



CHARTING *the* COURSE

THE COMPREHENSIVE CONSERVATION
AND MANAGEMENT PLAN FOR TAMPA BAY

MAY 2006

TAMPA BAY ESTUARY PROGRAM

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Charting the Course for Tampa Bay

May 2006

THE MISSION OF THE TAMPA BAY ESTUARY PROGRAM IS TO BUILD PARTNERSHIPS TO RESTORE AND PROTECT TAMPA BAY THROUGH IMPLEMENTATION OF A SCIENTIFICALLY SOUND, COMMUNITY-BASED MANAGEMENT PLAN.

*In memory of our friend and colleague, Roy G. Harrell, Jr.,
Tampa Bay Estuary Program Policy Board member (1992-1996), champion and
author of the landmark Interlocal Agreement for bay restoration
adopted in 1997.*

PREFACE

This first revision of *Charting the Course* encompasses the 2003-2008 timeframe. It provides a look back at progress made in implementing the original goals and priorities of the Comprehensive Conservation and Management Plan for Tampa Bay, and a look ahead at updated bay restoration and protection strategies. *Charting the Course* is intended to provide a flexible, evolving framework that can be adapted to the changing needs of both the bay and the bay management community.

The Tampa Bay Estuary Program (TBEP) was established by Congress in 1991 to assist the region in developing and implementing a comprehensive plan for bay improvement. The Program is a partnership of the U.S. Environmental Protection Agency; Florida Department of Environmental Protection; Southwest Florida Water Management District; Hillsborough, Pinellas and Manatee counties; and the cities of Tampa, St. Petersburg and Clearwater.

The revised Action Plans for bay improvement presented in this document reflect input from bay managers, advocates, key industries and citizens from throughout the region. The actions within this Plan were reviewed and refined by outside experts as well as members of TBEP's Technical Advisory Committee and Community Advisory Committee. Final Action Plans were approved by TBEP's Management and Policy Boards over a 2-year period. We thank all the individuals who participated for their substantial insights and contributions.

The Tampa Bay Estuary Program invites your comments and participation as we continue to assist the region in charting the course for the future well-being of Tampa Bay.

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ABOUT THE TAMPA BAY ESTUARY PROGRAM

The Tampa Bay National Estuary Program (TBNEP) was established in 1991 to assist the region in developing and implementing a comprehensive plan to restore and protect Tampa Bay. The Program is part of a national network of 28 estuary programs established under the Clean Water Act and administered by the U.S. Environmental Protection Agency (EPA).

The landmark agreement establishing the Tampa Bay NEP brought together Hillsborough, Pinellas and Manatee counties; the cities of Tampa, St. Petersburg and Clearwater; the Southwest Florida Water Management District; the Florida Department of Environmental Protection; and EPA in a partnership committed to action.

In 1998, these and six other partners signed a formal Interlocal Agreement, and ancillary agreements, pledging to achieve the goals of the newly completed Comprehensive Conservation and Management Plan (CCMP) for Tampa Bay, called *Charting the Course*. The Plan culminated nearly six years of scientific research into the bay's most pressing problems, and reflected broad-based input from citizens, groups and communities with a common interest in a healthy bay as the cornerstone of a prosperous economy.

Upon adoption of the Interlocal Agreement, the Tampa Bay National Estuary Program became simply the **Tampa Bay Estuary Program**, in recognition of its reorganization as a truly regional alliance.

TBEP continues to coordinate the overall protection and restoration of the bay with assistance and support from its many formal and informal partners. TBEP monitors progress in achieving the goals of the CCMP by regularly summarizing and evaluating information provided by program participants. Under the terms of the Interlocal Agreement governing the Program, TBEP is required to review and update the major goals for bay restoration every five years to assess progress, revise strategies as needed and address emerging issues affecting the bay.

TBEP leverages the resources of program partners by financing cutting-edge research into key problems impacting the bay; sponsoring demonstration projects to test innovative solutions to these problems; providing "Mini-Grants" to community groups to engage the public in bay restoration; and developing educational programs targeting key segments of the bay community – including teachers, boaters and homeowners.

ABOUT CHARTING THE COURSE

This document represents the first revision of *Charting the Course*, the Comprehensive Conservation and Management Plan for Tampa Bay, encompassing the years 2003-2008.

The original *Charting the Course*, formally adopted in 1997, set forth specific, measurable goals for bay improvement in five areas: Water & Sediment Quality, Bay Habitats, Fish & Wildlife, Dredging & Dredged Material Management, and Spill Prevention & Response. A sixth Action Plan highlighted Public Involvement and Education strategies to foster a bay stewardship ethic among the region's residents.

Within these action plans were 41 individual actions which identified a range of strategies that allow local communities to maximize return on their investment in bay restoration and protection.

In this first update, two Action Plan areas have been added to the initial list: Invasive Species and Public Access. These additions reflect new or emerging issues for the bay management community. Several individual actions in the original Plan have been merged, modified or eliminated as well, while new actions have been added based on revised information and newly identified priorities. New actions are underlined in the Index of Actions at the beginning of *Charting the Course*; merged, modified or retired actions also are noted in the Index. This update encompasses 38 actions – eight of them appearing in the Plan for the first time.

Following are descriptions of the document's major components.

STATE OF THE BAY

This chapter summarizes progress made in bay protection and restoration since the adoption of the original management plan, noting ongoing or new challenges. Important trends in the key issue areas identified by TBEP and its partners are presented here.

GOALS & PRIORITIES

Goals and priorities for Tampa Bay are summarized in a chart immediately preceding bay action plans. These specific and attainable targets are the foundation for strategies and themes advanced in *Charting the Course*. They relay overall priorities for bay restoration and protection, to better evaluate the benefits of measures to protect this vital environmental and economic resource.

ACTION PLANS FOR BAY IMPROVEMENT

Charting the Course presents a comprehensive slate of approved actions to assist community partners in selecting cost-effective and environmentally beneficial improvements in the eight key areas identified above. Action plans for Tampa Bay

identify a range of strategies that allow local communities to maximize return on their investment in bay recovery and protection. Many actions also achieve multiple environmental objectives, such as pollution prevention and water conservation.

Each action contains a background section summarizing the issue; the current status of the action; and the “next steps” necessary to implement the action, identifying a projected schedule for completion as well as responsible parties.

References in action plans to local governments under the heading “Responsible parties” refer to Hillsborough, Pinellas and Manatee counties and the cities of Tampa, St. Petersburg and Clearwater, unless otherwise noted, although all local communities in the region are urged to participate.

New actions are underlined in the Index of Action Plans at the beginning of this document. Old actions with a line through them (strikethrough) have been retired or incorporated into other actions as noted in the Index.

IMPLEMENTING THE PLAN

TBEP partners signed a formal Interlocal Agreement in 1997 pledging to achieve the goals of the bay management plan and committing to specific actions and timetables. The Implementation & Financing chapter describes the agreement and TBEP’s role in overseeing implementation, as well as mechanisms for financing bay restoration and protection strategies.

MONITORING BAY IMPROVEMENT

Long-term monitoring of Tampa Bay’s health is central to the success of bay restoration efforts, enabling communities to measure return on investment and helping bay managers redirect their efforts when necessary. The bay monitoring program devised by TBEP in cooperation with local governments and agencies is presented in the Research and Monitoring chapter, along with key research priorities that have been revised to reflect new issues and associated gaps in scientific knowledge.

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U.S. ENVIRONMENTAL PROTECTION AGENCY

Members of the Tampa Bay Management Conference

The work of the Tampa Bay National Estuary Program is guided by a Tampa Bay Management Conference, which was convened at the program's outset to provide direction and input into bay problems and solutions from diverse community sectors. The Conference is comprised of key policy leaders representing local, state and federal government; members of the region's scientific and technical communities; business, agricultural and special interest groups; and citizens from throughout the region. Conference participants are recognized here for their considerable contributions in charting the course for Tampa Bay.

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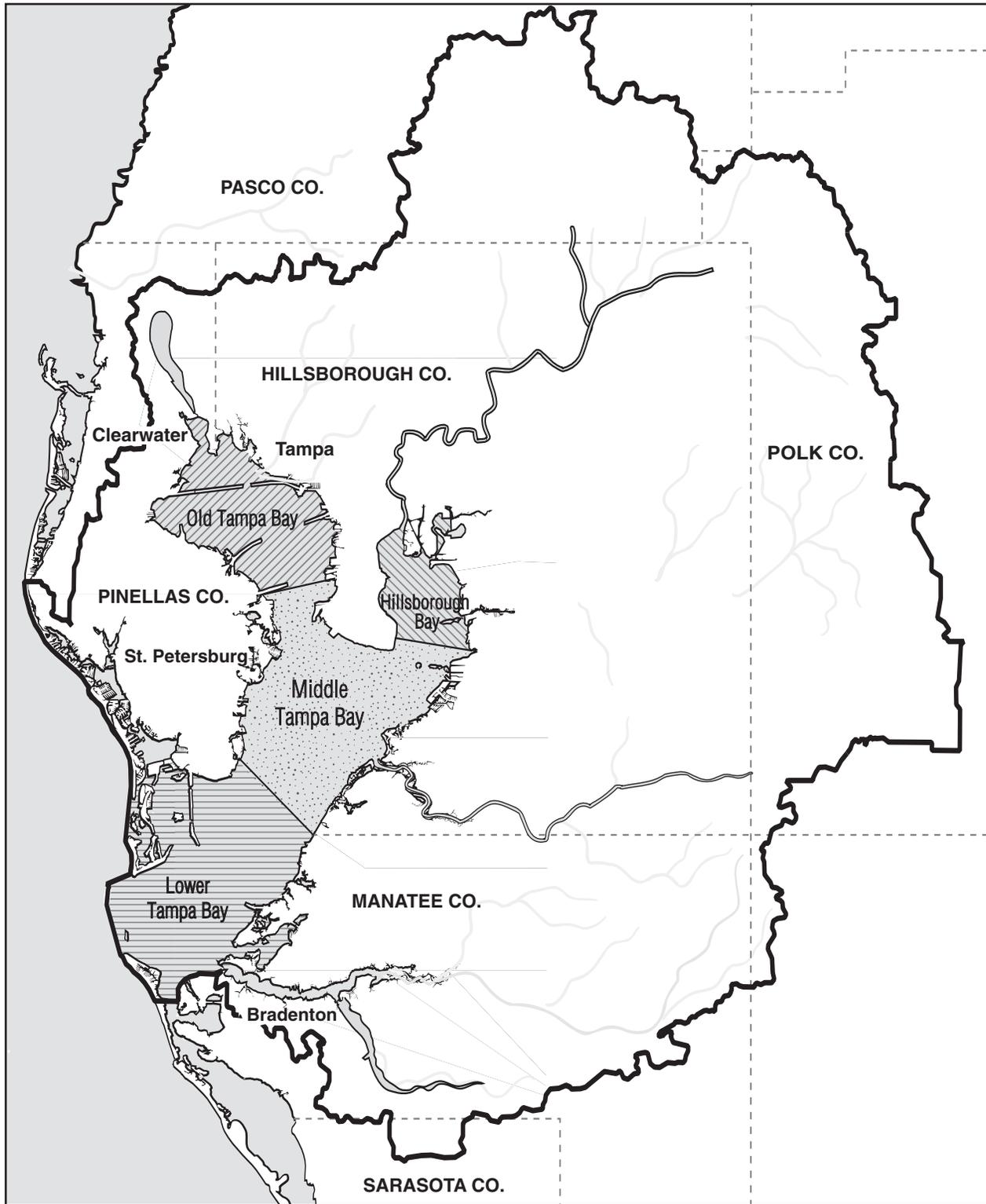
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Tampa Bay Watershed Boundaries and Major Bay Segments



More than two million people reside in the 2,200-square-mile Tampa Bay watershed, which reaches into Sarasota, Pasco and Polk counties. Tampa Bay is Florida's largest open-water estuary, covering almost 400 square miles.

State of the Bay

INTRODUCTION

Spanning 400 square miles, with a drainage area nearly six times as large, Tampa Bay and its watershed stretch from the spring-fed headwaters of the Hillsborough River to the salty waters off Anna Maria Island. Florida's largest open-water estuary harbors a rich and diverse assemblage of plants and animals, along with a rapidly growing human population that has made the region the second largest metropolitan area in the state.

In spite of its size, the bay has an average depth of only 11 feet – a troublesome figure to early commercial boosters who envisioned Tampa Bay as a great commercial harbor. Today, more than 80 miles of deep-water shipping channels – the largest 43 feet deep – have made that dream a reality. Three seaports now flourish along the bay's borders, in Tampa, St. Petersburg, and in northern Manatee County. The largest of these, the Port of Tampa, consistently ranks among the busiest ports in the nation. Combined, the three ports contribute an estimated \$15 billion to the local economy and support 130,000 jobs.

Tampa Bay is also a focal point of the region's premier industry – tourism. The bay and the sparkling beaches of the surrounding barrier islands attract nearly 5 million visitors a year. Fort DeSoto Park, at the mouth of Tampa Bay, was named the number one beach in the continental United States in the 2004 annual survey conducted by “Dr. Beach,” Professor Stephen Leatherman of Florida International University.

Sport fishing, boating, kayaking and wildlife watching are increasingly popular activities among both visitors and residents – an interest fueled by steady improvements in water quality that continue to reap ecological benefits. Today, some 40,000 pairs of wading and shore birds of 25 species nest annually on protected islands in the bay; one-sixth of the Gulf Coast population of Florida manatees spend the winter near power plants bordering the bay; and more than 200 species of fish spend some part of their lives within the Tampa Bay estuary.

More than 2.3 million people live in the three counties directly bordering Tampa Bay – Hillsborough, Manatee and Pinellas. That number is expected to grow by nearly 19 percent by the year 2015, as approximately 500 people move to one of those three counties each week.

With such fast-paced growth, redressing past damage to bay habitats and protecting them in the future, will remain the greatest challenge for bay managers. Maintaining

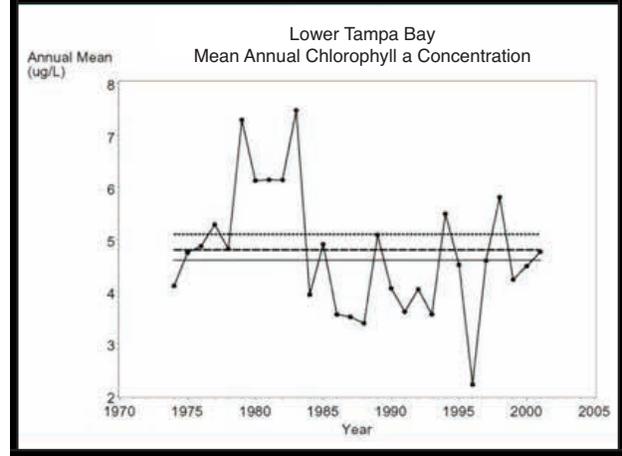
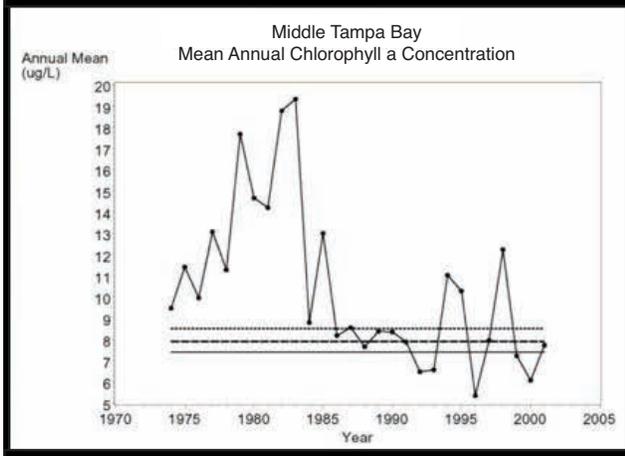
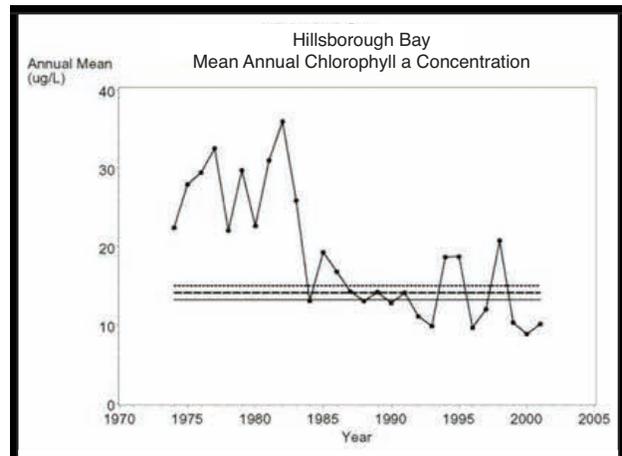
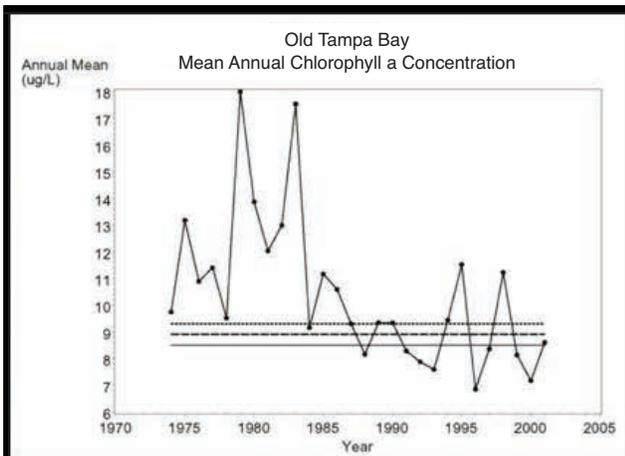
the water quality gains of recent decades will require more effort every year to compensate for increased pollution associated with growth. Actions we take both individually and collectively will increasingly influence the state of the bay.

This chapter explores the progress that has been made in achieving the primary goals of the original Comprehensive Conservation and Management Plan for Tampa Bay, and the current status of key indicators of the bay's health.

WATER AND SEDIMENT QUALITY

The amount of algae in Tampa Bay waters, as indicated by chlorophyll *a* concentrations, has declined dramatically since 1980, thanks to improved wastewater and stormwater treatment, reductions in industrial discharges, limits on dredging and filling, and removal of several wastewater point sources as extensive water reuse systems are constructed.

Chlorophyll Concentration Timeline



SOURCE: Environmental Protection Commission of Hillsborough County

Chlorophyll *a* is an important indicator of the amount of microscopic algae in the water. This chart shows average annual chlorophyll *a* concentrations (ug/l) for the four major bay segments. The solid lines indicate the target concentrations associated with adequate light penetration for seagrass growth in each respective bay segment.

Stormwater runoff from urban, residential and agricultural lands remains the largest source of nitrogen, the primary pollutant in the bay. An overabundance of nitrogen can cause algae blooms and reduce oxygen levels in the bay, resulting in turbid water, fish kills and loss of seagrass when the water becomes so opaque that sunlight cannot reach underwater grasses. Stormwater accounted for 63% of total nitrogen loadings to Tampa Bay from 1999-2003.

