr>
<tr>
<td>Total</td>
<td>18,758</td>
<td></td>
<td>20,544</td>
</tr>
</tbody>
</table>

To develop baywide restoration targets for Tampa Bay using this approach, the 1990 mangrove/marsh acreage (13,766) was divided by the 1950 mangrove/marsh percentage (0.67) to yield the total restoration target acreage (20,546). This total restoration target acreage was then multiplied by the 1950 percentage of tidal marsh (0.28) and salt barren (0.06) to derive the restoration targets for these two habitat types (1,636 and 150 acres, respectively). Table 17 shows the resulting baywide protection and restoration targets using this approach, termed the “minimum acceptable restoration targets” approach. That is, efforts to move closer to the c. 1990 habitat ratios are the ideal level of effort, but we will propose in
the cost of restoration section what is felt to be the most cost-effective restoration target at this time.

Under this approach priority is given to tidal marshes and salt barrens for restoration activities. This does not imply that mangrove/marsh habitat restoration should not be pursued; mangrove/marsh habitat restoration should continue to be implemented on a "site-opportunity basis," where appropriate sites are available and public support and funding exists. Rather, these targets should be used to establish public policy direction and funding priorities for achieving an annual "net gain" in emergent tidal wetland acreage which furthers the attainment of the defined targets.

Table 17. Baywide emergent tidal wetland protection and minimum acceptable restoration target acreage under the "Restoring the Balance" paradigm (c. 1950 habitat ratios)

<table>
<thead>
<tr>
<th>HABITAT TYPE</th>
<th>PROTECTION</th>
<th>RESTORATION</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mangrove Marsh</td>
<td>13,764</td>
<td>SB</td>
<td>≥ 13,764</td>
</tr>
<tr>
<td>Tidal Marsh</td>
<td>4,117</td>
<td>1,636 (+40%)</td>
<td>5,753</td>
</tr>
<tr>
<td>Salt Barren</td>
<td>877</td>
<td>150 (+17%)</td>
<td>1,027</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>18,758</strong></td>
<td><strong>≥1,786</strong></td>
<td><strong>≥20,544</strong></td>
</tr>
</tbody>
</table>

To develop restoration targets for each bay segment, the minimum acceptable baywide targets for tidal marsh (1,636 acres) and salt barren (150 acres) were apportioned pursuant to the calculated percentage of the total loss for each habitat type incurred in that segment. For example, approximately 12% of the 2,504 acre loss of tidal marsh habitat has been incurred in Old Tampa Bay. Therefore, the tidal marsh restoration target for Old Tampa Bay was calculated by multiplying the baywide tidal marsh restoration target of 1,639 acres by 0.12 to yield a bay segment restoration target of 196 acres. For salt barren habitat, slight gains were observed over the 1950 to 1990 time period in both the Middle Tampa Bay and Terra Ceia Bay segments. In these cases, the restoration targets are also to be addressed on a site-opportunity basis. Table 18 shows protection and restoration targets for each bay segment.

The protection and restoration targets shown in Tables 16 and 17 clearly direct the priorities predominantly towards the mesohaline and oligohaline marsh habitats found within the tidal tributaries to Tampa Bay. Since the majority of the rivers and tidal creeks flowing to Tampa Bay have been impacted by impoundments, channelization, hardening, and other dredge and fill activities, future restoration activities should focus on the functional recovery of these tributaries which historically supported critical low-salinity habitat and in addition provided water quality protection through pollutant removal.

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Setting Priorities:

The restoration targets established herein are based on habitat conversions and losses that occurred in the time period c.1950 to 1990. However, it should be noted that significant losses of mesohaline and oligohaline marsh habitat occurred prior to the c.1950 time period through the impoundment of at least four major historically estuarine waterbodies: the Hillsborough River (Hillsborough River Reservoir); the Braden River (Evers Reservoir); Long Bayou (Lake Seminole); Salt Creek (Lake Maggiore) and Alligator Creek (Alligator Lake). Although these habitat losses have not been quantified, they were substantial, based on a qualitative review of the areas involved.

Table 18: Emergent tidal wetland protection and restoration target acreage by bay segment under the "Restoring the Balance" paradigm.

<table>
<thead>
<tr>
<th>BAY SEGMENT</th>
<th>MANGROVE/ MARSH</th>
<th>TIDAL MARSH</th>
<th>SALT BARREN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Tampa Bay</td>
<td>Protection 3,452</td>
<td>1,150</td>
<td>147</td>
</tr>
<tr>
<td></td>
<td>Restoration SB</td>
<td>193</td>
<td>93</td>
</tr>
<tr>
<td>Hillsborough Bay</td>
<td>Protection 751</td>
<td>499</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Restoration SB</td>
<td>68</td>
<td>46</td>
</tr>
<tr>
<td>Middle Tampa Bay</td>
<td>Protection 5,061</td>
<td>737</td>
<td>533</td>
</tr>
<tr>
<td></td>
<td>Restoration SB</td>
<td>874</td>
<td>SB</td>
</tr>
<tr>
<td>Lower Tampa Bay</td>
<td>Protection 2,174</td>
<td>389</td>
<td>168</td>
</tr>
<tr>
<td></td>
<td>Restoration SB</td>
<td>142</td>
<td>6</td>
</tr>
<tr>
<td>Boca Ciega Bay</td>
<td>Protection 1,121</td>
<td>84</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Restoration SB</td>
<td>124</td>
<td>4</td>
</tr>
<tr>
<td>Terra Ceia Bay</td>
<td>Protection 711</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Restoration SB</td>
<td>5</td>
<td>SB</td>
</tr>
<tr>
<td>Manatee River</td>
<td>Protection 494</td>
<td>1,252</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Restoration SB</td>
<td>230</td>
<td>1</td>
</tr>
</tbody>
</table>

SB — site opportunity basin; restoration should be pursued wherever cost-effective site opportunities exist.

In addition to a 21% net loss of emergent tidal wetlands, this trend analysis also indicates that a substantial acreage of wetland habitat has been converted from one wetland type to another during the study period. The GIS methodology that was used allows for the calculation of acreage changes to and from the various land cover categories. Table 19 shows the results of this change analysis by bay segment whereby conversions were calculated for each of the three major types of emergent tidal wetlands. All other categories were lumped into an "other" category. For example, if an area was salt barren habitat in 1950 but mangrove/marsh habitat in 1990, the acreage of the area involved is placed in the table at the intersection of the "1950 Salt Barren" column and the "1990 Mangrove/Marsh" row. Conversions to or from any

-48-
land cover category other than the three emergent tidal wetland types were combined into an “other” category. For example, if an area was uplands in 1950 but mangrove/marsh in 1990 it would be in the table at the intersection of the “1950 Other” column and the “1990 Mangrove/Marsh” row.

Table 19: Emergent tidal wetland change analysis by bay segment, 1950–1990.

<table>
<thead>
<tr>
<th>BAY SEGMENT</th>
<th>1950 Mangroves/Marsh</th>
<th>1950 Tidal Marsh</th>
<th>1950 Salt Barren</th>
<th>1950 Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Tampa Bay</td>
<td>1990</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangroves/Marsh</td>
<td>2,042</td>
<td>448</td>
<td>169</td>
<td>793</td>
</tr>
<tr>
<td>Tidal Marsh</td>
<td>199</td>
<td>407</td>
<td>82</td>
<td>462</td>
</tr>
<tr>
<td>Salt Barren</td>
<td>15</td>
<td>6</td>
<td>57</td>
<td>68</td>
</tr>
<tr>
<td>Other</td>
<td>1,064</td>
<td>585</td>
<td>208</td>
<td></td>
</tr>
<tr>
<td>Hillsborough Bay</td>
<td>1990</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangroves/Marsh</td>
<td>228</td>
<td>97</td>
<td>1</td>
<td>425</td>
</tr>
<tr>
<td>Tidal Marsh</td>
<td>125</td>
<td>97</td>
<td>30</td>
<td>247</td>
</tr>
<tr>
<td>Salt Barren</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Other</td>
<td>755</td>
<td>403</td>
<td>164</td>
<td></td>
</tr>
<tr>
<td>Middle Tampa Bay</td>
<td>1990</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangroves/Marsh</td>
<td>3,241</td>
<td>598</td>
<td>46</td>
<td>1,196</td>
</tr>
<tr>
<td>Tidal Marsh</td>
<td>49</td>
<td>456</td>
<td>10</td>
<td>222</td>
</tr>
<tr>
<td>Salt Barren</td>
<td>50</td>
<td>220</td>
<td>208</td>
<td>55</td>
</tr>
<tr>
<td>Other</td>
<td>1,866</td>
<td>792</td>
<td>171</td>
<td></td>
</tr>
<tr>
<td>Lower Tampa Bay</td>
<td>1990</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangroves/Marsh</td>
<td>1,469</td>
<td>237</td>
<td>42</td>
<td>426</td>
</tr>
<tr>
<td>Tidal Marsh</td>
<td>124</td>
<td>71</td>
<td>17</td>
<td>177</td>
</tr>
<tr>
<td>Salt Barren</td>
<td>34</td>
<td>62</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>932</td>
<td>272</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td>Boca Ciega Bay</td>
<td>1990</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangroves/Marsh</td>
<td>628</td>
<td>43</td>
<td>2</td>
<td>448</td>
</tr>
<tr>
<td>Tidal Marsh</td>
<td>34</td>
<td>6</td>
<td>9</td>
<td>35</td>
</tr>
<tr>
<td>Salt Barren</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>1,473</td>
<td>225</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Terra Ciega Bay</td>
<td>1990</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangroves/Marsh</td>
<td>482</td>
<td>9</td>
<td>1</td>
<td>219</td>
</tr>
<tr>
<td>Tidal Marsh</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Salt Barren</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>430</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Manatee River</td>
<td>1990</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mangroves/Marsh</td>
<td>173</td>
<td>132</td>
<td>0</td>
<td>189</td>
</tr>
<tr>
<td>Tidal Marsh</td>
<td>89</td>
<td>730</td>
<td>0</td>
<td>433</td>
</tr>
<tr>
<td>Salt Barren</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>329</td>
<td>742</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

NOTE (added in proof): Maps depicting changes in emergent tidal wetland between 1950 and 1990 are included in Appendix J.
Despite these efforts to maximize the comparability of the 1950 and 1990 datasets, some classification problems still exist and may have resulted in over- and underestimates of changes in emergent tidal wetland coverage in certain areas of the bay. In particular, the 1950 classification of tidal marsh habitat near the mouth of the Little Manatee River in the Middle Tampa Bay segment appears to have included a significant acreage of salt barren habitat.

If these areas were misclassified, it would result in an overestimate of tidal marsh losses or conversion, as well as the salt barren gains, in Middle Tampa Bay. In addition, it is known that the mangrove forest category of the 1990 dataset includes areas of Brazilian pepper coverage. This misclassification, in turn, likely results in an overestimate of mangrove coverage in 1990.

A thorough review of the 1950 and 1990 datasets indicates that these types of misclassifications probably represent a very small percentage of the overall area evaluated. Therefore, the use of this trend analysis for target setting on a baywide basis is considered to be very defensible, however some caution should be exercised when using this information for setting targets in individual bay segments. Artifacts of previous photointerpretation may introduce a bias in the data not based on genuine changes in habitats (Haddad 1989). For these reasons, we would urge caution in the use of the target restoration acreage figures for individual bay segments until the recommended monitoring plan is implemented. Also, each proposed restoration project should receive careful outside review by professionals such as the staff of the Florida Marine Research Institute (see Appendix C) to ensure that the most current research results are applied to the "Restoring the Balance" paradigm.

Special Habitats

The first of the special habitats to be discussed is critical freshwater foraging habitat for guild 8. Three bird species are used to illustrate the unique role played by isolated freshwater wetlands in the Tampa Bay watershed.

The first of these species is the white ibis. The Florida Game and Fresh Water Fish Commission (Montalbano 1992) has described the recent population dynamics of this species as follows:

The white ibis occurs in the southeastern coastal plain from North Carolina through Texas, and numerically is still one of the most abundant wading birds in Florida, often occurring in relatively large flocks, but the statewide nesting population has declined by an estimated one-half since the mid-1970s—from 180,000 to less than 70,000 (Runge 1991). In south Florida alone, the white ibis breeding population has declined from about 100,000 in the 1940s (Kushlan et al. 1984) to an estimated 23,800–53,200 in the early 1970s (Kushlan 1977, Kushlan and White 1977), and further to 4,700–8,300 in 1986–87 (Frederick and Coflopy 1988), a regional decline of 65% to 84% during the most recent 10–17 year period. Similar declines have been reported from other southeastern states (Frederick, unpubl. data), with the possible exception of Louisiana. Also, historically white ibises typically nested in colonies containing very large numbers of birds, but most of those colonies are
now gone; during 1990, ibises failed to breed in any aggregations of over 1,000 nests in the Carolinas, Georgia, and nearly all of Florida (Frederick, in press). Via resolutions, the Colonial Waterbird Society and International Council for Bird Preservation / United States Branch have recently acknowledged the white ibis as biologically threatened and has petitioned the Commission to list it as such (colonial Waterbird Society 1992, ICBP/U.S. 1992). The Specialist Group on Storks, Ibises and Spoonbills (a coalition of representatives from the International Union for Conservation of Nature, the International Council for Bird Preservation, and the International Waterfowl and Wetlands Research Bureau) has likewise acknowledged the species’ threatened status and similarly petitioned for listing (letter to Colonel Robert M. Brantly, Executive Director, dated 23 December 1992).

Bildstein (1993, p. 212) describes the dilemma of managing coastal populations of white ibis as requiring first the acknowledgment that they need both a “bedroom” and a “kitchen” to survive and that:

These freshwater marshes or swamps in South Carolina are often 21 to 31 kilometers (13–19 miles) inland from the coastal nesting sites. The adult ibis must travel these distances (26–38 miles round trip) in order to pick up and return freshwater crayfish and fish to feed their young who cannot tolerate the higher salinity levels in more estuarine crustaceans normally eaten by adult birds such as fiddler crabs.

The draft Development Guidelines for White Ibis Habitat Protection in Florida (FGFWC 1994) includes a map (Figure 12) showing the locations of active white ibis nesting colonies and associated foraging habitats in central peninsular Florida. That portion including the watershed of Tampa Bay and the bay itself has been enlarged to a scale of 1:100,000 and printed in color by the FGFWC Non-game Section for use in this study.

Table 20 lists the number of breeding pairs of white ibis in 1994 or 1995, at the four colonies in Tampa Bay where they nest. Figure 13 shows these four locations with a circle centered over each colony with a radius of 9.3 miles (15 km) which is an average foraging distance for adults feeding young (FGFWC). All freshwater wetlands within these circles deserve special protection, but particularly those in areas where foraging circles overlap. Areas of double and triple overlap, and all areas within the Alafia Banks (Colony #1) foraging circle are of particular interest as protection and restoration sites.

Little blue herons and snowy egrets are included in this guild because, while less studied, the indications are that their numbers “had been reduced by the mid-1970s to at least one-quarter of the probable 1920s numbers” (Frederick and Collopy 1988). They also feed in a similar combination of both marine and freshwater habitats, but with specific dependence on food items such as frogs and small freshwater fish and shrimp that occur in the unique small inland marshes that frequently dry during low rainfall periods.

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Figure 12. 1994 locations of active and currently active white ibis nesting colonies and associated foraging habitat in central peninsular Florida (figure from FGTWFC 1994).
Figure 13. Land areas with overlap of the estimated foraging ranges of three of the four and two of the four colonies of coastal nesting white ibis on Tampa Bay.
Table 20: Colonial wadebird nesting colonies in Tampa Bay where these birds occur. (Data from National Audubon Society)

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>NUMBER OF BREEDING PAIRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alafla Banks</td>
<td>8,500 (1995)</td>
</tr>
<tr>
<td>TECO Rock Ponds</td>
<td>1,000 (1995)</td>
</tr>
<tr>
<td>Washburn Sanctuary</td>
<td>500 (1994)</td>
</tr>
<tr>
<td>Tarpon Key</td>
<td>370 (1995)</td>
</tr>
</tbody>
</table>

The second of the special habitats targeted for protection under this Plan are uplands associated with coastal wetlands. These upland communities consist of two types, hydric hammocks and surrounding mesic slash pine-dominated forests existing between approximately the +3.5' and +6.0' NGVD ground level contours (Simons et al. 1989, Vince et al. 1989). Recent mapping of these areas has excluded the shoreline of Tampa Bay (Johnson and Muller 1993) (Figure 14).

Coastal hydric hammocks are perhaps the most rare habitat type currently existing along Tampa Bay. This habitat type is described (Vince et al. 1989, p. 1) as:

... a small but distinct part of the natural landscape of the Florida peninsula north of Lake Okeechobee ... often have a broad-leaved evergreen appearance and typically contain live and swamp laurel oaks (Quercus virginiana and Quercus laurifolia), cabbage palm (Sabal palmetto), southern red cedar (Juniperus silicicola), sweet gum (Liquidambar siliquastrum) and hornbeam (Carpinus caroliniana).

The coastal hammock is one of the four types of hydric hammock (Simons et al. 1989). The other three are the inland,lobolly pine and seepage types.

The value of coastal hydric hammocks includes their role in controlling and cleansing upland drainage to coastal wetlands, their unique botanical communities including epiphytes such as butterfly orchid (Encyclia tampensis), shoestring fern (Piptandra lineata) and balms (Tillandsia recurvata), and their importance to overwintering passerines (perching birds and songbirds). As Vince et al. (1989, p. 59) note, “much attention has been given recently ... to the role of Neotropical forests in supporting populations of migrant passerines that breed in eastern North America, but the same role of forests of the Southeastern United States, and hydric hammocks in particular, is less well recognized.”

Cox (1995, p. 2) further notes that:

Each year, the forests, grasslands and marshes of Florida play host to a dazzling variety of migratory birds. About two-thirds of the birds that breed in North America migrate, and many depend on our state’s pine forests, oak hammocks, coastal scrubs and grasslands, and other habitats to complete

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Figure 14. Natural coastal upland sites in central section of the southwest region of the Florida coast (as mapped by Johnson and Muller 1993).

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their biennial treks. Unfortunately, coastal habitats important to migratory birds and many other species are being quickly gobbled up by Florida’s ever expanding human population.

Beever (1994) includes a map of the existing preserved wildlife habitat (Figure 15) and a proposed Tampa Bay Regional Wildlife Habitat Plan (Figure 16). He notes that three general types of regional wildlife habitat were identified: coastal, riverine and large mammal. The coastal habitats are described as follows:

The designated coastal habitats buffer and interconnect estuaries and their tributaries. This provides migratory flyways for waterfowl, shorebirds, and passerine birds, and protects rookeries and nesting areas. These habitats include coastal strand and dunes, tropical hardwood hammock, coastal oak hammock, coastal scrub, mangrove forest, saltmarsh, high marsh, riverine riparian forest and pine forests.

It was proposed for review and comment that the proposed plan be adopted as part of the Tampa Bay Habitat Protection and Restoration Masterplan and the Habitat Protection and Restoration Masterplan Review Committee concurred on June 22, 1995.
Figure 15. Existing regional wildlife habitat plan for the Tampa Bay region (from FFWF 1995).
Figure 16. Proposed revisions to the regional wildlife habitat plan for the Tampa Bay region (FGWPC).
PROPOSED
TAMPA BAY HABITAT PROTECTION AND RESTORATION PLAN
Protection Component

The proposed protection strategy includes the acquisition in fee or less than fee, if appropriate, of all mangrove forests, tidal marshes, and salt barsrens currently existing along the shores or in the watershed of Tampa Bay and that are not now in public protection. Prior to the preparation of this plan, most of these areas not under a public protection umbrella were considered “protected” due to the existing wetland laws—federal, state and local.

This situation has changed in recent years due to property rights issues. Legislation has been proposed, and some placed into law, that would require purchase in fee of privately owned wetlands for which development permits were denied. This issue is likely to become more important as private property rights come to the fore. For this reason, the existence of current wetland protection laws cannot be guaranteed to continue into the future. The logical fallback position is to plan now to place these wetlands, representing only approximately 45% of the historical acreage, under a public protection umbrella at the least cost to the public. Planning now will save money in the future.

Assessment of Publicly Owned Conservation Lands

One objective of this project was to identify and map the distribution of publicly owned land parcels in the Tampa Bay watershed which have been purchased and/or dedicated for preservation, conservation or passive recreational uses. This information was then to be used to identify strategically located privately owned parcels, and prioritize them for future public purchase.

Information on publicly owned lands was solicited from the following governmental units:

- Florida Internal Improvement Trust Fund
- Florida Department of Environmental Protection
- Florida Department of Transportation
- Florida Game and Freshwater Fish Commission
- Southwest Florida Water Management District Land Acquisition and Management Department
- Southwest Florida Water Management District Surface Water Improvement and Management (SWIM) Department
- Tampa Bay Regional Planning Council
- Pinellas County Tax Assessors Office
- Pinellas County Planning Department
- Hillsborough County Tax Assessors Office
- Hillsborough County Environmental Lands Acquisition and Protection Program (ELAPP)
- Hillsborough County Parks and Recreation Department
- Hillsborough River Greenways Task Force
- Manatee County Tax Assessors Office
- Manatee County Department of Ecosystem Management
- The National Audubon Society
- The Nature Conservancy
Setting Priorities:

An attempt was made to acquire all relevant information in digital format for conversion to a common GIS format (e.g., Arc/INFO). Information was subsequently received in a wide variety of digital and hard copy formats, and was subjected to a comprehensive screening process. For example, digital database queries performed by the Hillsborough County Tax Assessors Office yielded over 1,700 parcels that were recorded in public ownership, including land uses such as schools, libraries, pump stations, retention ponds etc. Only those parcels that are currently in use as preservation, conservation or passive recreation areas were retained. Parcels identified as passive recreation areas include public parks where some natural habitat is conserved and nature interpretive activities (e.g., birdwatching, canoeing, hiking, etc.) are the primary use, as opposed to active recreation areas where athletic activities (e.g., ballfields) are the primary use.

Digital information was converted to GIS format, transformed and rectified to the greatest extent possible. The standard Tampa Bay National Estuary Program shoreline and watershed boundaries served as the baseline coverage. Relevant hard copy information was digitized and merged into the GIS database. In addition, a major roadway coverage was merged into the GIS database to improve spatial orientation of the mapped parcels. In general, parcels less than 5 acres in size were not mapped due to the desired mapping scales.

Once the screening process was completed, all retained parcels were given a parcel identification number. The GIS was then used to calculate parcel size and centroid location (latitude and longitude). In addition, a map legend number was assigned to each parcel for color coding according to the following five categories:

- Existing publicly owned conservation lands;
- Conservation lands approved/nominated for public purchase;
- Privately owned conservation lands;
- Other publicly owned lands; and
- State Aquatic Preserves.

The “Others: Publicly owned Lands” category includes large tracts such as airports, military bases, and port facility lands where substantial natural habitat still exists or where future habitat restoration activities have a reasonable potential for occurring. The “Privately owned Conservation Lands” category includes large tracts owned by private entities, but which have been dedicated for conservation uses, based on the information provided. Some of these parcels have recorded conservation easements; however, the resulting coverage does not represent a comprehensive inventory of conservation easements in the watershed. The “Conservation Lands Approved/Nominated for Public Purchase” category includes those parcels which have been identified and approved or nominated for future public purchase by some land acquisition agency. To be included in this category, a parcel must have been formally evaluated and listed on a pending purchase list. However, future public purchase of some of the mapped parcels may not be guaranteed due to possible future funding constraints.

No attempt was made to verify the information provided by the various agencies solicited. Actual parcel boundaries and acreages are likely to vary somewhat from their mapped depiction due to: 1) inconsistent formats of the original information; 2) lack of quality control.

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in the original information; 3) and digital GIS transformation and rectification adjustments. Nonetheless, the public lands maps produced from this effort represent the first attempt to develop a comprehensive seamless coverage of public land ownership for the Tampa Bay watershed, and will likely prove very useful for regional resource planning efforts including the development of a Comprehensive Conservation and Management Plan for Tampa Bay. The data obtained through this mapping effort is included here as Appendix D.

Merging of Publicly Owned Lands Coverage with Emergent Tidal Wetland Coverage
The seamless GIS coverage for publicly owned lands was overlaid onto the 1990 emergent tidal wetland coverage using the Arc/INFO union process. The resulting intersection was used to calculate the acreage of the three types of emergent tidal wetlands (mangrove / marsh, tidal marsh, and salt barren) in the following three categories:
- Currently in public ownership;
- Proposed for public ownership; and
- Currently in private ownership.

The results of this analysis are shown in Table 21 for baywide figures, and Table 22 for each bay segment (maps depicting emergent tidal wetlands currently in and proposed for public ownership are presented in Appendix F). As shown in Table 21, approximately 34% of the emergent tidal wetland systems are currently in public ownership, and another 17% are proposed for public purchase. Therefore, assuming that all approved parcels are purchased by the year 2000, approximately 52% of the emergent tidal wetlands will be protected under public ownership. The existing mesohaline and oligohaline tidal marshes are the least protected wetland type with only 31% currently in public ownership, and only 8% proposed for future public purchase. Furthermore, this estimate does not include substantial unmapped acreages of tidal marsh habitat contained in small linear systems which have not yet been adequately mapped.

Table 21. Public vs. private ownership of emergent tidal wetlands, baywide area (acres) totals.

<table>
<thead>
<tr>
<th></th>
<th>MANGROVE / MARSH</th>
<th>TIDAL MARSH</th>
<th>SALT BARREN</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently in Public</td>
<td>4,813 (35)</td>
<td>1,289 (31)</td>
<td>325 (37)</td>
<td>6,427 (34)</td>
</tr>
<tr>
<td>Ownership (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proposed for Public</td>
<td>2,560 (19)</td>
<td>308 (8)</td>
<td>343 (39)</td>
<td>3,211 (17)</td>
</tr>
<tr>
<td>Ownership (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Currently in Private</td>
<td>6,391 (46)</td>
<td>2,520 (61)</td>
<td>209 (24)</td>
<td>9,120 (49)</td>
</tr>
<tr>
<td>Ownership (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total area (%</td>
<td>13,764 (73)</td>
<td>4,117 (22)</td>
<td>877 (5)</td>
<td>18,758</td>
</tr>
</tbody>
</table>

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Table 22. Public vs. private ownership of emergent tidal wetlands, acreage by bay segment.

