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Tampa Bay Area Study Group Project

3-1996

State of Tampa Bay 1995

Tampa Bay Regional Planning Council (TBRPC)

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State of Tampa Bay 1995





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**An Alliance of Agencies,
Organizations and
Interest Groups for the
Management of Tampa Bay**

Tampa Bay Regional Planning Council
Florida Senate
Florida House of Representatives
Tampa Bay National Estuary Program
Florida Department
of Environmental Protection
Florida Marine Research Institute
Florida Department of Transportation
Florida Game and
Fresh Water Fish Commission
Southwest Florida Water
Management District
Florida Sea Grant
Cargill Fertilizer, Inc.
U.S. Army Corps of Engineers
U.S. Geological Survey
U.S. Fish and Wildlife Service
National Marine Fisheries Service
MacDill Air Force Base
Tampa Port Authority
Manatee Port Authority
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Hillsborough County
Manatee County
Pasco County
Pinellas County
City of Clearwater
City of Oldsmar
City of St. Petersburg
City of Safety Harbor
City of Tampa
Environmental Protection Commission
of Hillsborough County
Greater Tampa Chamber of Commerce
Florida Power Corporation
Tampa Electric Company
Florida Conservation Association
Organized Fishermen of Florida
Mote Marine Laboratory
National Audubon Society
ManaSota 88
Hillsborough Environmental Coalition
University of South Florida
Hillsborough Community College
Lewis Environmental Services, Inc
Greiner, Inc
Coastal Environmental, Inc.
Tampa Bay Pilots

April 12, 1996

Dear Colleague:

Thank you for contributing to the State of Tampa Bay - 1995 Report. I hope you will agree that this, the ninth State of Tampa Bay Report, is one of the best yet produced - mainly due to your cooperation. The report is a tremendous public education tool. It is also a significant source of information for our state legislators. We expect to deliver the Report to our legislative delegation on April 17th.

Enclosed are two copies of the document for your use. Additional copies can be obtained from our regional information center at a nominal cost. If you submitted any material (photos, slides, graphics, etc.) which you requested be returned, it is enclosed. We appreciate the loan very much.

Thanks again for your cooperation. Please call if I can assist you in any way.

Sincerely,

Suzanne T. Cooper, AICP
Principal Planner

encls.

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Cover Photos: Three young Brown pelicans in their nest. Background is Tarpon Key in southern Pinellas County, an active pelican nest colony. (Courtesy of Rich Paul - National Audubon Society's Tampa Bay Sanctuaries, and Peter Clark - Tampa BAYWATCH, respectively)

State of Tampa Bay

1995

This document has been prepared by
the Tampa Bay Regional Planning
Council (TBRPC) and its Agency on
Bay Management pursuant to the rules
and operating procedures of the
TBRPC Agency on Bay Management.

March 1996

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Executive Summary

This, the ninth "State of Tampa Bay" report, is one of the most comprehensive ever produced. It includes updates on a myriad of programs and projects undertaken or ongoing during 1995. Prepared in accordance with the adopted rules of the Agency on Bay Management and funded by the Tampa Bay Regional Planning Council, it includes a summary of issues addressed by the Agency this year.

All organizations and agencies are invited to contribute to this status report, and it is the most complete summary of Tampa Bay programs prepared on an annual basis. Every effort is made to include the broad spectrum of activities positively affecting the Bay and to address issues of concern to those using and managing the bay.

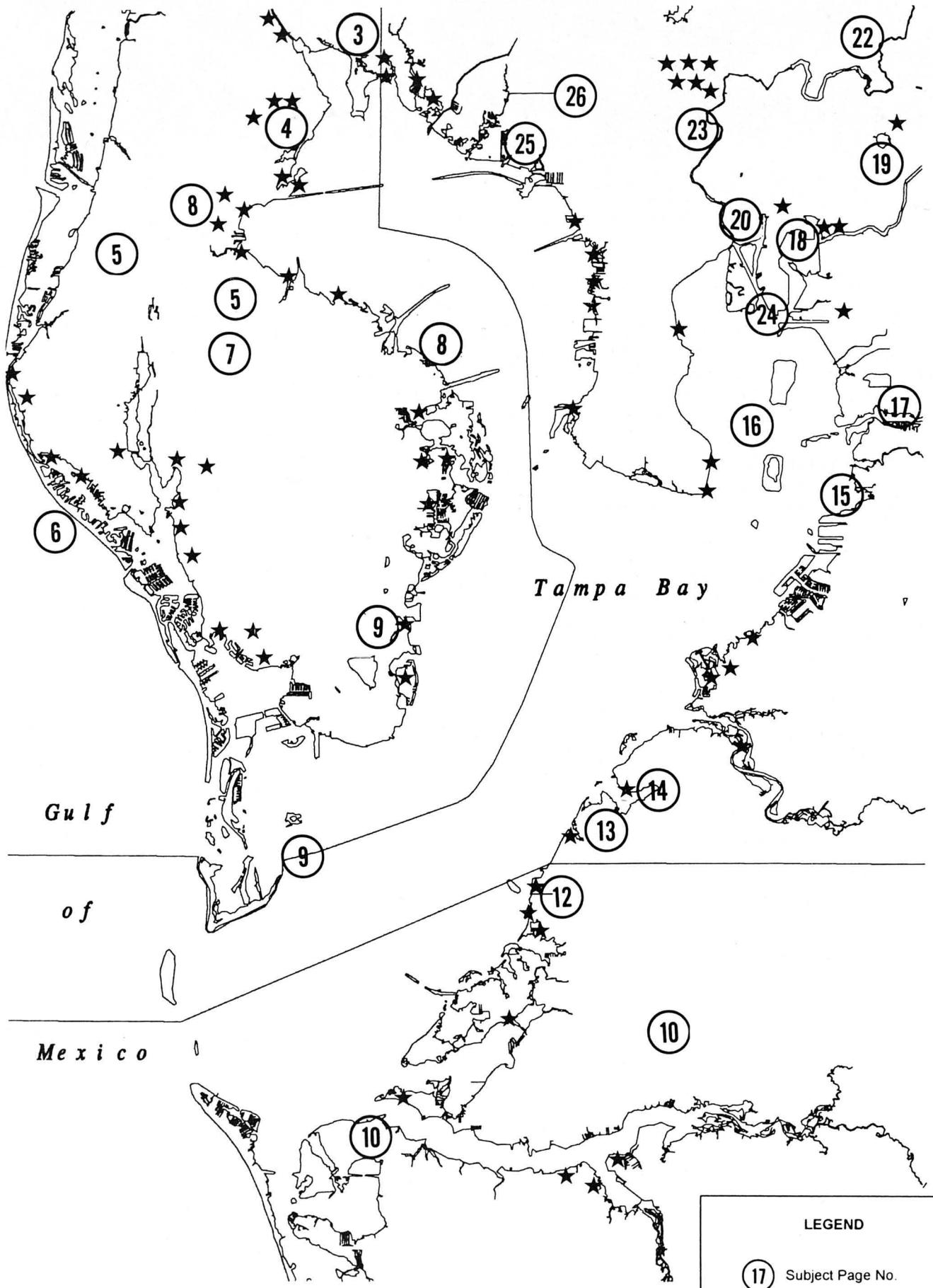
Tampa Bay, the state's largest open-water estuary, continues to be the focus of federal, state, regional and local initiatives on many fronts. Two very important programs are the Tampa Bay National Estuary Program (TBNEP) and the Surface Water Improvement and Management Program (SWIM) of the Southwest Florida Water Management District. The Tampa Bay National Estuary Program, funded by the U.S. Environmental Protection Agency, the Water Management District and local governments, completed extensive research and consensus building and produced the Draft Comprehensive Conservation and Management Plan. Technical, scientific and political expertise were combined to create this plan of action for protecting and restoring the Bay's estuarine resources. The Plan will be refined during 1996 to include a number of management options which, when implemented by local, state and federal agencies, will further reduce the current level of adverse impacts on the Bay, particularly with regard to water quality. TBNEP's report in the "State of Tampa Bay" outlines progress to date and the future course of action.

The Bay has been the number one priority water body by the Water Management District since the inception of SWIM. In its report, which is just a brief synopsis of what has been accomplished this year, the tangible and measurable successes to improve water quality and restore habitat are described. Most of the projects are cooperative ventures with local governments, many with recreational benefits as well.

The "State of Tampa Bay" report also includes summaries of several other significant programs. Surface water quality monitoring and benthic monitoring are now being conducted baywide in a coordinated manner. Land acquisition activities are becoming more focussed. The smaller cities are very involved in a variety of environmental endeavors. Citizen involvement has never been stronger than it was in 1995. Programs sponsored by The Florida Aquarium reach thousands of residents. Tampa BAYWATCH enlists hundreds of volunteers for a host of projects, including salt marsh plantings, monofilament line removal from bird-nesting islands; and stormdrain stenciling. Hillsborough County has active programs to involve citizens in environmental stewardship: Adopt-A-Pond and Operation Bayworks. Law enforcement agencies such as the Florida Marine Patrol are also engaged in public education and planning activities, realizing that preventing impacts is more efficient than recovery. And various private initiatives have yielded enormous benefits for the region's environment. The Hillsborough River Greenways Task Force has made tremendous strides toward the long-term management and restoration of the Hillsborough River watershed. The Alafia Watershed Area Restoration Effort (AWARE) is developing a management plan for the river basin. The Cockroach Bay User Group (C-BUG) is taking a very innovative and active role in managing that Aquatic Preserve.

The Agency on Bay Management was very active during 1995, but two work items are perhaps most representative of the Agency's role as the lead environmental forum in the region. The Agency served as technical advisor to the Tampa Bay Regional Planning Council in preparation of the Natural Resources Subject Area of its Strategic Regional Policy Plan. The Agency also prepared and adopted extensive recommendations for revising the 1995 version of the Mangrove Trimming and Preservation Act (403.93, Florida Statutes).

1995 was a very exciting year for Tampa Bay. Continued cooperation, communication and shared vision for the Tampa Bay estuary will ensure that this invaluable economic and environmental resource is maintained.



LEGEND

(17) Subject Page No.

★ SWIM Project; See Page 32.

The State of Restoration, Research and Monitoring Efforts Around the Bay

OLDSMAR'S BAY-RELATED ACTIVITIES



During this year the City of Oldsmar was involved in several activities which are expected to improve water quality, habitat and wildlife in the Tampa Bay system. In May, the City dedicated the Harbor Palms Nature Park, a collaborative effort between the Southwest Florida Water

Management District's Surface Water Improvement and Management Program (SWIM) and the City with funding assistance from the Department of Community Affairs, Coastal Zone Management and the Florida Department of Environmental Protection's Recreation and Parks Division. The project involved restoration of a tidal estuary and development of a passive park, with trail/boardwalk system and fishing dock on what was spoil from the Lake Tarpon Outfall Canal project.

In March, the City began the State Street/Burbank drainage project, an ambitious 550-acre watershed drainage project which will restrict direct runoff by collecting and treating stormwater entering Mobbly Bay. Designed as a state-of-the-art system, this \$1 million project will also create habitat through pond design and vegetative planting.

In July, the City and SWIM initiated the Mobbly Bay restoration project, which calls for regrading and enhancement of several retention ponds in the area to improve water quality entering the Bay and for improving wildlife habitat.

In September, as part of a land use amendment request, the City acquired 22 acres of pristine wetland and amended the land use designation from residential to preservation on an additional 50 acres in the Mobbly Bay area of the City. With this acquisition and land use amendment the City and Pinellas County hold most of the Mobbly Bay area in the public trust.

In December, the City completed a one million-gallon effluent water storage system for reuse by domestic and commercial irrigation customers. Reuse of treated effluent will significantly improve water quality in Tampa Bay.

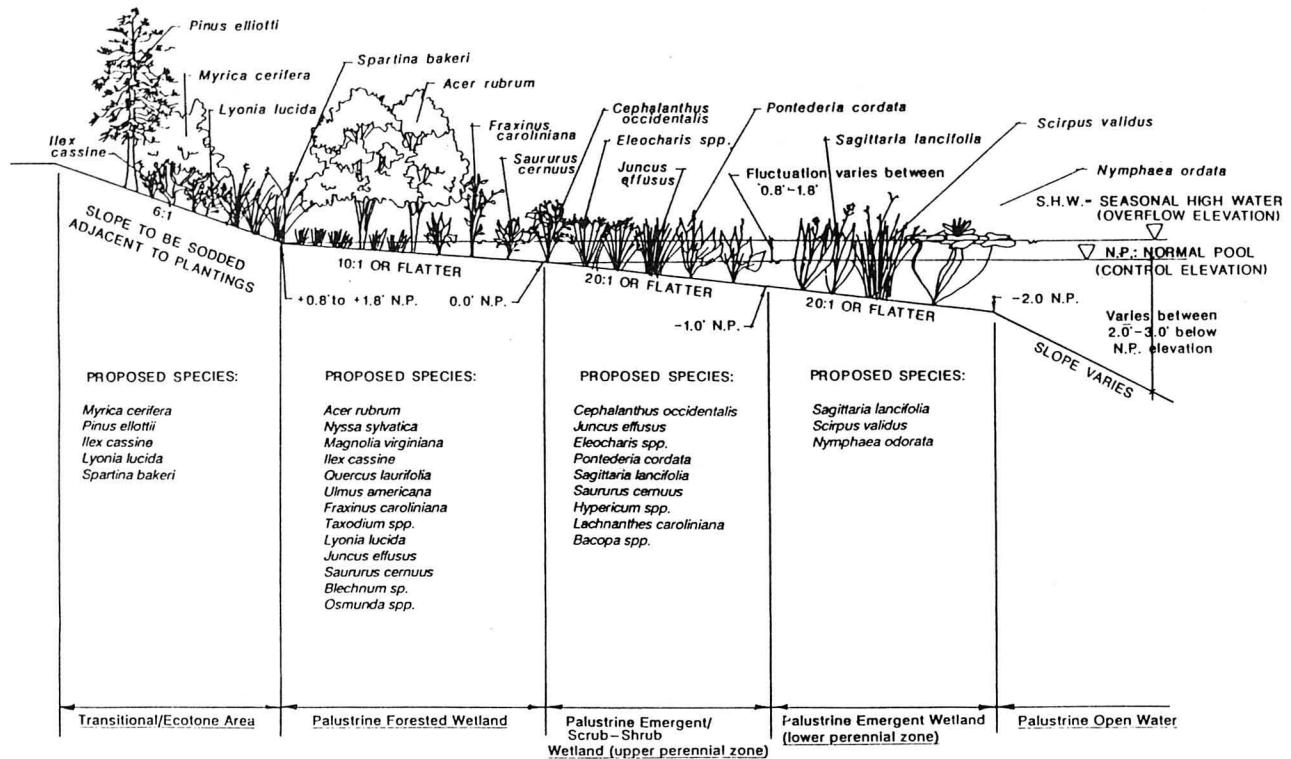
For more information contact Nick Staszko, City of Oldsmar (813) 855-4693.

MITIGATION BANKING TO PROVIDE ENVIRONMENTAL AND ECONOMIC BENEFITS FOR PINELLAS COUNTY

While the permitting agencies have allowed the "banking" of mitigation credit when constructing mitigation sites that are larger than that required for the project's impacts, there was no specific regulation allowing the creation of true mitigation banks. With the passage of the new law, mitigation banking is now a



regulatory option. The theory is that large tracts of land managed and protected from negative influences are much more environmentally desirable than many small wetland mitigation areas scattered in parking lots or adjacent to development.



Animals that need more acreage to establish and maintain themselves have a much better chance of populating these bank sites due to the inherent greater diversity and buffering capacity of a large tract of land. Small mitigation sites tend to have minimal species diversity and the plants and animals that live there do so with increased threat due to the proximity of human activity. Pinellas County sees mitigation banking as an opportunity to improve habitat availability while maintaining fiscal responsibility. Mitigation sites need periodic inspections and maintenance to maximize ecological value, and the banks' centralized locations allow these activities to be undertaken in a cost-efficient manner. The bottom line is that the County's mitigation sites function much more like natural ecosystems and the citizens save money while accomplishing this task; a win-win situation for Pinellas County government and its citizens.

Pinellas County is in the process of designing its first mitigation bank with construction scheduled for 1996. This site is currently an abandoned pasture with little habitat value. The County plans to create a variety of habitats within the parcel, including hardwood hammocks, herbaceous wetlands and cypress stands adjacent to upland fingers and islands.

In addition, the County is weighing the option of designating the Brooker Creek Preserve a mitigation bank. The Preserve is a huge tract of land that can support myriad species of plants and animals but needs restoration work to enhance degraded areas and restore water flow to areas that have been drained or damaged by previous owners' land management techniques. These projects can be costly and the County should be

able to obtain mitigation bank credits for these projects due to the much greater habitat value for the plants and animals living and passing through the area. For more information contact Eric Ferhmann, Pinellas County Department of Environmental Management (813) 298-1750.

CITY OF SAFETY HARBOR'S ENVIRONMENTAL ACTIVITIES



During 1995 the City of Safety Harbor, located in the northwestern corner of Tampa Bay, was involved in several Bay-related activities:

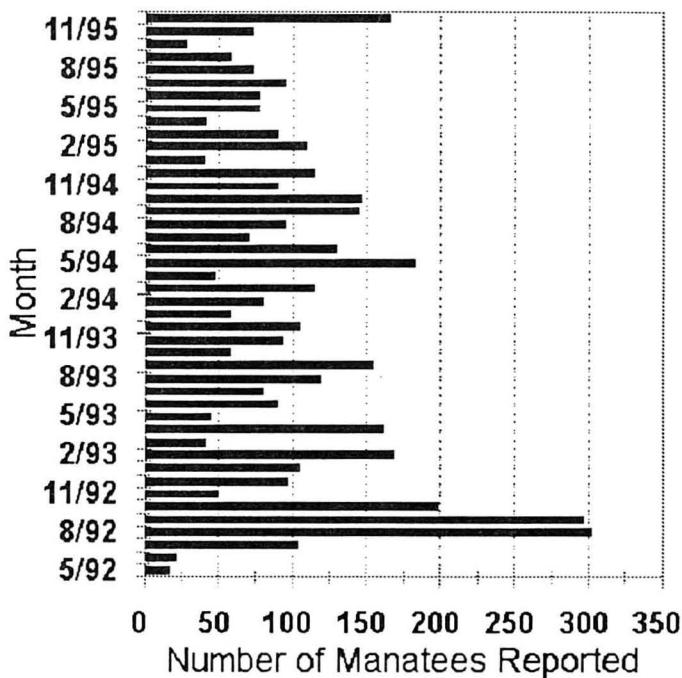
- The City purchased a seven-acre site in south Safety Harbor for the purpose of stormwater retention.
- Funding agreements were executed with the Southwest Florida Water Management District, the City of Clearwater and Pinellas County to provide \$420,000 in support of structure replacements and channel improvements to the Bishop Creek and Mullet Creek Drainage Corridors.
- A comprehensive, city-wide master drainage plan for Safety Harbor was completed.
- The City was awarded \$208,690 in Preservation 2000 funds from the Florida Communities Trust to purchase a 2.8-acre site in downtown, adjoining Tampa Bay. Preserving the site from overdevelopment, passive recreational use is proposed for the acquired property.

- Volunteers collected debris along the Tampa Bay shoreline of Safety Harbor during the annual Coastal Clean-up event on September 16th.

For more information contact Ron Rinzivillo, Associate Planner, (813) 726-0780.

MANATEE WATCH LINE PROGRAM IN PINELLAS COUNTY

One of the goals of the Pinellas County Department of Environmental Management is to find ways to enhance wildlife in an urbanized environment. This goal is contained in the Conservation Element of the County's Comprehensive Plan.



In 1989 the Department of Environmental Management created the Pinellas County Manatee Watch Line program to collect information regarding manatee sightings in Pinellas County waters reported by the public. The information collected by the Watch Line can be helpful in making management decisions regarding construction methods, alternative approaches to County projects and permitted activities, and identifying possible heavy manatee use areas that may lead to plans that minimize impacts to manatees or their habitat.

The Manatee Watch Line telephone line was first activated by the Pinellas County Department of Environmental Management in June 1992. Citizen response was so successful that a volunteer was added to help support the program by retrieving calls from the tele-

phone voice mail and recording the data. This information is entered into the County's Geographic Information System which provides a detailed map of the reported sightings.

A breakdown of sighting information collected from 1992 through 1995 follows:

	1992	1993	1994	1995
Phone Calls	461	485	521	330
Participation	352	252	219	134
Total Manatees	1,087	1,217	1,267	925
Adults	919	1,071	1,079	907
Young	168	146	188	118

The areas which have consistently yielded the greatest number of manatee sightings are Spring and Whitcomb Bayous in Tarpon Springs, Boca Ciega Bay near Bear Creek, McKay Creek, and Coffee Pot Bayou. For more information contact Pam Leisure, Pinellas County Department of Environmental Management (813) 464-4425.

CLEARWATER'S STORMWATER REINSPECTION PROGRAM

In an effort to improve the quality of the surface waters within the city limits and the surrounding water bodies of Tampa Bay, Clearwater Harbor and the Gulf of Mexico, the City of Clearwater's Environmental Division has been conducting a stormwater system reinspection program. This program was initiated in September 1994 and consists of reinspecting stormwater systems to determine compliance with the City's Land Development Code. The code requires property owners to maintain their developed property in a manner consistent with the approved certified site plan.

The program has been divided into phases by watershed drainage basin. The current phase combines two watersheds containing 32 commercial and residential sites which drain into Tampa Bay. These sites have a combined drainage area of 85 acres and a required treatment volume of 154,361 cubic feet (ft^3). Since this phase has just begun, no recovery data is available at this time. However, data collected from watersheds draining into Clearwater Harbor and the Gulf of Mexico revealed the successful recovery of 32,870 ft^3 of lost stormwater treatment volume from 162 commercial and residential sites. These sites have a combined drainage area of 188 acres and a required treatment volume of 340,939 ft^3 . Regaining this treatment volume has been

a direct result of reinspecting stormwater systems and enforcing the code that requires property owners to perform periodic maintenance on their stormwater systems.

The reinspection program has revealed cases in which weir elevations on the outfall structures have been lowered or altogether eliminated, underdrain pipes have been broken or exposed, and grease skimmers have been broken or removed. All of these cases allow the direct discharge of stormwater from the retention ponds to surface waters without adequate treatment. Furthermore, the most frequent maintenance requirement has been the removal of sediment build-up from the drainage systems' inlet pipes, drainage flumes, and pond bottoms. The majority of this sediment is caused by the deterioration of asphalt parking areas due to use over time. The resulting asphaltic sediment accumulates in the storm drainage system and ultimately the retention pond. In some cases, the sediment build-up was so extreme that 90 percent of the inlet pipe's flow capacity was lost.

Requiring property owners to assume responsibility for maintaining large and intricate stormwater systems continues to be a challenge. But with some guidance and education 100 percent compliance with the code requirements has been achieved. Accomplishing this success with the Stormwater System Reinspection Program is evidence that the City of Clearwater is devoted to the improvement of the water quality for all of the watersheds within the city limits. For more information contact Richard Albee, City of Clearwater (813) 462-6598.

SEA TURTLES IN THE TAMPA BAY REGION

Tampa Bay is a vital nursery for several different stages of sea turtle development. This includes juveniles and nesting adults. Within the bay there are three primary species, the green (*Chelonia mydas*), the Kemps ridley (*Lepidochelys kempi*), and the loggerhead (*Caretta caretta*), with the hawksbill (*Eretmochelys imbricata*) appearing on occasion. The populations of the green sea turtle and Kemps ridley consist mostly of juveniles living in the upper bays and estuaries of coastal Tampa Bay. The population of loggerheads consists mostly of adults that have migrated to the area for breeding and nesting purposes. Tampa Bay represents an important developmental area for the Kemps ridley, which is currently critically endangered. These turtles generally nest on a few remote beaches off the coast of Mexico. Due to human exploitation of these beaches and its peculiar method of mass nesting referred to as an "Arabida", the population of Kemps ridley has dwin-

dled significantly. Presently the Clearwater Marine Aquarium monitors the majority of Pinellas County beaches for nesting turtles. In addition, the Aquarium handles all of the live-stranded sea turtles in Pinellas County, and as far north as Citrus County. The majority of these strandings consist of green sea turtles that have contracted fibropapillomas: debilitating tumors that form on the soft portions of the body, preventing proper swimming and feeding. After green turtles, the next highest category of strandings consists of Kemps ridley and loggerheads. The majority of these strandings are the result of some sort of boating accident.

This year the Clearwater Marine Aquarium responded to 25 green turtle strandings, 10 loggerhead strandings, nine Kemps ridley strandings and one hawksbill stranding. Of these 45, 22 were of live turtles. Currently the Aquarium is caring for seven live green turtles that have fibropapillomas, two Kemps ridley that were hit by boats, and two loggerheads: one that appears to have been caught in a fishing net and one with a buoyancy defect. One of the Kemps ridley was hit so severely that the propeller severed the turtle's jaw completely. We are optimistic about this turtle's future, although unsure whether the jaw will ever heal properly.

The other major program concerning sea turtles is nesting. Nesting in Pinellas County consists primarily of loggerheads. During the 1995 nesting season we confirmed 137 nests out of a total of 260 crawls. This figure is up significantly from the previous years and is more nests than have ever been confirmed on Pinellas County beaches. While there was significant nesting on Pinellas beaches, the hatchling success was extremely low due to the high number of large storms which occurred during the summer. For example, on Clearwater Beach a total of 1,125 eggs were evaluated, of which only 250 resulted in hatchlings that escaped into the water. Overall Pinellas County experienced a 55% hatchling production from eggs that were evaluated. Aquarium staff also assisted in monitoring nesting activity on Egmont Key, at the mouth of Tampa Bay. Egmont Key consists of roughly 1.5 miles of good nesting beach, and on this small nesting area there were 175 crawls from which 58 nests were confirmed. These numbers are extremely high compared to the area monitored in Pinellas County, which is 35 miles long. Egmont Key is an example of undisturbed habitat, without the problems of lighting from beachfront urbanization. Lighting is still the most critical problem that nesting turtles face in their reproductive cycle, and is one problem that Pinellas County needs to address. The Aquarium staff works diligently during the off-season to educate citizens about lighting and its effects on emerging hatchlings, so that one day undisturbed habitat will exist throughout Pinellas County. For more information call Glenn Harmon, Clearwater Marine Aquarium (813) 441-1790.

THE ALLEN'S CREEK WATERSHED

The Allen's Creek Watershed is a typical urban stream located in the central portion of Pinellas County. Pinellas County, the Cities of Largo and Clearwater, and the Florida Department of Environmental Protection entered into an agreement to conduct a baseline study and develop a plan to address the problems of the creek. An 18-month baseline study was conducted to collect data on the watershed and identify problems. Efforts to develop a watershed management plan for the Allen's Creek basin commenced in 1991. Target conditions were established and a "problems and solutions matrix" was developed to address concerns in many specific areas.

Recently, the County hired a consultant to develop a computer model that will simulate the effects of potential projects on water quality, hydraulic and hydrologic conditions of the creek. The computer model is an important tool that will be used to evaluate potential structural projects in the watershed.

To keep the momentum of the plan development, projects called Immediate Action Projects (IAPs) were identified and are being implemented. These projects include the development of educational materials and demonstration sites for habitat restoration, exotic plant removal and stormwater treatment. One IAP is the Habitat Restoration and Enhancement Project near Lakeview Road and Hercules Avenue. The project aims to combine stormwater treatment, habitat restoration, and educational and recreational uses at a single site in the central portion of the watershed. The Southwest Florida Water Management District (SWFWMD), the City of Clearwater and Pinellas County signed an interagency agreement to jointly fund the design and construction of the project in May. Design of the project is expected to commence in 1996.

Pinellas County and SWFWMD signed another cooperative agreement to jointly fund the design and

construction of the Oligohaline Habitat Restoration Project at St. Paul's Drive and Belleair Road in November. Oligohaline (low salinity) habitat is scarce in the creek. A preliminary evaluation of wetlands in the watershed indicates 67% of oligohaline wetlands have been filled and developed since 1926. This project aims to restore low salinity wetlands and enhance habitat for aquatic species including snook, redfish, spotted seatrout and blue crabs. Participants expect to begin design for this project in 1996.