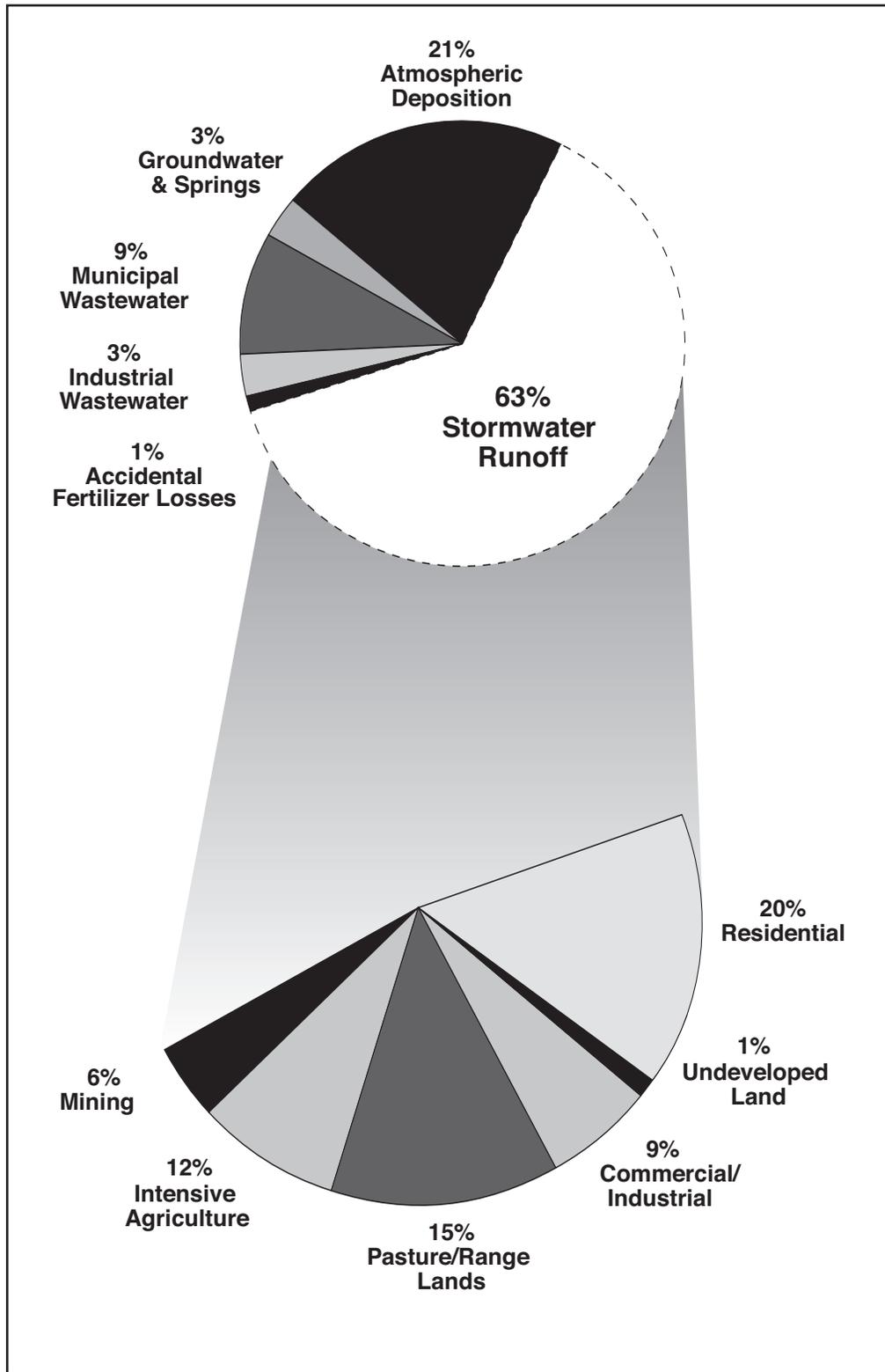
The Tampa Bay Estuary Program's Policy Board, along with TBEP's Nitrogen Management Consortium (NMC), a partnership of local governments and private industries with facilities along the bay, has adopted a goal of maintaining nitrogen loadings to the bay at the average calculated for the 1992-1994 timeframe. This "hold the line" approach is expected to foster water quality sufficient to allow continued natural recovery of seagrasses. However, achieving this goal with the continued growth and associated increases in stormwater runoff projected in the region will require bay-wide loadings to be reduced by 17 tons per year. Local governments have committed to assuming a reduction target of 11 tons per year, while industry partners have agreed to reduce their contributions by 6 tons per year.

As of 2004, projects completed in the Tampa Bay watershed by NMC partners actually exceeded those reduction goals. Additionally, all major bay segments except Old Tampa Bay met chlorophyll *a* targets (a measure of microscopic algae in the water) with the exception of El Nino years (1997-98 and 2003), providing sufficient water clarity for seagrass recovery. A separate seagrass recovery plan is being developed for Old Tampa Bay, to identify and remediate causes of continued water quality problems and seagrass declines there.

The bay narrowly averted a potentially devastating blow in 2001, when Mulberry Phosphates abandoned its Piney Point fertilizer plant and gypsum stack in northern Manatee County, forcing the Florida Department of Environmental Protection (DEP) to assume operation and cleanup of the facility. The threat of a potential breach in the gypsum stack holding ponds required DEP to discharge large volumes of nutrient-rich wastewater into Lower Tampa Bay, resulting in an additional 15 tons of nitrogen loading in one month – more than three times the annual load reduction target for that bay segment. The crisis was alleviated in 2003, when DEP was granted an emergency permit to disperse treated wastewater from the site into the deeper waters of the Gulf of Mexico. Closure of the facility is well underway, but future use of the site remains undetermined. Cleanup costs had reached more than \$77 million as of September 2005, prompting DEP to amend the rules pertaining to financial surety of phosphate companies operating in Florida to avoid a similar situation in the future.

A significant portion of the nitrogen entering the bay, about 21%, comes from atmospheric deposition (air pollution) directly to the bay's surface, either with rainfall or dry deposition. Research indicates that power plants and mobile sources (such as cars) are the primary locally generated sources of airborne nitrogen. New pollution controls on bay area power plants and conversion of one major plant (Tampa Electric's Gannon facility) to fueling by natural gas instead of coal will result in dramatic reductions in nitrogen emissions from these facilities in the next decade. Cleaner-burning fuels, improved fuel economy standards, expanded mass transit systems and increased telecommuting could mitigate emission increases associated with motor vehicles.

Total Nitrogen Loadings in Tampa Bay (1999-2003 average)



SOURCE: Poe et al, 2005

Ensuring that bay waters remain safe for swimming and other recreational uses is vital to the region's tourist-dependent economy, as well as to the quality of life for area residents. Local health departments routinely monitor public beaches, and mandate closures when bacteria counts exceed guidelines. Closures occur most often when heavy rainfall funnels large volumes of stormwater runoff to waters near public beaches, or when a spill of partially treated wastewater occurs. Recent research has shown that the traditional indicators of bacterial contamination, *E. coli* and fecal coliform, may not be the most suitable barometers of contamination, since both may occur naturally in warm-water climates. As a result, the use of enterococci as a supplemental and more reliable indicator is now gaining widespread acceptance.

With the exception of several "hot spots" primarily near ports and other industrial areas, Tampa Bay sediments remain relatively free of toxic contaminants. TBEP developed a Tampa Bay Benthic Index that indicates the severity of chemical contamination or hypoxia (low dissolved oxygen) at various sites based on lack of diversity or abundance of benthic (bottom-dwelling) organisms. The benthic index will serve as the foundation for ranking sites where restoration is needed.

Using the index, TBEP's Sediment Quality Assessment Group has identified several sites where degraded benthic communities were clearly associated with chemical contaminants of concern. Priority areas identified by the group for development of site-specific action plans are the Palm River and McKay Bay; Ybor Channel; West Davis Islands; East Bay; Largo Inlet; the Westshore area of Tampa; Bayboro Harbor; and the Apollo Beach/Big Bend area. Assessment of each of these areas began in 2005, and action plans for two will be initiated in 2006. Cleanup efforts may include dredging of contaminated areas or "capping" them with clean fill.

BAY HABITATS

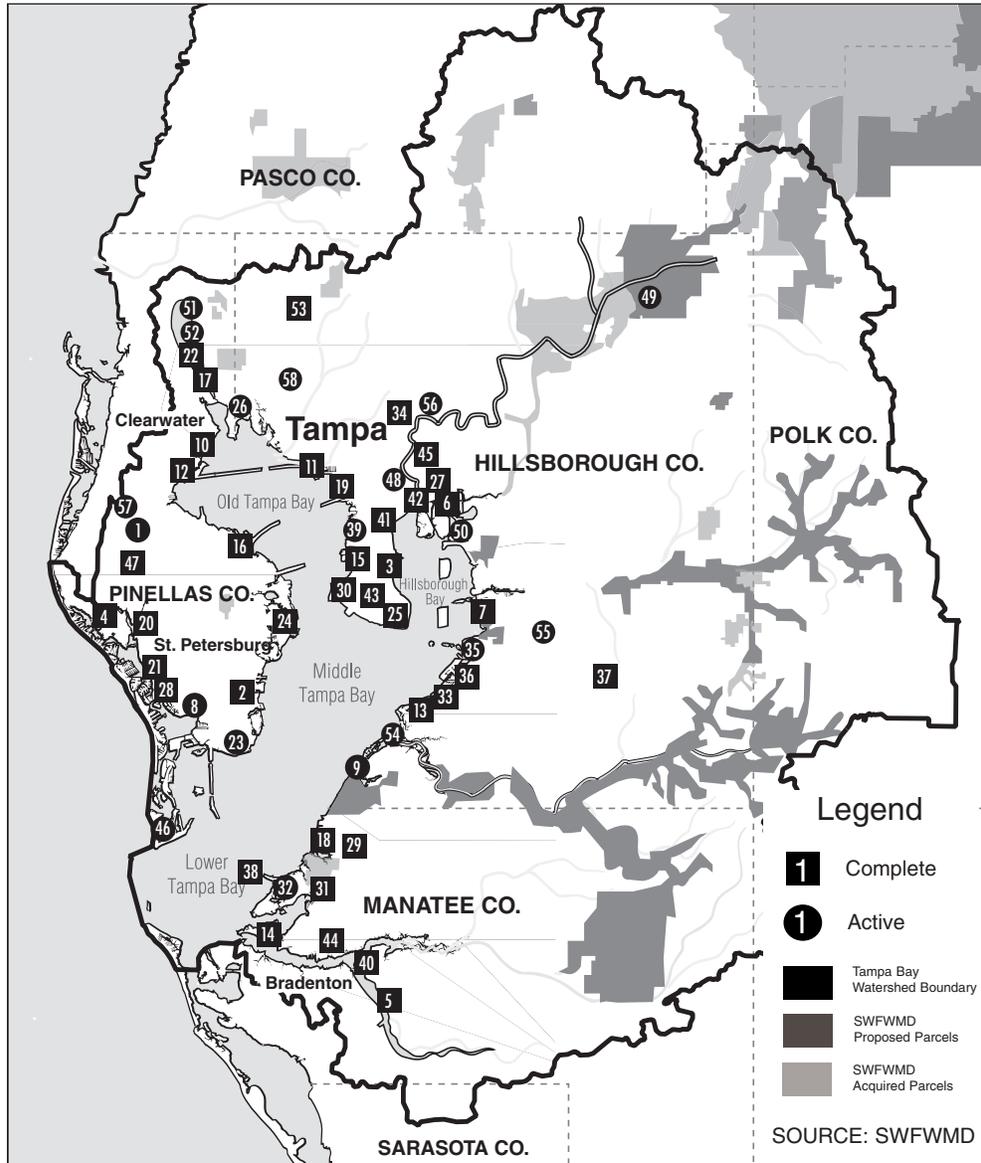
Tampa Bay boasts a diverse palette of habitats, from open-water rubble and reef communities to lush seagrass meadows and coastal hardwood hammocks.

Estimated losses of nearly half the bay's wetland habitats since the 1950s led to development of TBEP's "restoring the balance" strategy to guide restoration efforts. This approach recognizes that losses of some habitat types, such as low-salinity tidal marshes (-38%), have been disproportionately greater than for others, such as mangrove forests (-13%). While seeking to maximize recovery of those habitats hardest hit by development activities, "restoring the balance" also calls for preserving and enhancing existing mangrove and marsh communities through land acquisition, invasive species eradication and regulatory protections.

Specific goals for emergent habitat restoration and protection, as incorporated in the Habitat Restoration Master Plan, are:

- Restore the historic balance of coastal wetland habitats by restoring at least 100 acres of low-salinity habitats every five years.
- Preserve the bay's 18,800 acres of marsh and mangrove habitat, including 28 priority sites.
- Establish and maintain adequate freshwater flows to the bay and its tributaries.

Habitat Restoration Projects in Tampa Bay 2005



- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Allen's Creek I & Lancaster Tract 2. Bartlett Park 3. Bayshore Blvd. 4. Boca Ciega Phase 1, 2 & 3 5. Braden River (SR64 & SR70) 6. NE McKay Bay 7. Cargill South Parcel 8. Clam Bayou 1, 2 & 3 9. Cockroach Bay Phases A-B-C-D-E-F 10. Coopers Point 11. Cypress Point 12. Del Oro Park 13. E. G. Simmons Park 1 & 2 14. Emerson Point 15. Gandy Park 16. Howard Frankland/Gateway Tract 17. Harbor Palms Park 18. Hendry Delta Fill 19. Howard Frankland East 20. Joe's Creek 1 & 2 and Long/Cross Bayou 21. Jungle Prada Park 22. Lake Tarpon Outfall Canal Phase 1 & 2 23. Little Bayou 24. Mangrove Bay 1, 2 & 3 25. MacDill Air Force Base Phase 1 & 2 26. Mobbly Bay & Mobbly Bayou Wilderness Preserve Phase 2 27. Ribbon of Green 28. Osgood Point 29. Peanut Lake | <ol style="list-style-type: none"> 30. Picnic Island 31. Terra Ceia Causeway 32. Terra Ceia Aquatic and Buffer Preserve 1 & 2 33. Wolf Branch Creek Phase 1 & 2 34. Lowry Park 35. The Kitchen: Davis Tract, Schultz Preserve, Dug Creek 36. Apollo Beach 37. Balm Road Marsh 38. South Skyway 39. Polanis Park 40. Braden River 2 41. Ballast Point 42. Fort Brooke 43. South Tampa Greenway/Tappan 44. Palmetto Estuary 45. Reed Property 46. Fort DeSoto Park 47. Largo Central Park Habitat Restoration 48. River Garden Stabilization Study 49. Hillsborough River State Park 50. DeSoto Park Addition Shoreline Restoration 51. Brooker Creek Channel L 52. Brooker Creek Channel F 53. Brooker Creek ELAPP Habitat Restoration 54. Bahia Beach Habitat Restoration 55. Ekker Property Restoration 56. River Tower Shoreline Restoration 57. Eagle Lake Park Wetland Restoration 58. Sweetwater Creek Habitat Restoration |
|---|--|

From 1995-2001, more than 378 acres of low-salinity, or oligohaline, habitats were restored, far exceeding the original goal of 100 acres every five years. These critically important areas are vital to the survival of juvenile snook and mullet as well as numerous wading birds. A new research initiative, begun in 2005, will quantify specific water and sediment quality requirements for oligohaline tributaries of the bay, particularly small streams and creeks about which little is presently known.

Overall, about 2,350 total acres of marshes, mangroves and other benchmark habitats were restored in the Tampa Bay ecosystem from 1996-2003, primarily through projects coordinated by the Southwest Florida Water Management District's Surface Water Improvement and Management (SWIM) program. More than 60 percent of the total restored acres were marshes or mangroves, while 27 percent were coastal uplands. Pending projects will triple the amount of habitat restored in the next decade, as larger efforts that provide significant wildlife corridors and emphasize creation of a "mosaic" of diverse habitat types take shape.

The Habitat Restoration Master Plan also emphasizes the restoration or protection of small freshwater ponds in the vicinity of white ibis and other wading bird rookeries, as the crayfish and frogs found in these ponds are a critical food source for ibis chicks. Some progress has been made in preserving or restoring freshwater ponds, but the gains are not fully documented at present.

The Master Plan also identified 28 priority sites for protection to be managed or restored as necessary, through either direct purchase or other means such as conservation easements on private property. These sites were earmarked "high priority" by the Southwest Florida Water Management District in the state's Save Our Rivers and Florida Forever land-buying programs. A total of 11,494 acres of estuarine habitat was preserved through acquisition of these top-priority sites by TBEP partners between 1996 and 2003.

Critical habitats not included in the 1995 Bay Habitat Master Plan are hard-bottom habitats, including submerged rock or rubble reefs as well as oyster bars. These important habitats will be included in an updated Master Plan now being developed. Projects already are underway to map the extent and location of historic oyster bars in the bay and compare those with existing aerial photographs, and to evaluate the effectiveness of various artificial reef designs currently utilized.

Improvements in water quality have fueled steady gains in seagrass recovery, averaging about 250 acres per year, over the past two decades. Seagrasses are among the bay's most vital habitats, harboring an abundance of sea life. These flowering marine plants are generally found in waters 6 feet deep or less in Tampa Bay, where sunlight can penetrate the water column. Seagrass beds are important nursery and feeding grounds for several commercially and recreationally important species in Tampa Bay, including shrimp, spotted sea trout, red drum, and snook.

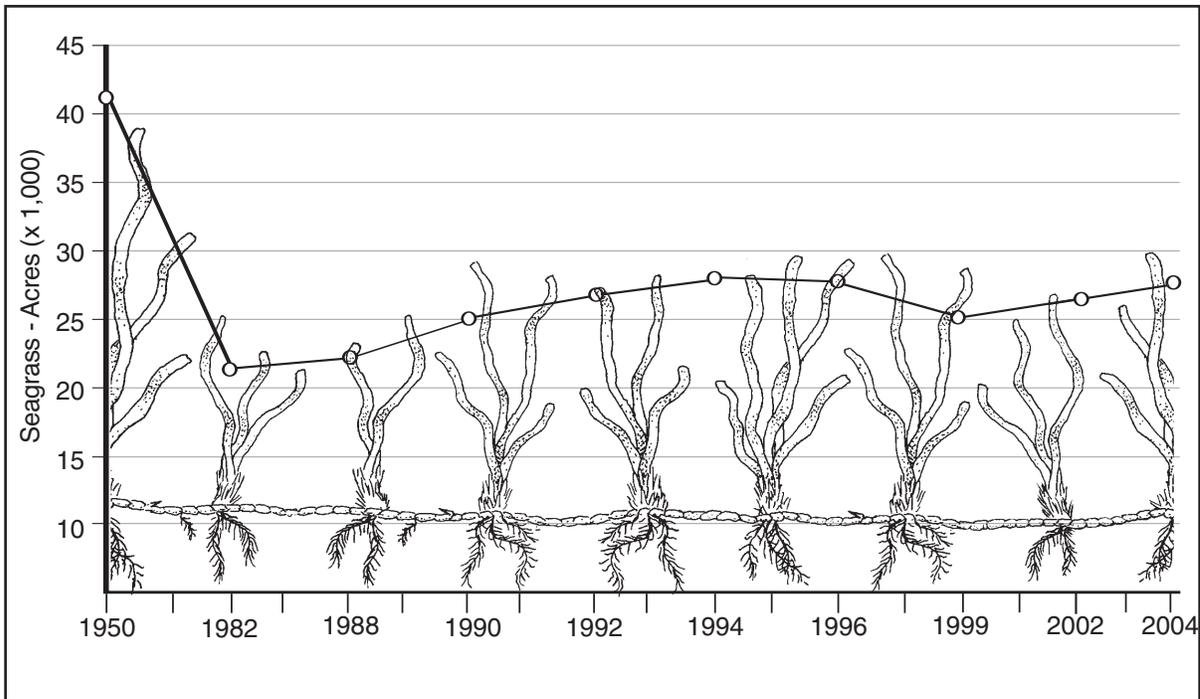
TBEP and its partners have established a seagrass recovery goal of approximately 12,000 acres, while preserving the bay's existing 26,000 acres, for a total of 38,000 acres baywide. By 1997, about 4,000 new acres of seagrass were documented. However, record-setting El Nino rains from 1997-1999 erased some of those gains, resulting in a loss of about 2,000 acres from nutrient-laden stormwater runoff that clouded the water. Seagrasses rebounded by about five percent to 26,078 acres in 2002.

The most recent aerial surveys conducted by the Southwest Florida Water Management District, assessing changes from 2002 to 2004, show a continued, albeit slower recovery of 946 acres baywide, or about 4 percent from 2002-2004. Gains were documented in every bay segment except Old Tampa Bay, where seagrasses declined by 636 acres, or 12 percent, during this two-year period.

It is important to note that the 2002-2004 surveys were completed prior to the record-setting 2004 hurricane season, and do not take into account any impacts from associated wastewater and phosphogypsum stack spills.

The lagging recovery of seagrasses in Old Tampa Bay, and especially a 2,000-acre area in Feather Sound, remains a key focus of research sponsored by the Tampa Bay

Seagrass Decline and Recovery



SOURCE: Southwest Florida Water Management District 1988 - 2004

GOAL: Recover an additional 10,976 acres of seagrass over 2004 levels, while preserving the bay's existing 27,024 acres of seagrass as of 2004; an increase of 946 acres from 2002.