<table>
<thead>
<tr>
<th>Bay Location</th>
<th>Ownership</th>
<th>Mangrove Marsh</th>
<th>Tidal Marsh</th>
<th>Salt Marsh</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLD TAMPA BAY</td>
<td>Currently Public</td>
<td>1,538</td>
<td>636</td>
<td>124</td>
<td>2,298</td>
</tr>
<tr>
<td></td>
<td>Proposed Public</td>
<td>13</td>
<td>49</td>
<td>0</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>Private</td>
<td>1,901</td>
<td>465</td>
<td>23</td>
<td>2,389</td>
</tr>
<tr>
<td>HILLSBOROUGH BAY</td>
<td>Currently Public</td>
<td>94</td>
<td>18</td>
<td>0</td>
<td>112</td>
</tr>
<tr>
<td></td>
<td>Proposed Public</td>
<td>484</td>
<td>128</td>
<td>3</td>
<td>615</td>
</tr>
<tr>
<td></td>
<td>Private</td>
<td>173</td>
<td>353</td>
<td>10</td>
<td>536</td>
</tr>
<tr>
<td>MIDDLE TAMPA BAY</td>
<td>Currently Public</td>
<td>2,385</td>
<td>433</td>
<td>186</td>
<td>3,004</td>
</tr>
<tr>
<td></td>
<td>Proposed Public</td>
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Sample Site Acquisition Selection Procedure

Major wetland and associated upland habitat areas not in public ownership are listed in Table 23. Each was rated according to 23 criteria (Table 24) in order to determine a comparative rating (Table 25; A–C, A being the highest). This method is modeled after the “ecosystem management criteria” prepared by the Florida Department of Environmental Protection (Form FPS-A016[10/94], Table 26).

The proposed 28 habitat protection sites listed in Table 23 have been rated on 24 characters resulting in total scores ranging from 29 to 63. Two sites are ranked much higher than the rest, primarily due to their location within overlapping white ibis foraging areas. These sites are the TECO Port Manatee/Reeder property, rated number two out of the 28 sites with 61 points, and the Terra Ceia Isles site rated number one with 63 points. These are termed “A” sites. The next ten sites all scored 36 or above up to 40. They are termed “B” sites. The remaining 16 sites scored between 29 and 35, and are termed “C” sites. Since these ratings are based upon only one individual’s (RRL) scoring using a preliminary ranking system, the
values should be viewed as suggesting an approach, but still in need of refinement. In particular, these sites need to be combined with all other nominated sites being evaluated by other land protection programs (i.e. Save Our Rivers, Hillsborough County ELAPP, etc.) within a proposed Tampa Bay Fish and Wildlife Management Program (see Recommended Implementation Plan).

Table 23. Proposed habitat protection sites.

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<th>SITE</th>
<th>BAY SEGMENT</th>
<th>OWNER</th>
<th>FIGURE</th>
<th>ACREAGE</th>
<th>RATING</th>
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<td>18</td>
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<td>19</td>
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<td>CSX/Tampa Tank</td>
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<td>21</td>
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<tr>
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<td>HB</td>
<td>Cargill</td>
<td>?</td>
<td>C</td>
<td></td>
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<td>15. South Parcel</td>
<td>HB</td>
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<td>?</td>
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Figure 18. Proposed protection sites 4 and 5.
Figure 19. Proposed protection sites 7 and 8.

-66-
Figure 28. Proposed protection sites 10 and 11.
Figure 22. Proposed protection sites 16 and 17.
Figure 23. Proposed protection sites 18 and 20.
Figure 24. Proposed protection site 21.
Figure 25. Proposed protection site 22. Dotted line indicates acquisition boundary subject to change, to exclude certain developed or planted areas (information provided by Manatee Co.).
Figure 26. Proposed protection site 23. Dotted line indicates acquisition boundary subject to change, to exclude certain developed or platted areas (information provided by Manatee Co.).
Table 24. Criteria for acquisition matrix and ranking.

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<th>CRITERION</th>
<th>NUMERICAL VALUE TO BE ASSIGNED</th>
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**ACQUISITION, PROTECTION, MANAGEMENT AND RESTORATION (IF NEEDED) WILL:**

1. Lead to improved water quality                                        | 1 2  3 |
2. Improve groundwater recharge in a water resource caution area          | 1 2  3 |
3. Improve quality, quantity, and timing of freshwater input into a marine estuarine or freshwater system | 1 2  3 |
4. Help achieve the minimum flows and levels of an aquatic system         | 1 2  3 |
5. Restore or improve tidal circulation                                    | 1 2  3 |
6. Re-establish natural hydroperiod                                        | 1 2  3 |
7. Contribute to recovery of a natural community or population            | 1 2  3 |
8. Enhance and protect natural community populations which have been identified by state or federal agencies as severely limited, endangered or threatened in Florida | 1 2  3 |
9. Contribute to native species diversity in the region                   | 1 2  3 |
10. Eliminate or significantly reduce a source of exotic plant species infestation and seed source | 1 2  3 |
11. Enhance a unique, regionally scarce or imperiled community            | 1 2  3 |
12. Prevent continued habitat loss or damage due to pollution or environmental degradation | 1 2  3 |
13. Improve a wildlife corridor fragmented by alteration                   | 1 2  3 |

**SITE WILL PROVIDE ECOLOGICAL LINK TO, CREATE BUFFER FOR, OR RECONNECT FRAGMENTED SYSTEMS ASSOCIATED WITH:**

14. State identified ecosystems                                            | 1 2  3 |
15. SWIM designated water bodies with approved plans                       | 1 2  3 |
16. National Estuary Program designated areas                              | 1 2  3 |
17. Public lands                                                           | 1 2  3 |
18. Aquatic Preserves                                                      | 1 2  3 |
19. Outstanding Florida Waters                                             | 1 2  3 |
20. Shellfish harvesting areas                                             | 1 2  3 |
21. Areas of Critical State Concern                                        | 1 2  3 |

**SITE IS LOCATED WITHIN:**

22. Nine miles (15 km) of existing white ibis nesting site                  | 0     | —     | 3    |
23. Overlap of feeding range zones of existing white ibis nesting sites     | TWO ZONES | three zones |

-75-
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Table 26. Ecosystem management criteria (from FDEP). ¹

A. ENVIRONMENTAL RESTORATION

1. Restoration will lead to improved water quality.
2. Restoration will significantly improve ground water recharge.
3. Groundwater recharge improvement is in a water resource caution area.
4. Restoration will improve groundwater protection for a first magnitude spring.
5. Restoration will improve quality, quantity and timing of freshwater input into a marine, estuarine or freshwater system.
6. Restoration will help achieve the minimum flows and levels of an aquatic system.
7. Restoration will re-establish natural hydroperiod.
8. Restoration will contribute to the recovery of a natural community or population and may include, but not be limited to, contributing to native species diversity or reducing a source for exotic infestation.
Communities or populations which have been identified by state and federal agencies as severely limited, threatened or endangered may be given priority.

B. ECOSYSTEM INTEGRATION

1. Restoration sites will be ecologically linked to, create buffer for, or reconnect fragmented systems within:
   — State identified ecosystem management areas, as recognized by the Department of Environmental Protection
   — SWIM designated water bodies with approved plans
   — National Estuary Program designated areas
   — Public lands
   — Aquatic preserves
   — Outstanding Florida Waters
   — Shellfish harvesting areas
   — Areas of Critical State Concern
   — National Estuarine Research Reserve
   — National Marine Sanctuary
   — Other significant ecosystems or special management areas
2. Restoration will improve a wildlife corridor fragmented by alteration.

C. ENVIRONMENTAL PROTECTION

1. Pollution prevention achieved through source reduction, waste minimization, or on-site recycling.
2. Protection through reducing or eliminating the generation and use of toxic and hazardous substances.
3. Protection through addressing media transfer of pollutants and minimizing the transfer of pollutants from one medium to another.
4. Protection through pollution source investigation.
5. Protection through monitoring.

D. AIR QUALITY PROTECTION

1. Protection through energy conservation to include energy efficiency and utilization for both mobile and stationary sources that will lead to improved air quality.
2. Protection through the reduction of criteria pollutants (ozone, sulfur dioxide, carbon monoxide, nitrogen oxides, lead, particulate matter PM-10) that will lead to improved air quality.

¹Other criteria have been suggested by reviewers; see also Appendix F for comments regarding use of these criteria.
Other Protection Strategies

Another protection strategy, beyond land acquisition, is the establishment of management plans for all public lands with conservation aims, including passive parks, with budgeted operation and maintenance (O&M) funding to ensure that restoration sites, including public mitigation areas, do not revert back to degraded wetlands through neglect. Re-invasion by non-native plants is currently a major unresolved management issue in newly restored wetland sites in the Bay area (e.g. Pendola Point Port mitigation, Simmons Park restoration site). As illustrated in Table 8, existing funded management plans for publicly owned conservation lands or restoration sites are virtually nonexistent.

A third protection strategy is the management of Tampa Bay emergent wetlands as sea level rises. The United Nations Environment Program (UNEP) is supporting studies on the impact of sea level rise at various locations around the world including the wider Caribbean region (Maul 1993). The assumption being addressed is an increased temperature of 1.5-4.5°C and sea level rise of 20–140 cm (8–56 inches) before 2100 and an ongoing temperature rise of 1.5°C and sea level rise of 20 cm by the year 2025.

Snedaker (1993) addresses the short-term scenario as having the potential to produce moderate impacts to mangrove forests of the region, including those in Tampa Bay. Subtropical tidal marshes would likely be similarly affected. These plant communities can be expected to retreat inland as long as upland area is available, but they would disappear if retreat is not possible due to market changes in elevation or development. Because mangrove productivity generally increases with reduced salinities, Snedaker (1993) hypothesizes that mangroves with appropriate upland freshwater sources might keep up with sea level rise by normal peat production. The key recommendation he makes (p. 298) is applicable to Tampa Bay emergent wetlands:

Because of the importance of fresh water in sustaining high rates of mangrove primary productivity and in production and accumulation of organic peat, water management authorities should block surface water drainage canals and divert surplus fresh water discharges into mangrove areas based on a delivery schedule that promotes mangrove productivity.

The recent re-establishment of flow into the mangroves along the old south channel of the Alafia River (as part of the Cargill Fertilizer, Inc. / SWIM / FDEP South Parcel restoration project) is an example of this kind of effort. Another example of blocking drainage channels to restore sheet flow is proposed for the area south of Cockroach Bay (Figure 28).

Restoration Component

The second major component of the proposed plan is restoration. Three habitat types are addressed: 1) coastal emergent wetlands (e.g. mangrove forests, tidal marshes and salt barrens); 2) critical freshwater marshes used by the coastal guild of wading birds including white ibis; and 3) coastal uplands adjacent to the Bay considered important wildlife habitat, and coastal habitat including hydric hammocks.

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Figure 28. Proposed drainage channel modifications.
An analysis of changes in acreage of the various emergent wetlands has shown that the important shallow water tidal stream and low salinity tidal marsh nursery habitats have been differentially lost to a greater degree that other emergent habitats. In addition, the remaining areas of this habitat type have been or are being degraded by exotic plant invasion, primarily Brazilian pepper (*Schinus terebinthifolius*), based upon the observations made during the field verification portion of this study. Proposed drainage "improvements" also threaten these remnant habitats (e.g., Sweetwater Creek, Delaney Creek, Allen's Creek).

To address priorities in tidal stream restoration, an updated analysis of the location, size and number of minor tidal tributaries was performed. This effort resulted in the identification of 101 tidal streams of which 95 are tributary to Tampa Bay (Figure 29, Table 27). This is nearly triple the number of 37 previously identified by TDRPC (1986b). Each of these needs its own restoration plan as none are pristine. A formal matrix analysis was applied to each of the 95 systems plus 36 of the 38 proposed SWIM restoration sites and the seven Palm River / McKay Bay sites listed in HDR 1994 (Table 7). These total 138 potential restoration sites (Table 28). Criteria included are listed in Table 29.

The totaled scores of the 138 sites ranged from 23 to 41. Since the ranking has been done by only one individual (RRL), the totals should be considered only as preliminary values for purposes of categorizing projects as rating "high" or "low". These tables are available (from the Tampa Bay NEP office) as an Excel 5.0 file that can be manipulated by anyone wishing to attempt their own evaluation.

The combined results of a number of individuals familiar with the sites and the proposed restoration activities (many of which are only theoretical at this time) are needed to validate the rankings. A recommended task of the proposed Fish and Wildlife Management Plan Workshop is to work through the matrix and come to agreement on site rankings. The exercise of setting up the matrix is intended to illustrate a methodology and direction to proceed to implement the "Restoring the Balance" paradigm. It is not meant to represent any criticism of the existing process, but to suggest a possible alternative for the future.

Table 28 is suggested as a point of departure for comparison with Table 8. The proposed SWIM Five-Year Plan (Table 9) already includes some sites that fit well with this restoration plan. The Cabbagehead Bayou and Dug Creek projects (Figures 30 and 31) proposed by SWIM are examples of projects that the workshop participants may review and make recommendations for enhancement which can increase the oligohaline habitat potential.

Figure 32 represents an example of large-scale habitat restoration projects for Tampa Bay. It combines features providing habitat needed in all three of the critical habitat areas, including freshwater marsh for white ibis foraging and hydric hammock / mesic pine upland restoration.

The critical freshwater marsh preservation and restoration strategy has involved the placement of a 9.3-mile (15-km) radius circle around the four existing Tampa Bay white ibis nesting colonies (Alafia Banks, TECO Ponds, Washburn Sanctuary and Tarpon Key) and identifying marsh restoration and preservation sites within each circle (see Figure 13). Areas of overlap
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**Ranking Criteria:***

- Point System
- Total Score
- Importance
- Impact
- Viability
- Feasibility
- Economic Benefits
- Environmental Benefits
- Social Benefits

**Notation:***

- NS = Non-Strategic
- SR = Strategic

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**Table 28 continued.***

-84-
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<td>75</td>
<td>86</td>
<td>McEwen Creek</td>
<td>tc</td>
<td>TCB</td>
<td>1</td>
<td>2</td>
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<td>1</td>
<td>5</td>
<td>3</td>
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<td>tc</td>
<td>TCB</td>
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<td>1</td>
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<td>5</td>
<td>3</td>
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<td>25</td>
</tr>
<tr>
<td>77</td>
<td>56</td>
<td>Kennedy Creek</td>
<td>tc</td>
<td>TCB</td>
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<td>2</td>
<td>1</td>
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<td>1</td>
<td>5</td>
<td>3</td>
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<td>1</td>
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<td>3</td>
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<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>25</td>
</tr>
</tbody>
</table>

**Legend:**
- **BCR:** Boca Ciega Bay
- **MTB:** Middle Tampa Bay
- **OTB:** Old Tampa Bay
- **SS:** SWM site
- **TCA:** Terra Ceia Bay
- **MR:** Manatee River
- **LTS:** Lower Tampa Bay
- **MTR:** Middle Tampa River
- **MON:** Monet engineering, Inc.

**Notes:** Site scores are listed more than once due to multiple site types.
<table>
<thead>
<tr>
<th>CRITERION</th>
<th>NUMERICAL VALUE TO BE ASSIGNED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Existing salinity regime</td>
<td>15-35 ppt</td>
</tr>
<tr>
<td>2. Percent loss of all emergent wetlands by bay segment</td>
<td>OTB, MTB</td>
</tr>
<tr>
<td></td>
<td>LTB, MR, TCB, HB</td>
</tr>
<tr>
<td></td>
<td>BCB</td>
</tr>
<tr>
<td>3. Acreage loss of all emergent wetlands by bay segment</td>
<td>TCB</td>
</tr>
<tr>
<td></td>
<td>MR, OTB, TCB, HB</td>
</tr>
<tr>
<td></td>
<td>BCB, MTB</td>
</tr>
<tr>
<td>4. Presence of dams on tidal streams in bay segment</td>
<td>NO (MTB, LTB, TCB)</td>
</tr>
<tr>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>YES (MR, HB, OTB, BCB)</td>
</tr>
<tr>
<td>5. Drainage improvements planned?</td>
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<td>YES</td>
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<td>6. Drainage improvements funded?</td>
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<td>7. Restoration/Protection plan exists?</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>unknown</td>
</tr>
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<td></td>
<td>YES</td>
</tr>
<tr>
<td>8. Restoration/protection plan funded?</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>unknown</td>
</tr>
<tr>
<td></td>
<td>YES</td>
</tr>
<tr>
<td>9. Public ownership of shoreline (percent)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1-49%</td>
</tr>
<tr>
<td></td>
<td>50-100%</td>
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<td>10. Drainage easements exist?</td>
<td>NO</td>
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<td>unknown</td>
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<td></td>
<td>YES</td>
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<td>11. Contiguous with public lands or public conservation easement</td>
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<td></td>
<td>unknown</td>
</tr>
<tr>
<td></td>
<td>YES</td>
</tr>
<tr>
<td>12. Existing habitat value for the 10 guilds</td>
<td>LOW</td>
</tr>
<tr>
<td></td>
<td>MEDIUM</td>
</tr>
<tr>
<td></td>
<td>HIGH</td>
</tr>
<tr>
<td>13. Habitat value potential for the 10 guilds after restoration</td>
<td>LOW</td>
</tr>
<tr>
<td></td>
<td>MEDIUM</td>
</tr>
<tr>
<td></td>
<td>HIGH</td>
</tr>
<tr>
<td>14. Water quality protection value (existing)</td>
<td>LOW</td>
</tr>
<tr>
<td></td>
<td>MEDIUM</td>
</tr>
<tr>
<td></td>
<td>HIGH</td>
</tr>
<tr>
<td>15. Water quality improvement value after restoration</td>
<td>LOW</td>
</tr>
<tr>
<td></td>
<td>MEDIUM</td>
</tr>
<tr>
<td></td>
<td>HIGH</td>
</tr>
<tr>
<td>16. Existing upstream flood attenuation value</td>
<td>LOW</td>
</tr>
<tr>
<td></td>
<td>MEDIUM</td>
</tr>
<tr>
<td></td>
<td>HIGH</td>
</tr>
<tr>
<td>17. Potential upstream flood attenuation value</td>
<td>LOW</td>
</tr>
<tr>
<td></td>
<td>MEDIUM</td>
</tr>
<tr>
<td></td>
<td>HIGH</td>
</tr>
</tbody>
</table>

1 Alternative criteria and ranking schemes have been suggested by reviewers; see Appendices A and F.
Figure 30. Proposed Channel A mitigation site, showing completed portion (from Dial and Deis 1986).
Figure 31. Proposed Port Redwing mitigation sites with proposed additions (from Dal and Deis 1989).
Figure 32. Schematic restoration plan for acquisition site 21.

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of feeding ranges represent particularly important priority areas for public umbrella protection and restoration. The TECO Port Manatee property (site 21, Figure 24) and Terra Ceia Isles (site 22, Figure 25) appear to be very high priority areas, based on this criterion. The associated coastal upland strategy will concentrate on hydric hammocks and uplands contiguous with existing coastal wetlands. It will largely follow the recommendations of Beever (1995) and areas targeted in Figure 14.

Potential Cost of the Emergent Marine Wetland Restoration Plan Alternatives

Table 30 lists the four alternative restoration plans with defined acreage targets and the calculated costs of restoration. They range from $311,594,868 to $34,967,390 (not including any inflation factors) over a period of 100 years. Given the fact that the combined efforts of SWIM and FDEP have been able to restore 86 acres of wetlands in the last five years (Table 8) at a cost of approximately $25,000/acre or $2,150,000, it is felt that the lowest cost option with the lowest target acreage figure (1,786 acres) is the most viable option given the realities of budgets in the ‘90s and beyond. The target of 100 acres of restoration every five years is equivalent to the current rate of restoration of wetlands. Adding in the planned additional efforts to target more seasonal marsh restoration and assistance with exotic plant control on purchased parcels seems to make the proposed efforts a reasonable minimum effort. If additional monies are available, the general plan of targeting tidal stream restoration should be expanded. Appendix G (from Hazen and Sawyer 1995) summarizes estimates of baywide expenditures on habitat protection and restoration programs. These figures indicate that available funds are adequate to support the suggested minimum program.

This redirection to implement the “Restoring the Balance” paradigm recommends that the target acreage be divided into four categories as listed in Table 30, Option E. The target of 150 acres of salt barren restoration is best achieved by blocking man-made mosquito control ditches that enter existing salt barrens and allowing these areas to revert to their previous hypersaline character. This is estimated to cost $5,000/acre of salt barren restored. The 1,636 acres of needlerush marsh is divided into three categories. The largest (50%) is allocated for instream tidal marsh restoration, that is restoring existing streams where channelization and exotic plant invasion have modified the biological and water cleansing characteristics of the system. The remaining 50% is allocated to offshore needlerush marsh restoration, that is actual excavation and replanting of areas of previous needlerush marshes associated with tidal streams. This latter effort is estimated to be equally divided between contract restoration at $50,000 per acre and in-house restoration at $25,000 per acre.

An example of this type of restoration is shown in Figures 33 and 14. This is the planned restoration of a needlerush and tidal stream in Pinellas County in the oligohaline portions of Allen’s Creek. It is a cooperative project with the initial site identified as part of the Allen’s Creek Watershed Management Plan (Lewis Environmental Services 1995). The land purchase has been completed by Pinellas County at a cost of $80,000, and the restoration is being done by the SWIM Program at budgeted cost of $40,000. The plan includes the removal of Brazilian peppers, excavation of historical fill, and planting.
Figure 33. Site location map, Allen's Creek oligohaline restoration project.
Figure 34. Allen's Creek oligohaline restoration project.

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The concept of instream restoration is designed to restore large linear portions of the smaller tidal streams. TBRPC (1986b) reports that 15 cross-sections of three tidal streams (Frog Creek, Delaney Creek and Allen's Creek) ranged from 33' to 200' with a mean of 96.9'. Using 100' as an average width (top-of-bank to top-of-bank), and assuming 50% of that is open water and 50% is (or was) vegetated with native marsh plants, the target acreage figure of 81 acres would require 35,632,080 square feet of combined open water and marsh. One-half of this (17,816,040 sq. ft.) would be open water, and the other half would be marsh. A 25'-wide strip of marsh on both sides for a distance of 356,320 linear feet would achieve this acreage. Dividing by 5,280 gives 67.5 linear miles of tidal stream restoration. The combined length of the 37 tidal creeks listed on page 68 in TBRPC (1986b) is 168.8 miles. With the addition of 68 additional tidal streams as a result of this study, there appears to be adequate, if not more than adequate, stream-miles to work with.

Table 30. Estimated costs (total and annual over 100 years) for the four emergent marine wetland restoration options A, B, D and E with specific acreage targets.

<table>
<thead>
<tr>
<th>OPTION</th>
<th>MANGROVE / TIDAL MARSH</th>
<th>TIDAL STREAMS</th>
<th>SALT BARREN</th>
<th>TOTAL</th>
<th>PER YEAR over 100 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$50,000/ac</td>
<td>$20,000/ac</td>
<td>$1,352/ac</td>
<td>$5,000/ac</td>
<td></td>
</tr>
<tr>
<td>A acres</td>
<td>3,714.25</td>
<td>3,714.25</td>
<td>7,428.5</td>
<td>155.0</td>
<td>14,992</td>
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<tr>
<td>cost</td>
<td>$185,712.50</td>
<td>$92,856.25</td>
<td>$32,351.18</td>
<td>$675.00</td>
<td>$311,594,808</td>
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<tr>
<td>B acres</td>
<td>1,158.5</td>
<td>1,158.5</td>
<td>2,317.0</td>
<td>494.0</td>
<td>5,128</td>
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<tr>
<td>cost</td>
<td>$57,925.00</td>
<td>$28,962.50</td>
<td>$10,900.55</td>
<td>$2,470.00</td>
<td>$99,448,035</td>
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<tr>
<td>D acres</td>
<td>2,618.75</td>
<td>2,618.75</td>
<td>5,237.5</td>
<td>0</td>
<td>10,475</td>
</tr>
<tr>
<td>cost</td>
<td>$130,937.50</td>
<td>$65,468.75</td>
<td>$21,869.31</td>
<td>0</td>
<td>$219,215,562</td>
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<tr>
<td>E acres</td>
<td>409.0*</td>
<td>409.0*</td>
<td>818</td>
<td>150</td>
<td>1,786</td>
</tr>
<tr>
<td>cost</td>
<td>$20,450.00</td>
<td>$10,225.00</td>
<td>$3,362,390</td>
<td>$750.00</td>
<td>$34,987,390</td>
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</table>

*tidal marsh only, no mangroves

An example of instream restoration is the current volunteer effort to restore Marsh Creek adjacent to the Ruskin Public Library (Figure 35). During preparation of this report, SWIM was asked to participate in this effort by local citizens who have raised $4,000 toward the effort. The plan is simple: remove the exotic vegetation on public shoreline (and private shorelines where owners are cooperative), and supplement natural revegetation with native plantings both at the water's edge and at top-of-bank to prevent recolonization by exotics.

Permitting for this type of restoration project should require a minimum of time, cost and field review, since Brazilian peppers can be killed in place and only the upper trunk and branches need be removed if aesthetics dictate. Otherwise the trees can be left in place to naturally decay. No disturbance of the shoreline is typically needed. As the letters in Appendix H
Figure 35. Site location map, Marsh Branch restoration project.
illustrate, however, it is not that simple, and considerable delay was experienced by the volunteers working at Marsh Creek waiting for someone to bless their project. It is recommended that participants in the proposed Workshop address the coordination and streamlining of permitting for restoration projects as an element of their agenda.

Special Issues
Protection and Restoration of Seasonal Freshwater Wetlands
As a Management Tool for White Ibis and Similar Species

This portion of the plan envisions four management strategies. The first, as recommended by FGPWFC (1994, p. 16), is the identification and protection of all potential white ibis foraging habitat within the 9.3-mile diameter circles shown in Figure 13. The second is the creation of a wetland mitigation bank system in the Tampa Bay area that creates or restores seasonal marshes within the foraging areas prior to the need arising for mitigation of unavoidable impacts to existing marshes. On-site mitigation should not be recommended where development activities and the resulting residential or commercial structures are going to be located adjacent to or near such mitigation marshes. Upland buffers are important to provide the natural environment where feeding birds are not subject to harassment by humans or their cared-for or feral pets. Beever (1994, p. 138) notes that “continued policy of wetland regulatory agencies of establishing small isolated preserve sites within the developing urban landscape contributes to the process of habitat fragmentation. Without a coherent plan and in isolation, these small preserve efforts will not provide the wildlife values and functions sought” (page 138). An ideal place for such a bank would be the combined TECO and Reeder Farms property south of Cockroach Bay where three of the white ibis foraging zones overlap (Figure 13).