Another IAP will enhance a freshwater system that runs along the eastern border of the Belcher Elementary School property. County staff started working with Belcher Elementary teachers and parents on "Project Nature" this year. Project Nature aims to provide an opportunity for teachers, students and the community to observe, learn, and respect nature by maintaining a natural schoolyard environment.

Yet another IAP, the Allen's Creek Storm Drain Stenciling Program had its first training class for volunteers in November. Eighth grade students, teachers and residents have volunteered to paint "Don't Dump! Drains to Allen's Creek (with fish logo)" on storm drains in their neighborhoods.

Pinellas County also produced and distributed "You and Your Septic Tank" booklets to Allen's Creek residents with septic tank systems. The booklet contains information on the function, operation and maintenance of septic tank systems. Copies of the booklet are available to the public through several County offices and the Pinellas County Public Health Unit.

Another booklet, "Naturescape: the Allen's Creek Urban Wildlife Enhancement Program" is expected to be completed for distribution to the public in 1996. The booklet contains information on plant species native to Pinellas County, artificial supplies for wildlife and tips on yard maintenance. The Program aims to develop mechanisms which will lead to the provision of food and shelter for wildlife, increased vegetative cover, and increased native and naturalized plant density. Implementation of the Program will involve multi-faceted



approaches to achieve established goals for the watershed. For more information contact Mariben Espiritu-Andersen, Pinellas County Department of Environmental Management (813) 464-4425.

SIGNIFICANT WATER RESOURCE PROJECTS WITHIN THE CITY OF CLEARWATER

The City has developed a five-year capital watershed action program to address projects under consideration or developed by the Engineering Department, Environmental Management Group. A total of 14 projects involving water quality studies, water quality improvements, or habitat restoration and improvement are identified. Three of particular note are:

Clearwater Mall Stormwater Treatment Retrofit Project: This fully-funded project is significant because it is the first arranged by mutual consent of a commercial enterprise in Clearwater, outside the usual site plan development process. The Mall was constructed prior to state or local implementation of stormwater quality requirements. About 40 percent of the site drains, without treatment, directly to Old Tampa Bay. Untreated urban runoff is a significant contributor to water quality degradation. By agreement with the Southwest Florida Water Management District (SWFWMD) and Clearwater Mall, a stormwater detention area will be constructed on mall property to intercept and treat the first 1/2-inch of run-off from the 27 acres of impervious surface. SWFWMD is funding the \$110,000 project.

Coopers Point Habitat Restoration and Management Program: This 136-acre site in east central Clearwater is jointly owned by the City and Pinellas County. Endangered and threatened species present in the area are further endangered by the encroachment of nuisance vegetation and the loss of productive habitat. A plan for restoring and managing the estuarine, freshwater and upland systems is being considered, along with the potential for environmental education and interpretive uses.

Del Oro Stormwater Treatment Program: As an extension of the storm sewer replacement project for the Del Oro Park Subdivision (including a 58-acre drainage basin), a vegetated stormwater treatment will be constructed; existing wetlands will be enhanced by Brazilian pepper removal and the planting of appropriate species; and park amenities will be provided. This project is being jointly funded by SWFWMD's Surface Water Improvement and Management Program, the Florida Department of Community Affairs, and the City.

For more information contact Tom Miller, City of Clearwater Engineering Department (813) 462-6593.

WATER QUALITY MONITORING IN PINELLAS COUNTY

Pinellas County initiated its surface water monitoring program in October, 1990. The station network was designed to carry out the goals of the County's comprehensive plan, specifically: to characterize the relative priority of each receiving water body in terms of its need for management; to identify those tributaries with the greatest contribution of pollutants; and to provide a baseline for evaluating the impacts of management programs or other actions on receiving-water quality. Since current watershed management activities in the County are in their infancy, it would be premature to expect significant changes in water quality as compared to baseline. It is possible however, in some cases, to compare current water quality data for certain areas to earlier studies, and to attempt to clarify the impacts of previous activities. The County is also able to utilize the data to identify areas where management efforts may be needed; a computer program has been developed which ranks either stations or watersheds on the basis of the degree to which water quality fails to meet standards or other criteria.

The network initially included 94 stations, some of which (primary stations) were sampled monthly, and others (secondary stations) sampled every other month. With the completion of the diagnostic phase of the Lake Seminole and Lake Tarpon projects, the intensive monitoring associated with those projects came to a close. At that time, Pinellas County began sampling twice monthly in Lake Tarpon at five stations, and in Lake Seminole at seven stations.

The current sampling network includes a total of 108 stations: 73 primary and 35 secondary. At least one primary station is located within most of the 52 drainage basins in the County, at a location close to where the basin discharges to the receiving water body. Samples at these sites are collected to determine the quality of drainage into receiving waters from the respective basins. Stations are also located at critical sites such as points where major tributaries join the basin's main channel. Other stations are located in the nearshore areas such as bayous and inlets to identify possible impacts to receiving waters from the drainage basins influencing them. Finally, there are stations in the bay or lakes which are the ultimate receiving waters to measure longer-term trends and general overall water quality.

The County produces an annual report of water quality data, and is presently working on a summary report and analysis of the first five years of monitoring results. For more information contact Eric Fehrmann, Pinellas County Environmental Management Department (813) 464-4425.

ST. PETERSBURG'S ENVIRONMENTAL ENHANCEMENT PROGRAM

Habitat restoration projects within Tampa Bay attempt to improve the environmental quality of the estuarine system and to improve water quality and other habitat values. The desired result is a reestablishment of biological communities and creation of ecosystems that complement human needs and uses of the resource. These are the ideal goals of restoration efforts. Often how we go about meeting these goals is determined by funding, land use and restrictions, available technology and expertise, and time. Mangrove Bay Phase III began with the same ideal goals as other restoration efforts; however, this project also addresses the way in which habitat restoration projects are planned.

Since the creation of the City of St. Petersburg's Environmental Enhancement Program in 1988, numerous habitat restoration projects have been completed by the city in cooperation with other agencies. In 1993 the City began developing the Mangrove Bay Phase III habitat restoration project as part of a Southwest Florida Water Management District Surface Water Improvement and Management Program project. This interlocal agreement is a continued effort to develop and implement habitat enhancement and restoration projects by SWFWMD and the City on publicly-owned properties associated with mid-western reaches of Tampa Bay. In 1991-1992 the City and SWFWMD developed a 13.5-acre restoration project: Mangrove Bay Phases I and II, also in this same area.

The proposed 21-acre Phase III is located within the rough and preservation areas of the 300-acre Mangrove Bay Golf Course at 62nd Avenue NE in St. Petersburg. There is an estimated 10 acres of transitional land between the golf course and the extant mangrove forest, with the remaining 11 acres involving two borrow pits and two mosquito ditches. The scope of work will involve removal of nuisance exotic vegetation, removal of mosquito ditch spoil piles, using fill from ditches to raise elevations of the borrow pits, replanting the site with native vegetation and the restoration of tidal flow patterns. The project is scheduled to begin construction in summer 1997.

Preliminary designs were begun by SWFWMD and Peninsula Design and Engineering (design consultant). It was proposed to create lateral shelves using fill from the redesigned mosquito ditches. Upon learning from the City's Police Marine Patrol that the deep waters of the borrow pits were highly productive nesting and feeding areas for mullet and many other juvenile fishes, the City contacted the Florida Marine Research Institute (FMRI). The FMRI viewed this project as an important example for future projects, and agreed to donate time

and money to gather evidence about the current status of fish and water chemistry of the borrow pit closest to the golf course and mosquito ditches. FMRI provided funds for the City to engage an environmental consultant to take pesticide samples and to purchase a hydrographic instrument for future water quality sampling after implementation of the project.

The FMRI's involvement was and is significant, not only to supply knowledge, but as an example of why it is important to gather biological information about the current conditions of a site, including its existing ecosystem functions, prior to final planning and design. The baseline and post-completion data gathered for the project will be useful in evaluating the entire project's success (plant and wildlife recruitment and/or elimination). Studying the site before final planning can advance the results of current and future projects. For more information contact Maureen Colaizzi, St. Petersburg Planning Department (813) 893-7882.

FT. DESOTO PARK AND AQUATIC HABITAT MANAGEMENT AREA BENEFITS FROM SEAGRASS PROTECTION AND MONITORING PROGRAM

To help protect the valuable seagrass beds in southern Pinellas County, the Pinellas County Board of County Commissioners reauthorized the provisions of the "Ft. DeSoto Park Wetlands and Aquatic Habitat Management Ordinance" in the spring of 1994. The original Ordinance established the Ft. DeSoto Park Wetlands and Aquatic Habitat Management Area which includes land from Indian Key on the north to Ft. DeSoto Park on the south.

The Area has been marked by an array of buoys, pilings and signs informing boaters of the various protection zones as well as the limits of Bunes Pass. Large informational signs have also been erected at the major area boat ramps. In addition, over 10,000 informational brochures depicting the zones and explaining the value of seagrass beds have been distributed to the public at Ft. DeSoto Park, area boat ramps, and bait shops.

The Area is divided into "Seagrass Caution Zones" and "Boat Restriction Zones". Boats with internal combustion engines may travel under power in the "Seagrass Caution Zones" but shall be operated so as not to cause damage to seagrasses. Use of internal combustion engines is strictly prohibited in "Boat Restriction Zones". Motorized Boats can enter the "Boat Restriction Zones", but only if poling, drifting or electric trolling motors are used to move the boat.

The County has been monitoring the Management Area to determine the effectiveness of the zones and the rate of seagrass bed recovery in the Area. To date, the analysis shows the management program has been a great success. This year's data indicates that there has been an educational spillover effect that has greatly reduced scarring not only in the protected zones, but in the unprotected zone as well. The Sheriff's Deputy that patrols the area has almost certainly had a positive affect also.



The aerial photography as well as the interpretation has been digitized and entered into the County Geographical Information System (GIS). Analysis of this data will enable Pinellas County to manage the Area in the most environmentally-sensitive manner for the citizens of Pinellas County. For more information contact Eric Fehrmann, Pinellas County Environmental Management Department (813) 464-4425.

CITY OF BRADENTON'S MEMORIAL TREE PROGRAM

The City of Bradenton has been designated as a "Tree City USA" by the National Arbor Day Foundation in cooperation with the National Association of State Foresters, USDA Forest Service, U.S. Conference of Mayors, and the National League of Cities. The "Tree City USA" program is designed to recognize those communities that effectively manage their public tree resources, and to encourage the implementation of community tree management based on four "Tree City USA" standards. These standards provide structure for a community forestry program, require the program to demonstrate success based on the judgment of the state forester's office, and provide for an awareness and appreciation of trees among the residents of the community. The standards include appointment of a Tree Board, a community Tree Ordinance, a community forestry program with an annual budget of at least \$2.00 per capita, and an Arbor Day observance and proclamation. The City of Bradenton celebrates Arbor Day on the third Friday of January.

Because trees have such an important role in the environment, the City of Bradenton Tree Board has been hard at work developing an Urban Forestry Masterplan, installing streetscape in the downtown, and developing and implementing the "Memorial Tree Program".

The Memorial Tree Program was designed to accomplish two goals: to honor a cherished loved one and at the same time add to the City's shade canopy. The \$150.00 donation required covers the price of a 7-8 foot live oak tree, and a permanent ground plaque inscribed with a message of remembrance. Acknowledgement cards are then sent to the person honored and the contributor. In the one year that the program has been in operation, 14 trees have been planted. For more information contact Pierre Abadjian, City of Bradenton, (941) 748-0800.

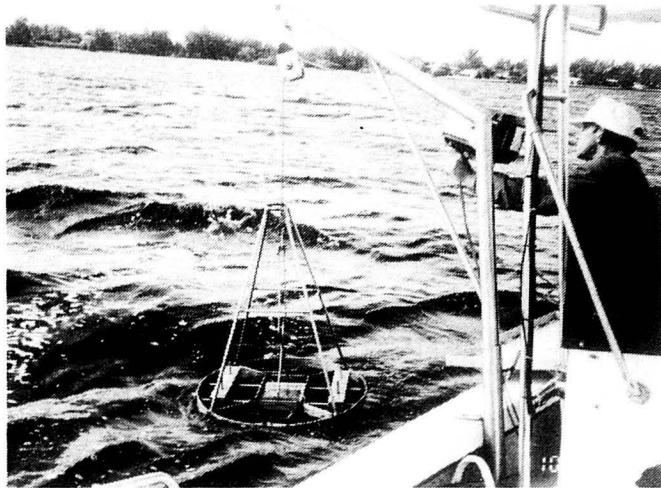
MANATEE COUNTY ENVIRONMENTAL MANAGEMENT DEPARTMENT



Bay-related activities of the Manatee County Environmental Management Department (EMD) during 1995 included:

- **Regional Ambient Monitoring Program** - Ambient (surrounding) water quality monitoring evaluates waterbody trends and serves as a vital measurement of the effectiveness of ecosystem management action

plans. The Southwest Regional Ambient Monitoring Program (RAMP) is an unique water quality monitoring program coordinated by the Water Quality Division of the EMD in 1995 to implement National Estuary Program (NEP) monitoring goals for Tampa and Sarasota Bays.



There is a vital need for this uniform monitoring system because traditionally, local environmental programs designed individual water quality monitoring programs to meet their own needs and objectives. Each local program produced unique data that could not be effectively shared among other jurisdictions on the same waterbody or estuary. RAMP has effectively solved this problem by offering a program that generates a sharable database by specifying core water quality variables, sampling design and uniform methods, thus allowing widespread shareability of data across jurisdictional boundaries. Participants may also add additional parameters or even interface RAMP water quality sampling with other, entirely different ambient water quality monitoring programs. The NEP estuarine action plans can be properly evaluated and adapted to best conserve and protect the target waterbodies - in this case, Tampa and Sarasota Bays.

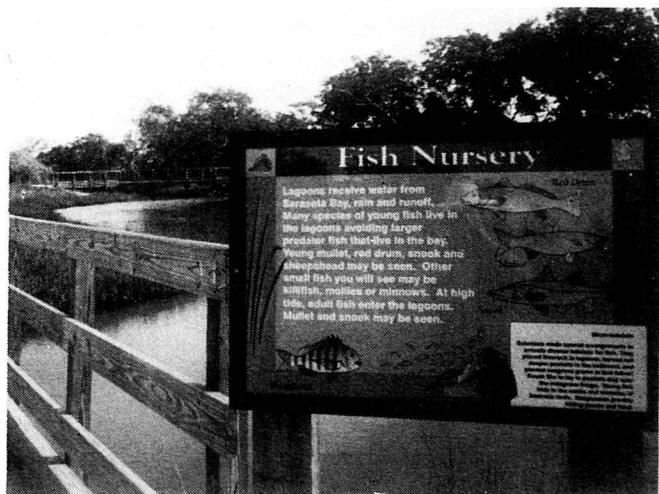
■ **Benthic Monitoring** - The EMD continued into the third year of its annual synoptic Benthic (biological) Water Quality Monitoring Assessment for Manatee County in 1995. This program, initiated by the Tampa Bay NEP, involves collection of estuarine invertebrate communities by boat at 18 different stations in the Manatee River and Terra Ceia Bay. The invertebrate communities sampled are then assessed under microscope in the EMD's environmental laboratory.

Benthic communities are excellent water and sediment quality indicators. Monitoring of invertebrate communities for signs of chronic pollution shows living

resource impacts directly, without the need to translate from physical environmental measurements to estimates of biological impact. The Benthic Monitoring Program results are used as long-term environmental trend indicators.

■ **Evers Reservoir Watershed Monitoring** - This project, a study of the watershed's water quality shared by Manatee County and the U.S. Geological Survey since 1988, continued through 1995 and will be an on-going EMD project. The Evers Project continues to provide a valuable look at long-term water quality changes in the watershed. This monitoring is important because the Evers Reservoir supplies potable water to the City of Bradenton, although the watershed itself lies in the developing part of Manatee County. The County has committed to maintaining good water quality standards through land use controls and the requirement that development employ a range of Best Management Practices.

Five years of monthly nutrient loading data selected from the Evers Watershed Monitoring Program proved indispensable in evaluating the General Water Quality goals of the Manatee County Comprehensive Plan during its required Evaluation and Appraisal Review (EAR). Evers data also proved invaluable in formulating the successor design for Evers watershed monitoring. When this design is implemented, stormwater utility fees will support a comprehensive, unified ambient water quality monitoring program. Conducted by the EMD, it will replace the non-uniform, fragmented monitoring currently required of developers.



■ **Leffis Key Habitat Restoration Project** - This project was prompted by the need to restore Florida's shorelines and waterbodies to their former productivity. Such areas had been ecologically damaged during the 1950-60s dredging and earth-moving activities.

Leffis Key is a 30-acre site owned by Manatee County. It is located along the Sarasota Bay shoreline on the southeast tip of Anna Maria Island, and was a pile of dredged muck/spoil, an ecologically-barren mound of sand covered with noxious exotic vegetation. Ideally suited for successful restoration since it was already surrounded by productive seagrass flats, the restoration effort began in summer 1991 with the removal of non-native plants, mainly Brazilian pepper and Australian pine. Excavation of intertidal pools and tidal inlets, and creation of a 26-foot high upland habitat began in October 1992. Boardwalk construction, to provide accessibility, began in spring 1992. A footbridge was installed to provide visitor access to Coquina BayWalk. Fill material from the Key and adjacent north and south shorelines was used to create dunes to buffer the site from traffic on the nearby beach road. The site was revegetated with salt marsh, intertidal and upland plants. Starting in 1994 colorful, easy-to-understand educational and interpretive signage installed. During this year additional boardwalk was constructed among the mangroves and additional signage was installed. A "Coquina BayWalk at Leffis Key" brochure was designed and produced to further enhance the "Leffis Experience". The restoration project has been received with great public enthusiasm. The site is heavily used as a park and nature center.

- Comprehensive Plan Review - The EMD helps maintain and protect the County's biological diversity through air quality, land development and water quality environmental reviews emphasizing land management and protection of wetlands, endangered species and natural habitats. Appropriate land use management and increasing integration of land and water planning are recognized as indispensable to sustaining suitable water and air quality standards.

Working with Manatee County's Planning, Permitting and Inspections Department, the EMD provided basic data and technical support for evaluation of the environmental elements of the Plan in 1995. During the latest Comprehensive Plan EAR, the EMD participated in a detailed water quality goals review. The success of existing Comprehensive Plan policies was evaluated by analyzing historical water quality data available due to the Evers Reservoir Watershed Project. As a result, the EMD will suggest ways to improve the Comprehensive Plan, including improved technical methods to determine whether or not goals are met.

- Atmospheric Deposition - The EMD is participating in Tampa Bay NEP's Atmospheric Deposition Project, developed under the auspices of the U.S. Environmental Protection Agency's Great Waters Initiative. Thanks to the Program, the importance of atmos-

pheric nutrient sources to Tampa Bay and the watersheds was realized, leading to the Atmospheric Deposition Project. Deposition of pollutants from the air is presumed to be a significant source of nutrients in bays and watersheds.

As a result of work done in 1995 in the Project, the EMD will recommend that the Manatee County Comprehensive Plan include atmospheric deposition as a separate pollution source that must be addressed by different methods than those for stormwater. The EMD will assess technical changes to the Manatee Comprehensive Plan reflecting the possible effects of atmospheric deposition of pollutants on water quality. For more information on EMD activities contact Lucile Mattern, Environmental Management Department (941) 742-5980.

MARINE RESEARCH INSTITUTE'S MARINE HABITAT RESEARCH AND RESTORATION PROGRAM

For over a decade the Florida Marine Research Institute used monies collected from the annual sale of commercial gill-net licenses in the counties surrounding Tampa Bay to support marine habitat restoration research. Since 1983, when the Pinellas County license legislation took affect, the Department has collected over \$1.25 million in license fees. The program also attracted considerable outside funding (\$600,000) from the Southwest Florida Water Management District's Tampa Bay Surface Water Improvement and Management (SWIM) Program, the Florida Department of Environmental Protection's (FDEP) Pollution Recovery Program and a special legislative appropriation sponsored by Representative Mary Figg in 1987. Because an amendment to the Florida Constitution prohibiting certain types of inshore netting became law on July 1, the Institute's program has been discontinued due to lack of funds.

The program's main focus over the past two years has been to complete construction and operation of a 1.5-acre *Spartina* marsh for treatment of saltwater discharged from the Stock Enhancement Research Facility (SERF, a hatchery) at Port Manatee. The saltwater discharged from the hatchery is regulated by FDEP as "industrial wastewater". The *Spartina* marsh project was begun with both SWIM and Institute funds with the goal of integrating wastewater management, producing the best quality effluent possible; and as an added benefit, providing salt marsh plants for interagency restoration of Tampa Bay marine habitats.

The Institute contracted with neighboring Port Manatee to begin construction of the project in 1993. The Institute's SWIM grant expired in June 1993 but contributed just under half of the project's total cost. As of July

1, 1993 the SERF no longer had a direct wastewater discharge to Tampa Bay. All saltwater from the hatchery ponds is now routed to a two-acre aerated pond. The retention pond has a V-notch weir set at 3.0 feet, and the rate of discharge at any time can be calculated.

In 1994 Port Manatee began Phase 2, involving the connection of the two-acre retention pond to a pump station housing a 600-gallon per minute saltwater pump. The project became operational June 28, 1995. The *Spartina* marsh was designed and constructed to flood and drain much like a natural marsh. Three volunteer groups were largely responsible for planting 20,000 units of *Spartina alterniflora* into the marsh: teachers participating in a training workshop for the Florida School of Environmental Studies; Youth Environmental Services; and the Manatee and Hillsborough Chapters of the Florida Conservation Association. Now fully planted, the *Spartina* will spread and begin to assimilate nutrients from the hatchery discharge. Bacteria and algae associated with the *Spartina* and the marsh surface will also contribute to nutrient reduction.



The cost of operating the *Spartina* marsh will be evaluated in terms of how well it performs in helping attain nutrient reduction and water quality goals. The total project cost has exceeded \$100,000 to date. When complete vegetative cover is achieved and a steady level of nutrient reduction has been attained, a managed program of controlled harvesting will make *Spartina* plants available for Tampa Bay area salt marsh restoration projects. It should be possible to provide *Spartina* plants while continuing to sustain nutrient reduction levels and water quality goals.

Port Manatee has recently been recognized with a Future of the Region Excellence Award from the Tampa Bay Regional Planning Council for their cooperative efforts in bringing this multi-year project to fruition.

The Institute's Restoration Program began large-scale seagrass transplant studies in 1987. In three

separate studies, transplants of *Halodule* and *Syringodium* were performed to investigate the best type of planting unit, the rate of transplant development, the rate of faunal colonization, the effects of fertilizer additions, and the recovery rate of donor sites. Over 25,000 units of seagrass were planted. In addition, the program completed a year-long study on the effects of shading (*in situ* light reduction) on deep and shallow *Thalassia* at East Beach, Ft. DeSoto.

When commercial quantities of *Spartina* were not available for Institute/SWIM salt marsh plantings at the Hendry Delta in Port Manatee, the Research Program implemented a study to investigate the effects of harvest on a *Spartina* marsh. The results of this study demonstrated that *Spartina* could be harvested from a shoreline marsh with minimal damage to the marsh, and that recovery occurred within two years. Large-scale salt marsh plantings were performed at Hendry Delta, Boca Ciega Tract, Joes Creek, Puryear Park, Gandy Bridge West, City Island and Leffis Key. Over 325,000 units of *Spartina* have been planted, providing over 20 acres of intertidal fisheries habitat.

In response to questions concerning the genetic makeup of *Spartina alterniflora*, the Program completed a two-year survey of *Spartina* in the Tampa Bay area and at six sites around the state: Apalachicola, Cedar Key, Charlotte Harbor, Port St. Lucie, Merritt Island and Jacksonville. The Program also initiated a multi-year study of *Spartina* seed production and morphology involving four natural and three planted sites in the Tampa Bay area from which data is currently being processed.

During this year the Institute's Program also provided assistance to both the Tampa Bay SWIM and Pollution Recovery marine habitat restoration projects at Clam Bayou in Gulfport, and at the Alafia South Parcel site. Institute staff were active participants in the Cockroach Bay Restoration Alliance and with the Bay Area Environmental Action Team. For more information contact Frank Courtney, FMRI (813) 896-8626.

TECO CORPORATE STEWARDSHIP PROGRAM

Tampa Electric Company's Corporate Stewardship Program, located between Port Manatee and Cockroach Bay, was established in 1989. The Stewardship Program has operated a Summer Youth Employment/Teachers-in-Industry program for seven years. Tampa Electric Company (TECO) and the Corporate Stewardship Advisory Committee have emphasized wetlands protection and restoration of habitat. The concentration of the program is removal of exotic species such as Brazilian pepper, Australian pine and Melaleuca. Local high school and college students

and teachers work at the site, improving and restoring animal habitats to their natural condition.

Each year the battle line with the exotic species is pushed back a few acres. The areas already cleared must be revisited to remove new seedlings. Those acres previously cleared are quickly regaining their natural appearance with Cabbage palms, Red cedars, pines, mangroves, and palmettos.



The property contains an active bird rookery. Last year 12 species, 3,900 pairs, were identified. The students and teachers saw many birds including Bald eagle, Osprey, Black ibis, and Roseate spoonbill. Other animals seen included Alligator, Bobcat, Gopher tortoise, and an Indigo snake. The Beach Sunflower is staging a comeback along the beach front and a delicate, epiphytic Florida orchid can be found in the hammock areas.

The 2,500 acres is slowly being restored through the guidance of the Corporate Stewardship Advisory Committee, the hard work of students and teachers, and the long-term financial commitment of Tampa Electric Company. For additional information contact Walt Plaag, TECO (813) 228-4111.

CAPMAT STATUS: OCT. 31, 1995

The Cockroach Bay Aquatic Preserve Management Advisory Team (CAPMAT) has recently been expanded to include representatives from eight agencies, three citizens' representatives, two varieties of fishermen, three varieties of agriculture plus agricultural extension/ag policy, forestry, aquaculture, phosphate mining, realty/development, Audubon Society, Tampa BAY-WATCH, and ecotourism. It is anticipated that this

broadly-representative team can prepare a Management Plan for the Cockroach Bay Aquatic Preserve, the Little Manatee River, and the associated watershed. Preparation of the Plan is scheduled to begin in early 1996.

An associated citizens group, called the Cockroach Bay Users Group (C-BUG) has been organized during the past several months, and has joined the CAPMAT membership. See "An Alternate Solution for Cockroach Bay". For more information on CAPMAT contact Dooley Houghtaling, CAPMAT Chair (813) 645-3256.

AN ALTERNATE SOLUTION FOR COCKROACH BAY



C-BUG, an acronym for the Cockroach Bay Users Group, is a non-profit citizens' group formed in 1995 to encourage protection and preservation of the seagrass and flats of the Cockroach Bay Aquatic Preserve. It began when the Cockroach Bay Aquatic Preserve Management Advisory Team (CAPMAT) recommended that large portions of Cockroach Bay be closed to boats with internal combustion engines. The reasoning was to prevent further damage to the seagrass from propeller cuts

by power boats.

The main purposes of the C-BUG organization were determined to be:

- To maintain and improve the environment of the Cockroach Bay Aquatic Preserve through a wide variety of educational programs.
- Assist other organizations in developing programs to restore areas that are damaged.
- Develop programs similar to the "neighborhood watch" to report incidents and individuals that damage the area to law enforcement authorities.
- Oppose any activities that could cause the loss of historic and traditional uses of the preserve.

The C-BUG membership addressed the County Commission, presenting a 1,000-signature petition rejecting the CAPMAT recommendations. An 18-month mandate was awarded to C-BUG to work with the preserve management.

First on the C-BUG agenda was to increase the membership by 200, to handle the many tasks required over the 18-month period. "Know Your Depth" 10 ft. boat push poles for poling in shallow seagrass beds were designed as a give-away for the membership drive. The 2,000 feet of plastic pipe and 400 end caps were do-

nated. The assembly and depth markings were handled by Youth Environmental Services students, a non-profit organization.

An Informational Center was designed and constructed by C-BUG members at the end of Cockroach Bay Road, just southeast of the launch ramp. A variety of instructional panels, and a "navigational" take-along brochure, are being prepared by citizen organizations and government agencies. Two additional Informational Centers are planned for other entrances to shallow Cockroach Bay waters, to provide up-to-date environmental knowledge to serious anglers, birders and nature lovers who want to use the Aquatic Preserve's waters in a way that will not stress the natural plant and fish habitats.