STATUS: Between 1988-1996, seagrass acreage increased an average of 450 acres per year. El Nino rains resulted in seagrass losses of about 2,000 acres between 1996-1999. In January 2004, seagrass acreage had increased an additional 946 acres, resulting in the highest observed acreage estimate since 1950.

Estuary Program beginning in 2003. Among potential causes of the seagrass declines are poor water quality, reduced circulation and flushing, and increased epiphytic growth on grass blades (which can prevent sunlight from reaching the blades), but studies so far are inconclusive. Solving the puzzle of the seagrass die-backs in Old Tampa Bay is critical to achieving the baywide seagrass recovery goal set by TBEP.

Wave erosion from passing ships is also suspected as a culprit in seagrass losses in some parts of the bay. Historical photos indicate that the presence of natural longshore sandbars that once existed in many areas may have helped to buffer wave action, allowing seagrass to flourish in the shallow waters landward of the bars. A pilot project to test this theory was launched in 2005 to reconstruct an experimental longshore bar along the southeastern shoreline of the bay.

FISH AND WILDLIFE

A spectacular variety of wildlife lives in, above and beside Tampa Bay – from the familiar brown pelican to the secretive diamondback terrapin to the magnificent tarpon, a premier gamefish.

Wading and shorebirds are among the bay's most visible inhabitants. Mangrove islands in the bay support up to 40,000 breeding pairs of 25 species of colonial waterbirds such as herons, ibis and egrets. As many as half breed in Hillsborough Bay. Many rare or coastal species nesting in Tampa Bay experienced sustained population increases between 1994-2001, including Reddish Egret, Roseate Spoonbill, American Oystercatcher, and Caspian, Royal and Sandwich Terns. El Nino rains created extremely advantageous foraging conditions in 1998, and breeding populations of some species, such as White Ibis, almost tripled before returning to pre-1998 conditions in 1999.

Beach-nesting birds such as black skimmers and least terns remain vulnerable to human-related impacts associated with waterfront development and recreational use, although nesting areas at Egmont Key, Shell Key and other islands have been protected in recent years.

Manatees, dolphins and sea turtles are high-profile bay residents. The number of manatees using Tampa Bay has steadily increased in the past decade, likely as a result of improved habitat and the presence of power plants that provide warm-water refuges for manatees wintering in the bay. More than 350 individuals have been counted in the bay in the winter months. About 150 animals are found in the bay in the summer, when the entire West Coast population is more scattered.

A number of year-round and slow-speed zones have been created in the bay, through federal, state or local regulation, along with two no-entry areas – the power plant outfalls at Tampa Electric's Big Bend complex near Apollo Beach and the Bartow plant owned by Progress Energy at Weedon Island. Extensive shoreline speed zones are in place in Hillsborough County from Tampa's Rocky Point area south to the Gandy Bridge, from the Alafia River to E.G. Simmons Park south of Ruskin, in Terra Ceia Bay, the Manatee River, and in Pinellas County north of the Courtney Campbell Causeway to Oldsmar.

Additionally, Pinellas County has implemented seagrass protection zones at Fort

DeSoto Park, Weedon Island and north of the Courtney Campbell Causeway that also serve to protect manatees feeding and resting in the shallow grass beds.

More than 850 individual dolphins have been identified in Tampa Bay, but resident population estimates are closer to 550. Researchers have identified five separate communities of dolphins in what is a relatively “closed” population strongly rooted to discrete home ranges within the bay. In fact, photo surveys confirm that a large proportion of dolphins first identified in Tampa Bay in the late 1980s still frequent these waters. Some individuals are thought to be more than 50 years old.

Although only about 350 sea turtles nest annually on beaches surrounding Tampa Bay – less than 1% of the average statewide total – this number is nevertheless regionally significant because it contributes to the diversity of the species as a whole. Nests are documented annually on the barrier islands off Pinellas and Manatee Counties, with Egmont Key providing the most pristine nesting beach remaining.

Sea turtles are common inhabitants of the bay itself. Loggerheads are by far the most numerous, but green, hawksbill, and Kemp’s ridley turtles also are found. Adults forage in the bay, while juveniles shelter there until they are large enough to survive in the open ocean. Recent research has revealed that Tampa Bay is an important nursery area for young Kemp’s ridley turtles – among the world’s most endangered animals.

Fisheries population estimates as measured by the state’s Fisheries Independent Monitoring Program since 1989 show species-specific patterns. For example:

- Red drum juvenile abundances peaked in 1991 and 1995, and were relatively constant from 1996-2001.
- Sheepshead juvenile abundance peaks seem to occur in three-year cycles, with high recruitment in 1991, 1994, 1997 and 2000.
- Snook juvenile abundance estimates were highest in 1999 and 2000.
- Spotted seatrout juvenile abundance has been relatively stable since 1991.
- Blue crab abundances were lowest in 1990 and highest in 1989, 1992, 1995 and 1998.

DREDGING AND DREDGED MATERIAL MANAGEMENT

The Tampa Bay region has developed a long-term plan specifically to address the issues associated with dredging and dredged material. This plan, a joint effort of the Tampa Bay Estuary Program and the Army Corps of Engineers, fosters coordination of dredging and dredged material management to maximize shared placement and beneficial use opportunities while minimizing the environmental impacts and costs associated with these activities. The plan is updated from time to time and is the driving force behind several recent pilot projects to explore innovative uses of dredge spoil.

Currently, dredging to maintain the bay’s nautical channels generates about a million cubic yards of material each year, enough to fill Raymond James Stadium 10 times.

Listed Species of the Tampa Bay Watershed

Scientific Name	Common Name(s)	Grp	FWC	FWS	Comments
<i>Acipenser oxyrinchus</i> (Gulf sturgeon)	Atlantic sturgeon	Fish	SSC	T*	* Applicable only to the subspecies <i>A.o. desotoi</i>
<i>Rivulus marmoratus</i>	Mangrove rivulus; rivulus	Fish	SSC		
<i>Rana capito</i>	Gopher (=crawfish) frog	Amph	SSC		
<i>Alligator mississippiensis</i>	American alligator	Rept	SSC	T(S/A)	
<i>Caretta caretta</i>	Atlantic loggerhead turtle	Rept	T	T	
<i>Chelonia mydas mydas</i>	Atlantic green turtle	Rept	E	E	
<i>Dermochelys coriacea</i>	Leatherback (=leathery) turtle	Rept	E	E	
<i>Drymarchon corais couperi</i>	Eastern indigo snake	Rept	T	T	
<i>Eretmochelys imbricata imbratica</i>	Atlantic hawksbill turtle	Rept	E	E	
<i>Gopherus polyphemus</i>	Gopher turtle	Rept	SSC		Associated primarily with uplands.
<i>Lepidochelys kempi</i>	Atlantic ridley turtle	Rept	E	E	
<i>Pituophis melanoleucus mugitus</i>	Florida pine snake	Rept	SSC		Confined to xeric sites
<i>Pseudemys concinna suwanniensis</i>	Suwannee cooter	Rept	SSC		
<i>Stilosoma extenuatum</i>	Short-tailed snake	Rept	T		Ranges S to uplands west of Kissimmee River
<i>Ajaia ajaja</i>	Roseate spoonbill	Bird	SSC		
<i>Aphelocoma coerulescens</i>	Florida scrub-jay	Bird	T	T	Confined to oak scrub habitat
<i>Aramus guarana</i>	Limpkin	Bird	SSC		
<i>Charadrius alexandrinus tenuirostris</i>	Southeastern snowy plover	Bird	T		
<i>Charadrius melodus</i>	Piping plover	Bird	T	T	
<i>Dendroica kirtlandii</i>	Kirtland's warbler	Bird	E	E	Migrates through uplands along FL's coast
<i>Egretta caerulea</i>	Little blue heron	Bird	SSC		
<i>Egretta rufescens</i>	Reddish egret	Bird	SSC		
<i>Egretta thula</i>	Snowy egret	Bird	SSC		
<i>Egretta tricolor</i>	Tricolored (=Louisiana) heron	Bird	SSC		
<i>Eudocimus albus</i>	White ibis	Bird	SSC		
<i>Falco peregrinus tundrius</i>	Arctic peregrine falcon	Bird	E		Migratory
<i>Falco sparverius paulus</i>	Southeastern American kestrel	Bird	T		Primarily observed in sandhill or sand pine-scrub habitats.
<i>Grus americana</i>	Whooping crane	Bird	SSC	T(E/P)	
<i>Grus canadensis pratensis</i>	Florida sandhill crane	Bird	T		
<i>Haematopus palliatus</i>	American oystercatcher	Bird	SSC		
<i>Haliaeetus leucocephalus</i>	Bald eagle	Bird	T	T	
<i>Mycteria americana</i>	Wood stork	Bird	E	E	
<i>Pelecanus occidentalis</i>	Brown pelican	Bird	SSC		
<i>Picoides borealis</i>	Red-cockaded woodpecker	Bird	SSC	E	
<i>Polyborus plancus audubonii</i>	Audubon's crested caracara	Bird	T	T	
<i>Rynchops niger</i>	Black skimmer	Bird	SSC		
<i>Speotyto cunicularia</i>	Burrowing owl	Bird	SSC		Prefer open, well-drained areas, such as dry prairies, canal banks, and road berms.
<i>Sterna antillarum</i>	Least tern	Bird	T		
<i>Sterna dougallii</i>	Roseate tern	Bird	T	T	FL breeding range confined to Keys and Dry Tortugas.
<i>Felis concolor coryi</i>	Florida panther	Mamm	E	E	
<i>Podomys floridanus</i>	Florida mouse	Mamm	SSC		Restricted to xeric habitats such as interior and coastal dunes.
<i>Sciurus niger shermani</i>	Sherman's fox squirrel	Mamm	SSC		Optimal habitat is mature longleaf pine-turkey oak sandhills and flatwoods.
<i>Trichechus manatus</i>	West Indian (=Florida) manatee	Mamm	E	E	
<i>Ursus americanus floridanus</i>	Florida black bear	Mamm	T*		

*Not applicable in Baker and Columbia counties and Apalachicola National Forest

SOURCE: Florida Fish and Wildlife Conservation Commission

Much of the sediment dredged during maintenance activities is deposited on two manmade spoil islands in Hillsborough Bay. Options for increasing the capacity of these islands are being studied; however, they eventually will reach capacity and alternatives will be necessary to accommodate the nearly 30 million cubic yards which will be created through the year 2030. Additional new spoil will be generated as a result of the Corps' Tampa and St. Petersburg Harbor Re-evaluation project, which is evaluating the need for additional navigational improvements to accommodate increased maritime commerce in the bay.

Finding environmentally useful ways to use the material dredged from the bay bottom will continue to be a key goal of the CCMP. Among the alternatives to traditional disposal of dredge spoil are: renourishing beaches and stabilizing shorelines; re-filling abandoned pits to restore tidal wetlands; re-creating longshore bars to aid in seagrass recovery; and filling of suitable manmade dredged holes in the bay.

A pilot project coordinated by TBEP and funded by a grant from the U.S. Environmental Protection Agency assessed the feasibility of filling dredge holes in the bay to improve fisheries habitat and encourage seagrass regrowth. Beginning in 2003, an advisory group convened for the project identified 11 priority dredge holes that could support seagrasses if filled to surrounding depth. The habitat value of the holes was then evaluated by a team of scientists to assess the existing fisheries utilization, benthic diversity and water quality.

Results from the research project indicated that most of the holes already were providing important habitat for a variety of commercially or recreationally important species. Water quality in most of the holes also was better than expected. As a result, the advisory committee recommended leaving 8 of the 11 holes as they are, and partially filling or enhancing three. A clear conclusion of the project is that each hole must be assessed independently to determine an appropriate management strategy.

Another possible use of dredged material is in the creation of shallow nearshore sandbars to help reduce wave erosion and facilitate seagrass recolonization in the quiet waters landward of the bars. In 2005, TBEP and a variety of partnering organizations initiated a multi-year pilot project to design and restore a degraded nearshore bar and monitor its impacts on surrounding areas. If successful, this project may pave the way for restoration of additional bars using dredge material of appropriate quality.

Upland disposal options for beneficial uses of dredge spoil also are being employed, including use of dredged material in habitat restoration projects at Cockroach Bay and in the Harbor Isles neighborhood of St. Petersburg. Additionally, Port Manatee plans to use the former state fish hatchery site to dispose of dredged material associated with port expansion.

SPILL PREVENTION & RESPONSE

Each year, an average 4 billion gallons of oil and other hazardous substances pass through Tampa Bay on modern ships the size of skyscrapers. These vessels, bound predominantly for one of the bay's three deepwater ports or its many industrial facilities, are joined by a variety of other cargo carriers as well as a rapidly expanding

cruise ship fleet.

Although the potential for a catastrophic spill of petroleum or other toxic substances remains, significant strides have been made in preventing such an accident, and improving the region's overall emergency response readiness. In fact, Tampa Bay has not suffered a major spill since more than 300,000 gallons of oil were released following a dramatic three-way ship collision at the mouth of the bay in August 1993.

The U.S. Coast Guard's Area Contingency Plan serves as the guiding blueprint for spill response, spelling out response protocols, available equipment and personnel, and environmentally sensitive areas and resources. The ACP is updated every five years, and was recently converted into an electronic version that allows users immediate, interactive access to critical maps and real-time data. The ACP also incorporates the GIS-based Florida Marine Spill Analysis System, which allows decision-makers to direct containment, cleanup and restoration efforts during an actual spill.

These high-tech tools are bolstered by a network of pre-positioned boom, absorbent pads and other containment and cleanup equipment, placed at or near key sensitive areas of the bay, such as Cockroach Bay, to ensure rapid deployment should a spill occur.

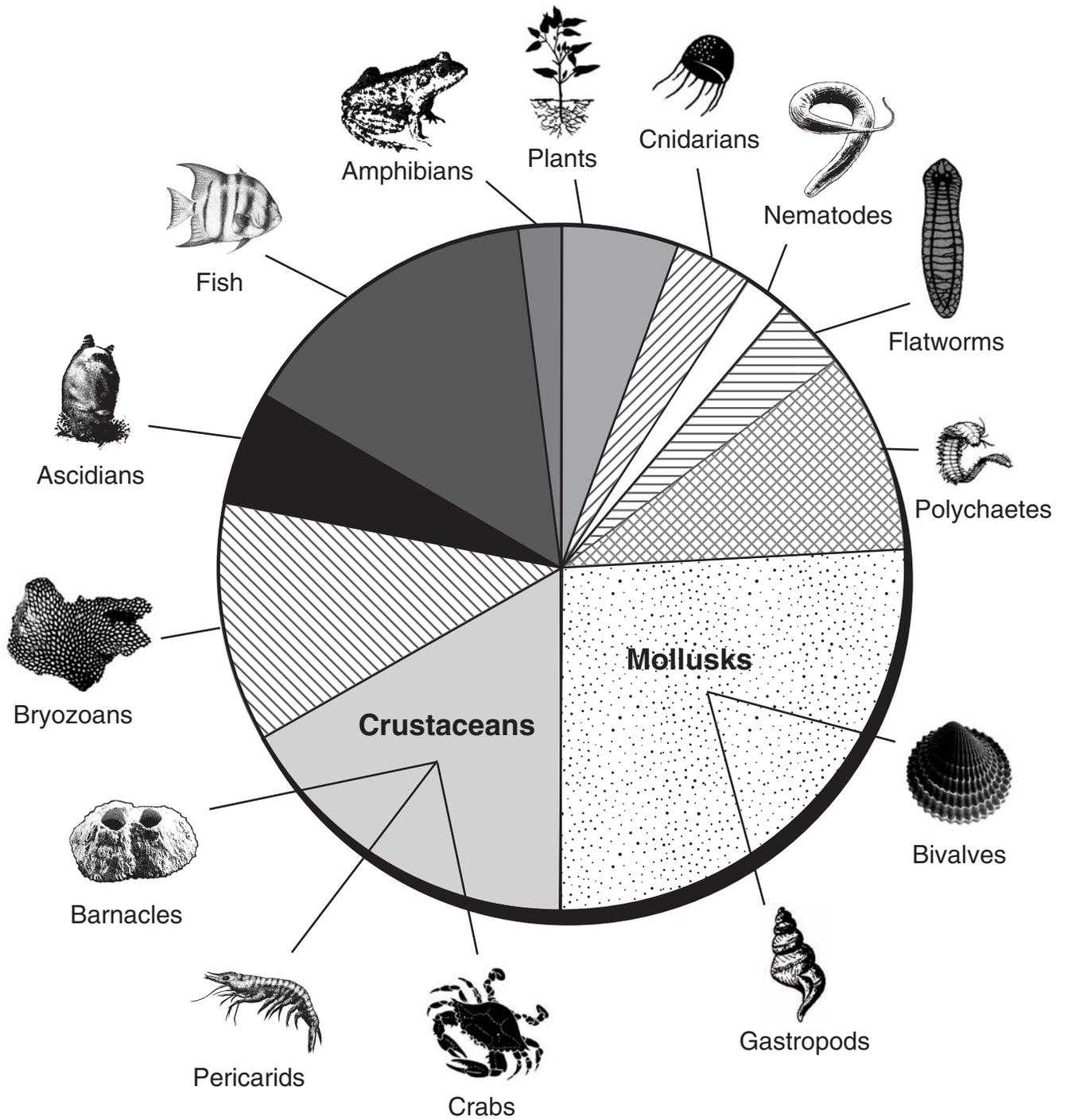
The excellent response record of the seabird rehabilitation organization Save Our Seabirds – which returned to the wild an impressive 85% of the birds rescued and treated during the 1993 spill – has been further enhanced by a comprehensive volunteer training program and the addition of a mobile hot-water trailer which allows volunteers to mobilize rescue and recovery efforts wherever a spill occurs.

Spill prevention remains a major goal of the region's maritime and environmental communities, and here important progress has been made as well. An integrated Vessel Tracking Information System (VTIS) has been fully implemented in Tampa Bay, equipping harbor pilots with shipboard laptop computers that provide up-to-the-minute displays of ship traffic in the bay's 44-mile main navigation channel. Combined with shore-based radar and current weather information, the VTIS provides the safest available means of navigation for commercial mariners.

Finally, the Physical Oceanographic Real-Time System (PORTS), a system of buoys and sensors that provides real-time weather, wind and current information to both professional and recreational mariners, is now accessible online as well as by phone. While no permanent source of funding has yet been found for PORTS – which is maintained by the University of South Florida – the system does have adequate funding from all three bay counties to remain operational through 2008.

Although large spills are by their nature the most visible threat to the bay, smaller chronic spills may be cumulatively more damaging. These spills occur through careless fueling practices, operation of outboard motors, discharges of oily bilge water and improper disposal of used oil products. Boater education remains the most effective long-term strategy for reducing these routine spills.

Taxonomic Breakdown of Nonindigenous & Cryptogenic Species in Greater Tampa Bay



SOURCE: Dr. Patrick Baker, University of Florida

INVASIVE SPECIES

Invasive species are plants or animals that have been introduced from another part of the world into a native, or endemic, ecosystem, resulting in environmental, economic or human health impacts. Invasives are particularly aggressive and successful species that can displace and overtake native populations, reducing biodiversity and diminishing biological integrity. According to the World Conservation Union, invasive species are second only to habitat loss as a cause of extinctions worldwide.

The 1999 discovery in Tampa Bay of an exotic mussel native to Asian waters reinforced the need for a baywide strategy to address the potential environmental threats posed by aquatic invasive species. As a result, an Invasive Species Action Plan was developed and is included in this update of the Comprehensive Conservation and Management Plan. The plan calls for a two-pronged approach focused on educating the public about the impacts of invasive species and ways in which residents can help prevent invasions, and additional research into the extent of the problem in Tampa Bay.

A literature review and field survey of aquatic nuisance species commissioned by TBEP in 2002 identified 55 known, suspected or likely marine invaders in the bay. Additional research has explored the potential for an invasion of Tampa Bay by the toxic algae, *Caulerpa taxifolia* Mediterranean strain, concluding that the bay faces a relatively low risk of introduction of this extremely harmful species at the present time.