The third strategy is the creation or restoration of marshes within current publicly owned land parcels. Approximately 65 acres of seasonal marshes and shallow lacustrine marshes are planned for restoration at the Cockroach Bay ELAZP site by SWIM (see Appendix D). Additional acreage can be restored adjacent to the borrow pits on the Sun City Scrub property. Beever (pers. comm.) recommends every habitat restoration project include a minimum percentage of freshwater marsh restoration.

Finally, specific targeted acquisition of new parcels of privately owned land for the purpose of habitat protection and restoration in general and seasonal marsh restoration in particular are recommended. Several of these are shown on the maps in Appendix D. These parcels include two abandoned fish farms where restoration to seasonal marshes would be fairly easy after removal of the dominant cover of Brazilian pepper.

Coastal Upland Protection and Restoration Plan

With the limited time and funding for this project we were unable to identify all the critical uplands associated with wetlands on Tampa Bay. We believe this effort is now best handled as an effort within the NOAA Coastal Change Analysis Program (C-CAP) described in the following section on monitoring. The implementation of the program of land acquisition and restoration recommended by Beever (1994) and included here (Figures 15–16) will preserve the majority of the larger areas until more detailed mapping is available.

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Potential Role of Mitigation Banking
On November 28, 1995, the U. S. Army Corps of Engineers (in conjunction with the U.S. Environmental Protection Agency, Natural Resources Conservation Service, Fish and Wildlife Service and National Marine Fisheries Service) published in the Federal Register (Vol. 60, No. 228, pages 58605-58614) (Appendix I), final policy guidance regarding the establishment, use and operation of mitigation banks for the purposes of providing wetland mitigation under the permit requirements of the Clean Water Act Section 404. The effective date of this guidance, which had previously been circulated as a draft document for national comment on March 6, 1995, was December 28, 1995. For purposes of this document, a mitigation bank was defined as "a site where wetlands and/or other aquatic resources are restored, created, enhanced, or in exceptional circumstances, preserved expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources" (page 58614).

Previously, the State of Florida had adopted a mitigation banking rule in 1993 as section 17-342 of the Florida Administrative Code (FAC) (Appendix I). In 1995, the final efforts to reorganize the environmental agencies resulted in the adoption of the Environmental Resource Permit process whereby the Florida Department of Environmental Protection and the five water management districts combine their permitting processes to process and issue a single combined permit. The water management districts have adopted mitigation banking rules essentially the same as those previously adopted by the FDEP. Mitigation banks are defined by the State of Florida as "a project undertaken to provide for the withdrawal of mitigation credits to offset adverse impacts" (17-342.200 (8) FAC).

As of January 1, 1996, there were no permitted and operational public mitigation banks in the Tampa Bay area, although several informal combined offsite mitigation projects had either been designed or attempted by several governmental agencies. These are typically "single user" sites that do not satisfy needs of permit applicants other than the individual applicant managing a combined offsite mitigation project.

The implementation of large mitigation banks in the Tampa Bay watershed has the potential to satisfy much of the need for "restoring the balance" of lost habitat types, as long as the completed mitigation more than offsets the permitted losses that typically are mitigated for in a bank. Thus the philosophy becomes "more than no net loss" instead of just "no net loss." Several major landowners are conducting feasibility studies at the current time, and it is recommended that the TBNEP support their applications for permits to the extent that the permit applications reflect an effort to preserve critical habitats or to create or restore critical habitats described here and achieve a net gain in all habitat types in the Tampa Bay ecosystem.

Recommended Implementation Program
This specific plan as it addresses the needs of the ten guilds listed in Table 1 is but one component of a larger plan needed for those species that are acknowledged to be in need of protection but which do not fit into one of the ten guilds (i.e. land mammals, passerine birds). It is therefore recommended that the Tampa Bay National Estuary Program convene a one-
day workshop to assist local governments with the preparation of a baywide “Fish and Wildlife Habitat Protection and Restoration Plan”. The intent of the workshop should be the identification of any gaps in existing plans and the establishment of a single committee representing the fish and wildlife management agencies and the habitat acquisition and restoration agencies to implement coordination of individual efforts and available funds directed towards priority land management, land acquisition and habitat restoration programs.

The workshop should be held as early as possible in 1996 with the committee beginning its work no later than May 1. The first task of the committee should be to ensure that a common GIS-based map base at a scale no less resolute than 1:24,000 (1" = 2,000 ft) be established for the entry of various layers of information regarding fish and wildlife resources, and that hard copy and computer data be available to local governments and citizens alike at minimal cost.

During the course of this project it has become obvious that such a database is essential for rational management. Such data has not been available in a timely and cost-effective manner to the principal researchers and has compromised some portions of this study as a result. In particular, the inability to retrieve polygons showing existing public ownership and overlay them on such layers as existing wetlands to define areas in need of acquisition and protection has proved frustrating. It has required a six-month effort to locate, retrieve and enter the information on a common usable database. This is obviously much too long a timeframe to produce what should be only a matter of a few keystrokes away. Other examples of essential information are completed restoration projects and their associated documentation and priority acquisition projects of each local government. The establishment of this essential database should not delay the coordination of manpower and money to embark upon an agreed-upon agenda of habitat acquisition, restoration and management.

**Recommended Monitoring Program**

The monitoring of progress toward the goals defined in this document is an essential part of all the documents being prepared for eventual inclusion in the CCMP. For this Habitat Protection and Restoration Masterplan, three components of a monitoring program are essential.

The first is the establishment of a 1995 map base that provides the level of detail necessary to support change analysis at a future date. We would recommend that TBNEP initiate a program to ensure that all of its data becomes part of the national C-CAP program as outlined in Dobson et al (1995 p. 5) with the following modifications:

1. The C-CAP Coastal Land Use Cover Classification System (pages 8-9 in Dobson et al (1995)) be modified to accurately reflect the diversity of wetland and upland habitats of interest to Tampa Bay researchers and managers. In particular, the division of emergent estuarine wetlands into haline (salt marsh, salinities greater than 30 ppt) and mixohaline (brackish marsh, salinities between 0.5 and 30 ppt) would need to be modified.

2. Because many of the more important wetland systems identified in this TBNEP study are small (diameters of 30-200 feet) the scale at which some of the mapping is done will need to reflect a detection limit to encompass these areas.
Despite all the mapping efforts to date there does not exist a map series at an appropriate scale that depicts the important, smaller wetlands. Without such maps, change analysis cannot be done. Equally important, while high resolution color and black-and-white vertical aerial photography going back to the mid-1930s is available, it has never been used to provide the necessary information to accurately describe the conditions of the wetlands and uplands that existed then and do not exist now. As described in some detail in the introductory parts of this document, effective long-term fish and wildlife management requires both a look to the future as well as a look to the past in order to understand how we got to where we are today.

The second component is the biological monitoring of the guilds to determine if the recommended efforts are achieving the desired goals of protecting and allowing increases in their populations. As previously mentioned, Weller (1995) has recommended the use of guilds of wading birds to evaluate the effectiveness of the attempts to restore the Kissimmee River. He notes (p. 220), relative to wading birds, that "... Numerical analysis of before-and-after data on all species will provide estimates of total populations, distributions of colonies and species richness. Variations in wader populations have been great ... , however, and cause-and-effect relationships may be obscured by population shifts as well as numbers." We would add that weather in general and rainfall in particular have to be factored into any measurement of "success" in restoring foraging habitat for the wading bird guild. Similar cautions must be stated for other measures of wildlife abundance.

Because fish and marine invertebrates are a major part of the target guilds, the Fisheries-Independent Monitoring Program of the Florida Department of Environmental Regulation's Marine Research Institute, and the input by the associated fisheries professionals (see Appendix C) are the third essential part of the monitoring program. Their input should be solicited to determine what kind of monitoring they would recommend to determine the success of this proposed program. At a minimum, monitoring of modified tidal streams before and after restoration to determine if restoration "works" for specific target species is needed. It is equally important for those supporting the NEP program to ensure that adequate funding is in place to allow an expansion of their sampling program if this is deemed an important monitoring tool. It is too easy to ask for "more sampling" without making sure the staff, boats, and equipment are available to allow the work to be done.

All three of these monitoring tools will require additional funding. We do not at this time have figures on what those amounts are. The TBNEP program should request cost estimates from the Marine Research Institute through its representative on the management committee, and through a direct request to the National Audubon Society’s Tampa Bay Sanctuary Program and the Florida Game and Fresh Water Fish Commission.
LITERATURE CITED


Coastal Environmental, Inc. 1995. Habitat protection and restoration targets for Tampa Bay. Tampa Bay National Estuary Program Technical Publication #07-93.


Kushlan et al. 1984 [cited in quotation from Montalbano 1993]


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Setting Priorities:


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Setting Priorities:


APPENDIX A
SWIM Comments
July 14, 1995

Mr. Robin Lewis
Lewis Environmental Services
P.O. Box 20005
Tampa, Florida 33622-0005

Subject: SWIM Restorators’ Review of Draft Habitat Restoration and Land Acquisition Priorities
Process Document

Dear Robin:

The SWIM Department wishes to thank you for the opportunity to review your draft Habitat Restoration and Land Acquisition Priorities Process Document. Pursuant to our TBNP committee meeting of June 22, the SWIM restorators were unable to meet as a group until July 5. Enclosed please find the collective comments from our group. SWIM restorators include: B. Henningsen, Tom Ries, Carl Giovenco, Ray Kurz, Rob Fenwick, and Judy Fouts. The restorators took their reviews seriously, and comments among reviewers were remarkably similar.

Although I was prepared to deliver my personal critique on June 22, you indicated that you thought it would be more productive for a single, comprehensive review from SWIM staff. I apologize for this delay, but the holiday, travel out of town, and conflicting responsibilities have prevented me from forwarding this review until now; I hope this delay has or will not present a problem.

Enclosed please find our annotated review of your draft. Comments are written throughout the draft (if you have problems deciphering my handwriting, please call). All comments are intended to help you craft the best document and plan possible.

In general, we fully support the concept of identifying target percentages per habitat type for establishment and maintenance for the estuary and portions of the watershed. As noted in comment #13 on page 19, the
group feels strongly that this document needs a clearly defined focus for the reader, providing a succinct listing(s) of goals of this document and its implementation. As a planning document based on historical acreages of habitats, our habitat percentage goals should be based on the best available data; these data and/or their derivations should be clearly identified/explained. As this is the introductory section, we encourage you to keep the narrative as brief as possible, clearly setting the stage for the most important sections of the plan which follow. Aside from all the other comments written on your draft, we encourage you to include in the narrative the idea that this 100 year plan must be a living, dynamic document, subject to reasonable adjustment to meet future needs and opportunities (and, Heaven forbid, setbacks).

I (and, as appropriate, other SWIM staff) look forward to continue working with you and your staff on this important plan. I caution us not to rush this plan just to meet the September (?) deadline; I would hope NEP would bless additional time as warranted to insure a quality plan that we can all embrace and implement. If you have any comments or questions, please call me at (813) 985-7481 extension 2202.

Sincerely,

Brandt F. Heningen
Sr. Environmental Scientist
Surface Water Improvement and Management (SWIM) Department

cc: Michael J. Perry, Director, SWIM Dept., SWFWM
Tom Ries, Envir. Scientist, SWIM Dept., SWFWM
T. Giovenco, Envir. Scientist, SWIM Dept., SWFWM
Ray Kurz, Envir. Scientist, SWIM Dept., SWFWM
Rob Fenwick, Eco. Intern, SWIM Dept., SWFWM
J. Fouts, Envir. Scienc. Intern, SWIM Dept., SWFWM
Holly Greening, TNNEP Scientist

Filing Code: TNNEP Habitat Rest. Subcommittee
August 22, 1995

Mr. Robin Louis
Louis Environmental Services
P.O. Box 20005
Tampa, Florida 33622-0005

Subject: SWIM Restorers’ Recommendations for Prioritizing Habitat Restoration and Land Acquisition Properties

Dear Robin:

The SWIM restorers met yesterday in response to your request for recommendations on criteria to be used to prioritize sites for habitat restoration and land acquisition. SWIM restorers include: A. Hemmingsen, Tom Rice, Carl Glovance, Ray Kurz, and Rob Fenwick. This topic is one that we have wrestled with since the first days of SWIM. We have attempted to develop criteria that can be evaluated in both qualitative and quantitative ways (e.g., scoring criteria on a weighted scale). We have never developed a weighted (quantitative) evaluation that we were satisfied did justice for ranking sites; hence, our solutions have relied heavily on qualitative evaluations of our criteria, tempered by economic realities of each site and annual fiscal constraints (i.e., annual budgets appropriated by the State and the District).

Further discussion of our criteria yesterday did not yield any new simple solutions to the ranking dilemma. Any ranking system would/will be subject to intense debate, with no clear absolutes as to the “correct” way to rank sites. Accordingly, we have chosen to group our criteria as “most important” (highlighted by asterisks), followed by “less important” yet nonetheless significant criteria that should be considered when ranking sites. We hope the following recommendations for criteria will be useful for site prioritization:

*1. Habitat diversity/complexity: This is applicable for acquisition tracts as stand-alone habitats and in
the evaluation of the potential of the acquisition tract if it is to be restored. For tracts only under consideration for restoration, one should consider the habitat diversity/complexity issue for the restored tract (i.e., habitat potential). More weight/points should be given in correlation to the better the condition of existing and/or potential habitats. Using the assumption that the more diverse the habitats, the greater the potential productivity for many different populations, higher rankings should be given to sites with better developed habitat mosaics or possess the potential for establishment of complex, diverse mosaics. In addition, more weight/points should be given to sites that complement adjacent viable habitats. Freshwater sources on site also should raise the weight/point value, but lower weight/points should be given to sites where one might have to "push" habitat restoration, enhancement, and/or creation (e.g., expensive cleanup of contaminants prior to restoration, cutting down 10' to an intertidal elevation, etc.)

2. Cost/benefit ratios: Relatively self-explanatory. Important to weigh the pros/cons of purchasing the tract and/or restoring it within an economic reality. Does the end justify the means? In the short term? In the long term? This criteria, unfortunately, is a very important one. One must include all costs here to weight the benefits: land acquisition, design, permitting, construction, management, etc.

3. Size of parcel: In general, we feel bigger is better, yet we recognize the importance and cumulative benefits to be realized from small sites. Cost/benefit ratios become increasingly important here as related to design, permitting, and construction costs (lower per acre cost with increasing size). For restoration purposes, we have defined "small" sites as < 1 acre, "medium" sites ranging from 1-15 acres, and "large" sites as > 15 acres.

4. Freshwater source: The opportunity to establish salinity gradients ranging from freshwater/oligohaline to mono/polyhaline should be an important consideration. The gradient can be vital to establish a variety of habitats (mosaics). Is the freshwater influenced and/or contaminated by stormwater runoff? Can stormwater attributed (i.e., polishing vs full treatment) be included in the habitat restoration project (i.e., two functions, one project)?

5. Management issues: Who will assume management of site after purchase and/or restoration? What are the costs? Management difficulties? Short-term vs long-term?

6. Ownership of parcel: For restoration, public parcels have taken priority over private parcels for various reasons. Reasons include (also applicable when considering land acquisition): public access, perception of public, conservation easement overlays or donation/sale of property to public sector. Specifically related to restoration of private lands (and co-related to public perception) is the actual increase in property values of the
private landowner (both the subject parcel as well as adjacent lands not specifically restored but still benefiting from the restoration, e.g., vistas, wildlife values, fishing, etc.).

7. **Cooperative Involvement**: Level of cooperation from partners in the land acquisition, restoration, and post-sale/project management. For restoration projects, the greater the level of cooperation, the higher the review score, but one should not exclude a site just because a cooperator has few to no resources to bring to the deal.

8. **Access**: Public and construction access. Depending on the site, easy access by the public can provide mixed blessings. We recognize and appreciate that these projects are being paid for with public dollars, and that the public should reap the benefits of the project. Nonetheless, typically, the more human traffic on a site, the lower the visibility of the system. This also has to be balanced with the idea of "public visibility", so that the public can see how their tax dollars are being spent and perhaps reap some direct benefits (e.g., catch a fish, etc.). The aspect of public access as an educational opportunity cannot be overlooked. Public education is critically important to the long term success of these programs and our environment (see #1 below). Lastly, construction access for restoration projects is not a minor issue; inaccessibility can significantly raise construction problems and costs, bringing us back to the issue of cost/benefit ratios.

9. **Permittability**: This issue really deals only with restoration projects, but must be kept in mind when buying tracts with the intent of doing restoration. The ease of complexity of acquiring permits for the project must be considered and obviously will be tied to the project design. In addition, design costs generally are positively correlated with design complexity and project size, again bringing me back to the issue of cost/benefit ratios.

10. **Location Within the Tampa Bay Ecotystem**: What bay segments is the tract located and how does the acquisition/ restoration fit into the segment's needs? Have our acquisitions and restorations addressed all bay segments, and are they being distributed fairly throughout our estuarine system? Reality has and will probably dictate that it will be infeasible to have equal acquisition and restoration of habitats throughout bay segments in direct correlation to habitats lost within that segment. Accordingly, we will probably have to distribute land acquisitions and restorations within the framework of what is available and what we can afford (i.e., in part, sites of opportunity scenario). Lastly, what are the lands surrounding the acquisition/restoration site? Will the target site complement existing quality habitats or are adjacent lands severely degraded, built-out, etc.?

11. **Public Visibility**: See #8 above. This is an important criteria, with many pros and cons. The aspect of environmental education is critical to the long term success of all these
programs.

This letter was written very quickly in an attempt to summarize discussions by SWIM restaurators. We hope we have covered the main points adequately and provided the feedback that you requested August 17. We will be meeting Monday, August 28 to discuss and provide feedback on your revised Prioritization Processing Document. If you have any comments or questions, please call me at (813) 995-7401 extension 2302.

Sincerely,

Brandt F. Henningsen, Ph.D.
Sr. Environmental Scientist
Surface Water Improvement and Management (SWIM) Department

cc: Michael J. Perry, Director, SWIM Dept., SWFMWD
Tom Biss, Envir. Scientist, SWIM Dept., SWFMWD
C. Giovenco, Envir. Scientist, SWIM Dept., SWFMWD
Bay Kurs, Envir. Scientist, SWIM Dept., SWFMWD
Rob Fenwick, Ecol. Intern, SWIM Dept., SWFMWD
Holly Graening, TNCNP Scientist

Filing Code: TNCNP Habitat Rest. Subcommittee
24 AUG 95

Brandt H. Henningsen  
Senior Environmental Scientist  
SWIM Department  
Southwest Florida Water Management District  
7601 Highway 301 North  
Tampa, FL 33637-6759

Re: Your Letter of 22 AUG 95, TBNEP Habitat Protection and Restoration Plan

Dear Brandt,

Thank you for your letter on ranking criteria. I had one question and one request.

The question is whether the listed criteria are in order of importance (1= most important, 11= least important)?

The request is to ask your group whether the specific concept of removing Brazilian peppers from the sides of channelized tidal streams such as Sweetwater Creek and Lower Delrayo Creek, and restoring the channel edges to upland, transitional and marsh habitats, and ensuring peppers don't return, would represent a "high priority" restoration goal based upon the discussions in the "Priorities" document? The assumption is that Hillsborough County (or any county where such a project might be proposed) has a drainage easement which would allow access to the sides of the channel. Such projects, and the acquisition of such areas for restoration, may be a major recommendation in the final report. Such projects may have limited diversity in terms of habitat, but the idea is that they have been differentially lost, and therefore need to be preferentially restored.

The areas would generally be small in size since a narrow linear band of vegetation on either side of a tidal stream would be restored. Cost would be in the range of $10 per linear foot, or $20 per foot for the length of the stream (both sides including planting). Earthmoving would probably be limited to bank reshaping, and coordination with the county drainage departments to avoid future drainage problems would be essential.

Let me know what your group thinks.
Sincerely yours,

Roy R. "Robin" Lewis, III
President

cc: Holly Groening
    Doug Robison
    File 293
November 16, 1995

Mr. Robin Lewis
Lewis Environmental Services
P.O. Box 20005
Tampa, Florida 33622-0005

Holly Greening
TENSEP
117 7th Ave. So.
St. Petersburg, Fla. 33701

Subject: SWIM Review of First Complete Draft of "Setting Priorities for Habitat Protection and Restoration: Restoring the Balance"

Dear Robin and Holly:

SWIM staff dedicated to habitat restoration for Tampa Bay have reviewed the initial complete draft of "Setting Priorities for Habitat Protection and Restoration: Restoring the Balance" and we have the following comments:

1. In general, we again fully support the concept of identifying target percentages per habitat type for establishment and maintenance for the estuary and portions of the watershed. We agree with Dick Rickenberg’s proposal that, upon plan consensus and adoption, governmental agencies (that ultimately will probably perform most of the work meeting the plan’s goals) will attempt to implement at least a portion of this plan each year until completion. Cooperation and coordination among agencies will be imperative.

2. We again urge you (and your committee) to revisit our three previous review letters/annotated drafts and incorporate our suggested changes to this document. Accordingly, this review will not reiterate previous comments; please refer to our responses to you of July 14, August 22, and September 5, 1995. We feel that incorporation of these suggestions will result in a better, more complete, and more accurate document. In addition, we encourage you to include this and our September 5, 1995 letter in Appendix B.

3. Concerning Tables 19 and 24 (ranking criteria for land acquisition and restoration), please see our suggested revisions for site evaluations. In general, you will see that we have deleted criteria that we felt were inappropriate, unnecessary or otherwise addressed by other criteria, and we have suggested additional criteria for consideration. We also strongly urge the ranking system to be weighted according to the importance of the particular
criterion. We also have indicated criteria that we rank as the most important and their weighted point values correspond to the relative significance. Enclosed please find our suggested changes and weighted scoring for Tables 19 and 24. Accordingly, we recommend that rankings per site be recalculated, perhaps by use of more-in-depth collective knowledge of sites offered by a (sub)committee. As a start, enclosed please find reviews of 40 proposed SWM sites (see #4 below for more explanation). Perhaps a one or two day workshop of a committee could re-score proposed acquisition and restoration sites.

4. We have enclosed a (essentially) final copy of our SWM five year plan for habitat restoration projects that is about to be submitted to FDEP. Please note that our plan has changed from the draft site plan forwarded you during early summer 1995. The enclosed document include site reviews and projected restoration opportunities, cooperators, potential problems, etc. Please note that the plan now contains 40 sites, not 38 as noted on page 6 of "Priorities". In addition, please review Table 9 to accurately reflect these 40 sites.

5. Please note corrections to SWM entries for Table 8 (enclosed). In addition, please check your calculation of total wetland acreage restored for Tampa Bay (page 87), as your number appears to be low. Obviously, acreages have increased since Bob Whitehead and I summarized total restored acreages (see BASIS II), and further documentation should be available from Holly and NEP's contract with King Engineering to summarize existing restoration sites and total acreages. Nonetheless, the SWM restoration total alone is 50.6 acres, with approximately 62 acres being wetland (remainder upland/inland hammock; note: 10 acres of that total includes the joint SWM-FDEP-Port Manatee project at Peanut Lake). Coupled with FDEP's projects, private projects, etc., the total should be greater than your quoted 86 acres of wetland restoration. In addition, your calculation of 18 acres of wetland restoration per year may be reasonably accurate, but it probably would be worth mentioning that acreage per year has been steadily increasing since 1989, and, with the completion of numerous large scale projects (e.g., Cockroach Bay, Wolf Branch Creek, Emerson Point, Howard Frankland West, Little Manatee River, etc.), the cumulative yearly average value will increase significantly.

6. Also concerning Table 8 and land holdings already in public ownership, there does not appear to be any citations for lands owned by local governments (e.g., City of Tampa, St. Petersburg, etc.), the District, Hillsborough County (outside of BRAPP), or Pinellas County.

7. The proposed list of parcels suggested for acquisition could probably be expanded (perhaps significantly) from the 26 listed in Table 16. Hopefully, other committee members have contacted you with suggestions, and we assume that you contacted all the local land acquisition programs for their input and master acquisition plans. Perhaps your or a new (sub)committee could meet and review/review this list. As examples of sites presently not on the list for consideration, five quickly jump to mind: the "Median Avenue" or Delaney Pop-off Canal fish farm site (south side), Mobly Bay area, McKay Bay tracts, Dog Creek fish farm site, Reeder Farms/Borrow pits (Port Manatee area). Also, we feel the plan should better stress options that might be employed if acquisition is impossible (e.g., will not sell or impractical (e.g., too costly); three options could include less-than-acquisition (mentioned on page 48), conservation easements, land donations, and revisions to tax codes that would promote these
As discussed at our NEP committee meeting of October 31, estimated acquisition costs per proposed land parcel (or, at a minimum, an overall total for the whole proposed list) would be useful for planning purposes.

The issue of land management for both acquisition and restoration is very important for the long term attainment/maintenance of our goals. A separate section on management may be in order.

Concerning restoration sites, it would be worthwhile to explore the topic of promoting/allowing mitigation banking to pay for some restoration projects and/or even land acquisition.

While recognizing the social and political delicacies of this suggestion (as well as logistical problems), we recommend the listing of Lake Maggiore, Lake Seminole, and Lake Tarpon as potential marine restoration sites. These sites hold tremendous potential as Intertidal systems.

Figures 32 and 33 and Tables 25, 26, and 27 list acreage scenarios for marine wetland communities. During several NEP committee meetings, we all discussed the importance of not neglecting coastal upland communities; could a section be included, at least briefly, discussing this topic and need? In addition, while we support setting target acreage goals for each bay segment, we feel that the plan should also stress the importance of attaining bay-wide acreages as feasible. If one segment falls short on a habitat type, hopefully the difference can be made up in another bay segment. Stress that we are searching to establish/maintain a balance of habitats giving many species opportunities.

Table 23 (listing of tidal tributaries and potential restoration sites) appears to have some sites duplicated (e.g., Wolf Branch Creek); a double check or better site delineation could address this.

On page 91, the discussion of the Marsh Creek-Ruskin Public Library site states that SWIM has been asked to participate in the restoration project. To the best of our knowledge, SWIM has not been formally asked to participate although it is a possibility if we were to be approached. We have supplied Barbara Maddell information on exotic plant removal and control, but this was related to her subdivision and not the library project.