C-BUG learned that there appears to be a lack of commercially-available seagrass for transplanting into damaged areas of the bay. As a result, one member has started a "replanting of seagrass" project in Cockroach Bay. Early observations look very promising.



C-BUG continues to advocate "Environmental CPR" (Conservation, Preservation, and Restoration) within the Cockroach Bay Aquatic Preserve. Volunteer opportunities exist: to design, build and maintain displays; serve as preserve hosts; conduct interpretive programs; help with shoreline clean-ups; restore and survey habitat; design artwork for bulletin boards; and staff informational centers. For more information on membership and member activities, including monthly meetings, write C-BUG, P.O. Box 812, Ruskin, FL 33570, (813) 654-2032, 654-3888 or 634-7440.

PORT REDWING: THE GOOD NEWS

In 1965 a 265-acre dredge and fill port project was begun on the east side of lower Hillsborough Bay near Gibsonton, adjacent to a biologically-rich embayment called the Kitchen and two National Audubon Society (NAS) Tampa Bay Sanctuaries islands: Green Key and Whiskey Stump Key. As construction progressed, dikes broke and silt spilled onto Whiskey Stump Key and the Kitchen, reaching depths of two feet and covering more than 200 acres of biologically-productive submerged land. Seagrasses present in the Kitchen died. Wildlife habitat was damaged.

In 1974 a maintenance dredging project was successfully opposed by Save Our Bay and NAS Sanctuary representatives, who raised concerns about the effects of port development and repeated dredging on the slowly recovering intertidal habitats of the Kitchen and the two sanctuary islands. Then-Department on Natural Resources staff recommended that the north channel, facing the Kitchen, receive "limited use" to "minimize disturbances to National Audubon Sanctuary islands".

For nearly thirty years the port site lay undeveloped. Various proposals were suggested, but always the same concerns about the protection of the Kitchen and its islands intervened. Finally, the owner declared bankruptcy and the port site became the property of the bank.

In the fall of 1994 a plan was devised by the National Audubon Society's Alafia Watershed Area Restoration Effort (AWARE) involving purchase of the Port Redwing site by three entities. The sensitive northern portions would be purchased by the Southwest Florida Water Management District and the Hillsborough County Environmental Lands Acquisition and Protection Program, restoring mangrove and marsh shorelines with plenty of room to create wetlands and uplands. The southern portion, the last undeveloped deep-water port area in the state of Florida, would be purchased by the Tampa Port Authority for port development. The various agencies agreed, and public support became unanimous, especially when a small beach park to accommodate public access was included in the restoration project plan.

The purchase was completed in October. Early planning efforts are underway for the restoration project. The result is a winning proposition: port facilities development can proceed, with the accompanying economic benefits; citizens in the Gibsonton area can anticipate a pleasant beach park and public access to Hillsborough Bay; and the threat of potentially-damaging port development adjacent to the delicate wildlife habitats of the Kitchen will be replaced with a positive habitat restoration effort. After 35 years, a 95-acre portion of the natural system will be returned to Tampa Bay. For more information call Ann Schnapf, National Audubon Society (813) 623-6826.

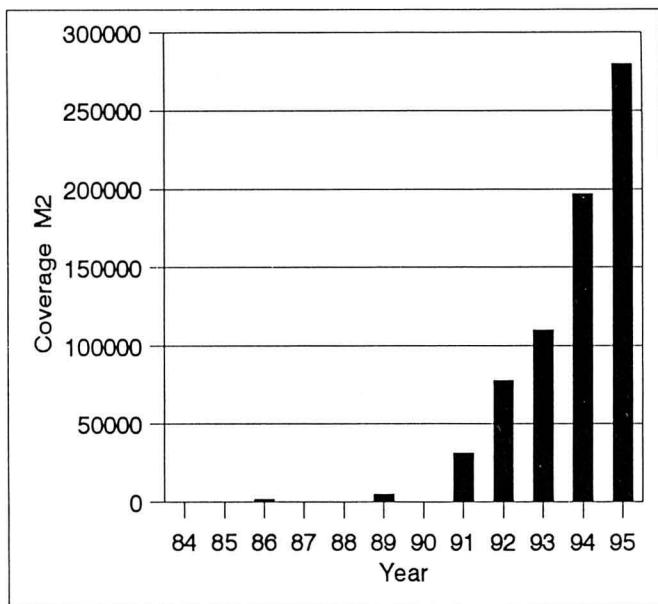
REESTABLISHMENT OF SEAGRASS MEADOWS IN HILLSBOROUGH BAY

Seagrass coverage in Tampa Bay has expanded in the past decade and this trend has been attributed to improvement in water quality. Hillsborough Bay, considered to be the most polluted section of Tampa Bay, is one portion of the bay where seagrass revegetation may be most visible.

Years of degraded water quality resulted in the loss of nearly all seagrass in Hillsborough Bay by 1980. However, management actions reduced nutrient loading to the bay and improvements in Hillsborough Bay water quality began in the early 1980's. Concurrent with improving water quality, seagrass started to revegetate areas near southern Hillsborough Bay. The City of Tampa Bay Study Group (BSG) began monitoring seagrass in Hillsborough Bay in 1986. In the initial seagrass survey, the BSG found nearly 2,000m² of the shoalgrass, *Halodule wrightii*. Seagrass surveys conducted in 1989 and 1991-1995 (Figure 1) found a substantial increase in shoalgrass coverage for each survey. In 1995, about 280,000m² of *H. wrightii* was reported in Hillsborough Bay.

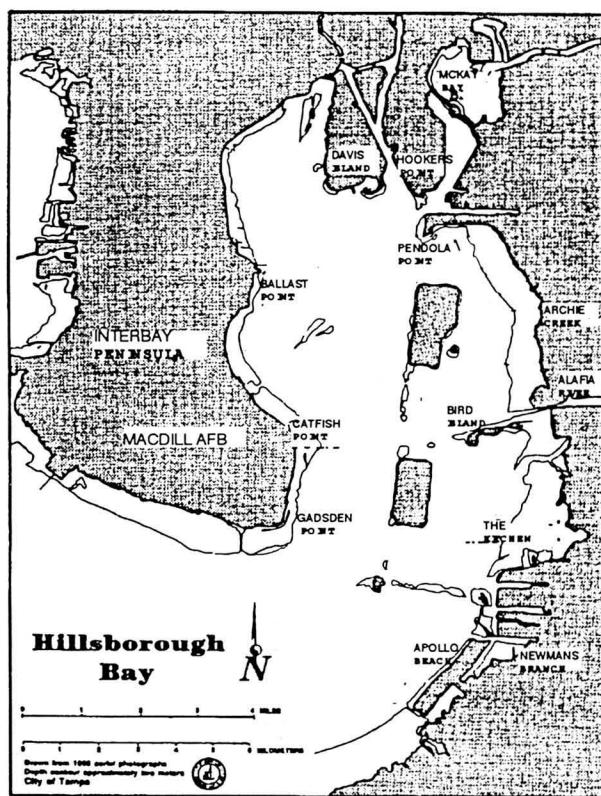
Figure 1.

Change in *Halodule wrightii* coverage in Hillsborough Bay from 1984-95. About 150m² was reported for 1984. No surveys were conducted in 1985, 1987-88, and 1990.



Several areas of Hillsborough Bay (Figure 2) have been rapidly revegetated by *H. wrightii*. For example, in the Kitchen, an area in the southeastern portion of Hillsborough Bay, seagrass coverage increased from 1,300m² in 1986 to 165,000m² in 1995. In addition, seagrass coverage in western Hillsborough Bay, from Catfish Point to Ballast Point, expanded from 140m² in 1986 to over 108,000m² in 1995. Seagrass coverage north of Ballast Point and the Alafia River has been sparse but continues to develop.

Figure 2.
Key landmarks in Hillsborough Bay.



In 1987, the BSG transplanted about 13m² of *H. wrightii* into several intertidal and shallow subtidal areas of Hillsborough Bay. Transplant coverage reached 1,200m² in 1992. However, following 1992, transplant coverage has been difficult to assess due to the coalition with areas of natural *H. wrightii*. Transplants enhanced the rate of recolonization in areas of sparse seagrass coverage and provided material to facilitate growth in areas lacking seagrass.

H. wrightii coverage in Hillsborough Bay has continued to increase each year since 1986, apparently in response to improving water quality. Several areas of the bay which had little or no seagrass coverage one

decade ago now support sizable stands of shoalgrass. For further information contact Walt Avery of the City of Tampa, Bay Study Group at (813) 247-3451.

HILLSBOROUGH COUNTY ENVIRONMENTAL LANDS ACQUISITION AND PROTECTION (ELAP) PROGRAM

To date, the Hillsborough County ELAP program has purchased approximately 20,000 acres of environmentally-sensitive lands, all within the Tampa Bay watershed. Among the various ongoing restoration projects, three projects have special implications for Tampa Bay:

Cockroach Bay Preserve: During this past year, a full-time preserve manager was hired and a permanent field office was established. Restoration of the upland farm fields (on the north side of Cockroach Bay) continues through a cooperative effort to remove Brazilian pepper and to replant native plants. In January, Hillsborough County was awarded a Small Business Administration Grant with a matched total of approximately \$70,000 (half from the ELAP Program and half from the Department of Agriculture). This will fund the purchase and planting of native tree and shrub species for the restoration project.

Pam Callahan Nature Preserve: A public hearing was held in August to hear the testimony from neighboring citizens on the issue of changing the name from Peppermound to Pam Callahan Nature Preserve. Pam Callahan was well known in the community for opposing high-density development in the environmentally-sensitive areas adjacent to Peppermound Creek. There was overwhelming support for the name change and it went into effect in September. A memorial boulder and plaque in honor of Pam Callahan are being purchased for the entrance to the site. Bollards and cables as well as posted signs were installed to increase site security. Other management activities include clearing for a nature trail and herbiciding exotic Brazilian pepper trees. Recently-reported manatee sighting and breeding activity in the area has spurred research into posting the adjacent waterway "no wake" and "manatee preserve".

Diamondback Tract: Large permanent signs are being installed and construction of a nature trail is underway at this shoreline site west of the Westshore Business District. With the continued replanting of natives, the site is being restored to quality coastal habitat. The site is open to the public through a gate on Gray St. and is available for scheduled interpretative nature walks by calling Resource Management at (813) 744-5610.

ALAFIA WATERSHED AREA RESTORATION EFFORT (AWARE)

Cargill Fertilizer, Inc. and Lewis Environmental Services, Inc., with the National Audubon Society, supported the Alafia Watershed Area Restoration Effort (AWARE), an environmental education and habitat restoration project focussing on an area surrounding the Alafia Bank, the largest bird nesting colony site in Florida and possibly the most diverse in North America. Progress includes:

A shoreline restoration demonstration project at the Riverview Civic Center on the Alafia River, with the full assistance of agencies, Hillsborough County Parks and Stormwater Departments, and local corporations, has been designed, partially funded, and submitted for permitting.

In late October Port Redwing, a 265-acre parcel on the eastern shore of Hillsborough Bay, was purchased by Hillsborough County, the Southwest Florida Water Management District and the Tampa Port Authority. (See "Port Redwing: The Good News").

The 1,100-acre Golden Aster Scrub was purchased by the Hillsborough County Endangered Lands Acquisition and Protection (ELAP) Program and the state Conservation and Recreation Lands program. This pine flatwoods area contains several wetlands, the headwaters of Kitchen Branch, and a ridge of oak scrub where both the Florida Scrub Jay and the Florida Golden Aster are found. National Audubon Society staff had nominated the site for acquisition.

A wetlands restoration project on the Gibson Lands has been designed; implementation of the project will be delayed until the County's ELAP Program buys the adjacent Davis Property along the shore of Hillsborough Bay. In addition, an upland restoration project is under design for the Gibsonton Landfill site, which is located on the Davis Property.

The National Audubon Society staff is writing the management plan for the Bullfrog Creek Aquatic Resource Protection Area (which includes Alafia Bank and the Kitchen), one of ten such "ARPAs" designated by the Tampa Port Authority. This is the first such contract awarded by the Authority.

A stormwater/wetland restoration project on the Delaney Creek Pop-off Canal has been added to the Southwest Florida Water Management District's (SWFWMD) five-year plan.

Alafia River project, blending erosion control and fisheries habitat enhancement, is being developed with the assistance of Tampa Electric Company.

Environmental education presentations were made to 18 local activist groups, and four workdays were organized to eradicate Brazilian pepper and remove trash from AWARE area sites.

Funding for the AWARE Program in 1996 will be provided by the Alafia Basin Board of SWFWMD, the Tampa Port Authority, and the National Audubon Society. For more information, contact Ann Schnapf, National Audubon Society (813) 623-6826.

ARTIFICIAL REEF PROGRAM OF THE ENVIRONMENTAL PROTECTION COMMISSION OF HILLSBOROUGH COUNTY

The Environmental Protection Commission's Artificial Reef Program has been conducting a study designed to compare relative abundance of fish species on artificial reefs and known live-bottom communities in Tampa Bay. Funded by Hillsborough County Pollution Recovery Trust Funds and Sport Fish Restoration monies, the program has been using a survey technique whereby employees use underwater video technology to record "samples" which can later be studied and enumerated in the comfort of our office. The use of video sampling has dramatically decreased our chances of misidentifying individual fish since the tapes can be freeze-framed or reviewed over and over again. Additionally, due to the limited visibility faced by our divers, the camera has been known to "see" things which might otherwise have been missed.

Based on quarterly sampling events on each of four artificial reefs and four live-bottom sites, it has been possible to make some preliminary observations regarding our first year's data. Twelve species of fish were recorded on the artificial reef sites between August 1994 and May 1995. This compares to six species on the live-bottom sites. Of those species found on the artificial reefs, by far the most abundant were Sheepshead (*Archosargus probatocephalus*), Mangrove Snapper (*Lutjanus griseus*), and Spadefish (*Chaetodipterus faber*). It is important to note here that over forty species of fish are known to occur on the artificial reefs to date. However, for the purposes of this study, if they were observed by divers but not recorded by the camera, they did not earn a relative abundance ranking. Each of the four artificial reef sites studied (Howard Frankland, Port Tampa, Bahia Beach and Port Manatee) had very similar species composition and seemed to be performing equally as well relative to each other. The live-bottom sites did not display this same homogeneity in either fish species present or in habitat composition. Some of those species found on the live-bottom sites were fish you would expect to find due to their adaptations for bottom dwelling. Examples of these are the Searobin (*Prionotus* spp.) and Blenny (*Hyleurochilus* spp.).

Some of the more interesting species added to the growing list of fish known to occur on artificial reefs in Tampa Bay include: Lookdowns (*Selene vomer*), Cubbyu (*Equetus umbrosus*), Spotfin Butterflyfish (*Chaetodon ocellatus*) and Hog Snapper (*Lachnolaimus maximus*). Anyone wishing to learn more about EPC's Artificial Reef Program can contact Tom Ash (813) 272-5960.

MCKAY BAY

The Strategic Management Initiative for McKay Bay was written and published with a grant from the Florida Department of Community Affairs. The compilation was the result of a cooperative effort by the City of Tampa Parks Department, Tampa BAYWATCH, Tampa Audubon Society, the Hillsborough County City-County Planning Commission, the Bay Area Environmental Action Team, Peninsula Design and Engineering, and the Southwest Florida Water Management District. This document outlines the current status of the bay; problems and opportunities; and includes action plans, funding opportunities and a matrix of agency responsibilities. Copies can be obtained by contacting Jim Valentine, City of Tampa Parks Department (813-931-2628).

Restoration efforts at three sites were undertaken at McKay Bay over the last year. At McKay Bay Nature Park, approximately four acres on the north end of the park were cleared of non-native vegetation and 21 reforested plant community "nodes" were planted. It is hoped that these plant community nodes will be easier to maintain and keep free of pioneering vegetative pest species while the community matures. In addition, several large cypress and palm trees were moved to the park from the "Ice Palace" hockey arena parking lot construction site. Tampa Audubon Society volunteers assisted with five workdays planting native species, particularly butterfly plants, and removing non-native vegetation.

On the northeast side of the 22nd Street Causeway, the Tampa Port Authority has established 5.6 acres of intertidal marsh. This work is part of the mitigation package connected to the development of Hookers Point within the Port. This effort comes as a redesign of a portion of the mitigation project at Pendola Point, resulting in the saving of sensitive coastal uplands and enhancement of on-site wetlands there. Significantly, the Port Authority has also signed a conservation easement with Hillsborough County and the State of Florida for the permanent protection of 220 acres of environmentally-sensitive bay bottom at McKay Bay.

On the upper eastern shore of the bay, non-native species removal (Melaleuca and Brazilian pepper) has begun. In addition, an interpretive nature trail through

the uplands with two foot-bridges providing access to tidally-influenced wetlands is being installed on property owned by Hillsborough County through the Environmental Lands Acquisition and Protection Program. Members of the Youth Services Camp have been involved in the project, which will allow access for visitors and volunteers for habitat restoration projects. Tampa Electric Company donated used telephone poles for the bridge construction. The Boy Scouts provided lumber which, unfortunately, was stolen.

Other efforts at the Nature Park include completion of one mile of the Bikeway, which will remain unopened until additional sections are completed. Discussions with the Crosstown Expressway Authority and the Florida Department of Transportation regarding a bikeway along the northern shore of the bay continue. A grant for native vegetation restoration on the park's south end was awarded from the County's Pollution Recovery Trust Fund.

The City of Tampa purchased two key trailer park sites adjacent to DeSoto Park. The trailers have been moved and the site will be used for restoration of the shoreline as an addition to the park. The City received conceptual approval for funding from the Florida Communities Trust and the Hillsborough County Environmental Lands Acquisition and Protection Program to purchase the old Drive Inn Movie site, now called Mullet Point. Mullet Point contains significant mangrove-forested shoreline, a tidal pond, and marshy areas. It also offers an upland restoration site.

Unfortunately, a project for creating oligohaline wetlands in the northeast corner of the bay in association with the U.S. Environmental Protection Agency, Gulf Coast Recycling, and Peninsula Design and Engineering was lost because of Florida Department of Environmental Protection concerns relating to excavation of the old landfill on the site. Possible soil decontamination expenses could not be covered by the project or the City.

The Florida Aquarium Learning Lab continues its Environmental Education Program at McKay Bay Nature Park. Students from the fourth and fifth grades visit the park using a curriculum partially developed with funding from the Junior League of Tampa. Volunteers participate regularly in non-native plant removal and the Coastal Cleanup. Summer programming involved approximately 2,000 children from the Inner City YMCA, the Police Athletic League programs, Nuccio Community Center, the Kids Odyssey Program, Girl Scouts, and the Men to Boys Club. Baywalks for the community are led twice monthly by volunteers trained as docents by The Florida Aquarium.

Mangroves and *Spartina alterniflora* spreading across the mudflats at McKay Bay is now a significant problem. As of yet, no decisions have been made concerning this vegetational succession. Open mudflat

habitat, important for large populations of migratory shorebirds, is lost when such succession occurs. For more information contact Ann Schnapf, National Audubon Society (813) 623-6826.

EAST LAKE RESTORATION PROJECT

The East Lake Area (ELA) watershed covers about 7.9 square miles or 5,056 acres, draining to the Tampa Bypass Canal (TBC) and ultimately into McKay Bay. According to studies conducted by the Environmental Protection Commission of Hillsborough County, McKay Bay has the poorest water quality in the Tampa Bay system. Additionally, the TBC is used to supplement drinking water supplies for the City of Tampa during periods of water shortage. The ELA is a highly-urbanized watershed which has lost much of its historic wetland systems and with them much of the pollutant-assimilative capacity that once existed. Thus it may discharge significant pollutant loads to the TBC and ultimately to McKay Bay. East Lake itself has lost virtually all of its historic wetland systems to dredging, has a large urbanized watershed of almost 1,200 acres, and is one of the most eutrophic lakes in Hillsborough County. The attached pie chart shows the percentage of the ELA watershed attributable to each of its sub-basins. The East Lake sub-basin is the largest in areal extent and as the attached bar graphs show, it also contributes the largest loadings of total Kjeldahl nitrogen, phosphorus, and total suspended solids.

Based on the above information, the Hillsborough County Stormwater Management Section of the Engineering and Construction Services Department and the Surface Water Improvement and Management Department of the Southwest Florida Water Management District have initiated the East Lake Restoration Project. This project will explore innovative stormwater treatment technology like alum injection, as well as traditional Best Management Practices to reduce nonpoint source pollutant loading to East Lake, the TBC, and McKay Bay. Alum injection for stormwater treatment is a new technology. Alum, a compound containing aluminum, has historically been used for treating drinking water and wastewater. It is used in a similar way to treat stormwater by injecting it into the incoming stormwater flow where it combines with phosphorus, suspended solids, and heavy metals. These insoluble precipitates then quickly settle out of the water column, thereby reducing the pollutant loads. For more information contact Jack Merriam, Hillsborough County (813) 272-5912.

HILLSBOROUGH BAY RESOURCE EXCHANGE PROJECT

This project is a modification to the proposed indirect potable re-use of supplementally-treated high quality water from the City of Tampa's Howard F. Curren Advanced Wastewater Treatment Facility (the Curren Facility) located on Hookers Point. This Phase II element of the West Coast Regional Water Supply Authority's (WCRWSA) Resource Development Plan 4A adds approximately 35 million gallons per day (mgd) of capacity to the region's water supply. The WCRWSA's Resource Development Plan 4A, designed to meet the demands of its members through the year 2030, recognizes the need to provide an additional 115 mgd while implementing an intensive, coordinated, demand management program to reduce use by 10 mgd in 2000, 26 mgd in 2015, and 42 mgd in 2030. The Hillsborough Bay Resource Exchange project entails taking water from wells located along the Tampa Bypass Canal (TBC), treating and feeding it into regional supplies of water, and replacing waters extracted by these wells with waters of the TBC. The work product developed to date has been a detailed analysis of supplementally-treated water taken from the Curren Facility and a comparison of health risks versus other sources of supply.

The potential for such a project was first described in 1978 in WCRWSA's Needs and Sources Report. Since then WCRWSA and the City have begun joint studies in a number of areas. The Tampa Water Resource Recovery Project Implementation Program is the next step in the process. It will identify and attempt to resolve potential impacts or stumbling blocks relating to the Recovery Project and the Resource Exchange, including the investigation of public acceptance, environmental impact, regulatory acceptance and permitting, legal and administrative issues, and project phasing and funding. The entire Implementation Program is scheduled for completion in mid-1997. The Southwest Florida Water Management District has identified this as a major element in its New Water Source Initiative and will be providing significant funding for it - about \$250,000. The remaining funds will come from WCRWSA and the City of Tampa. The estimated capital cost of the Hillsborough Bay Resource Exchange project is \$108.2 million. Annual operating cost for the supply of 35 mgd is estimated at \$14.7 million. For more information, contact Dave Bracciano, WCRWSA (813) 796-2355.



FDEP'S ECOSYSTEM MANAGEMENT PROGRAM FOR THE HILLSBOROUGH RIVER AND BAY

The Florida Department of Environmental Protection (FDEP), working in conjunction with other governmental agencies and numerous private parties, has developed a strategy to protect the functions of entire ecological systems. This concept, called ecosystem management, represents a new approach for environmental protection that relies heavily on citizens and government becoming partners. This new approach will improve efficiency and result in decisions that are better for Florida's natural resources, the regulated public, landowners and citizens.

To initiate implementation of the FDEP's ecosystem management strategy, the Legislature created the Hillsborough River and Bay Ecosystem Management Demonstration Project during its 1995 session. The legislation makes FDEP the lead agency in the design and implementation of a cooperative, coordinated ecosystem management-based program. The FDEP is directed to integrate the federal, state, local and private groups in this effort. The Hillsborough River Integration and Coordination Committee (HRICC) was established during the summer of 1995 for this purpose and serves as an umbrella for all ongoing activities within the watershed boundary. Members include agency representatives and the chairman and directors of the Hillsborough River Greenways Task Force, the Tampa Bay National Estuary Program, and the Hillsborough River Interlocal Planning Board. FDEP facilitates this integration effort. Each member entity ensures that their focus remains centered on their own priority projects while moving forward an integrated goal of ecosystem management.

Implementation projects reflect efforts underway within defined physical segments of the Hillsborough River and Tampa Bay, namely the upper basin, the lower

basin, the central pool and upper Hillsborough Bay. Moreover, there is an additional basin-wide component to reflect ecosystem-based tools and actions for the entire watershed.

Each implementation component has an entity or combination of entities coordinating action plans and priority projects. For example, the Hillsborough River Greenways Task Force leads the effort in the upper basin; the Tampa Bay National Estuary Program in the lower basin and Hillsborough Bay; and the Hillsborough River Interlocal Planning Board in the central pool. All parties are heavily involved in the basin-wide effort, and it is important to note that multi-agency involvement is present in each task, regardless of the sponsoring agency.

Several of the many implementation projects currently underway are:

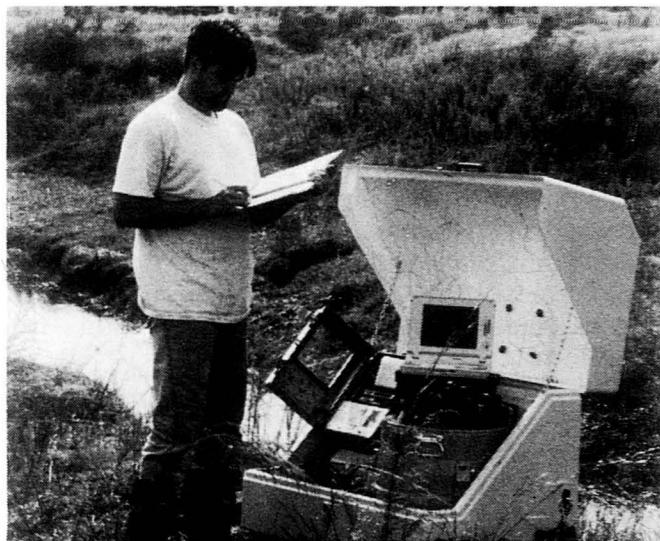
- **The Cone Ranch Restoration Project:** The Hillsborough River Greenways Task Force (HRGTF) developed a concept for the restoration and enhancement of wetland systems on the approx. 12,000-acre cattle ranch in northeastern Hillsborough County. It is called the "sponge concept" because of the improved site's increased ability to store water, like a sponge. Hillsborough County, which owns the property, and the West Coast Regional Water Supply Authority, which proposes to develop a future water supply wellfield on the ranch, are HRGTF members and have received the "sponge concept" favorably. The project is currently in the design/engineering phase for the de-channelization and de-ditching activities; construction is projected for winter 1996-97. The goals of the concept are to develop sustainable yields in the event of wellfield development, to restore proper site hydraulics, to improve and increase wildlife habitat, and to improve water quality discharged to Blackwater Creek and the Hillsborough River, both Outstanding Florida Waters.
- **The CF Industries Team Permitting Project:** The CF Industries (CFI) complex is located in northeastern Hillsborough County adjacent to the Cone Ranch. CFI is a national farm cooperative which converts phosphate rock into fertilizer. The company is working with the HRGTF to develop a wetland and upland restoration program to accompany CFI's proposed gypsum stack expansion. The project goals are to: coordinate development within the watershed which provides an opportunity to enhance natural systems and habitat within the basin; and promote greenway connections.

Team permitting is one of the ecosystem management implementation tools. A permitting team involves multiple agencies, the permittee(s) and third

party interests. Team permitting does not guarantee project approval; rather, it renders decisions in a manner which provides savings in cost, time and certainty to the applicant. The applicant is required to provide a net ecosystem benefit which is defined as an advantage that accrues to natural systems from using innovative planning, engineering or design to produce a better environmental outcome than would have been achieved through the traditional regulatory process. In turn, the regulatory agencies review projects with a holistic ecosystem management perspective. This project incorporates innovative features to link land use and environmental permitting.

The CFI gypsum stack expansion proposal is the first team permitting project and will set the precedent for future such projects.

- **Dairy BMP Project:** There are several dairies in the Tampa Bay area which are associated with non-point pollution of watersheds. These intensively-managed dairies are forced to operate with more animals on less space because of rapid urbanization and reduced land availability for traditional pasturing. This situation of super-nutritified stormwater and nutrient runoff can be significantly reduced by use of agricultural best management practices (BMPs).



