State of Tampa Bay
1998
April 19, 1999

Mr. Roger Johansson
City of Tampa
Sanitary Sewers Treatment Division
2700 Maritime Boulevard
Tampa, Florida 33605

Dear Mr. Johansson:

Thank you for contributing to the State of Tampa Bay - 1998 Report. I hope you will agree that the twelfth State of Tampa Bay Report truly represents the outstanding environmental efforts underway in the Tampa Bay region. The report is a tremendous public education tool. It is also a significant source of information for our state legislators. \textit{It was delivered to the entire state legislature this year.}

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

Enclosures

c: Ms. Barbara Romano, Chair, Agency on Bay Management
# Tampa Bay Regional Planning Council's Agency on Bay Management - 1998

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elie Araj</td>
<td>Hillsborough County Stormwater Division</td>
</tr>
<tr>
<td>John Ballaron</td>
<td>Manatee Port Authority</td>
</tr>
<tr>
<td>James W. Beever III</td>
<td>FL Game &amp; Fresh Water Fish Commission</td>
</tr>
<tr>
<td>Katherine Burbridge</td>
<td>Pasco County Planning Department</td>
</tr>
<tr>
<td>Tom Cardinal</td>
<td>Environmental Protection Commission of Hillsborough County</td>
</tr>
<tr>
<td>Peter Clark</td>
<td>Tampa BAYWATCH, Inc.</td>
</tr>
<tr>
<td>Maureen Colaizzi</td>
<td>City of St. Petersburg Planning Department</td>
</tr>
<tr>
<td>Karen Collins - Fleming</td>
<td>Manatee County Environmental Management Department</td>
</tr>
<tr>
<td>Charlie Crist</td>
<td>FL Senate</td>
</tr>
<tr>
<td>Victor D. Crist</td>
<td>FL House of Representatives</td>
</tr>
<tr>
<td>David Dale</td>
<td>National Marine Fisheries Service</td>
</tr>
<tr>
<td>Richard Eckenrod</td>
<td>Tampa Bay Estuary Program</td>
</tr>
<tr>
<td>Mr. John Farrington</td>
<td>FL Petroleum Council</td>
</tr>
<tr>
<td>Terry Finch</td>
<td>City of Clearwater</td>
</tr>
<tr>
<td>Mark G. Flanagan</td>
<td>FL House of Representatives</td>
</tr>
<tr>
<td>Bill Fonferek</td>
<td>U. S. Army Corps of Engineers</td>
</tr>
<tr>
<td>James T. Hargrett, Jr.</td>
<td>FL Senate</td>
</tr>
<tr>
<td>Calvin D. Harris, Jr.</td>
<td>FL Senate</td>
</tr>
<tr>
<td>Ken Hartley</td>
<td>Organized Fishermen of Florida</td>
</tr>
<tr>
<td>George Henderson</td>
<td>FL Marine Research Institute</td>
</tr>
<tr>
<td>Dick Holmes</td>
<td>Tampa Bay Regional Council</td>
</tr>
<tr>
<td>Ken Huntington</td>
<td>FL Department of Environmental Protection</td>
</tr>
<tr>
<td>Paul Jacobs</td>
<td>Coastal Conservation Association</td>
</tr>
<tr>
<td>Roger Johansson</td>
<td>City of Tampa</td>
</tr>
<tr>
<td>Gerry Leonard</td>
<td>Center for Marine Conservation</td>
</tr>
<tr>
<td>Linda Lucas</td>
<td>Eckerd College</td>
</tr>
<tr>
<td>Mark Luther</td>
<td>USF Department of Marine Science/PORTS</td>
</tr>
<tr>
<td>Deborah Manz</td>
<td>U. S. Fish &amp; Wildlife Service</td>
</tr>
<tr>
<td>Todd Mecklenborg</td>
<td>FL Department of Transportation</td>
</tr>
<tr>
<td>Brenda Menendez</td>
<td>Cargill Fertilizer, Inc.</td>
</tr>
<tr>
<td>David Metz</td>
<td>St. Petersburg Port Authority</td>
</tr>
<tr>
<td>Manitia Moultrie</td>
<td>Florida Power Corporation</td>
</tr>
<tr>
<td>Greg Nelson</td>
<td>Tampa Electric Company</td>
</tr>
<tr>
<td>Paul W. O'Neil</td>
<td>Southwest FL Water Management District</td>
</tr>
<tr>
<td>Sandy Oestreich</td>
<td>Citizen, Pinellas County</td>
</tr>
<tr>
<td>Roy E. Parker, Jr.</td>
<td>Citizen, Manatee County</td>
</tr>
<tr>
<td>David Parsche</td>
<td>Tampa Port Authority</td>
</tr>
<tr>
<td>Richard T. Paul</td>
<td>National Audubon Society</td>
</tr>
<tr>
<td>Michael J. Perry</td>
<td>Southwest FL Water Management District/SWIM Program</td>
</tr>
<tr>
<td>Jan K. Platt</td>
<td>Hillsborough County Board of County Commissioners</td>
</tr>
<tr>
<td>Ed Rathke</td>
<td>FL Power and Light Company</td>
</tr>
<tr>
<td>Thomas W. Reese, Esq.</td>
<td>ManaSota 88</td>
</tr>
<tr>
<td>Doug Robison</td>
<td>Post Buckley</td>
</tr>
<tr>
<td>Stuart Rogel</td>
<td>Tampa Bay Partnership</td>
</tr>
<tr>
<td>Barbara Romano</td>
<td>TBRPC Gubernatorial Appointee</td>
</tr>
<tr>
<td>Jim Rosenbluth</td>
<td>Contractors &amp; Builders Association of Pinellas County</td>
</tr>
<tr>
<td>R. Z. &quot;Sandy&quot; Safley</td>
<td>FL House of Representatives</td>
</tr>
<tr>
<td>Jane Silverberg</td>
<td>TBRPC Gubernatorial Appointee</td>
</tr>
<tr>
<td>Jim Spangler</td>
<td>Egmont Key Alliance</td>
</tr>
<tr>
<td>Amy Stein</td>
<td>Manatee County Board of County Commissioners</td>
</tr>
<tr>
<td>John Stevely</td>
<td>FL SeaGrant</td>
</tr>
<tr>
<td>Yvonne Stoker</td>
<td>U. S. Geological Survey</td>
</tr>
<tr>
<td>Jacob Stowers</td>
<td>Pinellas County</td>
</tr>
<tr>
<td>Sally Thompson</td>
<td>Citizen, Hillsborough County</td>
</tr>
<tr>
<td>John C. Timmel</td>
<td>Tampa Bay Pilots</td>
</tr>
<tr>
<td>Frederick J. Webb, Jr.</td>
<td>Hillsborough Community College</td>
</tr>
<tr>
<td>Greg Williams</td>
<td>IMC-Agrico Company</td>
</tr>
</tbody>
</table>
State of Tampa Bay

1998

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 1999
LIST OF PARTICIPANTS

Elie Araj
Tom Ash
Walt Avery
Lisa Baltus
Pat Cannizzaro
Tom Cardinale
Peter Clark
Suzanne Cooper
LT Sheryl Dickinson
Mariben Andersen
Eric Fehrmann
Charles Feldschau
Stephen S. Grabe
Holly Greening
Glenn Harman
Kerry Hennenfent
Nanette Holland
Roger Johannson
David Karlen
Joyce Kleen
Pam Leasure
Linda Lucas
Lucy Mattern
Heidi McCree
John Pacowta
Nancy Page
Julia Palaschak
Rich Paul
Gene Pinson
Michael J. Perry
Ron Rinzivillo
Ann Scnapf
Jim Spangler
Andrew Squires
Yvonne Stoker
Dr. William Tiffany
Nick Toth
Alan Wright
Angela Young

Hillsborough County Stormwater Section
Environmental Protection Commission of Hillsborough County
City of Tampa Bay Study Group
Pinellas County Dept. of Environmental Management
Hillsborough Community College
Environmental Protection Commission of Hillsborough County
Tampa BAYWATCH, Inc.
Tampa Bay Regional Planning Council/ Agency on Bay Management
US Coast Guard Marine Safety Office Tampa
Pinellas County Dept. of Environmental Management
Pinellas County Planning Department
Cockroach Bay Users Group
Environmental Protection Commission of Hillsborough County
Tampa Bay Estuary Program
Clearwater Marine Aquarium
City of Tampa Bay Study Group
Tampa Bay Estuary Program
City of Tampa Bay Study Group
Environmental Protection Commission of Hillsborough County
Chassahowitzka National Wildlife Refuge Complex
Pinellas County Dept. of Environmental Management
Eckerd College
Manatee County Dept. of Environmental Management
Hillsborough River Greenways Task Force
City of Tampa Bay Study Group
Pinellas County Dept. of Environmental Management
Hillsborough County Stormwater Section
National Audubon Society FL Coastal Islands Sanctuaries
City of Tampa Bay Study Group
Southwest FL Water Management District/ Surface Water Improvement and Management Program
City of Safety Harbor
National Audubon Society FL Coastal Islands Sanctuaries
Egmont Key Alliance
Pinellas County Dept. of Environmental Management
U.S. Geological Survey
Manatee County Port Authority
Hillsborough County Resource Management
Hillsborough County City-County Planning Commission
Pinellas County Dept. of Environmental Management
## Table of Contents

### EXECUTIVE SUMMARY

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Hillsborough River Greenways Task Force</td>
</tr>
<tr>
<td>22</td>
<td>Egmont Key - 1998</td>
</tr>
<tr>
<td>24</td>
<td>Sea Turtles in the Tampa Bay Area</td>
</tr>
<tr>
<td>26</td>
<td>Circulation Restoration and Ecological Enhancement Planned at Ft. DeSoto Park</td>
</tr>
<tr>
<td>28</td>
<td>Tampa Bay's National Wildlife Refuges</td>
</tr>
<tr>
<td>30</td>
<td>Seagrass Monitoring Program Has Continued Success at Weedon Island County Preserve and Ft. DeSoto Park and Aquatic Habitat Management Area</td>
</tr>
<tr>
<td>32</td>
<td>Pinellas County Department of Environmental Management's Bay-Related Activities</td>
</tr>
<tr>
<td>34</td>
<td>City of Safety Harbor</td>
</tr>
</tbody>
</table>

### THE STATE OF RESTORATION, RESEARCH AND MONITORING EFFORTS AROUND THE BAY

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Manatee County Department of Environmental Management's Tampa Bay-Related Activities</td>
</tr>
<tr>
<td>5</td>
<td>Port Manatee Mitigation Plan</td>
</tr>
<tr>
<td>5</td>
<td>Look What's Growing in Cockroach Bay</td>
</tr>
<tr>
<td>6</td>
<td>The Hillsborough County Stormwater Public Education and Awareness Campaign</td>
</tr>
<tr>
<td>7</td>
<td>Officer Snook</td>
</tr>
<tr>
<td>7</td>
<td>Hillsborough Stream-WaterWatch</td>
</tr>
<tr>
<td>8</td>
<td>Hillsborough Lake Atlas Project</td>
</tr>
<tr>
<td>9</td>
<td>Decreasing Phytoplankton Trend in Tampa Bay</td>
</tr>
<tr>
<td>9</td>
<td>Hillsborough County Watershed Planning</td>
</tr>
<tr>
<td>10</td>
<td>Benthic and Sediment Monitoring Program for Tampa Bay: The Tributaries</td>
</tr>
<tr>
<td>13</td>
<td>Delaney Creek</td>
</tr>
<tr>
<td>13</td>
<td>Hillsborough County Artificial Reef Program</td>
</tr>
<tr>
<td>14</td>
<td>East Lake Restoration Project</td>
</tr>
<tr>
<td>15</td>
<td>Hillsborough Community College Division of Environmental Programs</td>
</tr>
<tr>
<td>16</td>
<td>Hillsborough County Environmental Lands Acquisition and Protection Program</td>
</tr>
<tr>
<td>18</td>
<td>Reestablishment of Seagrass Meadows in Hillsborough Bay</td>
</tr>
<tr>
<td>19</td>
<td>Pemberton and Baker Creek Erosion and Sedimentation Control Project</td>
</tr>
<tr>
<td>20</td>
<td>Hillsborough River Interlocal Planning Board and Technical Advisory Council Activities</td>
</tr>
</tbody>
</table>

### THE STATE OF BAYWIDE PROGRAMS AND PROJECTS

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Agency on Bay Management</td>
</tr>
<tr>
<td>35</td>
<td>Southwest Florida Water Management District Surface Water Improvement and Management (SWIM) Section</td>
</tr>
<tr>
<td>39</td>
<td>Tampa Bay Estuary Program</td>
</tr>
<tr>
<td>43</td>
<td>United States Coast Guard Marine Safety Office Tampa</td>
</tr>
<tr>
<td>49</td>
<td>Update on Tampa Bay Chlorophyll-A Concentrations</td>
</tr>
<tr>
<td>51</td>
<td>Tampa BayWatch</td>
</tr>
<tr>
<td>52</td>
<td>Seasonal Control of Phytoplankton Biomass in Tampa Bay by the Tunicate <em>Bostrichobranchus digonas</em> (Abbott)</td>
</tr>
<tr>
<td>53</td>
<td>U.S. Geological Survey Water Resources Division Tampa, FL</td>
</tr>
<tr>
<td>54</td>
<td>Eckerd College Programs and Projects</td>
</tr>
<tr>
<td>55</td>
<td>Colonial Waterbird Nesting in Tampa Bay, 1998</td>
</tr>
</tbody>
</table>
Executive Summary

The 1998 "State of Tampa Bay" Report is the twelfth edition. It has been prepared in accordance with the rules of the Agency on Bay Management and funded by the Tampa Bay Regional Planning Council. The Report highlights projects and programs underway around the Tampa Bay estuary and its watershed. It also provides an excellent overview of several programs of Baywide significance.

In this edition are summaries submitted by the various researchers, activists, regulators and stewards engaged in understanding, managing, improving and restoring the estuary. From public education to watershed planning; seagrass monitoring to port improvements; the number and variety of projects is outstanding. The Tampa Bay community has been proactive in Bay issues for many years, and the level of cooperation among the diverse interests is unparalleled in the U.S. Our community, including the structures of the Agency on Bay Management and the Tampa Bay Estuary Program, is studied by others as a model for how to build an effective program.

Looking at the Baywide programs, the Tampa Bay Estuary Program became a free-standing entity this year and began implementing its Comprehensive Conservation and Management Plan in earnest. TBEP's report documents progress toward several goals, in spite of dramatic El Nino weather. Considerable progress has been made on many key Bay issues, and 1999 promises to be an even more productive year. The Southwest Florida Water Management District's Surface Water Improvement and Management Program has chosen to highlight a few of its activities in this year's report, reflecting accomplishments at Emerson Point in northern Manatee County and Mobbly Bay near Old Tampa Bay.

An important contributor to the health of Tampa Bay, one not often thought of when we count our partners, is the U.S. Coast Guard's Marine Safety Office, Tampa. Its report provides a thorough explanation of the many important roles which the Marine Safety Office plays in keeping the Bay free of pollutants and averting disasters. As home to two major ports and numerous industries, and with ship channels that are long and narrow, violent weather, and traffic that varies from dead ships being brought to dry dock to huge passenger vessels to oil tankers, Tampa Bay is continuously threatened with major catastrophes. It is only through the vigilance of the US Coast Guard and the skill and dedication of the Harbor Pilots that Tampa Bay has suffered as few disasters as it has.

The activation of a Tampa Bay Vessel Traffic Information System, involving all facets of the maritime community, will further protect ships, cargo and the estuarine system from harm. We are very fortunate to have such proactive and involved federal agency working for our community.

The Agency on Bay Management was formalized by the Tampa Bay Regional Planning Council in 1985, though its foundation was laid in the 1970s. The Tampa Bay Study Commission was enacted by the Legislature in 1983, leading to the formation of the Agency as a Committee of the Tampa Bay Regional Planning Council. This strong relationship continues, to the benefit of both bodies.

The Tampa Bay Estuary License Plate - As the 1998 State of Tampa Bay Report goes to press, the Florida Legislature is considering Senate Bill 1266 and House Bill 613, which would authorize a specialty license plate for the Tampa Bay Estuary. Sponsored by Senator Jim Sebesta and Representative Bob Henriquez, with many co-sponsors, this would create the opportunity to raise funds to benefit Tampa Bay. Funds would be used by the Tampa Bay Estuary Program and the Tampa Bay Regional Planning Council's Agency on Bay Management for habitat restoration and other projects designed to help accomplish the goals for Bay restoration set out in the Comprehensive Conservation and Management Plan for Tampa Bay. The proposed design, depicting a Silver King Tarpon in its native habitat, has been donated by Captain Russ Sirmons. This long-awaited specialty license plate will increase public awareness about Tampa Bay, its natural, cultural and recreational attributes, and the importance of protecting and restoring it for future generations.
The State of Restoration, Research and Monitoring Efforts Around the Bay

MANATEE COUNTY-ENVIRONMENTAL MANAGEMENT DEPARTMENT
Tampa Bay-Related Activities

of Manatee County began a seagrass field sampling program by selecting 15 transects or stations in lower Tampa Bay.

Seagrasses are vital to maintaining waterbody health. They contribute to good water quality, provide food for manatees and crustaceans, serve as juvenile fish habitat and afford hiding places for smaller creatures. The four species of seagrasses in our area are evaluated via snorkel for percent coverage, grass length and epiphyte density. Sediment condition is also catalogued. Water column sampling collected at the same time involves recording water quality parameters: salinity, temperature, visibility and photosynthetic active radiation (PAR). Any contributors to existing grass conditions are also noted. Chlorophyll samples and turbidity are correlated with grass growth.

In an effort to reduce prop scarring, which results in loss of seagrass, EMD is marking seagrass beds for signage to be developed to warn boaters to be careful - that they are in or near seagrass meadows.

ARTIFICIAL REEFS IN TAMPA BAY - Since assuming responsibility for Manatee County’s Artificial Reef Program in October 1995, EMD has worked to expand Manatee County's artificial reef projects to include Tampa Bay reef sites as well as those in the Gulf of Mexico. The Program grew from the need to increase and enhance recreational fishing and diving while creating and restoring marine habitat.

The Artificial Reef Task Force with EMD staff continue to review opportunities for artificial reef sites in lower Tampa Bay. These lower relief structures will be geared to provide juvenile and adult fish habitat.

ATMOSPHERIC DEPOSITION STUDY - EMD’s data collection for an FDOT-sponsored ambient air quality and atmospheric deposition project continued in 1998. This information will be useful in assessing the relationship between atmospheric deposition and stormwater quality in the Tampa Bay watershed. EMD’s continuous ambient air monitoring site will act as a research point for pollutant atmospheric concentration level criteria.

Atmospheric deposition of materials has been increasingly recognized as a significant pathway for the addition of both nutrients and toxic materials to aquatic systems. In the Tampa Bay area, atmospheric deposition has been estimated to be a major contributor of nutrient and toxic material loadings directly to the Bay’s surface.

BENTHIC MONITORING PROGRAM - EMD continued into the sixth year of its annual synoptic Benthic Water Quality Monitoring Assessment for Manatee County. This Tampa Bay Estuary Program-initiated program involves collection of bottom-dwelling estuarine invertebrates by boat at 22 different stations in the Manatee River and Terra Ceia Bay. The invertebrates sampled are then assessed under a...
microscope. Sediments are also sampled and analyzed for metals and toxics.

The Benthic Water Quality Program provides an excellent indicator of water and sediment quality. 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 valuable as long-term environmental trend indicators.

EVERS RESERVOIR WATERSHED MONITORING - The Evers Reservoir Watershed Monitoring Project, a joint study of Evers Reservoir Watershed water quality begun in 1988 and performed by Manatee County, the City of Bradenton and the United States Geological Survey (USGS) was continued this year by EMD staff. The Evers Project provides 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 data from five years of hydrologic studies from the Evers watershed is presented by the first of two USGS Reports: Hydrologic Description of the Braden River Watershed, West-Central Florida (Open-File Report 96-634). This report was prepared by the USGS in cooperation with the City of Bradenton Public Works Department, the Manatee County Environmental Management Department (EMD) and the Southwest Florida Water Management District (SWFWMD). It provides a general hydrologic description of the watershed and describes the data collection network established to monitor surface drainage in the Braden River watershed. A second, more detailed USGS Report is in preparation.

STORMWATER MANAGEMENT - NPDES MS4 PERMITTING - EMD is poised to coordinate and implement portions of the EPA National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit issued to Manatee County in 1997. This permit requires that the MS4 operators conduct stormwater monitoring to establish event-mean concentrations, identify sources and impacts of pollutants, and determine the effectiveness of stormwater management program elements.

The NPDES monitoring program requirements are being met by EMD’s current ambient water quality and benthic monitoring programs, both of which use a stratified random sampling design.

COMPREHENSIVE PLAN REVIEW - The Natural Resources Division of EMD, as a participant on the Manatee County Development Review Committee, conducts environmental reviews of all public hearing items such as rezones, plan development approval and special and administrative permits, and all final site plans in Manatee County. These environmental reviews help maintain and protect Manatee County's biological diversity as land management and protection of wetlands, endangered species and natural habitats are emphasized.

Working with Manatee County's Planning Department, EMD provides basic data and technical support for the evaluation of the environmental elements of Manatee County's Comprehensive Plan. The success of existing Manatee County Comp Plan policies can be evaluated by analyzing historical water quality data available from the Evers Reservoir Watershed Project.

For more information, please contact Lucy Mattern (941) 742-5980; fax (941) 742-5996 or e-mail: lucy.mattern@co.manatee.fl.us
PORT MANATEE MITIGATION PLAN

Recent studies conducted at Port Manatee regarding berth utilization and berth operational constraints have confirmed what port officials have long known: There is a need to expand dock space to prevent further loss of port business and to provide adequate berthing for existing tenants. Berth development requires several years of lead-time for permit processing through actual construction. Presently, permit applications have been submitted to add three new berths at Port Manatee, including expansion of docking facilities southward onto the newly-acquired Hendry property. A key element of the permit application is the process of mitigating for unavoidable natural resource impacts.

Port Manatee staff, in conjunction with Gee & Jensen and Lewis Environmental, have prepared an ambitious mitigation plan encompassing several areas of restoration, conservation and mitigation. This plan basically follows the ecosystem approach to mitigation, covering the entire coastal area surrounding Port Manatee.

Much of the mitigation effort will involve the salvage and transplanting of seagrasses directly impacted by dredging. The removal of historical fill from shallow bay bottom and subsequent seagrass planting to the south of the port, and the restoration of a stressed lagoon at Piney Point, will result in over 23 acres of seagrasses restored or salvaged. This amounts to a seagrass mitigation ratio of greater than 1.5:1. In conjunction with this effort, a manatee and seagrass protection plan has been developed which will cover almost 400 acres of shallow bay bottom. The preservation of this management area will help to ensure that feeding, nesting and cover necessary for the survival of native marine animal species is available, while also maintaining submerged vegetative communities.

An additional component of the port’s overall mitigation plan consists of a restoration and management program for the adjacent, offshore 66-acre spoil island. The plan, prepared by the National Audubon Society, will result in the restoration, enhancement and management of upland habitats beneficial to many breeding species of birds as well as to certain migrant and wintering species.

A final aspect of the mitigation plan will include restoration work on Little Redfish Creek and Piney Point. In both cases, mangrove and tidal marsh restoration will be employed. Additionally, restoration of the oligohaline habitat of Little Redfish Creek will greatly enhance its function.

Mitigation efforts in conjunction with berthing and navigation improvements at Port Manatee will cover approximately 600 acres, while the impacted areas comprise less than 80 acres. By taking an ecosystem approach to mitigation, this will result in greater than a 7:1 mitigation ratio.

For more information contact Bill Tiffany, (941) 722-6621

LOOK WHAT’S GROWING IN COCKROACH BAY!