On the other hand, the Asian green mussel (*Perna viridis*) has rapidly spread throughout the bay and beyond, with recent sightings in northeast Florida, southern Georgia and northwest Florida. Within one year of its discovery in Tampa Bay, it had spread south to the Charlotte Harbor estuary system. At first, the mussel colonized primarily manmade structures such as bridge pilings and docks, but has now been documented in Tampa Bay in bare sand or mud flats and interspersed with seagrasses. TBEP is currently sponsoring research into the relationship between the green mussel, water quality and seagrass recovery in the bay to gain a better understanding of the environmental impacts of this highly successful invader.

The Asian green mussel is thought to have arrived in the bay in ballast water that is carried in the underbellies of ships to maintain buoyancy on the open sea. In fact, ballast water is a primary avenue through which numerous invasive organisms are believed to have been transported from one waterway to another. The international nature of modern-day shipping dramatically increases the potential for marine organisms to “hitchhike” around the globe. Scientists estimate that an average of 40,000 gallons of ballast water is released in U.S. coastal waters every minute.

As many as one-quarter of all the ships entering the Port of Tampa contain ballast water which may be discharged into Tampa Bay, according to port officials. Several regional studies are underway to characterize the risk posed by this water, and to test

treatment and assessment techniques. National regulations approved in 2004, to be implemented by the U.S. Coast Guard, will require mandatory ballast water treatment for all commercial ships entering U.S. ports. The most feasible treatment option at present is open ocean exchange – the discharge of ballast in offshore waters where high salinity levels dramatically reduce the survival rates of hitchhiking plants or animals.

Significant attention and resources have been devoted to preventing or removing invasive plants in the bay watershed, especially Brazilian pepper, Australian pine and other coastal invasives. Most bay habitat restoration projects involve eradication of invasive plants, and private developers also are often required to remove invasives as part of mitigation for wetland impacts. However, it is highly unlikely that invasives will be eliminated from all public lands, because of the extent of the problem and the high cost of removal.

Several agencies and organizations recently launched an effort to encourage homeowners to remove invasive trees, shrubs and vines in their backyard landscapes, recognizing that even a single plant may serve as a seed source to infest nearby parks and preserves. TBEP, in partnership with Florida Sea Grant, the Hillsborough Invasive Species Task Force, the Cooperative Extension Service and others, has produced or supported the production of a complete package of materials designed to help homeowners identify common invasive plants and teach them safe and effective removal techniques. The packet includes a seminar presentation, a field guide to invasive plants, and a video with step-by-step instructions for treatment and disposal of invasives.

Educational initiatives also are being planned for boaters, pet shop owners, aquarium enthusiasts and others who may unwittingly introduce invasive plants or animals into the bay system.

CHARTING the COURSE:

Water & Sediment Quality

Goals for improving water and sediment quality include:

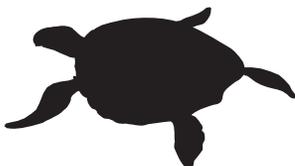
- Preventing increases in the bay's nitrogen levels to provide water clarity sufficient to recover 10,976 acres of seagrass. To accomplish this, local governments and industries will need to reduce their future nitrogen contributions to the bay by about 7% by the year 2010, or approximately 17 tons per year.
- Reducing the amount of toxic chemicals in contaminated bay sediments and protecting relatively clean areas of the bay from contamination.
- Understanding and addressing the sources and impacts of air pollution on the bay's water quality.
- Reducing bacterial contamination now present in the bay to levels safe for swimming and shellfish harvesting.

STATUS: *With the exception of very high rainfall years, water clarity is meeting site-specific targets in all bay segments except Old Tampa Bay. Seagrass recovery has been documented in all areas of the bay except Old Tampa Bay. As of 2004, projects completed by local government and industry partners in the Tampa Bay Nitrogen Management Consortium actually exceeded the 17-ton-per year nitrogen reduction goal.*

With one major power plant converted from coal to natural gas, and extensive pollution control improvements planned at another, a significant reduction in air pollution associated with these facilities is anticipated. However, research indicates that mobile sources (cars, trucks, etc.) are a larger component of the air pollution puzzle than previously thought.

The recently adopted Tampa Bay Benthic Index provides a practical tool for assessing the severity of toxic contamination in the bay, and identifies priority areas for remediation and cleanup.

New indicators of bacterial contamination adopted by state and local health officials provide a more accurate assessment of when swimming beaches should be closed, and ongoing research is helping to pinpoint chronic problem areas and sources of bacteria.



Bay Habitats

Goals for improving bay habitats include:

- Recovering an additional 10,976 acres of seagrass over 2004 levels, while preserving the bay's existing grass beds and reducing propeller scarring of seagrasses.
- "Restoring the historic balance" of coastal wetland habitats in Tampa Bay by restoring at least 100 acres of low-salinity tidal marsh every five years.
- Preserving and enhancing the bay's 18,800 acres of existing mangrove/salt marsh habitats.
- Establishing and maintaining adequate freshwater flows to Tampa Bay and its tributaries.

STATUS: *El Niño rains resulted in the loss of 2,000 acres of seagrass between 1996-1999. By 2002, about 1,237 acres had recovered, and an additional 946 acres were documented by 2004, resulting in the highest observed acreage estimate since 1950. A total of 2,357 acres of estuarine habitat, including 378 acres of critical low-salinity areas, was restored between 1996-2003. Additionally, 11,494 acres of existing estuarine habitat, including 2,261 acres of marshes and mangroves, were preserved through acquisition between 1996-2003.*

Minimum flows have been established for the lower Hillsborough River. Adoption of minimum flows for the upper Hillsborough, Alafia, Manatee and Little Manatee rivers is scheduled for 2006 and 2007.

Dredging & Dredged Material Management

The primary goal for dredging and dredged material management is to:

- Develop a long-term dredging and dredged material management plan for Tampa Bay.

STATUS: *The U.S. Army Corps of Engineers completed the dredged material management plan in 2000. The plan calls for meeting projected shortfalls in dredge disposal capacity by boosting the height of the two major existing spoil islands in the bay, and expanding beneficial use of dredged material for beach renourishment and habitat restoration projects.*

GOALS & PRIORITIES OF THE TAMPA BAY PLAN

Fish & Wildlife

Goals for improving fish and wildlife populations include:

- Increasing on-water enforcement of environmental regulations.
- Preserving the abundance and diversity of Tampa Bay's wildlife.
- Establishing and enforcing manatee protection zones.
- Restoring bay scallop populations in the bay to support recreational harvests.

STATUS: *The merger of fresh and saltwater enforcement agencies within the Florida Fish and Wildlife Conservation Commission has expanded the pool of officers trained to enforce both salt and freshwater regulations, and allowed officials to shift resources as needed to target priority problems. An extensive network of manatee protection zones (both state and local) has been adopted in Tampa Bay since 2000; posting of these zones should be completed by 2006. Although new stocking techniques for bay scallops are being tested, a severe red tide in 2005 hindered restoration efforts.*

Spill Prevention & Response

Goals for spill prevention and response include:

- Installing a state-of-the-art vessel traffic and information system (VTIS) to improve coordination of ship movements along the bay's narrow channels.
- Securing a permanent funding source for the Physical Oceanographic Real-Time System (PORTS) of navigational information.

STATUS: *VTIS installation is substantially complete, providing real-time information about shipping traffic to commercial pilots and the Coast Guard. Since installation, no major oils spills have occurred as a result of ship-to-ship collisions or groundings. Current contributions from all three bay counties will secure PORTS funding through 2008.*

Invasive Species

Goals to address impacts from invasive species include:

- Increasing scientific understanding and public awareness of the bay's vulnerability to marine bio-invasions.
- Creating an early warning system, utilizing bay managers and citizens, to assist in preventing future bio-invasions.

STATUS: *The Asian green mussel, first observed in Tampa Bay in 1999, has spread throughout the lower bay. A preliminary assessment of the bay, completed in 2004, revealed 55 known, suspected or potential marine invaders. A comprehensive public education program was launched in 2000 to increase public awareness of the impacts of invasive plants and animals, and enlist citizen help in combating them.*

Public Access

The primary goal for addressing public access to the bay is to:

- Reduce human and pet waste to ensure the continued viability of traditional bay recreation areas.

STATUS: *This is a new goal, adopted in 2004. Strategies for addressing this issue are detailed in Action PA-1.*

Public Education & Involvement

The primary goal for public education and involvement is to:

- Create a constituency of informed, involved citizens who understand both the environmental and economic value of Tampa Bay and actively participate in restoring and protecting it.

STATUS: *Priority areas for educational efforts include Florida-friendly landscaping, stormwater pollution, air pollution, invasive species and bay-friendly boating. A variety of programs and products have been developed for these areas, tailored to specific audiences. TBEP distributes an average of 10,000 educational materials each year.*

Introduction to Action Plans

The Tampa Bay Estuary Program was established in 1991 to assist the community in developing a Comprehensive Conservation and Management Plan (CCMP) for Tampa Bay. The original CCMP was adopted in 1996 and contained six Action Plans for bay improvement. This first revision of the Plan incorporates eight Action Plans, addressing:

- **Water & Sediment Quality**

- Nitrogen Management
- Stormwater Runoff
- Atmospheric Deposition
- Wastewater
- Toxic Contamination
- Public Health

- **Bay Habitats**

- Freshwater Inflow

- **Fish & Wildlife**

- **Dredging & Dredged Material Management**

- **Spill Prevention & Response**

- **Public Education**

- **Invasive Species**

- **Public Access**

Local government and agency partners of TBEP signed a binding agreement in 1997 pledging to achieve agreed-upon goals for water quality and natural resource recovery, as well as priorities for spill prevention, fish and wildlife protection, and dredging and dredged material management. New goals have been adopted in recent years addressing invasive species awareness and prevention, public education and public access.

How those goals are achieved is left largely to individual communities, who may select from among a range of acceptable alternatives. Many of these options are outlined in the following Action Plans. This approach not only emphasizes flexibility, but allows local governments to focus their limited resources in the most cost-effective and environmentally beneficial manner.

Bay Action Plans define the bay's most pressing needs, and present strategies to achieve bay goals and maximize the community's long-term return on investment. Some actions can be implemented quickly and with existing resources. Others will require long-term community commitments.

Action Plans have been developed with assistance from bay experts and advocates working through TBEP's management, technical and community advisory committees. Each Action Plan begins with an introduction to the issue followed by appropriate next steps in implementation, as well as a listing of responsible parties and a timetable for completion.

Water and Sediment Quality



Tampa Bay is among the most well-studied estuaries in the world, thanks to the cooperative efforts of the multiple governments and agencies engaged in research and sampling of the bay's water quality, bottom sediments, fisheries and wildlife.

Photo courtesy of the Florida Fish and Wildlife Conservation Commission

Implement the Nitrogen Management Strategy for Tampa Bay

WQ-1**ACTION:**

Implement the Nitrogen Management Strategy for Tampa Bay to facilitate recovery of seagrasses.

STATUS:

Ongoing.

BACKGROUND:

Controlling the bay's nitrogen intake as a means to regain vital underwater seagrass beds has been one of the most prominent initiatives of the Tampa Bay Estuary Program. Seagrasses were selected as a yardstick by which efforts to improve the bay are measured because of their overall importance as a bay habitat and nursery, and because they are an important barometer of their environment, signaling changes in water quality trends. Excess nitrogen fuels algal growth, robbing underwater grass flats of the light they need to survive.

A Nitrogen Management Consortium was established in 1996 to address long-term nitrogen management. The voluntary group, including electric utility, industry and agricultural representatives along with local governments and regulatory agencies, has gained national acclaim for its efforts to reduce nitrogen loadings to the bay, above and beyond requirements of individual entities. In fact, the process has been so effective that it satisfies state and federal requirements for establishing a Total Maximum Daily Load or TMDL for the bay, thereby achieving through consensus what otherwise would require additional command-and-control regulation.

The current goal, based on modeling efforts, is to "hold the line" on nitrogen loadings at 1992-1994 levels to encourage seagrass recruitment. That necessitates a net nitrogen reduction of about 17 tons per year, or 84 tons over 5 years, to offset anticipated increases associated with population growth in the region. For the period 1995 to 1999, projects completed in the Tampa Bay watershed by TBEP partners actually exceeded those reduction goals. Additionally, all four major bay segments met chlorophyll *a* targets through 2002 with the exception of El Nino years (1997-98 and 2002), providing sufficient water clarity for seagrass recovery. In 2003 and 2004, targets were met in three of four major bay segments – Old Tampa Bay being the exception.

Local governments agreed to meet that portion of the nitrogen target addressing non-agricultural runoff and municipal point sources in their jurisdictions. The balance is addressed by partners in the Nitrogen Management Consortium, whose members have pledged additional action to meet the goal.

Seagrasses are responding to the management strategy, with an overall gain of 5,371

WQ-1

Tampa Bay Decision Matrix

Year	Old Tampa Bay	Hillsborough Bay	Middle Tampa Bay	Lower Tampa Bay
1975	■	■	■	■
1976	■	■	■	□
1977	■	■	■	■
1978	■	■	■	□
1979	■	■	■	■
1980	■	■	■	■
1981	■	■	■	■
1982	■	■	■	■
1983	■	□	■	■
1984	■	■	■	□
1985	■	■	■	□
1986	■	□	■	■
1987	■	□	■	■
1988	□	■	□	■
1989	■	□	■	□
1990	■	■	■	□
1991	■	□	□	□
1992	□	■	□	□
1993	□	■	□	□
1994	□	□	■	■
1995	■	□	■	□
1996	□	■	□	■
1997	□	■	■	□
1998	■	■	■	■
1999	□	■	□	□
2000	■	■	□	□
2001	□	■	□	□
2002	□	■	■	■
2003	■	□	■	□
2004	■	■	■	□

SOURCE: TBEP

Legend:

- = Not meeting one of the targets (either chlorophyll or light penetration)
- = Not meeting chlorophyll *a* and light penetration targets
- = Meeting both targets

The Decision Matrix provides a quick “report card” on water clarity in the four major bay segments. The matrix encompasses average annual chlorophyll *a* and light penetration measurements from 1975-2004. With the exception of high rainfall years in 1995 and 1998, water clarity has shown steady improvement in all bay segments except Old Tampa Bay, where recent declines bear watching.

acres since 1982, even after substantial losses in the late 1990s due to El Nino rains. However, seagrass acreage has been declining in Old Tampa Bay since 1994. Studies are now underway to help understand the factors involved with successful seagrass recovery in this bay segment. Basin-specific management plans which include refined strategies for nutrient and other contamination load management designed for the characteristics of each basin will be important next steps in maintaining seagrass recovery baywide.

The TBEP Technical Advisory Committee's Modeling Subcommittee is also examining the need for an appropriately-scaled loading model, which may take into account the need for estimating attenuation of nutrients in the watershed and other issues important for adequately estimating nutrient loading from different sources. The Modeling Subcommittee is due to complete its recommendations in 2006. TBEP is scheduled to update the baywide loading model after the Modeling Subcommittee finalizes recommendations.

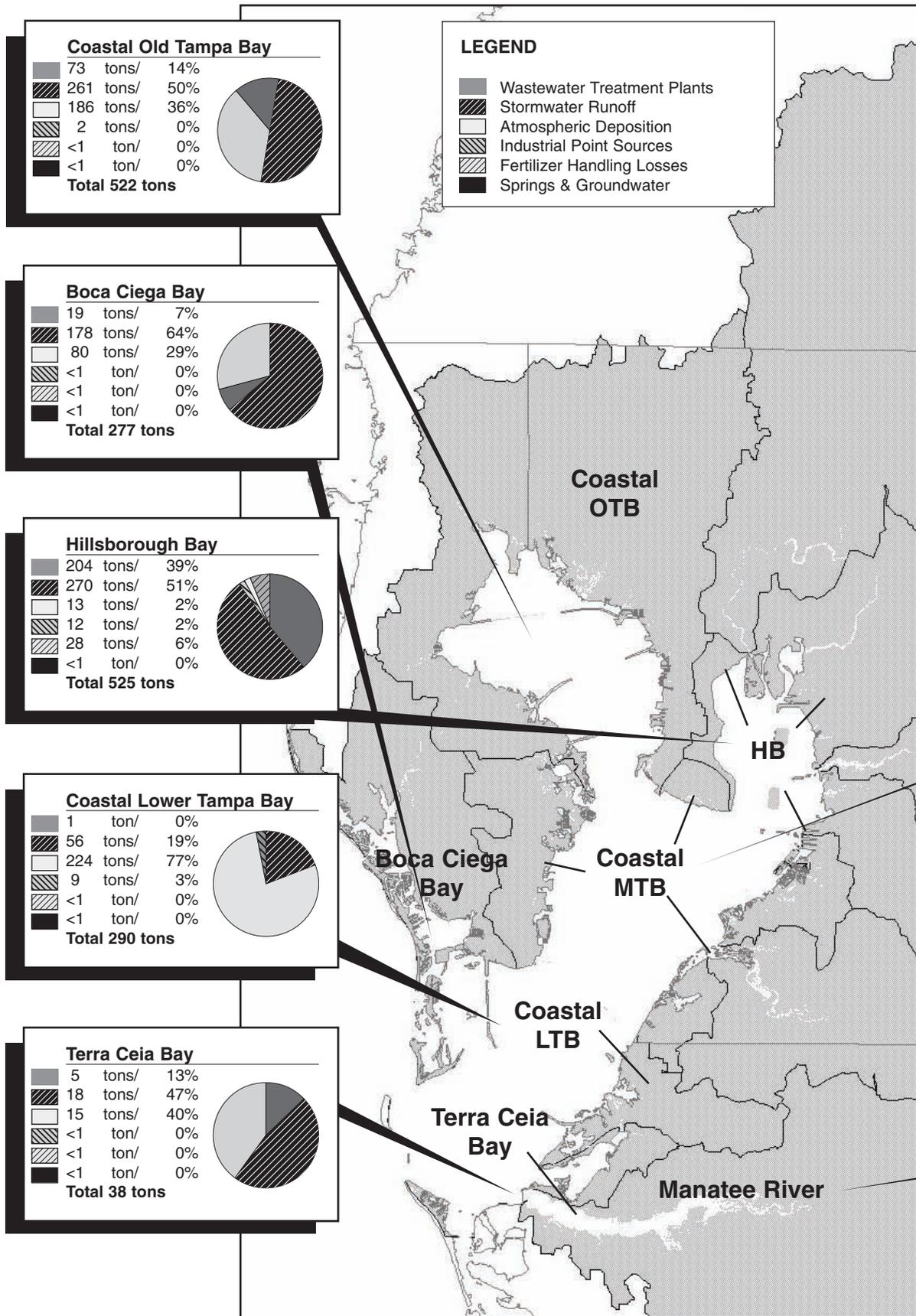
This important action calls for tracking nutrient reduction projects through an electronic database; development of more detailed drainage basin plans; updating the Tampa Bay watershed loading model; and re-evaluating seagrass recovery and nutrient reduction goals.