The FDEP has joined forces with other agencies, including the Southwest Florida Water Management District; the Environmental Protection Commission of Hillsborough County; the Florida Department of Corrections; Soil Conservation Service; University of Florida's Departments of Agricultural Engineering, Department of Dairy Science, and Extension Service; Dairy Farmers, Inc.; Tennessee Valley Authority and private industry. With grant money received from the U.S. Environmental Protection Agency, local dairy owners will provide match-

ing funds and implement BMPs unique to Tampa Bay's situation of urban/agricultural interface.

Project objectives are to reduce the nutrient load into the watershed while providing economic incentives to dairy farmers for on-site management of dairy waste and to promote re-use of manure into horticultural operations and home gardens.

An interim report to the Legislature summarizing these projects is to be completed by January 1996. Copies, and more information about ecosystem management may be obtained by contacting Kathy Liles, FDEP (813) 744-6100, Ext. 440.

- To protect in perpetuity the open space, habitats, compatible land uses, and recreational opportunities of the basin.

As a result of the efforts of the HRGTF, the Hillsborough River Basin has become the focus of state and regional ecosystem management and protection efforts. The Florida Department of Environmental Protection (FDEP) has chosen the Hillsborough River as one of the six sites to demonstrate the implementation of the Department's Ecosystem Management Initiative. FDEP has requested the Task Force serve as its steering committee. The Southwest Florida Water Management District has chosen the river basin to serve as its pilot project for the development of its basin-wide protection plan initiative called the Comprehensive Surface Water Management Initiative.

The HRGTF is serving as a demonstration project for the Suncoast Greenways Project of the 1000 Friends of Florida's Florida Greenways Program to highlight site-specific greenways planning and protection efforts. Serving this function, during the first two years of its existence the HRGTF developed criteria and methodology for the delineation of a greenways corridor containing core (preservation) and buffer (target restoration and compatible land uses) lands; developed a map delineating the core and buffer areas of the upper Hillsborough River Greenway; developed alternative analyses and recommended program action plan issues with the potential to affect wildlife habitat, water quality, water quantity, and recreational opportunities within the upper Hillsborough River Basin; and began initial efforts at implementing recommended program actions.

Since the publication of An Ecosystem Protection Plan of the Upper Hillsborough River; Issue Analysis, Action Plans, and Recommendations in February, the HRGTF has been successful in working towards the implementation of the 18 projects outlined in the report. Four of the projects have moved into implementation. These are: OFW Designation for the upper Hillsborough River Basin; Canoe Trail Recreational Trail Designation and subsequent management of the Trail system; Restoration of close to 1,000 acres of habitat within the core area of the greenway, on CF Industries and Hillsborough County properties; and Rehydration of channelized wetland systems on Cone Ranch. In January 1996 these accomplishments and the progression of the other projects will be brought before the Florida State Legislature in hopes that it will bring official backing to help implement the idea of ecosystem management and the HRGTF's plan. For more information contact Tabitha Orr, Hillsborough River Greenways Task Force (813) 276-8417.

THE HILLSBOROUGH RIVER GREENWAYS TASK FORCE

The Hillsborough River Greenways Task Force (HRGTF), formed in 1992, is an action-oriented, consensus-driven coalition of public, private, regulatory, environmental and corporate organizations and bodies formed to seek and implement programs for the permanent protection of the natural resources of the upper Hillsborough River Basin.

The mission of the HRGTF is to develop and implement a regional plan for the permanent protection of the Hillsborough River, its tributaries, headwaters, intermittent streams, recharge areas, wildlife corridors, etc., with special emphasis on the upper Hillsborough River Basin-Green Swamp Corridor. Upon completion of the mission, HRGTF can direct or transfer the monitoring, implementation and resource management of those designated programs to the proper public or private organizations. The initial project study area encompasses approximately 175,000 acres within the 456,909-acre Hillsborough River Basin.

The Task Force has four specific goals. They are:

- To identify both threats and opportunities to protect and/or enhance the natural resources within the basin; to assemble all available data and complete those studies necessary to fully analyze the affected areas and conditions; to develop alternative solutions and programs for the protection of the critical areas and habitats; to implement those protection plans; and to establish compatible resource management programs and monitoring systems.
- To insure the reservation of the adequate water resources for conservation and natural systems.
- To protect and encourage suitable land uses within the basin.

THE HILLSBOROUGH RIVER: A VARIETY OF ACTIVITIES FOR THE RESOURCE

DESIGNATION AS AN OUTSTANDING FLORIDA WATERS: The Hillsborough River begins in the Green Swamp in Pasco County and flows 54 miles in a south-westerly direction through Hillsborough County, the City of Temple Terrace and the City of Tampa emptying into Hillsborough Bay. As a part of the Hillsborough River Greenways Task Force's (HRGTF) efforts to protect the upper Hillsborough River basin, an Outstanding Florida Waters (OFW) designation was sought for a portion of the river. The designation area, as defined in the HRGTF petition, is from Crystal Springs Recreational Preserve in Pasco County south to Fletcher Avenue in Hillsborough County. A second petition proposed the designation area be expanded to include the river from its headwaters in the Green Swamp south to the City of Tampa dam and several of the river's major tributaries. Both petitions were submitted to the Florida Department of Environmental Protection (FDEP) for review and consideration.

In 1987, the Hillsborough River Interlocal Planning Board and Technical Advisory Council adopted the Hillsborough River Master Plan. Within that plan it was envisioned that, at a minimum, a portion of the Hillsborough River could attain an Outstanding Florida Waters (OFW) designation. An OFW designation provides additional protection to water bodies, above and beyond standard water quality regulations as administered by the FDEP.

As part of the HRGTF's efforts to protect the upper Hillsborough River, an OFW designation became an integral component in the protection strategy for the upper river basin. Through consensus building by the HRGTF for the designation area, support for a designation petition of a portion of the river was obtained from adjacent landowners. The petition was then prepared, providing extensive details of the petition area and documenting supportive evidence, and submitted to the FDEP in June 1994.

The second petition expanded on the HRGTF's petition area to encompass the Hillsborough River from its origin (in Polk County) to the City of Tampa dam and including several major tributaries. The rationale for this approach is that the river basin as a whole should be considered as an ecosystem. In addition, the river serves as a major source of potable water, making the protection of the water supply paramount.

The Florida Department of Environmental Protection staff reviewed both petitions and held a public workshop. Comments made at the public workshop were used in formulating its recommendation to the Environmental

Regulatory Commission (ERC). Those recommendations were presented to the ERC in January. The ERC's recommendation was to designate that portion of the river as submitted in the HRGTF petition and limited portions of the expanded petition, primarily to include the main river from Crystal Springs to its headwaters and some major tributaries. Final action was taken in March, with approval by the Governor and Cabinet.

STATE RECREATIONAL CANOE TRAIL DESIGNATION AREA: Canoes have been used on the Hillsborough River for hundreds of years. The first canoes were likely dug-outs that were fashioned from trees growing near the river. They were a necessity of life; used as a convenient mode of travel, for fishing and the trade of goods between various settlements that were located along the Hillsborough River.



As motorized vehicles began appearing and roads were established, the need to travel on the river became less of a necessity. Canoeing became a pleasurable pastime. In January the Hillsborough River Greenways Task Force (HRGTF) sought out the designation of the Hillsborough River as a Florida Recreational Trail to raise the level of public awareness and assist in promoting the river as a recreational resource, as well as acknowledge the natural functions which make the Hillsborough River a significant resource to the region and state.

On July 15th a portion of the Hillsborough River joined the State Recreational Trail System through its designation by the Florida Recreational Trails Council, based on a petition submitted by the HRGTF. In its findings, the Council designated the portion of the Hillsborough River between Crystal Springs and the City of Temple Ter-

race's Riverhills Park as a part of the State Recreational Trail System. Development of a management plan, including criteria for marking and maintaining the trail, is underway.

At first glance, drawing up a marking and management plan for this canoe trail would seem fairly clear-cut. However, clear-cutting is just one of many complicated issues that face completion of this plan. How many fall-overs (trees), if any, should be allowed to be removed? How should the trail be marked? How frequently should signs be placed? What design for signs will be followed? Who will retain responsibility for inspection and maintenance of the trail? These and other issues will be assessed in the development of an over-all plan that will suit the various parts of the river. One area is very natural; the other highly suburbanized. The portion upstream of Fletcher Avenue has unique natural attributes that need to be taken into consideration. Downstream of that point suburban issues, such as water craft speed limits, will come into play.

Volunteers from the HRGTF, representing canoeing interests, landowners, park managers and planners, have begun to identify these and other issues. From there, various options can be analyzed to devise a safe, environmentally-sensitive and aesthetically-responsible plan. Once the issues are assembled and options are reviewed, a draft management plan will be drawn up for general review. A final plan is expected to be completed by early 1996.

The recreational assets in the designated portion of the Hillsborough River currently benefit from local and regional authority and regulation. Still, the potential remains for urban encroachment to threaten the river's water quality, indigenous wildlife and recreational opportunities. Designation of this portion of the Hillsborough River as a part of the Florida Recreational Trails System will assist in protecting the existing environmental attributes of the river and promote recreational opportunities for the future.

MAYOR'S CLEAN-UP & PLANTING: The 8th Annual City of Tampa Mayor's Hillsborough River Clean-Up and Planting was held on November 18th. This annual event has grown to include over 700 volunteers. The participants were dispersed to over 17 sites located along the river from downtown Tampa to the 40th Street bridge. Volunteers picked up trash and debris from the shoreline and in the river itself.

The amount of recovered material has decreased slightly each year. Over 20 tons of trash and debris were collected in 1989. Nine tons were collected in 1993. In 1994, approximately 13 tons were collected. The higher tonnage figure was primarily due to the large number of heavy items, including two empty safes. Other unusual items removed were chairs, other furniture, batteries, syringes, cash registers, shopping carts, sleeping bags

and tires. Glass, plastic, aluminum, styrofoam and other suitable items were separated for recycling.

In addition to the clean-up effort, a limited planting program was started to clear the shoreline of nuisance plant species which inhibits the river's natural ability to cleanse itself. Cleared areas are being replanted with desirable shoreline vegetative species.

The Hillsborough River Clean-Up and Planting serves two purposes: cleaning up the environment and educating the public. Through participation, volunteers from the general public become more aware of the steps that are needed to keep a clean environment and learn how to take steps to prevent the pollution from happening in the first place. For more information contact Alan Wright, Hillsborough County City County Planning Commission (813) 272-5940.

GASPARILLA MANATEE WATCH PROGRAM

The Gasparilla Manatee Watch Program is a manatee survey/watch conducted by experienced observers, both in the air and on the water, prior to and during the annual Gasparilla Pirate Invasion of Tampa. Established at the request of Ye Mystic Krewe of Gasparilla, the program is designed to assess the potential impacts of the event on manatees in Tampa Bay and to prevent encounters between manatees and boat flotilla participants, pursuant to U.S. Fish and Wildlife Service Conservation Recommendations and U.S. Coast Guard Operation permits.

Gasparilla Manatee Watch Program activities also include training programs and public education. Coordinated by The Florida Aquarium, the program is a cooperative effort of the Aquarium, Florida Marine Patrol, U.S. Coast Guard and Auxiliary, Tampa Police Department, Hillsborough County Sheriff's Office and WFLA-TV News Channel 8. Boaters are requested to observe the idle speed "no wake zone" in Hillsborough Bay on the day of the invasion and to observe all other safe boating rules and regulations. The public is invited to participate in the watch by reporting any manatee sightings that morning along the flotilla route - from Ballast Point to Harbour Island - to the Florida Marine Patrol at 1-800-DIALFMP, *FMP on cellular telephones, or by hailing Channel 23A VHF. For more information contact Dena Leavengood, The Florida Aquarium (813) 273-4506.

ADOPT-A-POND

Adopt-A-Pond took major strides in 1995: the number of ponds "adopted" through the program totalled 22, more than doubling participation from the two years

before; the "On Our Pond" quarterly newsletter expanded from four to six pages and the mailing list included over 1,500 homes, with delivery for the year at 3,000 newsletters; over 300 attended Adopt-A-Pond educational meetings in their neighborhoods where they learned about stormwater pollution prevention and best management practices for yard and pond maintenance; 500 people (including elementary students) attended and participated in pond plantings where they cleaned up ponds, installed aquatic plants, and learned about the benefits of Florida native plants; the Adopt-A-Pond display appeared in several libraries, fairs and events during the year; and program staff took over 80 calls from citizens who had pond questions and who were interested in the Adopt-A-Pond program - each caller received an Adopt-A-Pond information packet and their name was added to the newsletter mailing list.

The '95 Fall Pond Seminar was a new event for the program, held on October 24th at the University Village Retirement Community. Over 100 people attended the free seminar to speak with exhibitors, visit an adopted pond, buy educational materials, and ask questions of a panel of experts. The panel discussion (which went on for an hour and a half) was lively, and the questions covered a wide range of topics. The entire program was taped by GATV, and the footage will be used to evaluate the program and develop an educational video. Given the positive response of those attending, this should be a regular event. The goal for 1996 is to hold two such seminars.

The 1996 program will assist 30 applicants in adopting their ponds and organizing their neighborhoods for educational meetings, planting days, clean-up days, and stormwater pollution prevention awareness. Also, the 1996 program will keep the '93, '94, and '95 pond groups motivated with maintenance programs, contests, and plantings. Stormdrain stenciling will become an integral part of the adoption process and the planting day activities; children seem to be especially attracted to this activity, and it will also reach people from streets away from the pond. The effect will be to educate more of the neighborhood than ever before. For more information contact Elie Araj, Program Director (813) 272-5912.

NATURAL HABITAT LANDSCAPING: FOR BUSINESS, A BETTER BOTTOM LINE

As a natural counterpart to its Florida Yards and Neighborhoods Handbook: A Guide to Environmentally Friendly Landscaping, the Tampa Bay National Estuary Program funded a project to investigate the potential advantages of natural habitat landscaping for businesses. Tampa Audubon Society, in partnership with the Tampa Bay Association of Environmental Profes-

sionals, the Westshore Alliance, and Lewis Environmental Services, Inc., used experiences gained with conversion of a high-maintenance landscape to a natural habitat landscape at the Tampa Critikon, Inc., site as a basis for the study. Critikon's corporate leaders were anxious to reduce their exorbitant lawn and landscape expenses; annual costs were running approximately \$7,500/acre. Careful assessment of the specific assets and challenges of their 33-acre plant site led to a redesign and installation of "natural habitats" on 10 acres of the property. Maintenance savings proved to be significant. The annual cost of the well-planned native landscaping is approximately \$2,000/acre and can be less, depending on the preferred level of maintenance and the degree to which a "manicured" look is desired. Savings with the natural habitat landscaping include:

- 7.2 pounds pesticide/acre/year
- 16 pounds herbicide/acre/year
- 200 pounds fertilizer/acre/year
- 1,600,000 gallons water/acre/year.

In dollar terms, this amounts to \$24,000 saved/five acres/year in chemicals and fertilizer alone. In addition, maintenance activities can be dramatically reduced. For example, ten rotary mowings of lawn area per year have replaced 88 reel-type mowings, and minimal maintenance and trimming of native plants is needed. These savings are possible because native plants, once established, require less watering; grow slower and need less pruning, shaping and manicuring; need little or no fertilizer, herbicides or pesticides; and have a high rate of survival, so replacement costs are minimal.

Other benefits that the use of native plants in commercial landscapes provide, besides these impressive monetary savings for the corporate bottom line, include:

- enhances the corporate image, as corporations step forward in a leadership role to proactively protect Tampa Bay's environment;
- encourages recreational use and appreciation of a corporate landscape by staff and visitors to the plant site;
- provides habitat, which is becoming increasingly important to birds and other wildlife as Florida becomes more developed;
- reduces negative impacts on stormwater runoff, specifically from pesticides, herbicides, and fertilizer additives, which contaminate Tampa Bay waters.

In association with the commercial natural habitat landscaping study, a brochure and slide show were created. For more information, to obtain copies of the brochure, or to schedule a talk featuring the commercial natural habitat landscaping program contact Mary

Hoppe, Tampa Bay National Estuary Program (813) 893-2765 or Ann Schnapf, Tampa Audubon Society (813) 253-3978.

OPERATION BAYWORKS: BUSINESSES FOR A CLEANER FUTURE

Operation Bayworks introduces workshop participants to the problems of stormwater pollution, the sources of stormwater pollution, and its historic impacts on the Tampa Bay ecosystem. The topics presented by

workshop speakers, and in the Operation Bayworks



Workbook of Best Management Practices for Pollution Prevention, focus on everyday business activities which can contribute to polluting stormwater runoff. Through this non-regulatory "P2" (pollution prevention) program, business owners learn about the individual actions they can take to protect Tampa Bay from stormwater pollution.

Many of the businesses targeted for Operation Bayworks are probably, according to the Environmental Protection Commission of Hillsborough County (EPC), Small Quantity Generators (SQG) of hazardous waste. The business groups targeted for Operation Bayworks, and the number of occupational licenses listed, are:

- Landscaping - includes landscape design, installation and maintenance (1,524);
- Manufacturing - includes processors and fabricators (2,367);
- Automotive and equipment repair - includes marine repair and small engine repair (1,692);
- Construction - includes planners, contractors and engineers (1,119); and
- Services - includes on-site service companies such as cleaners, appliance repair and roofers (2,348).

The participants at the first Operation Bayworks workshop were asked to evaluate and comment on the program. Some of the comments were:

"This is a good thing only if we could get more people to join."

"This is our future - we need to do this."

"Educational benefit to business community."

"A great way to begin the dialogue. I will make sure that our clients are referred to any future workshops."

This stormwater pollution prevention program was first funded by the Tampa Bay National Estuary Program. The first Operation Bayworks workshop for Hillsborough County businesses was held in February. The 1996 Operation Bayworks Program, consisting of three workshops, is being funded through the Florida Advisory Council on Environmental Education (FACEE) with money collected from panther and manatee license plates. The \$22,000 (not including staff costs) project was rated very high by FACEE, and was one of 28 projects selected from 84 proposals statewide.

The Tampa Bay National Estuary Program continues to support Operation Bayworks through the Advisory Committee and its staff. Other Advisory Committee members include: the EPC, the Cooperative Extension Service, the Southwest Florida Water Management District, the Florida Department of Environmental Protection, The Florida Specifier, the Associated General Contractors of Mid-Florida, Safety Kleen Corporation and the Tampa Bay Regional Planning Council.

This year Operation Bayworks staff and the Advisory Committee are working on incentives for businesses to participate in the program. The Florida Landscape Maintenance Association, the Florida Nursery Growers Association, and the Associated General Contractors have all approved the workshop for Continuing Education Units. Money-savings are very important to businesses, and many similar programs have documented real savings for businesses who use Pollution Prevention Plans to guide their daily activities. Operation Bayworks staff is working with the EPC to develop a "Coordinated Compliance Plan", which would allow program participants a deferral of enforcement; the plan will also allow EPC staff to use Operation Bayworks as an enforcement tool, allowing small violations to be resolved through the program as a much "softer" approach. Another important incentive for participation is to become familiar with the new County stormwater ordinance, which will be fully enforced by late 1997. Finally, the program will be striving to provide public recognition for businesses who participate, in the form of ads and awards, as well as mention in program publications. Everyone attending the workshop receives a sticker to display at their place of business or on their vehicles. For more information contact Elie Araj, Program Director (813) 272-5912.

The State of Baywide Programs

AGENCY ON BAY MANAGEMENT



cluding its surrounding coastal areas. During 1995 the Agency discussed a number of issues and addressed concerns relating to the health, restoration, protection and wise use of Tampa Bay. Participation in outreach events and presentations to various groups provided the opportunity to reach a broad spectrum of the public.

ABM members, with the Tampa Bay Regional Planning Council, sponsored an Environmental Breakfast on Tampa Bay Day in Tallahassee to discuss key issues affecting the Bay with state legislators, agency heads and others. The Agency gave its support to legislative changes which would benefit environmental quality, including:

- Long-term funding for the Tampa Bay Physical Oceanographic Real-Time System (PORTS), the weather information/tidal prediction system so valuable in preventing ship groundings and other environmental catastrophes;
- Establishment of a vessel information and positioning system (VIPS) for the Bay;
- Adoption of a statewide boater education program;
- Amendments to the 1993 Mangrove Protection Act; and
- Continued funding of Preservation 2000 and the Surface Water Improvement and Management Program (SWIM).

The Agency also participated in MarineQuest '95 of the Florida Marine Research Institute, co-sponsored the 59th Annual Meeting of the Florida Academy of Sciences, and was represented on a panel at the state's Coastal Zone '95 conference.

Among the issues the Agency addressed during 1995 were:

- The Mangrove Trimming and Preservation Act of 1995. Amendments made by the legislature this year allowed unsupervised cutting of this valuable estuarine resource and resulted in cases of severe destruction within the Tampa Bay region. The ABM prepared specific recommendations for further legislative changes to this law to correct several loopholes and excesses.
- Tampa Bay Regional Planning Council's Strategic Regional Policy Plan and Map of Regionally-Significant Natural Resources. The Agency carefully reviewed the Council's existing natural resource policies and prepared draft policies to reflect the Council's directive from Chapter 163, F.S., and Rule 9J-5, FAC, and to address the environmental issues facing the Tampa Bay region. It also recommended components for the Council's Natural Resource map.
- ABM role in Tampa Bay's long-term management. An oversight framework will be necessary once the Tampa Bay National Estuary Program has completed its formal work in preparing the Comprehensive Conservation and Management Plan (CCMP) and the various local, regional, state and federal governments have entered into an agreement to execute the Plan. The Agency discussed its possible and desired future roles, with the consensus that the Agency's strength is in its broad base of membership, its balanced approach to Bay-related issues, and its independence from political constraints. How those assets can be used in a post-TBNEP Plan implementation strategy continues to be discussed.
- The Florida Power & Light proposal to burn Orimulsion at its Manatee Plant. The ABM reviewed the proposal, discussed the potential impacts of the project on air quality and freshwater flows from the Little Manatee River; spill prevention and cleanup; and increased nitrogen loadings to Tampa Bay. The Agency recommended that the project not be certified by the state.
- Action items identified by the Tampa Bay National Estuary Program (TBNEP). The TBNEP had prepared a preliminary plan of action in which several tasks were identified as appropriate for the Agency on Bay Management. These tasks were: establishing

criteria for mitigating impacts to the tidal habitats of Tampa Bay and perhaps identifying suitable mitigation sites; evaluation of Special Management Area designation as a tool in protecting the Bay's coastal habitats; and identifying areas along the Bay's shoreline where off-road access should be controlled due to negative environmental impacts. The Agency accepted these tasks.

- A proposal by the U.S. Fish & Wildlife Service to limit public access to Egmont Key National Wildlife Refuge. Due to increasing public recreational pressure the Refuge is not serving its primary function of wildlife protection. The ABM held an open discussion with the various interest groups, and voted to support the Service's proposed public use plan.



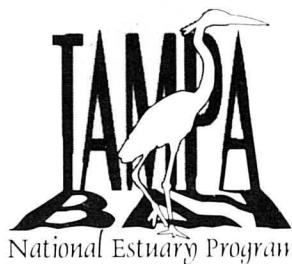
The ABM continued to support the TBNEP in development of a management plan for Tampa Bay. Successful execution of the management strategies within the Comprehensive Conservation and Management Plan and development of a post-TBNEP implementation oversight strategy is imperative.

Staff also served, on behalf of the Agency on Bay Management and Tampa Bay Regional Planning Council, on many committees and work groups involved in various environmental issues within the region, including: Operation Bayworks, the Cockroach Bay Restoration Alliance, the Hillsborough River Greenways Task Force, the TBNEP Technical Advisory Committee, the Cockroach Bay Aquatic Preserve Management Advisory Team, the Hillsborough River Interlocal Planning

Board's Technical Advisory Team, and the Myakka River Management Coordinating Council.

The technical, political and community interests represented on the Agency continued to provide the broad base necessary to ensure that the natural resource issues of the region are appropriately addressed. For more information contact Suzanne Cooper, TBRPC (813)577-5151, Ext. 240.

TAMPA BAY NATIONAL ESTUARY PROGRAM



Charting The Course, the draft strategic plan for the restoration and protection of Tampa Bay, was released in January 1996 by the Tampa Bay National Estuary Program (NEP). Town meetings and community forums are scheduled throughout the Tampa Bay region in early 1996 to present and discuss the plan with residents. Its release caps four years of scientific research and public education by the Tampa Bay NEP, which was established in 1991 to assist the region in planning for the bay's future. The document describes the current state of the bay, summarizes the latest technical findings and presents options for restoration and enhancement. It also offers practical advice on what citizens can do at home, at work, in their yards and on the water to improve and protect the bay.

Charting The Course was developed with assistance from a precedent-setting alliance of local governments, state and federal agencies, technical advisors, and broad-based community interests. The Tampa Bay NEP is a partnership of Hillsborough, Pinellas and Manatee counties; the cities of Tampa, St. Petersburg, and Clearwater; the Southwest Florida Water Management District; the Environmental Protection Commission of Hillsborough County; Florida Department of Environmental Protection; and the U.S. Environmental Protection Agency, which oversees the Program. Local administration is provided through the Tampa Bay Regional Planning Council.

Charting The Course spells out priority actions that bay managers and advisors consider most critical to the bay's long-term health. Key efforts focus on holding the line on nitrogen loadings to Tampa Bay, expanding seagrass meadows, and restoring low-salinity marshes which are vital to the bay's fisheries (see Goals & Priorities below).

The participants in the Tampa Bay National Estuary Program will sign an agreement in November 1996 to

implement actions advanced in *Charting The Course*, once the plan is finalized. Flexibility is a key element of the solutions presented in the draft plan. Bay managers recognize that different agencies and communities may choose different ways to accomplish similar goals, and the management plan allows for flexibility. The most cost-effective cleanup strategies may be selected, so long as they meet the overall goals of the management plan and address the bay's most vital needs.

GOALS & PRIORITIES FOR TAMPA BAY

Charting The Course advances measurable goals and associated strategies to restore and protect water quality and bay habitats as the foundation for healthy and diverse populations of fish and wildlife. When the Tampa Bay National Estuary Program was established, local government and regulatory agency partners pledged to participate in the development and implementation of a comprehensive conservation and management plan for Tampa Bay. Subsequent and extensive efforts by the Program's technical advisors over the past four years have centered on developing specific resource goals as long-term measures of success in implementing the bay restoration blueprint.

Goals for Water & Sediment Quality: Water quality goals focus on maintaining the proper water clarity to support seagrasses by controlling **nitrogen**, which continues to be a major concern in Tampa Bay. Excess nitrogen in rainfall, stormwater runoff, and from domestic and industrial point sources accelerates the growth of algae in the bay, limiting light penetration to seagrasses which require sunlight to grow. Past water quality declines contributed to the loss of nearly half the bay's seagrasses from the 1950s to 1980.

In 1993, the Tampa Bay NEP established a long-term seagrass restoration target of 14,000 acres. That goal was based on restoring seagrasses to 1950s levels, excluding areas that have been permanently altered. Subsequent studies by the NEP indicate that as many as 12,000 acres of seagrass can be recovered over time by maintaining existing water quality conditions. That would require local communities to reduce their nitrogen loadings to the bay by about 10 percent by the year 2010 to compensate for increases in nitrogen loadings associated with population growth. Additional seagrass recovery would require further reductions. Nitrogen loading goals for the bay will be finalized in early 1996.

A workshop sponsored by the Tampa Bay NEP in October brought together local governments, regulatory agencies, utilities and industry representatives to review provisional nitrogen loading goals for Tampa Bay and discuss ways to allocate reductions in nitrogen inputs once loading targets are finalized. Technical investigators projected increases in nitrogen loadings of about 30

tons per year from all sources, an amount that represents less than one percent of present-day levels. Participants discussed various proportional allocation methods, in which dischargers would be required to do their fair share to offset anticipated increases in nitrogen. Those allocations will be reflected in the final bay management plan. Toxic contaminants in bay sediments represent the other primary focus of concern for bay managers. Studies by the National Oceanic and Atmospheric Administration (NOAA) and Florida's Department of Environmental Regulation in the late 1980s and early 1990s documented relatively high levels of pesticides, heavy metals and other contaminants in sediments at some bay sites, and associated impacts to marine life. Currently, the Tampa Bay NEP is integrating these and other studies on sediment chemistry and toxicity with analyses depicting the health of the bay's bottom-dwelling communities--that component of the marine ecosystem most impacted by toxics. A closely-related study involves evaluating the level of risk to marine and human health associated with these contaminants. These studies, slated for completion in March 1996, will enable bay managers to better identify toxics of concern in Tampa Bay. They also will provide the basis for establishing management objectives to minimize associated risks to marine wildlife and humans to the greatest extent feasible, and to protect relatively healthy and clean areas of the bay from being degraded. The Tampa Bay NEP also is investigating the sources and status of these contaminants in priority drainage basins, research that will be used to determine and fine-tune cleanup and containment strategies.