It has been nearly four years since the Cockroach Bay Users Group (C-BUG™) began to address problems encountered in their favorite fishing hole. Our membership increases each year. Our goal is the preservation of the historic and traditional uses of Cockroach Bay. As each issue is brought to light, it is dealt with by those passionate to the cause. Underlying it all is the seagrass, without which much of the wildlife in the Bay would disappear.

As always, C-BUG has been very busy. In 1998, several projects were initiated or completed:

- The “Boater’s Guide to the Little Manatee River” provides information relevant to the portion of the Cockroach Bay Aquatic Preserve that extends from the mouth of the Little Manatee River to US 301 in Wimauma. It has been completed, printed and distributed at local bait shops, marinas, and fairs.
- As in years past, C-BUG participated in the November Ruskin Seafood Festival, providing the additional Boat Show exhibit as well as our information booth.
- A flyer describing C-BUG’s accomplishments over the past few years was completed. It includes our message, membership information and current staff of officers and was distributed at the Seafood Festival. Copies are available at any of our meetings. A formal brochure is an upcoming project.
- A grant is being sought for the production of a special-purpose bag, which will be distributed to hold loose, used fishing line that would otherwise end up tangled around birds, turtles, etc. The filled bag can then be dropped off at any bait shop or marina that has a bin for recycling.
- Developed a unique boating ‘stop-light’ tidal gauge, consisting of a vertical PVC pipe with bands of green, yellow and red in descending order, which alerts boaters to the current water depth they are about to enter.
- Jim Anderson’s innovative seagrass planting invention was patented. Growth of local planting projects is strong and many areas are showing positive results.
- C-BUG was one of the organizations involved in sharing the prestigious 1998 Coastal America Wetlands Restoration Award.
New officers were elected during a late 1998 meeting. They are:

President: James Anderson, Ruskin
Vice President: William A. Durrance, Wimauma
Secretary: Charles T. Feldschau, Sun City Center
Assist. Secretary: Linda Trainor, Ruskin
Treasurer: Donald Lynch, Ruskin
Assist. Treasurer: Dan LaValley, Ruskin

If you love the outdoors and are interested in helping conserve, protect and restore our environment in general and the Cockroach Bay Aquatic Preserve specifically, perhaps you would consider joining C-BUG. Our quarterly meetings are announced in the media. Send e-mail to: cfeldschau@aol.com. Membership is $10.00 per year and includes your choice of C-BUG decal, cap or 10-foot push pole. Donations are always welcome.

Always remember:

**The C-BUG message:**

- Observe all marked recovery areas and abide by posted restrictions.
- **Know your boat motor draft and water depths.**
- Maintain at least 6" min. clearance between propeller and seagrass.
- If you run aground, STOP, tilt motor up and push pole or paddle off.

---

**THE HILLSBOROUGH COUNTY STORMWATER PUBLIC EDUCATION AND AWARENESS CAMPAIGN**

"Be Part of the Solution to Stormwater Pollution"

The Stormwater Public Education and Awareness Campaign (SPEAC) was developed to make "stormwater" a household term and to reduce non-point source pollution. The program's motto is "Be Part of the Solution to Stormwater Pollution." SPEAC includes several programs: Adopt-A-Pond, Officer Snook, Storm Drain Marking, and Operation Bayworks. Each of the programs targets a specific audience and provides tools for implementing Best Management Practices (BMPs) for stormwater pollution prevention.

The Adopt-A-Pond Program targets neighborhood groups living around stormwater ponds and provides pond restorations with long-term pond management support. The Officer Snook Program targets elementary students and introduces them to Officer Snook, who teaches them how and why we work to stop water pollution. The Storm Drain Marking Program targets community groups and provides markers, door hangers, and transportation (when needed) to mark the storm drains in a neighborhood. The Operation Bayworks Program targets businesses and provides classes, workbooks, and commercial contacts for BMP tools. In 1998 and 1999 Operation Bayworks is focusing on erosion and sedimentation control. The program is providing classes for construction-site managers as well as county inspectors. The goal of this focus is to give Hillsborough County a reputation for the care and attention given towards having effective erosion control at construction sites.

One of the most important tools for SPEAC is the "On Our Pond" quarterly newsletter, which has been in circulation for four years and now goes out to over 4,000 residents. The award-winning newsletter not only informs the public of all of the Stormwater Management Section goals and projects, it invites the public to participate in achieving those goals and implementing those projects. For example, the fall '98 edition asked the public to be more observant of construction dirt on their neighborhood streets and provided the appropriate numbers for reporting incidents of erosion and sedimentation. An important part of SPEAC is making citizens understand that government needs their support and individual actions to make pollution prevention work.

**Citizen Monitors: The Best Investment** - Hillsborough County has over 200 citizen monitors who collect monthly water samples on their neighborhood lakes,
ponds, and streams. The newest program, Stream-WaterWatch provides training in sampling and stream biology to the citizen groups through Hillsborough Community College. Besides stream sampling, the citizen groups are encouraged to conduct stream clean-up and propose habitat restoration projects. Stream-WaterWatch groups are currently monitoring these areas: Hillsborough River, Alafia River, Blackwater Creek, Bull Frog Creek, Rocky Creek, Sweetwater Creek, Pemberton and Baker Creeks, Brushy Creek, Flint Creek, and Cypress Creek. The other programs that depend on citizen monitors are the Lake Management Program and Adopt-A-Pond. The water sampling results are used to develop neighborhood pond and lake management plans.

**OFFICER SNOOK**

The Officer Snook Water Pollution Program teaches children about the causes and prevention of water pollution. The program’s mascot, Officer Snook, is a costumed character who appears in coloring and comic book stories with children who fight against litter and the Water Pollution Monster. Each year Officer Snook visits county schools and teaches thousands of students to care for their water environment. Teachers and youth group leaders can request a visit from Officer Snook through the County’s SERVE Program. The Officer Snook Program is also now available at the Florida Aquarium. This program is made possible through the cooperative efforts of Hillsborough County, the Southwest Florida Water Management District, and the Florida Department of Transportation District Seven.

For more information call Julia Palaschak, County Stormwater Management Division (813) 272-5912.

**HILLSBOROUGH STREAM-WATERWATCH**

Hillsborough STREAM-WATERWATCH is managed by Hillsborough County and funded by the Florida Game and Fresh Water Fish Commission Environmental Education Grants Program. The project adopts an approach to water quality and habitat monitoring (community-based watershed monitoring) that has been used successfully in many parts of the United States and is now being applied to the Hillsborough River, Alafia River, tributaries to these rivers, and most of the named streams in Hillsborough County.

The term "community-based monitoring" is recognition of the important role played by volunteer citizen groups in the support of existing agency monitoring activities. The term is used in the context of the Hillsborough STREAM-WATERWATCH Project to emphasize the partnership being formed by the County and its citizens to preserve the Hillsborough River, Alafia River and Northwest Hillsborough Basins.

A key element of the project is the establishment of a regional environmental training center (RETC) at the Plant City Campus of Hillsborough Community College (HCC). HCC is under contract to the County to operate the RETC and coordinate the STREAM-WATERWATCH program. The RETC recruits, trains and assists citizen volunteers in adopting and monitoring stream and watershed segments. The RETC model will allow other areas to establish community-based stream-monitoring programs with a minimum of development cost and will allow the standardization of stream monitoring programs throughout Florida.

The project was begun in September with an all-day Level I (stream adoption/survey) and Level Iia (chemical and physical property monitoring) training session at the HCC English Creek facility. Figure 1 is a photograph showing the laboratory phase of the chemical and physical parameter monitoring training conducted at the English Creek facility.

![Figure 1. STREAM-WATERWATCH Level Iia (Chemical/Physical monitor) training at HCC English Creek.](image-url)
HILLSBOROUGH LAKE ATLAS PROJECT

The paucity of data available for small private lakes is a major problem encountered by a local government when attempting to assist its citizens in lake management. Hillsborough County is addressing this problem in cooperation with the Southwest Florida Water Management District through a project called the Hillsborough Lake Atlas. This project involves the development of a meta-database containing the location of all available agency and private information on Hillsborough County Lakes; a World Wide Web page that provides this data in a graphic and tabular form; and a similar form of the Atlas on CD-ROM. The University of South Florida’s Florida Center for Community Design and Research (CD+R) is under contract to the County to develop the Web site and data base design.

Figure 1 is the introductory page of the Atlas. It contains five tools for searching the Lake Atlas database (icons shown along left side of figure). On the bottom of the page are direct access boxes that allow the viewer to learn more about the atlas, receive technical help from the center, access reference material or talk to lake experts concerning specific problems in a watershed or a lake. Volunteers can also sign-up to join the Hillsborough Lake Management Program where they will be taught to monitor their lake and learn about management methods.

Figure 2 shows the lake page view. This page provides a snap shot of data available for a specific lake. The photo provides the latest available infrared photograph of the lake’s watershed, with a 3-D bathymetric map of the lake superimposed over the lake’s infrared photo. On the right-side is a graphic presenting the latest available chemical, physical and habitat/vegetation information from the Lake Atlas database. A contour map of the lake is available for download from this page. When the viewer selects one of the data-view boxes, a more detailed information display is shown.

For more information call Elie Araj, County Stormwater Management Division (813) 272-5912.
The Lake Atlas will be available to anyone with access to the World Wide Web by April 1999. A test version of the atlas is presently located on the web at lakeatlas.usf.edu. The atlas will also be available through CD-ROM and a special hard-copy version. Hillsborough County Libraries will be provided CD-ROM versions as well as hard copy versions. Updates to the atlas will be made each year.

DECREASING PHYTOPLANKTON TREND IN TAMPA BAY

The City of Tampa, Bay Study Group has been monitoring phytoplankton trends as a water quality indicator for Tampa Bay since 1979. Water samples from Hillsborough Bay and Middle Tampa Bay have been examined for phytoplankton taxonomy and enumeration on a monthly basis. These results, shown in Figure 1, represent the annual average of the monthly total of phytoplankton cells/milliliter. Only results from 1981 - 1998 are shown due to a change in plankton preparation. Although slight increases in the annual average have occurred intermittently, a decreasing long-term trend is apparent. This long-term decrease in the phytoplankton population, an indication of improved water quality, may be coupled with the decrease in nutrient loading to Tampa Bay.

For more information contact Kerry Hennenfent, City of Tampa, Bay Study Group at (813) 247-3451.

HILLSBOROUGH COUNTY WATERSHED PLANNING

The Hillsborough County Public Works Department, Stormwater Management Section, is developing watershed management plans for each of 17 basins that encompass the entire County. These watershed plans are envisioned as utilizing and building upon previous and current planning efforts underway throughout the Tampa Bay region. In 1998, six plans were completed for the following watersheds: Brooker Creek, Double Branch Creek, Rocky/Brushy Creek, Sweetwater Creek, Lower Sweetwater Creek, and Pemberton/Baker Creek. The remainder of the watershed plans (including the Alafia River, the Hillsborough River, and the Little Manatee River) will be completed over the next five years.

There are many policies and plans already in place to guide the development of the watershed plans. These include policies within the County's Comprehensive Plan, requirements of the County's NPDES permit, goals of the Tampa Bay Estuary Program, and State and Federal water quality criteria. Each watershed will be assessed with regard to flood control, water quality, natural systems, and water supply. Hydrologic and hydraulic modeling on a catchment level will be used to evaluate specific areas prone to flooding, and to develop solutions for achieving adequate levels of service. Water quality will be assessed, and a pollutant loading model developed for each watershed at the catchment level to evaluate “hot spots” and to establish a water quality level of service. Natural systems will be evaluated with regard to identifying areas of fragmented habitat, dehydrated wetland systems, and significant habitat loss due to increasing development. Water supply issues may include im-
pacts to wetlands and streams due to groundwater withdrawals, and identifying areas for potential recharge to the aquifer through the storage of stormwater. The plans will also include recommendations for specific projects to address flooding and water quality problem areas, as well as other issues that are identified. These are considered "living documents" and will be updated as new information is obtained, and as watershed planning matures for the region.

Citizens and neighborhood organizations are an important part of watershed planning, and their input will be solicited throughout the process. Groups such as the Hillsborough River Greenways Task Force, the Blue Sink Coalition, the Alafia River Basin Stewardship Council, and other citizen-based groups have a good understanding of their watershed's condition and needs, which will provide valuable information in developing a watershed management plan. In conjunction with our watershed planning efforts, Hillsborough County is teaching citizens to recognize that they are part of a watershed with specific boundaries, features, and unique concerns. For example, the theme of the County's annual Fall Pond Seminar was "Watching Our Watersheds" to emphasize the far-reaching impacts of even minor activities in a watershed. Through these efforts, Hillsborough County is continuing to develop a more holistic approach to water resources management, and balance the need to minimize impacts due to flooding while maintaining and improving water quality within the County and Tampa.

Each of the 17 watersheds in Hillsborough County will be assessed and modeled for stormwater planning over the next five years. Each resulting watershed model will identify specific stormwater management "hot spots" and a range of solutions to achieve a range of service levels. At the same time, Hillsborough County will be preparing Environmental Conditions Reports for each basin which will identify water quality "hot spots" and specific projects or BMPs to improve water quality. The planning staff will incorporate and utilize the information from the many environmental planning efforts currently underway in the Tampa Bay region. Several watershed plans and environmental assessments were completed in 1998. These are considered "living documents" and will be updated as the format and practice of watershed planning matures for the region.

Watershed planning is more an exercise in coordination and investigation than discovery. Most of the building blocks for building and implementing watershed plans already exist in Hillsborough County. The challenge is in finding the order.

**BENTHIC AND SEDIMENT MONITORING PROGRAM FOR TAMPA BAY: THE TRIBUTARIES**

Bay-wide monitoring of the benthic community (those small, bottom-dwelling invertebrate organisms which are an important food source for fishes) and of sediment contaminants is a cooperative effort between the Tampa Bay Estuary Program, Manatee County's Environmental Management Department, Pinellas County's Department of Environmental Management, and the Environmental Protection Commission of Hillsborough County (EPC). 1998 saw the completion of the sixth year of study, although complete data are only available through 1997 for Boca Ciega Bay (1995-1997), Terra Ceia Bay (1993-1997), and the Manatee River (1993-1997). Data for Hillsborough Bay and old Tampa Bay are complete for 1993-1996.

This program continues to undergo modifications which are consistent with the inherent flexibility of the basic design. The nature of the random, probability-based study design adopted for this monitoring program, however, has made it unlikely that the smaller tributaries to Tampa Bay (Hillsborough, Palm, Alafia, and Little Manatee rivers) would ever receive sufficient attention to quantify the status of these systems. Given that the Hillsborough and Palm rivers are currently indirect sources of drinking water which may be further exploited and the Alafia River is also a targeted source of drinking water to the region via alteration of the fresh-
water inflow to these rivers, an effort was made beginning in 1995 to collect background data on these systems. The 1995 and 1996 sample collections were random but the approach required refinement. Beginning in 1997 a study design was implemented for these rivers such that a total of 20-25 samples are to be collected during 1997-2000.

For the 1998-2000 sampling of these tributaries, EPC funding is being supplemented by a Cooperative Funding Grant from the Hillsborough River and Alafia River Basin Boards of the Southwest Florida Water Management District.

Table 1. Summary of physical and chemical characteristics (mean and range) of the Hillsborough, Palm, and Alafia River, 1995-1997.

<table>
<thead>
<tr>
<th></th>
<th>HILLSBOROUGH</th>
<th>PALM</th>
<th>ALAFIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMPLE DEPTH, M</td>
<td>2.4</td>
<td>2.9</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td>(0.6-3.4)</td>
<td>(0.3-6.0)</td>
<td>(0.1-3.4)</td>
</tr>
<tr>
<td>% SILT + CLAY</td>
<td>13.7</td>
<td>24.4</td>
<td>20.3</td>
</tr>
<tr>
<td></td>
<td>(0.3-61.9)</td>
<td>(3.2-96.6)</td>
<td>(0.5-68.4)</td>
</tr>
<tr>
<td>TEMPERATURE, C (BOTTOM)</td>
<td>27.1</td>
<td>27.8</td>
<td>27.3</td>
</tr>
<tr>
<td></td>
<td>(25.5-28.8)</td>
<td>(25.5-29.6)</td>
<td>(25.3-30.2)</td>
</tr>
<tr>
<td>SALINITY, PPT (BOTTOM)</td>
<td>5.4</td>
<td>14.2</td>
<td>10.6</td>
</tr>
<tr>
<td></td>
<td>(0-24.8)</td>
<td>(0.4-25.0)</td>
<td>(0.0-23.9)</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN, MG/L</td>
<td>4.0</td>
<td>3.8</td>
<td>3.0</td>
</tr>
<tr>
<td>(BOTTOM)</td>
<td>(0.04-5.8)</td>
<td>(0.08-6.0)</td>
<td>(0.4-6.1)</td>
</tr>
</tbody>
</table>

This report will summarize the data collected for 1995-1997 in the three more-urban tributaries which discharge freshwater to Hillsborough Bay and could be impacted by reductions in or diversions of freshwater flow to meet the region's needs for drinking water.

HILLSBOROUGH RIVER - Thirteen benthic samples were collected from the Hillsborough River during 1995-1997. Table 1 summarizes the physico-chemical data from these collections. The most abundant taxa (Table 2) included the polychaete worm *Stenonereis martini*, the bivalve *Mytilopsis leucophaeata*, and tubificid oligochaete worms. Of the at least 77 taxa identified to date, 11 taxa (aquatic insect larvae) are essentially freshwater.

Table 2. Ranked taxa comprising ≥1% of benthic abundance in the Hillsborough, Palm, and Alafia Rivers, 1995-1997. [A=Amphipoda; B=Bivalvia; C=Chironomidae; G=Gastropoda; I=Isopoda; N=Nemertea; O=Oligochaeta; P=Polychaeta]

<table>
<thead>
<tr>
<th></th>
<th>HILLSBOROUGH</th>
<th>PALM</th>
<th>ALAFIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL ABUNDANCE</td>
<td>4642</td>
<td>2504</td>
<td>2084</td>
</tr>
<tr>
<td>MEAN # TAXA</td>
<td>9.8</td>
<td>9.5</td>
<td>7.4</td>
</tr>
<tr>
<td>MEAN DIVERSITY</td>
<td>1.71</td>
<td>1.56</td>
<td>1.37</td>
</tr>
<tr>
<td>1. Stenonereis martini</td>
<td>43% [P]</td>
<td>33% [B]</td>
<td>14% [A]</td>
</tr>
<tr>
<td>5. Corbula fluminea</td>
<td>2% [B]</td>
<td>4% [P]</td>
<td>11% [A]</td>
</tr>
<tr>
<td>7. Paderopesis leviscina</td>
<td>2% [P]</td>
<td>3% [P]</td>
<td>5% [P]</td>
</tr>
<tr>
<td>8. Laroneresi culveri</td>
<td>1% [P]</td>
<td>3% [P]</td>
<td>1% [P]</td>
</tr>
<tr>
<td>9. Tagelus plebeius</td>
<td>1% [B]</td>
<td>3% [P]</td>
<td>2% [P]</td>
</tr>
<tr>
<td>10. Aricidea tjolari</td>
<td>1% [P]</td>
<td>2% [P]</td>
<td>2% [P]</td>
</tr>
<tr>
<td>11. A. philbinze</td>
<td>1% [P]</td>
<td>2% [P]</td>
<td>1% [P]</td>
</tr>
<tr>
<td>12. Parapristonopia pinnata</td>
<td>1% [P]</td>
<td>2% [P]</td>
<td>1% [P]</td>
</tr>
</tbody>
</table>

State of Tampa Bay 11
Based upon the Tampa Bay Benthic Index [TBBI] and the preliminary criteria for "degraded" benthic habitat, it appears that more than three quarters of the Hillsborough River benthic community may be subnominal; one third of the sites had near-bottom dissolved oxygen concentrations which were <4 mg/l; more than 60% of the rivers sediments were also considered to be degraded by metals, organochlorine pesticides, and polycyclic aromatic hydrocarbons (PAHs) (Table 3).

<table>
<thead>
<tr>
<th></th>
<th>HILLSBOROUGH (n=13)</th>
<th>PALM (n=8-11)</th>
<th>ALAFIA (n=10-17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BENTHOS</td>
<td>76.9</td>
<td>63.6</td>
<td>70.8</td>
</tr>
<tr>
<td>DISSOLVED OXYGEN</td>
<td>33.3</td>
<td>37.5</td>
<td>64.7</td>
</tr>
<tr>
<td>METALS (COMPOSITE)</td>
<td>7.7</td>
<td>27.3</td>
<td>0.0</td>
</tr>
<tr>
<td>PESTICIDES (COMPOSITE)</td>
<td>25.0</td>
<td>16.7</td>
<td>0.0</td>
</tr>
<tr>
<td>CHLORODANE</td>
<td>37.5</td>
<td>16.7</td>
<td>0.0</td>
</tr>
<tr>
<td>DDT</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>TOTAL PAHs</td>
<td>62.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>LOW MOLECULAR WEIGHT PAHs</td>
<td>62.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>HIGH MOLECULAR WEIGHT PAHs</td>
<td>62.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Table 3. Percentage of degraded benthic habitat in the Hillsborough, Palm, and Alafia rivers, 1995-1997. (n = number of samples)

**Palm River** - Eleven benthic samples have been collected from the Palm River during 1995-1997. Table 1 summarizes the physico-chemical data from these collections. The most abundant taxa (Table 2) included the amphipods *Grandidierella bonnieroides* and *A. abdita*, the oligochaete *Tubificoides brownae*, the bivalve *M. leucophaeata*, and the polychaete *S. benedicti*. Of the at least 77 taxa identified to date, 25 taxa (primarily aquatic insect larvae) are essentially freshwater.

Based upon the Tampa Bay Benthic Index [TBBI] and the preliminary criteria for "degraded" benthic habitat, it appears that 70% of the Alafia River may not support a "healthy" benthic community; almost two-thirds of the sites had near-bottom dissolved oxygen concentrations which were <4 mg/l; and there is no evidence of degraded sediments in the Alafia River based upon the samples analyzed to date (Table 3).

**CONCLUSIONS**

The preliminary data collected from the Hillsborough, Palm, and Alafia rivers during 1995-1997 suggest that these tributaries are considerably more degraded than their receiving waters, Hillsborough Bay, particularly with respect to benthic community structure. PAH and pesticide contaminated sediments are relatively more pervasive in the Hillsborough River and trace metal contaminants are more pervasive in the Palm River relative to Hillsborough Bay. The Alafia River sediments sampled to date are not degraded.

Freshwater taxa were generally not a large proportion of the fauna in any of these tributaries as a whole, although *Corbicula fluminea*, an exotic species, was occasionally abundant in low salinity/limnetic portions of the Hillsborough and Alafia rivers. Low salinity species such as *Mytilopsis leucophaeata*, and *Grandidierella bonnieroides* were often numerically dominant. *Stenomonereis martini* was often quite abundant in the Hillsborough River. The first record of this species from Florida was from Warm Mineral Springs (Sarasota County, FL)—an environment characterized by a high constant temperature (30°C), is anoxic, and has a total dissolved solids concentration of 17,000 ppm (Hartman, O. 1958. *J. Wash. Acad. Sci.* 48:263-266).

For additional information and copies of technical reports for this bay-wide program, contact Stephen Grabe or David Karlen, Environmental Protection Commission of Hillsborough County (813) 272-7104.
DELANEY CREEK WETLAND RESTORATION PROJECT

Delaney Creek is a channelized system that discharges directly into Hillsborough Bay. The old meandering creek channel is still evident in some areas. The Hillsborough County Environmental Lands Acquisition and Protection Program (ELAPP) purchased a parcel of land, approximately 1.5 miles from the Bay, containing a section of the old meandering creek channel which received minimal flow. This parcel is the site of Hillsborough County's Delaney Creek Wetland Restoration Project.