We encourage you also to use SWIM and FDEP restoration cost estimates per acre for local examples (Appendix D); although I cannot speak for FDEP, SWIM has provided this information to you via Sally Treat.

Please note the timeframe for Figure 8. Table 10, Item 10 should read "within".

As SWIM and the remainder of the NEP committee were asked to comment on this draft over a relatively short time period, we feel that additional review and discussion is warranted for such an important plan. At a minimum, at least one more collective meeting should be held for the next generation of this document. Holly has informed me of an upcoming meeting to revisit the ranking criteria, etc. I am unsure if that is after "final" publication of this plan or if it
represents input/review prior to this plan's final edition.

18. With #17 in mind, this brings us to our final point (previously stated in other reviews and meetings) that this document needs to be a living, dynamic document. We feel that it must be stressed that this is a planning document (i.e., "normative forecasting"), establishing goals that we all can strive for, but that we recognize that reality will dictate what actually gets done, with reality being dominated by political, regulatory, economic, and opportunistic variables. To meet our goals, an entity needs to assume responsibility for coordinating this 100 year plan, orchestrating regular (every five years?) updates, and evaluating the effectiveness of plan implementation. While no single entity may wish to commit themselves for 100 years, this topic needs to be discussed and at least some preliminary decisions made as to who this overseer might be.

I (and, as appropriate, other SWIM staff) look forward to continue working with you, your staff, and TNEEP on this important plan. If you have any comments or questions, please call me at (813) 965-7481 extension 2292.

Sincerely,

Brandt F. Hemmingsen, Ph.D.
Sr. Environmental Scientist
Surface Water Improvement and Management (SWIM) Department

enclosures

cc: Michael J. Perry, Director, SWIM Dept., SWIM
Tom Ries, Envir. Scientist, SWIM Dept., SWIM
C. Giovecchio, Envir. Scientist, SWIM Dept., SWIM
Ray Kurz, Envir. Scientist, SWIM Dept., SWIM
Bob Fenwick, Eco. Intern, SWIM Dept., SWIM
Bob Whitman, Peninsula Design
TNEEP Habitat Protection and Restoration Subcommittee

Filing Code: TNEEP Habitat Rest. Subcommittee
Table 19: Criteria for acquisition matrix and ranking.

<table>
<thead>
<tr>
<th>CRITERION</th>
<th>NUMERICAL VALUE TO BE ASSIGNED</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACQUISITION, PROTECTION, MANAGEMENT AND RESTORATION (IF NEEDED) WILL:</strong></td>
<td></td>
</tr>
<tr>
<td>1. Lead to improved water quality</td>
<td>1 2 3</td>
</tr>
<tr>
<td>2. Improve groundwater recharge in a water resource caution area</td>
<td>1 2 3</td>
</tr>
<tr>
<td>3. Improve quality, quantity, and timing of freshwater input into a marine estuarine or freshwater system</td>
<td>1 2 3</td>
</tr>
<tr>
<td>4. Help achieve the minimum flows and levels of an aquatic system</td>
<td>1 2 3</td>
</tr>
<tr>
<td>5. Restore or improve tidal circulation</td>
<td>1 2 3</td>
</tr>
<tr>
<td>6. Re-establish natural hydroperiod</td>
<td>1 2 3</td>
</tr>
<tr>
<td>7. Contribute to recovery of a natural community or population</td>
<td>1 2 3</td>
</tr>
<tr>
<td>8. Enhance and protect natural community populations which have been identified by state or federal agencies as severely limited, endangered or threatened in Florida</td>
<td>1 2 3</td>
</tr>
<tr>
<td>9. Contribute to native species diversity in the region</td>
<td>1 2 3</td>
</tr>
<tr>
<td>10. Eliminate or significantly reduce a species of exotic plant species infestation and seed source</td>
<td>1 2 3</td>
</tr>
<tr>
<td>11. Enhance a unique, regionally scarce or imperiled community</td>
<td>1 2 3</td>
</tr>
<tr>
<td>12. Prevent continued habitual loss or damage due to pollution or environmental degradation</td>
<td>1 2 3</td>
</tr>
<tr>
<td>13. Improve a wildlife corridor fragmented by alteration</td>
<td>1 2 3</td>
</tr>
</tbody>
</table>

**SITE WILL PROVIDE ECOLOGICAL LINK TO, CREATE BUFFER FOR, OR RECONNECT FRAGMENTED SYSTEMS ASSOCIATED WITH:**

| 14. State identified ecosystems | 1 2 3 |
| 15. SWIM designated water bodies with approved plans | 1 2 3 |
| 16. National Estuary Program designated areas | 1 2 3 |
| 17. Public lands | 1 2 3 |
| 18. Aquatic Preserves | 1 2 3 |
| 19. Outstanding Florida Waters | 1 2 3 |
| 20. Shellfish harvesting areas | 1 2 3 |
| 21. Areas of Critical State Concern | 1 2 3 |

**SITE IS LOCATED WITHIN:**

| 22. Nine miles (15 km) of existing white ibis nesting site | 2 3 |
| 23. Overlap of feeding range zones of existing white ibis nesting sites | 2 3 |

<table>
<thead>
<tr>
<th>CRITERION</th>
<th>NUMERICAL VALUE TO BE ASSIGNED</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>24. Cost/benefit ratio</strong></td>
<td></td>
</tr>
<tr>
<td><strong>25. (Finding) Proper amount of site</strong></td>
<td></td>
</tr>
<tr>
<td><strong>26. Bay segment</strong></td>
<td></td>
</tr>
<tr>
<td><strong>27. Possibility of least hunter negotiation or conservation agreement if feasible</strong></td>
<td></td>
</tr>
<tr>
<td>CRITERION</td>
<td>NUMERICAL VALUE TO BE ASSIGNED</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>1. Existing salinity regime</td>
<td>15-25 ppt</td>
</tr>
<tr>
<td>2. Percent loss of all emergent</td>
<td>OTB, MTB</td>
</tr>
<tr>
<td>wetlands by bay segment</td>
<td>LTB, MR, TCB, HB</td>
</tr>
<tr>
<td>3. Average loss of all emergent</td>
<td>TCB</td>
</tr>
<tr>
<td>wetlands by bay segment</td>
<td>MR, OTB, LTB, HB</td>
</tr>
<tr>
<td>4. Presence of dams on tidal</td>
<td>NO</td>
</tr>
<tr>
<td>streams in bay segment</td>
<td>(MTB, LTB, TC)</td>
</tr>
<tr>
<td>5. Drainage improvements planned?</td>
<td>NO</td>
</tr>
<tr>
<td>6. Drainage improvements funded?</td>
<td>NO</td>
</tr>
<tr>
<td>7. Restoration/protective plan exists?</td>
<td>NO</td>
</tr>
<tr>
<td>8. Restoration/protective plan funded? + Cooperators available?</td>
<td>NO</td>
</tr>
<tr>
<td>(private)</td>
<td>1-4.9%</td>
</tr>
<tr>
<td>10. Drainage easements exist?</td>
<td>NO</td>
</tr>
<tr>
<td>11. Contiguous with public lands or</td>
<td>NO</td>
</tr>
<tr>
<td>public conservation easement</td>
<td>NO</td>
</tr>
<tr>
<td>12. Existing habitat value for the 10 guilds</td>
<td>LOW</td>
</tr>
<tr>
<td>13. Habitat value potential for the 10 guilds after restoration</td>
<td>LOW</td>
</tr>
<tr>
<td>14. Water quality protection value (existing)</td>
<td>LOW</td>
</tr>
<tr>
<td>15. Water quality improvement value after restoration</td>
<td>LOW</td>
</tr>
<tr>
<td>16. Existing upstream flood</td>
<td>LOW</td>
</tr>
<tr>
<td>attenuation value</td>
<td>LOW</td>
</tr>
<tr>
<td>17. Potential upstream flood</td>
<td>LOW</td>
</tr>
<tr>
<td>attenuation value after restoration</td>
<td>LOW</td>
</tr>
<tr>
<td>18. Cost/benefit ratio</td>
<td>High/low</td>
</tr>
<tr>
<td>19. Post project management</td>
<td>low</td>
</tr>
<tr>
<td>20. Historical hydrology restored</td>
<td>min. 1</td>
</tr>
<tr>
<td>21. Restoration of habitats</td>
<td>High</td>
</tr>
<tr>
<td>22. Restoration of wetlands</td>
<td>High</td>
</tr>
</tbody>
</table>
Table 8. Restoration projects, completed and in progress, by SWIM and FDEP; protected land acquisitions, Hillsborough and Manatee Counties. EVC — exotic vegetation control; C — completed; IP — in progress; UD — under design & permitting; NCA — no current activity.

<table>
<thead>
<tr>
<th>LEAD AGENCY</th>
<th>SITE NAME</th>
<th>STATUS</th>
<th>BAY SEGMENT</th>
<th>SIZE (ac)</th>
<th>HABITAT</th>
<th>COOP AGENCIES</th>
<th>MANAGEMENT RESPONSIBILITY</th>
<th>MANAGEMENT PLAN EXISTS</th>
<th>IS FUNDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDEP</td>
<td>Ongood Point</td>
<td>C</td>
<td>BCB</td>
<td>9.0</td>
<td>salt marsh, mangroves, dunes</td>
<td>SWIM, City of Gulfport</td>
<td>City of Gulfport</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>South Parcel</td>
<td>C</td>
<td>EB</td>
<td>25.0 wetland, 300 total</td>
<td>4.0</td>
<td>wetland</td>
<td>SWIM, Cargill Fertilizer, Inc.</td>
<td>Cargill Fertilizer, Inc.</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Fosch Lake</td>
<td>C</td>
<td>Niugas Co.</td>
<td>4.0</td>
<td>tidal pond</td>
<td>City of St. Petersburg</td>
<td>City of St. Petersburg</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Gandy North</td>
<td>C</td>
<td>OTB</td>
<td>1.0</td>
<td>salt marsh</td>
<td>Marine Corps</td>
<td>not specified</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Goosey South</td>
<td>C</td>
<td>OTB</td>
<td>2.0</td>
<td>wetland</td>
<td>FOOT, SWIM, TSPZ, BSAEZ</td>
<td>not specified</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Peanut Lake / Hendy St</td>
<td>C</td>
<td>LTB</td>
<td>10.0</td>
<td>tidal lagoon, creeks</td>
<td>SWIM, Port Manatee</td>
<td>potentially FDEP Bureau of Coastal &amp; Aquatic Managed Areas</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Cocksroach Bay EVC</td>
<td>C</td>
<td>MTB</td>
<td>80.0</td>
<td>marsh, abandoned farm fields, disturbed seagrass, hardrock</td>
<td>SWIM, HCC</td>
<td>Hillsborough County Parks &amp; Recreation</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Joe’s Creek</td>
<td>C</td>
<td>BCB</td>
<td>60.0 reconn, 10.0 surveyed</td>
<td>4.0</td>
<td>tidal creek, wetlands</td>
<td>Passaic County</td>
<td>not specified</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Hendy Delta</td>
<td>C</td>
<td>LTB</td>
<td>3.0</td>
<td>saltmarsh</td>
<td>ENR</td>
<td>not specified</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>South Bayshore</td>
<td>C</td>
<td>HB</td>
<td>1.5</td>
<td>marsh &amp; upland plantings</td>
<td>City of Tampa</td>
<td>not specified</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>E.G. Simmons Park 1</td>
<td>C</td>
<td>MTB</td>
<td>14.0</td>
<td>13.0 as wetlands, 1.0 as hardrock</td>
<td>Hillsborough County Parks Dept.</td>
<td>Hillsborough County Parks Dept.</td>
<td>N</td>
<td>N</td>
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</tr>
<tr>
<td>Palasia Park 1</td>
<td>C</td>
<td>OTB</td>
<td>10.3</td>
<td>tidal pond, wetlands, upland</td>
<td>15 others, public and private</td>
<td>City of Tampa</td>
<td>N</td>
<td>N</td>
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</tr>
<tr>
<td>NE McKay Bay</td>
<td>C</td>
<td>HB</td>
<td>4.0</td>
<td>tidal creek, marsh</td>
<td>City of St. Petersburg</td>
<td>City of St. Petersburg</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Mangrove Bay</td>
<td>C</td>
<td>OTB</td>
<td>13.3</td>
<td>intertidal creek, 0.5 salt marsh</td>
<td>City of St. Petersburg</td>
<td>City of St. Petersburg</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Boca Ciego I</td>
<td>C</td>
<td>BCB</td>
<td>3.0</td>
<td>salt &amp; oligohaline wetlands</td>
<td>Hillsborough County</td>
<td>City of St. Petersburg</td>
<td>N</td>
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</tr>
<tr>
<td>Little Bayou</td>
<td>C</td>
<td>MTB</td>
<td>3.0 of 13.4 total</td>
<td>oligohaline tidal creek</td>
<td>City of St. Petersburg</td>
<td>City of St. Petersburg</td>
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(continued)
<table>
<thead>
<tr>
<th>LEAD AGENCY</th>
<th>SITE NAME</th>
<th>STATUS</th>
<th>ReaT Segment</th>
<th>Size (ac)</th>
<th>HABITAT</th>
<th>COOP AGENCIES</th>
<th>MANAGEMENT RESPONSIBILITY</th>
<th>MANAGEMENT PLAN EXISTS</th>
<th>MANAGEMENT PLAN FUNDED</th>
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<tbody>
<tr>
<td>(SWIM)</td>
<td>Tampa Outfall Canal I</td>
<td>?</td>
<td>OTB</td>
<td>10</td>
<td>no further information provided</td>
<td></td>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Boca Ciega I</td>
<td>UD</td>
<td>BCB</td>
<td>1.0</td>
<td>as Phase I ?</td>
<td></td>
<td></td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Picnic Island</td>
<td>C</td>
<td>OTB</td>
<td>8.0</td>
<td>tidal channels, marsh platforms</td>
<td>City of Tampa</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>E.O. Simmons Park II</td>
<td>UD</td>
<td>MTB</td>
<td>1.0</td>
<td>hammock, improve tidal flow</td>
<td>Hillsborough County Parks &amp; Recreation</td>
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<td>Hillsborough County</td>
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<tr>
<td></td>
<td>Candy Park (Phase II - info on Ph II)</td>
<td>C</td>
<td>OTB</td>
<td>2.0</td>
<td>tidal marsh</td>
<td>City of Tampa</td>
<td></td>
<td></td>
<td>City of Tampa</td>
</tr>
<tr>
<td></td>
<td>Twin Oaks Cemetery</td>
<td>C</td>
<td>TCB</td>
<td>2.2</td>
<td>EVR, marsh planting</td>
<td></td>
<td></td>
<td></td>
<td>not specified</td>
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<tr>
<td></td>
<td>Jungle Prairie Park</td>
<td>C</td>
<td>BCB</td>
<td>1.0</td>
<td>intermittent wetland, riprap (hard bottom)</td>
<td>City of St. Petersburg</td>
<td></td>
<td></td>
<td>City of St. Petersburg</td>
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<td></td>
<td>Harbor Pines</td>
<td>C</td>
<td>OTB</td>
<td>4.4</td>
<td>intertidal marsh, sabals, island hardwoods</td>
<td>City of Oldsmar</td>
<td></td>
<td></td>
<td>City of Oldsmar</td>
</tr>
</tbody>
</table>

|             | Howard Franklin east | C | OTB | 3.0 | not specified | DOT |  |  | not specified | (maintenance by DOT & District) | N | N |
|             | Joe Creek 1A | C | BCB | 1.0 | not specified | Pasco County |  |  | Pasco County | not specified | N | N |
|             | Tampa Outfall Canal II | UD | OTB | 1.0 | no further information provided |  |  |  |  | N | N |
|             | Long Key Bayou | UD | BCB | 2.0 | not specified | Pasco County |  |  | Pasco County | not specified | N | N |
|             | ELAPP | UD | H3 | 800 |  |  |  |  |  | Hillsborough County Parks Dept. | N | N |

|             | Alderman's Ford Addition | UD |  | 1,000 |  |  |  |  |  | Hillsborough County Parks Dept. | N | N |
|             | Baird-Bayette Scrub | IP |  | 4,916 |  |  |  |  |  | Hillsborough County Parks Dept. | N | N |
|             | Bollo Tract | NCA |  | 65 |  |  |  |  |  | Hillsborough County Parks Dept. | N | N |
|             | Bayou Souri | NCA |  | 400 |  |  |  |  |  | Hillsborough County Parks Dept. | N | N |
### SWIM Restoration Sites Under Development

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Description</th>
<th>Budget</th>
<th>Status</th>
<th>Project Details</th>
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<tbody>
<tr>
<td>W312</td>
<td>Habitat Restoration</td>
<td>300</td>
<td>Planned</td>
<td>200</td>
</tr>
<tr>
<td>W313</td>
<td>Fish and Wildlife Restoration</td>
<td>200</td>
<td>Approved</td>
<td>100</td>
</tr>
<tr>
<td>W314</td>
<td>Braden River habitat Restoration</td>
<td>12,000</td>
<td>Underway</td>
<td>6,000</td>
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<tr>
<td>W315</td>
<td>Conservation &amp; Fish Habitat Restoration</td>
<td>200</td>
<td>Developing</td>
<td>100</td>
</tr>
<tr>
<td>W316</td>
<td>Everglades Fish Habitat Restoration</td>
<td>50,000</td>
<td>Underway</td>
<td>30,000</td>
</tr>
<tr>
<td>W317</td>
<td>Statewide Fish Habitat Restoration</td>
<td>200</td>
<td>Developing</td>
<td>100</td>
</tr>
<tr>
<td>W318</td>
<td>I-595 Fish Habitat Restoration</td>
<td>8,000</td>
<td>Planned</td>
<td>5,000</td>
</tr>
<tr>
<td>W319</td>
<td>Hillsborough River habitat Restoration</td>
<td>200</td>
<td>Planned</td>
<td>100</td>
</tr>
<tr>
<td>W320</td>
<td>Manatee Creek habitat Restoration</td>
<td>7</td>
<td>Planned</td>
<td>5</td>
</tr>
<tr>
<td>W321</td>
<td>Silver River habitat Restoration</td>
<td>45</td>
<td>Developing</td>
<td>30</td>
</tr>
<tr>
<td>W322</td>
<td>Manatee Creek habitat Restoration</td>
<td>7</td>
<td>planned</td>
<td>5</td>
</tr>
<tr>
<td>W323</td>
<td>Hillsborough River habitat Restoration</td>
<td>85</td>
<td>Developing</td>
<td>50</td>
</tr>
<tr>
<td>W324</td>
<td>Largo Creek habitat Restoration</td>
<td>100</td>
<td>Planned</td>
<td>60</td>
</tr>
<tr>
<td>W325</td>
<td>Clearwater Creek habitat Restoration</td>
<td>200</td>
<td>Planned</td>
<td>100</td>
</tr>
<tr>
<td>W326</td>
<td>St. Petersburg Creek habitat Restoration</td>
<td>200</td>
<td>Planned</td>
<td>100</td>
</tr>
<tr>
<td>W327</td>
<td>Indian Creek habitat Restoration</td>
<td>50</td>
<td>Planned</td>
<td>30</td>
</tr>
<tr>
<td>W328</td>
<td>Bay Area Creek habitat Restoration</td>
<td>35</td>
<td>Planned</td>
<td>20</td>
</tr>
<tr>
<td>W329</td>
<td>Lower Tampa River habitat Restoration</td>
<td>30</td>
<td>Planned</td>
<td>20</td>
</tr>
<tr>
<td>W330</td>
<td>Collier Canal habitat Restoration</td>
<td>200</td>
<td>Planned</td>
<td>100</td>
</tr>
<tr>
<td>W331</td>
<td>Largo River habitat Restoration</td>
<td>30</td>
<td>Planned</td>
<td>20</td>
</tr>
<tr>
<td>W332</td>
<td>New Port Richey River habitat Restoration</td>
<td>50</td>
<td>Planned</td>
<td>30</td>
</tr>
<tr>
<td>W333</td>
<td>Indian River habitat Restoration</td>
<td>100</td>
<td>Planned</td>
<td>60</td>
</tr>
<tr>
<td>W334</td>
<td>Pinellas Lagoon River habitat Restoration</td>
<td>75</td>
<td>Planned</td>
<td>50</td>
</tr>
<tr>
<td>W335</td>
<td>Tarpon Springs River habitat Restoration</td>
<td>25</td>
<td>Planned</td>
<td>15</td>
</tr>
</tbody>
</table>

**Total Budget Proposed:** $1,984,444

**Note:** You may have covered most/all of these by listing our 5yr plan, but a cross check is recommended.
APPENDIX B
Preliminary Cost Analysis
PRELIMINARY COST ANALYSIS:
HABITAT RESTORATION & CREATION MASTER PLAN
FOR TAMPA BAY
Introduction
For the purposes of habitat restoration and creation planning in the Tampa Bay area, a preliminary review of actual and hypothetical coastal wetland habitat restoration costs has been conducted. Throughout this study, it has remained obvious that 1) there is substantial variability in costs, even among projects of similar types and size, and 2) costs are directly affected by the quality of the restoration effort in question. Although effective and desirable results can be obtained through relatively simple design and implementation approaches, such is rarely the case. In this discussion of wetland restoration costs, we will provide reminders of the multiple factors that can and will affect overall costs in individual circumstances.

Despite the increasingly large number of restoration projects that have been conducted in Tampa Bay and the rest of the state, few generalizations are possible. However, there are some trends and relationships that appear to be applicable to the majority of wetland restoration projects and which are useful in interpreting the results of this cost analysis.

Previous Studies
Analysis of wetland habitat restoration costs (excluding land acquisition costs) has been undertaken on a national level by King and Bohlen (1994). These authors presented point estimates and typical ranges of per-acre costs associated with nine different categories of wetland restoration projects. The categories used were developed on the basis of wetland characteristics that affect the tasks required to achieve restoration success, not on the basis of wetland functions and values. In this sense they are categories of project types, not categories of wetlands per se.

Two general sources of data were used by King and Bohlen (1994) in determining the values presented. Reports (published and unpublished), general trade literature, and various levels of government databases were used to provide what is referred to as secondary data. Primary data was obtained from engineering and cost-accounting details provided by leading wetland experts in the United States. Lewis Environmenta1 Services, Inc. provided a substantial amount of the information on wetland restoration projects in Florida.

For various reasons, the authors disregarded the majority of the secondary data and based their estimates principally on the primary data obtained. Most of the projects from which the secondary data was obtained were federal programs focusing on restoration of agricultural land back to wetlands. These projects typically involved restoring altered hydrology. While inexpensive and usually successful, this approach is not representative of restoration of structurally and biologically more complex wetlands, and does not take into account the problems associated with habitat restoration within an urban or suburban context.

The primary data was drawn almost entirely from wetland restoration projects conducted as mitigation for wetland impacts regulated under Section 404 of the Clean Water Act.

1The term "restoration" as used here also includes habitat creation; see Lewis 1990 for definitions of terms.
The available data from these projects revealed a "persistent pattern of low cost and poor success rates" (p. 3). The authors note that this trend results from market conditions that provide rewards for low cost, not high quality restoration. Consequently, cost data drawn from past mitigation projects have a significant downward bias (are unrealistically low) and are not indicative of the costs of completing medium or high quality restoration projects.

In the course of obtaining data, King and Bohlen (1994) recognized several assumptions and limitations that are important to note in any discussion of wetland restoration costs. Many projects reviewed involved volunteer efforts, which often exclude the opportunity cost of contributed labor and other "in kind" contributions, leading to underestimates of cost. The costs of government-subsidized projects may also be similarly underestimated because the cost of the restoration project is simply included in the cost of running the government. Other factors affecting the cost estimates include the costs of permitting prior to any actual project implementation, project size (extremely small project sizes can produce extremely high project costs), and the types of projects themselves.

Preliminary analysis of the data revealed that 1) an inverse relationship does seem to exist between cost per acre and project size for wetland mitigation projects (in both the primary and secondary database) and 2) for each 10% increase in project size, costs per acre declined by 3.5% (primary database, non-agricultural projects).

The following table summarizes the results obtained by King and Bohlen (1994) for the three types of wetland habitats of concern here. Land acquisition costs are not included.

<table>
<thead>
<tr>
<th></th>
<th>SALTMARSH</th>
<th>MANGROVE</th>
<th>SEAGRASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Costs (thousands)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>$18.1</td>
<td>$18.0</td>
<td>$19.5</td>
</tr>
<tr>
<td>Minimum</td>
<td>1.0</td>
<td>2.1</td>
<td>18.3</td>
</tr>
<tr>
<td>Maximum</td>
<td>43.6</td>
<td>42.8</td>
<td>21.7</td>
</tr>
<tr>
<td>Median</td>
<td>10.2</td>
<td>13.6</td>
<td>18.6</td>
</tr>
<tr>
<td>Sample size</td>
<td>9</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>By Tasks*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preconstruction</td>
<td>$3.9</td>
<td>16%</td>
<td>$2.3</td>
</tr>
<tr>
<td>Construction</td>
<td>13.2</td>
<td>73%</td>
<td>11.9</td>
</tr>
<tr>
<td>Postconstruction</td>
<td>2.0</td>
<td>11%</td>
<td>3.8</td>
</tr>
<tr>
<td>By Input</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor</td>
<td>$9.4</td>
<td>52%</td>
<td>$9.2</td>
</tr>
<tr>
<td>Materials</td>
<td>4.9</td>
<td>27%</td>
<td>3.8</td>
</tr>
<tr>
<td>Equipment</td>
<td>3.6</td>
<td>20%</td>
<td>5.0</td>
</tr>
<tr>
<td>Other</td>
<td>0.4</td>
<td>2%</td>
<td>0.0</td>
</tr>
</tbody>
</table>

*costs are percent of average

At this point, it is probably worthwhile to note that the different tasks as listed above can each contain some activities which are highly variable in terms of cost. Preconstruction includes planning, permitting and design phases. These are somewhat dependent on
project size, but can be drastically affected by project complexity. The costs of permitting a project which is in any way innovative, untested, or experimental can be very high. (However, these costs may be outweighed by significant savings during the construction phase if the project has been designed by an experienced wetlands scientist and a professional engineer.)

The construction phase includes both site preparation and actual installation of plant material. Site preparation can range from none at all (e.g., seagrass planting) to extensive earthwork involving both wet and dry dredging of large volumes of material, incurring disposal costs as well. Earthwork can be the single most expensive task within a wetland restoration budget, and is difficult to avoid as unaltered land appropriate for wetland restoration is increasingly unavailable. The costs of plant installation are relatively constant on a per-acre basis, and depend more on the type of material being installed (seeds, seedlings, grasses, trees, etc.) than on any other factors.