Recent events also have focused the attention of citizens and bay managers on problems associated with sewer overflows and discharges to the bay during heavy rainstorms. That problem came to light recently when the City of St. Petersburg was forced to discharge more than 15 million gallons of raw sewage into Boca Ciega Bay when excessive rainfall infiltrated and overtaxed the city's wastewater collection network. Other communities around the bay have occasionally experienced similar problems during periods of high rainfall. To keep the bay safe for swimming and shellfish harvesting in the future, local communities will need to grapple with infrastructure improvements that will ensure that the significant investments made to upgrade sewage treatment facilities are not diminished by chronic failures in collection and distribution networks.

Goals for Bay Habitats: *Charting the Course* also sets forth an innovative watershed strategy for coastal habitat restoration and protection that goes further and will accomplish more for Tampa Bay than existing "no net loss" goals for wetlands, which many suspect fall short of that aim. About half of the bay's saltwater wetlands have been lost to development since the

1950s. Development also has exacted an especially heavy toll on the low-salinity portions of the bay's tributaries, areas which provide critical nursery habitat for numerous species of fish.

Equally important is the fact that some habitats have declined or been degraded more rapidly than others. The resulting imbalance of habitat types has contributed to declines in certain fish and wildlife. A strategy to address this imbalance is the centerpiece of the Tampa Bay NEP's forthcoming watershed plan for coastal habitat restoration and protection. The strategy is based on restoring an optimum mix of habitats to meet the needs of the bay's representative fish and wildlife guilds - groups of animals that share similar habitat and food requirements. An overall minimum goal is to restore roughly 100 acres of low-salinity tidal marsh habitat every five years, while maintaining and enhancing salt marshes and mangroves at existing levels. The long-term aim is to recover as many as 1,600 acres of these habitats over time, either through habitat restoration or enhancement of existing areas that have been severely degraded. The strategy effectively targets one of the major causes of bay wildlife declines--the accelerated decline of a few unique and absolutely crucial habitats whose losses place a "biological chokehold" on the bay ecosystem. Now being finalized, the coastal habitat master plan coordinates existing local, state and regional restoration programs and identifies priorities for both habitat restoration and protection, including environmental lands purchases and less-than-fee-simple methods such as conservation easements.

A preliminary seagrass restoration target for Tampa Bay of approximately 14,000 acres also has been established. That figure is based on the amount of seagrasses lost due predominantly to water quality declines between 1950 and 1990. Water quality improvements stemming from wastewater and stormwater treatment upgrades in the 1970s and early 1980s already are helping to reap rewards in this endeavor. Since 1988, more than 2,600 acres of seagrasses have re-established in Tampa Bay as a result of improving water quality conditions. Even as water quality improvements occur, the natural lag time in seagrass regrowth indicates that recovery will be a long-term process.

Goals for Fish & Wildlife: While the Tampa Bay NEP has not adopted any specific goals for increases in fish and wildlife species, the goals established for water quality and habitat restoration will provide direct benefits for bay inhabitants by improving the areas in which they live, reproduce and feed. Reductions in nitrogen loading and increases in seagrass coverage, for instance, will assist efforts to increase fisheries and return the Bay scallop to Tampa Bay by providing suitable water quality and habitat. Achieving the NEP's seagrass recovery

target also will help the bay's population of endangered manatees, which feed in seagrass beds.

Birds, too, will benefit from the goals set forth in the NEP's habitat restoration masterplan, which will assure protection and enhancement of existing habitats important for feeding and nesting and increase other habitats, such as salt barrens and freshwater ponds, which have been severely reduced due to development. The restoration and protection of freshwater ponds, for instance, is critical to the survival of the White ibis, which depends upon freshwater crayfish and insects to feed its young.

Additionally, preserving the flow of freshwater into the bay from its myriad tributaries will yield dividends for a variety of commercially and recreationally valuable fish, which seek out these sheltered, low-salinity havens as nurseries.

Other Bay Improvement Goals: Other goals, aimed at improving spill prevention and response and dredging and dredge material management, are equally important in preserving the bay's health and promoting cooperative planning. Objectives for managing dredging and dredge material focus on the development of a long-term, coordinated dredging and dredge disposal plan involving the bay's three major seaports and the U.S. Army Corps of Engineers. The plan seeks to reduce the environmental impacts associated with dredging, and to maximize beneficial uses of material dredged from the bay's shipping channels.

Goals for spill prevention and response center on the installation of a state-of-the-art Vessel Traffic System (VTS) that employs a combination of shore-based radar and global positioning technology to monitor and assist shipping traffic in the bay. The system would greatly reduce the likelihood of an economically and environmentally devastating spill of oil or hazardous materials.

Measures to Ensure Success: To ensure effective and timely implementation of the bay master plan, local government and regulatory agency partners have pledged to continue regular dialogue and meetings to review actions and evaluate progress toward meeting the bay's goals. Continued monitoring of the bay's health also is essential to this process. This allows policy leaders and bay managers to adjust management actions as necessary to keep the plan on track. An overall theme expressed in various bay action plans in *Charting The Course* is to better utilize existing federal, state and local resources to carry out recommended actions. A strong focus on compliance monitoring and enforcement also is emphasized throughout the plan and in specific actions to ensure that established environmental regulations are followed.

Finally, the Tampa Bay NEP recognizes the need to continue strong community outreach and education efforts as the plan is implemented. These efforts are discussed in the chapter on public involvement.

CONTINUING RESEARCH

Important research continues in 1996 as the plan for Tampa Bay is being finalized. Tampa Bay was recently selected to participate in EPA's Great Waters Program, which provides funding to assist research into the sources and effects of atmospheric deposition on the nation's waterways. The \$100,000 grant will help support a three-year project to investigate sources of this pollution and associated impacts to stormwater pollution, information that will be used to develop a long-term strategy to address the problem. The studies, which began in 1995, include daily sampling of wet and dry deposition to the bay and watershed, in conjunction with County air quality divisions; application of a computer model that will help researchers determine how and where pollutants travel once they are airborne; and stormwater sampling to find out what portion of pollutants that enter the bay from the watershed actually come from the air.

EARLY ACTION

Since its inception, the Tampa Bay NEP has demonstrated its commitment to improving Tampa Bay by investing in early action projects designed to jump-start restoration efforts and build a community consensus for the bay's recovery. Almost a million dollars in matching grants and federal funds have been secured to support a wide variety of restoration and outreach projects. Additionally, the Program has administered more than \$50,000 in small grants for bay improvement projects sponsored by local communities, non-profit organizations and schools. These diverse projects have allowed researchers to test new techniques and concepts for reducing pollution and restoring degraded habitats; identify and fill gaps in current protection programs; and educate bay area citizens about threats facing the bay and how they can help overcome them.

Several of these key early action initiatives are summarized below:

Bay Conservation Corps: Tampa BAYWATCH was awarded \$25,000 to establish a Bay Conservation Corps to coordinate volunteers baywide for hands-on clean-up and improvement projects. Since its creation in 1994, the Corps has recruited more than 1,000 volunteers to participate in salt marsh plantings, exotic plant removal, bird island and coastal cleanups and stenciling of storm drains to discourage dumping of oil and other harmful substances which could wind up in the bay.

Cockroach Bay Restoration: This secluded inlet on Tampa Bay's eastern shore harbors some of the most productive mangrove forests and seagrass meadows in the entire bay system. However, the long-term health of

this area has been jeopardized by intensive alteration of its upland fringe, primarily from agricultural and mining operations. The Tampa Bay NEP, together with regional and state agencies providing matching funds, secured \$700,000 in federal grants to assist in the restoration of this area, \$300,000 from the Coastal America Program and \$400,000 in grants under Section 319(h) of the federal Clean Water Act. The effort is part of a \$2.3-million restoration directed by Hillsborough County the Southwest Florida Water Management District's Surface Water Improvement and Management (SWIM) Program, in cooperation with NEP and more than a dozen other public- and private-sector partners. Hillsborough County spent \$2.1 million to purchase the restoration site.

The 500-acre project is the largest restoration of its kind conducted in Florida. The project is unique in its multi-faceted focus on creating a mosaic of habitats, including brackish and freshwater marshes, grass beds, oyster and live-bottom reefs, salt barrens, and upland pine and hardwood forests. In addition, the project will provide much-needed treatment of stormwater runoff from the surrounding farmlands by building a treatment pond in which runoff will be filtered before being discharged naturally to a restored stream bed leading to the bay. Extensive removal of exotic vegetation such as Brazilian pepper already has been accomplished, and construction of the stormwater improvements was slated to begin in December.

Bay Scallop Recovery: This species was once a common resident of Tampa Bay, but virtually disappeared in the mid-1960s. Many scientists blame declining water quality for the scallop's demise, and speculate that the dramatic improvements now occurring in the bay's health may offer hope for restoring local populations of this sensitive mollusc.

The Tampa Bay NEP has contributed more than \$130,000 to research aimed at pinpointing the water quality conditions necessary to support Bay scallops, and to aggressively restocking suitable bay segments with scallops. That effort, directed by the University of South Florida, has so far raised more than 1 million juvenile scallops in laboratories, using strips of artificial turf that mimic the seagrasses to which the scallops cling in the wild. Hundreds of thousands of these juvenile scallops have been released in lower Tampa Bay, and monitoring is underway to determine whether these preliminary transplant attempts can help bring back a sustainable scallop population.

Pepper Busters Brochure: Brazilian pepper is the most invasive and persistent of the exotic plants to gain a toehold along Tampa Bay. This tall shrub, sometimes called Florida holly because of its red berries, quickly moves into disturbed shoreline areas, strangling mangroves and forming a dense monoculture that provides

little ecological benefit and is extremely difficult to eradicate.

The Tampa Bay NEP funded a \$3,000 project by the Cockroach Bay Aquatic Preserve Management Team (CAPMAT) and its South Hillsborough Pepper Patrol to create an illustrated brochure explaining the environmental hazards of this plant and how to get rid of it. It also explained the importance of preserving native plant communities. This popular brochure, one of the first of its kind written for the general public, is widely distributed by county and state environmental agencies, county extension agents and public libraries.

Assessment of Management Efforts to Protect Seagrass: Propeller scarring of seagrass beds in Tampa Bay is widespread, and impairs the ability of these underwater meadows to protect against erosion and provide habitats for marine life. This project, financed in part with \$14,000 from the Tampa Bay NEP, enabled Pinellas County to assess the extent of seagrass scarring in one area of the bay through aerial mapping and interpretation, and to evaluate various methods of protecting those seagrasses from further damage.

The site chosen for the project encompassed 420 acres of severely scarred seagrass around Fort DeSoto Park in Pinellas County, in a large embayment called Boca Ciega Bay. Scarred areas were mapped in March and October 1993, and again in October 1994. Mapping will continue annually for three more years. After examining results of the baseline survey, two protection zones were established in the seagrass beds. Signs were posted restricting boating access in one area except at high tide, while motor boats were completely prohibited in the second area. The losses were virtually the same for both the closed and restricted-access areas, indicating that signs alone may be as effective a deterrent to seagrass scarring as complete closures.

This project is providing important information about what protective measures are effective in reducing seagrass scarring, and may help bay managers develop uniform, easily recognizable guidelines that can be implemented throughout the bay, and even the entire state.

Data-Sharing Through GIS: Tampa Bay is among the best-studied waterways in the nation, yet valuable information from research and monitoring projects is not always shared among bay managers. This is often because the data bases and formats used by one agency are incompatible with those of another. Maps are a particularly important and visible management tool, with their ability to relate a vast amount of information, including land uses, natural resources, drainage patterns, pollution sources, and political boundaries.

This project, supported with nearly \$20,000 from the Tampa Bay NEP, enabled the Environmental Protection Commission of Hillsborough County (EPC) to create a

comprehensive, readily retrievable date base for the bay based on computer-generated maps utilizing Geographic Information System (GIS) technology. Cockroach Bay was selected as a testing ground for this innovative approach. Officials with the EPC compiled information about Cockroach Bay from various sources and imported those files into their data banks. They then produced GIS maps that synthesized the information in a format compatible with other agencies, government organizations and research institutions. These techniques will be expanded baywide, providing across-the-board information that will result in less duplication and promote greater cooperation among bay managers in the future.

Emerson Point Project: This is an historically and ecologically rich coastal area at the mouth of the Manatee River. The cultural resources of the 195-acre site include American Indian mounds and middens that were studied by researchers with the Smithsonian Institution, and the remains of a 19th-century plantation. Natural resources include extensive hardwood hammocks, mangroves and salt marshes, as well as colorful and rare live-bottom reefs in the shallow waters offshore.

The Tampa Bay NEP provided \$50,000 to Manatee County to aid in the protection and restoration of this area, which was purchased by the state in 1991 and is now managed by the County as Emerson Point Park. The project focuses on providing public access to the site for education and recreation while preserving its unique cultural and natural attributes. Work includes removal of exotic vegetation, excavation and stabilization of the Indian mounds and plantation, and the construction of boardwalks and trails for public access. Signs will be posted to describe the land, its human and natural history, and resident wildlife; and plans are now underway to develop a county environmental education center on the site to teach schoolchildren about this priceless ecological and historical heritage.

For a copy of *Charting The Course* or to inquire about mailings or community forums contact the Tampa Bay NEP (813) 893-2765.

SURFACE WATER IMPROVEMENT AND MANAGEMENT PROGRAM (SWIM)

Tampa Bay was identified as a priority in the 1987 Surface Water Improvement and Management legislation. The Bay was also named as the top priority on the Southwest Florida Water Management District's (SWFWMD) SWIM priority list. Through 1995, significant progress continues in implementing the Tampa Bay SWIM plan.

Water Quality Initiative

Water Quality Assessment - The purpose of the legislatively-mandated water quality assessment project is to determine appropriate resource-based water quality targets for the bay and establish a long-range watershed management strategy for achieving those targets. The project involves:

- improving water quality modeling tools;
- identifying the water quality requirements of selected organisms (e.g., seagrass species), chosen to serve as sensitive indicators of overall environmental quality;
- working cooperatively with the Tampa Bay National Estuary Program (TBNEP) to develop appropriate resource-based water quality targets to restore and protect those species; and
- identifying appropriate pollutant load reduction goals and watershed management strategies to reach the resource-based targets.

During this year statistical and mechanistic models were used to assess current impacts of external nutrient loadings on the water quality of Tampa Bay, and to predict the reductions in future nutrient loadings that will be required to reach selected water quality targets. An initial target, developed by the Technical Advisory Committee of the TBNEP, is an ambient chlorophyll concentration that will allow sufficient light penetration through the water column to support the establishment and survival of seagrasses to the depths observed in 1950. Based on monthly water quality data and pollutant loading estimates for the period 1985-1994, the models are being used to predict the reductions in external nutrient loadings and ambient nutrient concentrations that will be required to reach this target. Those estimates are being used, in turn, to identify appropriate load reduction goals for nutrients for the Tampa Bay watershed. Because the statistical and mechanistic models are based on very different technical approaches, SWIM and TBNEP staff believe that pollutant load reduction goals developed using the combined results of both models will be more robust, and more widely accepted by the local technical community, than goals developed using either model alone.

Following extensive discussion, a technical committee organized by the TBNEP and SWIM to review the water quality modeling effort has agreed that water clarity conditions sufficient to allow 20% to 25% of surface light to reach target depths appear necessary to meet the light requirements of seagrasses in Tampa Bay. This range corresponds to the annual average light penetration currently observed in Lower Tampa Bay at the deep edge

(at depths of approximately 2m) of existing seagrass meadows.

Preliminary results of the statistical and mechanistic models suggest that a "hold the line" watershed management strategy, which maintains nutrient loadings at existing levels over the next 15-20 years, may be sufficient to allow 20% of surface light to reach the target depths in all bay segments. However, those results also suggest that achieving 25% penetration of surface light to target depths may require significant reductions in nutrient (primarily nitrogen) loadings below existing levels. Because the human population of the Tampa Bay watershed is projected to continue increasing over the next several decades, efforts to hold pollutant loadings at or below existing (1985-1994) levels during that period are anticipated to involve substantial costs. An effort to increase the precision of model predictions, and develop more precise projections of the costs associated with different water quality management strategies, is currently underway.

Since 1980, concerted action has been taken at the federal, state, regional, and local levels to reduce pollutant loadings entering the bay from point and nonpoint sources. That effort bore considerable fruit during the period 1980-1993, producing large reductions in external loadings of nutrients and other pollutants, improvements in water quality, and expanding seagrass populations in several bay segments. Substantial improvement observed in heavily impacted bay segments (such as Hillsborough Bay, portions of Old Tampa Bay and Middle Tampa Bay) during the late 1970s and early 1980s is continuing.

Hillsborough River Ecosystem Management Initiative: During 1994, the Hillsborough River (a major tributary of Tampa Bay) was designated a pilot waterbody in the state's ecosystem management initiative. To assist FDEP in developing the water quality portion of the ecosystem management program, SWIM has initiated a diagnostic water quality assessment of the Hillsborough River watershed. The assessment, which began in 1995, is mapping land uses and the locations of point and nonpoint discharges within the watershed. SWIM is also developing hydrologic and nutrient budgets, resource-based water quality targets, and load reduction goals for selected river segments and pollutants.

Improvement and protection of water quality in the City of Tampa's drinking water reservoir, which is located on a dammed portion of the lower Hillsborough River, will be a primary focus of the ecosystem management initiative's water quality component. Toward that end, the cooperative SWIM/FDEP water quality assessment is seeking to identify existing and potential sources of pollutant loadings to this river segment. Nutrient over-enrichment, whose symptoms include the frequent

development of nuisance blue-green algae blooms, is an obvious problem for the reservoir. One project is seeking to identify the sources of nutrient discharges in the watershed and develop nutrient loading targets for the river, in order to address those causes. Potential loadings of pathogens and toxicants are also of concern from a water quality and ecosystem management perspective. Existing and projected future loadings of these constituents are being estimated, and concentration and loadings targets are being developed, as part of the assessment project.

Urban Stormwater Improvement Initiative: The SWIM Department's stormwater initiative for Tampa Bay continued this year with the completion of construction of the Channel 2 Stormwater Rehabilitation Project and the Enhancement of the 102nd Avenue, 94th Avenue, and 70th Avenue Stormwater Ponds Project. The Channel 2 Stormwater Rehabilitation is of significance because it represents the first time alum injection technology has been used for the treatment of stormwater runoff in Pinellas County. Additionally, the Channel 2 project is the first attempt in the state to use alum treatment in an in-line, conveyance dominated system. If it can be demonstrated that alum floc can successfully be contained in a relatively small catchment basin, and subsequently harvested with minimal downstream migration, the Channel 2 design could have far-reaching implications in attempting to meet the State Water Policy's goals for nonpoint source load reductions for "older" systems. As of year end, a total of twelve stormwater rehabilitation projects have been successfully implemented by the SWIM Program and an additional twelve cooperative stormwater rehabilitation projects were either in the planning stage, under design, or under construction during 1995 with eight different cooperators. The majority of these projects are being funded with SWIM Trust Fund dollars; however, several of the projects are funded one hundred percent by the involved Basin Board through the SWFWMD's Cooperative Funding Program. Table 1 on page 36 briefly summarizes each project and its progress during 1995.

Natural Systems Initiative

Activities under this initiative are directed toward assessing and improving biological conditions, habitat, and other elements of the natural system. This year SWIM made progress in habitat restoration, natural systems assessment and short-term research.

Tampa Bay Aerial Mapping: A seagrass mapping effort was initiated for Tampa Bay in 1988 to monitor improvements to the Tampa Bay system as a result of the SWIM projects. This effort was the first comprehensive mapping of submerged aquatic vegetation (SAV) for the entire Bay area since 1982. Aerial missions shooting

true color photos have been flown on a bi-annual basis in December through January to capitalize on times of maximum water clarity and best light penetration. These photos were prepared and interpreted for SAV populations.

Working closely with the Tampa Bay National Estuary Program, the site specific monitoring of seagrass populations has been fine-tuned so that statistically-valid design criteria are involved within the original SWIM design. Protocol now includes the measuring of dissolved oxygen, water temperature and salinity. There are 60 sites randomly located throughout the Bay, pinpointed via a Differential GPS system. All of these sites are visited twice each year (March and October).

Fisheries Research: In the spring of 1992, a monitoring program was established by the SWIM staff to evaluate the impacts of coastal habitat restoration on local fish communities. Five sites were chosen throughout the Tampa Bay area which had either been recently restored or are scheduled for future habitat enhancement. A control site was established at Delaney Creek, a relatively undisturbed estuarine/salt marsh ecosystem in west-central Hillsborough County. Two additional sites have been added since 1993 and the Boca Ciega site has been omitted due to logistical constraints. A short-term study was established at the Howard Frankland restoration site in the fall of 1994 and will provide information on early fish colonization of restored marshes. A benthic study was also established (assisted by the University of South Florida - USF) to coincide with the short-term fish study to investigate invertebrate colonization of the sediments in the project area.

During the first year of the program, a passive, non-destructive sampling technique using Breder traps was used to sample these areas. Unfortunately, many commercially important fish species avoid these traps and, therefore, were absent from our observations. During the second year of the program, seining was employed to obtain a more complete description of the fish communities at each of the sites. Preliminary analyses of the data indicate that the marsh-resident fish communities are highly similar among sites with similar salinity regimes, and are composed of the same species found at the control site. Abundances of fishes among the sites are extremely variable and appear to be related to season. A number of commercially- and recreationally-important fish and invertebrate species were present, including snook, redfish, black drum, spotted sea trout, bay anchovy, menhaden, mullet, sheepshead, pink shrimp, and squid. Seine monitoring is currently ongoing and will continue for at least one more year. A report discussing the analysis of the first year of data is currently in preparation and should be completed by mid-1996.

Habitat Restoration: During 1995 30 restoration projects for Tampa Bay were either completed or had under some phase of development: 26 projects under development; four projects constructed (this total does not include several restoration projects that were funded by SWIM but coordinated by the Department of Environmental Protection and the City of Tampa). Since 1989 SWIM restoration projects have evolved from simple salt marsh projects (0.1 acre) to large, complex assemblages of habitats (200 acres), and 24 restoration projects have been completed for a total of 91.6 acres. These progressive, interdisciplinary projects typically combine habitat enhancement, restoration, and creation (including improved water quality through enhanced tidal flushing and/or water circulation) with stormwater treatment. In addition, each project typically employs the restoration strategy of enhancing/restoring/creating habitat mosaics, where a habitat mosaic represents a collection of habitats normally found in coastal ecosystems.

As a member of the Habitat Restoration Subcommittee of the Tampa Bay National Estuary Program (TBNEP), the SWIM Program has embraced and will coordinate with TBNEP to implement their "restoring the balance" approach to habitat restoration, a restoration strategy highly compatible with SWIM's mosaic approach.

All four projects completed during 1995 were constructed on public land and represent cooperative efforts (both financially and in-kind services) between the SWFWMD and a local government or state agency. Each project has involved a year or more of planning, permitting, and implementation. Perhaps the most notable is the Cockroach Bay restoration project in southern Hillsborough County. Other projects are summarized in Table 2.

Cockroach Bay (Hillsborough County): This project involves over 651 acres of publicly-owned property and has involved considerable time and manpower to develop and to implement. The tract originally was purchased during the summer of 1991 for \$2.1 million by the Hillsborough County Environmental Lands Acquisition and Protection Program (ELAPP). About 150 acres are intertidal wetlands, the remaining 500 acres represent fallow farm fields and decommissioned shell pits ("Leisey Shell Pits"). Significant portions of the tract were heavily infested with exotic Brazilian pepper and Australian pine trees. The watershed is primarily agricultural, with partially-treated runoff draining into the estuary. In spite of watershed and estuarine impacts, Cockroach Bay is often touted as the "crown jewel" of Tampa Bay and is noted for its seagrass beds and fisheries production.

The project will include a 14-acre stormwater pond that will treat agricultural runoff from a 210-acre basin draining to the upper reaches of Cockroach Bay; the

enhancement/restoration/creation of 93 acres of upland and intertidal wetland habitats associated with the shell pits in the northern reaches of the tract; and construction of a 18.5-acre tidal creek system downstream of the outfall of the 24.5-acre stormwater pond system.

Hillsborough Community College, through a grant from the Florida Department of Environmental Protection's Pollution Recovery Trust Fund, completed eradication of 85 acres of exotic plants from the southern sectors and removal of 176 tons of trash from the saltern located in the southwestern reaches. Exotic plant removal continues.

An in-house nursery of plants was established and several plantings using volunteer labor were conducted. Hillsborough County performed several control burns of portions of the site and some of the exotic plant piles were also burned. COBRA (Cockroach Bay Restoration Alliance) members, Hillsborough County Parks and Recreation Department staff, FDEP personnel, SWFWMD Operations crews and SWIM staff cooperated in cutting 20-30 cords of firewood from Australian pine trees felled during early construction; Australian pine trees are rated as some of the best quality firewood in the world. Two free firewood give-aways were sponsored by COBRA in an effort to educate the public about the restoration project, the perils of exotic plants, and the attributes of native plants; promote the practice of recycling; and reduce the volume of exotic plant material that were in need of disposal. The educational benefits and firewood giveaway was very successful and all wood was claimed.

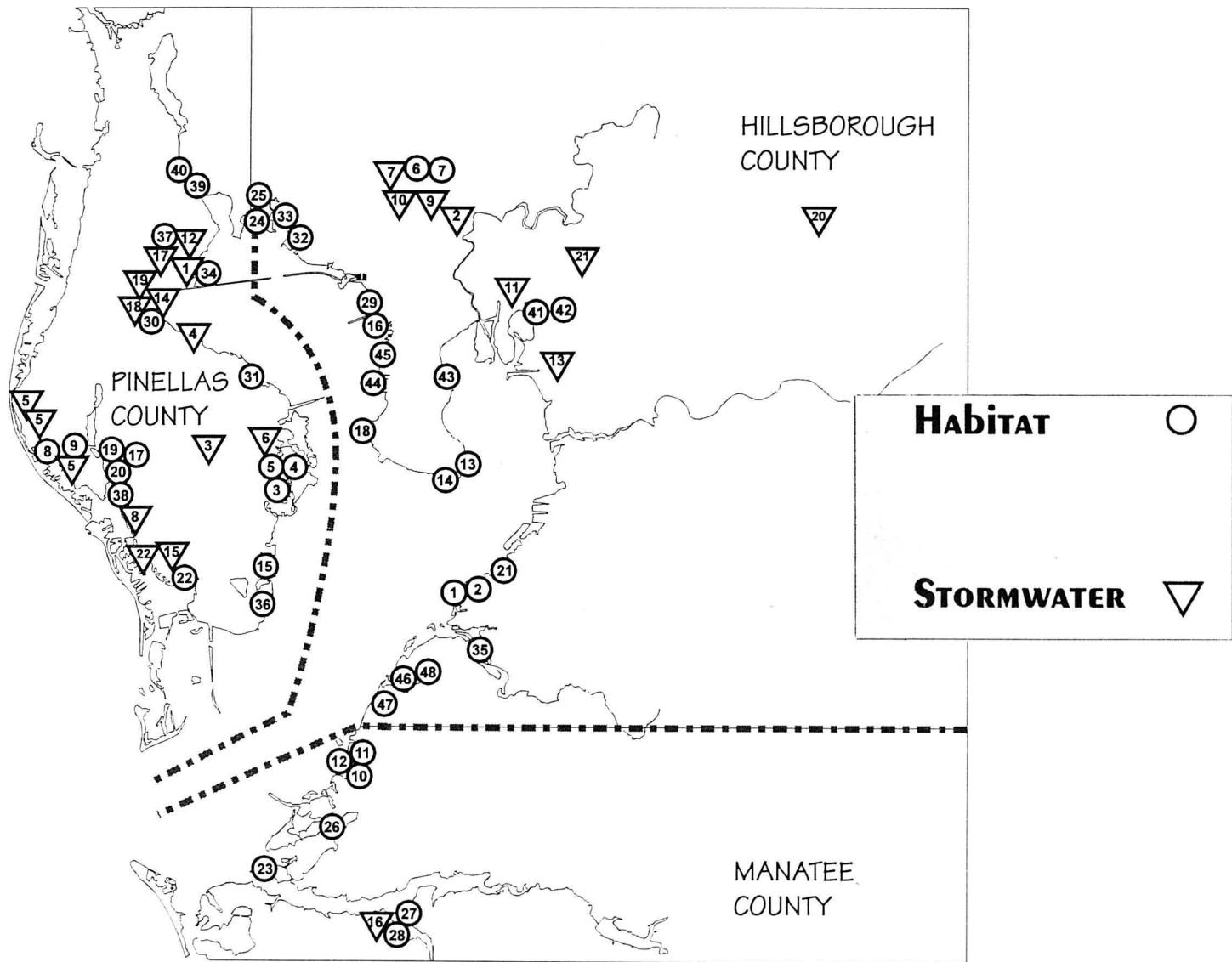
SWIM and members of the Wetland Subcommittee continued to explore the possibility of grant funds from the U.S. Army Corps of Engineers and its Beneficial Reuse of Dredged Materials Program. Several meetings with the Corps have resulted in their support of the project and their belief that our application will be funded. Discussions with the Corps and the Manatee County Port Authority have also paved the way for use of clean sediments from the dredging of the Port's new turning basin.