The Project (upstream of U.S. Hwy 41) was built to route base flow, first flush and minor storm events through an expanded wetland system and provide water treatment prior to discharging into Hillsborough Bay. The project's goal was to reduce total nitrogen (TN) and total suspended solids (TSS) loadings to the Bay, along with the creation of new wetland habitat. This goal was accomplished by planting over 16,000 aquatic plants, creation of an additional three acres of wetlands, and the installation of a sediment sump that is routinely maintained by Hillsborough County. Water elevations to and from the old meandering creek channel and restoration site are controlled by gabions, wire mesh boxes filled with large rocks.

The project was completed prior to the El Nino event of 1997-98. The extraordinary rain events associated with El Nino carried tons of sediment down the Delaney Creek system. The project's sediment sump collected 950 cubic yards of sediment, which would otherwise have ended up in the Bay. The project was funded by Hillsborough County and the Southwest Florida Water Management District through the Surface Water Improvement and Management Program.

For more information contact Elie Araj, County Stormwater Management Division (813) 272-5912.

HILLSBOROUGH COUNTY ARTIFICIAL REEF PROGRAM

The Artificial Reef Program is administered by the Environmental Protection Commission of Hillsborough County and was started October 23, 1986. The goal of the Artificial Reef Program is to increase habitat diversity by providing hard-bottom substrates and communities which might not otherwise be available in Tampa Bay. The reefs also provide additional fishing opportunities for the sport-fishing public in the bay area. More than 45 different species of fish are found on the reefs, including: Snook, Permit, Cobia, Grouper, Jewfish, Sheepshead, Mangrove Snapper, and Hogfish.

The staff of the Artificial Reef Program frequently speaks to fishing clubs, schools and many other civic groups in the Tampa Bay area. Almost always, these people are pleasantly surprised to find out that the reefs don't cost them a single tax dollar. In fact, we have never purchased a single piece of reef material!

The Artificial Reef Program is funded by the Environmental Protection Commission's Pollution Recovery Trust Fund. This fund was established to specifically address environmental cleanup and restoration in Hillsborough County.

Additional funds have been provided by the Federal Aid in Sport Fish Restoration Program. We also rely on the generous donations of the local marine construction industry for materials and construction services.

For more information on the Environmental Protection Commission's Artificial Reef Program, contact Tom Ash at (813) 272-5960.

State of Tampa Bay 13
EAST LAKE RESTORATION PROJECT

In the summer of 1996 Hillsborough County, in cooperation with the Southwest Florida Water Management District Surface Water Improvement and Management Program (SWIM), began work on the project to improve water quality within East Lake and the subsequent discharge downstream to the Tampa Bypass Canal. East Lake is a 98-acre, hypereutrophic lake on the north side of Interstate 4 at Orient Road (see the map below).

Its watershed is a highly urbanized area draining approximately 1,100 acres. Much of the development in the watershed was constructed in the 1950s and 60s, including East Lake Park subdivision, and a series of canals were dredged in East Lake to create waterfront lots. This dredging process apparently created an island in the lake on the eastern shore. East Lake Mall was constructed on the northern side of East Lake and discharge from a stormwater pond on the Mall property flows into East Lake. Residents watched water quality decline between the 60s and 80s, leading them in about 1988 to request federal, state, or local assistance in diagnosing and correcting the problems. It wasn't until 1996 that Hillsborough County and the SWIM program teamed up to address the problems of East Lake. They hired Environmental Research and Design, Inc. (ERD), an environmental consulting firm based in Orlando, which has worked extensively to determine the causes and solutions to pollution of lakes. The firm has pioneered the use of alum, or aluminum sulfate, a chemical historically used in treating drinking water, in the treatment of stormwater.

ERD’s first task was to study the lake and determine the causes of the pollution. Since the lake receives drainage from an urbanized area covering 1,100 acres, the assumption at the beginning of the study was that the over-enrichment of the lake was the result of stormwater pollutants. ERD started by reviewing historic water quality data available for East Lake. The earliest data collection began in 1974 as a result of an agreement between the owners of the then-new East Lake Mall and the East Lake Park Civic Association. This agreement included a provision that East Lake Mall perform quarterly sampling that included one station near the center of East Lake. Additionally, data on East Lake was included in a detailed limnological study of four lakes in West Central Florida, performed by Dawes, Cowell, Gardiner, and Scheda from the Department of Biology of the University of South Florida in 1980-81. The most recent data on the lake was from a single water quality monitoring event performed by the Environmental Section of the District in 1995. This data indicate that Total Kjeldahl Nitrogen (TKN) was significantly higher than typical urban lakes and total phosphorus was 2-5 times higher.

ERD began studies which included: a bathymetric survey, evaluation of hydrologic/hydraulic inputs, sampling of inputs to the lake from stormwater, baseflow, or seepage and calculation of annual pollutant loads based on the sampling. The bathymetric survey showed that East Lake is a relatively shallow lake with a mean depth of 5.45 ft. and a maximum depth of 7-8 ft. The hydrologic/hydraulic analysis showed the following contributions: stormwater runoff 19%, baseflow inputs 50%, groundwater seepage 11%, and direct rainfall 20%. The results of the sampling of pollutant sources were used in a model and the modeling results indicated that there were additional sources of substantial amounts of nitrogen and phosphorus.

ERD determined that the additional source was an island in the lake which serves as a roost for hundreds of birds. The pollutant loading coming from the island was measured using pans to collect the bird guano.

The percentage of nutrient loading from each of the sources measured is shown in the following chart.

<table>
<thead>
<tr>
<th>INPUT SOURCE</th>
<th>PERCENT OF TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Nitrogen</td>
</tr>
<tr>
<td>Stormwater Runoff</td>
<td>12</td>
</tr>
<tr>
<td>Dry Weather Baseflow</td>
<td>26</td>
</tr>
<tr>
<td>Groundwater Seepage</td>
<td>26</td>
</tr>
<tr>
<td>Bulk Precipitation</td>
<td>5</td>
</tr>
<tr>
<td>Water Fowl</td>
<td>31</td>
</tr>
<tr>
<td>TOTALS</td>
<td>100</td>
</tr>
</tbody>
</table>
So, as is readily apparent from the table above, the original assumption that stormwater was the primary source of pollutant loading to East Lake, was not the case. In fact, with reference to total phosphorus, the waterfowls appear to be the dominant source. The waterfowl population likely increased after the dredging in the 1950s created the island. Over time the island became vegetated and provided roosting and nesting habitat for greater and greater numbers of waterfowls. The total annual load of nitrogen is estimated at 8,743 kilogram; with about 1,376 kilograms of phosphorus.

Based on their findings, ERD developed a restoration plan to improve water quality within East Lake itself and especially to reduce nutrient loading downstream into the Tampa By-Pass Canal. The plan has two components. First, it will entail treating all of East Lake with alum, bi-annually, to remove nutrients and algae from the water column. The alum causes particles in the water to precipitate or settle out, and hopefully will tie them up in the bottom sediments so that they don't get returned to the water column. The second part of the plan will build an off-line alum treatment system on the southeast side of I-4, on property previously-owned by the Florida Department of Transportation. East Lake discharges through a canal that runs under the interstate and adjacent to the site of the future alum treatment system. Low flows will be diverted into the treatment system via a weir, injected with alum, flow through a settling pond, and ultimately be discharged back into the East Lake discharge canal to flow on into the Tampa By-Pass canal. This plan is projected to reduce total nitrogen and phosphorus in the discharge from East Lake by 69% and 98% respectively. This plan will produce the most cost-effective reduction in nitrogen and phosphorus based on capital, operating, and maintenance costs.

HILLSBOROUGH COMMUNITY COLLEGE
DIVISION OF ENVIRONMENTAL PROGRAMS

The Hillsborough Community College Division of Environmental Programs has been providing environmental education programs for over 24 years. It is the purpose of these programs to: provide the citizens of the Tampa Bay area with a better appreciation and understanding of the ecological, economic, aesthetic and recreational importance of our natural areas; provide professionals in the environmental field with opportunities for upgrading their knowledge and skills; and to prepare students to enter the workforce as environmental technicians ready to respond to the demands of a rapidly-changing work environment. Program areas of the Division include:

1. Environmental Science Technology Program
   This college credit program, leading to an A.S. degree, will prepare students to enter the workforce as Environmental Technicians ready to respond to the demands of a rapidly-changing work environment. An Environmental Technician is defined as a person trained to monitor the environment, take and process samples, understand environmental linkages, know about state and federal regulations, and utilize the appropriate techniques and tools required to monitor and manage natural resources. Students may select from specialty areas in air monitoring, water monitoring, GIS/GPS, and Natural Areas Management. This program was implemented and the first classes were held during 1998.

2. Environmental Occupational Training - The Environmental Occupational Training programs will provide persons currently working in environmental occupations, such as environmental research, environmental regulation/compliance, natural areas management, and environmental/occupational health and safety, with opportunities for upgrading their knowledge and skills. Non-credit courses and certification currently are offered in the following areas: water and wastewater operator's licensing, prescribed fire training, environmental regulation and compliance training, environmental and occupational health and safety training, and lead-based paint and asbestos compliance training.

3. The Institute of Florida Studies - The HCC Institute of Florida Studies (IFS) is a community-based educational institute designed for the study of the biology, ecology, earth sciences, history, and natural history of Florida. It is the purpose of the Institute to promote a greater understanding and appreciation of the biological, economic, recreational and aesthetic importance of environmental systems and of the natural history of Florida through education, information and research.

The IFS operates the Environmental Studies Center which has locations at Cockroach Bay, English Creek and the Upper Tampa Bay Park. The Center offers outdoor and field trip activities for K-12 school groups, institutions of higher education, and the general public. Facilities include lab/classroom space, nature trails and boardwalks, and equipment includes field sampling and observation equipment and laboratory equipment. During 1998 approximately 5,000 people attended programs/activities at the Center.

The Institute also offers non-credit courses for the general public. Courses cover a wide range of topics ranging from Introduction to Canoeing to Exploring the
Withlacoochee Caves. A special series of non-credit courses targeting family outdoor activities (Exploring Florida’s Environment) is also sponsored by the IFS. During 1998 approximately 1,000 people attended these courses.

The Annual Conference on Ecosystems Restoration and Creation is also sponsored by the Institute. This conference provides a forum for the nationwide exchange of results of scientific research and current regulatory practices in the restoration, creation and management of wetland, upland and transitional ecosystems. The conference is of benefit to representatives of governmental agencies, planners, land managers, representatives of colleges and universities, corporations and environmental groups which have an interest in restoration and creation. The Conference is normally held each May in Tampa. Proceedings of the Conference are published and made available to conference attendees and those requesting them. Approximately 120 people attended the 25th Annual Conference on Ecosystems Restoration and Creation.

The IFS, in cooperation with the HCC Aquaculture program, was also the recipient of a NSF grant (Interdisciplinary Program on Live Rock Culture) this year. This grant will utilize students, under faculty tutelage, to explore best practices of culturing and harvesting live rock and will also monitor physical and biological effects of live rock culture/harvesting.

The Institute is also working with Hillsborough County under its Stream-WaterWatch Program, which is funded by a grant from the Florida Game and Fish Commission Advisory Committee on Environmental Education. This grant was funded during 1998. The purpose of this program is to train citizens to conduct physical and biological monitoring of selected streams of Hillsborough County. To date over 50 people have been trained.

For more information, please contact the HCC Division of Environmental Programs at (813) 757-2104, or see http://www.hcc.cc.fl.us/services/departments/FloridaStudies/dep.htm.

HILLSBOROUGH COUNTY ENVIRONMENTAL LANDS ACQUISITION AND PROTECTION PROGRAM (ELAPP)

On March 3, 1987, a referendum providing for the collection of a 0.25-mil tax, for four years, for the purchase or protection of environmentally-sensitive lands was approved by the voters of Hillsborough County. This four-year, quarter-mil tax provided approximately $21,000,000. Administration of the program was assigned to the Parks and Recreation Department. To ensure citizen involvement, three teams were established for the purpose of assessing, analyzing, and selecting sites. The ELAPP Advisory Committee was established to guide the preservation and acquisition process. Also, in February of 1989, a position of Acquisition Manager was established in the Real Estate Department to carry out these processes.

In 1990, the voters approved another ELAPP referendum, authorizing the County to issue bonds up to $100 million that would be retired by the levy of ad valorem taxes not to exceed 0.25-mil in any one year for up to twenty years, to designate a portion of such funding for site restoration and management, and to permit the conveyance of such lands to other public agencies for the purpose of preservation, provided the proceeds be used to acquire additional land or retire bonds. In 1993, the Board approved amendments to both ordinances which authorized the ability to convey property rights that are not essential for the preservation of the land, the transfer of property to settle actual or potential litigation by public or quasi-public entities, and stating that the preservation of properties acquired through these ordinances is the highest public purpose. Additionally, the ordinance associated with the $100 million referendum was amended to permit the sale of properties as “Acquisitions of Convenience”.

The ELAPP Program was established to conserve and protect those lands which have environmentally-unique, and irreplaceable and valued ecological resources. These lands must satisfy one or more of the following criteria:

- Land containing native and scarce flora and fauna;
- Lands that supply a significant habitat for endangered or threatened plants or animals;
- Land which plays a vital role in the protection and enhancement of water quality (but cannot be protected through other government agencies or regulations);
- Land that provides buffer zones, links or additions to existing environmentally-sensitive lands, or which forms part of a natural greenway;
- Land containing unusual, outstanding, or unique geological features; or
- Land containing significant archeological sites.

Lands are considered for the program after they have been nominated. Any property owner, concerned citizen, community or environmental organization can nominate property in Hillsborough County. There is no fee associated with the nomination. Applications and instructions to nominate property, known as a "site," are available through the Hillsborough County Parks and Recreation Department. Nominations are taken annually until November 1 and are considered during the following year.

Once a site has been nominated, it goes through an assessment process to determine its environmental significance and if it meets program objectives. After the assessment, it is reviewed by a committee of citizens, environmental experts, and County staff to confirm that the site should be in the program. Selected sites are presented to the Hillsborough County Parks Board and the Board of County Commissioners for approval. Public meetings are held by the Site Selection Committee, the Parks Board and Board of County Commissioners to allow property owners of nominated sites to state their position and citizens to express opinions, as well as to allow the County staff to present information and answer questions.
ELAPP is a voluntary program. The current program does not plan to use eminent domain to acquire property. If a property owner does not wish to sell, ELAPP does not plan to force the sale. If a property owner wants more than the property is worth or more than the program is willing to pay, ELAPP does not have to buy the land. With the annual approval of new sites, the program has far more land to acquire than available funding.

After a site is acquired by the County, a detailed management plan is developed by County staff with citizen input. Priority is given to protecting a site’s natural resources. All sites acquired by the County will be made accessible to the public for compatible, resource-based recreation to the greatest extent possible. No sites acquired for preservation will be used for active recreation such as organized sports or athletics, or undergo any other form of public or private development.

Through the first 11 years, the ELAPP Teams have completed 230 reviews and identified 100 sites as meeting the ELAPP criteria for protection or acquisition. The program has acquired or participated in the preservation of 40 sites totalling over 30,000 acres at a cost of approximately $109 million. On existing acquisitions and pending contracts, approximately 33% of the total acquisition costs have or will be funded by Preservation 2000 or by partnerships with other agencies. The programs and agencies include the Florida Communities Trust (Department of Community Affairs), the Southwest Florida Water Management District Save Our Rivers Program, and the Conservation and Recreational Lands Program. ELAPP has also cooperated with the City of Tampa, City of Temple Terrace, and Plant City for funding applications on ELAPP sites. Total funding from other agencies for the preservation of ELAPP sites, either under established agreements on existing acquisitions, or direct participation by other agencies with the County providing a portion of the purchase price, exceeds $36 million. It is estimated that there is an additional $14 million available through existing agreements on future acquisitions. Currently many of the approved sites are in various stages of negotiations. A total of six nominations were submitted by November 1 of this, the twelfth year of the program.

For detailed information and the site nomination process, or to participate in the program, please contact: Peter Fowler, Manager, Parks and Recreation Department, 1101 East River Cove Avenue, Tampa, FL 33604-3257; (813) 903-2283. For more information regarding the acquisition of approved sites contact: Kurt G. Gremley, Manager, Real Estate Department, P.O. Box 1110, Tampa, FL 33601-1110; (813) 272-5810.

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.

Alteration of seagrass habitat and 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 1980s. 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 1991-1997 found a substantial increase in shoalgrass coverage for each survey and by 1997 about 556,000m² of H. wrightii was reported in Hillsborough Bay. However, in 1998, there was only a slight increase for H. wrightii coverage as gains in some portions of Hillsborough Bay were offset by losses in other sections of the bay. Areal coverage of H. wrightii in Hillsborough Bay from 1986-1998 is presented in Figure 1.

![Figure 1. Halodule wrightii coverage in Hillsborough Bay from 1984-1998. About 150m² was reported for 1984. No surveys were conducted in 1985, 1987-88, and 1990.](image-url)
Several areas of Hillsborough Bay (Figure 2) have been rapidly revegetated by *H. wrightii*. For example, in the Kitchen, an area in southeastern Hillsborough Bay, seagrass coverage increased from $1,300m^2$ in 1986 to about $400,000m^2$ in 1997, and this coverage remained stable in 1998. Just north of this *H. wrightii* meadow, on the flats between the Kitchen and Bullfrog Creek, the BSG noted hundreds of new *H. wrightii* patches developing in the early to mid 1990s. The patchy seagrass in this area has coalesced and developed into a $55,000m^2$ seagrass meadow in 1998. Seagrass coverage in western Hillsborough Bay, from Catfish Point to Ballast Point, expanded from $140m^2$ in 1986 to nearly $122,000m^2$ in 1997. However, in 1998 this coverage decreased to about $90,000m^2$. Seagrass coverage north of Ballast Point has been sparse, but new coverage continues to develop. Several new patches of *H. wrightii* were documented nearly three miles north of Ballast Point, possibly the first seagrass seen in this area in over 35 years. Finally, *H. wrightii* coverage on the shallow flats between the Alafia River and Pendola Point declined in 1998 to about $4,000m^2$ after reaching $17,000m^2$ by 1997.

In 1987 the BSG transplanted about $13m^2$ of *H. wrightii* into several intertidal and shallow subtidal areas of Hillsborough Bay. Transplant coverage reached $1,200m^2$ in 1992. However, since 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 increased each year from 1986 to 1997, apparently in response to improving water quality. Several areas of the bay which had little or no seagrass coverage one decade ago developed sizable stands of shoalgrass. However, in the past few years, the rate of recolonization has appeared to slow. In 1998, expansion of seagrass beds was noted in some sections of Hillsborough Bay, however, the gains in seagrass coverage were offset by declining seagrass coverage in other areas of the bay. This trend in seagrass growth may possibly be due to the increased phytoplankton biomass coinciding with increased rainfall. Trends in Tampa Bay phytoplankton biomass, an indicator of water quality, are discussed by Roger Johansson in this issue. For further information contact Walt Avery with the City of Tampa, Bay Study Group at (813) 247-3451.

**PEMBERTON AND BAKER CREEK EROSION AND SEDIMENTATION CONTROL PROJECT**

Lake Thonotosassa is Hillsborough County's largest lake, supplying water to the upper reaches of the Hillsborough River. Water quality in Lake Thonotosassa over the last ten years has been declining, in part from sediment being transported into the lake from the Pemberton Creek and Baker Creek watersheds. In 1998 a large sediment sump was constructed in Pemberton Creek near its discharge to Lake Thonotosassa. The sediment sump location was carefully chosen to assure easy access for routine maintenance. The sump is 1,000 feet long, dug to a depth four feet below that of the adjacent upstream section of Baker Creek.

Besides controlling the sediment flowing through the creek system, the project focused on reducing bank erosion, a major sediment source in the creek system. In choosing the method for bank stabilization, Hillsborough County needed to achieve several goals: the method should be environmentally sound, maintain flows, be cost-effective, and be installed with minimal earthwork. The method chosen was a unique system of Armortec A-Jacks with Bestman Green 12" fiber rolls placed on top to trap sediment and allow for re-
vegetation of the banks. This erosion control project was funded by Hillsborough County and the Southwest Florida Water Management District's Surface Water Improvement and Management Program.

For more information contact Elie Araj, County Stormwater Management Division (813) 272-5912.

**HILLSBOROUGH RIVER INTERLOCAL PLANNING BOARD AND TECHNICAL ADVISORY COUNCIL ACTIVITIES**

There were numerous activities pertaining to the Hillsborough River in 1998. They reflect the community's continued commitment to the Hillsborough and other rivers in the area. Many river-related issues were reviewed, discussed, and acted upon during 1998 by the River Board Interlocal Planning Board and Technical Advisory Council (HRB&TAC). Some issues remain under study. Other unanticipated issues surfaced and are requiring closer examination. The following is a brief summary of the activities and issues of the Hillsborough River Interlocal Planning Board and Technical Advisory Council during 1998.

**RIVER BOARD & TAC CARRY OUT THEIR MANDATE**

In 1998 the HRB&TAC carried out their legislated functions as directed by the enabling legislation Special Act, 86-335, Laws of Florida. The HRB&TAC monitored proposed development, redevelopment, and various other activities in the river corridor and made recommendations about management of the river to the local governmental jurisdictions, regulatory agencies, and others. As demonstrated in the following narrative, the HRB&TAC were involved with several river-related projects, responded effectively to community driven issues and explored innovative approaches to managing river issues, within Hillsborough County and, at times, outside those bounds.

**COMPREHENSIVE/MASTER PLAN IMPLEMENTATION**

Over the past few years the HRB&TAC were involved in the updates of the local Comprehensive Plans. Plan amendments and updates were initiated to streamline river-related policy statements and to reflect changing conditions within the Hillsborough River corridor. With these amendments now in place, activities along the river are reviewed for consistency with the newly-updated goals, objectives, and policies. They also make clear the community's intent in relation to the vision for the river's future and how to achieve it. Annexations by the City of Tampa in proximity to the river raised new challenges to various facets of river management. Public acquisition of a portion of the Cypress Creek Preserve reinforced the importance placed on the role of tributaries to the welfare of the Hillsborough River system by elected officials and the public. Land use category changes for Blackwater Hammock, City of Tampa, were reviewed by the HRB&TAC.

**PUBLIC ACCESS ISSUES**

The HRB&TAC continued to work towards establishing a public boat ramp in downtown Tampa. A recommended public boat ramp site near the North Boulevard Bridge, on the north side of the river, has been identified as an area being targeted by the City of Tampa for redevelopment. While that exact site may not be a future home for a public boat ramp, the City has been agreeable to considering a public boat ramp in the area and has been working with the TAC to make this a reality in the near future. The HRB&TAC explored the proposal for an offshore riverwalk through downtown Tampa along the river's east bank. The riverwalk, as proposed, would extend from the Tampa Convention Center north to the Performing Arts Center. Because of funding limitations due to ownership and elevation...
changes, the riverwalk has been designed to be constructed on piers approximately six feet or more out from the shoreline. The riverwalk would have several access points and would provide a unique viewpoint of the City. Funding for this project, however, does not seem imminent. Projections are for this portion of the riverwalk to be started in the next century.

**MONITORING and EDUCATIONAL ACTIVITIES**

The HRB&TAC have been monitoring activities associated with Crystal Springs, which is located north of the Hillsborough County line in Pasco County. This spring system provides a significant amount of water to the Hillsborough River. Two primary concerns brought to the HRB&TAC involving Crystal Springs were considered: a pending permit application to the Southwest Florida Water Management District (District) to allow an increase of withdrawal from the spring for commercial use; and whether or not the state has sovereignty over the spring. Ownership of the immediately-surrounding lands has been in dispute. Public access to Crystal Springs has been another issue that remains outstanding. The HRB&TAC directed questions to state and local officials in an effort to resolve these issues, and will continue to monitor events as they continue.

The HRB&TAC continued their interest in the establishment of a minimum flow for the lower Hillsborough River. A minimum flow is required to be established by legislation by the District. The HRB&TAC followed the process taken by the District and other bodies involved, and comments were offered. Peer review has been requested that will extend establishment of a minimum flow well into the next year. The development of a Cone Ranch Management Plan is another project in which the HRB&TAC have continued interest and in which staff has been directed to participate.