STRATEGY:

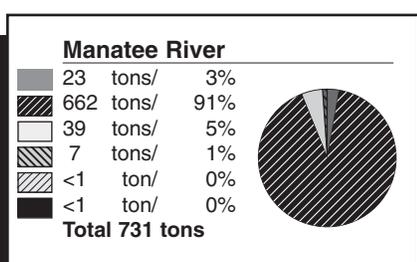
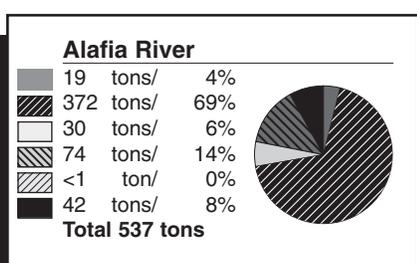
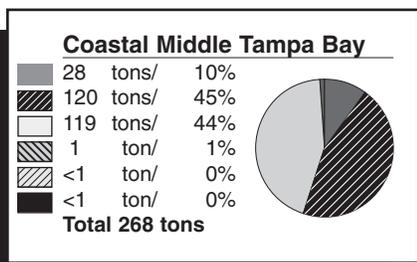
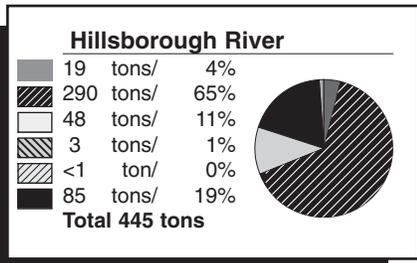
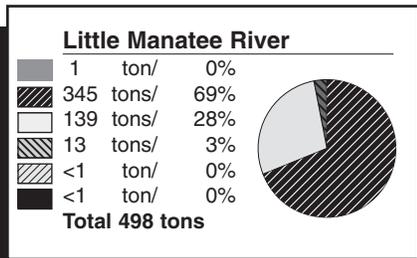
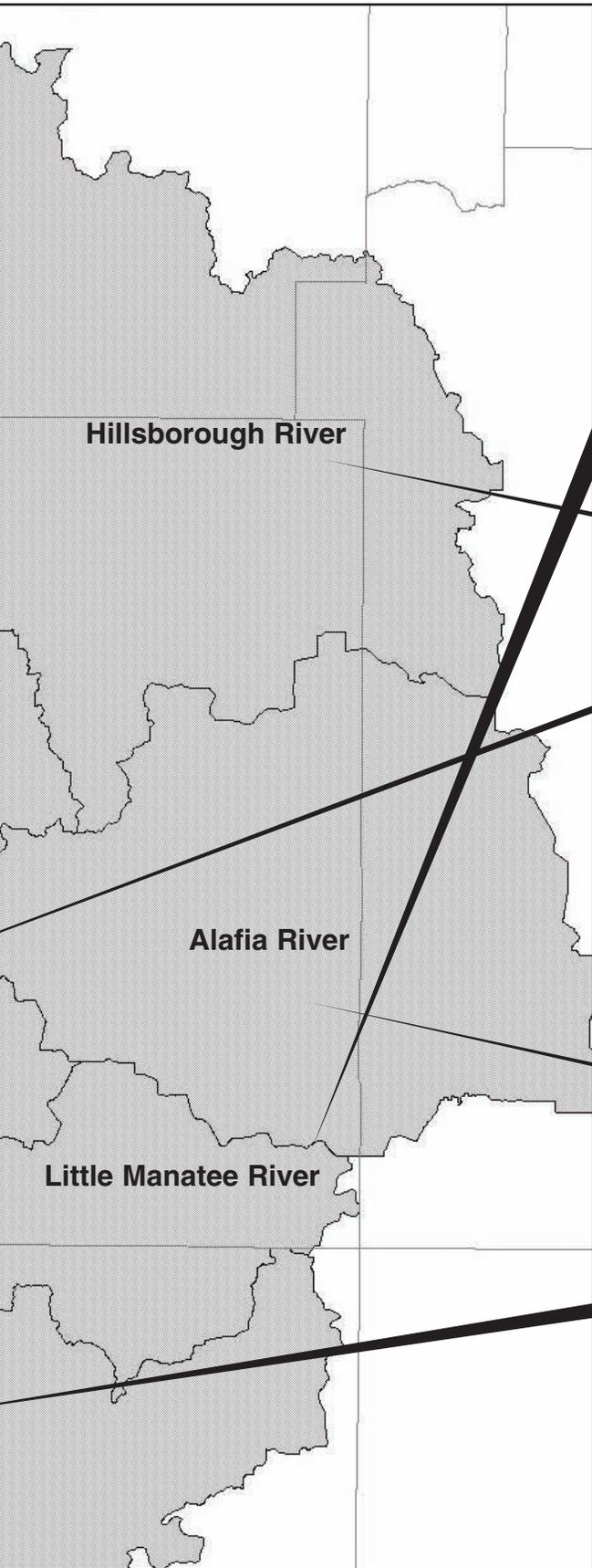
- STEP 1 Populate the electronic database developed by TBEP to effectively track and quantify nitrogen reduction projects outlined in partner action plans.
Responsible parties: TBEP (database maintenance) and TBEP partners (development and implementation of partner action plans and submittal of information for database)
Schedule: Ongoing
- STEP 2 Encourage local government and industry participation in the development of drainage basin action plans.
Responsible parties: TBEP and Nitrogen Management Consortium partners
Schedule: Initiate in 2005
- STEP 3 Develop numeric targets for chlorophyll *a* and light attenuation for Boca Ciega Bay, Terra Ceia and Manatee River.
Responsible parties: TBEP
Schedule: Initiate in 2005
- STEP 4 Update the Tampa Bay nutrient loading model following recommendations of the Modeling Subcommittee. Consider how to include spills in loading estimates and reduction goals.
Responsible parties: TBEP
Schedule: 2006
- STEP 5 Re-evaluate seagrass recovery and nitrogen reduction goals, following completion of site-specific evaluations in Old Tampa Bay and other areas.
Responsible parties: TBEP and partners
Schedule: 2006

WQ-1

Major Drainage Basins Estimated TN Loadings (tons/year and percentage of total) by



Source and Major Basin 1999-2003



SOURCE: Poe, et al (2005)

WQ-2

Reduce Pollution from Recreational Boaters

ACTION:

Reduce pollution associated with recreational boating in the bay.

STATUS:

This action is a consolidation of actions TX-3 (Reduce toxic contaminants from ports and marinas; SP-3 (Improve fueling and bilge-pumping practices among pleasure boaters); and PH-3 (Install additional sewage pump-out facilities for recreational boaters and live-aboards).

BACKGROUND:

Significant progress has been made in implementing all three of the actions that are consolidated here. Among the accomplishments:

Twelve marinas in Pinellas, three in Manatee and one in Hillsborough have been designated Clean Marinas under the FDEP program.

FDEP estimates that about 17-18% of the marinas in Tampa Bay now have pump-out facilities, slightly higher than the 16.5% of marinas statewide. Pinellas ranks third in the state in the number of marinas receiving pump-out grants for the years 1994-1998, with 19 completed or under construction. Hillsborough and Manatee counties have not been as proactive in seeking grants, although one marina in Manatee and two in Hillsborough took advantage of the grant program. Additionally, all new marinas are now required to have pump-outs, as well as all designated Clean Marinas.

TBEP has assisted in promoting both the Clean Marina Program, and the Clean Vessel Act grant program, and in making local governments aware of these programs so they could help promote participation. TBEP also already provides a wealth of information on clean boating to area marinas and individual boaters upon request.

TBEP's Manatee Awareness Coalition (MAC) has expanded its mission to encompass a broader "bay-friendly boating" message, and created "new boater" packets in 2005 that include information on safe fueling, bilge pumping and a variety of other issues. Additionally, TBEP regularly contributes educational articles about bay-friendly boating to a new magazine, *Boaters i*, which is direct-mailed to some 15,000 boaters in the bay area – providing another forum for distributing information about clean boating practices.

STRATEGY:

STEP 1 Continue to promote FDEP's Clean Marina Program to area marinas, particularly in Hillsborough County, where participation in the program is lagging.

Responsible parties: FDEP, local governments, TBEP

Schedule: Ongoing

WQ-2

- STEP 2 Encourage greater participation in the Clean Vessel Act grant program, which provides financial assistance to older marinas for installing sewage pump-outs.
Responsible parties: FDEP, local governments, TBEP
Schedule: Ongoing
- STEP 3 Evaluate feasibility of distributing bilge socks to area boaters as a method of reducing fuel and oil spills from recreational vessels.
Responsible parties: FDEP, local governments, TBEP, Coast Guard Auxiliary
Schedule: If funds are available, distribution could begin in 2005-2006.
- STEP 4 Encourage the U.S. Coast Guard Auxiliary and Power Squadron to include information about safe fueling, bilge pumping, and bay-friendly boating in their Safe Boating Courses.
Responsible parties: TBEP's Manatee Awareness Coalition
Schedule: The MAC could revise its "Minute for Manatees" curriculum in FY 2005, for inclusion in Safe Boating Courses thereafter.
- STEP 5 Continue to distribute existing boater education materials, such as the Clean Boating Habits booklet and the Boaters' Guide series, and develop new materials as needed to target new concerns or to reinforce existing messages.
Responsible parties: TBEP, FDEP, FWC, local governments, Coast Guard Auxiliary
Schedule: Ongoing

SW-1

Continue Support for the Florida Yards & Neighborhoods Program and Similar Pollution Prevention Initiatives

ACTION:

Support the Florida Yards & Neighborhoods Program and similar pollution prevention initiatives.

STATUS:

Complete. Continue to monitor implementation.

BACKGROUND:

The Florida Yards and Neighborhoods Program encourages homeowners to utilize Florida-friendly gardening concepts that save water and reduce use of pesticides and fertilizers. FY&N encourages homeowners to water efficiently, mulch, recycle and select the least toxic pest control measures; put the right plant in the right spot; fertilize only when necessary; provide food, water and shelter for wildlife; protect surface water bodies (i.e., bays, rivers, streams, ponds); and minimize stormwater runoff.

The Indian River Lagoon, Tampa Bay and Sarasota Bay National Estuary Programs were among the original developers of this innovative program, in partnership with the University of Florida's Extension Service. As of 2005, 40 of Florida's 67 counties have implemented a FY&N program, and three more were expected to join the program by the end of 2005.

Locally, FY&N programs are active in Hillsborough, Pinellas, Manatee and Pasco counties, with full-time coordinators implementing a variety of initiatives. Manatee County's FY&N coordinator has worked successfully with developers in Sarasota and Manatee counties, while programs in Hillsborough and Pinellas counties have focused on individual homeowners, and even partnered with retailers such as Home Depot to distribute FY&N materials. The Hillsborough and Pinellas programs also are partnering with Tampa Bay Water and the Southwest Florida Water Management District to implement the Water-Wise Awards program, which recognizes water-efficient landscapes created by homebuilders as well as homeowners. Regionally, the Department of Environmental Protection recommends the use of FY&N concepts for Developments of Regional Impact.

Local FY&N programs also are at the forefront of efforts to educate residents about invasive plants and proper eradication and control techniques.

Advisory committees composed of water conservation and landscape professionals as well as educators set priorities for the local programs annually.

Additionally, a variety of other local government or agency initiatives promote water quality stewardship and pollution prevention to both children and adults, including:

- Hillsborough County's Officer Snook and Adopt-A-Pond programs
- The Museum of Science and Industry's Marine Gang
- The Florida Department of Environmental Protection's Clean Marina and Pollution Prevention (P2) programs, targeting specific businesses or industries.
- The Florida LakeWatch program, which trains lakefront residents to monitor water quality and reduce residential impacts to lakes.

TBEP should continue to support these existing programs as needed, assist in developing common reporting protocols for assessing the nitrogen reduction benefits of such programs, and encourage greater business and industry participation.

STRATEGY:

STEP 1 Continue to support FY&N programs in Hillsborough, Manatee and Pinellas counties, and assist in promoting and assessing the program by:

- Working with the Extension Service and local governments to develop common reporting protocols that better assess the impact of the program on reducing nutrient loads – such as mapping locations of participating households and total acres implementing FY&N, and estimating corresponding reductions in nitrogen loading.
- Encouraging more FY&N and pollution prevention education outreach to businesses, including builders, developers, and irrigation and landscaping specialists. (see Action SW-2)
- Emphasizing economic as well as environmental benefits of the Program. Coordinate with local and federal government Brownfields, Grayfields and Brightfields programs to optimize funding opportunities.
- Requesting information on how FY&N concepts are being implemented for publicly owned properties, such as government office complexes, parks, etc.

Responsible parties: Extension Services of Hillsborough, Pinellas and Manatee counties; TBEP

Schedule: Program ongoing. Initiate reporting protocols and other assessment tools in 2005.

Assist Businesses in Implementing Best Management Practices to Reduce Stormwater Pollution, and Develop Model Landscaping Guidelines for Commercial Use

ACTION:

Assist businesses in implementing best management practices (BMPs) to reduce stormwater pollution, and develop model landscaping guidelines for commercial use.

STATUS:

Complete. Continue to monitor implementation.

BACKGROUND:

This action appears to be complete as written. The Florida Department of Environmental Protection (FDEP) and Bay Area counties all have active Pollution Prevention programs that provide voluntary, non-regulatory assistance with environmental compliance issues to local businesses.

Among the accomplishments:

- Several local P2 programs have expanded to include erosion and sedimentation from building sites as a priority issue for assistance in promoting best management practices (BMPs) to protect Tampa Bay and its tributaries from siltation and runoff associated with construction.
- The state Clean Marina Program requires marinas to implement BMPs for stormwater management as part of the “Clean Marina” designation process.
- FDEP is partnering with Enterprise Florida to provide services and assessments for manufacturing companies, and identify opportunities for businesses to implement self-audits and strategies for pollution prevention and waste minimization.
- The Environmental Protection Commission (EPC) of Hillsborough County operates an active Small Quantity Generator program. From January 2001-December 2004, the program performed on-site visits to approximately 3,166 businesses. In addition to verifying potential hazardous waste generators in Hillsborough County, these inspections provide an opportunity for EPC staff to discuss proper waste handling practices as well as require cleanup efforts for those facilities with environmental violations. EPC also mailed 56,000 notification fact sheets to affected businesses, and disseminated more than 10,000 pieces of related literature encouraging more efficient irrigation, use of Integrated Pest Management, and wise fertilizer use.

Additionally, EPC has signed Interlocal Agreements with Hillsborough County and the City of Tampa to assist in the reporting requirements of their stormwater-related National Pollutant Discharge Elimination System permits. Negotiations are currently underway with the City of Temple Terrace to establish a similar Interlocal Agreement.

- The Southwest Florida Water Management District, in cooperation with the other Water Management Districts, has completed a landscape ordinance model. Several local governments have adopted some elements of this model. Local governments in general have become stricter in landscaping requirements for new commercial buildings as a result of prolonged drought, and several now restrict the amount of turf grass that can be installed.
- Best management practices for the landscape industry have been revised statewide, and now encourage more efficient irrigation, use of Integrated Pest Management, and wise fertilizer application.

To more accurately quantify implementation of this action, there is a need to collect information from local governments on the number of businesses using BMPs for stormwater treatment and landscaping for inclusion in the CCMP action plan database. Targeting outreach assistance to individual business with repeated violations or problems might also be effective.

STRATEGY:

- STEP 1 Request quantifiable information on the number of businesses using BMPs for stormwater treatment and landscaping for inclusion in the CCMP action plan database.
Responsible parties: TBEP
Schedule: Initiate in 2005
- STEP 2 Ensure that BMPs being recommended are consistent among federal, state and local government agencies.
Responsible parties: federal, state and local agencies with P2 programs, through ABM or TBEP TAC
Schedule: 2006
- STEP 3 Emphasize economic incentives of P2 programs for specific businesses and industries.
Responsible parties: agencies with P2 Programs, TBEP
Schedule: Ongoing
- STEP 4 Request information from local governments on illicit stormwater discharge violations, to better target program to those sectors experiencing the greatest incidence of violations.
Responsible parties: TBEP
Schedule: 2006
- STEP 5 Encourage the use of the “Florida Green Industries Best Management Practices for Protection of Water Resources in Florida” developed by the multi-agency effort of FDEP, FDACS, DCA, water management districts, UF and many private industry partners.
Responsible parties: TBEP
Schedule: Ongoing
- STEP 6 Consider a “Bay Friendly Business” certification.
Responsible parties: Local governments, SWFWMD, FDEP, TBEP
Schedule: Initiate in 2006

Encourage Local Governments to Adopt Integrated Pest Management Policies and Implement Environmentally Beneficial Landscaping Practices

ACTION:

Encourage local governments to adopt integrated pest management policies to reduce chemical use and implement environmentally beneficial landscaping practices.

STATUS:

Complete. Continue to monitor implementation

BACKGROUND:

This action is complete as written in the original CCMP. All local governments are actively utilizing IPM techniques in management of public lands, and all local governments have installed low-maintenance native or drought-tolerant landscapes in a variety of public areas.

For example:

- All local governments now employ IPM techniques on public lands to some extent. Hillsborough County and the City of Tampa adopted a formal resolution requiring the use of IPM on all county or city-owned lands. Clearwater also requires use of least-toxic pesticides and slow-release fertilizers by contractors that perform maintenance on city-owned bodies of water.
- Several local governments sponsored seminars in IPM utilization or sent employees to free IPM training provided by the Cooperative Extension Service through a grant from the Florida Department of Transportation's NPDES Stormwater Task Force.
- Florida Yards demonstration projects have been created at several public facilities, including a post office in Tampa, roadway medians in Pinellas and Hillsborough counties, the Pinellas Trail easement, TECO's Manatee Viewing Center, and the County Center complex in Tampa. Manatee Community College also incorporated FY&N landscape and maintenance concepts throughout its campus.
- All local governments utilize native and drought-tolerant plants wherever possible at their park properties, as well as on road easements and street medians.

However, there is a need for additional education, particularly of city, county and state road maintenance crews, to ensure that road easements and ditches are not mowed or sprayed indiscriminately.

One successful model appears to be the Invasive Species Task Force in Hillsborough County, which originally was established by the Hillsborough County Commission to

foster communication and cooperation among intergovernmental departments with regard to exotic species control. Members include Parks and Recreation, Resource Management, Solid Waste, Mosquito Control and Highway departments. These departments work together on invasive plant removal projects on county-owned properties.

The Task Force has expanded its membership to include interested citizens, non-profit and educational groups, and launched an aggressive public outreach campaign in which TBEP has played a major role. For example, TBEP has sponsored several "Give A Day For The Bay" invasive plant workdays with the Task Force utilizing citizen-volunteers working in partnership with city and county personnel to remove invasive plants from county parks and preserves. Additionally, TBEP provided funding in 2003 for a field guide to invasive plants in Tampa Bay, targeted at both homeowners and professionals. Upcoming Task Force projects include a video being produced by the Hillsborough Extension Service and TBEP showing homeowners how to remove invasive trees, vines and shrubs from their landscapes, and a series of homeowner seminars on invasive plant identification and eradication.

SW-3**STRATEGY:**

- STEP 1 Ensure that all state, city and county personnel using herbicides are practicing IPM.
Responsible parties: SWFWMD, DEP, local governments
Schedule: Ongoing
- STEP 2 Consider ways to incorporate economic incentives and ensure consistency in implementation of IPM programs.
Responsible parties: Local governments
Schedule: Initiate next steps in 2005
- STEP 3 Survey local governments to determine the extent to which IPM practices are being implemented by road maintenance crews.
Responsible parties: TBEP
Schedule: 2006
- STEP 4 Promote benefits of IPM to water quality in ponds, lakes and streams as well as landscapes, possibly through the LakeWatch, StreamWater Watch and Adopt-A-Pond programs.
Responsible parties: local volunteer water monitoring programs
Schedule: Ongoing
- STEP 5 Emphasize the connection between pesticide and herbicide use and contamination of bay sediments.
Responsible parties: FY & N Programs, local citizen-based water monitoring programs, TBEP
Schedule: Ongoing
- STEP 6 Explore how IPM education programs can be delivered to commercial pesticide applicators more effectively.
Responsible parties: County Extension Services
Schedule: Initiate in 2005

Enforce and Require the Timely Completion of the Consent Orders for the Cleanup of Fertilizer Facilities in the East Bay Sector

ACTION:

Enforce and require the timely completion of the consent orders for the cleanup of fertilizer facilities in the East Bay section of Tampa Bay.

STATUS:

Nearly complete. Incorporate monitoring of nitrogen loading and water quality data for fertilizer facilities in East Bay and upper Hillsborough Bay into WQ-1, as part of the Tampa Bay Nitrogen Management Strategy.

BACKGROUND:

In 1990, the Florida Department of Environmental Protection (FDEP) and the Environmental Protection Commission (EPC) of Hillsborough County discovered that five fertilizer-shipping facilities in the East Bay area were discharging high levels of nutrients into the bay. Subsequent investigations determined that fertilizer product spillage from these facilities was affecting the Bay, and that associated stormwater runoff was not meeting current water quality standards.

Following lengthy negotiations, the five terminal facilities entered into joint consent orders with FDEP and EPCHC in late 1991. The consent orders included requirements for regular sampling of stormwater discharges, assessments of wastewater flows and concentrations at the facilities, and sediment sampling at the facilities and around adjacent loading docks. After completing an assessment phase, the facilities were to implement comprehensive best management practices (BMPs) to curtail product spillage and reduce nutrient-enriched discharges.