SWIM's proposal for assistance with plant installations, exotic removal, and trash removal from the saltern was accepted by the federally-sponsored National Civilian Community Corps (Americorps). A federal team of 20+ individuals are scheduled for about one month of work during spring 1996.

Miscellaneous Restoration Strategies: Over the years, SWIM has strived to develop and implement increasingly cost effective and environmentally-productive methods for habitat restoration projects. As described above, since 1991 SWIM has accrued significant cost savings through "in-house" use of SWFWMD Operations and Survey Departments. Use of in-house

Southwest Florida Water Management District

Surface Water Improvement and Management Program *Habitat and Stormwater Project Locations*



map prepared by SWFWMD SWIM Department

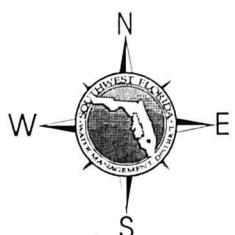


Table 1. 1995 Stormwater Rehabilitation Activities for Tampa Bay. ▽

PROJECT NAME COOPERATOR (STATUS)	PROJECT DESCRIPTION	WATERSHED SERVED
1. Alligator Creek (M) Channel H Pinellas County	Stormwater Detention and Treatment Pond	376 acres
2. Al Lopez Park Tampa (M)	Improve existing pond; create wetland	162 acres
3. Channel 2/Sawgrass Lake Pinellas Park (C)	Stormwater treatment; in-line alum treatment	83 acres
4. St. Petersburg/ Clearwater Airport Pinellas Co/ Airport Authority (P)	Stormwater Treatment; enhance wetland	102 acres
5. 102nd Ave., 94th Ave. & 70th Ave. Pinellas County (C)	Enhancement of four stormwater ponds	250 acres
6. Haynsworth Tract Pinellas County (P)	regional stormwater treatment facility; the largest stormwater rehabilitation project on Tampa Bay	428 acres
7. Brushy Creek Hillsborough County (M)	Increased flood control; wetland creation	10,688 acres
8. Jungle Lake/ Fuller Park St. Petersburg (C)	Water quality improvements; habitat enhancement; public education	1,000 acres
9. Lowry Park Phase I Tampa (M)	Improve water quality; habitat enhancement; public education	270 acres
10. Lowry Park Phase II Tampa (P)	Improve water quality; habitat enhancement; public education	270 acres
11. 29th Street Tampa (P)	Improve stormwater treatment	1,700+ acres
12. Safety Harbor/Mullet Creek Safety Harbor (M)	Rehabilitate stormwater treatment system	
13. Delaney Creek Hillsborough County (P)	Water quality and habitat improvements	
14. Clearwater Mall Clearwater (L)	Stormwater retrofit	27 acres
15. Clam Bayou St. Petersburg (L)	Stormwater retrofit	67 acres
16. Glenn Creek Manatee County (L)	Stormwater treatment	250 acres

PROJECT NAME COOPERATOR (STATUS)	PROJECT DESCRIPTION	WATERSHED SERVED
17. Alligator Creek <i>Safety Harbor, Clearwater, Pinellas County (S)</i>	Watershed management plan	5,700 acres
18. Red Maple Swamp, Allen's Creek (L) <i>Pinellas County, Clearwater</i>	Surface water management; floodplain and wildlife habitat restoration	4,700 acres
19. Experimental/ Educt'l Pond, Allen's Creek (L) Pinellas Co, Clearwater	Educational use	4,900 acres
20. Westside Canal <i>Plant City (L)</i>	Stormwater treatment; habitat restoration	1,920 acres
21. East Lake Watershed <i>Hillsborough County (L)</i>	Alum treatment; stormwater retrofit	660 acres
22. Wood Ibis Park <i>Gulfport (L)</i>	Stormwater pond	72 acres

C = Construction completed.

I = Construction in progress.

L = Planning or design underway.

M = Construction complete; maintenance/monitoring underway.

P = Construction pending.

S = Study underway.

crews for construction and survey are but two of many innovations. Several others are worthy of note:

- Project Development/Implementation - SWIM has been moving to become increasingly autonomous from outside contractors (environmental consultants, construction contractors, horticultural firms, survey crews). To that end, "in-house" responsibility for all project components have gradually increased. Use of SFWMD personnel and talents is extremely cost-effective and has tremendous advantages during the design and construction of projects. The goal is to assume, as least for a portion of our projects, 100% responsibility for the design, permitting, and construction of restoration projects.
- Marsh Plants - Since 1989 SWIM has contracted with horticultural firms for the mass grow-out and installation of marsh grasses typically used for our restoration projects. Competitively bid contracts for fixed plant/installation prices for hundreds of thousands of plants has proven significantly cheaper than awarding contracts for each individual project. Additionally, as a prudent measure and as an educational outreach

effort, we have saved thousands of dollars in planting fees by organizing volunteers to accomplish this task. Since 1994, SWIM has coordinated with Tampa BAYWATCH to organize many volunteer plantings and their assistance has been of great service.

Another cost-saving strategy involves use of a SWIM-sponsored marsh grass grow-out pond developed and constructed by FDEP at their Port Manatee Fish Hatchery. Upon maturation of recently-installed marsh grasses, SWIM (and other restoration programs) will have the opportunity to harvest these grasses for use in restoration projects. Volunteer labor may be feasible for the harvesting.

We continue to explore the option (as at the Cockroach Bay project) of developing "in-house" nurseries for specific projects. The use of volunteer labor for development of these nurseries (i.e., collection, potting, and planting of upland and wetland species) has and could continue to prove very cost effective. Although uncalculated, the Cockroach Bay nursery is believed to have saved taxpayers thousands of dollars while providing important native species for the project.

Table 2. Other Significant Habitat Restoration Projects in the Tampa Bay Watershed.

PROJECT NAME COOPERATOR (STATUS)	PROJECT SIZE	PROJECT DESCRIPTION
1. E. G. Simmons Park Phase 1 <i>Hillsborough County (M)</i>	14 acres	Habitat restoration, creation; improve tidal flushing
2. E. G. Simmons Park Phase 2 <i>Hillsborough County (M)</i>	1 acre	Transitional habitats and hammock restoration
3. Mangrove Bay Phase 1 (C) <i>St. Petersburg, Pinellas County</i>	13.5 acres	Stormwater polishing; upland restoration
4. Mangrove Bay Phase 2 (C) <i>St. Petersburg, Pinellas County</i>	0.5 acres	Fill portion of borrow pit to create shallow intertidal and subtidal habitats
5. Mangrove Bay Phase 3 (L) <i>St. Petersburg, Pinellas County</i>	15-30 acres	Create marshes; stormwater treatment; improve circulation; create habitat mosaics; remove exotics
6. Lowry Park Spring & Shoreline Tampa (L)	0.5 acres	Spring and shoreline restoration
7. Lowry Park Tampa (L)		Modify project to ease maintenance; install public access
8. Boca Ciega Tract Phase 2 <i>Pinellas County (S)</i>	4-5 acres	Rehydration of 2 meandering creeks with water from downstream; stormwater retention ponds
9. Boca Ciega Tract Phase 1 <i>Pinellas County (S)</i>	4.5 acres	Saltmarsh and tidal creek creation, wetland restoration; stormwater polishing
10. Peanut Lake Phase I <i>Fl. Dept. of Environ. Protection, Port Manatee (M)</i>	10 acres	Dredging lake and tidal channels to Bishop Harbor; enhance wetlands
11. Peanut Lake Phase II <i>Fl. Dept. of Environ. Protection, (S)</i>		Treat wastewater entering the lake; restore Redfish Creek and enhance channels; or restore spoil island at mouth of Port Manatee
12. Hendry Delta (C) <i>Fl. Dept of Environ. Prot., FMRI</i>	3 acres	Saltmarsh creation
13. MacDill Air Force Base Phase 1 U.S. Air Force (I)	3 acres	Habitat restoration; exotic removal; regrading
14. MacDill Air Force Base Phase 2 U.S. Air Force (I)	20-30 acres	Habitat mosaic and stormwater treatment
15. Little Bayou/Bayou Bonita <i>St. Petersburg (I)</i>	3 acres	Passive park construction; tidal creek restoration; nuisance species removal
16. Howard Frankland Bridge Spit <i>Fl. Dept. of Transportation (M)</i>	3 acres	Habitat restoration: intertidal, dunes, uplands

PROJECT NAME COOPERATOR (STATUS)	PROJECT SIZE	PROJECT DESCRIPTION
17. Long/Cross Bayou Pinellas County (M)	4 acres	Restoration of tidal channel, marsh and transitional habitats
18. Picnic Island Tampa (M)	8 acres	Construct tidal channels and marshes; stormwater treatment; exotic plant removal
19. Joe's Creek Pinellas County (M)		Habitat restoration; incorporate reuse to lower salinities
20. Joe's Creek 1A Pinellas County (M)	0.5 acres	Restoration of tidal channel, marsh and transitional habitats
21. Wolf Branch Creek Hillsborough County (S)		Habitat enhancement, restoration and creation
22. Osgood Point Gulfport, Fl. Dept. of Environ. Prot. (C, L)	10 acres	Constructed tidal channels and lagoons, marshes, dunes, hammocks and uplands; a canoe launch, nature trails, boardwalks, fishing piers and parking lot.
23. Emerson Point Manatee County (L)	30-40 acres	Habitat restoration
24. Mobbly Bay Oldsmar, Pinellas County (L)	40-50 acres	Habitat enhancement, restoration and creation
25. Harbor Palms Park Oldsmar (C)	4.4 acres	Redesign stormwater pond; improve habitat quality; create additional tidal channels, marshes, salterns, transitional habitats and upland hammocks
26. Terra Ceia Causeway Fl. Dept. of Transportation (M)	2.2 acres	Exotic plant removal; regrading and planting to establish marsh; creation of habitat mosaic
27. Braden River Park Manatee County (P)	5-8 acres	Exotic plant removal; habitat enhancement; development of tidal channels, marshes; stormwater treatment
28. Braden River II Fl. Dept. of Transportation (C, P)	4-6 acres	Removed exotic vegetation along SR 64; pending construction of wetlands
29. Cypress Point Tampa (L)		Habitat restoration
30. Allen's Creek Pinellas County (L)	1 acre	Restoration of oligohaline habitat
31. Howard Frankland West Fl. Dept. of Transportation (L)		Habitat restoration in conjunction with road improvements
32. Cabbagehead Bayou (S)	N/A	Adjust control elevations of the breach in Channel A berm to restore open water features and functions
33. State Road 580 Fl. Dept. of Transportation (S)	1 acre	Habitat restoration
34. Cooper's Point Pinellas County, Clearwater (S)	5-7 acres	Remove exotic vegetation; create mangrove and marsh habitats; establish open water habitats

- **Mulching** - Since 1991, SWIM has encouraged and practiced (as practicable) recycling of exotic vegetation. Specifically, Brazilian pepper and Australian pine can be mulched and then used in transitional and upland zones. The mulch is of exceedingly high quality and can last for three or more years. In addition, Australian pine is an extremely high quality firewood. This wood has been recycled through public giveaways, using the events as educational opportunities about our program, the restoration project, and various environmental matters (native vs exotic plants, etc.). This year the first "general" contract for mulching and firewood services was awarded. Although mulching and firewood preparation of all trees is probably not economically feasible, such recycling is often warranted and environmentally astute.
- **Land Acquisition** - Since 1994, SWIM has coordinated with the District's Land Resources Department and their land acquisition program to include parcels in their five year acquisition plan. In the process, parcels are identified of appropriate size and ecological significance, and that harbor attractive restoration opportunities. Once purchased, the SWIM program will implement restoration projects for the sites. This year two important purchases were made by Land Resources:

Port Redwing - Port Redwing is a 270-acre parcel located in the mid-eastern reaches of Tampa Bay, just north of the Big Bend power plant. The \$3 million acquisition was a tri-party affair joining the forces of the SWFWMD with Hillsborough County and the Tampa Port Authority. The SWIM program will cooperate with Hillsborough County for the implementation of a large (30-40 acres) restoration project. This acquisition is but the first of a series of proposed acquisitions throughout "The Kitchen" area.

Terra Ceia Isles - Terra Ceia Isles is a 1,500-acre tract located in the southeastern reaches of Tampa Bay, within the Terra Ceia Aquatic Preserve, adjacent and southwest of Bishop Harbor. The tract offers exciting opportunities for large-scale restoration of coastal mosaics. The tract was purchased for \$1.5 million although some private estimates had placed its commercial value as high as \$8.1 million. A multi-phased approach will have to be taken for a parcel of this size, and the SWFWMD and SWIM will be cooperating with FDEP for project implementation and site management. Additional tracts within the preserve are under consideration for inclusion in the District's five-year plan.

Natural Systems Assessment: Protection of natural systems is certainly more cost-effective than restoration of altered systems. SWFWMD activity in this area includes the final year of a resource assessment of the Little Manatee River. The Little Manatee is the least

disturbed tidal tributary of Tampa Bay, and may be representative of historic conditions in the watershed. By examining the Little Manatee River, the District will learn much about the relationships between water chemistry, biological systems and land use. Data obtained through this work will provide resource managers and local governments the tools necessary to guide restoration and ensure protection of the remaining natural systems around the bay.

Fisheries Research Peanut Lake of the Hendry Fill Site: The District has been under contract with USF since August, 1989 to perform biological sampling to evaluate fisheries utilization of Peanut Lake prior to and after the planned restoration project. Following 18 months of pre-restoration sampling, construction was begun in February 1993 and completed in April 1993. The 18 months of post-construction fisheries sampling was completed in February 1995.

The sampling data shows a dramatic shift in fish populations after restoration. Before restoration, the site was dominated by small, marsh residents (sheepshead minnows, mosquitofish, killifishes, etc.). After restoration, the lake was almost completely dominated by juveniles and adults of transient species, many which are of significant commercial and sportfishing importance (snook, tarpon, grouper, black drum, trout, menhaden, pinfish, mullet, etc.). Manuscripts reporting these findings are being prepared for submission to scientific journals.

Additional information about the SWIM program and its projects in the Tampa Bay area can be found in the 1995 Annual SWIM Report. Contact Mike Perry, SWFWMD SWIM (813) 985-7481.

STATUS OF COLONIAL WATERBIRDS IN TAMPA BAY

The Tampa Bay region boasts some of the most outstanding colonial waterbird populations in the state. This is remarkable in view of the human population that now exceeds 2.3 million people and the extensive environmental changes wrought to accommodate our needs. Pelicans, herons, spoonbills, gulls and other waterbirds are a critical, highly visible component of natural systems. In addition, they provide important aesthetic, educational and recreational values. Further, long-term population trends offer a significant (and largely under-utilized) indicator of society's success in protecting wetland and estuarine systems.

Staff of the National Audubon's Tampa Bay Sanctuaries annually attempt to survey every bird colony in Tampa Bay. We are pleased to acknowledge the assistance of Tampa BAYWATCH and volunteers from local Audubon chapters. Again this year 20 colony sites were

surveyed (see 1994 report for map and list.) All colonies active in 1994 were active again except one: the "Isla" colony of Black skimmers and Least terns was lost to condominium development. The most important single colony was the Alafia Bank, where 14,000 pairs of birds of 20 species nested. Other large colonies (1,000 breeding pairs) occurred at Terra Ceia Bird Key, Tarpon Key, Passage Key, Shell Key, Island 2D, and Piney Point.

Population Status: Overall nesting effort increased nearly 25 percent over 1994, with more than 46,000 nesting pairs found of 25 species. Of these, 11 are state-listed as Endangered (E), Threatened (T) or Species of Special Concern (SSC). The increase was attributed primarily to the excellent 1994 summer rainy season, the first really normal rainy season since 1988. Abundant rains allowed recovery of many of the parched wetlands of the Tampa Bay watershed, ensuring an improved food supply for species such as the White ibis. Particularly noteworthy increases or declines are noted below.

- Brown Pelican (SSC): About 2,020 breeding pairs occurred at seven colonies, plus 530 more at five sites near Clearwater and Bradenton; officially out of Tampa Bay but functionally part of the same population. Nesting success was near normal for the first time since 1989. Despite the widely-publicized population "crash" of 1989-92, this species' numbers appear to be stable or increasing slowly.
- Reddish Egret (SSC): This is the rarest heron in the United States. About 75 pairs were estimated at five colonies, including 60 at Alafia Bank alone, marking a slight increase. Just 400 pairs are estimated for the entire state.
- White Ibis (SSC): Some 10,800 pairs were found at four colonies, including 9,000 at Alafia Bank. This is the most since 1983, and may represent the maximum number that local systems can support. Even so, these numbers suggest a 66 percent decline since the late 1940s.
- Roseate Spoonbill (SSC): Numbers increased an astonishing 50 percent in 1995, to 150 pairs at three colonies, including 140 at Alafia Bank. Nesting success was outstanding, with nearly 300 young produced. This was the best year for spoonbills in Tampa Bay since at least the 1870s!
- Wood Stork (E): A single colony of this Endangered species occurs in the Tampa Bay system. The colony was abandoned due to human disturbance (jet skis) in 1994. This year, 40 pairs nested successfully.
- American Oystercatcher (SSC): In Hillsborough Bay 75 pairs were counted. About 100 pairs occur in all of Tampa Bay, one-third of the state population. Most nests washed out in early June when Hurricane Allison passed by; re-nesting attempts were mostly

unsuccessful. Since oystercatchers nest along shorelines and beaches, they are highly vulnerable to human disturbance.

- Laughing Gull: This species enjoyed the largest increase of all. About 21,000 breeding pairs were estimated at five colonies, a 40 percent increase over last year. A sharp increase was observed at Shell Key near Pass-a-Grille, where 7,500 pairs nested.
- Caspian Tern: At the sole colony in Florida, Alafia Bank, 84 pairs were counted.
- Royal Tern: Numbers increased slightly at the two Tampa Bay colonies, to about 2,700 pairs.
- Sandwich Tern: Some 440 pairs were counted at two colonies, a significant increase over last fall's 270. These are the only two nesting sites known in Florida.
- Black Skimmer: Most of the area's colonies, which normally comprise 60 percent of the state's population, were flooded by Hurricane Allison. Late nesting efforts were largely unsuccessful.

Management: Primary management needs remain the protection of breeding colonies and foraging habitats (see also the longer discussion in the 1994 report). Most major colonies and many smaller ones are posted and protected by the National Audubon Society, U.S. Fish and Wildlife Service, Florida Park Service, Tampa BAYWATCH and local Audubon volunteers. However, vandalism and colony disturbance by island visitors or their dogs continue to pose significant threats. State and local environmental land acquisition programs continue to secure important native habitats, including wetlands important to wading birds (e.g. the Golden Aster Scrub, which includes the headwaters of Kitchen Branch). Un-



fortunately, these welcome gains are out-paced by new residential/commercial development in the I-75 corridor of Hillsborough County where many of the ibis and herons of the Alafia Bank colony forage, and the long-term outlook is for continuing loss or deterioration of wading bird foraging habitat.

The volunteer effort to protect beach-nesting birds at Shell Key, Pass-a-Grille, deserves special mention. Shell Key is an extremely popular destination for beach-goers, both human and avian. For over 15 years, sporadic attempts to protect breeding colonies have been frustratingly unsuccessful. Since 1992, a team led by Paul Blair and Barbara Isaacson of St. Petersburg Audubon has posted and protected the colony area, and developed educational materials for the public. In that time the colony has increased from a few hundred pairs to nearly 8,000. This is by far the most effective volunteer effort in the state.

Beach-nesting species such as the Snowy Plover, American Oystercatcher, Least Tern and Black Skimmer are especially vulnerable to human disturbance. Few undisturbed areas remain where they are able to nest successfully. Their continued survival in Florida literally depends upon the ability of resources management agencies, conservation groups, and volunteers to protect their nesting areas. A key factor in their success will be the support and cooperation of the public.

For the second year, monofilament fishing line was removed from area bird colonies in a special Fall Colony Cleanup sponsored by Tampa BAYWATCH and National Audubon. An estimated 26 miles of fishing line was removed from 40 islands. We estimate that 200-300 birds are saved annually by this effort. Because most of the survivors are breeding adults, this project contributes directly to the protection of nesting populations. For more information contact Richard T. Paul, National Audubon's Tampa Bay Sanctuaries (813) 623-6826.

COASTAL CLEANUP

On September 16th, about 5,200 volunteers around Tampa Bay and on the region's Gulf beaches participated in the 8th annual Florida Coastal Cleanup. This is part of the Center for Marine Conservation's International Coastal Cleanup, involving over 210,000 people in 61 countries. Within the Tampa Bay region an estimated 258 miles of shoreline were cleaned by 5,200 volunteers, including 128 divers. Approximately 60 tons of trash were removed from our shorelines during the one-day event, resulting in about 23 percent of the statewide volunteers collecting 29 percent of the state's total amount from 16 percent of the state's coastline.

The 1995 event was cosponsored by The Florida Aquarium, with many agencies and private organizations such as radio stations, restaurants and recycling compa-



nies contributing to make the event a huge success. Civic groups, social clubs and high school classes turned out enthusiastic contingents. The success of the annual event in the Tampa Bay region is a tribute to the variety of environmental education programs and the level of public awareness which has been raised about our valuable coastal resources. For more information on the Center for Marine Conservation or the Florida Coastal Cleanup call (813) 895-2188 or 1-800-CMC-FLOR.

ANNUAL UPDATE OF TAMPA BAY CHLOROPHYLL-A CONCENTRATIONS

The green plant pigment chlorophyll-a is a measure of the amount of phytoplankton present in the water column. Phytoplankton is one of several major forms of plants that exist in Tampa Bay and most other estuaries. Other major plant types are submerged seagrass, macro-algae and benthic micro-algae. The different plants can be viewed as being in competition with each other for required resources, such as light and nutrients. Studies conducted in several urbanized estuaries have shown that excessive loading of nitrogen generally is accompanied by an increase of phytoplankton and macro-algae, including epiphytic and drift macro-algae, and by a reduction of seagrass. Relatively little is known about the response of benthic micro-algae to changes in nutrient availability. From a resource perspective, the loss of seagrass means a loss of essential habitat for a multitude of marine animal species. Therefore, the

amount of chlorophyll-a present in the water column not only measures phytoplankton biomass, but the amount present also gives a general understanding of resource competition within the Tampa Bay ecosystem.

ABM Chlorophyll-a Targets: Recognizing that chlorophyll-a can be used as an effective means to monitor water quality in Tampa Bay and to protect natural resources such as seagrass, the ABM Task Force on Resource-Based Water Quality in 1989 established yearly average chlorophyll-a target concentrations for the four major subdivisions of Tampa Bay (Table 1). The targets chosen for the four subdivisions were based on monthly measurements by the Hillsborough County Environmental Protection Commission (EPC) during a five year period, 1984 through 1988. The 1989 State of the Bay document (pages 38-39) gives a detailed discussion of the process used to establish the target concentrations.

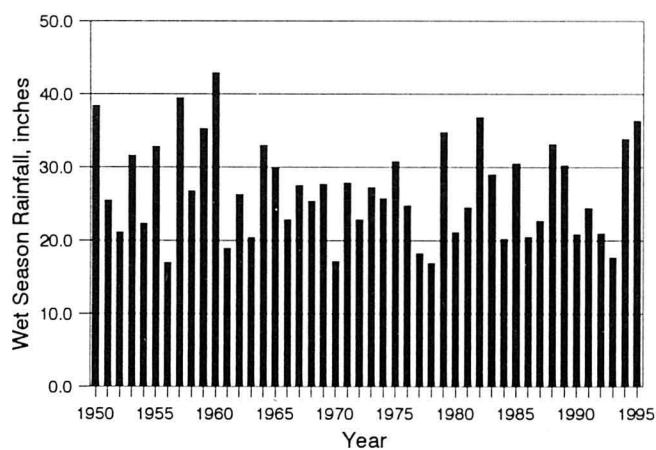
Seven years of Tampa Bay chlorophyll-a data after target selection are now available from the EPC monitoring program. Comparisons between the targets and the 1989 through 1995 measured annual averages, as well as the seven year average are shown in Table 1.

Table 1.
Chlorophyll-a targets and EPC measured annual average concentrations ($\mu\text{g/l}$) for the major subdivisions of Tampa Bay (HB=Hillsborough Bay; OTB=Old Tampa Bay; MTB=Middle Tampa Bay; LTB=Lower Tampa Bay).

	HB	OTB	MTB	LTB
TARGET VALUE	15.0	10.0	8.0	4.0
1989	14.5	9.9	8.0	5.1
1990	13.1	9.8	7.8	4.2
1991	13.9	8.8	7.1	3.7
1992	12.1	7.6	6.1	4.2
1993	9.9	7.7	6.0	3.6
1994	16.7	10.0	10.1	5.6
1995	17.6	11.9	9.4	4.7
AVERAGE 1989-95	14.0	9.4	7.8	4.4

The trend of decreasing chlorophyll-a averages seen from 1989 through 1993 was interrupted in 1994 and the averages continued to be relatively high for 1995 as well (Table 1 and Figure 2). The elevated 1994 and 1995 values were most probably caused by an increased supply of nutrients (specifically nitrogen) as a result of the higher than usual wet season rainfall amounts for these two years. River discharge and runoff from the land, as well as rain falling directly over the bay, are important sources of nutrients to the bay. The wet season rainfall (June through September) at Tampa International Airport totaled 33.9 inches in 1994 and 36.4 inches in 1995. These are the highest wet season rainfall amounts since 1982, and further, the 1995 amount is the fifth highest during the last 45 years (Figure 1). Therefore, considering the active wet seasons of 1994 and 1995 and the associated increase of available nitrogen during the most active growing period of the phytoplankton, it is not surprising that chlorophyll-a concentrations were elevated in comparison to recent years. Although all bay segments had averages above the target concentrations during the last two years, chlorophyll-a concentrations remained relatively close to target levels and were much below levels found during the 1970's and early 1980's (Figure 2).

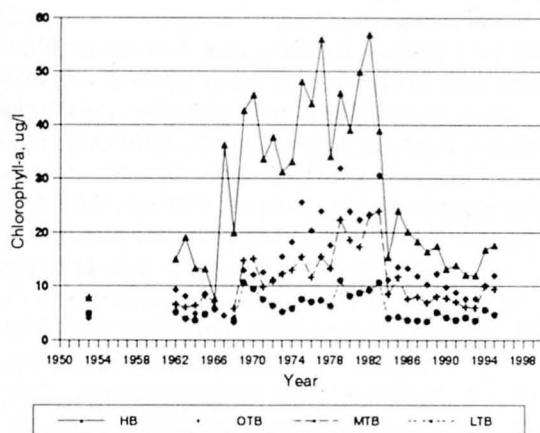
Figure 1.
Total wet season (June through September) rainfall measured at the Tampa International Airport, 1950 through 1995.