The HRB&TAC continue to monitor proposals for development involving a portion of or parcels adjacent to Curtis Hixon Park in downtown Tampa. This potential development prompted the HRB&TAC to recommend that all downtown Tampa park sites be dedicated park sites to assure those parcels continued use in the future as parks.

The HRB&TAC carried out a number of development reviews that ranged in size and scope from single family dock requests to large-scale urban development or redevelopment. One plan of particular interest to the HRB&TAC is the redevelopment of Tampa Heights in downtown Tampa. Concerns regarding public access along the river via a sufficient setback from the waterfront were of primary concern. Inclusion of a public boat ramp in the area was also a high priority. A development proposed along the river for a community center in the City of Temple Terrace was the focus of another review resulting in support by the HRB&TAC.

The HRB&TAC found the continuation of allowing vehicular parking along the waterfront in downtown Tampa inconsistent with the Tampa Comprehensive Plan and recommended its discontinuation. The HRB&TAC opposed revisions to downtown Tampa setbacks that would have reduced the area required between structures and the waterfront.

The HRB&TAC kept track of the status of the Tampa Water Resource Recovery Project as proposed to Tampa Bay Water. During the Fall, this project was not selected by Tampa Bay Water as one of the initial projects to augment the region's water supply. The project will remain as a potential project for implementation at some point in the future.

In support of the HRB&TAC, the River Hotline was staffed throughout the year. The River Hotline provides a central point of communication where the public can call for information about the river or to report activities on or along the river that they believe warrant further investigation. Six issues of the newly-formatted River News were published and distributed. This publication keeps the public and elected officials up to date on activities involving the river. Planning Commission staff provides these functions.

**COOPERATIVE PARTNERSHIPS**

The HRB&TAC have been actively participating with other groups and agencies in planning partnerships directed to the river. Some of these groups address basin wide concerns, encompassing the ecosystem of the river and surrounding areas. Other groups have been more focused such as neighborhood and community groups. The HRB&TAC believe its contribution to these efforts help to provide important support for these groups' successes and provides...
additional insight into factors and forces beyond the HRB&TAC's legislative mandate.

One exciting project underway this year that will carry over into next year is a Hillsborough River computer visualization project. This project links still photographs, panoramic photos and video clips to specific sites or areas by a Geographic Information System (GIS) computer program. The project will allow historic images from days past to be entered, as well as current information. It will serve as a reference resource, showing conditions at a certain point in time. This resource will allow users to virtually view the Hillsborough River by pointing and clicking on a resource icon along the river, and the computer will show information in various media forms. This project is a joint effort of the River Board, Planning Commission, and Environmental Protection Commission of Hillsborough County.

In November the City of Tampa held the eleventh annual Mayor's Hillsborough River and Waterway Clean up. This event resulted in nearly 12 tons of trash and debris being removed from the river and its banks. This annual event attracted nearly 1,000 participants. The HRB&TAC support the City's efforts to stage this annual event, which benefits the river and raises environmental awareness in the community.

For more information contact Alan Wright HRB&TAC staff, at (813) 272-5940.

THE HILLSBOROUGH RIVER GREENWAYS TASK FORCE

The Hillsborough River Greenways Task Force, or the HRGTF, is a nonprofit, public-private partnership whose mission is to facilitate the implementation of its regional plan for the permanent protection of the natural resources of the Hillsborough River watershed, with special emphasis on the Upper Hillsborough River-Green Swamp Corridor. The HRGTF is open to anyone and everyone who is interested in, or affected by, issues within the Hillsborough River watershed and who is dedicated to achieving the HRGTF's mission and goals.

Although the HRGTF's primary emphasis is on the Upper Hillsborough River, when issues arise that affect or involve other portions of the watershed, the HRGTF works collaboratively with programs such as the Tampa Bay Estuary Program or the Hillsborough River Interlocal Planning Board. It is important to the HRGTF that as many partners as possible collaborate to achieve a truly sustainable Hillsborough River system. In recognition of this philosophy, the HRGTF has received national and state recognition and is an honored past recipient of the Governor's Environmental Education Award presented by the Governor's Council for a Sustainable Florida and has been nominated for this year's Governor's Sustainable Florida Standards Leadership Awards.

Formed in 1992, after several years of defining issues, conducting research and performing alternative analyses, the HRGTF achieved consensus on approximately 20 major issues affecting the Upper Hillsborough River Greenway. In 1995, the HRGTF unveiled its guiding report, entitled An Ecosystem Protection Plan for the Upper Hillsborough River Greenway, otherwise referred to as "The Greenbook," describing the issues and HRGTF recommendations. The HRGTF has been working to facilitate the implementation of these recommendations ever since.

The intent of the HRGTF is not to be another governmental or regulatory body, but a voluntary, goal-driven, action-oriented group. Upon completion of its mission and consensus-based project goals, the HRGTF intends to transfer the monitoring, continued implementation and resource management of these activities to the appropriate public or private organizations.

As the HRGTF has moved from advanced planning to facilitating the implementation of its recommendations, it strives to focus more and more on education and outreach projects in an effort to involve more citizens in stewardship activities. To this end, 1998 has been a very successful year for the HRGTF. The following highlights only a few HRGTF successes.
The HRGTF published the first edition of its quarterly newsletter, *The Croaker*, currently reaching nearly 1,000 individuals; collaborated with the Florida Center at the University of South Florida to create and post our first webpage (thanks also to HRGTF volunteers Richard Owen and Dave Bracciano for the design of the webpage); produced the second HRGTF brochure; and designed and printed HRGTF T-shirts with the new logo designed by Margo McKnight, formerly of Busch Gardens.

On May 9th the HRGTF organized the second annual "A River Runs Through It" event. This event was sponsored through a grant from the SWFWMD Hillsborough River Basin Board and collaborating organizations including: Hillsborough County Parks & Recreation, Canoe Escape, USF Recreation Department, the City of Tampa, the Hillsborough River Interlocal Planning Board and Nature’s Classroom, among many other civic and environmental groups and individuals. The purposes of the event were to:

- Celebrate and experience the Hillsborough River with canoe rides and nature walks;
- Celebrate the City of Tampa’s “Drinking Water Week”;
- Learn about the River System and ways in which individuals can become involved in its protection;
- Support Nature’s Classroom through proceeds from refreshment sales; and
- Highlight the Hillsborough River as a State Recreational Canoe Trail.

The HRGTF initiated and served as a catalyst in the development of a Management Plan for the proposed Cone Ranch Wellfield. This Plan was completed in partnership with the Hillsborough County Planning and Growth Management Department as well as many other interested agencies and citizens. The HRGTF worked to ensure consistency with the HRGTF vision for the Cone Ranch property. The HRGTF vision states that Cone Ranch should be planned, positioned and managed as a living laboratory and center for the development of new concepts to meet our community’s need for water supply, habitat, wetland and upland restoration, recreation and agricultural production, with sustainable economic and environmental management practices.

The HRGTF completed the distribution of over 10,000 Hillsborough River State Canoe Trail brochures during the year. The brochure serves as a guide to the canoe trail and highlight many of the beautiful natural habitats found along the Upper Hillsborough River. The HRGTF is currently working with the Florida Department of Environmental Protection’s Office of Greenways and Trails to print more brochures, as well as the Hillsborough River Interlocal Planning Board and the City of Tampa in the extension of the canoe trail further down the Hillsborough.

The HRGTF co-hosted the Governor’s Council for Sustainable Florida’s quarterly Executive Forum in January. This Forum highlighted the HRGTF as a public-private partnership, the first successfully completed team permitting project in the state (CF Industries), and stimulated discussions about the role of ecosystem management in achieving a sustainable Florida.

In early 1998 the HRGTF was appointed by the Florida Audubon Society to represent conservation interests and the Hillsborough River Greenway on the Southwest Regional Greenways Task Force, the regional forum of the Florida Greenways Coordinating Council. HRGTF volunteer, Jim Beever, serves as Chair of the Regional Task Force and as Founder and Chair of the HRGTF Frog Listening Network.

In the Fall the HRGTF completed a visioning process in which the HRGTF mission and goals were reviewed and re-affirmed in the planning of Fiscal Year 1999 and beyond. The following highlights the specific Project Groups which were adopted at the 1998 Annual HRGTF Business Meeting as a result of this process.

**Coordinated Linear Infrastructure Project (CLIP):** This Project Group is developing recommendations and economic incentives for the coordinated siting, design, management and permitting of linear infrastructure in order to minimize habitat and greenway fragmentation. The HRGTF raised over $35,000 in 1998 to conduct an economic analysis of this concept,
which will include incentives and financing mechanisms to ensure implementation, and was recently selected as a national finalist by the Federal Highway Administration for this program.

**Frog Listening Network/Environmental Indicators Project Group:** Frog Listening Network participants are trained citizens who conduct research through an interactive, community-based initiative listening for frog calls within the Hillsborough River watershed. The data collected is mapped on GIS and used for trend analysis as an environmental indicator of the health of the river system. The Frog Listening Network has provided over 50 trainings; has been presented to over 1,100 school children using an interactive computer Power Point presentation; and is still expanding.

**Land Trust Project Group:** This Project Group is conducting a land use compatibility study, updating the HRGTF annual Coordinated Conservation Plan and evaluating the feasibility of creating a local nonprofit land trust to leverage the resources of existing public land acquisition programs. In partnership with the Trust for Public Lands and the Pegasus Foundation, the HRGTF raised $10,000 from the Elizabeth Ordway Dunn Foundation to coordinate and sponsor the 1999 Florida Land Trust conference in Tampa on May 22-23, 1999.

**Model Communities Project Group:** Model Communities seeks to demonstrate the implementation of principles to build “greenways compatible” developments to ensure a sustainable community. This group is coordinating developers, landowners, scientists and citizens to apply good planning techniques, sound environmental research and cutting-edge best development practices to one or two developments in the Hillsborough River watershed in hopes of serving as a role model for other sustainable greenways communities.

**Water Issues Project Group:** Participants evaluate water projects affecting the Upper Hillsborough River system, including the setting of In-stream Flows, proposed wellfields, and a cumulative impact study of existing and proposed water withdrawals. The HRGTF is concerned that the proposed water supply projects do not adversely affect the natural resources of the Hillsborough River system and seeks unique and sustainable methods to meet the regional water demands.

**Education & Outreach:** The Education and Outreach Workgroup is charged with involving the general public in every aspect of the HRGTF project awareness and implementation as well as educating the public on greenways and sustainable community issues. This is accomplished, in part, through brochures, a quarterly newsletter, a webpage, a Speaker’s Bureau and Saturday events including canoe outings, plantings and river clean-ups.

The aforementioned are only a sample of the many issues affecting the Hillsborough River Greenway. If you would like more information on the Hillsborough River Greenways Task Force, or would like to get involved, please contact the HRGTF: Chair Dave Sumpter; Vice-Chair Stu Marvin; or staff Heidi McCree and Laura DeLise at: 601 E. Kennedy Boulevard, 20th Floor, P.O. Box 1110, Tampa, FL 33601; (813) 276-8417; Fax: (813)272-6068; e-mail: mccreeeh@hillsboroughcounty.org or delisel@hillsboroughcounty.org.

The HRGTF is open to anyone and everyone who is interested in protecting and preserving the Hillsborough River Greenway. We welcome your active participation!

**EGMONT KEY - 1998**

1998 was an even busier year than 1997 at Egmont Key. Some of the significant events are listed below.

**NATURAL RESOURCES**

- A strong partnership with the U.S. Fish and Wildlife Service (USFWS) continued. Egmont Key Alliance volunteers worked closely with USFWS personnel and State Park staff in patrolling the southern 1/3 of the island, which is now a wildlife sanctuary and closed to the public.
- Volunteers and USFWS personnel treated over 80 acres at the southern end with Garlon 4 and JLB Plus to control the continuing growth of Australian pine and Brazilian pepper. While control of exotic plants is still a major concern on the island, we believe expansion...
of current efforts will result in reduction and, finally, the elimination of exotics.

- Sea turtle nesting was about average with 71 loggerhead nests observed. Of these, 37 nests yielded 4,500 eggs which produced 3,540 hatchlings. The other 34 nests were lost to erosion and storm tides.

- 747 Gopher tortoises were surveyed and marked by volunteers and Park Service personnel. It is believed that this makes it one of the largest, and possibly the largest, study of this species conducted anywhere.

- Shorebird nesting failed due to human intrusion into the nesting areas and will receive increased attention in 1999 by USFWS, State Park staff and Alliance volunteers.

- Construction of a plant nursery was begun, with the purpose of providing seedlings of native plants now growing on Egmont Key. These plants will be used to replace exotics as they are removed. All of this is part of the program to restore vegetation on the island to its native state.

VISITOR SERVICES

- Almost 92,000 people visited the island in 1998, a significant increase over the 80,000 during the previous year.

- The Alliance and Park staff expanded the interpretive schedules during weekends and by appointment, with a total 2,918 visitors. Significantly, among these visitors were 1,230 school students who were able to see first-hand the historic and natural resources of Egmont Key.

- The first public restroom, a disabled-accessible composting toilet with deck and ramp, was erected.

- The lighthouse was designated a Hillsborough County Historical Landmark at a ceremony which highlighted the 140th anniversary of the completion of the current lighthouse and the 150th anniversary of Light Service at Egmont Key.

- For the first time in its history, Egmont Key lighthouse was decorated with lights to become a welcoming “Christmas Tree” to all incoming ships to Tampa Bay and was easily visible from Fort DeSoto Park. Egmont Key was one of five lighthouses in Florida to be so decorated, and it is hoped that this event will spread to lighthouses throughout the U.S. in coming years.

HISTORIC STRUCTURES

Many events, both good and bad, occurred during the year which impacted the lighthouse area and Fort Dade’s remaining structures.

- Erosion continues to take its toll on the west side of the island. Battery Guy Howard is now in ruins.

- Battery McIntosh, the larger of the two remaining batteries is now being undermined by Gulf waters, and is in imminent danger.

- Two small ammunition bunkers and the ice/power plant were lost.

- Two previously-unknown graves were exposed by erosion. Archaeologist Richard Kanaski from the USFWS has excavated the sites and is conducting an investigation.

- On the positive side, due to the establishment of the new nursery and relocation of tool sheds previously located near the lighthouse, the entire lighthouse area is taking on an “earlier” historic look. The original oil shed, which stored oil used in the light, is being refitted to be a temporary visitors center and gift shop.
The Alliance received a legislative appropriation from the State of Florida for $139,400. This will stabilize and repair the concrete in the Fort Dade guardhouse, and install a roof and provide temporary coverings for doors and windows to close in and preserve the building. Further appropriations are being proposed which will finish the restoration and turn this best preserved building from the Spanish American War period into the Egmont Key State Park Headquarters and home of the Egmont Key Alliance.

CONCERNS

Our over-riding concern is the impact of erosion on the west side of the island. Major storm activity in 1998 escalated the loss of historic structures.

The remaining parts of the ice/power house must be torn down, because of concern for injury to visitors in this area.

As stated earlier, Battery McIntosh is already being undermined and could start to collapse at any time.

An engineering study prepared in 1997 for the State of Florida shows that, if erosion continues unchecked, the end result will be the loss of all of the structures at the north end of the island.

A major effort has been initiated to bring this issue to the attention of the Florida Legislature and to request line item funds, during the 1999 session, to install seawalls and groins to stop additional erosion and preserve the remaining historic structures on Egmont Key.

Our goal continues to be to stop the continuing erosion and to see the beach on the west side of Egmont Key stabilized and renourished.

For more information contact Jim Spangler, Egmont Key Alliance (727) 367-1497.

SEA TURTLES IN THE TAMPA BAY AREA

Once again marine turtles have shown their ability to survive in spite of great obstacles. This was a year of many successes as well as many tragedies. The annual migration of Loggerhead (Caretta caretta) took place during the summer along the barrier islands surrounding Tampa Bay. In Tampa Bay itself there is hope of a resurgence of Kemp's ridleys to Tampa Bay as well as other areas along the coast. The Gulf of Mexico is home to five species of marine turtle. These include the Loggerhead, Green (Chelonia mydas), Kemp's ridley (Lepidochelys kempi), and the Hawksbill (Eretmochelys imbricata). The populations of Green turtle and Kemp's ridley consist mostly of juveniles that use the sheltered areas of Tampa Bay for development. The population of Loggerheads consists mostly of adults that have migrated to coastal areas for breeding and nesting. These species are important to the health of an area. Green turtles, in particular, can be important indicator species of the health of Florida's bays and estuaries, including Tampa Bay. Currently many of these animals are experiencing the viral disease Fibropapillomatosis. This viral infection causes external and internal tumors which results in death in about 50% of cases. This viral infection has also been observed in Loggerheads and Kemp's ridley sea turtles as well, however, the frequency of occurrence of the disease is greatest in Green turtles.

The number of turtles that have stranded with fibropapillomas was up from 13 in 1997 to 19 during 1998. The majority of these turtles stranded dead; 5 were found alive, but most of these were in such a state of emaciation that they did not survive long. Two of the live turtles found with fibropapillomas are currently recovering at Clearwater Marine Aquarium (CMA.) Both of these turtles have undergone extensive surgery to remove the tumors from the soft portions of their bodies. At this time surgery is the most effective means of removing the tumors from the turtles' bodies. This is a delicate task, especially when the tumors are near the eyes and mouth. During the summer of 1998 eight Green turtles that had recovered from fibropapillomatosis were released back into the Gulf of Mexico. It is the goal of the CMA to release as many of the injured marine turtles that come into our facility as possible, and give those that can not be released a good home. The Green turtles that recovered from the viral infection fibropapillomatosis were kept for one year after surgery was performed to remove the tumors to ensure that there was no recurrence.

Pinellas County, where most marine turtle strandings occur in Tampa Bay, had the highest number of strandings on the West Coast of Florida, with 47 as of July 1998. CMA documented a total of 52 strandings in its survey area during 1998, which extends from Treasure Island north to Citrus County. A large portion of these were Kemp's ridleys found during an unusual stranding event that occurred in Citrus County. These turtles were found mostly trapped in the intake channels at the Crystal River Nuclear Power Plant during the Spring. Officials at the plant removed all barnacle growth from the grates that protect the intake channels. The result was that the number of turtles caught was drastically reduced. Many of the turtles caught in the intake channel were healthy and released immediately to a safer location, however some were damaged by the grates and required further treatment at CMA. This was the first time that a large concentration of Kemp's ridley turtles was observed along the west coast and could repre-
sent an increase in the number of turtles seeking refuge from the open Gulf of Mexico.

Boat-related injuries still account for the highest number of strandings of marine turtles in Florida. Overall stranding numbers for the state during 1998 were up by 50% over the previous ten-year average. CMA documented 15 adult Loggerheads that were killed by boats during the 1998 nesting season. The CMA received one sub-adult loggerhead from the east coast that had a severe wound to the head and left-front flipper. The turtle's left flipper was damaged so severely that it had to be amputated. The turtle recovered quickly and was released back into the Atlantic after several months of rehabilitation. Boat collisions are taking a tremendous toll on marine turtles because most of the victims are adults and the majority of the interactions result in death. It is estimated that one adult Loggerhead can account for as many as 10,000 hatchlings. This means that the number of turtles killed by boats during a reproductive season is more than the number replaced by hatchlings during a nesting season. Boating and fishing interactions are problems that can be solved through education and awareness. The problem of boating collisions is well documented with manatees, however little has been written about the affects of boating collisions with marine turtles. Hopefully, this article will help to shed some light on this problem and through education we can stem the tide of boating collisions with marine turtles.

The CMA also monitors turtle nesting activity along the shoreline of Pinellas County from Blind Pass to Dunedin Pass. This monitoring effort has been going on continuously since 1978. During that time we have documented a substantial increase in the number of nesting turtles along the shoreline. During the 1998 nesting season CMA confirmed 145 nests; this was the second highest number documented in our survey area. Unfortunately, only 105 nests hatched successfully. Tropical Storm Earl and Hurricane Georges destroyed 40 nests, resulting in the loss of several thousand eggs and hatchlings. Overall CMA documented 7,707 hatchlings released from 11,319 eggs, for a total hatching success of 68.8%. This was up slightly from the previous season's hatching success of 66.7%. This nesting season started out to be the most successful ever, with more hatchlings emerging from individual nests than ever before. With the two storms that came later in the season, many nests were washed out completely or buried by several additional feet of sand.

Beach-front development still remains another big obstacle that marine turtles face during nesting season. In Pinellas County artificial lighting has the potential to disorient the majority of the hatchlings that emerge from nests. With help from CMA this is an infrequent occurrence, however the methods that are employed are both time consuming and manipulative to the hatchlings. That is why CMA's marine turtle department is working with the individual cities in its survey area to do something about the level of artificial lighting on the beach. The city of Indian Rocks Beach has shown the most promise in this area. Indian Rocks Beach is working towards reducing the lighting that spills out onto the beach from street accesses, residents' homes, and condominiums. Getting lighting under control in Pinellas County is a huge task that will take many years to accomplish, but with support from local residents and businesses the goal can be obtained.

The status of marine turtle populations in the Tampa Bay area is still in question. There are some bright spots, such as the large number of juvenile Kemp's ridleys that have been observed in many areas along the west coast. With the increased number of turtles, however, there are more interactions with man. CMA has for many years been in the forefront of rehabilitation of marine turtles. Currently there are fewer facilities to do this job, shifting more of the burden to CMA. We are taking care of an ever-increasing number of stranded turtles each year, as well as increasing the area which strandings are recovered from. The majority of live animals that strand alive along the West Coast of Florida come to CMA. Many of these turtles are rehabilitated successfully and released. Eighteen marine turtles including very endangered species such as Kemp's ridley and Hawksbill were rescued and released by CMA during 1998. The CMA is currently undertaking an ambitious program to increase rehabilitation space by building additional tanks and hospital space. However, without support, these plans will not materialize. The CMA needs all the help it can get to continue the work with marine turtles, to ensure their future. For more information contact Glenn Harman, director of the Marine Turtle Program at the Clearwater Marine Aquarium (727) 441-1790 Ext. 24; e-mail: turtles@cmaquarium.org
CIRCULATION RESTORATION AND ECOLOGICAL ENHANCEMENT PLANNED AT FT. DeSOTO PARK

In a cooperative effort between Pinellas County and the Pinellas/Ancolte Basin Board of the Southwest Florida Water Management District, water circulation will be improved by the design, construction and performance evaluation of "Consplan" bridges to replace portions of the filled causeways at Ft. DeSoto Park in Pinellas County. The Park was once a group of separate islands (1957 aerial). During the Park's development in the late 1950s and early 1960s, the main island was connected to the smaller islands by dredging and filling two causeways, one to provide access to the mainland and the other to create a maintenance area and Park Manager residence.

Data obtained during a 1985 study of water quality, circulation and benthic fauna of the area support the theory that the causeways are restricting flow and reducing water exchange within the back bays of the Park. This study was conducted as a result of the not-optimal operation of the four sewage treatment plants located at the park. Water quality was very bad due to the incomplete treatment of sewage during peak use and suspected entrapment in the back bays. Tidal surge and flow patterns were mapped to determine if the back bays were flushing or if they were stagnant. As expected, although the tidal flux travels from east to west, the flow patterns merely fill the bays then empty them in a very calm manner not conducive to flushing. This led to elevated water temperatures, water quality degradation and seagrass mortality.

Although the plants were dismantled and the sewage pumped to mainland treatment plants, water quality still was poor as compared with surrounding waters. Again, stagnant conditions were suspected. Field visits confirmed this and at times one can observe differences in the tidal and wind driven water levels between the cells of Mullet Key. By opening a channel between the cells, pocketing and stagnation would be reduced. Opening the causeways by partial replacement with "Consplan" will restore east-west circulation to the semi-enclosed embayments and improve ecosystem health.