Post-construction costs are likely to include some kind of monitoring program, and perhaps a regular or periodic schedule of maintenance. Monitoring is minimally dependent on project size and associated costs can be projected at the time of permit issuance, since the monitoring regime is typically specified as a permit condition. If conducted early and frequently, maintenance costs can be kept at a minimum. Post-construction costs may be the most predictable expenses associated with wetland restoration.

**Actual Projects Conducted in the Tampa Bay and Florida West Coast Area**

**Saltmarshes**

Although some projects conducted in the Tampa Bay area were included in King and Bohlen’s (1994) primary data, data for the saltmarsh projects listed in the following table was not. The per-acre costs of the three projects are considerably higher than the average calculated by King and Bohlen (1994). Two hypothetical saltmarsh projects for which costs were estimated by Lewis Environmental Services and data provided to King and Bohlen averaged from $442/acre (for restoration via re-establishment of tidal connection) to $25,700/acre (saltmarsh creation, of which $10,000/acre is for earthwork).

<table>
<thead>
<tr>
<th>SALTMARSH PROJECTS</th>
<th>South Parcel</th>
<th>Delaney Creek</th>
<th>Out. Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Costs, per acre (thousands)</td>
<td>$98.0</td>
<td>$32.5</td>
<td>$82.5</td>
</tr>
<tr>
<td>By Tasks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preconstruction</td>
<td>18%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>82%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postconstruction</td>
<td>not incl. above</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Detailed information regarding costs of the South Parcel project is available for the construction phase. However, the costs shown for the other two projects are educated estimates at best. A substantial portion of the Delaney Creek project was conducted by
state government agencies, and records of consultant costs are not public information or otherwise available to us. The relatively high cost of the One-Acre Marsh project is attributable to the large volume of earthwork required.

**Mangroves**

Information on the mangrove projects listed below was provided for King and Bohlen’s (1994) study, but it is not known if any or all of it is included in their calculations.

<table>
<thead>
<tr>
<th>MANGROVE PROJECTS</th>
<th>Windstar</th>
<th>Thunderbay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Costs, per acre (thousands)</td>
<td>$20.4</td>
<td>$11.3</td>
</tr>
<tr>
<td>By Task (percent)</td>
<td>Preconstruction</td>
<td>6</td>
</tr>
<tr>
<td>Construction</td>
<td>93</td>
<td>26</td>
</tr>
<tr>
<td>Postconstruction</td>
<td>1</td>
<td>27</td>
</tr>
<tr>
<td>By Input Category (percent)</td>
<td>Labor</td>
<td>20</td>
</tr>
<tr>
<td>Expenses</td>
<td>80</td>
<td>15</td>
</tr>
</tbody>
</table>

Summarizing this information in the manner shown can be somewhat misleading, as suggested by the percentages for labor and expenses shown for these two mangrove projects. In one case, expenses account for 80% of the total cost, but they account for only 15% in the other case. This kind of variability is not unusual, and is readily explained by the particular conditions of each project. The Windstar project entailed 15 acres of planting of red mangrove propagules on one-meter centers, in an area that had to be graded to appropriate elevations prior to planting. Thunderbay, on the other hand, was an area of mixed restoration activities, including re-establishment of tidal connections, transplanting of desirable vegetation, and allowing natural recolonization by white mangroves. The nature of the project and its associated restoration effort (conducted as mitigation) necessitated an unusually lengthy permitting process, accounting for relatively high preconstruction costs.

To illustrate what might be considered as a typical distribution of costs associated with mangrove or saltmarsh restoration, we developed the following detailed budget for a hypothetical 3-acre (*Spartina alterniflora*) or mangrove (*Rhizophora mangle*) habitat creation project in the Tampa Bay area. We are assuming 1) the project is local; 2) no boat travel is required; 3) similar natural habitat occurs nearby; and 4) the cost of vegetation is the same for cordgrass planting units and mangrove seeds or propagules.
Preconstruction —

Plans & Specifications — research; site assessment (soils & topo); field habitat mapping; concept plan; client meetings; construction plans; bid docs:

<table>
<thead>
<tr>
<th>Hours</th>
<th>Description</th>
<th>Rate</th>
<th>Total</th>
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<tr>
<td>23</td>
<td>Principal Ecologist</td>
<td>@ $150</td>
<td>$3,450</td>
</tr>
<tr>
<td>12</td>
<td>P.E. @ 150</td>
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<td>1,800</td>
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<tr>
<td>30</td>
<td>Ecologist @ 100</td>
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<td>3,000</td>
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<tr>
<td>16</td>
<td>CAD tech. @ 60</td>
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<td>960</td>
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<td>10</td>
<td>Tech. Editor @ 60</td>
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<td>600</td>
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<tr>
<td>20</td>
<td>Draftsman @ 35</td>
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<td>700</td>
</tr>
<tr>
<td>8</td>
<td>Clerical @ 35</td>
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<td>280</td>
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$10,790

Jurisdictional & Permitting:

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<th>Description</th>
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<tr>
<td>70</td>
<td>Principal Ecologist</td>
<td>@ $150</td>
<td>$1,500</td>
</tr>
<tr>
<td>3</td>
<td>P.E. @ 150</td>
<td></td>
<td>450</td>
</tr>
<tr>
<td>52</td>
<td>Ecologist @ 100</td>
<td></td>
<td>5,200</td>
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<td>8</td>
<td>Reg. Land Surveyor @ 100</td>
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<td>800</td>
</tr>
<tr>
<td>26</td>
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<td>1,560</td>
</tr>
<tr>
<td>8</td>
<td>Eng. Intern @ 60</td>
<td></td>
<td>480</td>
</tr>
<tr>
<td>11</td>
<td>Tech. Editor @ 60</td>
<td></td>
<td>660</td>
</tr>
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<td>8</td>
<td>Draftsman @ 35</td>
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<td>8</td>
<td>3-man survey crew @ 125</td>
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$12,280

Construction:

Earthwork (includes install cut stakes and as-built survey):

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<td>22</td>
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<td>16</td>
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<td>4</td>
<td>Reg. Land Surveyor @ 100</td>
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Excavation — 2,420 cy/ac* @ $4.15/cy 30,129 $35,829

*this would lower the elevation by 1.5'

Planting:

4,900 plants/acre @ 43¢/plant, less 10% for quantity, delivered to site

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$13,954

Postconstruction:

Seven monitoring episodes @ $1,500 ea. (time zero, 3, 6, 9, 12, 18 & 24 months)
includes simultaneous maintenance

$10,500
Summary: Plans & Specs $10,790
Jurisdictional & Permitting 12,280
Earthwork 35,829
Planting 13,954
Monitoring & Maintenance 10,500
Total $83,353
3% expense allowance for 2,500
a local project

Total, 3-acre created saltmarsh/mangrove habitat $85,853 or $28,618/acre

These figures yield the following percentages by phase:
Preconstruction 27%
Construction 58%
Post-construction 12%

+ + +

If no earthwork is necessary (highly unlikely),
reduce preconstruction by 25%, to $17,303
reduce site preparation by 95%, to 1,751
Planting remains the same 13,954
Mon. & Misc. remains the same 10,500
Subtotal, with no earthwork $43,548
3% expense allowance 1,306
Total, with no earthwork (highly unlikely) $44,854

A one-acre project would probably cost 58% to 74% of the totals shown, because pre-
and post-construction costs would be the same or nearly so. With excavation to reduce
elevations by 1.5', a one-acre project would cost about $50,164 (58% of 3-acre with
evacation total) With no excavation (again, highly unlikely) and reduction in
preconstruction costs as shown above for a 3-acre project without excavation, a one-acre
project would cost about $33,054 (74% of 3-acre without excavation total).

Cost Estimates Based on Actual Projects
Averaging the three saltmarsh projects (Table 2) with the two mangrove projects gives a
mean cost per acre, excluding land costs, of $52,940. This is nearly twice the per-acre cost
estimated for the hypothetical 3-acre project, but in our experience the higher figure is
more realistic. The only difference between tidal marsh and mangrove restoration projects
in terms of cost is the difference in planting unit cost, which is negligible. We would therefore recommend the use of a $50,000/acre estimate.

Applying this figure to the requested project sizes yields the following:

a) saltmarsh, 1-3 acres @ $50,000/acre = $50,000-150,000
b) mangrove, 5-13 acres @ $50,000/acre = $250,000-650,000

Percentage of costs for specific work tasks are estimated at:
15% Preconstruction
65% Construction
20% Postconstruction

Applying these to the per-acre costs yields:

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Land Acquisition Costs
The following is a compilation of actual land acquisition costs for habitat restoration projects conducted in Pinellas County. (Costs are in thousands.)

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<td>Mobley Bay 2</td>
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The actual cost per acre of the above 11 projects is slightly over $17,000, but the average is $28,500 per acre.
To provide a more realistic projection of what land acquisition costs might be for smaller scale habitat restoration projects, the actual and average costs per acre have been recalculated. The three sites within the size range of 5 to 15 acres (total 23.8 acres) cost a total of $754,000, or an actual cost of about $32,000/acre. The average cost per acre of these projects is $29,400. The three sites in the size range of 20 to 40 acres (55.2 acres total) cost $4,215,000, or $45,000/acre. They averaged $41,600 per acre. Eliminating the largest project sites from consideration results in what we feel are more realistic land acquisition cost estimates, which we would recommend using.

On the basis of this data, larger areas do not necessarily result in lower per-acre costs. Factors which may affect land acquisition costs include market conditions, potential developability of site, motivation of seller, and neighborhood.
BIBLIOGRAPHY


APPENDIX C
FMRI Comments No. 1
Kevin Peters
Florida Marine Research Institute
100 8th Ave. SE
St. Petersburg, FL 33701-5695

Re: Recent Discussions of Restoring Fisheries Habitats

June 13, 1995

Dear Kevin:

I would appreciate your critical review of the enclosed document which is being circulated by TBNEP (and myself) for review. In particular, I would request your comments on the concept of targeting critical fish nursery habitats for emphasis as preservation and restoration sites instead of the "random restoration" we currently have. Also, how small is "too small to be concerned about", with reference to potential nursery habitats?

You mentioned you might have prepared some updated graphics to better illustrate the true range of fish nursery habitats (particularly for snook) in Tampa Bay, and I would certainly include or substitute them for the existing Figures 2 and 3 with due credit to their origin if you can supply them. Alternatively, if you want to simply mark up the existing figures and return them with your other comments, I will have them redrafted, again with due credit to their source.

Please feel free to call with any questions.

Sincerely,

Roy R. Lewis III, CEP
President/Principal Ecologist

cc w/enc: D. Crewz
c c w/o enc: H. Greening, D. Robison, D. Savereool, file 293
RRL/sft
Dear Robin:

I would like to respond to your request in great detail. However, time limits a full discussion here, so I will touch on a few important topics I think deserve consideration and you may contact me if you require additional information on these topics.

The first issue was questions regarding "targeting critical fish nursery habitats for emphasis on preservation and restoration sites" and "how small is too small" for potential fish nursery habitats. My general answer regarding size is that no area is too small. We are talking here about fish that spawn inshore and whose larvae move from the pelagic water to shallow nursery areas at 6-8 ft. Hundreds can fit along a few hundred yards of proper shoreline. Estimates of water surface area for some of our snook and red drum study sites range from a low of 0.5 acres up to about 15 or 20 acres. Remember that while some species can withstand and even require the high energy environment of the surf zone (gulf kingfish, pompano, and permit), many species depend on the area being relatively small and having quiet waters (snook, tarpon, black drum, striped mullet). Of course, the smaller areas are critically tied and change rapidly according to habitat and conditions both upland and in nearby waterways.

I think the discussion about targeting critical nursery habitats was derived from this same concept. People have begun to recognize broad categories of habitat types such as "seagrass" and the ones you list in your text—mangroves, tidal marsh, oligohaline wetlands, and salt barrens. However, the more we learn about individual species of fishes, the more we learn that many are much more particular than accepting just seagrass or just mangroves. These systems are subdivided within the ecosystem into many smaller habitat types. Seagrasses can be any of several species, each with its own requirements of nutrients, light, sediment, depth, salinity, and wave and current energy. Mangroves are the same way. Many small fishes and the early stages of larger fishes have specialized to individual types of seagrass, mangroves, marsh grass, or whatever. These individual habitat types are much

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Printed on recycled paper.
smaller in area than even the remaining seagrasses and mangroves plotted on wetlands maps. Some include the types of emergent habitats you are writing about and as we both know, these areas are often the most impacted.

A second issue was updating the graphic of snook nursery habitats. I don’t have a specific graphic for Tampa Bay (Ron Taylor had one, but it’s lost now), but I think I can describe to you my concern such that you can modify the existing graphic. The current graphic indicates that all young snook move far up river systems. This is not true. Probably as many use nursery sites at the edge of the bay, while others move shorter distances up the rivers. For example, we find early juvenile stages of snook in lagoons of Terra Ceia Bay and Critical Bayou, in canals of Cockroach Bay and Bishop Harbor, and in lagoons, secondary creeks, and canals scattered along the length of the Little Manatee River. In Tampa Bay, the use of once-disturbed sites includes the canals of Cockroach and Bishop Harbor, the borrow pits of north St. Pete, and the spillway below Lake Seminole (and then there’s Gilmore’s mosquito impoundment studies of the east coast). The point is that their salinity tolerance is wide and that additional characteristics define their nursery habitat requirements (small water basins with little wave or current energy; proper bottom slope; shaded canopy; underwater structure). If we don’t define, acknowledge, and preserve these areas, we may lose half the fishery. (I know it doesn’t help the case for preserving, say, oligohaline river habitats, but it’s the truth as we know it today.)

For tarpon, I’m not as familiar with their specific requirements, except that the young inshore stages are generally found in isolated, stagnant pools—the kind most people would probably fill, ditch, or spray for mosquitoes. As far as specific areas, I have captured a few tarpon lepto in Cockroach Bay as well as the Little Manatee River. Roy Crabtree’s assistant says they have found metamorphic tarpon in the Indian River mosquito impoundments and backwater areas of Collier-Seminole State Park, so they don’t require low salinity any more than snook. Assuming they are somewhat similar to ladyfish would lead us to believe they might be attracted to areas such as Bob and I’s Alafia River sites, Lake Seminole spillway, and the city borrow pits. For the graphic, you should change the lepto from an ewi to a tarpon and better indicate that tarpon move further offshore for spawning.

The to examples you use represent fish using oligohaline nursery habitats. I will reiterate the theme of my Coastal Workshop talk which was that there are many habitat divisions that we don’t even think about and different fisheries species and forage species are specialized to use each type. And, as you mention, these systems are all tied together from the uplands to the ocean. Putting them back in their approximate historic proportion is the only relatively unbiased approach of returning the complexity that once existed.
A concern I have, which I'm sure you've heard from Dave as well, is that many sites targeted for restoration are places that have been degraded but which are now somewhat naturalized. Many of these areas (the Alafia mouth tidal creek, the canals beneath the Alafia power lines) are very productive for valuable fisheries species. These are certainly not logical areas for extensive restoration and one could even argue against enhancement on the chance that we could destroy the existing balance since we really don't know the details of why these systems are productive. Efforts should concentrate on cleaning up runoff to existing habitat and limit restoration to habitats where damage has been severe or none currently exists. In my mind, this would include filter marshes and pollution control of runoff, and enhancement/restoration of spillways, areas with dredge and fill, hardened shorelines, etc.

An additional comment I have is that Pinellas drainage systems don't seem to be addressed. There are numerous small drainage creeks and ditches entering small basins scattered around this pinellas county, but many are extensively altered or degraded. Because Pinellas has such a long coastline and receives abundant recruitment of larval fishes, preservation or restoration of these areas would be of great benefit to area fisheries. I have already alluded to one situation and that is the spillways which foreshorten the amount of oligohaline shoreline and shallow-water lagoons for the young fish. Fish are attracted to these areas through a combination of factors that include current and odor trails, but most spillways have just a dredged channel with deep water, steep banks, and little shallow nursery habitat. The same goes for storm drains that often dump directly into a deep harbor—no habitat. The drainage systems that are above ground and could (and do to an extent) offer bird and fish habitat are usually used for runoff and flood control. Joe's Creek, for example, drains a good portion of the city, has steep sides that either slough off sediment or are hardened, and rapidly transfers it's load to the Cross Bayou/Long Bayou area, thus stressing that somewhat preserved area.

I could go on, but I think you get the idea. We should be concerned about these small divisions of habitat types in Pinellas and throughout the developed areas of the state. They provide the specialized habitats required by the specialized fisheries species we find desirable for food and sport.

Sincerely;

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Kevin M. Peters
Assoc. Res. Sci.
Florida Marine Research Institute
APPENDIX D
Public Land Ownership Maps
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- Passive Recreation: Recreational activities not protected by a specific conservation plan.
- Preservation/Conservation: Areas with conservation measures in place to protect natural resources and preserve unique ecosystems.
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<td>无名小路</td>
<td>市政厅</td>
<td>大阪市</td>
<td>4丁目</td>
<td>2.1</td>
<td>123.45</td>
<td>67.89</td>
</tr>
<tr>
<td>8168</td>
<td>未知の道</td>
<td>市政厅</td>
<td>大阪市</td>
<td>3丁目</td>
<td>1.2</td>
<td>123.45</td>
<td>67.89</td>
</tr>
</tbody>
</table>

**NOTES:**
- The table above lists the addresses and land uses of various parties in Osaka, Japan.
- The addresses are in Japanese, and the land uses are also listed.
- The table format ensures clear organization and easy reading.

---

**LEGEND:**
- D: Date
- L: Location
- M: Method
- A: Address
- R: Radius
- S: Size
- T: Type
- G: Grade
- N: Name
- P: Party
- U: Unit
- V: Volume
- W: Width
- H: Height

---

This page contains a table listing various addresses and land uses in Osaka, Japan, with corresponding coordinates and land sizes.
<table>
<thead>
<tr>
<th>PARAEC</th>
<th>PARAEC NAME</th>
<th>LOCATION</th>
<th>ACRES</th>
<th>DESCRIPTION</th>
<th>LAND USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>230</td>
<td>Baltimore/Washington Internationa</td>
<td>MD</td>
<td>10,900</td>
<td></td>
<td></td>
</tr>
<tr>
<td>240</td>
<td>Southeastern Maryland</td>
<td>MD</td>
<td>8,400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>Gulf States</td>
<td>TX</td>
<td>12,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>260</td>
<td>Southeast Louisiana</td>
<td>LA</td>
<td>14,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>270</td>
<td>Northern Florida</td>
<td>FL</td>
<td>10,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>280</td>
<td>Northeastern New England</td>
<td>VT</td>
<td>6,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>290</td>
<td>Northeastern New England</td>
<td>MA</td>
<td>5,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
- All dimensions are approximate.
- Land use data is subject to change.

**LEGEND:**
- L:\ Land Use
- A:\ Acres
- M:\ Miles
- S:\ Square Miles
APPENDIX E
Emergent Tidal Wetlands in Public Ownership
EXISTING AND PROPOSED PUBLICLY-OWNED EMERGENT TIDAL WETLANDS
Old Tampa Bay

- Emergent Tidal Wetlands Currently under Private Ownership
- Emergent Tidal Wetlands Currently under Public Ownership
- Emergent Tidal Wetlands Proposed for Public Ownership

Scale: 1:150,000
Projection: UTM
Datum: NAD 27

Coastal Environmental, Inc.
Map Publication No. 109517901
EXISTING AND PROPOSED PUBLICLY-OWNED EMERGENT TIDAL WETLANDS
Hillsborough Bay

Emergent Tidal Wetlands Currently under Private Ownership
Emergent Tidal Wetlands Currently under Public Ownership
Emergent Tidal Wetlands Proposed for Public Ownership

Scale 1:100,000
Projection UTM
Datum NAD 27

Coastal Environmental, Inc.
Map Publication No. 19970001
EXISTING AND PROPOSED PUBLICLY-OWNED EMERGENT TIDAL WETLANDS
Terra Ceia Bay and Manatee River

- Emergent Tidal Wetlands Currently under Private Ownership
- Emergent Tidal Wetlands Currently under Public Ownership
- Emergent Tidal Wetlands Proposed for Public Ownership

Scale 1:170,000
Projection UTM
Datum NAD 27

Miles

Coastal Environmental, Inc.
Map Publication No: 09534401
APPENDIX F
FDEP Comments
Date: November 14, 1995

To: Holly Greening, Senior Scientist

From: Stormy Ingold, Environmental Specialist

Subject: Habitat Protection and Restoration Plan

On behalf of the FDEP, I would like to thank you for the opportunity to review the TBNEP’s final draft report for habitat protection and restoration. Please consider the following comments:

1. The “criteria for acquisition matrix and ranking” in Table 19 are neither adequate nor appropriate for the purpose to which they have been applied. These criteria were extracted from the draft provisions for the Florida Pollution Recovery Program and were intended to be used to aid the FDEP’s restoration staff in evaluating proposals for pollution recovery and restoration projects from state and local governments. The criteria apply only to that particular program, not to other ecosystem management activities, and do not address acquisition. While the criteria have been revised and the provisions redrafted and adopted as FDEP policy, they still do not adequately speak to acquisition. (I have included a copy of the new provisions for your information, however.)

It is my suggestion that the plan should attempt to consolidate the criteria used by various state and local acquisition programs, such as Save Our Rivers, CARL, and SLAPP. It is also preferable that these criteria be sifted through and the restoration subcommittee and/or any other qualified people (the contractors, for example) add/delete/modify as they see fit.

2. I believe any committee will find it difficult to assign an objective score to each criterion. The ability to weight the scores and be reasonably subjective may be necessary.

For example, as valued in Table 19, a site could earn more points

"Prevent, Control and Manage Florida's Environment and Natural Resources"

In accordance with page.
for all "not applicable" criteria than to have several "yes" criteria, no matter how strong a yes it is. This just doesn’t make sense. And averaging the scores individual team members give sites will result in a list of sites with all average scores. We tried it and it happens. If final decisions about acquisitions are made by committee, the members will balance each other and end up with a good ranking.

3. It is preferable that the tables and figures in the report include titles that fully describe the information contained therein. I believe this is appropriate for technical writing and is extremely convenient for the reader.

4. On that same note, it is preferable that references to tables and figures in the text accurately discuss the information therein. For example, the last paragraph on page six briefly mentions SWIM projects in Tables 3 and 5, when more information (such as FDEP and SLAPP projects) is listed. This is confusing and understates the amount of completed and developing restoration projects.

5. In general, the FDEP is in support of a restoration master plan such as the one being developed here. It should be a useful tool for all entities engaged in restoration and acquisition. But I wish to point out that due to the nature of the FDEP’s restoration program, i.e. local and state governmental submit proposals to us for consideration, we may not always have the option of focusing primarily on systems this plan deems most desirable. However, we can try to prompt other governmental entities to sponsor and work with them to develop these types of projects before proposal submittal.
4.(3) ELIGIBILITY DETERMINATION. Program eligibility of the applicant and project is determined pursuant to the following:

4.(3)(a) Applicant Eligibility. Following closure of a preapplication or application submission period, Department staff shall review each applicant's eligibility pursuant to these provisions, and, when applicable, notify the applicant of its ineligibility.

4.(3)(b) Project Eligibility. After determining the eligibility of an applicant, District staff shall review the project described in the preapplication or application for program eligibility pursuant to these provisions, especially as identified in Section 3.(6) and Section 403.165, F.S. When applicable, Department staff shall notify the applicant of an ineligible project.

4.(3)(c) Application Resubmittal. If an eligible applicant submits a preapplication or complete application in sufficient time for district staff to determine the eligibility of the project prior to closure of the announced application submission period and the project is determined ineligible by district staff, the applicant may submit another eligible application prior to termination of the announced applicant submission period.

4.(4) APPLICATION ASSISTANCE. District staff may, depending on staff availability and at the request of an applicant, provide technical assistance to an eligible applicant completing an eligible project application prior to closure of the Department announced application submission period. After closure of the submission period, district staff may establish a date for the applicant to submit deficient application information. If the deficient information is not submitted by or on the prescribed date, the application shall be declared ineligible for funding consideration.

4.(5) MAXIMUM AWARD REQUEST. The Department may announce the maximum funds that an applicant may request in a FPRP application when publicizing the establishment of an application submission period.

4.(6) NUMBER OF APPLICATIONS. An applicant may submit no more than three applications during each announced application submission period. Applicants shall prioritize multiple applications.

4.(7) APPLICATION FORM. The FPRP Preapplication Form, FPS-A015, effective 9/95, and FPRP Application Form, FPS-A016, effective date 9/95, are hereby incorporated by reference and are available from the district office or the Department's Bureau of Design and Construction, Division of Recreation and Parks, 3900 Commonwealth Boulevard, Mall Station 520, Tallahassee, Florida 32399-3000.

4.(8) APPLICATION SELECTION. Each eligible application shall be evaluated, assigned a total point score and ranked on the basis of the information provided in the application and in accordance with Section 5.0 of these provisions.
4.9 NOTIFICATION. After the funding status of all eligible applications is determined, the Department will notify all applicants.

5.0 APPLICATION EVALUATION AND SELECTION. Eligible applications shall be evaluated and ranked by Department evaluation teams pursuant to the following:

5.1 PRIORITIZATION. Eligible applications within each district shall be ranked pursuant to subsections 5.(4) - 5.(6).

5.2 DISTRICT EVALUATION TEAM. Each district director shall appoint up to a five-member district team to evaluate and score all eligible district applications.

5.3 PROGRAM EVALUATION COMMITTEE. The deputy secretary shall appoint up to a five-member program evaluation committee to review all eligible applications to provide oversight and assure statewide consistency for FPRP. If the committee determines that implementation procedures have not been properly followed, the committee shall recommend changes to the district ranked list to correct any improperly ranked applications. The director or designate of the Office of Ecosystem Planning and Coordination shall serve as a committee member. Any Department division submitting projects for funding is not eligible to participate in the overview committee. Committee approved district recommended application priority lists shall be submitted to the Secretary for approval.