Long-Term Chlorophyll-a Record: The long-term chlorophyll-a record for Tampa Bay starts in 1953 (Figure 2). The record is based on measurements by several organizations using different sampling frequency and station locations, but generally similar methodologies. However, sections of the record shown in Figure 2 have been adjusted to account for potentially underestimated

measurements caused by methodological shortcomings. It is believed at this time that the data shown in this figure best describes the long-term Tampa Bay chlorophyll-a record. Generally, relatively low values were found in all major sections of Tampa Bay prior to the late 1960's. After an elevated period of approximately 15 years, values decreased dramatically between 1982 and 1984 in all subdivisions of the bay. The recent concentrations appear similar to levels found during the early portion of the long-term record.

Figure 2.
Annual average chlorophyll-a concentrations for the major subdivisions of Tampa Bay, 1953-1995
(HB=Hillsborough Bay; OTB=Old Tampa Bay;
MTB=Middle Tampa Bay; LTB=Lower Tampa Bay).



The cause of the large chlorophyll-a reduction in the early 1980's is not completely understood, but it is almost certainly linked to a substantial reduction in nitrogen loading from anthropogenic sources. This reduction was the result of management actions taken a decade or longer ago, specifically to reduce the impact by domestic wastewater and fertilizer industry effluents. In addition, recent nitrogen loading reductions from fertilizer storage facilities and shiploading terminals located in Hillsborough Bay and from domestic wastewater plants in Old Tampa Bay should have contributed to lower chlorophyll-a levels. Also, secondary effects resulting from the anthropogenic nitrogen reductions may have become increasingly important in the control of chlorophyll-a. These effects, which often are called "natural control processes", directly or indirectly impact the phytoplankton population of Tampa Bay.

The scenario of reduced loadings agrees with the nitrogen loading/chlorophyll-a concept established in other estuaries and laboratories. It is unlikely that meteorological conditions, specifically rainfall amounts, could have caused the large reduction of chlorophyll-a seen in

the early 1980s. Nevertheless, the substantial chlorophyll-a reduction suggests a recovery of Tampa Bay water quality and the potential for significant natural seagrass recolonization. Please see other articles in this report which specifically discuss the recent increase of Tampa Bay seagrass cover.

Ecological Considerations: The demonstrated trend of decreasing phytoplankton biomass, as well as a potentially large biomass reduction of drift macro-algae which also appears to have occurred recently in Tampa Bay, should benefit seagrass growth and allow for the expansion of seagrass meadows, ultimately resulting in a more abundant seagrass dependant animal community. Although both phytoplankton and macro-algae are important components of the Tampa Bay ecosystem, the current standing crop of these algae may better resemble the biomass found prior to the period when algal biomass was artificially elevated through high anthropogenic nitrogen discharges to the bay.

For more information Roger Johansson, City of Tampa Bay Study Group (813) 247-3451.

TAMPA BAYWATCH

Tampa BAYWATCH is a non-profit environmental stewardship program for the Tampa Bay estuary, and is devoted exclusively to the scientific and charitable purpose of monitoring, restoring, and protecting the marine and wetland environment of the bay. Incorporated in February of 1993, Tampa BAYWATCH is the first organization of its kind in the southeastern United States, and is unique in its approach to developing grassroots support and participation for habitat restoration and protection projects. Tampa BAYWATCH implements an aggressive monitoring schedule whereby staff conduct aerial and boat surveys to identify environmental problems in the bay. These survey methods have been highly successful in pinpointing the locations of abandoned vessels, illegal construction and shoreline development, damaged seagrass beds, degraded water quality discharges, wildlife impacts, and other environmental perturbations.

With funding from the Tampa Bay National Estuary Program, Tampa BAYWATCH founded the Conservation Corps Volunteer Network in 1994 to promote a flexible partnership between area citizens, governmental agencies, and local environmental groups. Through the Conservation Corps Volunteer Network, Tampa BAYWATCH recruits volunteers from the community, and disseminates information to local organizations, civic groups, and the media to facilitate community awareness, concern and participation in solving the problems facing the Tampa Bay estuary. So far, thousands of individuals from community groups, scout troops, high schools and elsewhere have joined Tampa BAYWATCH

in a wide variety of projects, demonstrating environmental activism in its purest form. Some of the most effective efforts during 1995 were:

The Great Bay Scallop Search - this annual resource monitoring event utilizes volunteers to snorkel set transects in lower Tampa Bay to count scallop populations. Three scallops were found during the Third Great Bay Scallop Search, held on September 9th, involving over 200 volunteers and 42 boats. Baseline data provided by this effort has compelled Tampa BAYWATCH biologists to develop a program where scallops are transplanted to the bay from healthy donor sites farther north in an effort to help re-establish a viable breeding population in the bay's waters.



High School Wetland Nurseries - Tampa BAYWATCH has enlisted the help of the Lakewood and Chamberlain high school ecology clubs to build their own wetland nurseries on-campus to grow saltmarsh grasses for our restoration efforts. Through the construction and maintenance of the wetland nurseries, students gain hands-on experience in botany and resource management, and grow the plants needed for habitat restoration projects at low cost. This exciting program will be expanded to a total of five high schools throughout Hillsborough and Pinellas counties in 1996.

Saltmarsh planting projects - Tampa BAYWATCH has coordinated dozens of restoration projects around the bay. Some of the planting projects conducted this year include:

- Jungle Prada, May 19th: 25 Lakewood High School students planted 3,000 saltmarsh grasses in a one-acre tidal pond.
- Florida Marine Research Institute Fish Hatchery Treatment Pond, June 24th: 75 volunteers planted 5,000 smooth cordgrasses in a one-acre tidal pond.
- Osgood Point in Gulfport, August 12th: 50 volunteers planted over 5,000 saltmarsh grasses and 800 native trees in a six-acre existing park.

Palm River Steward - Tampa BAYWATCH, in partnership with the Palm River Management Committee, has initiated an important stewardship program for this oligohaline system. McKay Bay is one of the most productive bird nesting sanctuaries in the southeastern U.S., yet is seriously compromised by man-made alterations to the Palm River and by having the most industrialized area of the Tampa Port fringing its habitat borders. The water quality and environmental conditions of the Palm River/McKay Bay are being monitored and a resource management plan is being implemented to ensure its long-range health and protection.

Monofilament fishing line removals - are highly effective in protecting nesting birds from death caused by entanglement. On October 21st over 200 Tampa BAYWATCH and National Audubon Society volunteers in 50 boats removed the monofilament line and other marine debris from 55 important bird nesting islands from Sarasota Bay to Clearwater harbor, in anticipation of the bird nesting season. Our event is the largest of its kind in the nation, and is particularly important to many endangered bird species (such as the Roseate spoonbill, White ibis, herons and egrets) utilizing Tampa Bay nesting sites.

Storm drain marking programs - Tampa BAYWATCH organized the "Paint Tampa Bay Clean" campaign, the largest regional effort of its kind, and possibly the largest in the country, to paint the cement caps on storm drains with variations of the message, "Dumping Here Pollutes Our Bay!". This is an effective reminder that the grass clippings, oil residues, lawn fertilizers, pesticides and other pollutants that go down the gutter will eventually affect water quality.

Tampa BAYWATCH strives to educate and involve our community through informational programs aired on public broadcast stations and local cable companies; to work with local, state and federal agencies to act as an information and reporting resource to protect of the Tampa Bay estuary from continued pollution and misuse. For more information contact Peter Clark, Director, Tampa BAYWATCH (813) 896-5320.

AQUATIC PRESERVES OF TAMPA BAY

The Tampa Bay Aquatic Preserves are comprised of four separate preserves which encompass 370,634 acres of submerged lands in Tampa Bay and nearby Gulf waters. Some of the most pristine areas left in Tampa Bay are contained within the Terra Ceia and Cockroach Bay Aquatic Preserves. Boca Ciega Bay and Pinellas County are the most altered of the aquatic preserves. The Aquatic Preserve designation was established for the purpose of preserving essentially natural or existing conditions so that their aesthetic, biological, and scientific values may endure for the enjoyment of future generations. The Aquatic Preserve Program (APP) pro-

vides resource protection and management through land acquisition, habitat restoration, environmental education, basic and applied research and long-term monitoring. Ongoing and completed projects for 1995 include the following:

Cockroach Bay

Buoys and Brochures: As part of the seagrass protection effort in Cockroach Bay, buoys were installed by APP staff and the Hillsborough Environmental Lands Acquisition and Protection Program (ELAPP) to further delineate the recovery areas that have been designated as "No Boat" areas. The APP produced an informational brochure which provides a detailed map of Cockroach Bay, including landmarks, depths, and designated boating areas. The brochure also explains the importance of seagrass, the impacts of prop scarring and steps being taken to correct the problem. Both the brochure and the buoys were funded with moneys obtained by the APP through the Florida Department of Environmental Protection, Office of Waterway Management.

Shoreline Restoration Project: Working in conjunction with the Ruskin Pepper Patrol, the Tampa Bay APP, ELAPP, and Youth Environmental Services took some of the first steps in emergent wetland restoration efforts along Marsh Creek (Ruskin Inlet) and the Little Manatee River. The groups participated in a two-day effort to clear the shoreline in front of the Ruskin Library of Brazilian pepper. The Pepper Patrol also planted the area with native vegetation donated by ELAPP.

International Workshop Participants Visited Cockroach Bay: Twenty-five international coastal managers from developing nations participated in a field trip to Cockroach Bay Aquatic Preserve on July 17th as part of a workshop designed to enhance understanding of co-operative coastal management during the Coastal Zone 95 Conference. The field trip was jointly conducted by the Tampa Bay APP, the Southwest Florida Water Management District's Surface Water Improvement and Management (SWIM) Program, Hillsborough County Parks and Recreation Resource Management, Hillsborough Community College, and the Cockroach Bay User's Group (C-BUG). The international visitors participated in a guided boat tour and discussed resource protection issues, including seagrass protection and the effects of net bans. They also visited the SWIM site located near the bay to learn about restoration planning and technology. Participants were from Costa Rica, Thailand, Russia, Tonga, Brazil, Croatia, and other countries with an interest in sustainable development and coastal resource protection.

Terra Ceia

Shoreline Cleanup: Routine clean-up efforts and the placement of trash receptacles by AP staff along the US

19 causeway adjacent to Terra Ceia Bay has provided much needed pollution control in this area. This effort has not only helped to reduce litter along this high use area, but it has identified the area as an important Aquatic Preserve.

Bird Nesting Protection: Tampa Bay APP staff have seasonally posted the sand spit on the southern portion of the Skyway Bridge approach as a shorebird nesting site. This area gets intensive bird usage during the nesting season. Plans are to continue this in 1996 and to also begin annual documentation of the nesting species.

Boca Ciega/Pinellas County

Bird Nesting at Shell Key: APP staff assisted the St. Petersburg Audubon Society in the posting of bird nesting habitat on Shell Key in Boca Ciega Bay. Shell Key is a nesting area for shorebirds, including the Black skimmer, a designated species of special concern, and it is also an important stop-over for migratory birds. This area is posted closed during the spring and summer months.

Spoil Island Enhancement: APP staff have started a program to identify the amount of exotic vegetation intrusion on spoil islands located along the Intracoastal Waterway in Pinellas County. The plan is to eradicate the invasive exotics on selected islands, enhance native vegetation, and examine trends in the relative abundance and diversity of wildlife. The long-term goal is to introduce additional habitat for shore- and wading-bird usage.

Education

Workshops for Environmental Professionals: APP staff co-sponsored four workshops with the Florida Coastal Management Program in 1995. The programs were Watershed Management, Fisheries Habitat, Importance of Mud Flats, and GIS as a Management Tool. Workshops will be provided again in 1996 on a quarterly basis and will be on Aquaculture and Stormwater Management. Each workshop is free and open to anyone interested in coastal management issues. If you would like to get on the mailing list for workshop announcements, please contact Shelly Allen, FDEP (813) 744-6100, Ext. 448.

STATUS OF BAY SCALLOP RESTORATION

The southern bay scallop, *Argopecten irradians concentricus*, is one of the only non-finfish species to support a large, although rapidly declining, recreational interest in the state of Florida. The subspecies once supported a considerable commercial fishery along Florida's west coast as well. In the early 1950s, between 10 and 120 thousand pounds of scallop meat were commercially

landed in Lee County, but landings decreased to near zero by the early 1960s. Bay scallops, which require good water quality, had all but disappeared from Tampa Bay in commercially or recreationally viable numbers by 1963.

The exact causes of these declines are unknown, although deteriorating water quality is a possible reason. The bay scallop is perhaps the most susceptible of the bivalve molluscs to poor water quality and due to the life-history and reproductive strategy of the species, populations can easily be lost from an estuary such as Tampa Bay. While the waters of Tampa Bay and possibly other estuaries may have improved to the point that they can again support a bay scallop population, there have not been enough adults to supply the necessary larvae to repopulate these areas.

Since 1990 the Shellfish Biology Laboratory at the University of South Florida (USF) has continued to develop techniques to spawn adult bay scallops in the laboratory and to raise the larvae through the juvenile stages. These juveniles have been used in a number of studies aimed at restoring the bay scallop population to Tampa Bay. In 1993 over 300,000 were planted in seagrass areas near Cockroach Bay, Big Bayou and Fort DeSoto. In 1994 20,000 were given to 50 home owners on Tampa Bay who were willing to allow scallops to be suspended in cages from their docks. These scallops were monitored through reproduction, and by spring shrimp fishermen were reporting an increased abundance of bay scallops.

In May 1995 another 20,000 scallops were offered to homeowners from lower Tampa Bay to the Gulf Beaches. In addition, 2,400 were placed in a penned seagrass area on the southeastern side of Egmont Key. Unfortunately, a red tide bloom occurred off the west coast in the late spring and early summer. Although most shellfish are relatively unaffected by red tide, the bay scallop appears to be very sensitive. Most of the caged scallops on the Gulf Beaches and all of the penned scallops off Egmont Key failed to survive. Some of the caged scallops in the northern portion of the bay survived and succeeded in spawning. The success of the spawned larvae will not be known until the summer of 1996. For more information contact Dr. Norman J. Blake, USF Department of Marine Science (813) 893-9130.

U.S. COAST GUARD ACTIVITIES

GROUP V OILS: Marine Safety Office (MSO) Tampa has actively addressed the threat posed by the transport of Group V oils (API Gravity 10). This began by researching the characteristics and behavior of Group V residual fuel oil (also known as low API Oil or LAPIO) which is more difficult to detect, contain and cleanup

when spilled. MSO Tampa formed a local work group consisting of not only the Coast Guard but also the Florida Department of Environmental Protection (FDEP), the National Oceanic and Atmospheric Administration, and other agencies as well as representatives from the maritime, electric power and spill response industries. The work group developed a list of possible response methods and strategies for LAPIO. MSO Tampa also implemented operational controls on tank vessels carrying LAPIO to reduce the risk of collisions or groundings. MSO Tampa has proactively worked to develop spill preventive measures for Orimulsion in the event that the product is eventually shipped into Tampa Bay. MSO Tampa took the lead on the Coast Guard working group that included NOAA and the FDEP, which conducted a comprehensive review of Group V oils and prepared a detailed report with recommendations that were submitted to Coast Guard Headquarters, Washington DC.

PREP AREA EXERCISE: On September 27th and 28th, the U.S. Coast Guard conducted its first triennial oil spill area exercise in MSO Tampa's zone under the National Preparedness for Response Exercise Program (PREP). The purpose was to exercise the entire response community in a particular geographic area, validating the Tampa Bay Area Contingency Plan and the responsible parties' Facility Response Plan. The response involved more than 250 representatives from over 55 different federal, state and local organizations. CITGO Petroleum Corporation volunteered to participate as the responsible party and the FDEP was the lead agency for the state of Florida. The area exercise demonstrated the ability of the government and the marine industry to successfully interface in a spill response on a large scale. All objectives identified in the design of the exercise were met by the response organization. An exercise debrief was held on September 29th and Lessons Learned were prepared to identify areas of improvement in the response organization and area contingency plan. Recommended changes to the Area Contingency Plan as a result of the PREP Area Exercise are forthcoming in the next annual update, due in July 1996. The Tampa Bay area received credit for the exercise satisfying all OPA 90-mandated federal pollution response exercise requirements, and is not due again for an area exercise until 1998.

MSO TAMPA'S AREA CONTINGENCY PLAN
CHANGE 1 ISSUE: MSO Tampa has completed the 1995 update to our Area Contingency Plan for Oil and Hazardous Substance Pollution Response (ACP). The Change 1 issue contains updated data as a result of MSO Tampa's Lessons Learned resulting from the August 10, 1993 three-vessel collision in Tampa Bay. Copies of the ACP and the Change 1 may be obtained at local Tampa area printers. In addition, our ACP has been placed at 12 county libraries, for public access.

Please contact the Planning Department at MSO Tampa (813)228-2894 and request Port Community Information Bulletin 18-95 for the location of these printers and libraries.

PORT STATE CONTROL BOARDING PROGRAM: Port State Control boardings have become a major emphasis in Tampa Bay and ports nationwide. The U.S. Coast Guard has shifted emphasis from domestic inspections in an effort to address the greater risk posed by substandard foreign vessels entering the U.S.

All vessels over 1,600 gross tons are required to provide the Captain of the Port with a 24-hour advance notice of arrival. In addition, arrivals for smaller vessels can be found on pilots' reports. Histories of all known arrivals are retrieved from a Coast Guard-wide computer data base and prioritized for boarding based on flag state, classification society, owner, the results of past boardings and present cargo. Based on a matrix of the above factors, vessels receive a boarding priority of I, II, III, or IV and are boarded as follows:

Priority I- Board prior to entry

Priority II- Board prior to cargo operations

Priority III- Board while in port, manpower permitting

Priority IV- Typically not boarded

The following figures are the result of our Port State boarding for the period from 1 June 95 to 13 November 95:

540 Vessel arrivals

203 Vessel boardings

49 Destinations

COAST GUARD RESPONDS TO 5,000-GALLON MYSTERY SPILL IN EAST BAY: MSO Tampa received a report of an oil spill at the Port of Tampa in the early morning hours of September 28th. The initial investigation revealed an unknown amount of heavy black waste oil in the vicinity of berths 204-205. The Coast Guard immediately accessed the Oil Spill Liability Fund (OSLTF) and hired a local cleanup contractor. As the sun rose, the true magnitude of the spill became apparent. The oil had left a bathtub ring varying from 1 inch to 18 inches in width along the piers, rip-rap, and shoreline from berth 201 to 211, approximately 1.75 miles. At the height of the cleanup, more than 50 personnel, 13 small boats, and 10 hot/pressure washing units from eight spill contractors participated in the cleanup efforts.

During the course of the investigation, the Coast Guard took over 40 samples from all possible sources within East Bay. Unfortunately, no samples matched the spilled product in the water. The FDEP and Coast Guard officials declared the spill site clean on October 23rd. The cleanup was hampered for two days by the passage

of Hurricane Opal. After working 12-hour days for more than three weeks, at a total cost of \$550,000, the cause of this incident remains a mystery.

ENVIRONMENTAL EDUCATION PROGRAMS ANNOUNCED: Helping people learn ways to protect the maritime environment is the goal of a new program offered to schools, groups and industry by the U.S. Coast Guard Reserve. Called Sea-Partners, the program will provide speakers to groups interested in ways of protecting the marine environment. Specific topics include:

- How marine environmental protection laws and regulations apply to various marine users.
- Effects of oil, hazardous chemicals, waste, and debris on the marine environment.
- Ways groups and individuals can take actions to protect the marine environment.

Presentations are tailored for schools (elementary, secondary and college), recreational boaters, private groups, environmental organizations, and businesses in the maritime industry. The presentations are available at no charge. Groups interested in more information and to schedule a presentation should contact Steve Lang, MSO Tampa 228-2190 or 228-2197, between 8:00 am and 2:00 pm.

Sea-Partners is part of the Department of Defense's Civil Military Cooperative (CMC) Action Program. The program authorizes reservists from the U.S. Coast Guard to support critical public needs in the areas of education, health care, engineering and infrastructure. The goal of the program is to use the Coast Guard reservists to help the United States address its domestic needs in the areas of health care, education, job training, and rebuilding the nation's infrastructure, without affecting unit readiness.

U.S. COAST GUARD ENVIRONMENTAL LAW ENFORCEMENT OPERATIONS: In conjunction with the Department of Justice and other agencies, the U.S. Coast Guard has undertaken an aggressive campaign of environmental law enforcement to protect the sensitive ecosystems of the southeastern United States.

The most recent case involved Regency Cruises, Inc., which was sentenced in federal court in Tampa on March 8 for the illegal dumping of plastics at sea. On February 6, 1993, fishermen discovered 30-40 bags of garbage in the Gulf of Mexico, about 36 miles off St. Petersburg. Upon investigation MSO Tampa, working with the FBI, determined the garbage had come from the cruise ship *Regent Rainbow*. A second MSO investigation was launched after a passenger on the *Regent Sea* reported seeing plastics dumped overboard during a cruise from 7-14 February. The detailed investigations led to the court's sentence, which included a \$250,000 criminal fine, installation of pollution control equipment in

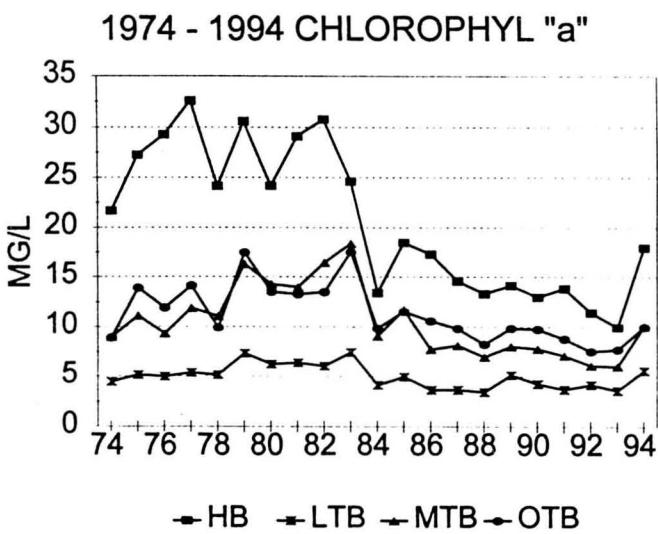
its vessels, adoption of a program to prevent future violations, and the publishing of letters of public apology.

For more information contact Lt. David Murk, MSO Tampa (813) 228-2191.

SURFACE WATER QUALITY MONITORING ENVIRONMENTAL PROTECTION COMMISSION OF HILLSBOROUGH COUNTY

The legislative act that creates and gives legal standing to the Environmental Protection Commission (EPC) of Hillsborough County mandates that the quality of the area's surface waters be monitored. Accordingly, the EPC continues to monitor an array of water quality parameters in the four largest subsections of Tampa Bay and its Hillsborough County tributaries.

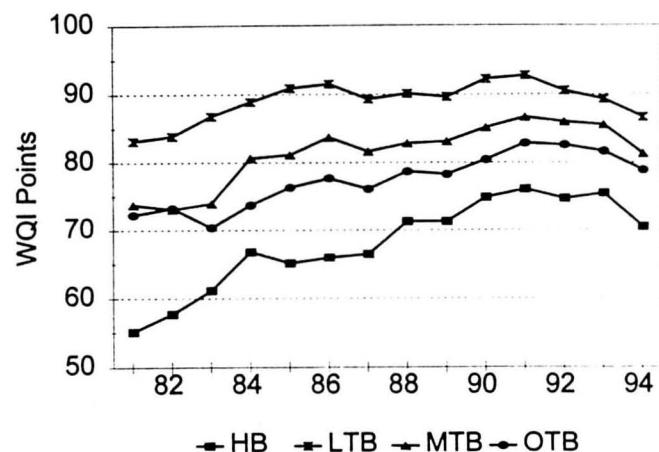
The monitoring program began in 1972 and has developed one of the largest continuous databases for any estuary in the country. Water samples are collected monthly from 52 stations in Tampa Bay and from 40 stations in the various tributaries. The database documents the status of water quality in the surface waters and identifies areas of pollution impact. The findings of the water quality monitoring program are presented in a triennial report; the most recent Surface Water Quality report covers the findings of 1992 through 1994.



EPC's data indicate that during the 1980s water quality in Tampa Bay, especially in those areas most degraded, i.e. Hillsborough Bay, improved with respect to most parameters. The graphs presented reflect these changes. The water quality index (WQI) graph represents a generalized way to describe the water quality in

Tampa Bay. The WQI is an aggregate of several key parameters; higher points indicate better water quality. The level of nitrogen is one of the major components of a balanced, viable estuary, and is one of the key parameters for the water quality index. Unfortunately, the values for nitrogen in the early part of the data set are dubious, consequently the time frame for the water quality index graph begins with 1981.

1981 - 1994 WATER QUALITY INDEX



Another important consideration in the health and viability of an estuary centers around phytoplankton, the microscopic algae. Phytoplankton is the basis of the food web. However, because these plants have short life cycles, they respond quickly to environmental conditions and may "upset the balance of nature" by over-proliferating. Chlorophyll "a" is an indirect measure of phytoplankton. The chlorophyll "a" graph shows that in the 1970s much of Tampa Bay, and especially Hillsborough Bay, had elevated levels indicating excessive phytoplankton. Since the mid 1980s, chlorophyll "a" levels have been declining and the various subsections of the Bay have more balanced and comparable values.

Noteworthy in both of these graphs are the 1994 values; water quality in 1994 was generally depressed compared to 1992 and 1993. It is important to bear in mind that in the few years previous to 1994, rainfall was well below normal for the Tampa Bay area. Consequently, freshwater inflows and associated nutrient loading to the Bay from stormwater runoff were not as profound in the early 1990s. More than 47 inches rain fell in 1994, slightly more than the historical average for this area, and resulted in greater tributary discharge to Tampa Bay. Again, in 1995 a greater than average amount of rain was measured. A preliminary review of the 1995 data indicates water quality conditions similar to those of 1994. The recent data underscores the major

impact that stormwater has on the water quality of Tampa Bay.

The Surface Water Quality report covering the findings from 1992 through 1994 is available from EPC. The report is distributed at no charge to elected government officials, related government entities and the academic community. The report is available to private and commercial groups for \$13.75, the cost of printing, tax and postage. To receive a copy of the report contact EPC's Monitoring/Analysis Department at 1900 9th Avenue, Tampa, FL 33605, (813) 272-5960 or FAX (813) 272-5157.

BAY AREA NATIONAL WILDLIFE REFUGES

Passage Key and Pinellas National Wildlife Refuges (NWR): These two refuges are maintained as inviolate sanctuaries for shorebirds and waterbirds. Management activities this past year have included maintaining sanctuary signs and removal of monofilament line. Non-native pine trees were removed from Passage Key. Approximately ten acres of Passage Key were lost during Hurricane Opal, as were most of the refuge signs.

Egmont Key National Wildlife Refuge: The current level and distribution of public use has been identified as incompatible with the purpose of Egmont Key NWR. The mission statement for Egmont Key NWR is to provide nesting habitat for Brown Pelicans and other waterbirds, as well as to preserve and protect barrier island habitat and historical structures of national significance.

The U.S. Fish and Wildlife Service has developed an environmental assessment which proposes closing the southern one-quarter of the island to all public use and the future implementation of a reservation system which will limit public use on the island during peak use periods. A public meeting will be held in February 1996 to present this management change to the public.