Pinellas County proposes to perform pre- and post-construction water quality monitoring to document the improved conditions. Allowing the natural tidal flux and wind driven gulf/bay water to pass between the cells will help modulate water temperature and improve water quality by restoring the historic circulation patterns that existed prior to the filling of the passes. The project directly affects a SWIM (Surface Water Improvement and Management Program) priority water body. It affects water quality and habitat value at a regional park facility. The project is consistent with the Pinellas County Comprehensive Plan and with the goals of the Tampa Bay Estuary Program.

For more information contact Eric Fehrmann, Pinellas County Dept. of Environmental Management, (727) 464-4761.

TAMPA BAY'S NATIONAL WILDLIFE Refuges

Egmont Key National Wildlife Refuge - For the second year in a row, only one American oystercatcher nest was recorded on Egmont Key, and only one of the two young survived. Black skimmers started to nest, but all nests were lost due to human intrusion.
The markedly contrasting sex ratio of 2.5 males to females found in their nests. When the adult leaves, gulls steal the eggs. Although the area is designated as a wildlife sanctuary and closed to all public use, visitors entering the closed area disturbed the birds and no young skimmers were produced. No Least tern nesting was recorded on the island this year.

A total of 30 acres of Brazilian pepper and Australian pine were treated during the year. Two one-week treatments were completed using Refuge fire crews from other Florida Refuges. Chainsaws and Garlon were the principle methods of treatment. Follow-up assessments will take place in late winter/early spring 1999 to determine the effectiveness of those efforts.

**Pinellas National Wildlife Refuge** - Diamondback terrapins are the only species of euryhaline turtles found in the New World, and seven subspecies are found along the Atlantic and Gulf coasts of North America, from Cape Cod to Texas. The northern Diamondback terrapin (*M. terrapin terrapin*) and the mangrove terrapin (*M. terrapin rhizophorarum*) are the only two subspecies that have been afforded protection. Scientists attending a workshop on the status of the Diamondback terrapin recommended that the other five subspecies be added to Appendix II of the Endangered Species list.

Scott Boykin, biology student at Eckerd College, began a pilot study to monitor the population of Ornate Diamondback terrapins on Tarpon Key within the Pinellas National Wildlife Refuge in September. Capture methods included hand capture when the terrapins moved into the black mangrove pneumatophores to feed at high tide, as well as the use of blue crab traps modified to allow access to the surface to prevent drowning.

A total of 83 terrapins were captured from September 5 to December 31: 73 individuals and 10 recaptures. Females were more abundant in this survey, comprising 54 of the 73 terrapins. Males accounted for 18, and only one juvenile was found. Additionally, 22 dead terrapins were found, 13 female and nine males. Two of the dead were marked turtles from the 1998 field season. Raccoons are believed to be responsible for the losses, as all of the terrapins were partly dismembered and fresh raccoon tracks were observed throughout the island.

The absence of juveniles from this survey may be the result of not trapping in the shallow tidal creeks adjacent to the upland spoil mounds. However, dozens of raided terrapin nests were found on the spoil mounds and in the upland palm stand of the island. Raccoons appear to be taking a toll on the terrapin nesting efforts, as well as on the terrapins themselves. The markedly-contrasting sex ratio of 2.5 females per male (mortalities included), could be a natural balance as one male can service many females. However, blue crab traps are responsible for the selective removal of males throughout the entire range of the species. Terrapins exhibit extreme sexual dimorphism, and the larger females are excluded from entering the traps. In 1982 a single blue crab trap that washed ashore in Tampa Bay was found to contain 31 dead male terrapins. It is hoped that the status survey of this population of terrapins can be continued in 1999.

For more information contact Joyce Kleen, Chassowitzka National Wildlife Refuge Complex, (352) 563-2088.

**SEAGRASS MONITORING PROGRAM HAS CONTINUED SUCCESS AT WEEDON ISLAND COUNTY PRESERVE AND FT. DE SOTO PARK AND AQUATIC HABITAT MANAGEMENT AREA**

To help protect the valuable seagrass beds in southern Pinellas County, the Board of County Commissioners authorized the provisions of the "Ft. DeSoto Park Wetlands and Aquatic Habitat Management Ordinance" in 1990. The original Ordinance established the Ft. DeSoto Park Wetlands and Aquatic Habitat Management Area, which includes land from Indian Key in the north to Ft. DeSoto Park in the south. Pinellas County amended the ordinance in 1996. continuing this effort while adding protection of the seagrass beds surrounding Weedon Island.

The area around Weedon Island is marked by an array of buoys and signs informing boaters of the protective "Boat Restriction Zones." Use of internal combustion engines is strictly prohibited in the "Boat Restriction Zones," however, motorized boats can enter the zones only if poling, drifting or electric trolling motors are used to move the boat.

The County has continued monitoring the Management Area at Ft. DeSoto to determine the effectiveness of the zones and the rate of seagrass bed recovery in the Area. The analysis shows that the management program continues to be a success. The County has obtained detailed aerial photos of the seagrass beds surrounding the Weedon Island County Preserve. These photos will generate a baseline database that could be used to estimate damage from natural or anthropogenic causes or expansion of the seagrass beds due to enhanced growth conditions.
The aerial photography, as well as the interpretation, has been digitized and entered into the County's Geographical Information System (GIS). Analysis of this data will enable Pinellas County to manage the area in the most environmentally sensitive and beneficial manner.

As in past years, Pinellas County has continued to provide aerial photography of the seagrass areas surrounding Honeymoon and Caladesi Islands to the park managers. This continued cooperation between the County and the State enables improved management of this State park for the benefit of the citizens of Pinellas County.

For more information contact Eric Fehrmann, Pinellas County Dept. of Environmental Management, (727) 464-4761.

PINELLAS COUNTY DEPARTMENT OF ENVIRONMENTAL MANAGEMENT'S BAY-RELATED ACTIVITIES

PINELLAS COUNTY SURFACE WATER AMBIENT MONITORING PROGRAM - The Pinellas County Comprehensive Plan, adopted in 1989, mandated the implementation of ambient water quality monitoring in the waters of the County. The Water Resources Management Section of Pinellas County's Department of Environmental Management initiated this surface water monitoring program in October 1990. The station network was designed to carry out the goals of the comprehensive plan, specifically: (1) to characterize the relative priority of each receiving water for development of management plans, (2) to identify those tributaries contributing the greatest load of pollutants, and (3) to provide a baseline for evaluating the impacts of management programs on receiving water quality.

The baseline data allow for comparisons of past and present water quality conditions; characterization of existing water quality by basin; evaluation of how watersheds activities may have impacted surface water bodies; and help focus management efforts to protect, preserve and enhance the County's valuable surface waters. Most of the County's 52 drainage basins contain at least one primary station located at or near the final discharge point from the basin. Sampling at these downstream stations allows for estimates of water quality constituent concentrations and nutrient loads representative of each basin. Stations are also located in bayous, inlets, near-shore areas, open bays, lake, and other sites where major tributaries join the basin’s main stream or channel. Different groups of sites are monitored weekly, resulting in a monthly sampling of all 73 primary sites and bimonthly (once every two months) sampling of the 35 secondary sites.

THE ALLEN'S CREEK WATERSHED - The Allen's Creek Watershed is a typical urban stream in the central portion of the County. Pinellas County, the City of Largo, and the City of Clearwater agreed to fund and develop a watershed management plan to address the problems of the creek. The Allen's Creek watershed management plan was completed in 1996. The plan was adopted by the Board of County Commissioners in October 1996 and by the Largo Commission in May 1997. Programs and proposed projects in the plan will be evaluated by County and City staff for possible funding and implementation.

In 1997, a County-hired consultant developed and completed a set of computer models that will simulate the effects of potential projects on water quality, hydraulic and hydrologic conditions of the creek. The model will enable County and City staff to evaluate potential structural projects and Best Management Practices within the watershed.

During the development of the plan, projects called Immediate Action Projects (IAPs) were identified and implemented. These projects included the development of educational materials and demonstration sites.
for habitat restoration, exotic plant removal and stormwater treatment.

One of these IAPs is the Habitat Restoration and Enhancement Project near Lakeview Road and Hercules Avenue, also known as Maple Swamp. The project aims to combine stormwater treatment, habitat restoration, and educational and recreational use at a single site in the central portion of the watershed. Design of the project commenced in 1996 and was completed in December 1997. This project is under construction and is expected to be completed in mid-1999. Students at Plumb Elementary School have been assisting County staff by monitoring wildlife activity at Maple Swamp since April 1997. Clearwater Audubon Society members conducted the two annual bird surveys of the project site (1997 and 1998). This information will serve as baseline data that will be compared to wildlife use after the restoration project is completed.

Pinellas County and the Southwest Florida Water Management District (District) jointly funded the design and construction of the Oligohaline Habitat Restoration Project at St. Paul's Drive and Belleair Road. This project aims to restore low salinity wetlands and enhance habitat for aquatic species' use, including snook, redfish, spotted seatrout and blue crabs. Construction of the project was completed in March 1997. More than 200 student, teacher and parent volunteers along with County, City and District staff planted the site in April 1997 with 3,500 upland and salt-tolerant wetland plants. St. Paul's School students have adopted the project site and are observing bird activity and monitoring plant growth. County staff is monitoring fish population abundance and diversity every six weeks from March through December of each year.

Another IAP was the enhancement of a freshwater and upland system than runs along the eastern border of the Belcher Elementary School property. County staff and the Florida Yard and Neighborhoods Program have been working with Belcher Elementary teachers and parents on the Belcher Backyard Nature Center. The Center aims to provide an opportunity for teachers, students and the community to observe, learn about, and respect nature by maintaining a natural habitat within the schoolyard environment. Project design and construction for Phase One, upland habitat enhancement, were completed in May 1997. Activities and lessons using the Center were developed and integrated into classroom curricula this year. Phase Two, wetland habitat enhancement, was also completed this year. Additionally, garden plots were planted between classrooms to increase plant diversity on school grounds.

Pinellas County funded a Dry Pond Demonstration Enhancement Project at Largo Fire Station 42. This is another IAP, illustrating how dry ponds can be an amenity to a community in addition to enhancing wildlife habitat. This project was designed by City of Largo and County staff. The site was planted in late 1997 by St. Paul's School students as well as County and City staff. The City of Largo maintains the project site.

For more information contact Mariben Espiritu-Andersen, Pinellas County Department of Environmental Management at (727) 464-4425.

LAKE TARPON BASIN MANAGEMENT PLAN - Lake Tarpon, a SWIM (Surface Water Improvement and Management Program) priority water body, is the largest freshwater lake in Pinellas County, with a surface area of approximately four square miles. The Lake Tarpon watershed is 52 square miles and is comprised of three drainage basins: Lake Tarpon, South Creek and Brooker Creek.

Lake Tarpon Basin Project

Lake Tarpon was considered to have excellent water quality and a valuable recreational fishing resource until the summer of 1987, when an algal bloom covered 80% of the lake's surface creating odor and aesthetic problems as well as fish kills. An advisory committee, the Lake Tarpon Management Committee (LTMC), established management goals to address diagnostic needs of the lake. The LTMC was an
effective advisory committee for a consultant hired by Pinellas County to complete a diagnostic/feasibility study. Since the Lake Tarpon sampling program began in 1988, Lake Tarpon has become more eutrophic. The Lake Tarpon District SWIM Plan was completed in 1989 and updated in 1994.

Following the completion of the diagnostic/feasibility study in 1992, Pinellas County hired a consultant to develop a Lake Tarpon Drainage Basin Management Plan. The Final Plan was submitted in October 1998. The Plan is a balance of projects to improve water quality, control nuisance aquatic vegetation and enhance wildlife and natural habitats without imposing on the beneficial human uses of the lake. The Final Plan is scheduled to be adopted by the Pinellas County Board of County Commissioners and the Pinellas-Ancolte River Basin Board by February 1999.

Implementation of projects recommended in the Plan are scheduled to begin in 1999. Projects may include creation of stormwater ponds, a revised lake level fluctuation schedule, and detailed monitoring programs to assess implementation success.

For more information contact Pam Leasure, Pinellas County Department of Environmental Management at (727) 464-4425.

LAKE SEMINOLE WATERSHED - Lake Seminole, in southwest Pinellas County, is the second largest lake in the County. Local and state agencies have received many complaints over the years regarding declining water quality in the lake. The Lake Seminole Diagnostic Feasibility Study showed that stormwater runoff is the major source of declining water quality in the lake. The watershed is highly developed, most of which occurred before any stormwater regulations were in effect. Most of the water inflow to the lake is from stormwater. This, combined with a stabilized water level, are contributing factors to the lake’s degradation. Lake Seminole has elevated nutrient concentrations resulting in high chlorophyll-a levels, as evident by its year-round pea-green color. The trophic state index for the entire lake is above 80, which places Lake Seminole within the hypereutrophic classification for Florida lakes.

After completion of the Diagnostic Study, Pinellas County and the District entered into an agreement for the development and implementation of a watershed management plan. The watershed management plan, which is scheduled for completion by the summer of 1999, will recommend activities and programs to improve water quality, flood control, and wildlife and vegetative habitat within the lake and watershed.

The County and the District initiated an ongoing program of cattail removal. Because cattails were forming a dense monoculture unsuitable as fish habitat, the Lake Seminole Advisory Committee, formed at

A: CATTAIL HARVESTING
B: RETENTION POND CREATION
C: STORMWATER POND REFURBISHMENT
D: WATER LEVEL CONTROL STRUCTURE

the project initiation and composed of study participants and citizen representatives, recommended that cattails be removed and revegetated with more desirable species. The changes should result in higher rates of sportfish recruitment and improve angler fishing success and satisfaction. More diverse and beneficial macrophyte communities should provide better habitat for wildlife species frequenting the Lake Seminole watershed and allow for improved boat navigation and aesthetics. Removal of cattail biomass will remove nutrients from the lake and preclude accumulation of organic matter that would occur if the plants were only treated chemically. To date about 20 acres of cattails have been removed. To provide lasting benefits to the improved macrophyte community, it is important to allow the lake to fluctuate regularly.

At the same time as entering into the agreement for the watershed management plan, the County and District also agreed to several projects for implementation in the watershed. The lake level fluctuation is being addressed as one of those projects. Weir modification involves the construction of an adjustable water level control structure, allowing for release of water from the...
lake. Permitting and construction of the weir will take place after completion of the watershed management plan and a fluctuation schedule has been adopted. The lake level can then be managed to follow a more natural hydrological cycle to maintain aquatic plant diversity and stimulate expansion of desirable species. Two additional projects planned for the Seminole watershed include creation of a new retention pond and refurbishment of an existing pond, both in Subbasin #6 of the watershed. The pond creation, adjacent to Seminole Boulevard at 89th Avenue, will be under construction in 1999. The 2.4-acre pond will treat the runoff from 66.5 acres of land and is designed to remove about 5% of the stormwater nutrient load to the lake. The refurbished pond, at 114th Avenue and 88th Terrace, will improve an existing 3.2-acre pond to provide better nutrient removal before discharging into Lake Seminole, and will treat the runoff from 67.8 acres. This project should also be underway in 1999.

For more information contact Nancy Page, Pinellas County Department of Environmental Management at (727) 464-4425.

ATMOSPHERIC DEPOSITION MONITORING - Pinellas County began a two-year atmospheric deposition study in June 1997. The study was designed to help determine the atmospheric nutrient load directly to the water surface of Lake Tarpon and Lake Seminole. The sampling equipment and methods measure bulk deposition and are based on the 1994-95 Mote Marine Study for TBNEP (Mote Marine Laboratory Technical Report #466). Samples are collected every Tuesday and analyzed for nitrogen and phosphorus.

Preliminary analysis of the first year’s data shows results falling within the range of other atmospheric deposition studies done in the Tampa Bay area. The graph shows a comparison of Tarpon and Seminole annual loads for June 1997 - June 1998 and also includes the Tampa Bay nitrogen load representing existing conditions (1985-91) as calculated from Zarbock et al. 1994 (Tampa Bay National Estuary Program Tech. Publ. #04-94). Pinellas County data compare 44 weeks of samples. The other eight weeks were removed because of equipment or contamination problems. The small differences between the two lake sites may be due to the variation of rainfall. Tarpon and Seminole received 58.1" and 54.4", respectively, during the 44 weeks samples were collected.

For more information contact Lisa Baltus, Pinellas County Department of Environmental Management at (727) 464-4425.

MANATEE WATCH LINE - One of the goals in the Conservation Element of the Pinellas County Comprehensive Plan is to find ways to protect manatees and their habitat. The Pinellas County Department of Environmental Management created the Manatee Watch Line Program in June 1992 to collect information regarding manatee sightings in Pinellas County waters. Information provided by citizens is used to identify areas and types of manatee activity and possible threats or hazards to manatees.

The Manatee Watch Line Program has helped increase public awareness of manatees through the County’s Speakers Bureau. The Department averages fifteen speaking engagements each year to schools and various civic organizations to help educate the public about manatees and their habitat.

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. The number of sightings reported in the Ft. DeSoto area has increased considerably over the past two years. The County has increased seagrass protection efforts in Ft. Desoto through boating restrictions and additional signage to educate the public about manatees. It is hoped that the observed increase in manatee activity in Ft. DeSoto is a result of these efforts.

Pinellas County was a member of the Manatee Protection Strategies Task Force, a workgroup responsible for providing recommendations about establishing manatee protection zones in Tampa Bay to the Agency on Bay Management for the Tampa Bay Estuary Program. The Task Force prepared a Position Paper of the Summary of Issues and Recommendations Concerning Protection of the West Indian Manatee in Tampa Bay. Pinellas County will continue to participate to assure successful implementation of manatee protection strategies.
For more information contact Pam Leasure, Pinellas County Department of Environmental Management at (727) 464-4425.

**STORM DRAIN MARKING PROGRAM AND STORMWATER HOTLINE** - Pinellas County Department of Environmental Management's storm drain marking program is off and running. The program began three years ago to educate citizens on stormwater pollution prevention to help minimize stormwater impacts to Tampa Bay from residential areas. Through volunteer efforts and increased public awareness, it is hoped that storm drain markings will reduce trash, debris, and nutrients flowing into Tampa Bay. The transition from spray paint and stencils to using aluminum plaques has made storm drain marking a safer and easier task for groups of all ages. Efforts have been concentrated in priority basins within unincorporated Pinellas County, including Allen's Creek, Lake Tarpon, and most recently, Lake Seminole. Data collected from these marking events are entered into the Department's Geographic Information System to map the precise location where storm drains have been marked. With over 1,000 drains marked and events already slated for next year, the marking program has been a huge success in 1998.

To further involve citizens with protecting Tampa Bay from stormwater pollution, the Department operates a **Stormwater Hotline**. By calling 464-5060, citizens can report suspected illicit discharges to the county's storm drain system. Messages left on the hotline are checked daily (workdays only) and addressed immediately by Water Resources staff in the Department of Environmental Management.

For more information contact Angela Young, Pinellas County Department of Environmental Management at (727) 464-4425.

**CITY OF SAFETY HARBOR**

The following Bay-related activities occurred in the City of Safety Harbor during 1998:

- Volunteers collected debris along the City's Tampa Bay shoreline during the annual Coastal Cleanup event in September.
- Construction of the Seminole Park phase of downtown drainage improvements began.

For more information contact Ron Rinzivillo, City of Safety Harbor (727) 724-1555.
The State of Baywide Programs and Projects

AGENCY ON BAY MANAGEMENT - 1998

The Agency on Bay Management remains focused on the protection and management of the Tampa Bay estuary. The diverse interests concerned with Tampa Bay are represented by members of the shipping industry; recreational and commercial fisheries; tourism; environmental regulators; industrial users; local, regional, state and federal governments; state legislators; scientists, researchers and the community at-large. The Agency serves as a forum for open discussion of the myriad issues involving the Tampa Bay estuary, and as a voice for protection, restoration, and wise use of the Bay by the entire region.

The Agency continued to support the efforts of the Tampa Bay Estuary Program (TBEP), which developed the Comprehensive Conservation and Management Plan, a long-term management plan for the Bay, and has begun implementing the plan. We also supported the Surface Water Improvement and Management Program (SWIM), the habitat and water quality restoration program of the Southwest Florida Water Management District (SWFWMD), as an important component of natural resource protection, restoration and management. These programs, as well as local initiatives to acquire, protect and restore natural habitats, enhance water quality, and moderate the impacts of development, are resulting in significant improvements to the Tampa Bay estuary and the region’s other natural features.

Topics which were presented to, and discussed by, the Agency during 1998 include:

ALAFIA RIVER NAVIGATIONAL CHANNEL - The US Army Corps of Engineers (COE) is studying alternatives for expanding the basin at the mouth of the river. Under consideration are construction of a new basin outside the river and widening the existing basin. The Agency provided comments to the COE, expressing concerns that should be addressed during the study.

MARINE LAW ENFORCEMENT REVENUES - Due to existing legislation, revenues collected by local marine law enforcement agents were placed in the state fund. This discouraged local governments from funding marine enforcement. The Agency requested the Tampa Bay legislative delegation to pass a law to return locally-collected revenues to local programs. The 1998 Legislature did pass such legislation.

PROJECTS FOR THE TBEP - The Agency assumed responsibility for three actions identified in the Draft Comprehensive Conservation and Management Plan (CCMP). These actions were: establishment and implementation of mitigation criteria for Tampa Bay; identification of manatee protection mechanisms to be implemented by local governments around the region; and restriction of off-road vehicle access along causeways and coastal areas. Two were completed in 1997. During 1998 work was completed by the Manatee Protection Strategies Task Force, and recommendations were produced for the Tampa Bay Estuary Program.

MASTER WATER PLAN PROJECTS - The West Coast Regional Water Supply Authority (now Tampa Bay Water) identified the need for alternative water supplies to replace wellfield sources in Pasco and northwestern Hillsborough Counties. The Agency requested presentations and information from the Authority on the various water supply projects. Agency staff attended many Board meetings to relay the Agency’s concerns. Several letters were sent to express the Agency’s concern over the time table and the information on-hand to make important and long-lasting decisions about the region’s future water sources. Agency concerns included, for each project:

Desalination: the need to identify potential environmental impacts from each proposed project - long-term, cumulative changes in salinity; impingement and entrainment, and to consider these impacts in the selection of the project site. Concerns were expressed about reliance on a study done by the SWFWMD and University of South Florida researchers on brine disposal in Antigua. Recommendations were made that a similar study as was performed at the Anclote site be conducted for the Big Bend site.

Surface Water Sources: the need to determine the potential effect of these projects and the proposed

State of Tampa Bay 35
withdrawal schedules on the ecological system, including gravitational residual circulation and biota.

Cumulative Impact Analysis: reviewed the analysis and determined that many additional issues should be addressed to gain a clear understanding of the potential cumulative impacts. Recommended that additional studies be done.

Water Use Permit Applications: The Agency requested that it be included as a technical reviewer of the Water Use Permit applications submitted by Tampa Bay Water for the Tampa Bypass Canal, Alafia River, and Brandon Urban Dispersed Wellfield projects, after identifying a number of deficiencies in the Cumulative Impact Analysis. A listing of the positive aspects of the projects, as well as the concerns and information needs, was provided to the SWFWMD.

Tampa Bay Regional Planning Council/Agency on Bay Management Action Plan for Implementing the Comprehensive Conservation and Management Plan for Tampa Bay - In order to participate in the process, the Council and Agency prepared a plan, specifying actions that would be undertaken to address each Action identified in the CCMP where the RPC or the Agency had been listed as a responsible entity.

Port Manatee Berth Improvements - The Agency provided recommendations to the FL Department of Environmental Protection on the proposal to add two berths and improve access to the port. Modifications to reduce the expected amount of seagrass loss and other environmental impacts and optimize mitigation options were suggested. The Port is continuing to work on the project design.

City of St. Petersburg’s Class I Injection Wells - The City was facing the abandonment of its deep injection wastewater wells due to the movement of fluid into the Underground Source of Drinking Water (as classified by the U.S. EPA). The Agency recommended that the U.S. Environmental Protection Agency adopt new rules to allow continued use of the City’s wells where the overlying water strata is not proposed for public use, so that the City would not be forced to treat the water to tertiary standards and discharge it into Tampa Bay and Boca Ciega Bay. Such a process would add an additional 114 tons of nitrogen per year to the already over-nutriified estuary.