Four of the five companies resolved the associated consent orders and currently operate under FDEP industrial wastewater permits, which include ongoing monitoring requirements. Environmental agencies report significant nutrient reductions in the East Bay sector as a result of the BMPs that have been implemented, and the percent of nitrogen delivered to the Bay from the facilities has dropped from 7% of the total load in 1992-1994 to approximately 1% or less of the total load in 1999-2003.

One company remains under consent order, though FDEP is working with the facility to secure compliance and place it under a valid operating permit pending resolution of TMDL limits for nitrogen in eastern Tampa Bay.

STRATEGY:

STEP 1 Resolve final active consent order and complete implementation of stormwater management systems at all associated facilities.

Responsible parties: FDEP

Schedule: 2005

STEP 2 Continue the monitoring and reporting of nitrogen loadings from fertilizer facilities (along with other point source discharges) as an element of the Tampa Bay Nitrogen Management Strategy (WQ-1).

Responsible parties: Fertilizer terminal operators, EPCHC, FDEP, TBEP

Schedule: Ongoing

SW-7

SW-8

Encourage Use of Best Management Practices (BMPs) on Farms

ACTION:

Encourage implementation of effective best management practices (BMPs) on farms.

STATUS:

Ongoing.

BACKGROUND:

Implementation of effective best management practices, or BMPs, can help farmers reduce impacts to soil and water resources while maintaining economically viable crop production levels. BMPs generally include a broad array of structural and non-structural approaches to conserving water and reducing fertilizer and pesticide use.

Based on nitrogen loading estimates for 1995 – 1998, a period of major El Nino storm events, intensive agriculture accounts for about 12% of the bay’s total nitrogen loadings. Whereas nitrogen loading from agricultural sources has decreased in some areas of the watershed due to improved irrigation and fertilization practices, public acquisition of former cropland, and reduction in the number of dairies, loadings from localized areas of south Hillsborough and Manatee counties are still significant.

While recommended practices exist – and are promoted — for virtually every commodity, there are relatively few BMPs adopted by rule for this region. To date, BMP manuals have been published for the horticulture or green industry; cow/calf operations; silviculture; aquaculture; agrichemical handling; and for citrus in the Indian River Lagoon region. A BMP manual on row crops entitled “Water Quality/Quantity Best Management Practices for Florida Vegetable and Agronomic Crops Manual,” 2003 edition, was finalized in 2004.

The 1999 Florida Watershed Restoration Act provides a means for the agricultural community to satisfy federally mandated water quality targets. Farmers and growers that voluntarily implement BMPs receive a “presumption of compliance” for helping meet Total Maximum Daily Loads (TMDLs) in impaired watersheds. The Legislation directs the Florida Department of Agriculture and Consumer Services (FDACS) to develop and publish BMP manuals in cooperation with commodity groups and the University of Florida Institute for Food & Agricultural Sciences (IFAS). Participating farmers choose from a menu of approved BMPs, and then sign a notice of intent to implement them. The Florida Department of Environmental Protection (FDEP) verifies the effectiveness of those BMPs and the grower is presumed compliant and eligible for cost-share monies. DEP and FDACS submitted a report to the Legislature in 2005 detailing progress and participation in the voluntary program. A sufficiency review of the progress report to be conducted by the Florida Legislature may provide a strong incentive for increased participation by agriculture in the Tampa Bay Nitrogen Management Consortium.

While the program is still evolving, particularly in Tampa Bay where established BMPs are lacking for certain commodity groups, overall participation is good in commodities and regions where BMPs exist. For participating growers, presumption of compliance relieves them of having to satisfy more stringent regulations and opens the door to cost-share funding that makes it feasible to implement new technologies. The Agricultural Lands and Practices Act adopted by the 2003 Florida Legislature provides that local governments may not adopt ordinances or policies regulating farm operations if the activity is already regulated through best management practices or by an existing state, regional, or federal regulatory program. The Act does not apply to existing regulations.

The Southwest Florida Water Management District, in cooperation with FDACS, has developed an innovative, cost-share program with the agricultural community known as Facilitating Agricultural Resource Management Systems, or FARMS. The program offers farmers grant money to encourage utilization of BMPs that can, if effectively applied, foster efficient irrigation and help reduce wasteful irrigation runoff. This prototype program is currently fully funded by the Manasota and Peace River Basin Board, but could be expanded to other basins including the Southern Water Use Caution Area to enhance participation and environmental protection.

Incentives to farmers other than financial ones have been proposed from time to time to encourage implementation of BMPs. For example, a program that streamlined and consolidated permitting and monitoring requirements in exchange for a commitment to implement effective BMPs and other environmentally sound practices could be an attractive supplement to financial support programs for agriculture. The Aquaculture Certification Program recently adopted by FDACS includes various incentives for aquafarmers to implement BMPs and might serve as a model farm certification program for other commodity groups in the Tampa Bay watershed.

STRATEGY:

STEP 1 Ensure base-level utilization of agricultural Best Management Practices (BMPs) in accordance with the process and principles outlined in the 2001 FDEP "Report to the Governor and the Legislature on the Allocation of Total Maximum Daily Loads in Florida." The BMP manual for row crops, a key commodity group in the Tampa Bay watershed, is now being finalized.

Responsible parties: FDACS and FDEP; TBEP TAC and NMC (for review)

Schedule: Report to Legislature submitted in 2005; sufficiency review pending

STEP 2 Encourage regional cost-sharing programs for implementing BMPs, including grower investment, low-interest loans and grants, and other incentives to make implementation of BMPs more affordable. Explore expansion of SWFWMD's FARMS cost-sharing program (currently funded by SWFWMD and FDACS) beyond the Manasota and Peace River Basin Board boundaries.

Responsible parties: SWFWMD

Schedule: Ongoing

ACTION PLAN

- STEP 3 Improve rules and procedures for monitoring compliance with Agricultural Ground and Surface Water Management Plans and other voluntary programs. Consider cross-training agency staff to help streamline and improve compliance monitoring of voluntary programs.
Responsible parties: FDACS, SWFWMD and FDEP
Schedule: Ongoing
- STEP 4 Evaluate the merits of a farm certification program that streamlines and consolidates permitting and monitoring requirements in exchange for a commitment to implement effective BMPs and other environmentally sound practices.
Responsible parties: FDACS
Schedule: By 2006
- STEP 5 Conduct workshop to inform the Tampa Bay Nitrogen Management Consortium of various water quality improvement programs available to agriculture, particularly those that could contribute to nitrogen load reduction.
Responsible parties: TBEP and Nitrogen Management Consortium
Schedule: Conducted in 2005

Design and Implement A Low Impact Development Strategy

SW-10**ACTION:**

Design and implement a strategy to promote Low Impact Development.

STATUS:

New action consolidating actions SW-4, SW-5, SW-6 and actions to improve habitat and wildlife benefits of stormwater ponds as recommended by the Community Advisory Committee.

BACKGROUND:

Low Impact Development (LID) is an innovative stormwater management approach based on managing rainfall at the source using uniformly distributed, decentralized controls. The goal of LID is to mimic a site's predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source. LID addresses stormwater through small, cost-effective landscape features located at the lot level. LID is a versatile approach that can be applied equally well to new development, urban retrofits, and redevelopment/revitalization projects. Low Impact Development is a logical approach to integrating three currently separate actions in the Stormwater Action Plan of the CCMP: reducing impervious surfaces (SW-4); meeting current stormwater standards on redeveloped properties (SW-5); promoting compact urban development (SW-6); and a CAC proposal to enhance the habitat and wildlife benefits of stormwater ponds.

Reduce impervious paved surfaces (SW-4): Impervious paved surfaces dramatically increase the flow of pollutant-laden stormwater runoff to the bay. While incorporating pervious paving in parking lots may not be as cost-effective as standard pavement, other design features – such as small swales, berms and gardens, using grass or gravel for overflow parking, and generally avoiding direct connection of impervious surfaces to pipes – can produce a significant payback.

The Southwest Florida Water Management District (SWFWMD) has conducted an evaluation of stormwater research projects the District has constructed since 1989. Preliminary results of monitoring runoff from the 11.5-acre Florida Aquarium parking lot show substantial reductions in runoff, even after accounting for dryer than normal conditions. Almost all stormwater was retained on site, based on comparisons of the volume of water discharged from various elements in the treatment train (swales, strands and ponds). Researchers estimate that discharge would have occurred only four to five times during a normal year, and in greatly reduced amounts.

Results from the Florida Aquarium research project indicate that permeable paving reduces runoff from small rain events, although swales are more effective overall for reducing runoff, and asphalt pavement is a significant source of metals and PAHs.

The general consensus is that there are important opportunities to significantly reduce runoff from parking lots, with minimal or no impact on parking space, by incorporating cost-effective, alternative designs. That effort is aided by significant advances in BMP technologies and options in the past decade since the TBEP study was completed, along with a flourishing low impact design movement.

Meeting current stormwater standards on redeveloped properties (SW-5):

While this action appears complete as written in the CCMP, it will be important to monitor stormwater treatment requirements for redevelopment in local government comprehensive plans and regulations to assure their adequacy.

All six TBEP local government partners indicate that they require stormwater treatment, or equivalent compensation, during redevelopment where new construction exceeds 3,000 square feet. Additionally, existing environmental resource permitting (ERP) rules require redevelopment to comply with stormwater rules in effect at the time of redevelopment.

Promote compact urban development (SW-6):

TBEP, the Tampa Bay Regional Planning Council and the Florida Department of Environmental Protection conducted a workshop in May 2004 to explore issues and opportunities associated with Low Impact Development. The workshop concluded that LID practices such as grassed swales, permeable paving, cisterns, rain gardens and other features may enhance stormwater treatment and storage, but that cost-benefit assessments of these techniques are lacking. A key recommendation was to conduct a side-by-side comparison of traditional versus LID techniques through a demonstration project. This workshop fulfilled the call for a Future of the Region conference in the original SW-6 Action.

A LID Design and Development Workshop also was conducted in April 2005 by Pascowildlife, Inc. and the Southwest Florida Water Management District. More than 80 workshop participants were trained by Larry Coffman, P.E., a recognized expert in LID technologies, in the principles and successful practices of Low Impact Development. At least 26 issues – real and perceived – impeding the implementation of LID in Florida and the nation were examined. The issues ranged from mosquito breeding in ponded areas and groundwater contamination to the need for more research to determine the effectiveness of LID practices.

Enhance the water quality and wildlife benefits of stormwater ponds:

The TBEP Community Advisory Committee recommended that the Management and Policy Boards consider several actions addressing the landscaping design and maintenance of stormwater detention ponds in the urban environment to improve water quality and expand habitat of native wildlife. The actions included: (1) requiring that new wet detention ponds be planted with native vegetation; and (2) requiring that new wet detention ponds include shallow littoral shelves wherever possible. A survey of local government and agency stormwater managers in the Tampa Bay area revealed that SWFWMD stormwater regulations already require creation of shallow littoral shelves on new wet detention ponds. However, SWFWMD rules and most local stormwater management ordinances do not require that native plants be planted along the pond shoreline.

STRATEGY:

- STEP 1 Conduct a workshop on Low Impact Development (LID) co-sponsored by the Tampa Bay Regional Planning Council and prominent representatives of the development community. The purpose of the workshop will be to examine the principles and practices of LID and to determine if there is sufficient support at local government staff and policy-making levels and interest within the development community to pursue implementation of LID practices in the Tampa Bay region.
Responsible parties: TBRPC, TBEP
Schedule: Completed in May 2004
- STEP 2 Conduct a side-by-side demonstration project of LID versus conventional stormwater management techniques to quantify costs and benefits, incorporating long-term operational and maintenance costs.
Responsible parties: TBEP, FDEP and other appropriate partners
Schedule: Identify project site and public/private partners by the end of 2006; construct demonstration project by 2008.
- STEP 3 Incorporate elements of Low Impact Development specifically pertaining to stormwater management into the Strategic Regional Policy Plan; local government comprehensive plans; local development and redevelopment codes and stormwater management ordinances; and long-range transportation plans as needed. Include flexibility and incentives in those documents, where appropriate, to encourage developers to utilize LID features and alternatives for commercial and residential developments – particularly for parking areas — without lengthy permitting delays.
Responsible parties: Local governments through EAR process; FDEP for rule revision if appropriate.
Schedule: Initiate in 2005
- STEP 4 Package and promote Low Impact Development practices through professional engineering and development associations.
Responsible parties: Professional engineering associations, such as the Florida Stormwater Programs Association; homebuilder associations
Schedule: Following completion and monitoring of side-by-side comparison pilot project (STEP 2).
- STEP 5 Monitor implementation of LID strategies through updates by TBEP partners in their local action plans. Also, monitor implementation of local government ordinances requiring older properties being redeveloped to meet current stormwater treatment standards for that portion of the site being redeveloped, or provide equivalent compensation.
Responsible parties: TBEP local partners
Schedule: Following integration of LID practices in local comprehensive land use plans and land development codes.

SW-11

Expand the Adopt-A-Pond Program to Additional Communities

ACTION:

Expand the Adopt-A-Pond Program developed by Hillsborough County to additional communities to assist homeowners in maintaining and improving residential stormwater ponds.

STATUS:

New action.

BACKGROUND:

State and local regulations require that new stormwater ponds be designed and constructed to maximize their ability to retain and treat stormwater runoff before it is discharged to a larger waterway and, ultimately, to Tampa Bay. In fact, well-constructed and properly maintained stormwater ponds are essential to preserving water quality in Tampa Bay. They also serve an important secondary role for wildlife, by providing feeding and breeding areas for birds, amphibians and other creatures in urban areas where natural habitats are rapidly disappearing.

However, long-term maintenance of the ponds to ensure that they continue to provide these ecological benefits is a widespread problem. Typically, ponds in new developments are deeded to a homeowners association once the residential construction is complete. As the ponds age and begin to fill with sediments and excess nutrients from runoff, severe water quality problems may result. The homeowners association may be unwilling or unable to properly maintain the pond, or simply not know what types of management practices should be adopted.

Since 1992, the Adopt-A-Pond program has been helping neighborhoods in Hillsborough County improve the water quality, wildlife habitat value and aesthetics of stormwater ponds. This innovative partnership between the county and the Southwest Florida Water Management District empowers residents to take charge of their ponds through hands-on advice and assistance.

Among other benefits, participating neighborhoods receive a free one-time dredging of their pond; free native plants with which to landscape their pond; on-demand advice and occasional “pond walks” from a county biologist; and instruction in monitoring the water quality of the pond.

To be eligible for the program, the neighborhood’s stormwater pond must be owned by the county or, if privately owned, must have at least one drainage easement dedicated to Hillsborough County. Additionally, neighborhoods must sign an agreement pledging to monitor their pond’s water quality, plant native vegetation and submit regular maintenance reports to the county.

Although not all-encompassing, the Adopt-A-Program is a highly cost-effective way of addressing at least a portion of the residential stormwater ponds located within a community. The annual cost of the program for Hillsborough County is about \$120,000, excluding the salary of one full-time staff member. The capital outlay for a Schaeff dredge machine (to conduct the one-time pond clean-out) is about \$100,000. The Adopt-A-Pond Program can be operated without offering the one-time pond dredging; in fact, dredging is not possible for ponds without public easements. However, officials agree that, where practical, one-time dredging is a much-needed service that provides a strong incentive for neighborhoods to participate in the program. Chemical treatment (alum) also could be offered as an alternative to dredging.

Education is an important component of the Adopt-A-Pond program. A full-color brochure about the program was completed in 2002, and more than 5,000 citizens receive the quarterly newsletter. Adopt-A-Pond participants receive an Adopt-A-Pond notebook, aquatic plant identification references, educational meetings, pond walks, neighborhood signs, waders, native plants, a Pond Management Plan workbook, an annual pond seminar, annual awards and county staff support as needed.

The Storm Drain marking portion of the program provides materials to mark storm drains and participates annually in the Tampa BayWatch "Paint Tampa Bay Clean" event. The Storm Drain Marking program includes door-hangers, which are distributed door-to-door to educate residents about stormwater pollution.

While several bay area communities offer occasional pond improvement/restoration seminars or distribute educational materials about pond care, the direct assistance and long-term monitoring offered by the Hillsborough Adopt-A-Pond Program set it apart.

Currently, there are more than 150 ponds in the Hillsborough Adopt-A-Pond program.

STRATEGY:

STEP 1 Organize a seminar on the Adopt-A-Pond Program and invite stormwater managers from all over the region to attend to learn more about the program.

Responsible parties: TBEP, TBEP's Community Advisory Committee, Hillsborough County

Schedule: 2006

STEP 2 Encourage expansion of the Adopt-A-Pond Program into at least one additional community every 3-5 years by identifying potential funding sources and assisting interested communities in applying for grants to jump-start an Adopt-A-Pond program, or to develop a similar initiative providing direct assistance to neighborhoods with publicly owned ponds.

Responsible parties: TBEP, Southwest Florida Water Management District

Schedule: Ongoing

AD-1

Continue Atmospheric Deposition Studies to Better Understand the Relationship between Air and Water Quality

ACTION:

Continue atmospheric deposition studies to increase understanding of the relationship between emissions and deposition to the bay, and the effect on Tampa Bay water quality.

STATUS:

Ongoing. Strategy revised in 2004.

BACKGROUND:

Intensive research on atmospheric deposition over the past seven years has addressed many important questions about air quality and air pollutants that end up in the bay, leading to better informed management efforts.

Of key concern are nitrogen oxides, or NO_x, which contribute to the formation of ozone, an air pollutant of great public health concern in Florida. NO_x emissions from power plants also increase the bay's nitrogen burden, spurring algal growth that can ultimately harm vital underwater grassbeds. Air pollution from stationary sources (oil and coal-fired power plants and waste incinerators) and mobile sources (including cars, trucks and boats) may also transport significant quantities of heavy metals to the bay.

Results of recent investigations indicate that:

- Tampa Bay's "airshed" includes all of Florida and south Georgia, and about 35% of the air pollutants that wind up here come from outside the region.
- About 20-30% of the bay's total nitrogen burden falls directly to the surface of the bay from the atmosphere. However, atmospheric deposition's true contribution is greater when air pollutants falling in the watershed are considered, since a portion of these will eventually enter the bay in stormwater runoff. Current estimates are that 15% of the atmospheric nitrogen falling on the watershed eventually reaches the bay through stormwater runoff.

Even though power plants are the largest local source of nitrogen emissions, preliminary investigations suggest that motor vehicles (including cars, trucks and boats) may account for half of the direct atmospheric deposition to the bay. That's because emissions from power plant stacks are more likely than those from low-to-the-ground vehicles to travel outside our watershed.

The relative contribution between wet deposition (pollutants transported in rainfall) and dry deposition (dust and particulates) is about 1:1 over water. Gaseous pollutants like ammonia and nitric acid deposit locally; aerosols are carried long distances before depositing either in dry fall or rainfall.

Several recent developments are working in the bay's favor. Tampa Electric Company's agreement, based on 1999 settlements with EPA and DEP, to clean up its Big Bend facility and convert its Gannon plant from coal to natural gas, will reduce NOx emissions from those plants more than 90% by 2010. The largest single source of NOx emissions in the region and among the largest in Florida, TECO's Big Bend and Gannon facilities together emitted 119,000 tons of NOx in 1996. NOx emissions will fall to 10,000 tons by 2010, translating into a reduction of 273 tons of nitrogen to the bay over the 14-year period. In addition, every boiler at Big Bend is now being scrubbed to control sulfur dioxide, the pollutant that causes acid rain. The utility is also cooperating with DEP to study the effects of air pollution on Tampa Bay with research funded through settlement fines.

The Environmental Protection Agency has recently finalized regulations for newly produced commercial and recreational marine diesel engines. These standards are for NOx, hydrocarbons, particulate matter, and carbon monoxide emissions. Many of the Tier 1 standards became mandatory in 2004 and stricter Tier 2 standards will begin as early as 2004 for smaller vessels. Larger Category 3 vessels, such as container ships and cruise ships, are subject only to NOx emissions standards.

Additionally, while more people will bring more cars to the region in the coming years, vehicle emissions are likely to remain steady or decline as new regulations clamp down on per-car emissions.

On the other hand, a reduction in NOx concentrations associated with Florida Power & Light Company's decision to convert two units at its Manatee County plant to "co-fire" natural gas and oil will be offset by an overall rise in NOx emissions as the plant expands generating capacity to meet increasing demand in fast-growing Manatee County.