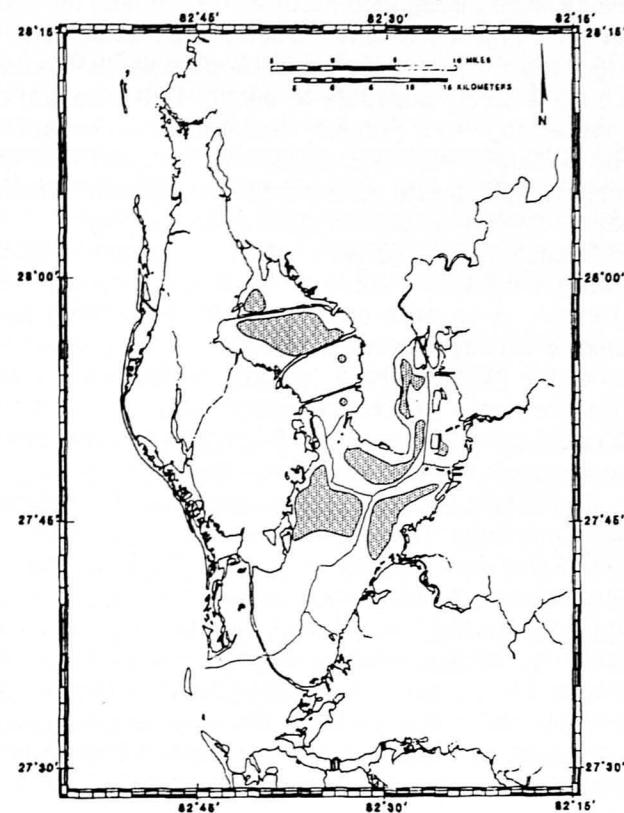
Management activities this past year have been limited to maintaining the status quo. All Black skimmer production this year was lost because intrusion by visitors into the bird sanctuary caused the adult birds to abandon their nests.

For more information contact Cameron Shaw, U.S. Fish and Wildlife Service (352) 563-2088.

TUNICATE (SEA SQUIRT) INVESTIGATIONS IN TAMPA BAY: AN UPDATE

Since 1987, large numbers of the tunicate *Bostrichobranchus digonas*, have been observed between the months of October and May in Hillsborough Bay, the northeastern portion of Tampa Bay. These tunicates are

of interest due to their potential impact on the water column. Since 1987, the City of Tampa, Bay Study Group (BSG) has continued to investigate the effects of this organism on the ecology of Tampa Bay.



Bostrichobranchus digonas distribution in Tampa Bay (1994-95).

Tunicates are very efficient biological filters, feeding primarily on phytoplankton in the water column. Plankton-laden water is drawn into an incurved siphon and is screened by a filtering mechanism before the filtered water is released back into the water column through the excurrent siphon. As a result, water clarity may increase as phytoplankton is reduced in the water column.

During the winter of 1994-95, the BSG attempted to map the distribution of *B. digonas* throughout Tampa Bay. The presence of the tunicate was determined by sampling 115 stations using a trawl with a 60cm opening. The BSG found that *B. digonas* northern range extended above Courtney Campbell Causeway in Old Tampa Bay and to Davis Island in Hillsborough Bay. The southern limit was found in Middle Tampa Bay and was delineated by a line between Coquina Key and the Little Manatee River.

Sediment type and the reproductive strategy of *B. digonas* are important in understanding the distribution of this organism. *B. digonas* is generally found on predominantly sandy substrate. During spawning, egg cases (this tunicate has no free-swimming larval stage) are expelled through the excurrent siphon and the eggs fall to the adjacent sediments or may be distributed over larger areas by water currents. Apparently, *B. digonas* prefers a sandy substrate to anchor to the bottom as opposed to a finer grained, mud dominated substrate. The apparent sediment preference, coupled with the limited egg dispersal mechanism, probably explains the patchy distribution of *B. digonas* in Tampa Bay.

Impacts by *B. digonas* on the water column may be readily noticeable in areas of high tunicate density. For example, in an area east of the St. Petersburg pier, tunicate density exceeding 10,000/m² was documented during the 1994-95 winter. In addition, chlorophyll a was measured at a low concentration of 0.7 ug/l and the Secchi depth was recorded at 8.7m (28.5 ft), the greatest Secchi depth on record for Tampa Bay.

The filtration activity of *B. digonas* may be a significant contributor to improved water clarity observed in Tampa Bay during the winter months. Tunicate filtration rate experiments have produced results indicating filtration rates as high as 0.7 liters per day per individual. Using the areal coverage, density, and filtration rate observed in this tunicate, it is estimated that the volume of Hillsborough Bay could be filtered in approximately two weeks. For further information contact Eugene Pinson, City of Tampa Bay Study Group (813) 247-3451.

FLORIDA MARINE PATROL

This year there have been many interesting and exciting issues which have positively affected the "State of Tampa Bay" and the Florida Marine Patrol's (FMP) role in protecting and enhancing the quality of the bay. It is important to understand that the FMP has taken on a new role and many diverse duties as a part of the Florida Department of Environmental Protection's (FDEP) Law Enforcement Division. Some of the more critical issues are summarized below:

Boater Education: In 1995 the FDEP submitted a "Mandatory Boater Safety and Education" bill, which had tremendous support from the public. This issue, with some adjustment, has gained even more momentum for the 1996 legislative session. FDEP is submitting a revised bill seeking a mandatory boating safety education requirement for certain boat operators in the state. If it passes, the bill will require all persons born on or after January 1, 1990 to successfully complete an approved boating safety education course before operating any vessel with 20 or more horsepower.

"Approved course" means any boating safety education course approved by the National Association of Safe Boating Law Administrators. Such courses include, among others, those offered by FDEP through the FMP, Florida Game and Fresh Water Fish Commission, United States Coast Guard Auxiliary, United States Power Squadron, Chapman's School of Seamanship, and Sea School. All courses completed are good for a lifetime and would not have to be renewed. Persons who would be required to take mandatory education will be offered the option of applying for a temporary education certificate in lieu of taking an approved course. Application for a temporary certificate will require a passing score on a short multiple-choice test. Applications will be made available throughout the state at the same locations where fishing licenses are sold. Temporary certificates will be valid for 12 months from the application date.

Law Enforcement: FDEP's Division of Law Enforcement, including the FMP, is in support of the mandatory boating safety education initiative. In the event of the education bill's passage, the FMP would devote a large part of its mission to communicating to the boating public the need to comply with the new law. This would be conducted through our new program of Proactive Policing and Public Outreach, which was very successful in 1995. Every FMP officer and supervisor has sought and is eagerly seeking forums to speak on our enforcement and education efforts. Officers are teaching on the water from their vessels, working with the community in large club gatherings, and in small groups on the docks. They are knocking on the doors of fish houses to solicit their cooperation in posting new laws and encouraging compliance from the commercial industry. Throughout 1995 FMP Supervisors and Officers visited waterfront neighborhood watch groups, schools, town meetings, boat shows, fairs and sporting events. Outreach is also being conducted through the media on radio talk shows, special television reports and safety bulletins. The community is encouraged to continue to invite the FMP to educational forums and related events.

Ecosystem Management: This year FDEP also integrated the Law Enforcement Division into its ongoing Ecosystem Management implementation initiatives. The role of Law Enforcement is crucial in Ecosystem Management, not only as a potent tool for those who willfully or habitually commit environmental crimes, but as a leader in the compliance area. This has been and will continue to be accomplished through education and outreach as described above. It will also be realized through the utilization of FDEP's "Compliance Initiative", which taps the resources of the Agency's entire technical support staff, encourages cooperative problem-solving, and provides the public with an alternative means to prevent environmental damage. This proactive approach is based upon the tenet that gradual

environmental decline will continue unless the public accepts responsibility for and actively participates in protecting the resources. In their uniforms, the FMP and the Florida Park Patrol are effective educators in the public eye, and are highly visible reminders that violating laws will have consequences for those not willing to comply. For more information contact Major Jenna Venero, Florida Marine Patrol (813) 272-2516.

REGIONAL WILDLIFE PLANNING IN THE TAMPA BAY REGION

Implementation of the five-year Regional Wildlife Habitat Plan in the Tampa Bay Region project experienced continued successes in 1995 in northern Pinellas County, the upper Hillsborough River, the Alafia River, the Little Manatee River, the eastern Myakka River basin, and in the Anclote River basin of central Pasco County. Regional wildlife habitat planning is critical in the Tampa Bay region because of the high rate of urban growth and habitat removal. The commitment to regional wildlife habitat planning, in order to help maintain regional species viability and diversity, has been adopted in Goal 10 of the Tampa Bay Regional Planning Council's Comprehensive Regional Policy Plan, in Subject Area 4 of the Council's Strategic Regional Policy Plan, and in several local government comprehensive plans. The plan includes identification and protection of large preserves linked by coastal, riverine, and large mammal wildlife corridors. Implementation techniques to protect identified wildlife habitats include regulation, acquisition, and incentive programs. Important contributions to plan implementation were made in 1995 by Hillsborough County, Pinellas County, the Southwest Florida Water Management District (SWFWMD) Save Our Rivers (SOR) program, and the Preservation 2000-funded land acquisition programs of the City of Tampa and the City of Temple Terrace. The planning and regulatory staff of Hillsborough, Manatee, Pasco and Pinellas Counties; the Surface Water Improvement and Management and SOR staff of the SWFWMD; the Ecosystem Management staff of the Florida Department of Environmental Protection; and the Florida Game and Fresh Water Fish Commission's (GFC) Office of Environmental Services staff have provided significant coordination and input to achieve plan goals. Continued progress is expected from Manatee County as they implement the land acquisition priorities developed last year; the implementation of the Hillsborough River Greenways Coordinated Conservation Plan by the project participants; in Pasco County from implementation of several mitigation banks; and the establishment of gopher tortoise mitigation parks by GFC in Hillsborough and Manatee Counties.

Difficulties in implementing the plan in 1995 included resolving multiple-use land conflicts for the same parcels of native lands; developing improved incentives for private wildlife habitat preservation; the occasional absence of coordination on upland wildlife impacts with wetland regulatory entities; the avoidance of wildlife impact review in some public and public-private partnership projects; and a general acceleration of natural habitat conversion to developed land uses with an improved regional development economy. This acceleration included vested developments, often Developments of Regional Impact, that were approved before regional wildlife habitat planning efforts occurred in the Tampa Bay region. For more information contact Mr. Jim Beever, GFC Office of Environmental Services (941) 639-3515.

THE FLORIDA AQUARIUM

The Florida Aquarium, a private, not-for-profit, environmental education facility, opened to the public on March 31, 1995. It is located on 4.3 acres of leased downtown waterfront land on the site of the Tampa Port Authority's Garrison Seaport Center. The one-million gallon aquarium is dedicated to statewide environmental education and the preservation of our freshwater and marine ecosystems - the natural resources that make Florida alluring to millions of residents and tourists. It contains more than 5,300 animals and plants representing 600 native species. It also features a signature Florida Coral Reefs exhibit with a 43-foot wide viewing window composed of 30,000 pounds of acrylic, a substance more clear than glass. A visit to The Florida Aquarium is both dramatic and unique.

The aquarium is a 152,000 square-foot facility featuring a signature shell-shaped glass dome of more than 1,100 solarflex panels which keep out 54% of the infrared light while allowing the visible light in. The project includes an environmentally-friendly parking area, which was specially designed with financial assistance from the Southwest Florida Water Management District. The aquarium also features a Conservation Station, which encourages environmental advocacy by providing information about major conservation issues and the ways people can get involved.

Construction of The Florida Aquarium was financed through an \$84 million bond issue, backed by the City of Tampa and the Tampa Port Authority. Exhibits within the complex include:

- Experimental Parking Lot: Explores how a naturalized drainage system provides a living laboratory for stormwater management and wetland ecology.
- Florida Wetlands Gallery: Traces water from its underground source through springs, sawgrass



marshes, rivers, hammocks, cypress swamps, bogs and mangrove forests.

- Florida Bays and Beaches Gallery: Highlights the various bay bottom and nearshore communities that occupy these brackish and salty waters, from lush seagrass beds to sandy beaches.
- Florida Coral Reefs Gallery: Presents life on the reef from just below the surface to a simulated depth of 60 feet, with tunnels, mazes, and a variety of windows, including the floor-to-ceiling panorama window.
- Florida Offshore Gallery: Reveals the diverse habitats of the open ocean, from microscopic plankton and the fish who feed upon it to the larger offshore sea life.

The aquarium's work in education began with outreach programs in 1991. The innovative Florida Aquarium Learning Lab has touched over 200,000 people through field trips to area parks, classroom presentations, nature restoration projects and environmental career counseling. Public programs include weekly BayWalks on Tampa Bay at McKay Bay Nature Park in Tampa and Weedon Island in Pinellas County (led by volunteers), monthly First Saturday family-oriented educational programs and field trips in the Tampa Bay area, and community cleanups and plantings.

The Florida Aquarium's education programs are expected to serve about 160,000 people each year through continued outreach and new on-site programs. Educational facilities at the aquarium include smart carts and

three interactive wetlabs along the visitor path, two state-of-the-art classrooms and a teaching auditorium. All on-site educational programs for grade levels kindergarten through 12 are enhanced through the use of a teacher packet, including pre- and post-visit classroom materials for building lesson plans and worksheets around the aquarium. The aquarium also offers internships for college and secondary school students.

Public programs in the wetlabs and at the smart cart stations enhance the visitors' experience and provide an opportunity for them to learn directly from staff and volunteers. These students of the environment can enjoy lectures or a repertoire of one-act theatrical presentations in the Florida Peoples Gallery in the upper lobby or in the auditorium downstairs. They can tour the aquarium with the aid of animal identification cards and audio wands that provide more information about exhibit areas.

By continuing to establish partnerships with public and private schools and universities statewide, The Florida Aquarium will be on the cutting edge of environmental programming in America. Through these programs, the aquarium aspires to truly be *Florida's* aquarium, dedicated to statewide environmental education and the preservation of the state's freshwater and marine ecosystems. Additionally, in support of regional conservation efforts, The Florida Aquarium coordinates the Tampa Bay Marine Animal Stranding Team and the annual Gasparilla Manatee Watch Program for the

Gasparilla Pirate Invasion of Tampa. For more information contact Dena Leavengood, The Florida Aquarium (813) 273-4506.

BENTHIC MONITORING PROGRAM FOR TAMPA BAY

September 1993 saw the commencement of the first bay-wide effort since 1963 to monitor the "benthos" (small, bottom dwelling invertebrate organisms). This program of the Environmental Protection Commission of Hillsborough County (EPC) was recommended by the Tampa Bay National Estuary Program's (NEP) Technical Advisory Committee, which recognized that a long-term benthic monitoring program was needed to better evaluate the "health" of the bay. More recently, the NEP's Science Advisory Group drafted a management plan for toxics in bay sediments and recommended that the ecosystem objective for the plan be to "maintain environmental conditions in Tampa Bay sediments such that the benthic community... is protected and, where necessary, restored". NEP, EPC, and Manatee County have funded this program since its inception. In 1995 Pinellas County joined the effort to make this a truly regional approach to environmental protection.

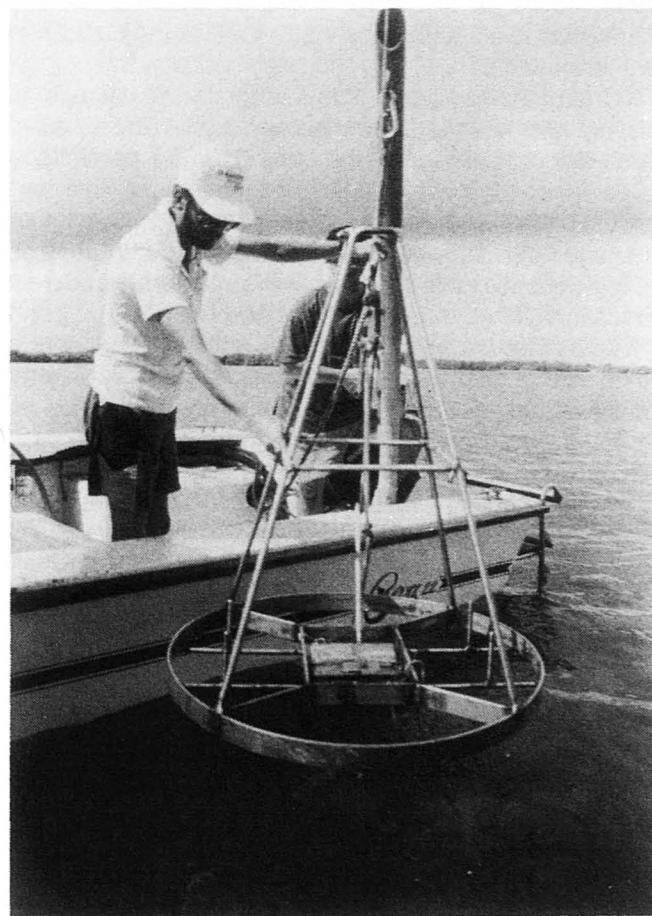
To the public, the animals which comprise the benthos-- clams, snails, worms-- may seem inconsequential. But these small animals are important because they are the primary food for many fishes and birds. Changes in the composition of the benthos can have a profound effect on commercial and recreational fishing, as well as on populations of migratory waterfowl.

Less obvious, but more relevant to the rationale for this program, is that benthos are recognized as a sensitive indicator of environmental "health". These animals live in and on sediments, and it is the sediments which ultimately bind many water and air-borne pollutants (metals, pesticides, and hydrocarbons), removing such pollutants from the water column. These animals are either sedentary or have limited swimming capabilities and are not generally able to leave an area when conditions change.

The benthos can be affected by all pollutants acting on a water body as well as physical alterations to the estuary (channelization, loss of seagrasses, etc.) The numbers and types of animals comprising the benthos, when evaluated over time, can provide insight into changes, good or bad.

Since this program integrates sediment chemistry and water column measurements with biological (benthic) monitoring, it provides a more powerful vehicle for monitoring and detecting environmental change than a

program based upon only one or two of these elements. The study design is similar to that employed by the U.S. Environmental Protection Agency in their Environmental Monitoring and Assessment Program (EMAP). A hexagonal grid is randomly superimposed over Tampa Bay and sampling points are randomly assigned by means of a computer program. In practical terms, we can calculate an areal estimate for variables of interest. For example, the acres of Hillsborough Bay in which the oxygen concentration is less than the State standard can be estimated within a known error range. In more "traditional" monitoring programs, where stations are "fixed", we can only make inferences about what is happening at that point. With this study design, each of the seven bay segments (Old Tampa Bay, Hillsborough Bay, Middle Tampa Bay, Lower Tampa Bay, Terra Ceia Bay, Manatee River, and Boca Ciega Bay) should be viewed as a "station" and each sampling location viewed as a "replicate" collected at that station.



Sampling takes place during late summer, when environmental stresses from high temperature, stormwater runoff, and low dissolved oxygen are greatest. The 1995 sampling program generated 149 samples from through-

out the bay. Areas sampled in 1995 which were not covered in 1993-1994 included low salinity reaches of the Hillsborough, Palm, and Alafia rivers, the Little Manatee River (an Outstanding Florida Water), Cockroach Bay, as well as several residential canals.

Although this is the third year of sampling, only data for 1993 are yet available. The results have shown that the bay segments are characterized by somewhat different groups of organisms. For example, Old Tampa Bay was numerically dominated by amphipod crustaceans whereas Hillsborough Bay was dominated by a few types of polychaete worms. In addition, we have shown that the benthos is affected by physical factors such as sediment type and the amount of oxygen in the bottom waters. Generally, amphipod crustaceans appear to be more sensitive indicators of environmental conditions than polychaete worms and molluscs. Such findings are not especially surprising, but with more information we expect to be able to detect trends in the distribution of abundant species based upon contaminant levels. In 1993, seven of the more abundant species showed significant relationships between their density and one or more metals.

One of the key goals of this program is to be able to distinguish "healthy" from "subnominal" habitat based upon the composition of the benthos. The percentage of each bay segment falling into either category can then be estimated and tracked over time. As stormwater management improves and as atmospheric deposition of toxic chemicals is reduced, we may be able to detect reductions in the extent of subnominal habitat.

One of the major steps towards achieving this goal is to be able to define what constitutes "healthy" and "subnominal" habitat. Efforts are underway to develop an index which will successfully discriminate between such habitats. This index will incorporate a number of measures of the condition of the benthos into a single number, whose ultimate value will be reflective of status of the sediments and the overlying waters. This is a controversial area as some scientists believe that much information is lost or hidden by indices. The trade-off is that a single number, when presented as part of a range to which qualitative value is assigned, should be understandable by the public. It is imperative that the results of this program be effectively communicated to those who are ultimately responsible for making the decisions which will affect the vital natural resource which is Tampa Bay.

The comprehensive assessment report for the 1993 data will be available during winter 1995-1996. For additional information on this bay-wide benthic monitoring program contact Stephen Grabe, Environmental Protection Commission of Hillsborough County (813) 272-7104.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION RESTORATION EFFORTS IN TAMPA BAY

A number of projects are underway within the Tampa Bay watershed to restore habitat and water quality, funded by environmental trust funds established specifically for such purposes. Some of the more noteworthy are:

Projects undertaken with the State's Pollution Recovery Trust Fund:

OSGOOD POINT: In the autumn of 1995, the Florida Department of Environmental Protection (FDEP), the Surface Water Improvement and Management Program (SWIM) and the City of Gulfport completed the restoration project at Osgood Point on Boca Ciega Bay. The purpose of the project was to restore almost nine acres of historic marine wetland and upland habitats, including salt marsh, mangroves, shallow-water live bottom, and coastal dunes. The site will be managed as a city park by the City of Gulfport and is located in southern Boca Ciega Bay. Total project cost was approximately \$283,000, of which \$95,000 was provided by the FDEP. The project included earthwork, plantings, paths, boardwalks, observation platforms, fencing, signage, and initial maintenance.



COCKROACH BAY: After years of planning, construction began this year on the Cockroach Bay Restoration project. Through a cooperative effort the FDEP, SWIM, Hillsborough County, the Tampa Bay National Estuary Program and other interested parties have developed a plan to provide a variety of habitat types, to improve water quality and to restore sheetflow to Cockroach Bay. The implementation of this multifaceted plan will restore and enhance natural systems on

over 500 acres of property surrounding Cockroach Bay. Specifically the project will include exotic species control; creation of stormwater treatment wetlands; creation, enhancement and restoration of coastal wetland habitats; and restoration of upland habitats. Total cost of the project cannot yet be calculated, but \$1.6 million has been allocated for the construction of the first phase and includes \$350,000 from the FDEP. The site will be managed by Hillsborough County Parks Department.

CYPRESS POINT: Although this project encountered various obstacles in the past year, purchase of the property by the Hillsborough County Environmental Land Acquisition and Protection Program is moving forward, as is the development of a management plan. After completion of an assessment of the historic landfill on site, this project will begin to restore some original wetland function to an area of Old Tampa Bay that was filled with dredge spoil and debris and to provide water quality improvement to stormwater flowing from the Lemon Street Canal. The project will control exotic vegetation, create meandering tidal channels, restore native upland species and provide public access to bay. The project is being carried out by FDEP, SWIM and City of Tampa. The site is located at the west end of Cypress Street north of the Howard Frankland Bridge in Tampa. Total cost of the restoration is estimated to be almost \$900,000 with the FDEP funding \$254,000. The City of Tampa Parks Department will manage the site as a bayside city park.

Future projects to be done with funding from the Pollution Recovery Trust Fund include Cooper's Point and Emerson Point.

Projects undertaken with the Gardiner Settlement Fund (jointly administered by FDEP and the Environmental Protection Commission (EPC) of Hillsborough County):

ALAFIA RIVER SOUTH PARCEL: This project was undertaken for the purpose of reconnecting the south and main channels of the Alafia River and re-establishing a system of water ways within 300 acres previously impacted by the deposition of dredge spoil. Approximately 25 acres of wetland habitat and 23,000 linear feet of shoreline were restored while preserving valuable upland habitat. Most recently, TBRPC sponsored the placement of oyster bars at the site to encourage the recolonization of oysters in the area. The project was carried out through a cooperative effort among FDEP, SWIM (as contract administrator) and Cargill Fertilizer, Inc. Located on property owned by Cargill on the southern shore of the mouth of the Alafia River, the project cost was approximately \$800,000 and was completed early in 1995. FDEP and Cargill are in the process of working out a conservation easement to encompass the project area. Long-term management of the site will be the responsibility of Cargill.

COCKROACH BAY EXOTIC VEGETATION CONTROL: Through an agreement with Hillsborough Community College, Brazilian pepper and Australian pine were treated and/or removed from over 80 acres at Cockroach Bay. Long term management of the site is the responsibility of Hillsborough County. The project was intended to supplement the larger restoration effort for the area.

WILLIAMS PARK PIER: Oyster Reef Designs, Inc. is contracted to place an artificial reef frame under the Williams Park pier on the Alafia River in an attempt to provide substrate for filter feeders and habitat for juvenile fish. The cost will be \$3,235 and the reef will be monitored by EPC.

MCKAY BAY: Working with the City of Tampa, EPC and FDEP intend to supplement efforts to create wetlands and enhance transitional areas at the McKay Bay Nature Park in the most northwestern corner of McKay Bay. While total project cost is not yet known, \$50,000 has been approved so far. The park is managed by the City of Tampa Parks Department.

BLOOMINGDALE HIGH SCHOOL: Through an agreement with the high school, \$13,200 is available to help enhance wetlands on school grounds, to help in the effort to build an environmental studies facility, and to grow plants for restoration projects. This is an ongoing program at BLOOMINGDALE High School and has benefited from many partners through the years.

Future projects being developed for funding from Gardiner Settlement Fund include Delaney Creek Rehabilitation and Hillsborough County High School Wetland Nurseries. For more information contact Stormy Ingold, FDEP (813) 744-6100, Ext. 325.

TAMPA BAY MARINE ANIMAL STRANDING TEAM

The Tampa Bay Marine Animal Stranding Team (TBMAST) is a volunteer group of individuals and institutions interested in the status of marine mammals (dolphins, whales and manatees) and sea turtles in the Tampa Bay area. TBMAST was organized to assist the Florida Marine Patrol in responding to stranding reports; to establish better lines of communication among local members of the Federal Marine Mammal Stranding Network; to reduce response time for stranding events in the Tampa Bay area; and to provide an opportunity for members to exchange information at its quarterly meetings.

TBMAST activities also include training programs and public education. Coordinated by The Florida Aquarium, TBMAST is composed of governmental agency staff and interested others. Only federally-

authorized letter- or permit-holders may legally touch injured or dead marine mammals or sea turtles.

Marine animal strandings or unusual occurrences should be reported to the Florida Marine Patrol at 1-800-DIALFMP, who then contacts TBMAST to coordinate the actual response, including animal identification, evaluation, examination, data and/or tissue sample collection, and transport or disposal. Data and samples collected from strandings in the Tampa Bay area are forwarded to appropriate agencies for analysis. For more information contact Dena Leavengood, The Florida Aquarium (813) 273-4506.

TAMPA BAY: AN ANGLER'S PERSPECTIVE

**Frank Sargeant, Outdoors Editor, The
Tampa Tribune**

Ten years ago, Tampa Bay was enough to bring a tear to the eyes of fisherpersons who had seen it in its glory days. In fact, some of the more polluted sections of Hillsborough Bay would literally bring tears to the eyes with the combination of sewer fumes and phosphate dust. Fishing was a sad joke, with little to catch except the occasional catfish.

All of that has changed for the better, thanks to a decade of hard work by so many concerned citizens and city and county agencies. The water is far cleaner than

it has been in years, the grasses are regrowing, and restoration projects along the east and south shores of the bay are bringing back habitat that has not been productive since before World War II.

The changes have not gone unnoticed by the fish. Nature responds rapidly to good habitat, just as to bad, and the snook, redfish and tarpon have come back to the bay in profusion. There are again grouper and snapper in the ship channels, and cobia prowl the marker buoys.

Sea trout have been slow to return, in part because of harvest rules that remain too liberal. But with a ban on gill netting in all inshore waters and with new recreational fishing limits that took effect on the first day of 1996 that species, too, should rejoin the family of Tampa Bay fishes in abundance.

Perhaps the only cloud on the horizon for anglers is the fact that there are too many of us. Particularly on the flats, the continuous passage of powerboats over shallow grasses runs off the fish and disturbs their life patterns. In some areas, it even destroys the habitat itself.

So, though our fisheries are well on the way to restoration, more and more of us are beginning to realize that the unlimited freedom we once had to go where we want and when we want may have to be limited. Hopefully, we can work together with regulatory groups to develop rules that preserve the habitat as well as the angling opportunities we all love.

TAMPA BAY REGIONAL PLANNING COUNCIL - 1995

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Terrye Bradley Gubernatorial Appt. Pinellas County	Dr. Richard Garrity Ex-Officio, FL Dept. of Environmental Protection	Barbara Romano Gubernatorial Appt. Hillsborough County
Gwendolyn Brown Gubernatorial Appt. Manatee County	John Gause Commissioner, Manatee County	Frederick O. Runnels Councilman, City of Bradenton
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