Port Tampa Cut “G” Maintenance Dredging - The Agency recommended to the US Army Corps of Engineers that the dredged hole located near the channel be used as a disposal site for the dredged material. It also recommended further analysis of the value of such deep holes for sport fish species, since research has already shown that these man-made structures appear to be heavily used by large fish during certain times of the year.

Southwest Florida Water Management District Surface Water Improvement and Management Program - The Agency continued its support of the SWIM Program. During this year the Program proposed to revise its Priority list of water bodies. Tampa Bay remains #1 Priority Water Body for the SWFWMD Program, and two others - Lake Thonotosassa and Lake Tarpon, are also within the Tampa Bay watershed. The Program also updated its Plan for Tampa Bay, identifying the ways it will accomplish its mission of water quality and habitat improvements, and how its actions will assist in implementing the CCMP.

State of Tampa Bay Report - Last but not least, the 1997 Report was produced for the State Legislature and the public. This report summarizes the numerous research and restoration efforts underway around the Bay. It also highlights various issues and activities undertaken during the year.

Other Activities - Agency staff, which is also staff to the Tampa Bay Regional Planning Council, serves on various committees on behalf of the Agency or the Council:

The West Central Florida Air Quality Coordinating Committee, which includes a seven-county area to address air-related issues. This group sponsored a workshop/forum to educate local officials and the general public about the state of air quality in the region, the impending changes in our designation as an attainment area, and the ramifications of such a change.

The Hillsborough River Interlocal Planning Board’s Technical Advisory Council, reviewing issues affecting the health of the river.

The Tampa Bay Harbor Safety Committee, a group of public and private interests devoted to implementing the Vessel Traffic System for the Bay. This system will increase safety and reduce the incidence of spills and collisions by providing substantially more information to pilots and ship captains as they traverse the Bay’s long and narrow channels.

The Cockroach Bay Aquatic Preserve Management Advisory Team, formulating a plan for protecting and managing the Bay and the Little Manatee River.

The Tampa Bay Estuary Program’s Technical Advisory Committee, providing scientific expertise as requested by the Program.

For more information contact Suzanne Cooper, ABM staff (727) 577-5151 x240
The Southwest Florida Water Management District’s SWIM Section remained focused on habitat restoration projects and stormwater retrofit projects consistent with the Tampa Bay SWIM Plan and the Tampa Bay Estuary Program’s Comprehensive Conservation and Management Plan (CCMP). Since the inception of SWIM by the Legislature in 1987, 40 habitat restoration projects and 28 stormwater retrofit projects have either been completed or are being designed, permitted or constructed by SWIM staff. In addition to the restoration projects, SWIM staff have continued the biannual seagrass mapping and monitoring program and have been active participants in many Bay management-related committees, work groups and special meetings.

For the 1998 State of the Bay document, the District has chosen to highlight a few activities rather than try to describe the progress on all of the projects. The following are summaries of three significant projects that the SWIM Section was involved with in 1998: the Emerson Point Habitat Restoration Project, the Mobbly Bay Habitat Restoration Project, and Seagrass Mapping in Tampa Bay.

**Emerson Point Habitat Restoration Project**

Emerson Point is a rare and precious coastal feature located in southeastern Tampa Bay within Manatee County. This peninsula comprises most of western Snead Island lying between extensive seagrass beds and the Terra Ceia Aquatic Preserve to the north and the low-salinity waters of the Manatee River to the south. In 1991, the State of Florida’s Conservation and Recreation Land Acquisition (CARL) Program purchased an 195-acre parcel at Emerson Point that had been predominantly used for agriculture during the last century. The property has since been leased to Manatee County for the purposes of establishing and operating a recreational park sensitive to the significant natural and archaeological resources of the area. The District and Manatee County entered into an agreement to restore the site in 1996. Much of the perimeter of the island is comprised of mangrove forests and tidally-influenced mosquito ditches, while the more central areas have freshwater wetlands, hardwood hammocks, and a number of archaeological features including remnant Native American shell mounds and several early 20th century farm homes. The entire northern coastline lies adjacent to lush seagrass beds and a relatively undisturbed bay bottom community which support healthy sportfish (snook, redfish, trout) populations. Approximately 50-70 acres of the site have been infested by exotic or nuisance vegetation including Brazilian pepper, Australian pine, and punk trees (*Melaleuca* sp.). These disturbed upland areas and a series of ditches and borrow pits which alter the natural hydrology of the site were in dire need of restoration.

**Emerson Point, view from the west**

Due to its size, Emerson Point will be restored over a period of several years. Restoration of freshwater and estuarine wetlands totaling approximately 30 acres was started in April and should be completed by early 1999. Staff from the District's Operations Department have constructed the majority of the project by skillfully creating a series of meandering channels, marsh platforms, and open water ponds while leaving the existing natural habitats in place. Created intertidal wetlands have been replanted with native marsh grasses like *Spartina alterniflora*, *S. patens*, and *Paspalum distichum*. These grasses are able to colonize bare areas rapidly, have a high survival rate, reduce erosion, provide a source of food and refuge for small fish and invertebrates, and help trap mangrove seedlings which eventually colonize the fringes of the marsh. Additional upland restoration will be enhanced by planting native trees, shrubs, and grasses during the next few years.

Funding for the restoration project was contributed by a number of sources including the State's SWIM Trust Fund ($146,000), the District's Manasota Basin Board ($97,000), Manatee County ($20,000), Florida Department of Environmental Protection ($177,000), Tampa Bay Estuary Program ($60,000), Department...
of Labor - Job Training Partnership Act ($12,000), and the National Association of Counties ($8,500 through a grant from the U.S. Environmental Protection Agency - EPA). Approximately $70,000 of the initial construction costs were funded through an agreement developed with the EPA and Gulf Coast Recycling, Inc. as part of a Superfund mitigation decree.

**Mobbly Bay Habitat Restoration Project** - The Mobbly Bay habitat restoration project is a cooperative effort between the District and the City of Oldsmar to restore and enhance approximately 15 acres of coastal wetlands in Old Tampa Bay. Tampa Bay has lost an estimated 11,000 acres of valuable intertidal emergent wetland habitat and approximately 80% of its seagrasses over the last 100-150 years. The habitat restoration and enhancement project in the Mobbly Bay area will help reestablish critical nursery and feeding habitats for recreational sportfish and wildlife such as blue crab, shrimp, snook, redfish, seatrout, mullet, and shorebirds.

The project is located on several tracts owned by the City of Oldsmar and Pinellas County. The majority of the project lies within the Florida Power Corporation easement to the east of and parallel to Country Club Drive and south of Patty Drive. The project site is composed of several small open-water ponds or borrow pits, open fields, and forested wetlands and uplands. Marsh platforms were planted by volunteers (high school students, college students, Girl Scouts, Coastal Conservation Association) organized by Tampa BayWatch and a private horticultural contractor.

The project was constructed by the District's Operations Department with technical assistance from the City of Oldsmar. Funding for the project was provided by the State of Florida's Surface Water Improvement and Management (SWIM) Program, the Pinellas-Anclote Basin Board of the Southwest Florida Water Management District, and Gulf Coast Recycling, Inc. through the direction of the EPA. The total cost to complete the project was approximately $160,000.

**Seagrass Mapping in Tampa Bay** - Seagrasses are a vital component of marine ecosystems and are present in most shallow coastal waters throughout the world. By binding sediments and baffling waves and strong currents, seagrasses can reduce coastal erosion and provide important nursery and foraging habitat for a variety of economically-important fish and shellfish species. In Florida, seagrasses have been identified as a valuable habitat, both economically and ecologically, and so monitoring seagrass distribution and health has become a useful resource management tool for several important estuaries including Tampa Bay, Sarasota Bay, and Charlotte Harbor.

Five species of seagrass are common in southwest Florida including *Thalassia testudinum*, *Syringodium*...
filiforme, Halodule wrightii, Ruppia maritima, and Halodule spp. In Tampa Bay, Lewis et al. (1981) estimated that as much as 80 percent of historic seagrass beds had been lost since the late 1800s as a result of dredging, pollution, and poor water clarity. Extensive seagrass loss has occurred in other coastal areas such as Clearwater Harbor and Sarasota Bay, however, Charlotte Harbor and Lemon Bay support extensive seagrass beds which have been less impacted by urbanization and coastal development. To assess the temporal and spatial changes in coverage and health, a number of initiatives have recently been implemented.

In 1988 the District began mapping seagrasses every other year to assess trends in seagrass distribution in the Tampa Bay estuary. In 1990 Charlotte Harbor was included, followed by Sarasota Bay and Lemon Bay in 1994 - St. Joseph's Sound was included in 1996. Historic photography was obtained for both Charlotte Harbor (1982, 1988) and Sarasota Bay (1988) which were photo-interpreted to determine historical trends in seagrass distribution.

Seagrass distributions are affected by a number of factors including light availability, water depth, pollution, sediment characteristics, temperature, salinity, epiphyte colonization, and morphological and physiological adaptations to a combination of these various physical factors. In Tampa Bay, seagrasses are being used as an ecological barometer for water quality and are mapped to assess trends in pollution reduction strategies. Seagrasses have also been monitored using field studies to assess the importance of various water quality parameters on seagrass growth and productivity.

In general, Tampa Bay has experienced consistent, measurable gains in seagrass coverage since 1988. Based on photo-interpretation and mapping, seagrass coverage in Tampa Bay has increased an average of 2% per year between 1988 and 1996. At this rate, it is estimated that seagrass coverage could reach the established goal of (35,000 acres) within 20-24 years. Approximately 90% of seagrasses in the Tampa Bay area occur at depths between 3 to 6 feet (1 to 2 m) and the greatest increases in seagrass acreage have occurred in this depth zone over the past eight years. Thinning of seagrass beds has increased more than thickening in Tampa Bay between 1988 and 1996.

The recolonization of once-barren shallow subtidal platforms are most likely the result of improving water clarity (and light penetration) which can be affected by normal and stochastic weather events that result in variable rainfall, streamflow, and nutrient loading to the estuary. Many of the observed increases in seagrass coverage are believed to be directly linked to improving water quality resulting from the efforts of many local governments and agencies to reduce point and non-point source pollutant loads to the bay. Additional increases in seagrass coverage are expected to occur if water quality continues to improve in the bay.

Continued mapping is recommended and will continue to be a valuable tool for assessing trends in the "health" of this important ecological indicator for Tampa Bay. Since the depth to which seagrasses grow is a critical component of several resource management initiatives for the estuary, detailed bathymetric data will be needed in order to more accurately assess linkages between water quality/clarity, light penetration, and growth of seagrasses into deeper waters.

For more information, contact Mike Perry, SWIM staff, at (813) 985-7481.

TAMPA BAY ESTUARY PROGRAM

Commitment to Action
In February the Tampa Bay Estuary Program capped nearly six years of scientific research and community dialogue about the future of Tampa Bay with the signing of a landmark agreement that commits local governments and regulators to implementing Charting the Course, the far-reaching master plan for bay restoration and protection. This unique agreement - the first of its kind in the nation - was ratified on February 12 in a special ceremony at the Belleview Hotel in Belleair.

Under the Agreement, the Tampa Bay Estuary Program became an independent entity responsible for overseeing implementation of Charting the Course. All six major local governments in the Tampa Bay area - Pinellas, Manatee and Hillsborough counties and the cities of Tampa, St. Petersburg and Clearwater - are parties to the Agreement along with the Southwest Florida Water Management District, the Florida Department of Environmental Protection, the Tampa Bay Regional Planning Council, the Tampa Port Authority, the Environmental Protection Commission of Hillsborough County, and the Florida Game and Fresh Water Fish Commission. Additionally, the U.S. Environmental
**Figure 1**


**GOAL:** “Hold the line” at nitrogen loading estimated for 1992-1994. To compensate for expected growth, reduce or preclude additional nitrogen loading by 17 tons per year (beginning in 1995).

**STATUS:** 1995-1999 reduction goals for all bay segments are expected to be met by the end of 1999.

**Figure 2**

Acres of Seagrasses: 1988 - 1994

**GOAL:** Recover an additional 12,350 acres of seagrass over 1992 levels, while preserving the bay’s existing 25,600 acres.

**STATUS:** Since 1988, seagrass acreage is increasing at about 500 acres per year. At this rate, the goal will be reached in 25 years.
Protection Agency and the U.S. Army Corps of Engineers entered separate agreements with the restructured Tampa Bay Estuary Program entity that specify their contributions and responsibilities for achieving bay improvement goals.

The Interlocal Agreement secures commitments from each NEP partner to achieve specific bay restoration and protection targets within an agreed-upon time frame. How those goals are met, however, is up to the individual governments, who may choose the most affordable and environmentally-beneficial options for their community from among a variety of alternatives. Pursuant to the Interlocal Agreement, each party has submitted a detailed action plan describing the projects and actions it either has or will undertake during the first five-year planning cycle (1995-1999) that contribute to achieving the goals of the Plan.

On a parallel track, industry and government partners on the Estuary Program's Nitrogen Management Consortium completed a comprehensive Nitrogen Management Action Plan with the aim of capping nitrogen loading to the bay at the average 1992-1994 level. By "holding the line" on nitrogen loading, water clarity should be sufficient to allow the recovery of more than 12,000 acres of seagrasses. Seagrasses serve as a natural life support system for the bay. A special ceremony was held in September at the CF Industries facility at the Port of Tampa to recognize the contributions of the Consortium's private-sector members in controlling nitrogen inputs.

Progress Toward Goals

Taken together the projects in the action plans of local governments and agencies, along with industries participating in the Consortium, represent excellent progress toward the goals for bay recovery. On the nitrogen management front, the 105 projects included in the Nitrogen Management Action Plan will reduce or prevent the discharge of approximately 120 tons of nitrogen per year to the bay, exceeding the goal by more than 30 tons per year. The nitrogen management goals and expected reductions for each major bay segment are displayed graphically in Figure 1.

Industry members of the Consortium which includes representatives from the phosphate and fertilizer manufacturing and shipping industries, electric utilities and agricultural interests, contribute almost 50 percent of the total nitrogen load reduction. Governmental bodies contribute the remainder. This cooperative approach to natural resource management represented by the Nitrogen Management Consortium has been recognized with a Sustainable Florida Award for Leadership by the Governor's Council for Sustainable Florida.

In response to nitrogen management efforts, seagrass coverage in the bay continues to expand at a rate of approximately 500 acres per year. The trend in seagrass recovery for the period 1982 through 1994 (the most recent year for which results are available) is shown in Figure 2.

Another major goal of Charting the Course is the restoration of an optimum balance of wetland and associated upland habitats for fish and wildlife, while protecting and enhancing existing habitats. Specific targets include:

- protecting and enhancing the bay's mangrove and salt marsh communities which total nearly 150 acres;
- restoring a minimum of 100 acres of low-salinity tidal marsh every five years; and
- restoring and protecting small freshwater ponds, critical to the survival of White ibis.

During 1995-1999, SWFWMD, FDEP and other TBEP partners anticipate furthering those targets as follows (see Figure 3):

- 123 acres of coastal habitat restoration in Old Tampa Bay;
- 140 acres of coastal habitat restoration in Hillsborough Bay;
- 575 acres of coastal habitat restoration in Middle Tampa Bay;
- 710 acres of coastal habitat restoration in Lower Tampa Bay;
- 40 acres of coastal habitat restoration in Boca Ciega Bay;
- Of the 1,600-acre total, 250 acres of low-salinity habitat will be created or restored, far exceeding the five-year goal of 100 acres; and
- 1,000 acres of freshwater habitats specifically designed as a forage area for White ibis and other wading birds within the feeding area for the Alafia Banks bird rookery.

Ongoing Research and Target-Setting

The Estuary Program is actively conducting research on three priority issues identified in the CCMP, with the objective of developing scientifically-sound bases for actions to address those issues. The issues are: (1) the causes and effects of atmospheric deposition of nitrogen compounds and toxic contaminants; (2) developing numeric targets for sediment quality in the bay; and (3) identifying appropriate public health indicators for subtropical areas such as Tampa Bay.

The TBEP and other partners are currently working on eight separate but related projects addressing the characterization, sources, and impacts of atmospheric deposition of pollutants to Tampa Bay and its watershed. Among those efforts is: the ongoing, intensive monitoring of wet and dry deposition of nitrogen at the
Figure 3
Tampa Bay Estuary Program

- Expected oligohaline habitat: 250 acres.
- Expected total estuarine restoration: 1589 acres.

GOAL: Restore historic balance of coastal wetland habitats in Tampa Bay by restoring at least 100 acres of oligohaline habitat every five years, for a total increase of 1800 acres.

STATUS: A total of 250 acres of oligohaline habitat will be restored in all bay segments, exceeding the goal by 150 acres.

Chlorophyll-α Concentration Trends

TARGET: Maintain segment-specific chlorophyll-α concentration equal to the lowest of either the annual average of 1992-1994 or the concentration that supports the seagrass restoration goal.

STATUS: Average annual chlorophyll-α levels for each bay segment have fluctuated above and below the targets since 1994. No obvious trends over time are apparent.
Gandy site in Tampa; a project to estimate the relative contribution of atmospheric deposition to stormwater; quantifying trace metals and other contaminants in ambient air; and a Bay Regional Atmospheric Chemistry Experiment (BRACE), being conducted principally by FDEP to estimate the contribution of emissions from motor vehicles and stationary sources to atmospheric deposition.

In July the Science Advisory Committee of the national Sediment Quality Assessment Group met in a workshop format to help develop a draft strategy for setting measurable targets for sediment quality in Tampa Bay. The Committee recommended a five-step strategy based on using a "weight-of-evidence" approach to assess the relative importance of a number of parameters to sediment quality in a particular area of the bay. Results of the assessment will be used to develop site-specific sediment quality targets and management strategies.

In September the Policy Board of the TBEP approved the Program's participation in a project entitled "Tampa Bay Healthy Bay and Beaches" which will establish reliable indicators of pathogens and methods for identifying the sources of pathogens. In the final step of the project, Bay and Gulf swimming beaches will be surveyed using the indicators and methods developed in the previous steps. This 18-month project is being cooperatively funded by SWFWMD, TBEP, and the Pinellas County Visitors Bureau.

Communicating Our Successes

Efforts to involve area citizens in bay protection remain a key component of the management strategy for Tampa Bay. The Estuary Program's Community Advisory Committee (CAC) continues to provide valuable input on bay management priorities, as well as assistance in educating residents about bay problems and solutions.

In September the Community Advisory Committee sponsored a public forum exploring the pros and cons of desalination as a water supply solution for the region. This informative, science-based forum, which featured a panel of community representatives and impartial experts, was filmed and broadcast on public and government access stations throughout the bay area.

CAC members also served as judges for the Bay Mini-Grants Program, which awards grants of up to $5,000 to community groups, schools and civic organization for bay improvement projects. Ten projects were selected for funding with the $30,000 available; the winning projects included a monofilament line recycling program at Cockroach Bay; shoreline restoration at a school in Clearwater; a workshop to teach bay-friendly operating practices to marina and boatyard operators; and creation of an Internet site to educate area schoolchildren about marine debris.

The Estuary Program also sponsored a baywide manatee awareness program, through the Manatee Awareness Coalition (MAC). Members include commercial and recreational fishermen, scientists, educators, environmentalists and boating experts. The MAC was formed in 1998 to implement the recommendations of the Manatee Protection Strategies Task Force, which advocated a largely voluntary program to encourage boaters to go slow in shallow-water seagrass habitats where manatees feed and rest. The MAC developed "Manatee Watch" to accomplish this goal. Coordinated by Tampa BayWatch, Manatee Watch will recruit and train citizen-volunteers to provide both on-water and shoreside information to boaters about how to avoid hitting or disturbing manatees in Tampa Bay. Maps identifying the recommended slow-speed zones in Tampa Bay also were developed by the MAC as a companion to the Tampa Bay Boaters Guide.

Other public outreach activities of the Estuary Program included development of a new, user-friendly Internet site (www.tbep.org) that features color photos of key bay inhabitants; an extensive "How You Can Help" section with specific bay protection tips for boaters, homeowners and other bay users; an electronic order form for TBEP publications; and a community bulletin board where users can exchange information or find out about volunteer opportunities.

For more information contact Nanette Holland at (727) 893-2765.

UNITED STATES COAST GUARD MARINE SAFETY OFFICE TAMPA

The United States Coast Guard (USCG) Marine Safety Office (MSO) Tampa had a busy year in 1998. Several new programs, initiatives and partnerships were brought on line to streamline internal operations, increase outreach efforts, educate the public, and drastically improve and enhance safety on Tampa Bay. Significant events and accomplishments of the past year are summarized below, which are in addition to the day-to-day operations of the MSO. By continuing to move forward in the areas of contingency preparedness, waterways management, pollution prevention and response, and vessel inspection programs, we can continue to ensure that Tampa Bay remains at the nation's forefront in marine environmental protection and vessel safety programs.
PREPAREDNESS AND PARTNERSHIPS

This past summer, Admiral Loy succeeded Admiral Kramek as Commandant of the USCG. Admiral Loy’s personal motto, adopted by the USCG, is “PREPARATION EQUALS PERFORMANCE.” The MSO turned this concept into a way of doing business, as several events undertaken by the Port Management Department were highly successful in enhancing the USCG’s and maritime community’s ability to respond to incidents in the future by increasing communications and sharing training, knowledge and resources.

CRUISE SHIP FIREFIGHTING EXERCISE: In March, the department designed, coordinated and executed a full-scale, first of its kind fire-fighting exercise utilizing an operating cruise ship and its full complement of passengers. The exercise tested the marine fire-fighting and response capability of the USCG and local fire departments, as well as state and county emergency management personnel. Over 300 people from 26 different agencies came together to test their response capabilities and operational readiness. The cruise ship REGAL EMPRESS provided the real-life platform for the exercise, and as the ship docked at Port Manatee with a simulated fire aboard, over 800 passengers were evacuated from the vessel. The evacuation of the passengers, the deployment of fire-fighting personnel and extensive firefighting equipment, K-9 search units, thermal imaging and other technology, along with air medevac and water-side asset use ensured a realistic exercise. The local fire departments, emergency personnel, and the owners, operators and crew of the passenger vessel received invaluable training.

THREE-VEssel COLLISION LESSONS-LEARNED CONFERENCE: In November the MSO hosted a two-day conference which focused on reviewing the events and lessons learned during the 1993 collision of three vessels and subsequent oil spill on Tampa Bay. The conference was attended by over 150 people from more than 60 different organizations, including private industry; state, federal and local government officials. During the conference, 23 speakers discussed the collision of three vessels on August 10, 1993, which resulted in several explosions and the release of over 350,000 gallons of oil. The conference examined the response to the incident and lessons learned, and focused on improvements made in the past five years in the areas of marine fire-fighting and oil-spill response. It also looked forward to future expected physical and technological changes which will enhance the safety of navigation on the Bay. The distinguished panel of speakers and presenters included many of the individuals involved in the actual response, including representatives of the responsible vessels’ owners. This highly successful event served as a conduit for further discussions and partnerships with all maritime interests on the Bay.

POLLUTION RESPONSE AND PREPAREDNESS EXERCISES: Personnel attended several fire-fighting training sessions sponsored by industry, as well as classroom instruction in chemical releases, hazardous material and oil pollution response and clean-up. Three unannounced oil-spill drills were conducted this year. These surprise exercises are designed to test a facility’s ability to respond quickly to a discharge of 50 barrels or less while transferring oil. MSO personnel conducted these exercises at Florida Power and Light’s Boca Grande facility, Martin Gas, and the Tampa Pilot Station at Egmont Key. All the facilities successfully demonstrated an ability to conduct a rapid
response. MSO personnel also attended a full scale exercise in Savannah, Georgia conducted under the national Preparedness for Response Exercise Program (PREP) guidelines which were promulgated by the Oil Pollution Act of 1990 (OPA 90) in response to the EXXON VALDEZ disaster.