5.4 SELECTION CRITERIA. Eligible applications shall be ranked to the extent to which they are found to meet the selection criteria in this subsection. A score shall be assigned to each eligible application. Applications shall be scored for ecosystem restoration criteria or quality criteria. All applications shall be scored for each potential criteria, public benefit criteria, and time constraints criteria. Scores shall be determined as follows:

5.4(a) Ecosystem Restoration Criteria - up to 30 total points. As ecosystem management is the Department's overriding strategy for protecting and managing Florida's environment, low a project restores, integrates with, or protects its surrounding ecosystem shall be given significant consideration. Ecosystem management includes the preservation of ecosystem integrity through the restoration or protection of its natural communities and processes. Projects will be assigned a score up to 30 points based on their consistency with meeting the following objectives:

5.4(a)(1) Environmental Restoration - means the degree to which a site can be restored to a state that best provides restored or enhanced functions to the ecosystem - will be assigned a score of 15 points based on consistency with meeting the following objectives:

5.4(a)(1)a. Restoration will lead to improved water quality.
5.(4)(a).b. Restoration will significantly improve ground water recharge.

5.(4)(a).c. Groundwater recharge improvement is in a water resource caution area.

5.(4)(a).d. Restoration will increase groundwater protection for a first magnitude spring.

5.(4)(a).e. Restoration will improve quality, quantity and timing of freshwater input into a marine, estuarine, or freshwater system.

5.(4)(a).f. Restoration will help achieve the minimum flows and levels of an aquatic system.

5.(4)(a).g. Restoration will re-establish natural hydroperiod.

5.(4)(a).h. Restoration will contribute to recovery of a natural community or population and may include, but not be limited to, contributing to native species diversity or reducing a source for exotic hifestation. Communities or populations which have been identified by state and federal agencies as severely limited, threatened or endangered may be given priority.

5.(4)(a).2. Ecosystem integration - meaning the relative importance of the site in relation to the surrounding ecosystem - will be assigned up to 10 points based on consistency with the following objectives:

5.(4)(a).2.a. Restoration sites will be ecologically linked to, create buffer for, or reconnect fragmented systems within:

5.(4)(a).2.a.i. State identified ecosystem management areas, as recognized by the Department of Environmental Protection.

5.(4)(a).2.a.ii. SWIM designated water bodies with approved plans.

5.(4)(a).2.a.iii. National Estuarine Program designated areas.


9/2/2002
PPRP Provisions
5.4(a)2.a.ix. National Estuarine Research Reserve,
5.4(a)2.a.x. National Marine Sanctuary, or
5.4(a)2.a.xi. Other significant ecosystems or special management areas.
5.4(a)2.b. Restoration will improve a wildlife corridor fragmented by alteration.
5.4(a)3.a. Environmental Protection - meaning preventing, existing or potential threats of loss or damage to a site through pollution or environmental degradation - will be assigned up to 5 points based on consistency with the following objectives:
5.4(a)3.a. Pollution prevention achieved through source reduction, waste minimization, or on-site recycling.
5.4(a)3.b. Protection through reducing or elimination of the generation and use of toxic and hazardous substances.
5.4(a)3.c. Protection through addressing media transfer of pollutants and minimizing the transfer of pollutants from one medium to another.
5.4(a)3.d. Protection through pollution source investigation.
5.4(a)3.e. Protection through monitoring.
5.4(b) Air Quality Criteria - up to 30 total points. As air quality violations are elusive by nature but penalties collected from air violations contribute significantly to the Pollution Recovery Fund, the Department will give special consideration to air quality projects based on protection and management criteria as well as how the project integrates with the surrounding area and ecosystem. In general, air quality projects should provide for the prevention of air pollution which may be harmful or injurious to human health or welfare, animal or plant life, or property, including outdoor recreation. Projects will be assigned up to 30 points based on their consistency with meeting the following objectives:
5.4(b)1. Air quality protection - meaning the degree to which the ambient air quality of a site or location can be improved or maintained - will be assigned up to 15 points based on consistency with meeting the following objectives:
5.4(b)1.a. Protection through energy conservation to include energy efficiency and utilization for both mobile and stationary sources that will lead to improved air quality.
5.4(b)1.b. Protection through the reduction of criteria pollutants (ozone, sulfur dioxide, carbon monoxide, nitrogen oxides, lead, particulate matter PM-10) that will lead to improved air quality.
APPENDIX G
Budget Summary
Tampa Bay Living Resources
(Hazen and Sawyer 1995)
Relative Program Budgets
Tampa Bay Restoration Programs

(from Hazen and Sawyer 1995)

Budget summary, Tampa Bay living resources, habitat preservation and restoration programs (from Hazen and Sawyer 1995).

<table>
<thead>
<tr>
<th>Agency and Program</th>
<th>FTEs</th>
<th>BUDGET FY 94-95</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Army Corps of Engineers (primarily shore protection, i.e. beach renourishment)</td>
<td>N/A</td>
<td>$12,214,600</td>
</tr>
<tr>
<td>Florida Department of Environmental Protection</td>
<td>9.5</td>
<td>1,058,715</td>
</tr>
<tr>
<td>Florida Game and Fresh Water Fish Commission</td>
<td>0.35</td>
<td>17,850</td>
</tr>
<tr>
<td>Southwest Florida Water Management District</td>
<td>N/A</td>
<td>1,473,600</td>
</tr>
<tr>
<td>Hillsborough County</td>
<td>22</td>
<td>1,126,200</td>
</tr>
<tr>
<td>Manatee County</td>
<td>4.1</td>
<td>291,500</td>
</tr>
<tr>
<td>Pinellas County</td>
<td>0.2</td>
<td>39,180</td>
</tr>
<tr>
<td>City of Clearwater</td>
<td>N/A</td>
<td>130,000</td>
</tr>
<tr>
<td>City of St. Petersburg</td>
<td>N/A</td>
<td>158,000</td>
</tr>
<tr>
<td>Tampa Port Authority</td>
<td>1</td>
<td>1,000,000</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>$17,549,645</td>
</tr>
</tbody>
</table>
### Budget Summary, Tampa Bay Land Acquisition Programs (from Hazen and Sawyer 1995)

<table>
<thead>
<tr>
<th>Government Agency</th>
<th>FTEs</th>
<th>Budget FY 94-95</th>
</tr>
</thead>
<tbody>
<tr>
<td>Florida Game and Fresh Water Fish Commission</td>
<td>0.6</td>
<td>$ 635,970</td>
</tr>
<tr>
<td>Hillsborough County</td>
<td>3</td>
<td>6,130,000</td>
</tr>
<tr>
<td>Pinellas County</td>
<td>N/A</td>
<td>3,065,100</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>8.6</strong></td>
<td><strong>$9,831,070</strong></td>
</tr>
</tbody>
</table>

Summary of government agency FY 94–95 budgets for all Bay restoration and management activities (from Hazen and Sawyer 1995)

<table>
<thead>
<tr>
<th>Level of Government</th>
<th>Agency</th>
<th>FTEs</th>
<th>Budget FY 94-95</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal</td>
<td>U.S. Environmental Protection Agency</td>
<td>N/A</td>
<td>$ 768,500</td>
</tr>
<tr>
<td></td>
<td>U.S. Army Corps of Engineers</td>
<td>N/A</td>
<td>18,614,600</td>
</tr>
<tr>
<td></td>
<td>U.S. Coast Guard</td>
<td>43</td>
<td>1,034,000</td>
</tr>
<tr>
<td><strong>TOTAL, Federal Agencies</strong></td>
<td><strong>90.6</strong></td>
<td><strong>$20,417,100</strong></td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>Florida Dept. of Environmental Protection</td>
<td>10</td>
<td>$7,063,415</td>
</tr>
<tr>
<td></td>
<td>Florida Game &amp; Fresh Water Fish Commission</td>
<td>10</td>
<td>1,215,370</td>
</tr>
<tr>
<td><strong>TOTAL, State Agencies</strong></td>
<td><strong>100</strong></td>
<td><strong>$8,278,785</strong></td>
<td></td>
</tr>
<tr>
<td>Regional</td>
<td>Southwest Florida Water Management District (non-SWIM)</td>
<td>6</td>
<td>$35,023,700</td>
</tr>
<tr>
<td></td>
<td>Southwest Florida Water Management District (SWIM)</td>
<td>N/A</td>
<td>2,688,500</td>
</tr>
<tr>
<td></td>
<td>Tampa Port Authority</td>
<td>9</td>
<td>2,360,000</td>
</tr>
<tr>
<td></td>
<td>Tampa Bay Regional Planning Council</td>
<td>1.23</td>
<td>95,000</td>
</tr>
<tr>
<td></td>
<td>Tampa Bay National Estuary Program</td>
<td>N/A</td>
<td>1,346,567</td>
</tr>
<tr>
<td><strong>TOTAL, Regional Agencies</strong></td>
<td><strong>101.23</strong></td>
<td><strong>$41,313,880</strong></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td>Hillsborough County</td>
<td>409.5</td>
<td>$55,995,700</td>
</tr>
<tr>
<td></td>
<td>Manatee County</td>
<td>151.6</td>
<td>23,516,500</td>
</tr>
<tr>
<td></td>
<td>Pinellas County</td>
<td>104</td>
<td>12,506,952</td>
</tr>
<tr>
<td></td>
<td>City of St. Petersburg</td>
<td>N/A</td>
<td>19,751,600</td>
</tr>
<tr>
<td></td>
<td>City of Tampa</td>
<td>501</td>
<td>70,916,500</td>
</tr>
<tr>
<td></td>
<td>City of Clearwater</td>
<td>N/A</td>
<td>8,995,100</td>
</tr>
<tr>
<td><strong>TOTAL, Local Agencies</strong></td>
<td><strong>864.15</strong></td>
<td><strong>$191,682,352</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Total Tampa Bay Restoration and Management Budgets, FY 94-95**: $261,892,104
APPENDIX H
Letter dated May 9, 1995 from FDEP to B. Waddell
Letter dated June 29, 1995 from HCEPC to J. Stines
Department of Environmental Protection

Lawton Chiles
Governor
Southwest District
3804 Coconut Palm Drive
Tampa, Florida 33619

Virginia B. Wetherell
Secretary

May 9, 1995

Barbara Waddell
2026 Bayou Drive S.
Ruskin, FL 33570

File No: 292697393
County: Hillsborough

Dear Ms. Waddell:

This is to acknowledge receipt of your application, File No. 292697393 on March 29, 1995, for authorization to remove Brazilian Pepper in Ruskin Inlet, Section 7, Township 32S, Range 19E, in Ruskin, Hillsborough County.

At this time no permit is required by this Department for your project. Any modifications in your plans should be submitted for review, as changes might result in permits being required. This letter does not relieve you from the need to obtain any other permits (local, state or federal) which might be required.

This document does not authorize the disposal of projected related debris within waters or wetlands of the State. Additionally, this document does not authorize you to conduct the above described project without the consent of the owner, lessee, or record easement holder of the property on which the proposed project is to be undertaken.

A person whose substantial interests are affected by the Department's proposed decision may petition for an administrative proceeding (hearing) under Section 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the permit applicant and the parties listed below must be filed within fourteen days of receipt of this intent. Petitions filed by other persons must be filed within fourteen days of publication of the public notice or within fourteen days of their receipt of this intent, whichever first occurs. (The petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of

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Printed on recycled paper.
Failure to file a petition within this time period shall constitute a waiver of any right that such a person may have to request an administrative determination (hearing) under section 120.57 of the Florida Statutes.

The Petition shall contain the following information:

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department file number, and the county in which the proposed project would be located;

(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

(d) A statement of the material facts disputed by the petitioner. If any;

(e) A statement of facts that the petitioner contends warrant reversal or modification of the Department's action or proposed action;

(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and

(g) A statement of the relief sought by petitioner, stating precisely the action that the petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within fourteen days of receipt of this notice in the Office of General Counsel at the Department's address set forth above. Failure to petition within the allowed time frame constitutes a waiver of any right that such a person has to request a hearing under section 120.57 of the Florida Statutes and to participate as a party to this
proceeding. Any later intervention will only be at the approval of the presiding officer on motion filed under rule 28-5.207, F.A.C.

If you have any questions, please contact Ken Huntington (Ext. 330) of this office. When referring to this project, please use the file number listed above.

Sincerely,

Bob Statler
Environmental Administrator
Submerged Lands and
Environmental Resources Program

RS/er
cc: Corps of Engineers
June 29, 1995

Mr. Joe Stines
Ruskin Public Library
7 Dickman Drive, S.E.
Ruskin, FL 33570

SUBJECT: EPC REVIEW OF AN APPLICATION TO PERFORM MISCELLANEOUS ACTIVITIES IN WETLANDS/NUISANCE VEGETATION REMOVAL FOR HILLSBOROUGH COUNTY AT THE RUSKIN PUBLIC LIBRARY AT 7 DICKMAN DRIVE S.E., RUSKIN/APPLICATION RECEIVED JUNE 12, 1995/STB 4-32-19

Dear Mr. Stines:

The Environmental Protection Commission (EPC) of Hillsborough County has conducted an environmental review on the subject application. EPC staff will authorize the subject activity with the following conditions:

1. The only vegetation authorized for removal at this time are the Brazilian pepper trees (Schinus terebinthifolius), lead trees (Leucocarya leucocephala), and Australian pine trees (Casuarina sp.). To prevent potential erosion problems, the trees shall be cut down at their base, leaving the root system intact. To prevent resprouting, treatment of the freshly cut bases with an EPA approved herbicide will be recommended. For those trees likely to come in contact with waters from the Ruskin Inlet, Roedel would be a good choice to treat the trees. For those plants outside of the range of the tidal waters, Carlon 4 or AzoSena would be more effective.

The use of any herbicide waterward of the Mean Higher High Tide line will require a permit from the Florida Department of Environmental Protection.

2. All the removed vegetation must be deposited outside of the wetland within an acceptable upland location.

To facilitate the establishment of more desirable native species, and to help prevent revegetation of the nuisance species from within the areas targeted for removal, EPC staff will recommend voluntary plantings within these areas.

An Affirmative Action - Equal Opportunity Employer
Printed on recycled paper
Mr. Joe Stines
June 29, 1995
page two

For the areas at the upper reaches of the tidal influence, the following species are among the recommended:

- salt meadow cordgrass - *Spartina patens*
- sand cordgrass - *Spartina bakeri*
- sea oxeye daisy - *Hoffichis frutescens*
- leather fern - *Acrostichum danesiifolium*.

Outside of the areas of tidal influence, within the upland portion of the property, the following species are recommended:

- sea oats - *Uniola paniculata*
- beach sunflower - *Helianthus debilis*
- muhly grass - *Muhlenbergia capillaris*
- railroad vine - *Ipomea pes-caprae*
- sea grape - *Coccoloba uvifera*
- painted daisy - *Gaillardia pulchella*.

There are many other attractive native species which should thrive in the environment found along the banks of the inlet. If you have any questions or concerns, or would like some planting advice, please feel free to contact EPC staff at 272-7104.

Sincerely,

P. Daniel Alberdi, Jr.
Environmental Scientist II
Environmental Protection Commission
of Hilleborough County

cc: Barbara Waddell
Stan Maloy, EPC
APPENDIX I
Mitigation Banking
Rules and Guidelines
FEDERAL GUIDANCE FOR THE ESTABLISHMENT, USE AND OPERATION OF MITIGATION BANKS

On November 28, 1995, the U.S. Army Corps of Engineers (Corps), Environmental Protection Agency (EPA), National Resources Conservation Service (NRCS), Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) issued final policy guidance in the Federal Register (Volume 60, Number 228, Pages 58655-58614) regarding the establishment, use and operation of mitigation banks for the purpose of providing compensation for adverse impacts to wetlands and other aquatic resources. The full text of the guidance is attached for your convenience. The guidance is also available via the Internet World Wide Web by accessing the Regulatory Branch Home Page at


This Public Notice is being released to the Jacksonville District's full mailing list in Florida, Puerto Rico, and the U.S. Virgin Islands.

A key element of the guidance is the interagency team approach to the evaluation of mitigation bank proposals. Representatives from the Corps, EPA, FWS, NMFS and NRCS, as appropriate given the projected use for the bank, will typically comprise the Mitigation Bank Review Team (MBRT). In addition, it is appropriate for representatives from state, tribal and local regulatory and resource agencies to participate where an agency has authorities and/or mandates directly affecting or affected by the establishment, use, or operation of a bank. In view of the mitigation banking program implemented in the State of Florida by the Department of Environmental Protection (DEP), and the Water Management Districts (WMD's), efforts are underway to integrate, to the extent possible, the State and Federal evaluation of mitigation bank proposals. A Mitigation Bank Prospectus
Guideline checklist, which was developed jointly by the DEP, WMD’s and the Corps, is also attached to aid mitigation bankers in the preparation of a prospectus. As the joint process further develops, additional information will be provided through subsequent Public Notices. A similar initiative will be pursued in Puerto Rico and the U.S. Virgin Islands.

Any questions regarding mitigation banking should be directed to Mr. Graham N. Story by writing to the letterhead address or by telephone at (904) 332-1682.

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ENVIRONMENTAL PROTECTION AGENCY
DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service
DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Federal Guidance for the Establishment, Use and Operation of Mitigation Banks


ACTION: Notice

SUMMARY: The Army Corps of Engineers (Corps), Environmental Protection Agency (EPA), National Resources Conservation Service (NRCS), Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) are issuing final policy guidance regarding the establishment, use and operation of mitigation banks for the purpose of providing compensation for adverse impacts to wetlands and other aquatic resources. The purpose of this guidance is to clarify the manner in which mitigation banks may be used to satisfy mitigation requirements of the Clean Water Act (CWA) Section 404 permit program and the wetland conservation provisions of the Food Security Act (FSA) (i.e., "Swampbuster" provisions). Recognizing the potential benefits mitigation banking offers for streamlining the permit evaluation process and providing more effective mitigation for authorized impacts to wetlands, the agencies encourage the establishment and appropriate use of mitigation banks in the Section 404 and "Swampbuster" programs.

DATES: The effective date of this Memorandum to the Field is December 28, 1995.

FOR FURTHER INFORMATION CONTACT: Mr. Jack Chowning (Corps) at (202) 761-
1781; Mr. Thomas Kalick (EPA) at (302) 260-4705; Ms. Barbara Byrd (NRCS) at (302) 660-3501; Mr. Mark Miller (FWS) at (302) 713-3215; Ms. Susan Anne Stokes (NRESC) at (301) 713-3323.

SUPPLEMENTARY INFORMATION: Mitigating the environmental impacts of necessary development actions on the Nation's wetlands and other aquatic resources is a central premise of Federal wetlands programs. The CWA Section 404 permit program relies on the use of compensatory mitigation to offset unavoidable damage to wetlands and other aquatic resources through, for example, the restoration or creation of wetlands. Under the "Swampbuster" provisions of the FSA, farmers are required to provide mitigation to offset certain conversions of wetlands for agricultural purposes in order to maintain their program eligibility. Mitigation banking has been defined as wetland recreation, creation, enhancement, and in exceptional circumstances, preservation undertaken expressly for the purpose of compensating for unavoidable wetland losses in advance of development actions, when such compensation cannot be achieved at the development site or would not be as environmentally beneficial. It typically involves the consolidation of small, fragmented wetland mitigation projects into one large one. The projects, when consolidated, created, enhanced or preserved wetlands are referred to as "credits" which may subsequently be withdrawn to offset "debts" incurred at a project development site.

Ideally, mitigation banks are constructed and funded for an advance of development impacts, and are seen as a way of reducing uncertainty in the CWA Section 404 permit program or the FSA "Swampbuster" program by having established compensatory mitigation credits available to an applicant. By consolidating compensation requirements, banks can more effectively replace lost wetland functions within a watershed, as well as provide economies of scale relating to the planning, implementation, monitoring and management of mitigation projects.

On August 23, 1993, the Clinton Administration released a comprehensive package of improvements to the CWA Section 404 program which included support for the use of mitigation banks. At that same time, EPA and the Department of the Army issued interim guidance clarifying the role of mitigation banks in the Section 404 permit program and providing general guidelines for their establishment and use. In that document it was acknowledged that additional guidance would be developed as necessary. Following completion of the first phase of the Corps Institute for Water Resources national study on mitigation banking:

The Corps, EPA, NRCS, FWS, and NRESC provided notice (58 FR 11224; March 6, 1993) of a proposed guidance on the policy of the Federal government regarding the establishment, use and operation of mitigation banks. The proposed guidance was developed, in part, on the experiences to date with mitigation banking, as well as other environmental, economic and institutional issues identified through the Corps national study. Over 130 comments were received on the proposed guidance. The final guidance is based on full and thorough consideration of the public comments received.

A majority of the letters received supported the proposed guidance in general. However, some modifications to one or more parts of the proposed guidance were suggested. In response to these comments, several changes have been made to further clarify the provisions and make additional modifications, as necessary, to ensure effective establishment and use of mitigation banks. One key issue on which the agencies reached numerous comments focused on the timing of credit withdrawal. In order to provide additional clarification of the changes made to the final guidance in response to comments, the agencies wish to emphasize that it is our intent to ensure that decisions to allow withdrawal of credits from a mitigation bank in advance of bank maturity be made on a case-by-case basis to best reflect the particular ecological and economic circumstances of each bank. The percentage of advance credits permitted for a particular bank may be higher or lower than the 15 percent example included in the proposed guidance. The final guidance is being revised to eliminate the references to a specific percentage in order to provide needed flexibility. Copies of the comments and the agencies' response to significant comments are available for public review. Interested parties should contact the agency representative for additional information.

This guidance does not change the substantive requirements of the Section 404 permit program or the "Swampbuster" program. Rather, it interprets and provides internal guidance and procedures to the corollary field personnel for the establishment, use and operation of mitigation banks consistent with existing regulations and policies of each program. The policies set out in this document are not final agency action, but are intended solely as guidance. The guidance is not intended, nor can it be relied upon, to create any rights enforceable by any party in litigation with the United States. The guidance does not establish or affect legal rights or obligations, establish a binding commitment on any part of the United States nor is it finally determinative of the issues addressed. Any regulatory decisions made by the agencies in any particular matter addressed by this guidance will be made by applying the governing law and regulations to the relevant facts.

The purpose of the document is to provide policy and technical guidance to encourage the effective use of mitigation banks as a means of compensating for the authorized, lost production of wetlands and other aquatic resources. John H. Zawisky, Acting Assistant Secretary (Civil Works), Department of the Army.

Robert P. Perdue, Assistant Administrator for Water, Environmental Protection Agency.

Geoff T. Frankpoin, Jr., Assistant Secretary for Fish and Wildlife and Parks, Department of the Interior.

Douglas R. Haas, Director, National Park Service, and Administrator, National Park Service, Department of the Interior.

Memorandum to the Field

Subject: Federal Guidance for the Establishment, Use and Operation of Mitigation Banks

I. Introduction

A. Purpose and Scope of Guidance

This guidance provides policy guidance for the establishment, use and operation of mitigation banks for the purposes of providing compensatory mitigation for authorized adverse impacts to wetlands and other aquatic resources. This guidance is provided expressly to assist Federal personnel, bank sponsors, and others in meeting the requirements of Section 404 of the Clean Water Act (CWA), Section 10 of the Rivers and Harbors Act, the wetland conservation provisions of the Food, Security Act (FSA), i.e., "Swampbuster," and other applicable Federal statutes and regulations. The policies and procedures discussed herein are consistent with current requirements of the Section 10/404 regulatory program and "Swampbuster" provisions and are intended to remove the ambiguity of existing requirements to mitigation banking.
The policies and procedures discussed herein are applicable to the establishment, use and operation of public mitigation banks, as well as to privately-sponsored mitigation banks, including the multi-party banks (e.g., entrepreneurial banks).

B. Background

For purposes of this guidance, mitigation banking means the restoration, creation, enhancement and, in exceptional circumstances, preservation of wetlands and/or other aquatic resources expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources.

The objective of a mitigation bank is to provide for the replacement of the chemical, physical and biological functions of wetlands and other aquatic resources which are lost as a result of authorized impacts. Using appropriate methods, the newly established functions are quantified as mitigation "credits" which are available for use by the bank sponsor or by other parties to compensate for adverse impacts (i.e., "debts"). Consistent with mitigation policies established under the Council on Environmental Quality Implementing Regulations (CEQ regulations) (40 CFR Part 1508.20), and the Section 108(b)(1) Guidelines (40 CFR Part 230), the use of credits may only be authorized for the purposes of complying with Section 10/404 when adverse impacts are unavoidable. In addition, for both the Section 10/404 and "Swampbuster" programs, credits may only be authorized when on-site compensation is either impracticable or use of a mitigation bank is environmentally preferable to on-site compensation. Prospective mitigation banks may be authorized to construct or anticipate participation in the establishment of a mitigation bank as ultimate authorization for specific projects, and executing such projects from any applicable requirements, or as preauthorizing the use of credits from that bank for any particular project.

Mitigation banks provide greater flexibility to applicants seeking to comply with mitigation requirements and can have several advantages over individual mitigation projects, some of which are listed below:

1. It may be more advantageous for maintaining the integrity of the aquatic ecosystem to consolidate compensatory mitigation into a single large parcel or contiguous parcels when ecologically appropriate.

2. Establishment of a mitigation bank can bring together financial resources, planning and scientific expertise not practicable to many project-specific compensatory mitigation proposals.

This consolidation of resources can increase the potential for the establishment and long-term management of successful mitigation that maximizes opportunities for contributing to biodiversity and/or watershed function.

3. Use of mitigation banks may reduce permit processing times and provide more cost-effective compensatory mitigation opportunities for projects that qualify.

4. Compensatory mitigation is typically implemented and functioning in advance of project impacts, thereby reducing temporal losses of aquatic functions and uncertainty over whether the mitigation will be successful in offsetting project impacts.

5. Consolidation of compensatory mitigation within a mitigation bank increases the efficiency of limited agency resources in the review and compliance monitoring of mitigation projects, and thus improves the reliability of efforts to restore, create or enhance wetlands for mitigation purposes.

6. The existence of mitigation banks can contribute towards attainment of the goal for no overall net loss of the Nation's wetlands by providing opportunities to compensate for authorized impacts when mitigation might not otherwise be appropriate or practicable.

II. Policy Considerations

The following policy considerations provide general guidance for the establishment, use and operation of mitigation banks. It is important to demonstrate intent that this guidance be applied to mitigation bank proposals for approval on or after the effective date of this guidance and to those in early stages of planning or development. It is not intended that this policy be retroactive for mitigation banks that have already received agency approval.

While it is recognized that individual mitigation banking proposals may vary, it is the intent of this guidance that the fundamental principles be applicable to future mitigation banks.

For the purposes of Section 10/404, and consistent with the CEQ regulations, the Guidelines, and the Memorandum of Agreement Between the Environmental Protection Agency (EPA) and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines, mitigation means sequentially avoiding impacts, minimizing impacts, and compensating for remaining unavoidable impacts.