Many important questions about air pollution and its effect on the bay remain. Researchers don't yet know, for example, how much of what is emitted from sources in the Tampa Bay watershed actually is deposited in the bay, or what the effects of emissions from commercial and recreational boats may have on air quality and the bay. Additional studies already planned for Tampa Bay will help answer some of these critical questions.

STRATEGY:

STEP 1 Continue studies to determine the sources and impact of atmospheric pollutants on the bay:

- Support continuation of BRACE (Bay Regional Atmospheric Chemistry Experiment) through the repowering of TECO's Gannon plant (from coal to natural gas) in 2004, to quantify and track effects of reduced emissions on atmospheric loadings of total nitrogen. Validate 15% indirect contribution and be more specific regarding sites, (e.g., basins or land use).

Increase understanding of the impacts of denitrification.

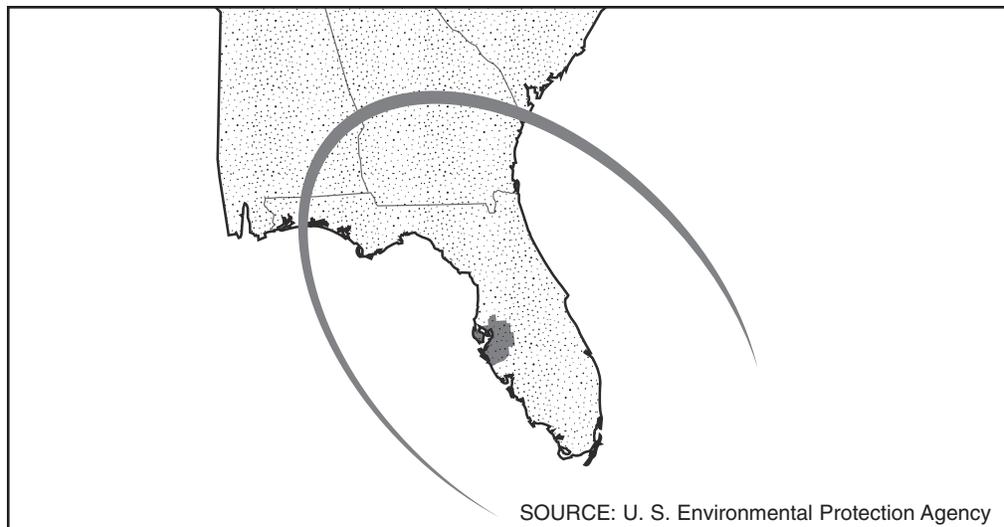
Responsible parties: FDEP and USF College of Public Health

Schedule: Ongoing

AD-1

- Support continuation of AIRMon monitoring to estimate long-term wet deposition tracking.
Responsible parties: FDEP
Schedule: Ongoing, but may be limited duration
- Quantify the relative contribution of motorboat and ship exhaust to atmospheric deposition.
Responsible parties: USF College of Public Health (student thesis)
Schedule: 2004-2005
- Pursue estimating effects of Clean Air Act reductions so they can be incorporated into nutrient reduction action plans. The TBEP nitrogen management plan currently does not reflect “credits” from anticipated reductions that have not yet been quantified.
Responsible parties: EPA and TBEP
Schedule: 2005
- Continue collaboration at the regional, state and national levels to curtail air pollution (long-range transport) impacting the bay from outside the region. Gain a better understanding of the impacts of long-range pollution to local and regional areas.
Responsible parties: Local, state and federal governments involved with the Tampa Bay Atmospheric Deposition Study (TBADS)
Schedule: Ongoing
- Track atmospheric mercury concentrations from the Chassahowitzka NWR monitoring station, and track mercury concentrations in fish tissue from Tampa Bay.
Responsible parties: TBEP and FWRI (for fish tissue concentrations)
Schedule: Initiate tracking in 2005

Principle Oxidized Nitrogen Airshed for Tampa Bay



Promote Public and Business Energy Conservation

ACTION:

Promote public and business energy conservation.

STATUS:

Ongoing. Strategy refocused in 2004 to concentrate on energy conservation related to motor vehicles.

BACKGROUND:

This action appears mostly complete as originally written in the CCMP, with multiple programs in place in both the public and private sector to encourage and reward energy conservation.

EPA's Green Lights program was incorporated into the Energy Stars program in 1998. EPA and TBEP sponsored an Energy Stars workshop targeting hospitals in the Tampa Bay area, and EPA continues to market the program in the region. Among the participants are Hillsborough County, Tampa General Hospital, Eckerd Corporation, Oxford Properties, Verizon, the Hillsborough County School District and the University of South Florida.

Nationwide, there are more than 13,000 Energy Star qualifying models in over 35 product categories nationwide, including VCRs, computers and major household appliances. To earn the Energy Star, these products meet strict energy efficiency guidelines set by the EPA and U.S. Department of Energy.

Examples of other energy conservation initiatives include:

- A wealth of rebate programs, free energy audits and other incentive programs sponsored by local utilities such as TECO, FP&L and Progress Energy to increase efficiency of appliances, heat pumps, ducts, insulation, etc. Progress Energy also maintains six experimental solar-powered homes in Palm Harbor that are being monitored as part of an effort to reduce the cost of photovoltaic cells and assess the energy savings of solar-powered systems.
- TECO has recently initiated its Smart Source Renewable Energy Program, in which customers pay a small monthly fee to purchase a portion of their monthly power needs from renewable energy sources such as organic waste. Currently, about 200 residential customers and 10 businesses participate, but that number is expected to increase as awareness and marketing of the program expands.
- The City of Tampa has developed its own energy-saving program, which includes a demonstration site at the Tampa Municipal Office Building.

AD-2

AD-2

The program is now being expanded to community and recreation centers, fire stations and other city buildings. The Tampa Convention Center has also implemented improvements in energy-saving lighting, and the city estimates that a 45% savings in energy use has been achieved there.

- The Tampa Bay Regional Planning Council has initiated the “TELEWORK Tampa Bay” program to promote and assess the benefits of tele-commuting to local businesses. TBEP is among the companies and organizations participating in the program.
- FDEP’s Small Business Assistance Program provides confidential, free technical and regulatory assistance to businesses statewide in the form of light/heating/air conditioning energy audits.
- The City of St. Petersburg is continuing to implement city-wide energy conservation measures, including replacing inefficient/high maintenance chillers and air handling units with state-of-the-art systems and controls at the Mahaffey Theater and St. Petersburg Police Department. The city has also replaced incandescent lighting systems with fluorescent systems in 26 city buildings. In addition, the city has completed retrofitting of street lighting systems from metal halide and mercury vapor to high pressure sodium
- The Extension Service has developed a series of workshops to promote “green” home building and buying. “Build Green and Profit” shows home builders how to incorporate eco-friendly components, while “Buy Green and Save” teaches homebuyers the benefits of “green” construction, and “Sell Green and Profit” educates realtors and mortgage brokers about discount or tax incentive programs available for “green” homes. Energy conservation is a major element of all these workshops.

Despite these substantial successes, more could be done especially in the private sector and among individual homeowners to conserve energy. And TBEP and its partners could do a better job of explaining the link between energy usage and water quality in the bay, particularly the connection between automobiles and pollution from nitrogen, air toxins and carbon dioxide.

STRATEGY:

TBEP will focus its efforts on energy conservation as it relates to motor vehicles, since research is showing that emissions from vehicles are a primary source of nitrogen loadings to the bay.

STEP 1 Work with commuter and public health organizations, such as Bay Area Commuter Services, local MPOs and the American Lung Association, to better publicize the link between air and water quality, and public health.

Responsible parties: TBEP Partners

Schedule: Initiate in 2005 and continue thereafter

STEP 2 Encourage carpooling, vanpooling, telecommuting, and other alternative

forms of transportation. Emphasize the link between obesity and the built environment, which currently discourages walking.

Responsible parties: Local commuter agencies, TBEP partners, TBRPC

Schedule: Ongoing

STEP 3 Assist in promoting the use of fuel-efficient hybrid vehicles in government and industry fleets.

Responsible parties: TBEP

Schedule: Initiate in 2005-2006 and continue thereafter

STEP 4 Assist in evaluating the potential impacts to the bay of various transportation strategies and alternative fuel sources.

Responsible parties: ABM, TBEP

Schedule: Ongoing, as needed

WW-1

Expand the Use of Reclaimed Water Where Reuse Benefits the Bay

ACTION:

Expand the use of reclaimed water where reuse benefits the bay.

STATUS:

Ongoing.

BACKGROUND:

Efforts to develop and expand reclaimed water systems in the Tampa Bay watershed for irrigation and natural system restoration continue at a breathtaking pace, reducing the region's dependence on groundwater while saving the bay from an overly rich diet of nutrients discharged in treated wastewater. However, reductions to the bay's nitrogen loadings must be balanced against the need to preserve and restore water flows in areas where restricted flows could harm juvenile fisheries.

Local government wastewater reuse has more than doubled since the region's bay management blueprint, *Charting the Course*, was finalized in 1996 – and is expected to double again by 2010. Pinellas, Pasco, Hillsborough and Manatee counties used more than 89 million gallons per day (mgd) of reclaimed water in 2000, up from 40 mgd in 1996. That represents almost 40% of the 227 mgd of wastewater produced in the four-county region, offsetting the need to tap existing or new potable water supplies by an estimated 55 mgd.

Early efforts by St. Petersburg paved the way in the use of reclaimed water. Pinellas County (and the cities therein) remain at the forefront, with approximately 46 mgd of reclaimed water, followed by Hillsborough County's 20 mgd, 15.5 mgd in Manatee County and 7.5 mgd in Pasco County. Combined expansions in the region are expected to increase the reclaimed water supply by as much as 105 mgd for a total reclaimed water use of 194 mgd by 2010, or approximately 73% of the 265 mgd of the treated wastewater these counties are projected to produce.

These efforts bring the region closer to meeting the reuse goals of the Southwest Florida Water Management District to utilize at least 75% of the available reclaimed water supply, and to promote efficient use of the water once it reaches customers to further relieve demand for freshwater and groundwater sources. The District is meeting these goals by:

- Maximizing local reuse to meet water demands
- Using technology to increase the efficiency of reclaimed water by managing demand (through education and meters) and pursuing wet-weather aquifer storage and recovery (ASR), and

- Interconnecting systems to move excess flows to areas where it's needed and when it's needed.

ASR technology was developed to help communities address demand and supply challenges, which can force them, for example, to dump excess water in wet-weather months while leaving them without enough water to meet demand during dry periods. Efforts to interconnect local and regional systems may also help to alleviate demand and supply problems. Tracking ASR projects and potential benefits and impacts will be an element of the first step of this action.

An issue identified by the TAC during review of this action is the need for education of managers of large areas receiving reclaimed water on the proper application of reclaimed water. Maintenance of irrigation systems for ball fields, golf courses, and larger landscaped areas around public or private buildings will ensure that reclaimed water is not being directed to stormwater drains (and eventually to the bay) from impervious surfaces. Education should focus initially on areas around the bay and tributaries.

REUSE BY COUNTY, 2000-2010 (as of November 2003)

Pinellas County

Ongoing reuse expansion projects between 2000 and 2005 are expected to supply an additional 18 mgd of reclaimed water and offset 8 mgd of potable quality water. Project sponsors include Pinellas County; the cities of Clearwater, Largo, Oldsmar, Pinellas Park, Dunedin, Tarpon Springs and St. Petersburg; and On Top of the World Utility. Most of these utilities are also pursuing Aquifer Storage and Recovery (ASR) of reclaimed water, coupled with system interconnects, to maximize utilization of reclaimed water and increase system reliability.

Between 2000 and 2010, new construction projects may result in an additional 27 mgd of reuse, offsetting at least 12 mgd of potable quality water.

Pasco County

Ongoing expansion of reclaimed water systems in Dade City, New Port Richey, and Zephyrhills, along with Aloha Utility and Pasco County Utilities, are expected to supply an additional 1.3 mgd of reclaimed water to the county between 2000 and 2005, while offsetting 1 mgd of potable quality water.

By 2010, new reuse projects may produce another 4 mgd of reclaimed water, offsetting 2.4 mgd of potable quality water. Pasco County also may be receiving reclaimed water through the Hillsborough River Watershed Regional Reclaimed Water Project, and the Largo/Clearwater/Pasco ASR-Interconnect Project following city approvals, to restore lakes and wetlands damaged by excessive groundwater pumping. Altogether, about 13 mgd of reclaimed water from the cities of Tampa, Largo and Clearwater will be used to recharge and restore these natural systems.

WW-1

Hillsborough County

Substantial reuse expansion projects are planned and underway in Hillsborough County. Between 2000 and 2005, Tampa, Temple Terrace, Plant City and Hillsborough County are expected to expand reuse by an additional 20 mgd, offsetting 12 mgd of potable water. Additionally, Hillsborough County Utilities permitted and constructed Florida's first ASR and is currently exploring other ASR expansions to store wet-season reclaimed water supplies. Future innovations include investigations to determine the potential of ASRs to prevent aquifer saltwater intrusion.

The City of Tampa, Pasco County, Hillsborough County, and the City of Temple Terrace are jointly planning the Hillsborough River Watershed Regional Reclaimed Water Project. If completed, the project will interconnect their reclaimed water systems to maximize utilization and increase system reliability, while boosting restoration of vital natural systems. About 6 mgd of reclaimed water could be distributed below the Hillsborough River dam to meet minimum flows during the dry season, and an estimated 10 mgd could be used to recharge and restore wetlands in Pasco and Hillsborough counties damaged by excessive groundwater pumping.

Between 2000 and 2010, local governments within the county plan to construct reclaimed water projects resulting in an additional 55 mgd of reclaimed water, which will eliminate the need for more than 36 mgd of potable quality water.

Manatee County

Expansion of reclaimed water systems in Manatee County is similar in scope to those for Pinellas County. Between 2000 and 2005, the cities of Bradenton and Palmetto, together with Manatee County's "Manatee Agricultural Reuse Supply" (MARS) project, are expected to supply an additional 7.4 mgd of reclaimed water, offsetting another 5.5 mgd of potable quality water. The MARS project also is pursuing ASR and system interconnects.

Between 2000 and 2010, new reuse projects could produce another 18.6 mgd of reclaimed water, offsetting at least 12.7 mgd of potable quality water.

STRATEGY:

STEP 1 Complete calculations of actual nitrogen reductions associated with reclaimed water through 2003 (TBEP). Using the SWFWMD Regional Reuse Plan as a base, update information on major reuse projects, ASR and interconnects, including project name, reuse volume, total nitrogen reduction, where reduction will occur, and project status.

Responsible parties: TBEP

Schedule: 2005-2006

STEP 2 Identify and evaluate issues associated with downstream augmentation on rivers.

Responsible parties: ABM/TBEP TAC and Tampa Bay Water for identification of issues; Tampa Bay Water for evaluation of issues

Schedule: Identification of issues for the Hillsborough River and Tampa Bypass Canal completed in Spring 2005; evaluation completed Fall 2005.

STEP 3 Develop and implement education for institutions (e.g., schools; government buildings, parks and open spaces; hospitals) and public and private golf courses on the proper application and maintenance of reclaimed water systems for landscaped areas. Establish cut-off valves for use where applicable.

Responsible parties: Local governments, SWFWMD and Tampa Bay Water

Schedule: 2006

STEP 4 Reevaluate next steps based on results of updated loading estimates by the Tampa Bay Estuary Program Nitrogen Management Consortium in 2005.

Responsible parties: TBEP, Tampa Bay Nitrogen Management Consortium

Schedule: 2005-2006

WW-1

WW-2

Extend Central Sewer Service to Priority Areas Now Served by Septic Systems

ACTION:

Extend central sewer service to priority areas now served by septic systems.

STATUS:

Ongoing.

BACKGROUND:

While most bay-related septic system investigations have focused on the impact of nitrogen loadings from septic tanks (thought to be relatively minor overall), recent studies have shifted the spotlight to bacterial pollution from older, malfunctioning septic tanks. A 1999 survey of 22 rural, urban and beach water sites around Tampa Bay identified Allen's Creek and the Courtney Campbell Causeway in Pinellas County, and Hillsborough County's Sweetwater Creek and Bullfrog Creek, as problem spots. The sites were surveyed using a variety of traditional and alternative indicators, and included bacterial source tracking, coliphage testing (for the presence of viruses and indication of recent fecal pollution) and direct pathogen monitoring for viruses and parasites.

Bullfrog Creek and Sweetwater Creek were among the most heavily polluted. These sites not only revealed increased coliphage levels, but also high levels of human fecal contamination based on virus testing and bacterial source tracking. Bullfrog Creek near Riverview in southern Hillsborough County is bordered by fairly intense residential and commercial land uses and there is no central sewer service. Sweetwater Creek on Old Tampa Bay's northwestern shore, by comparison, drains a largely residential area with a mixture of central sewer service and septic tanks, which may or may not be the cause of the contamination.

The most heavily impacted site in Pinellas County was Allen's Creek. Older septic systems dominate in the largely residential communities bordering its shores, and efforts to convert portions of these neighborhoods to central sewer service are underway. While the nitrogen loading from septic systems is a concern, so are other chemicals including phosphates and "emerging contaminants" such as pharmaceuticals and metabolites.

Conversion from septic to sewer service can be costly, with residential hookup fees ranging anywhere from \$2,000 to \$5,000 or more. That underscores the need for financing options such as interest-free loans and cost-sharing grants to assist residents in areas slated for conversion. Additionally, the availability of central sewer service may actually encourage higher density development in environmentally sensitive areas, an issue local governments must consider in their long-term planning.

Jurisdictional boundaries can further complicate matters. Most of the remaining septic

tanks in the Allen's Creek watershed, for example, are located in unincorporated Pinellas County in numerous enclaves inside Clearwater city boundaries and far from Pinellas County sewer lines. Accessing sewer hookup from Clearwater may require residents to annex into the City, or for the City to agree to provide sewer service to residents in County enclaves as Largo has done.

Another problem recently identified is that numerous neighborhoods with septic tanks have been upgraded with central service on their streets, but for a variety of reasons, many homes and possibly even businesses have not connected to sewer service. In some cases, septic systems have been operating for many years despite readily available sewer service.

In some instances the link to septic tanks as the cause of contamination is strong; in other areas, less so. This revised action calls for a review of current knowledge regarding the environmental impacts of septic tanks to identify appropriate next steps. These next steps may include additional source tracking and/or epidemiology studies to quantify the human health risks associated with the levels of pollutants.

Bacterial contamination at some level is common in all surface waters. Sources of these contaminants range from wildlife and domestic animal waste to septic tanks and sewer overflows, and not all bacteria are harmful to humans. The Healthy Beaches Study used a variety of indicators to focus in on potential trouble spots, then used source tracking to further identify areas most heavily impacted by human contaminants. One of the most striking findings was the extent to which animals (wild and domestic) dominate as a source of fecal coliforms. In 73.6% of all water quality samples, the majority of isolates were from non-human sources. The Healthy Beaches report, coupled with source typing in the City of Clearwater's Stevenson Creek study, also show that septic systems on low-lying land near creeks can leak into water bodies.

Local government partners are taking steps to remediate problem areas where feasible.

In Pinellas County

A watershed management plan completed in 1996 identified approximately 1700 septic systems in the Allen's Creek watershed. By 2000, the City of Largo had converted the 130 within its boundaries to central sewer service. Nearly all of the septic tanks that remain are north of Belleair Road, in numerous small (unincorporated) Pinellas County enclaves inside Clearwater city boundaries but far from Pinellas County sewer lines.

The City of Clearwater conducted a sewer expansion feasibility study and conceptual sewer layout in April 2002. The study identified 1,674 residential homes with septic tank systems (9% of the properties) in the Allen's Creek watershed. However, funding is not currently available to implement sewer expansion. Accessing sewer service will also require annexation into the City.

Pinellas County also has completed all identified sewer line extensions and collection system construction in its service area around Lake Tarpon,

WW-2

though many septic tanks remain within the City of Tarpon Springs' service area adjacent to the lake.

The City of St. Petersburg continues to inventory the septic tanks in its service area. At this time 95 tanks have been located, with the vast majority located in the Snug Harbor area of unincorporated Pinellas County. Some properties here are connected to the city sewer system. While there are no plans at present to expand sewer service in this area, rapid property turnover may prompt future expansion.