AREA CONTINGENCY PLAN: Immediately following the conference in November, a full area committee meeting was held to chart the future course of the Area Contingency Plan (ACP.) The committee appointed an Executive Steering Committee comprised of the chairs of each of the subcommittees, the Federal On-Scene Coordinator, the State On-Scene Coordinator, and one at-large member. This January the committee will meet again to discuss various aspects of the ACP, including updating area sensitivity maps, the feasibility of dividing the plan into geographic areas, and potential future format changes.

WATERWAYS MANAGEMENT INITIATIVES

Throughout this past year, the MSO continued to work closely with the port community to develop new partnerships and programs and expand those previously in place.

PORT HEAVY WEATHER ADVISORY GROUP: The Advisory Group, consisting of representatives from the USCG, Tampa Port Authority, Port Manatee Port Authority, Tampa Bay Pilots, and Tampa Bay Towing, provides recommendations and advice to the Captain of the Port in the event of heavy weather. The Advisory Group had its first test during the recent hurricane season with the threat of Hurricane Georges. The Advisory Group provided the Captain of the Port with accurate and timely recommendations for port closures and placement of vessels to ensure the safety of the vessels and port facilities. Ongoing recommendations were made for denying or granting entry to vessels into port. This Advisory Group truly embodies the Commandant’s motto of “PREPARATION EQUALS PERFORMANCE,” and is a shining example of the success of partnerships within the port community.

VESSEL TRAFFIC INFORMATION SYSTEM: Under the guidance of the Tampa Bay Harbor Safety Committee, the implementation of a state-of-the-art Vessel Traffic Information System (VTIS) for Tampa Bay continued full steam ahead. In May a Memorandum of Understanding was signed between the USCG Headquarters, Washington, D.C., the Chairman of the Tampa Bay Harbor Safety Committee, and the local Captain of the Port, formalizing the partnership to share resources and to develop, fund and place in service a model port and waterway management system. In August the contract for the system was awarded to Ross Engineering, with the delivery of 26 units beginning in November. The extensive work involved in implementing the VTIS is being accomplished through several subcommittees, including the Technical, Operations, and Finance subcommittees. The system’s primary components include an all-weather portable precision navigation system which utilizes laptop computers and the USCG’s Differential Global Positioning System (DGPS). This system will not only provide the vessel with precise information regarding its own position, but will show the location and maneuvering data of other vessels in the system. In addition to providing the vessel’s master and pilot with a wealth of information for making navigational decisions, the system will have the ability to “see through” the fog and thunderstorms which are common on the bay and which often clutter and render useless conventional radar.

Future plans for continued implementation of the VTIS include upgrading VHF communications, establishing a Vessel Traffic Center jointly staffed by personnel from the USCG, Port Authorities, pilots, and local maritime companies, and the development of a comprehensive Harbor Safety Plan. The implementation of the Tampa Bay Vessel Traffic Information System is a model public/private partnership for the nation. Experts believe that the 1993 collision may not have happened had such a system been in place at that time.

CRUISE-SHIP ACTIVITY: The Port of Tampa has seen an increase in cruise-ship activity over the past year. In November, a new ferry service from Tampa to Mexico was started by American Viking Line. The SCOTIA PRINCE carries cars and passengers on a bi-weekly basis. In addition, in December the 2,599-passenger, 855-foot SENSATION began service from Tampa. This is the largest cruise vessel to...
call Tampa home; so large that many of the Tampa Bay pilots "practiced" bringing the vessel into port on a ship simulator located in Dania, FL prior to the actual arrival. The TROPICALE and NOORDAM continued their weekly schedules, as did the REGAL EMPRESS out of Port Manatee.

ANTI-TERRORISM EFFORTS: In addition to closely monitoring the cruise ship and terminal activity, the MSO worked closely with local law enforcement officials to identify potential threat sites, minimize exposures and train for response to terrorist activities. Four bomb threats to area bridges were reported, including three to the Sunshine Skyway Bridge. MSO Tampa joined in a coordinated response to these threats with Florida Highway Patrol, Florida Marine Patrol, State Department of Transportation, and others by establishing a safety zone in the vicinity of the bridge, effectively closing the waterway to all traffic. Close liaison was established with Tampa pilots and the Tampa Port Authority to ensure the safety of commercial vessel traffic. As a result of the threats, several meetings were held with all responding agencies to develop a multi-agency response plan.

VEssel Inspection Activity and Programs

SHIPYARD ACTIVITY: MSO personnel were involved in implementing and enforcing a wide variety of new U.S. and international regulations, overseeing vessel construction projects, and implementing state-of-the-art vessel-inspection programs. Inspectors oversaw two unique projects involving large-scale vessel conversions: a 90' mid-body extension of a Gulfcoast Transit Company ocean-going coal/phosphate barge; and the conversion of one of the first ocean-going single-hull oil tank barge to a double-hull tank barge, required under OPA 90. Working closely with the American Bureau of Shipping (ABS) surveyed, Tampa Bay Shipyard and Repair (TBSR) personnel, and Maritrans company representatives, the year-long double-hull project involved monitoring the construction, testing of welds and updating all documentation for the newly-constructed 7.4 million-gallon, 12-cargo tank module which was placed inside the existing 460', 11,800 gross ton, Maritrans hull.

Another major result of the OPA 90 legislation impacting the Tampa Bay shipyards was a program called the Enhanced Survey program for all remaining single-hull oil-carrying tankships and tank barges over 5,000 gross tons. This program required an intense, close-up survey of the vessel's internal structure, looking for deteriorated and cracked framing and thinning hull plating during the vessel's normal drydock period. Since the port of Tampa Bay is one of the leaders for ship repair in Florida and the Gulf of Mexico, MSO Tampa and ABS conducted seven of these enhanced surveys, resulting in one of these barges being taken out of service. MSO Tampa took the lead in this type of vessel inspection and developed lessons learned that were forwarded to USCG Headquarters as a "best practice" instruction.

FACILITIES INSPECTIONS: MSO Tampa waterfront facility inspectors worked closely with Tampa Port Authority and industry representatives in the development of a one-mile voice and audible hazardous chemical release warning siren system which was brought on-line and successfully tested for the first time in August. This system can be activated from any of the port's three Anhydrous Ammonia facilities or the Hillsborough County EOC to warn local residents and businesses within one-mile of the facilities of a potential hazardous gas release. The facility inspectors continued to conduct routine inspections and cargo transfer monitors at area facilities and conducted detailed review of emergency response plans.

PASSENGER VESSEL SAFETY: Another major initiative undertaken this past year will serve to maximize safety aboard gaming and dinner-cruise vessels carrying between 150 to 800 passengers. Our Commercial Vessel Branch, in cooperation with the vessel owners and operators of these large passenger vessels, began implementing safety measures that go above and beyond the present regulations. Emergency Evacuation Plans (EEP) were developed for these vessels. The EEPs provide training for the vessels' crews in dealing with emergencies such as shipboard fires, a person overboard, passenger care, and transit of passengers to a designated emergency muster area. Although not required, this positive step greatly increases the overall safety of both passengers and crew aboard such vessels.

This past year, MSO inspectors also conducted an intense enforcement initiative on all passenger ships under the Retroactive Fire Safety Amendment (RFSA) to SOLAS. These vessel inspections were the result of fire safety improvements for ships based on catastrophic loss of life as a result of fires on passenger ships. The RFSA examinations conducted by MSO Tampa resulted in the thorough review of the fire-fighting capabilities, fire-detection and structural fire protection onboard very large passenger ships.

FOREIGN VESSEL INSPECTIONS: The Port State Control Branch enforces U.S. and International regulations on all foreign vessels entering Tampa Bay. The primary goal is the elimination of substandard vessels from U.S. ports. Foreign-flag vessels are targeted for boarding based on a risk assessment matrix, taking into account the safety record of the ves-
sel, its owner, flag and classification society. Those vessels posing the highest risk are required to be boarded prior to entering Tampa Bay, or must show they pose no immediate risk to the environment or the safety of the port. In 1998, MSO Tampa conducted more than 1,500 commercial vessel inspections; resulting in the detention of 23 substandard vessels. In ensuring the Commandant’s goal of reducing these substandard vessels, over the past three years we have experienced an annual decrease in the number of substandard vessels entering the port.

On July 1, newly-adopted International regulations were implemented requiring certain bulk-freight ships, tank ships and passenger-ship companies to develop written environmental and safety policies for their vessels. The International Safety Management (ISM) Code greatly impacted this port since a large number of bulk carriers, tank ships and cruise ships call on the Port of Tampa. MSO Tampa was the first USCG office to detain a foreign vessel for a violation of this regulation promulgated under the Safety of Life at Sea (SOLAS) Convention. Almost immediately after the regulation became effective, a loaded foreign-flag tanker had a near miss with a USCG cutter in the Caribbean Sea. Upon docking at Tampa, a complete audit of the vessel’s Safety Management System was conducted by the USCG and the issuing authority, resulting in the detention of the vessel until corrective actions were implemented.

**POLLUTION PREVENTION AND RESPONSE**

The MSO is responsible for the investigation and mitigation of oil spills and hazardous material releases in coordination with other federal, state and local enforcement agencies. This past year that responsibility included the investigation of over 410 pollution reports, holding steady with the 404 spills reported in 1997. The department also conducted investigations of all marine casualties, seeking to determine the root cause and identify ways such incidents may be prevented.

**OIL SPILLS:** Of the 410 reports of spills to date, it was determined that approximately 2,250 gallons were released into the waters of Tampa Bay or the Gulf of Mexico in close vicinity of the West Coast of Florida. Each of these incidents was investigated by the USCG in close coordination with the Florida Marine Patrol and the Florida Department of Environmental Protection (FDEP). In about half of these cases a responsible individual could not be identified due to the product dissipating and quickly moving away from its original source. Where a known source was identified, some form of enforcement action was taken, such as a letter of warning, a monetary ticket issued by the on-scene USCG pollution investigator, or a civil penalty administered by a USCG Hearing Officer.

Two reports of interest in 1998 involved large commercial ships. One vessel entered port after experiencing storm damage in which pipe, carried as cargo on deck, was washed overboard and punctured a hole in the ship’s cargo tank at or below the waterline. The vessel spilled 14,300 gallons of its cargo-soybean oil - into the Gulf of Mexico. The USCG Captain of the Port, in consultation with the FDEP, permitted entry into Tampa Bay only after a helicopter over-flight confirmed the vessel was no longer leaking oil. The vessel was boomed immediately upon docking and it was discovered that a small amount of hydraulic oil was leaking from the propeller shaft. In the second case, a ship was found to be leaking jet fuel at the dock through a pin-hole leak in the ship’s hull. Environmental precautions and structural repairs were performed immediately.

**ENVIRONMENTAL OUTREACH PROGRAMS:**

MSO pollution responders recently initiated several new programs in an effort to educate commercial and recreational boaters on ways to prevent oil and hazardous debris from entering Tampa Bay waters. One new program is aimed at reducing the number of mystery spills through an environmental outreach program.

The program is entitled “Solutions to Pollution” and focuses on the recreational boating public and marinas. Educational brochures, being hand delivered to marinas by MSO pollution responders and the USCG Auxiliary, offer easy solutions or best practices for eliminating oil spills. The program aims to develop stronger partnerships with the boating community, a good example of which is the partnership formed between the Center for Marine Conservation and FDEP who are all actively spreading the word to area marinas.

**INITIAL POLLUTION RESPONSE PROGRAM:**

Another new initiative of the Environmental Response Branch is aimed at extending the unit’s ability to quickly respond to remote areas by increasing the number of individuals qualified to conduct an initial pol-

*State of Tampa Bay 47*
olution assessment. Through the Initial Pollution Investigation program, over 50 USCG Auxiliary personnel have been trained in oil-spill response and hazardous waste operations. The program has drawn national attention and created a model for utilization of the auxiliary workforce. In addition to the auxiliary, MSO environmental response personnel conducted enhanced training in oil-spill response, Incident Command System and hazardous waste operations at all five USCG small boat stations, Group St. Petersburg and the Air Station Clearwater. Personnel from these units are routinely called upon to conduct initial pollution investigations and forward documentation to MSO Tampa for follow-up action and enforcement. With all these individuals spread over the entire West Coast of Florida, initial response time by the USCG has been dramatically reduced. As a result, we expect to see a reduction in the number of mystery spills in 1999.

**REGIONAL RESPONSE TEAM MEETING IN TAMPA:** In January MSO Tampa hosted the Regional Response Team for its quarterly meeting, introducing local Area Committee members to the Regional Response members from over 15 federal agencies and nine states. At the meeting, Tampa’s federal, state and local agencies and dozens of commercial response organizations volunteered their time and resources to put on an extensive display showcasing state-of-the-art response technology and equipment along with environmental exhibits and presentations. This cooperative effort was an outstanding example of the ports’ cohesive partnerships and the environmental response community’s proactive stance.

**COMMUNITY INCIDENT COMMAND SYSTEM (ICS) TRAINING:** MSO Tampa, together with the Tampa Port Committee for Spillage Control sponsored a joint training session on the ICS. Local oil-spill contractors, area oil terminal representatives, emergency planners, fire department personnel and the USCG attended this training session, enhancing the area’s ability to jointly respond to a major incident. The training provided the attendees with a solid foundation in response management skills necessary to effectively respond to a variety of incidents. The USCG officially adopted the National Interagency Incident Management System ICS in 1996 as the model for response management.

**VESSEL CASUALTY INVESTIGATIONS:** The MSO investigates and tracks the number of commercial marine casualties, including groundings, collisions and allisions. These statistics are being used to evaluate the effectiveness of our efforts to reduce casualties within the port. While groundings remain the lead cause of casualties with Tampa Bay, use of human factors, engineering, improved bridge management team training and the new Vessel Traffic Information System should help significantly reduce mishaps by concentrating on the human element.

In 1998, the port experienced nine major ship or tug/barge groundings associated with cargo vessels entering or leaving the ports of Tampa and Manatee. Each of these groundings puts the port at an extreme risk of environmental damage due to a possible rupture of the vessel’s cargo or fuel tanks. Each grounding was treated as a potential major oil spill with immediate environmental precautions being taken, and extensive coordination between the USCG Captain of the Port, the FDEP and the involved party. None of these events resulted in an actual spill. The MSO has designated a new position to focus on waterways management issues and the implementation of the vessel traffic system. Together the USCG and the broad spectrum of representatives on the Harbor Safety Committee will continue to work closely to improve Tampa’s waterways management and reduce the number of future casualties.

This year the Investigations Branch conducted 60 personnel investigations involving actions by merchant mariners. The majority of these cases involved instances where actions of USCG-licensed mariners were found to have contributed to a casualty. Penalties ranged from letters of warning to formal hearings before an administrative law judge where a license or document may be revoked or suspended. Other cases included revocation proceedings to withdraw merchant mariner licenses and documents from those mariners who tested positive for drugs during pre-employment, random or post-casualty drug tests. All USCG proceedings are designed to ensure competent and safe navigation of commercial vessels on Tampa Bay and those waters off the West Coast of Florida.

In sum, the men and women of USCG MSO Tampa continue to work with our customers and the port community to ensure that we are at the forefront of vessel
and facility safety programs, environmental protection and preparedness/response initiatives. Prepared by LT Sheryl L. Dickinson, Chief, Port Management Department.

For further information, contact MSO Tampa at (813) 228-2189.

**UPDATE OF TAMPA BAY CHLOROPHYLL-A CONCENTRATIONS**

The amount of phytoplankton present in Tampa Bay waters can be estimated from measurements of the green plant pigment chlorophyll-a. 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 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.

**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. The targets chosen for the four subdivisions were based on monthly measurements by the Environmental Protection Commission of Hillsborough County (EPC).

In 1996 the Tampa Bay Estuary Program (TBEP) adopted modified chlorophyll-a targets for the major subsections of Tampa Bay (Table 1). These targets were calculated from model predictions that related chlorophyll-a, water column light transparency and seagrass depth distribution. The targets reflect the chlorophyll-a concentration which will support the TBEP goal for restoration and protection of seagrass to near 1950s levels, which has been estimated at about 38,000 acres. Targets will also be developed for Boca Ciega Bay, Terra Ceia Bay and the estuarine portion of the Manatee River when sufficient data is available. Table 1 shows the TBEP target concentrations for the four major subsections of Tampa Bay, as well as the EPC-measured annual concentrations since 1992 and the average annual concentrations for the seven-year period of 1992 through 1998.

<table>
<thead>
<tr>
<th>Year</th>
<th>HB</th>
<th>OTB</th>
<th>MTB</th>
<th>LTB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>13.2</td>
<td>8.5</td>
<td>7.4</td>
<td>4.6</td>
</tr>
<tr>
<td>1993</td>
<td>11.1</td>
<td>7.4</td>
<td>6.1</td>
<td>4.2</td>
</tr>
<tr>
<td>1994</td>
<td>9.8</td>
<td>7.6</td>
<td>6.0</td>
<td>3.5</td>
</tr>
<tr>
<td>1995</td>
<td>18.7</td>
<td>11.5</td>
<td>9.4</td>
<td>4.8</td>
</tr>
<tr>
<td>1996</td>
<td>18.7</td>
<td>11.5</td>
<td>9.4</td>
<td>4.8</td>
</tr>
<tr>
<td>1997</td>
<td>12.0</td>
<td>8.4</td>
<td>7.4</td>
<td>4.7</td>
</tr>
<tr>
<td>1998</td>
<td>20.7</td>
<td>11.2</td>
<td>11.5</td>
<td>6.0</td>
</tr>
<tr>
<td>AVERAGE 1992-98</td>
<td>14.4</td>
<td>8.9</td>
<td>7.9</td>
<td>4.5</td>
</tr>
</tbody>
</table>

**Table 1.** TBEP Chlorophyll-a targets and EPC-measured annual average concentrations (ug/l) for the major subdivisions of Tampa Bay (HB=Hillsborough Bay; OTB=Old Tampa Bay; MTB=Middle Tampa Bay; LTB=Lower Tampa Bay).

The measured annual chlorophyll-a concentrations are generally below the TBEP targets for all years except 1994 and 1995. The elevated 1994 and 1995 values were most probably caused by an increased supply of nutrients (specifically nitrogen) to the Bay as a result of the higher-than-usual wet season rainfall amounts in 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. Considering the active wet seasons of 1994 and 1995 and the increase of available nitrogen during the most active growing period of the phytoplankton, it is not surprising that chlorophyll-a concentrations were elevated during these two years.

Chlorophyll-a concentrations decreased dramatically in 1996. In fact, the four Bay segments had the lowest annual averages that have ever been recorded during the 23 years of EPC monitoring. Chlorophyll-a concentrations remained relatively low and near target values in 1997, although the total 1997 rainfall at Tampa International Airport (TIA) was about 68
inches, 30% greater than the long-term average and the greatest amount of rain at this site since 1959. Annual chlorophyll-a levels for 1997 probably remained low, albeit the high 1997 rainfall total, because much of the rain was associated with the 1997-98 El Nino event. This event started late in the year, past the most active period of phytoplankton growth.

The heavy rains associated with El Nino continued into the early months of 1998. For example, during the period January through March, TIA received 20.6 inches of rain, the highest amount for this period since the start of records in 1946. Also, relatively large amounts of rain fell during the late summer of 1998. Although the data needed to calculate nitrogen loading to the Bay for 1998 is not yet available, it can be safely assumed, based on rainfall amounts, that nitrogen loading was high. In addition, a large industrial spill of phosphate mining waste material to the Alafia River in December 1997 probably also impacted Bay conditions in early 1998. As a result of the unusual winter conditions and the wet summer, chlorophyll-a concentrations were relatively high in 1998 and the TBEP targets were substantially exceeded for all four Bay segments (Table 1). The largest differences (>50%) between ambient and target concentrations occurred in Hillsborough Bay and Middle Tampa Bay.

Long-Term Chlorophyll-a Record - The long-term chlorophyll-a record for Tampa Bay starts in 1953 (Figure 1). 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 1 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 concentrations were found in all major sections of Tampa Bay prior to the late 1960s. 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.

The cause of the large chlorophyll-a reduction in the early 1980s is not completely understood, but 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, more recent nitrogen loading reductions from fertilizer storage facilities and ship loading terminals located in Hillsborough Bay and from domestic wastewater plants in Old Tampa Bay should also have contributed to the continued downward chlorophyll-a trend. Also, in-bay chlorophyll control processes may have become increasingly important as a result of the anthropogenic nitrogen reductions and improved Bay conditions. These "natural control processes" include, among others, utilization of the phytoplankton population by benthic filter feeders and benthic denitrification.

The scenario of reduced loadings agrees with the nitrogen loading/chlorophyll-a concept established in other estuaries and laboratories. The substantial reduction of chlorophyll-a concentrations 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 in 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 that may 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-dependent 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 on this subject, please contact Roger Johansson, City of Tampa Bay Study Group, at (813) 247-3451.

Tampa BayWatch

Tampa BayWatch, a non-profit environmental stewardship program for the Tampa Bay estuary, continued its community-driven restoration efforts throughout 1998. Utilizing trained professional staff and thousands of volunteers, students and other youth groups, Tampa BayWatch made great strides towards restoring and protecting the Bay. Their programs and efforts in 1998 were able to:

- bring together more than 2,200 community and youth group volunteers in Bay restoration activities, bringing its all-time total volunteers to 7,072;
- restore 15 acres of critical saltmarsh habitats by installing 50,000 plants throughout the bay area;
- protect bird nesting islands, by clearing them of deadly monofilament fishing line, posting signs and installing decoys to lure nesting birds;
- participate in numerous coastal and river cleanup efforts to remove marine debris from the Bay’s shorelines;
- transplant nearly 3,000 seagrass units with its high school and college student Internship Program;
- cultivate 55,580 planting units of saltmarsh grasses in its High School Wetland Nursery Program;
- monitor and document the health and population of the Bay scallop during its “Great Bay Scallop Search;” and
- provide hands-on environmental stewardship programs and educational opportunities for the Bay area’s student, youth and at-risk kids groups.

Saltmarsh Planting Projects continued to play a critical role throughout 1998 in efforts to restore vital coastal habitat systems. This year, Tampa BayWatch and more than 450 volunteers conducted four community saltmarsh planting events. These restoration efforts were carried out at Bartlett Park, Del Oro Park and Mobbly Bay in Pinellas County and Emerson Point Park in Manatee County. Fifty thousand saltmarsh plants were installed, resulting in the restoration of fifteen acres of intertidal areas along Tampa Bay’s shorelines. Community support for saltmarsh restoration projects continues to grow and Tampa BayWatch is committed to working towards the Tampa Bay Estuary Program’s long-range goal to restore 500 acres of tidal marsh over the next decade. Tampa BayWatch’s nationally acclaimed High School Wetland Nursery Program provided 10,000 plants for these restoration events. 1998 saw the addition of two participating schools, bringing the total to eight schools; the addition of two more is scheduled for 1999. This program is helping to build a generation of youth who take responsibility in their community and an active role in the preservation of the environment. The High School Wetland Nursery Program was sponsored primarily by the National Marine Fisheries Service in 1998.

The Great Bay Scallop Search was once again a community favorite in 1998. Over 200 volunteers turned out for the 1998 Scallop Search event. Participants enjoyed a catered lunch and event T-shirts, both provided by Shells Seafood Restaurants. This year’s search yielded a total count of only 27 scallops, due largely to El Nino (really), the excessive amount of freshwater dumped into the Bay by higher-than-usual summertime rainfall and the fact that the weather conditions the day of the search were not ideal for clear waters. This project provides a fantastic opportunity for the community to take an active role in monitoring a resource that completely disappeared from Bay waters in the 1960s. Judging from this year’s turnout and enthusiasm, Tampa BayWatch expects this annual event to continue growing, providing biologists and researchers with more detailed and accurate data every year.