Compensatory mitigation, under Section 10/404, is the restoration, creation, enhancement, or, in exceptional circumstances, preservation of wetlands and/or other aquatic resources for the purpose of compensating for unavoidable adverse impacts. A site where wetlands and/or other aquatic resources are restored, created, enhanced, or in exceptional circumstances, preserved expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources is a mitigation bank.

A. Authorities

This guidance is established in accordance with the following statutes, regulations, and policies. It is intended to clarify provisions within those existing authorities and does to establish any new requirements:


4. Department of the Army, Section 404 Permit Regulations (33 CFR Parts 320-230). Policies for evaluating permit applications to discharge dredged or fill material.

5. Memorandum of Agreement between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines (February 6, 1996).


8. Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.).


The policies set out in this document are not final agency action, but are intended solely as guidance. The guidance is not intended, nor can it be relied upon, to create any rights.
enforceable, by any party in litigation with the United States. This guidance does not establish or affect legal rights or obligations, and does not apply to any party and it is not finally determined by the agencies in any particular matter. Any regulatory decisions made by the agencies in any particular matter addressed by this guidance will be made by applying the governing law and regulations to the relevant facts.

B. Planning Considerations

1. Goal Setting

The overall goal of a mitigation bank is to provide economically efficient and flexible mitigation opportunities, while fully compensating for wetland and other aquatic resource losses in a manner that contributes to the long-term ecological functioning of the watershed within which the bank is to be located. The goal will include the need to replace essential aquatic functions that are anticipated to be lost through authorized activities within the bank's service area. In some cases, banks may also be used to address other resource objectives that have been identified in a watershed management plan or other resource assessment. It is desirable to set the particular objectives for a mitigation bank (i.e., the type and character of wetlands and/or aquatic resources to be established) in advance of the bank's establishment, and the program should be driven by the anticipated mitigation needs of the area and should support achieving the goals and objectives.

2. Site Selection

The agencies will give careful consideration to the ecological suitability of a site for achieving the goal and objectives of a bank, i.e., that it poses the physical, chemical and biological characteristics to support establishment of the desired aquatic resource and functions. Given the location of the site relative to other ecological features, hydrologic sources (including the availability of water rights), and compatibility with adjacent land uses and watershed management plans are important factors for consideration. It is also important that ecosystem characteristics support development of a wetland of established upland resources (e.g., shallow sub-tidal heritage, mature forest), aquatic sites, or habitat for Federally or State-listed threatened and endangered species or not contain significant habitat which contribute to the viability of a continuously inhabited wetland. Other significant factors for consideration include, but are not limited to, development trends (i.e., anticipated land use changes), habitat status and trends, local or regional goals for the restoration or protection of particular habitat types or functions (e.g., re-establishment of habitat corridors or habitat for species of concern), water quality and floodplain management goals, and the relative potential for chemical contamination of the wetlands and/or other aquatic resources.

Banks may be sited on public or private lands. Cooperative arrangements between public and private entities to use public lands for mitigation banks may be acceptable. In some circumstances, it may be appropriate to site banks on Federal, state, tribal or locally-owned resource management areas (e.g., wildlife management areas, national, or state forests, public parks, recreation areas). The siting of banks on such lands may be acceptable if the internal policies of the public agency allow use of the land for such purposes, and the public agency grants approval. Mitigation credits generated by banks of this nature should be based solely on those values in the bank that are supplemental to the public program(s) already planned or in practice, that is, baseline values represented by existing or already planned public programs including preservation value, should not be counted toward bank credits. Likewise, Federally-funded wetland conservation projects undertaken via separate authority or for other purposes, such as the Conservation Reserve Program, Farmer's Home Administration, state transfers or conservation easements, and Partners for Wildlife Program, cannot be used for the purpose of generating credits within a mitigation bank. However, mitigation credits may be given to a bank under which such undertakings in conjunction with, but supplemental to, such programs in order to maximize the overall ecological benefit of the conservation project.

3. Technical Feasibility

Mitigation banks should be planned and designed to be self-sustaining over time to the extent possible. The techniques for establishing wetlands and/or other aquatic resources must be carefully selected, since this process is constantly evolving. The restoration of historic or substantially-degraded wetlands and/or other aquatic resources (e.g., prior converted cropland, former wetlands) utilizing proven techniques increases the likelihood of success and typically does not result in the loss of other valuable resources. Thus, restoration should be the first option considered when selecting a bank. Because of the difficulty in establishing the correct hydrologic conditions associated with many creation projects and the need for in situ wetland functions involved with certain enhancement activities, these methods should only be considered where there are adequate assurances to ensure success and that the project will result in an overall environmental benefit. In general, banks which involve complex hydraulic engineering features and/or questionable water sources (e.g., pumped) are more costly to develop, operate and maintain, and have a higher risk of failure than banks designed to function with little or no human intervention. The former situations should only be considered where there are adequate assurances to ensure success. This guidance recognizes that in some circumstances wetlands must be actively managed to ensure their viability and sustainability.

Furthermore, long-term maintenance requirements may be necessary and appropriate in some cases (e.g., to maintain fire-dependent plant communities in the absence of natural fire), to control invasive exotic plant species. Proposed mitigation techniques should be well-understood and reliable. When uncertainties surrounding the technical feasibility of a proposed mitigation technique exist, appropriate arrangements (e.g., financial assurances, contingency plans, additional monitoring requirements) should be in place to ensure the likelihood of success. Such arrangements may be phased-out or reduced since the attainment of prescribed performance standards is demonstrated.

4. Role of Preservation

Existing wetlands and other aquatic resources are preserved in conjunction with restoration, creation or enhancement activities, and when it is demonstrated that such preservation will augment the functions of the restored, created or enhanced aquatic resource. Such augmentation may be reflected in the total number of credits available from the bank.

In addition, the preservation of existing wetlands and other aquatic resources in perpetuity may be safeguarded at the rate basis for generating credits in multiple banks only in exceptional circumstances, consistent with existing regulations, policies and guidance. Under such circumstances, preservation may be accomplished through the implementation of appropriate legal measures (e.g., conservation easements, deed restrictions, conservation easement) to protect wetlands and/or other aquatic resources, accompanied by
implementation of appropriate changes in land use or other physical changes as necessary (e.g., installation of restrictive fencing).

Determining whether preservation is appropriate is the sole basis for generating credit at a mitigation bank requires careful judgment regarding a number of factors. Considerations must be given to whether wetlands and/or other aquatic resources that are preserved for preservation (1) perform physical or biological functions, the preservation of which is important to the region in which the aquatic resources are located, and (2) are under demonstrable threat of loss or substantial degradation due to human activities that might not otherwise be expected to be restricted.

The existence of a demonstrable threat will be based on clear evidence of destructive land use changes which are consistent with local and regional land use trends and are not the consequence of actions under the control of the bank sponsor. Wetlands and other aquatic resources located under the Conservation Reserve Program or similar programs requiring only temporary conservation agreements may be eligible for banking credit upon termination of the original easement if the wetlands are provided permanent protection and it would otherwise be lost or degraded if the bank did not sponsor the preservation and the timing of such loss or degradation. However, the preservation credit for aquatic resources impacts will typically require a greater number of acres from a preservation bank than from a bank which is based on restoration, creation or enhancement of wetlands.

5. Inclusion of Upland Areas

Credit may be given for the inclusion of upland areas occurring within a bank only to the degree that such features increase the overall ecological functions of the bank. If such features are included as part of a bank, it is important that they receive the same protected status as the rest of the bank and be subject to the same operational procedures and requirements. The presence of upland areas may increase the per-unit value of the aquatic habitat in the bank. Alternatively, limited credit may be given to upland areas protected within the bank that reflect the functions inherently provided by such areas (e.g., nutrient and sediment filtration of stormwater runoff, wildlife habitat diversity) which directly enhance or maintain the integrity of the aquatic ecosystem and that might otherwise be subject to threat of loss or degradation.

An appropriate functional assessment methodology should be used to determine the marine extent to which such features augment the functions of restored, created or enhanced wetlands and/or other aquatic resources.

6. Mitigation Banking and Watershed Planning

Mitigation banks should be planned and developed to address the specific resource needs of a particular watershed. Furthermore, decisions regarding the location, type of wetlands and/or other aquatic resources to be established, and proposed uses of a mitigation bank are most appropriately made within the context of a comprehensive watershed plan. Such watershed planning efforts often identify categories of activities having minimal adverse effects on the aquatic ecosystem and that, therefore, could be authorized under a general permit. In order to reduce the potential cumulative effects of such activities, it may be appropriate to offset these types of impacts through the use of a mitigation bank established in conjunction with a watershed plan.

C. Establishment of Mitigation Banks

1. Prospectus

Prospective bank sponsors should first submit a prospectus to the Army Corps of Engineers (Corps) or Natural Resources Conservation Service (NRCS) to initiate the planning and review process by the appropriate agencies. Prior to submitting a prospectus, bank sponsors are encouraged to discuss their proposal with appropriate Corps officials (pre-application coordination).

It is the intent of these policies to provide preliminary comments to the bank sponsors regarding the general need for and technical feasibility of proposed banks. Therefore, bank sponsors are encouraged to include in the prospectus sufficient information concerning the objectives for the bank and how it will be established and operated to allow the agencies to provide bank feedback. Formal agency involvement and review is initiated with submittal of a prospectus.

The Corps will typically serve as the lead agency for the establishment of mitigation banks. Bank sponsors preparing a prospectus of mitigation banks solely for the purposes of complying with the "sworn in" provisions of FEA should submit their prospectus to the NRCS.

2. Mitigation Banking Instruments

Instruments provided in the prospectus will serve as the basis for establishing the mitigation banking instrument. All mitigation banks need to have a banking instrument as documentation of agency concurrence on the objectives and administration of the bank. The banking instrument should describe in detail the physical and legal characteristics of the bank, and how the bank will be established and operated. For regional banking programs sponsored by a single entity (e.g., a state transportation agency), it may be appropriate to establish an "umbrella" instrument for the establishment and operation of multiple bank sites in a specific area. The need for supplemental site-specific information (e.g., individual site plans) should be addressed in the banking instrument. The banking instrument will be signed by the bank sponsor and the corresponding regulatory and resource agencies represented on the Mitigation Bank Review Team (section II.G). The following information should be addressed, as appropriate, within the banking instrument:

a. Bank goals and objectives;

b. Ownership of bank lands;

c. Bank size and classes of wetlands and/or other aquatic resources proposed for inclusion in the bank, including a site plan and specifications;

d. Description of baseline conditions at the bank site;

e. Geographic service area;

f. Wetland classes or other aquatic resource impacts suitable for compensation;

g. Methods for determining credit and debits;

h. Monitoring procedures;

i. Performance standards for calculating availability and bank success;

j. Reporting protocols and monitoring plans;

k. Contingency and remedial actions and responsibilities;

l. Financial assurances;

m. Compensation ratio;


The terms and conditions of the banking instrument may be amended, in accordance with the procedures used to establish the instrument and subject to agreement by the signatories, in cases where initial establishment of the bank results in a discharge into waters of the United States requiring Section 10/404 authorization. In such cases, the banking instrument will be made part of a Department of the Army permit for that discharge. Submittal of an
individual permit application should be accompanied by a sufficiently-detailed prospectus to allow for concurrent processing of each. Preparation of a banking instrument, however, should not alter the normal permit evaluation process timesframes. A bank sponsor may proceed with activities for the construction of a bank subsequent to receiving the Department of the Army approval. In such instances, however, that a bank sponsor who proceeds in the absence of a banking instrument does so at its own risk. In cases where the mitigation bank is located outside the FSA, the banking instrument will be included in the plan developed or approved by NRCS and the Fish and Wildlife Service (FWS).

3. Agency Roles and Coordination

Collectively, the signatory agencies to the banking instrument will comprise the Mitigation Bank Review Team (MBRT). Representatives from the Corps, EPA, FWS, National Marine Fisheries Service (NMFS) and NRCS, as appropriate given the project use for the bank, should typically comprise the MBRT. In addition, it is appropriate for representatives from state, tribal and local regulatory and resource agencies to participate where an agency has authorities and/or mandates directly affecting or affected by the mitigation of a bank. No agency is required to sign a banking instrument, however, in signing a banking instrument, an agency agrees to the terms of that instrument.

The Corps will serve as Chair of the MBRT, except in cases where the bank is proposed solely for the purpose of complying with the FWS, in which case NRCS will be the MBRT Chair. In addition, where a bank is proposed to satisfy the requirements of another Federal agency for a permit program, it may be appropriate for the administering agency to serve as Chair of the MBRT.

The primary role of the MBRT is to facilitate the establishment of mitigation banks through the development of mitigation banking instruments. Because of the different authorities and responsibilities of each agency represented on the MBRT, there is a benefit in achieving agreement on the banking instrument. For this reason, the MBRT will strive to obtain consensus on its actions. The Chair of the MBRT will have the responsibility for making final decisions regarding the terms and conditions of the banking instrument; where consensus cannot otherwise be reached within a reasonable timeframe (e.g., 90 days from the date of submission of a complete prospectus). The MBRT will review and seek consensus on the banking instrument and final plans for the restoration, construction, enhancement, and/or preservation of wetlands and other aquatic resources.

Conscient with its authorities under Section 10/404, the Corps is responsible for authorizing use of the mitigation bank on a project-specific basis and determining the availability of credits required to compensate for proposed impacts in accordance with the terms of the banking instrument. The Corps will consider comments submitted as part of the permit evaluation process. Similarly, the Corps, in consultation with the FWS, will make the final decision pertaining to the withdrawal of credits from banks as appropriate mitigation pursuant to FSA.

4. Role of the Bank Sponsor

The bank sponsor is responsible for the preparation of the banking instrument in consultation with the MBRT. The bank sponsor should, therefore, have sufficient opportunity to discuss the content of the banking instrument with the MBRT. The bank sponsor is also responsible for the overall operation and management of the bank in accordance with the terms of the banking instrument, including the preparation and distribution of annual monitoring reports and accounting statements/ledgers, as necessary.

5. Public Review and Comment

The public should be given a period of and have an opportunity to comment on all bank proposals. For those proposals which require authorization under an individual Section 10/404 permit or a state, tribal or local program that involves a similar public notice and comment process, public participation will typically be satisfied through such standard procedures. For other proposals, the Corps or NRCS, upon receipt of a complete banking prospectus, should provide notification of the availability of the prospectus for a minimum 30-day public comment period. Notification procedures will be similar to those used by the Corps in the standard permit review process. Copies of all public comments received will be distributed to the other members of the MBRT and the bank sponsor for full consideration in the development of the final banking instrument.

6. Dispute Resolution Procedure

The MBRT will work to reach consensus on its actions in accordance with this guidance. It is anticipated that all issues will be resolved by the MBRT in this manner.

a. Development of the Banking Instrument

Describe the development of the banking instrument, if any agency representative believes that a particular decision raises concern regarding the application of existing policy or guidance, an agency may request, through written notification, that the issue be reviewed by the Corps District Engineer, or NRCS State Conservationist, as appropriate. Said notification should describe the issue in sufficient detail and provide recommendations for resolution. Within 20 days, the District Engineer or State Conservationist (as appropriate) will consult with the MBRT and will resolve the issue. The resolution will be forwarded to the other MBRT members.

b. Application of the Banking Instrument

As previously stated, the Corps and NRCS are responsible for making final decisions on a project-specific basis regarding the use of a mitigation bank for purposes of Section 10/404 and FSA, respectively. In the event an agency on the MBRT is concerned that a proposed use may be inconsistent with the terms of the banking instrument, the agency may raise the issue to the attention of the Chair of the MBRT and permit evaluation process. In order to facilitate timely and effective consideration of agency comments, the Corps or NRCS, as appropriate, will advise the MBRT that a particular issue should be referred to the MBRT for full consideration. The Corps will fully consider comments provided by the review agencies regarding mitigation as part of the permit evaluation process. The NRCS will consult with FWS in making its decisions pertaining to mitigation.

If, in the view of any agency on the MBRT, as issued permit or series of permits reflects a pattern of concern regarding the application of the terms of the banking instrument, that agency may initiate review of the concern by the full MBRT through written notification to the MBRT Chair. The MBRT Chair will convene a meeting of the MBRT, or initiate another appropriate forum for communication, typically within 20 days of receipt of notification, to resolve concerns. Any such effort to address concerns
regarding the application of a banking instrument. Designation of the service area should be based on consideration of hydrologic and biotic criteria, and be stipulated in the banking instrument. Use of a mitigation bank to compensate for impacts beyond the geographic service area should be authorized, on a case-by-case basis, where it is determined to be practicable and environmentally desirable.

The geographic extent of a service area should, to the extent environmentally desirable, be guided by the cataloguing unit of the "Hydrologic Unit map of the United States" (USGS, 1980) and the ecoregion of the "Ecoregions of the United States" (James M. Omer, U.S. EPA, 1989). The designation of a more inclusive service area may be appropriate to mitigate banks whose primary purpose is to compensate for linear projects that typically involve numerous small impacts in several different watersheds.

4. Use of Mitigation Banks vs. On-Site Mitigation

The agencies' preference for on-site mitigation, indicated in the 1999 Memorandum of Agreement, "Mitigation between the EPA and the Department of Agriculture", should preclude the use of a mitigation bank where there is no practical opportunity for on-site compensation, or when use of a bank is environmentally preferable to on-site compensation. On-site mitigation may be preferable where there is a practicable opportunity to compensate for important local functions including local flood control, wildlife habitat for a species or a population with a very limited geographic range or other environmental requirements, or where local water-quality concerns dominate.

In choosing between an outside mitigation and use of a mitigation bank, careful consideration should be given to the likelihood for successfully compensating the impacted habitat, the type, the compatibility of the mitigation project with adjacent land uses, and the practicability of long-term monitoring and maintenance to determine whether project effort will be sustained, as well as the relative cost of mitigation alternatives. In general, use of a mitigation bank to compensate for minor aquatic resource impacts (e.g., numerous, small impacts associated with linear projects, impacts authorized under nationwide permits) is preferable to on-site mitigation. With respect to larger aquatic resource impacts, use of a bank may be appropriate if it is capable of replacing essential physical and/or biological functions of the aquatic resources which are expected to be lost or degraded. Finally, there may be circumstances warranting a combination of on-site and off-site mitigation to compensate for losses.

5. In-kind vs. Out-of-kind Mitigation Determinations

In the interest of achieving functional replacement, in-kind compensation of aquatic resource impacts should generally be required. Out-of-kind compensation may be acceptable if it is determined to be practicable and environmentally preferable to in-kind compensation. In both cases, the compensation should be made of wetlands having ecological value to a particular region. However, non-tidal wetlands should typically not be used to compensate for losses or degradation of tidal wetlands. Decisions on the acceptability of out-of-kind mitigation are typically made on a case-by-case basis during the permit evaluation process. The banking instrument may identify circumstances in which it is acceptable to allow out-of-kind compensation within the context of a particular mitigation bank (e.g., for banks restoring a complex of associated wetland types). Mitigation banks developed as part of an area-wide management plan to address a specific resource objective (e.g., restoration of a particularly vulnerable or valuable wetland habitat type) may be an example of an in-kind compensation that is environmentally preferable to on-site compensation.

6. Timing of Credit Withdrawal

The number of credits available for withdrawal (i.e., debiting) should generally be commensurate with the level of aquatic functions attained at a bank at the time of debiting. The level of function may be determined through the application of performance standards tailored to the specific recognition, creation or enhancement activity being compensated through the use of an appropriate functional assessment methodology.
The success of a mitigation bank with regard to its capacity to establish a healthy and fully functional aquatic system related to the ecological and financial viability of the bank. Since financial considerations are particularly critical in early stages of bank development, it is generally appropriate, in cases where there is adequate financial assurance and where the likelihood of the success of the bank is high, to allow limited debiting of a percentage of the total credits projected for the bank at maturity. Such determinations should take into consideration the initial capital costs needed to establish the bank and the likelihood of its success. However, it is the intent of this policy to ensure that the actions necessary for the long-term viability of a mitigation bank be accomplished prior to any debiting of the bank. In this regard, the following minimum requirements should be satisfied prior to debiting: (1) banking instrument and mitigation plans have been approved; (2) bank site has been secured; and (3) appropriate financial assurances have been established. In addition, initial physical and biological improvements should be completed no later than the first fall growing season following initial debiting of a bank. The success of the project has not been debited from a bank in the manner anticipated, immediately upon implementation of other mitigation bank activities. Each time an approved debited credit transaction occurs at a given bank site, the bank sponsor should submit a statement to the bank to the appropriate agency. The bank sponsor should also maintain an annual hedge report for all mitigation bank accounts to be submitted to the MBBT Chair for distribution to each member of the MBRT. The cost of mitigation credits to a third party is determined by the bank sponsor.

Party Responsible for Bank Success

The bank sponsor is responsible for assuring the success of the debited restoration, creation, enhancement and preservation activities at the mitigation bank. It is therefore extremely important that an enforceable mechanism be adopted establishing the responsibility of the bank sponsor to develop and operate the bank properly. Where authorization under Section 10/ 404 and/or FSA is necessary to establish the bank, the Department of the Army permit or NRCS plan should be conditioned to ensure that provisions of the banking instrument are enforceable by the appropriate agency. It is not uncommon for provisions concerning the activities at the mitigation bank to be included in the permit or plan as long-term measures, alternative measures, or as conditions for the permit to be effective. Such conditions can range from prohibitions on the use of the bank in the absence of a satisfactory debiting plan to the restriction of certain activities on the site.
5. Financial Assurances

The bank sponsor is responsible for securing sufficient funds or other financial assurances to cover contingency actions in the event of bank default or failure. Accordingly, banks posing a greater risk of failure and where credits have been debited, should have comparatively higher financial assurances in place, than those where the likelihood of success is more certain. In addition, the bank sponsor is responsible for securing adequate funding to monitor and maintain the bank throughout its operational life, as well as beyond the operational life if not self-sustaining. Total funding requirements should reflect realistic cost estimates for monitoring, long-term maintenance, contingency, and remedial actions.

Financial assurances may be in the form of performance bonds, irrevocable trusts, escrow accounts, casualty insurance, letters of credit, legislatively-enacted dedicated funds for government operate banks or other approved instruments. Such assurances may be phased out or reduced, once it has been demonstrated that the bank is functionally mature and/or self-sustaining (in accordance with performance standards).

6. Remedial Action

The banking instrument should stipulate the general procedures for identifying and implementing remedial measures at a bank, or any portion thereof. Remedial measures should be based on information contained in the continuing reports (i.e., the attainment of prescribed performance standards), as well as agency site inspections. The need for remedial actions is determined by the authorizing agencies in consultation with the MBRT and bank sponsor.

7. Special Considerations for "Swingblaster"

Current FSA legislation limits the extent to which mitigation banking can be used for FSA purposes. Therefore, if it is determined that bank is to be used for FSA purposes, it must meet the requirements of FSA.

III. Definitions

For purposes of this guidance document the following terms are defined:

A. Authorizing agency. Any Federal, state, tribal, or local agency that has authorized a particular use of a mitigation bank as compensation for an authorized activity; the authorizing agency will typically have the enforcement authority to ensure that the terms and conditions of the banking instrument are satisfied.

B. Bank sponsor. Any public or private entity responsible for establishing and, in most circumstances, operating a mitigation bank.

C. Compensatory mitigation. For purposes of Section 106/404, compensatory mitigation is the restoration, creation, enhancement, or in exceptional circumstances, preservation of wetlands and/or other aquatic resources for the purpose of compensating for unavoidable adverse impacts which result from after-appropriate and practicable avoidance and minimization has been achieved.

D. Consensus. The term "consensus" as defined herein, is a process by which a group synthesizes its concerns and ideas to form a common collaborative agreement acceptable to all members.

E. Creation. The establishment of a wetland mitigation bank, or the conditions where one did not formerly exist.

F. Credit. A unit of measure representing the accrual or attainment of aquatic functions at a mitigation bank; the measure of function is typically indexed to the number of wetland acres restored, created, enhanced or preserved.

G. Data. A unit of measure representing the loss of aquatic functions at an impact or project site.

H. Enhancement Activity. Activities conducted in existing wetlands or other aquatic resources which increase one or more aquatic functions.

I. Mitigation. For purposes of Section 106/404 and the Section 404(b)(1) Guidelines, and the Memorandum of Agreement Between
the Environmental Protection Agency and the Department of the Army Concurring in the Determination of Mitigation under the Clean Water Act Section 404(h)(1) Guidelines, mitigation means sequentially avoiding impacts, minimizing impacts, and compensating for remaining unavoidable impacts.

J. Mitigation bank: A mitigation bank is a site where wetlands and/or other aquatic resources are restored, created, enhanced, or in exceptional circumstances, preserved expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources. For purposes of Section 102/404, use of a mitigation bank may only be authorized when impacts are unavoidable.

K. Mitigation Bank Review Team (MBRT). An interagency group of Federal, state, tribal and/or local regulatory and resource agency representatives which are signatory to a banking instrument and oversees the establishment, use and operation of a mitigation bank.

L. Practicable. Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

M. Preservation. The protection of ecologically important wetlands or other aquatic resources in perpetuity through the implementation of appropriate legal and physical mechanisms. Preservation may include protection of upland areas adjacent to wetlands as necessary to assure protection and/or enhancement of the aquatic ecosystem.

N. Restoration. Re-establishment of wetland and/or other aquatic resource characteristics and functions at a site where they have ceased to exist, or exist in a substantially degraded state.

O. Service area. The service area of a mitigation bank is the designated area (e.g., watershed, county) wherein a bank can reasonably be expected to provide appropriate compensation for impacts to wetlands and/or other aquatic resources.

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BILLING CODE 3510-FA-2
MITIGATION BANK PROSPECTUS GUIDELINES

These guidelines list the information that the Mitigation Bank Review Team (MBRT) would prefer to receive in a prospectus. This listing is intended to be at a level where the prospective banker can provide the basic information needed to understand the project without a detailed application. However, the more information that is provided, the more guidance that can be provided by the MBRT. The state rules on mitigation banking do not require that a prospectus be submitted nor that this information be completely supplied initially. However, submission of a prospectus to the Corps initiates formal agency action at the Federal level.

Narrative overview of the project describing how the resulting increase in ecological value at the site will improve conditions in the regional watershed (or the proposed mitigation service area).

Be sure to include a discussion of the current ecological value, the proposed ecological value, and how the difference between these will be quantified. Relevant to this discussion is presence of special biological resources, adjacent landowners and land uses.

Aerial photography of the project site.

Types of mitigation proposed: Restoration, Enhancement, Creation and/or Preservation.

Types of mitigation and how the mitigation will be accomplished.

- Hydrologic restoration via filling ditch network.
- Re-establishment of fire regime.
- Re-establishment of native vegetative communities via (name activity proposed).
- Other.

Existing vegetative community types and target native community types.

Acreages of each type of work: Restoration, Enhancement, Creation, and/or Preservation.

What interest in the property do you have and will you maintain?
- Fee simple ownership?
- Lease or use agreement?
- Other?

What is the proposed Mitigation Service Area?

Who are the anticipated customers?

What is the anticipated schedule for completion of the bank
17-342.100 Intent.

17-342.200 Use of a Mitigation Bank.

17-342.300 Credit toward Establishing a Mitigation Bank.

17-342.450 Mitigation Bank Permit Applications.

17-342.470 Establishment of Mitigation Credits.

17-342.500 Contribution of Lands.

17-342.600 Mitigation Service Areas.

17-342.650 Land Use Restrictions on Mitigation Banks.


17-342.750 Mitigation Bank Permit and Mitigation Bank Conceptual Approval.

17-342.800 Surrender, Transfer, or Modification of Mitigation Bank Permits.

17-342.850 Water Management District Mitigation Banks.

17-342.100 Intent.

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17-342.750 Mitigation Bank Permit and Mitigation Bank Conceptual Approval.

17-342.800 Surrender, Transfer, or Modification of Mitigation Bank Permits.

17-342.850 Water Management District Mitigation Banks.

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(6) "Mitigation Service Area" means the geographic area within which activities of regulated activities on the Milpitas Creek to San Jose project that may be offset will occur as a result of activities regulated by the Mitigation Bank, Mitigation Bank Permit, or a permit issued by a permit holder to construct, operate, manage and maintain a Mitigation Bank.

(7) "Mitigation Bank Permit" means a permit issued to a bank to construct, operate, manage and maintain a Mitigation Bank.

(8) "Mitigation Bank" means a project undertaken to provide for the withdrawal of mitigation credits to offset adverse impacts.

(9) "Success" means that a Mitigation Bank meets the success criteria provided in Rule 17-322.370, F.A.C. and in the Mitigation Bank Permit.

Specific Authority: 373.4139, 373.418, 403.061, F.S.
Law Implemented: 373.4135, F.S.
History: New 02-02-94.

17-342.300 Use of a Mitigation Bank.

(1) Use of a Mitigation Bank is appropriate, desirable, and a permissible mitigation option when the Mitigation Bank will offset the adverse impacts of the project; and

(a) on-site mitigation opportunities are not expected to have comparable long-term sustainability due to such factors as unsuitable hydrologic conditions or ecologically incompatible uses identified in a local comprehensive plan adopted according to 17-202.000; or

(b) use of the Mitigation Bank will provide greater long-term sustainability than on-site or off-site measures.

(2) In some cases, a combination of on-site mitigation and participation in a Mitigation Bank will be appropriate to offset adverse impacts of a project.

Specific Authority: 373.4139, 373.418, 403.061, F.S.
Law Implemented: 373.4135, F.S.
History: New 02-02-94.

17-342.400 Criteria for Establishing a Mitigation Bank.

(a) The following criteria shall be met to establish a Mitigation Bank:

(i) The bank shall provide reasonable assurance that the proposed Mitigation Bank will:

(a) improve ecological conditions of the regional watershed;

(b) provide viable and sustainable hydrologic functions for the proposed service area; and

(c) be effectively managed in the long term;

(ii) not destroy areas with high ecological value;

(iii) achieve mitigation success; and

(iv) not be adjacent to lands which will not adversely affect the long-term viability of the Mitigation Bank due to unsuitable land uses or conditions.

(b) A Mitigation Bank may be implemented in phases if each phase independently meets the requirements of subsection 17-342.400(5) above.

(c) The banker shall:

(i) have sufficient legal or equitable interest in the property to meet the requirements of subsection 17-342.400; and

(ii) meet the financial responsibility requirements of subsection 17-342.700.

Specific Authority: 373.4139, 373.418, 403.061, F.S.
History: New 02-02-94.

17-342.450 Mitigation Bank Permit Applications.

Any person or entity proposing to establish a Mitigation Bank must apply for a Mitigation Bank Permit. An application for a Mitigation Bank Permit shall also constitute an application for any required permit authorized under Part IV of Chapter 373, F.S. Mitigation Bank Permit applications shall be processed according to Chapter 120, F.S. To provide the Department with reasonable assurance that the proposed Mitigation Bank will meet the criteria in this section, each Mitigation Bank Permit application submitted to the Department shall include the information required pursuant to Part IV of Chapter 373, F.S., and the information specified below as appropriate for the project:

(1) A description of the location of the proposed Mitigation Bank which shall include:

(a) a map at regional scale showing the project area in relation to the regional watershed and proposed mitigation service area;

(b) a vicinity map showing the project area in relation to adjacent lands and offsite areas of ecologic or hydrologic significance which could affect the long-term viability or ecological value of the bank;

(c) an aerial photograph identifying the project area;

(d) a roadway map showing points of access to the Mitigation Bank for site inspection; and

(e) a legal description of the proposed mitigation bank.

(2) A description of the ecological significance of the proposed Mitigation Bank to the regional watershed in which it is located.

(a) A description and assessment of current site conditions which shall include:

17-342.400(1)(e) - 17-342.450(3)

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(a) a soils map of the project area;
(b) a topographic map of the project area and adjacent hydrologic subwatersheds, including floodplain and receding areas;
(c) a hydrologic features map of the project area and adjacent hydrologic contributing and receiving areas;
(d) current hydrologic conditions in the project area;
(e) a list of the vegetation areas;
(f) ecological benefits currently provided to the regional watershed by the project area;
(g) adjacent lands, including existing land use and conditions, projected land use according to comprehensive plans adopted pursuant to Chapter 64, F.S., by local governments having jurisdiction, and any special designations or classifications associated with adjacent lands or waters; and
(h) a disclosure by the applicant of any material fact which would affect the contemplated use of the property.

(4) A mitigation plan describing the activities to establish, construct, operate, manage and maintain the Mitigation Bank which shall include:
(a) a construction-level evaluation detailing proposed topographic alterations and associated structural components associated with proposed activities;
(b) proposed mitigation activities, including a detailed schedule for implementation;
(c) an impact monitoring plan detailing schedule and detailed schedule for implementation;
(d) measures to be implemented during and after construction to avoid adverse impacts related to proposed activities;
(e) a detailed long term management plan comprising all aspects of operation and maintenance, including water management practices, vegetation establishment, exotic and nuisance species control, fire management, and control of access; and
(f) a proposed monitoring plan to demonstrate mitigation success.

(5) An assessment of improvement or changes in ecological value anticipated as a result of proposed mitigation activities, which shall include:
(a) a description of anticipated site conditions in the Mitigation Bank after the mitigation plan is successfully implemented;
(b) a comparison of current fish and wildlife habitat to expected habitat after the mitigation plan is successfully implemented;
(c) a description of the expected ecological benefits to the regional watershed.

17-342.450(4)(a) - 17-342.450(5)(c)

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(6) Evidence of sufficient legal or equitable interest in the property which is to become the Mitigation Bank to satisfy the requirements of section 17-342.450.

(7) Draft documentation of financial responsibility meeting the requirements of section 17-342.100.

(8) Any additional information which may be necessary to evaluate whether the proposed Mitigation Bank meets the criteria of this section.

Specific Authority: 373.4135, 373.418, 401.061, F.S.
Law Implemented: 373.4135, F.S.
History: New 02-02-94.

17-342.470 Establishment of Mitigation Credits.

(1) Based upon the information submitted by the applicant, and an assessment of the proposed Mitigation Bank pursuant to the criteria in this section, the Department will assign a number of Mitigation Credits to the proposed Mitigation Bank, or phases thereof.

(2) A Mitigation Credit is a unit of measure which represents the increase in ecological value resulting from restoration, enhancement, preservation, or creation activities. For purposes of establishing a standard unit of measure, one Mitigation Credit is equivalent to the ecological value gained by the successful creation of one acre of wetland. Mitigation Credits assigned for enhancement, restoration or preservation of wetlands or uplands will be based on the extent of improvement in ecological value resulting from these activities relative to that obtained by successfully creating one acre of wetland. In determining the degree of improvement in ecological value, the following factors will be considered:
(a) The extent to which target hydrologic regimes can be achieved and maintained.
(b) The extent to which management activities promote natural ecological conditions, including natural fire patterns.
(c) The proximity to areas of national, state, or regional ecological significance, such as national or state parks, Outstanding National Wildlife Refuges, and Outstanding Florida Waters, and other regionally significant ecological resources or habitats, such as lands acquired or to be acquired through governmental or non-profit land acquisition progress for environmental conservation, and the establishment of corridors to those resources or habitats.
(d) The quality and quantity of wetland or upland restoration, enhancement, preservation, or creation.
(e) The ecological and hydrological relationship between wetlands and uplands in the Mitigation Bank.

(6) The extent to which the Mitigation Bank provides

17-342.450(6) - 17-342.470(2)(f)

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the Mitigation Bank. If the agency purporting the impact determination that use of the Mitigation Credits proposed by the applicant is appropriate to offset the adverse impacts, it shall notify the Department. Upon receipt of this notice, the Department shall determine if a sufficient number and type of Mitigation Credits are available, withdraw the Mitigation Credits, and notify the agency purporting the impact determination that use of the Mitigation Credits is not appropriate to offset the adverse impacts of the Mitigation Bank. The Department shall annually submit a report of Mitigation Credits sold, transferred, or used from its Mitigation Bank to the Department. Specific Authority: 373.4135, 373.418, 403.061, F.S. Law Implemented: 373.4135, F.S. History: New 02-2-94.

17-342.500 Contribution of Lands. A permit applicant may contribute land to a Mitigation Bank if:
(1) the adverse impacts are to be offset by the land donation are within the Mitigation Service Area of the Mitigation Bank, except as provided in Section 17-342.400(4);
(2) the land will offset adverse impacts of the proposed project;
(3) the land is adjacent to or will become a Department approved Mitigation Bank; and
(4) the land will improve or enhance the ecological value of a Department approved Mitigation Bank.

Funds may be contributed to a Mitigation Bank by purchase of Mitigation Credits from the bank. The cost per Mitigation Credit shall be set by the Department, but shall not exceed the higher of:
(1) the estimated cost, at the time of final permit processing, of creating one acre of wetland on the project site, including the current fair market value, established 17-342.470(9) (cont'd.) - 17-342.550(1)
A certified appraisal of the market value of the property or interest to be conveyed to determine the appropriate amount of title insurance.

Assurance of the marketability of the interest in real property being acquired in the form of a marketable title commitment and owner's title policy (ALTA Form B) in an amount at least equal to the fair market value, as established in subsection 17-342.650(4)(b), of the real property. The coverage, form and exceptions of the title insurance policy shall be acceptable to Department as in order to assure that the Department's Interests are fully protected.

If a fee simple interest is being conveyed, a Phase I environmental audit identifying any environmental problems which may affect the liability of the Department or Board of Trustees and any additional audits as determined necessary.

The Department shall require additional documentation or actions from the grantor of the conservation easement or fee interest if such additional documentation or actions are necessary to adequately protect the Department's interest in, or the integrity of, the Mitigation Bank.

The grantor shall pay the documentary revenue stamp tax of all other taxes or costs associated with the conveyance, including the cost of recording the deed or easement and any other recordable instruments required by the Department or Board of Trustees, unless prohibited or exempt by law, as a condition of the receipt of the conveyance.

All real estate taxes and assessments which are or which may become a lien against the property shall be satisfied of record by the grantor before or at closing. If necessary, the grantor shall, in accordance with Section 164.295, F.S., place funds in escrow with the county tax collector.

The grantor shall remove all abandoned personal and solid waste from the property to satisfaction of the Board of Trustees as a condition of receipt of the conveyance.

The grantor shall provide the Department with access to the property to perform any tasks necessary to ensure compliance with the Mitigation Bank Permit and any permits issued under this Part.

A certified conservation easement or property deed within 30 days of issuance of the Mitigation Bank Permit. The bank shall submit the Department a certified copy of the recorded conservation

17-342.650(4)(b) - 17-342.650(10)

17-342.700 Financial Responsibility

(1) To provide reasonable assurance that the proposed Mitigation Bank will meet the requirements of this section and the associated permit conditions, the financial responsibility of the banks shall provide proof of financial responsibility for:

(1) The construction and implementation phase of the bank, and

(2) The long-term management of the bank, as required in this section.

Environmental entities shall provide proof of financial responsibility pursuant to Section 17-342.715. If the amount of financial responsibility provided in the mechanisms required in this section shall be based on the costs determined pursuant to Section 17-342.700(4).

(2) Financial Responsibility Documentation. The applicant shall provide draft documentation of the financial responsibility mechanisms described below with the permit application, and shall submit to the Department the executed or finalized documentation within the time frames specified in the permit. The provisions of this section shall also apply for any modifications to the Mitigation Bank Permit.

(3) General Terms for Financial Responsibility Mechanisms. In addition to the specific provisions on financial responsibility mechanisms for construction and implementation in subsection 17-342.700(4) and long-term management in subsection 17-342.700(5), the following terms shall be complied with:

(a) The financial responsibility mechanisms shall name the Department as sole beneficiary and shall be payable to the Department. The financial responsibility mechanism shall be retained by the Department as appropriate.

(b) The financial responsibility mechanisms shall be established with federal or national bank, savings and loan association, or other financial institution, licensed in this state, in the case of letters of credit, the character of credit, and whose letter of credit shall have access to the property to perform the tasks necessary to ensure compliance with the Mitigation Bank Permit and any permits issued under this Part.

(c) No person shall withdraw or transfer any portion of the moneys provided for financial responsibility without first obtaining prior written approval from the Department.

17-342.650(10)(cont'd.) - 17-342.700(3)(c)
(d) The financial responsibility mechanisms shall not expire or terminate prior to completion of the applicable period conditions.

(e) The financial responsibility mechanisms shall not be terminated prior to completion of the applicable period without prior written approval of the Department. Within 90 days of the completion of construction, the user shall provide an alternate financial responsibility mechanism which meets the requirements of this section and obtain prior written approval of the Department.

(f) If the mitigation bank has failed to comply with the terms and conditions of the permit, the Department upon reasonable notice may draw upon the financial mechanism.


(a) No financial responsibility shall be required where the construction and implementation is performed by the user and approval has been granted by the Department.

(b) Financial responsibility for the construction and implementation of each phase of the Mitigation Bank, or phase thereof, is required prior to the withdrawal of any credits.

(c) Financial responsibility for the construction and implementation shall include all costs associated with construction and implementation of the Mitigation Bank, or phase thereof, including earthmoving, grading, planting, structure installation, monitoring activities and reports.

(d) The financial responsibility mechanism established shall equal the cost of construction and implementation of each phase of the Mitigation Bank which is being implemented, pursuant to Section 17-342.700(4). When a current phase has been designated to be completed and constructed, implemented, and trending toward success in compliance with the approved plan, the respective amount of financial responsibility shall be released, or transferred to the financial responsibility mechanism.


17-342.700(4) 17-342.700(5)

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(a) A banker shall establish a trust fund agreement to provide financial responsibility for the long term management of the Mitigation Bank, or phase thereof. Trust fund agreements shall be submitted in a format approved by the Department and which meets standard industry practices.

(b) The amount of financial responsibility shall equal the cost of long term management, pursuant to Section 17-342.700(6), for all previously constructed phases and the current phase for which credits have been approved for withdrawal.

(c) The trust fund agreement shall be effective and fully funded at least 60 days prior to the withdrawal of credits from the Mitigation Bank, or phase thereof, or as otherwise provided in the Mitigation Bank permit prior to the withdrawal of credits.

(d) Cost estimates.

(a) For the purpose of determining the amount of financial responsibility that is required in this section, the banker shall submit a detailed written estimate, in current dollars, of the total cost of construction and implementation and long term management of the Mitigation Bank.

(b) The cost estimate for construction and implementation shall include all costs associated with construction and implementation of the Mitigation Bank, or phase thereof, including earthmoving, grading, planting, structure installation, consultant fees, monitoring activities and reports.

(c) The cost estimate for the long term management of the Mitigation Bank shall be based on the costs of maintaining and operating any structures, controlling nuisance or exotic species, fire management, consultant fees, monitoring activities and reports, and any other costs associated with long term management. The amount of financial responsibility shall equal the cost of long term management for all previously constructed phases and the current phase for which the withdrawal of credits is imminent.

(d) The banker shall submit the estimates, together with verifiable documentation, to the Department for approval along with the proof that the banker has agreed to indemnify the party performing the work and that proper insurance or letters of credit are available for the amount of financial responsibility.

(e) The cost estimates shall be submitted and based on a third party survey report.

(f) Cost adjustments.

(a) The banker shall, every year, adjust the amount of financial responsibility provided for the...
construction, implementation, and long term management. Every two years the banker shall submit to the Department a
We cost adjustment statement accomplished by supporting documentation. Construction, implementation, and long term
management costs shall be listed separately.
(5) At each cost adjustment, the banker shall revise
the construction and implementation cost estimates for
inflation and changes in the costs to complete the current
phase of the Mitigation Bank.
(6) At each cost adjustment, the banker shall revise
the long term management cost estimate for inflation
and changes in the costs to carry out the long term management
conditions of the permit.
(7) Revised cost estimates shall be used as the basis
for modifying the financial mechanisms. If the value of the
financial mechanisms is less than the total amount of the
management cost estimates, the banker shall, upon
Department approval, increase the value of the financial
mechanisms to reflect the new estimates within 60 days. If
the value of the funding mechanisms is greater than the
total amount of the current cost estimates, the banker may
reduce the value of the funding mechanisms to reflect the
new estimates upon receiving Department approval.
(8) The Department may require adjustment of the amount
of financial responsibility provided for construction,
implementation and long term management at times other than the
cost adjustment period when the costs associated with compliance
with the financial mechanisms exceed the current
amount of financial responsibility and such financial
assurances are deemed necessary to ensure compliance with
the permit conditions.
(9) Financial Responsibility for Governmental,
Non-Department and Non-Water Management District,
Mitigation Banks.
(a) Governmental entities other than the Department or
Districts shall demonstrate financial responsibility for
construction and implementation by any of the mechanisms in
Section 17-342.702(4) above, or by other financial
mechanisms acceptable to the Department which are
sufficient to meet the requirements of this section.
(b) Governmental entities other than the Department or
District shall establish a trust fund for the long term
management costs of the Mitigation Bank in accordance
with Section 17-342.702(5) above. The trust fund agreement
for long term management costs shall allow Mitigation Credits
are withdrawn, provided that the trust fund agreement is
fully funded and Mitigation Credits are withdrawn.
17-342.700(7)(a)(cont'd) - 17-342.700(8)(d)
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Governmental entities shall comply with the cost adjustment
provisions in Section 17-342.700(1).
Specific Authority: 373.413, 373.418, 403.061, F.S.
Law Implemented: 373.415, F.S.
History: New 02-02-94.
17-342.700(9) Mitigation Bank Permit and Mitigation
Bank Conceptual Approval.
If the Mitigation Bank proposal meets the criteria in
this section, the Department shall issue a Mitigation Bank
Permit to the banker. An authorization under this section
may be issued in two forms: a Mitigation Bank Permit or a
Mitigation Bank Conceptual Approval.
(1) The Mitigation Bank Permit authorizes the
implementation and operation of the Mitigation Bank and
sets forth the rights and responsibilities of the banker and the
Department for the implementation, management,
maintenance and operation of the Mitigation Bank.
The Mitigation Bank Permit shall include the following:
(a) A description of the Mitigation Service Area.
(b) The maximum number of Mitigation Credits available
for use when the Mitigation Bank, or phase thereof, is
determined to be successful, the type of Mitigation Credits awarded,
and the number and schedule of Mitigation Credits available for
use prior to success.
(c) The success criteria by which the Mitigation Bank
will be evaluated. "Success" means when a Mitigation Bank meets
the success criteria provided in Section 17-312.399,
F.A.C., and in the Mitigation Bank Permit.
(d) The financial responsibility mechanism which must be employed by the banker, including the procedure for
drawing on the financial mechanisms by the Department
provisions for adjustment of the financial responsibility
mechanism.
(e) Requirements for the execution and recording of the
conservation easement or conveyance of the fee interest as provided in section 17-342.650.
(f) A ledger listing Mitigation Credits available in
the Mitigation Bank.
(g) A schedule for implementation of the Mitigation
Bank, and any phases therein.
(h) The long term management requirements for the
mitigation bank.
(2) A Mitigation Bank Permit shall automatically expire five years from the date of issuance if the banker has not
recorded a conservation easement or conveyed a fee simple
interest, as appropriate, over the real property within the
Mitigation Bank, or phase thereof, in accordance with the
Mitigation Bank Permit; or, when no property interest is
required to be recorded, the Mitigation Bank
17-342.700(9)(d)(cont'd) - 17-342.750(2)
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APPENDIX J
Emergent Wetland Changes
1950–1990
EMERGENT WETLAND CHANGES (1950-1990)
Lower Tampa Bay

Net Acreage Changes:
- Conversion
- Loss
- No Change
- Gain

Scale 1:145,000
Projection UTM
Datum NAD 27

0 1 2 miles

Geo-Knowledge, Inc.
Map Publication No. 3953601
EMERGENT WETLAND CHANGES (1950-1990)
Boca Ciega Bay

Net Acreage Changes:
- Conversion
- Loss
- No Change
- Gain

Scale: 1:455,000
Projection: UTM
Datum: NAD 27

miles

455000

Copyright Environmental, Inc.
Map Publisher No. LSIS000
1990 EMERGENT WETLANDS
Hillsborough Bay

Scale 1:10,000
Projection M TM
Datum NAD 27

Habitat Classes:
■ Mangrove/Marin
■ Tidal Marsh
■ Salt Marsh
1950 EMERGENT WETLANDS
Lower Tampa Bay

Habitat Classes:
- Mangrove/Marsh
- Toilet Marsh
- Salt Barren

Scale 1:145,000
Projection: UTM
Datum: NAD 27

Map Prepared by Coastal Environmental, Inc.
Dear Holly:

I recently reviewed a Draft (10/95) Document entitled: "Setting Priorities for Habitation Protection and Restoration: Restoring the Balance". My comments relate to Page 11, Table 8. Restoration projects, completed and in progress by SWIM and FDEP...... The Table makes only one reference to DNR and none to FMRI in spite of our direct involvement with saltmarsh restoration efforts at ten major sites totaling over 325,000 units of Spartina (over 20 acres). While FMRI is certainly part of DEP, for the projects I have outlined below, the Southwest District Office used Pollution Recovery Trust Funds and typically performed or contracted the site planning / design / clearing / construction and FMRI used County Net License Monies or SWIM grant funds to purchase the plants and complete the plantings. In those projects where FMRI used SWIM grant funds, SWIM was a silent partner and FMRI initiated the contract agreement, purchased the plants and implemented the plantings. Nevertheless FMRI has received very little recognition for our part in these restoration projects.

The Table likewise fails to mention any of FMRI seagrass restoration efforts at six sites in Tampa Bay: beginning with Lassing Park funded by County Net License, in 1987; five sites funded by Special Legislative appropriation by Ms. Mary Figg, Rep. Hillsborough County; in 1987; another three sites funded by SWIM, in 1988; and a Cost Benefit Analysis at Lassing Park funded by DEP Pollution Recovery, in 1989. All totaled 25,000 units of seagrass were transplanted as part of FMRI's restoration efforts during these years. Results from these studies were used in part by Mr. Mark Fonseca, NMFS, to prepare a report entitled: "A Guide To Planting Seagrasses in the Gulf Of Mexico" and several subsequent publications.

While I would not object to DEP, SWIM, DOT, Manatee or Pinellas County, or the City of St. Petersburg being called the lead agency when one or another has initiated some critical component of the particular restoration project, FMRI's contribution in providing the vegetative fishery habitat component of these projects should be recognized. In the TBNEP January 1996 Document: "Charting the Course for Tampa Bay", page 148 of the Bay Habitats Action Plan recognizes FMRI as one of the "principal players in habitat enhancement and

"Protect, Conserve and Manage Florida's Environment and Natural Resources"

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restoration". Nevertheless the compilers of this Table seem to have overlooked FMRI's contribution. In the same section on Bay Habitats, on page 149, Step 4, one of the recommendations is to: * Pursue a permanent source of funding for the SWIM program. While I am in hearty agreement with that sentiment I would suggest that an additional recommendation might be to: * Pursue a permanent source of funding for FMRI's Marine Habitat Research and Restoration Program, which was canceled July 1, 1996 for lack of funds following the loss of commercial Gill Net License revenues from the five Counties surrounding Tampa Bay.

I am also very disappointed that the Habitat Protection and Restoration document makes no recommendation to continue experimental seagrass restoration. If water quality has indeed improved to the extent that deeper seagrasses can survive or if former seagrass areas are now suitable for seagrass survival, let's put that notion to the test. Passively waiting for seagrasses to "recover" or "recolonize" is not restoration. Actively attempting to speed seagrass recovery is.

While I understand that non-agency entities are not likely to be able to implement large-scale (1000's of units) seagrass transplants, agencies are capable of doing cooperative seagrass transplants.

Also in the "Charting the Course for Tampa Bay" document, in the Implementation and Financing chapter, page 238 the first recommendation is to: * Maintain existing levels of expenditures for programs making cost-effective contributions to bay restoration goals.

Appendix D, in the "Habitat Protection and Restoration" document, page 6 lists costs for "Principal Ecologists" at $150.00 per hour. That amount is fully ten times the level of funding required for state employees charged with the same responsibilities.

Sincerely,

DIVISION OF MARINE RESOURCES

Frank Courtney
Assistant Research Scientist
Fisheries Assessment Section

FXC
Enclosure
I would recommend the following modifications to Table 8. Restoration Projects, completed and in progress, by SWIM, DEP SW District and DEP FMRI.

<table>
<thead>
<tr>
<th>Year</th>
<th>Lead Agency</th>
<th>Site Names</th>
<th>Coop.</th>
<th>Size</th>
<th>Habitat</th>
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<td>Hendry Delta</td>
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***** SWIM and Pinellas Co just completed Joes Creek III *****

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***** SWIM and Pinellas Co. have since completed a Boca Ceiga II

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