Tampa BayWatch’s Seagrass Transplanting Program with high school and college student interns proved to be a valuable tool in restoring critical seagrass communities in Tampa Bay, while providing a hands-on educational opportunity for bay-area high school and college students. During the summer of 1998 these students worked side by side with staff scientists to transplant seagrass from approved donor sites into areas of the Bay where seagrass beds have diminished but water quality has improved sufficiently to allow new seagrass growth. This year’s effort was
funded by the U.S. Fish and Wildlife Service and SFC Charitable Foundation and included students from Eckerd College, University of South Florida and bay-area high schools, who assisted Tampa BayWatch in constructing 14 plots of transplanted seagrass in Tampa Bay. Monitoring of the test sites will continue throughout the year.

Tampa BayWatch’s Seawall Oyster Reef Program was designed to combat the natural losses of coastal habitat that residential finger canal construction has caused. Constructing biodegradable reef tubes in man-made canals promotes oyster colonization, which will in turn greatly enhance habitat and water quality within the residential canals. Students, homeowners and others assisted, on a volunteer basis, in constructing more than 160 sea wall oyster reefs throughout Tampa Bay. This effort will result in improved water quality, reduced erosion, and increased recreational fishing. The long-range goal is to have 500 reefs installed by the end of the century. This important effort was made possible in 1998 through support from the Elizabeth Ordway Dunn Foundation and the U.S. Fish and Wildlife Service.

Tampa BayWatch will continue these and other programs in pursuit of its mission to restore, monitor and protect the marine and wetland environments of the Tampa Bay estuary. Our programs seek to build citizen awareness, concern, and participation through educational outreach, and rely heavily on the efforts of community volunteers and the involvement of several student and youth groups.

For more information or to find out about volunteer and membership opportunities, contact Tampa BayWatch at (727) 896-5320.

**SEASONAL CONTROL OF PHYTOPLANKTON BIOMASS IN TAMPA BAY BY THE TUNICATE *BOSTRICHOBRANCHUS DIGONAS* (ABBOTT)**

The City of Tampa, Bay Study Group (BSG) has investigated water quality and biological indicators, including phytoplankton biomass, in Tampa Bay since 1978. Results from these studies suggest that benthic filter-feeding organisms strongly impact the Tampa Bay phytoplankton population seasonally. Specifically, the tunicate *Bostrichobranchus digonas*, which is often found in dense concentrations on the bottom of Hillsborough Bay and other subsections of Tampa Bay during the winter, may for several months control phytoplankton biomass through its feeding process. Therefore, the mechanism determining phytoplankton biomass (chlorophyll-a) in Tampa Bay may shift seasonally from the warm period, when the phytoplankton population is driven by the nutrient supply (bottom-up control), to the cold period when grazing (top-down control) dominates the phytoplankton population.

A study was initiated in 1987, and expanded in 1996, to investigate the temporal and spatial distribution of *B. digonas* in Tampa Bay (Table 1) and to

---

**Table 1.** Total number of benthic trawls and the number of trawls with *B. digonas* present from the major Tampa Bay subsections (Hillsborough Bay (HB), Old Tampa Bay (OTB), Middle Tampa Bay (MTB), and Lower Tampa Bay (LTB)) for the winter seasons of 1994-95 through 1997-98.

<table>
<thead>
<tr>
<th>Bay Subsection</th>
<th>Trawls</th>
<th>Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>HB</td>
<td>Total Trawls</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>Trawls with <em>B. digonas</em></td>
<td>31</td>
</tr>
<tr>
<td>OTB</td>
<td>Total Trawls</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Trawls with <em>B. digonas</em></td>
<td>14</td>
</tr>
<tr>
<td>MTB</td>
<td>Total Trawls</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Trawls with <em>B. digonas</em></td>
<td>33</td>
</tr>
<tr>
<td>LTB</td>
<td>Total Trawls</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Trawls with <em>B. digonas</em></td>
<td>0</td>
</tr>
</tbody>
</table>

---

**Table 2.** The potential volume of bay water (m³) filtered by *B. digonas* for the winter seasons of 1994-95 through 1997-98. Values were based on 12mm diameter tunicates and estimated average biomass (gww/m²) of the tunicate beds for each season. The volume of each bay subsection was determined as 623 x 10⁶ m³ for Hillsborough Bay (HB), 608 x 10⁶ m³ for Old Tampa Bay (OTB), and 1161 x 10⁶ m³ for Middle Tampa Bay (MTB).

<table>
<thead>
<tr>
<th>Season</th>
<th>Bay Subsections</th>
<th>HB</th>
<th>OTB</th>
<th>MTB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994-95</td>
<td>Area of tunicate beds (m²)</td>
<td>18.61 x 10⁶</td>
<td>31.40 x 10⁶</td>
<td>51.84 x 10⁶</td>
</tr>
<tr>
<td></td>
<td>Biomass (gww/m²)</td>
<td>110</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>Volume filtered per day (m³/day)</td>
<td>2.35 x 10⁸</td>
<td>3.96 x 10⁸</td>
<td>6.54 x 10⁸</td>
</tr>
<tr>
<td></td>
<td>Days to filter bay</td>
<td>136</td>
<td>154</td>
<td>247</td>
</tr>
<tr>
<td></td>
<td>Days to filter water column over tunicates</td>
<td>25</td>
<td>25</td>
<td>44</td>
</tr>
<tr>
<td>1995-96</td>
<td>Area of tunicates (m²)</td>
<td>8.96 x 10⁷</td>
<td>0.50 x 10⁷</td>
<td>10.4 x 10⁷</td>
</tr>
<tr>
<td></td>
<td>Biomass (gww/m²)</td>
<td>1,700</td>
<td>1,700</td>
<td>1,700</td>
</tr>
<tr>
<td></td>
<td>Volume filtered per day (m³/day)</td>
<td>17.7 x 10⁷</td>
<td>0.99 x 10⁷</td>
<td>20.7 x 10⁷</td>
</tr>
<tr>
<td></td>
<td>Days to filter bay</td>
<td>18</td>
<td>616</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Days to filter water column over tunicates</td>
<td>1.6</td>
<td>1.6</td>
<td>2.8</td>
</tr>
<tr>
<td>1996-97</td>
<td>Area of tunicates (m²)</td>
<td>5.07 x 10⁷</td>
<td>14.27 x 10⁷</td>
<td>1.00 x 10⁸</td>
</tr>
<tr>
<td></td>
<td>Biomass (gww/m²)</td>
<td>87</td>
<td>87</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>Volume filtered per day (m³/day)</td>
<td>0.52 x 10⁸</td>
<td>1.46 x 10⁸</td>
<td>0.10 x 10⁸</td>
</tr>
<tr>
<td></td>
<td>Days to filter bay</td>
<td>623</td>
<td>417</td>
<td>157</td>
</tr>
<tr>
<td></td>
<td>Days to filter water column over tunicates</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>1997-98</td>
<td>Area of tunicates (m²)</td>
<td>3.32 x 10⁷</td>
<td>3.32 x 10⁷</td>
<td>3.93 x 10⁷</td>
</tr>
<tr>
<td></td>
<td>Biomass (gww/m²)</td>
<td>250</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>Volume filtered per day (m³/day)</td>
<td>0.96 x 10⁸</td>
<td>0.96 x 10⁸</td>
<td>1.13 x 10⁸</td>
</tr>
<tr>
<td></td>
<td>Days to filter bay</td>
<td>338</td>
<td>635</td>
<td>1422</td>
</tr>
<tr>
<td></td>
<td>Days to filter water column over tunicates</td>
<td>11</td>
<td>11</td>
<td>19</td>
</tr>
</tbody>
</table>
attempt to link variations in winter season chlorophyll-a concentrations to the distribution and biomass of the tunicate. Statistical analyses of the data collected at specific monitoring stations suggest a strong positive association between B. digonas biomass and parameters that relate to water clarity, which include phytoplankton biomass (chlorophyll-a). Also, calculations that relate B. digonas feeding activities to impacts on the Tampa Bay phytoplankton population strongly imply that B. digonas, at least in areas with developed tunicate beds, has a controlling effect on chlorophyll-a concentrations (Table 2). These results are supported by Tampa Bay field observations of extremely clear water in the vicinity of well-developed B. digonas beds. Further, the results from this study agree with findings reported from other estuaries and fresh water systems with abundant populations of benthic filter-feeders.

For more information on this subject please contact Roger Johansson or Gene Pinson, City of Tampa, Bay Study Group, at (813) 247-3451.

**U.S. GEOLOGICAL SURVEY WATER RESOURCES DIVISION TAMPA, FL**

The U.S. Geological Survey (USGS) provides the Nation with reliable, impartial information to describe and understand the Earth. This information is used to minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; enhance and protect the quality of life; and contribute to wise economic and physical development (Strategic Plan for the USGS, 1996 to 2005). The USGS is organized into 4 major divisions: the Biological Resources Division (formerly the National Biological Service), the National Mapping Division, the Geologic Division, and the Water Resources Division.

The Water Resources Division (WRD) conducts data collection and research activities using a cooperative funding process in partnership with local and State agencies. The USGS WRD office in Tampa collects data on stage and discharge at over 80 streams; elevations at about 40 lakes and over 600 wells; and water quality at over 100 surface-water sites and over 100 ground-water sites. These data are published annually and are used extensively by area water resources managers; local, State, and Federal agencies; universities; private consulting firms; and the public. Cooperative partners in this data collection effort include the Counties of Hillsborough, Manatee, Pinellas, and Sarasota; the Cities of Bradenton, North Port, St. Petersburg, Sarasota, and Tampa; the Manatee County Environmental Management Department; the Southwest Florida Water Management District; Tampa Bay Water, and the Peace River/Manasota Regional Water Supply Authority.

Recent innovations at the USGS have resulted in the development of the only real-time network for water-level and discharge data in the Tampa Bay area. Data from about 60 streams and about 80 wells can be viewed on the World Wide Web at [http://www.tampa.er.usgs.gov/](http://www.tampa.er.usgs.gov/). Historical data can be downloaded from this site as well.

In addition to the extensive data collection network of the USGS, scientists at the USGS conduct interpre-
tive studies of area water resources. Recent studies in the Tampa Bay watershed documented the effectiveness of the Bayside Bridge stormwater collection and detention system; measured discharge, water quality, and nutrient loads to Tampa Bay from the Alafia River, Hillsborough River, Tampa Bypass Canal, East Bay, and Delaney Creek; determined tidal flow patterns near the mouth of Tampa Bay and in Lower Hillsborough Bay; described the hydrology of the Braden River watershed; and studied subsurface storage and recovery of effluent in the St. Petersburg area. Results of all these and other USGS studies are published and are available at the USGS office in Tampa.

Current studies underway in the Tampa Bay watershed include an evaluation of the effects of ground-water augmentation on the water quality and hydrology of selected lakes; discharge, water quality, and constituent loading in the Braden River watershed; flood frequency characteristics for streams in the area; evaluation of the availability of brackish ground-water sources in Pinellas County for reverse osmosis; hydrogeologic evaluation of aquifers in the area; and evaluation of clay-settling ponds created by phosphate mining operations.

For more information on past and present USGS studies, contact Yvonne Stoker at (813) 884-9336, Ext. 133.

ECKERD COLLEGE PROGRAMS AND PROJECTS

Eckerd College continues to draw strong enrollments to its outstanding programs in Environmental Studies and in Marine Science. These majors provide students and faculty the opportunity to learn and work together on projects of import.

A sampling of recent projects related to Tampa Bay includes:

"The Digital Analysis to Recognize Whale Images on a Network" (DARWIN) project is a computer vision system, which automates the process of identifying individual bottlenose dolphins by comparing a digital image of a new, unknown dorsal fin to a database of previously-identified fins. DARWIN is an on-going project which was initially implemented by Mark Allen ('96) under the direction of Professor Dean Stewman. Dan Wilkin ('98) continued the development and improvements and has a web page which details the program: http://eckserver.eckerd.edu/~wilkindj/darwin-1.html Since Dan's graduation student Zach Roberts ('00) has been working on the project under the direction of Professor Kelly Debure.

Altfeld, Laura ('96) completed her senior thesis on Wetland Management in Tampa Bay: an examination of ichthyofauna in three created salt marshes.

Students in Marine Resource Policy in fall 1998 under the direction of Professor Linda Lucas completed a preliminary analysis of shrimp imports as they impact prices of domestic shrimp catches in the Gulf of Mexico.

C. Scott Boykin and Professors Beth Forys and Peter Meylan are working on "The Ecology of the Ornate Diamondback Terrapin, Tarpon Key National Wildlife Refuge." The objectives of this research are to determine population size, structure, home range and habitat use of this understudied and seldom-seen subspecies of terrapin. This was the first year of this study and 66 individual terrapins have been captured and studied through November.

Eckerd College students and faculty use Tampa Bay as a laboratory for courses and projects. Students in Environmental Studies pursue one of two tracks: Policy or Humanities. These tracks are unique and prepare students for a wide variety of career tracks including urban planning, natural resource management, scientific journalism, environmental law and policy making, parks and recreation, Peace Corps and private consulting. Students acquire skills in laboratory research and environmental science; policy analysis, social, historical and global awareness; philosophical and ethical inquiry into environmental issues; and group enterprise. During their period of study, the students work as interns and volunteer with Tampa Bay Area environmental groups and policy-making bodies as well. For information on this course of study contact Professor Elizabeth Forys at (727) 864-7880.
Students in Marine Science benefit from an equally dedicated faculty specializing in marine areas of biology, chemistry, geology, and geophysics. Students studying any of these tracks are knowledgeable regarding fundamental concepts of biological, geological, chemical and physical oceanography; research methods employed by oceanographers; history of oceanographic exploration and research, as well as ability to synthesize information from the various marine science disciplines. For information on these studies contact Professor John Reynolds (727) 864-8431.

**COLONIAL WATERBIRD NESTING IN TAMPA BAY, 1998**

Across Florida, wading bird nesting was strongly affected by El Nino in 1998, which brought drenching rains and flooding to the state until late March, followed by a strong Spring drought. As a result, in south Florida, colony formation was delayed and numbers were generally reduced for all species except Great Egret. But in the Tampa Bay area, El Nino was good news for some colonial waterbirds which depend on dry season water levels to drop, concentrating fish and wetland prey. El Nino filled all the region's wetlands to overflowing, and then began to dry them out just as nesting season began in earnest. Species which apparently particularly benefitted from this weather pattern were White Ibis - which enjoyed the best nesting year in more than 20 years, and Roseate Spoonbills - with over 180 pairs nesting in Tampa Bay, the most since the 1880s. Speculation suggests that some south Florida ibis, having failed to nest there in the Winter, moved north to Tampa Bay for the Spring nesting effort.

In addition, gulls, terns, skimmers, and other ground-nesters such as American Oystercatchers enjoyed high nesting success during that all-important first nesting effort, since no storms washed out nests.

Several colony sites which have been active in recent years were abandoned this year, due to either disturbance by humans (Sunshine Skyway south) or "infestation" by raccoons (Courtney Campbell Causeway and John's Pass). Raccoons are a persistent, recurring threat to colonial nesting birds, and several colonies which had raccoons for all or part of the nesting season exhibited depressed nesting numbers (Tarpon Key, Shell Key, and Washburn Sanctuary = Terra Ceia Bird Key).

Brown Pelicans nested in lower-than-normal numbers, but the nesting effort held up well and nesting success seemed widespread, with many young birds raised to fledgling. Meanwhile Reddish Egrets, with only about 400 pairs in the state, did not have as successful a year as last year.

A state-wide survey of larids turned up an estimated total of just 18,066 pairs of Laughing Gulls at 16 colonies. While this may omit some small colonies in Florida Bay and the lower Keys, it is a far cry from the early 1980s when 50,000 pairs were estimated in Tampa Bay alone. This year 13,000 pairs were estimated from Tampa Bay, 72% of the state total. Laughing Gulls are often taken for granted in Florida and many consider them ubiquitous, but they are not. This decline is over 60% in 16 years.

It is important to note that many birds nest only in a very few locations. For instance Cattle Egrets, considered fairly common, nest in only seven coastal sites and White Ibis in only five sites in the Tampa Bay area. Glossy Ibis are even more restricted, with only three nesting sites here; the only Tampa Bay colony of Wood Stork is at Dot-Dash at the mouth of the Braden River. Snowy Plovers, perhaps Florida's rarest bird with only 200 pairs in the state, were known to have nested successfully in Tampa Bay at only one site - Shell Key.

In addition, it should be pointed out that Tampa Bay is a very important region for many colonial waterbirds. Half of the state's population of American Oystercatchers nest in Tampa Bay. Specifically, the State's two most important wading bird colonies, as listed by the Florida Game and Fresh Water Fish Commission, are Alafia Bank and Terra Ceia Bird Key; and four of the most important shore-bird colonies are also in Tampa Bay (Tampa port Authority islands 2D and 3D, Shell Key, Passage Key and Three-Rooker Bar.) Gull-billed, Caspian, Royal, and Sandwich Tern nesting in Florida occurs only in Tampa and Apalachicola bays, with most of these terns nesting in Tampa Bay.

Over 25 nesting colony islands occur in the coastal portions of Tampa Bay; of these, 18 were surveyed (see table). In all, nearly 45,000 nesting pairs of birds were found, representing about 90,000 adults. Thus the Tampa Bay area boasts nationally-important wading and shore-bird populations. Conservation of this diverse natural resource through protection of nesting islands and foraging habitats is a challenge, considering our expanding human population, but also a great responsibility.
## 1998 Colonial Waterbird Survey

*note: numbers represent breeding pairs*

<table>
<thead>
<tr>
<th>Species</th>
<th>State Listing</th>
<th># Local Nesting Sites</th>
<th>Local Population (Pairs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown Pelican</td>
<td>SSC</td>
<td>6</td>
<td>1,665</td>
</tr>
<tr>
<td>Double-crested Cormorant</td>
<td></td>
<td>9</td>
<td>460</td>
</tr>
<tr>
<td>Anhinga</td>
<td></td>
<td>6</td>
<td>275</td>
</tr>
<tr>
<td>Least Bittern</td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Great Blue Heron</td>
<td></td>
<td>10</td>
<td>315</td>
</tr>
<tr>
<td>Great Egret</td>
<td></td>
<td>10</td>
<td>875</td>
</tr>
<tr>
<td>Snowy Egret</td>
<td>SSC</td>
<td>10</td>
<td>850</td>
</tr>
<tr>
<td>Little Blue Heron</td>
<td>SSC</td>
<td>8</td>
<td>270</td>
</tr>
<tr>
<td>Tricolored Heron</td>
<td>SSC</td>
<td>8</td>
<td>745</td>
</tr>
<tr>
<td>Reddish Egret</td>
<td>SSC</td>
<td>6</td>
<td>57</td>
</tr>
<tr>
<td>Cattle Egret</td>
<td></td>
<td>7</td>
<td>2,382</td>
</tr>
<tr>
<td>Green Heron</td>
<td></td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td>Black-crowned Night-Heron</td>
<td></td>
<td>9</td>
<td>265</td>
</tr>
<tr>
<td>Yellow-crowned Night-Heron</td>
<td></td>
<td>5</td>
<td>91</td>
</tr>
<tr>
<td>White Ibis</td>
<td>SSC</td>
<td>5</td>
<td>17,200</td>
</tr>
<tr>
<td>Glossy Ibis</td>
<td></td>
<td>3</td>
<td>545</td>
</tr>
<tr>
<td>Roseate Spoonbill</td>
<td>SSC</td>
<td>4</td>
<td>186</td>
</tr>
<tr>
<td>Wood Stork</td>
<td>E</td>
<td>1</td>
<td>53</td>
</tr>
<tr>
<td>Snowy Plover</td>
<td>T</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Wilson's Plover</td>
<td></td>
<td>2</td>
<td>33</td>
</tr>
<tr>
<td>American Oystercatcher</td>
<td>SSC</td>
<td>12</td>
<td>102</td>
</tr>
<tr>
<td>Willet</td>
<td></td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>Laughing Gull</td>
<td></td>
<td>3</td>
<td>13,000</td>
</tr>
<tr>
<td>Gull-billed Tern</td>
<td></td>
<td>1</td>
<td>1-2</td>
</tr>
<tr>
<td>Caspian Tern</td>
<td></td>
<td>2</td>
<td>76</td>
</tr>
<tr>
<td>Royal Tern</td>
<td></td>
<td>2</td>
<td>2,080</td>
</tr>
<tr>
<td>Sandwich Tern</td>
<td></td>
<td>2</td>
<td>560</td>
</tr>
<tr>
<td>Least Tern</td>
<td>T</td>
<td>8</td>
<td>480</td>
</tr>
<tr>
<td>Black Skimmer</td>
<td>SSC</td>
<td>9</td>
<td>1,160</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td><strong>44,667</strong></td>
</tr>
</tbody>
</table>

1. Florida Game and Fresh Water Fish Commission listings:
   - E = Endangered;
   - T = Threatened; SSC = Species of Special Concern

2. Nesting areas surveyed were colonial nesting islands in the Tampa Bay system, from John's Pass to the north, and including Terra Ceia Bay and the mouth of the Manatee River to the south. Inland colonies are not included (as Temple Crest, Alafia River ELAPP site, and Cypress Creek).

3. Some species nest in small colonies or singly, as Yellow-crowned Night Herons, Least Bittern, and Green Heron, and are more common than suggested by this table.

For more information contact Ann Schnapf or Rich Paul, National Audubon Society Florida Coastal Islands Sanctuaries, (813) 623-6826.
TAMPA BAY REGIONAL PLANNING COUNCIL - 1998

Tom Anderson
Mayor
City of Dunedin

Dr. Rina P. Ayala
Gubernatorial Appointee
Pasco County

George Bobotas
Commissioner
City of Tarpon Springs

Terrye Bradley
Gubernatorial Appointee
Pinellas County

Gwendolyn Y. Brown
Gubernatorial Appointee
Manatee County

Bob Buckhorn
Councilman
City of Tampa

Joe Catalfamo
Gubernatorial Appointee
Pinellas County

David "Hap" Clark
Commissioner
Pasco County

Harriet K. Crozier
Commissioner
City of Largo

Albert Davis
Gubernatorial Appointee
Hillsborough County

John L. Dicks
Commissioner
City of Plant City

Ward Friszolowski
Vice Mayor
City of St. Pete Beach

Dr. Richard Garrity
Ex-Officio, FL Dept. of Environ. Protection

Lari Ann Harris
Commissioner
Manatee County

Chris Hart
Commissioner
Hillsborough County

Dick Holmes
Vice Mayor
City of South Pasadena

Dr. Sam J. Horton
Gubernatorial Appointee
Hillsborough County

J. B. Johnson
Commissioner
City of Clearwater

Otis Kelly
Gubernatorial Appointee
Manatee County

Thomas Kennedy
Gubernatorial Appointee
Pinellas County

Robert A. Kersteen
Councilman
City of St. Petersburg

Jerry King
Councilman
City of Temple Terrace

George Makrauer
Commissioner
City of Treasure Island

Edward Manny
Councilman
City of Oldsmar

Bob Matthews
Councilman
City of Seminole

Charles A. McIntosh, Jr.
Mayor
City of Dade City

John E. Phillips
Vice Mayor
City of Gulfport

Saundra Rahn
Councilwoman
City of Bradenton

Frederick T. Reeves
Gubernatorial Appointee
Pasco County

Barbara Romano
Gubernatorial Appointee
Hillsborough County

Steve Seibert
Commissioner
Pinellas County

Jane Silverberg
Gubernatorial Appointee
Pinellas County

Don Skelton
Ex-Officio
Florida Dept. of Transportation

William Starkey
Gubernatorial Appointee
Hillsborough County

Ed Taylor
Councilman
City of Pinellas Park

Jack Van Keuren
Councilman
City of New Port Richey

Dr. David Welch
Ex-Officio - Southwest FL Water Mgmt District

Pat Whitesel
Mayor
City of Palmetto

Rollin Yanchar
Commissioner
City of Safety Harbor

Helen W. Young
Gubernatorial Appointee
Hillsborough County