In Hillsborough County

Hillsborough County DOH will assess findings from the Healthy Beaches report and other sources to identify areas where septic tank conversion may be desirable and feasible.

In Manatee County

In Manatee County, all areas where septic systems are suspected of causing water quality impacts are either already on the County's central sewer system, or have been included for assessment in Manatee County Comprehensive Plan Capital Improvement Element for connection to central sewer. The only coastal area that still has septic systems is a portion of Terra Ceia Bay. In 2004 the county implemented new, countywide requirements that mandate a 400-foot setback from waterways for new septic systems, encompassing freshwater, marine and tidal waters. If this setback is not feasible, then performance-based standards providing Advanced Wastewater Treatment must be achieved by the septic system.

STRATEGY:

STEP 1 Include this action in both the Wastewater (nutrients) and the Public Health (pathogens) sections of the Water and Sediment Quality Action Plan.

Responsible Parties: TBEP

Schedule: 2005

STEP 2 Assess progress towards removal of package plants.

Responsible parties: TBEP, working with FDEP and local governments

Schedule: 2005-2006

STEP 3 Convene small working group of local health department designees, along with experts from FDEP, SWFWMD and USF, to:

- Review relevant findings from the 2001 Healthy Beaches report and EPA's 1997 Response to Congress on the Use of Decentralized Wastewater Treatment Systems.
- Evaluate progress on sewerage older areas dominated by septic tanks.
- Create a map of central sewer service areas for the watershed, by compiling county and city maps.

WW-2

- Determine factors contributing to failure of septic systems and create a map overlay of these factors.
- Evaluate how best to encourage homes and businesses with access to central sewer to connect, including potential funding opportunities.
- Determine whether additional research is needed in areas where high levels of human fecal contamination have been documented to trace sources or associated human health risks.
- Evaluate current septage design standards and monitoring.
- Discuss whether environmental performance or design standards for septic tanks to address nitrogen impacts are warranted or worth pursuing.
- Evaluate new performance-based systems for possible use in the Tampa Bay area.
- Address septage spreading as a nutrient and public health concern, and as a source water protection issue.
- Identify next steps and strategic opportunities for collaboration.
- Assess maintenance/inspection requirements for existing systems in identified “hot spots” of bacterial contamination.
- Determine the density and impacts of septic systems during development review process.
- Develop recommendations for setback requirements, considering local conditions.

Responsible parties: TBEP to convene working group; participants as noted

Schedule: 2005-2006

STEP 4 Increase educational outreach in problem areas to encourage proper operation and maintenance of septic systems, and encourage hook-up to central service where it is available. See Pinellas County literature developed for Allen’s Creek, which could be adapted by other local governments.

Responsible parties: Local governments

Schedule: 2005-2006

WW-3

Require Standardized Monitoring of Wastewater Discharges

ACTION:

Require standardized monitoring of wastewater discharges to improve the accuracy and timeliness of pollutant loading estimates.

STATUS:

Ongoing.

BACKGROUND:

Important strides have been made in implementing this action. For example, FDEP now requires domestic wastewater facilities in the Tampa Bay watershed to monitor and report TN, TP, and TSS and other parameters including ammonia if they are reasonably expected to cause or contribute to water quality degradation or standard violations in the receiving water body.

FDEP data entry also has been centralized for discharge monitoring report (DMR) data for dischargers to state surface waters. FDEP strives to enter the data within 30 days of submittal. The Department is also testing a new Electronic Discharge Monitoring Report system that allows permit holders to submit monitoring data electronically and thereby expedite entry in the database. TBEP has offered to help FDEP assess the accuracy of output from the database. FDEP also has established a Statewide Monitoring Program Core Group that has been meeting to review and inventory existing monitoring programs, formats, types of information, and posting/linkage opportunities.

On the local level, EPCHC currently maintains its own files of discharge monitoring reports (DMRs) and data.

While all point source discharges may be required to report the concentrations of monitored parameters in consistent units (e.g., mg/l), a number of industrial facilities are not currently required to report their TN, TP, and TSS discharges. Many of these facilities report discharge concentrations of only a subset of nutrient forms (e.g., un-ionized ammonia, ortho-phosphate), and often do so in a way (e.g., without concomitant flow data) that is not conducive to the calculation of accurate loading estimates. In recent years, this lack of standardization has caused problems for watershed management programs seeking to estimate cumulative loadings of TN, TP, and TSS to receiving water bodies such as Tampa Bay and Charlotte Harbor.

STRATEGY:

STEP 1 Require the measurement and timely reporting (including standardized reporting units) of a core group of parameters — including TN, TP, TSS, and average daily or monthly flow — from point-source facilities in the Tampa Bay watershed with National Pollutant Discharge Elimination

System (NPDES) permits discharging an average daily flow of more than 100,000 gallons of wastewater, when discharge of a constituent is reasonably expected to contribute to water quality degradation.

Responsible parties: FDEP

Schedule: Initiate in 2005

STEP 2 Improve access to the FDEP computerized databases for permit compliance and for wastewater spills at the regional level through District offices.

Responsible parties: FDEP

Schedule: 2005

STEP 3 Assess accessibility and usefulness of FDEP's discharge monitoring database(s) and send a letter to FDEP outlining recommendations. If necessary, consider options for a reliable and accessible Tampa Bay regional database of discharge monitoring reports.

Responsible parties: TBEP

Schedule: 2005-2006

WW-3

Address Hot Spots of Toxic Contamination in the Bay

TX-1

ACTION:

Identify and remediate priority “hot spots” of toxic contamination in the bay.

STATUS:

Ongoing.

BACKGROUND:

A Tampa Bay Benthic Index (TBBI) has been adopted which provides a measure of the health of bottom-dwelling animal communities in the bay. This Index assesses the severity of contamination at various sites based on lack of diversity or abundance of benthic organisms, low dissolved oxygen concentrations, or exceedances of contamination thresholds for heavy metals, PAHs and other toxics.

Areas of the bay are being ranked from degraded to healthy based on an analysis of benthic communities using the new Benthic Index. Goals for improvement will likely focus on maintaining healthy areas while steadily upgrading the quality of degraded bay sectors.

Benthic index scores indicate that most of Tampa Bay remains healthy, with the exception of “hot spots” of contamination around the Port of Tampa, the mouth of the Hillsborough River, the St. Petersburg/Clearwater Airport, Bayboro Harbor and the Apollo Beach/Big Bend area. This includes areas where pollutant sources are no longer active (i.e.; banned pesticides such as DDT that linger in the environment).

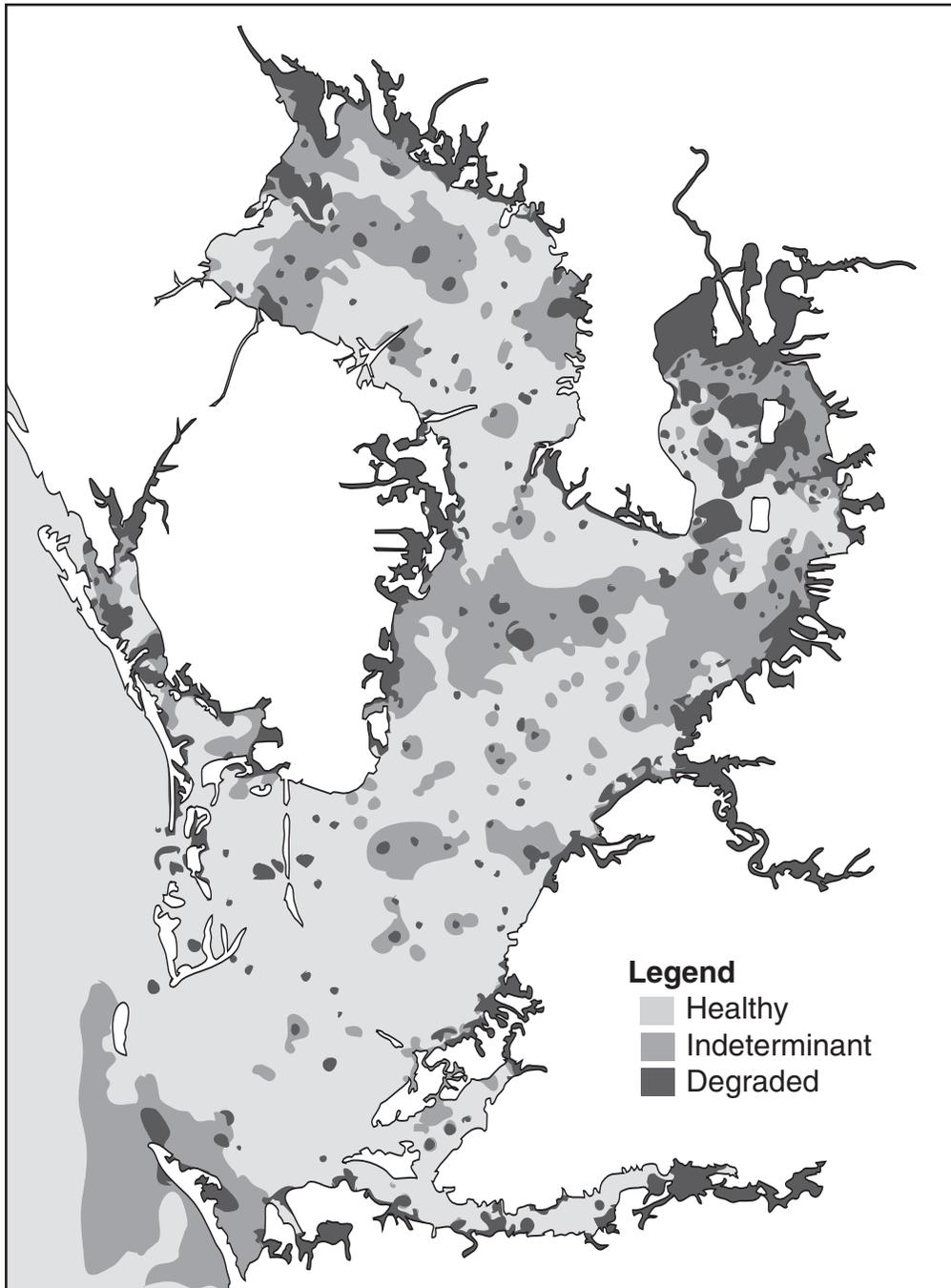
Hot spots are areas where contaminated sediments may pose a direct threat to fish and wildlife, or impact human health through the consumption of fish. Contaminants include heavy metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and organic pesticides. Most of these pollutants enter the bay in stormwater runoff and air pollution.

While priority projects have not yet been identified for each hot spot, efforts are progressing in some of the bay’s most heavily impacted sectors. SWFWMD’s Surface Water Improvement and Management (SWIM) program and local governments have spearheaded five stormwater treatment projects along Tampa’s McKay Bay, an industrialized embayment in the upper arm of Hillsborough Bay, to stem the flow of contaminated sediments. The projects, at the 30th Street outfall, Pond 56, Melbourne Pond, East Lake (near the old East Lake Mall), and East Shore Commerce Park near the intersection of Hwy 301 and State Road 60, employ a variety of treatment techniques, from concrete baffle-boxes to alum injection, to “cleanse” contaminants and sediments from stormwater before they reach the bay.

Bay sediment samples taken from 1995 to 2002 show no significant changes in conta-

Tampa Bay Benthic Index

TX-1



SOURCE: EPC, Manatee County, Pinellas County DEM, from samples collected in 1993-2000

The Benthic Index is a tool for assessing the severity of contamination at various bay sites based on lack of diversity or abundance of benthic (bottom-dwelling) organisms, low dissolved oxygen concentrations, or exceedances of contamination thresholds for heavy metals, PAHs and other toxics.

mination since 1993 when intensive sediment sampling began, although additional hot spots were identified. Most of these hot spots are in the lower Hillsborough and Palm rivers, where targeted sampling didn't commence until 1997. Benthic monitoring is coordinated by the Environmental Protection Commission of Hillsborough County with participation from Manatee and Pinellas Counties. About 120 samples are analyzed each year (since modifications to the study design in 2000) for the presence of contaminants and to determine the abundance and health of organisms living in the sediments.

STRATEGY:

STEP 1 Complete development of benthic health assessments for impacted areas of the Bay, using the new Tampa Bay Benthic Index to identify priority sites in need of cleanup.

Responsible parties: TBEP Sediment Quality Assessment Group

Schedule: Priority sites identified in 2005

STEP 2 Develop and implement site-specific Action Plans for contaminated areas on the priority list. Action Plans may incorporate stormwater improvements, pollution abatement projects, source-control strategies and sediment remediation, such as capping of degraded sediments with clean fill.

Responsible parties: TBEP Sediment Quality Assessment Group for development of Action Plans for first two priority areas; implementation may involve various partners, including local governments, the Tampa Port Authority, U.S. Army Corps of Engineers, and private industries

Schedule: First two Action Plans developed in 2006; implementation initiated in 2007 with appropriate responsible parties

STEP 3 Incorporate benthic community targets with tidal streams target development.

Responsible parties: TBEP Sediment Quality Assessment Group

Schedule: 2006

Toxics of Concern for Tampa Bay

	Contaminant/Impacts	Sources
Heavy Metals	Cadmium - Potentially toxic and may concentrate in food webs as it is retained for long periods in biological systems. Does not appear to accumulate in fish or undergo biomagnification, but does accumulate in sediments. High levels of cadmium present in sediments from the Hillsborough Bay/Lower Palm River, Allen's Creek, Cross Bayou and Boca Ciega Bay.	Common trace element widely employed in electroplating applications. Also present in paints, plastics, batteries and domestic sewage sludge.
	Chromium - Exhibits varied levels of toxicity in different fish species. Also listed as a mammalian carcinogen. Highest levels in bay sediments found in Hillsborough Bay near the mouth of the Alafia River, in Boca Ciega Bay near Cross Bayou, and near Bayboro Harbor.	Atmospheric sources include alloy and metal production, coal combustion, waste incineration, cement production. Direct sources include electroplating/metal finishing, wastewater treatment plants, iron/steel foundries and other industrial applications, residential runoff and phosphate fertilizers.
	Copper - Widely distributed in the natural environment, but also demonstrates acute toxicological effects at small concentrations above essential levels. Exceedingly toxic to aquatic biota. Highest levels in bay sediments found in Boca Ciega Bay near Cross Bayou, in Hillsborough Bay near the Alafia River and Davis Islands, and in Middle Tampa Bay near Bayboro Harbor and Papys Bayou.	Large number of human-induced sources to marine environment, including oil and fuel combustion, antifouling paints, metal cleaning operations, plating baths and rinses, commercial pigments and dyes, wood preservatives, leachate from copper pipes, domestic sewage sludge, and copper sulfate used to control algae in reservoirs.
	Lead - Causes a number of acute and chronic human health impacts, and accumulates in sediments. High levels found in bay sediments from Hillsborough Bay near the Alafia River, the lower Hillsborough River, and Boca Ciega Bay near Cross Bayou.	Largest source of lead to the environment originates from its past use as a gasoline additive and from atmospheric deposition from auto emissions. Paint, batteries and domestic sewage sludge also are potential sources.
	Zinc - Toxic at high concentrations and widespread in the environment. Highest levels in bay sediments found in Boca Ciega Bay near Cross Bayou and in Hillsborough Bay near the Alafia River.	Major application is coating of other metals to protect against corrosion. Used widely as a component in batteries and tires. Sources include municipal wastewater and sludge, direct industrial discharges, surface runoff, and atmospheric deposition.
Pesticides	DDT - Animal and potential human carcinogen; biomagnifies in organisms and persists in the environment. Caused widespread contamination of fish and wildlife, especially during 1960-80. Banned in 1972. DDT remains in sediments at several bay sites. Highest concentrations are reported at northern Boca Ciega Bay, northern Hillsborough Bay and near the Alafia River and Papys Bayou.	Formerly used to control a broad spectrum of agricultural, silvicultural and household insect pests.
	Chlordane - Environmentally persistent insecticide used extensively in termite control and also to control certain agricultural insects. Banned in 1988. Concentrations of chlordane at northern Boca Ciega Bay, Papys Bayou, Mullet Key and northern Hillsborough Bay were the highest of any sites measured in the bay.	Farmers used granular chlordane mixed with fertilizers for broad-spectrum insect control on field crops. Also applied occasionally as a liquid spray for some beetles, and used as an insecticide on golf courses. Agricultural and urban runoff are among the major documented sources.

Contaminant/Impacts	Sources	
Pesticides	<p>Mirex - Neuro-toxic pesticide; also known as Dechlorane. Sublethal effects in the marine environment include decreased algal growth, reduced fish growth, disrupted blue crab behavior, reduction in body weight and body lipid in salmon. Sublethal effects in birds include reduced reproductive capacity. Causes tumors in rats and mice. Mammalian symptoms include weight loss, enlarged livers, altered liver enzyme response, reproductive failure, fetal abnormalities including cataracts, heart defects, scoliosis and cleft palate. Concentrations of mirex in oysters from Tampa Bay are relatively low compared to many other sites around the nation. Production of mirex discontinued in 1977. Highest concentrations in bay sediments at Boca Ciega Bay, Mullet Key and Cockroach Bay.</p>	<p>Widely applied by aircraft to control fire ants on pastures between 1965 and 1978. Also used as fire retardant in electrical components, fabrics and plastics. Sewage sludge also a potential source.</p>
	<p>Endosulfan - Hazardous neuro-toxic pesticide with acute toxicity to marine organisms, high bioconcentration factor and fairly long half-life. Although not widely sampled for in Tampa Bay, endosulfan has been recorded in sediments from Cockroach Bay and in stormwater from an industrial park in West Tampa.</p>	<p>Introduced about 30 years ago and widely used to control winged insects associated with many row and field crops. Applied as a liquid spray to crops.</p>
	<p>Dieldrin - Pesticide for soil-dwelling insects including termites. Sublethal effects include starvation, liver damage, immunological suppression, decreased fertility, postnatal mortality. A carcinogen for some animals and a mutagen in cell cultures. Highest levels in bay sediments reported at the mouths of the Hillsborough River and Boca Ciega Bay.</p>	<p>Widely used from 1950-1974 to control soil insects on cotton, corn and citrus. All uses banned in 1985 except subsurface termite control and some mothproofing. Dieldrin is a breakdown product of the pesticide aldrin, both of which are long-lasting in soils and not highly water-soluble.</p>
PCBs/PAHs	<p>PCBs - Among the most persistent and toxic of organic compounds. Most risk of cancer from consumption of contaminated seafood attributed to PCBs. Biomagnifies. Manufacture ended in 1976. PCBs at sites in Hillsborough Bay exceed Florida's Probable Effects Level (PEL) for biological effects from toxic contaminants. PCBs also found in sediments at Boca Ciega Bay near Cross Bayou.</p>	<p>Formerly employed in a wide variety of industrial applications including insulation in electrical capacitors and transformers; paints, additives, adhesives, and caulking compounds; hydraulic fluids. Sources to environment are varied including direct discharge from production facilities into municipal sewage systems, leaching from disposal sites, refuse incineration and reuse of transformer oil.</p>
	<p>PAHs - Many PAHs are potent carcinogens or mutagens. Highest levels in bay sediments found in Hillsborough Bay near Davis Islands and the Alafia River, Boca Ciega Bay, and Middle Tampa Bay near Papyrus Bayou.</p>	<p>A group of related compounds present in crude oil and its products, released to the atmosphere during combustion. Also released from burning of non-petroleum substances, such as wood (brush fires). Sources include treated sewage, stormwater runoff and oil spills. Suspected sources include aerial fallout, petroleum refinery wastes, and discharges of drilling fluids.</p>

TX-2

Improve Opportunities for Proper Hazardous Waste Disposal

ACTION:

Improve opportunities for proper hazardous waste disposal by area residents and businesses.

STATUS:

Complete. Continue to monitor implementation.

BACKGROUND:

This action appears to be complete.

All Tampa Bay counties now have permanent household hazardous waste collection centers. The times and dates these centers are open vary, but most are open at least one or two weekend days a month. Geographically large counties such as Hillsborough have opened multiple permanent centers to ensure access for residents throughout the county. Other communities, such as Pinellas, combine permanent drop-off facilities with occasional mobile collection days tied to specific events. City residents are permitted and encouraged to use the county drop-off facilities, and several cities – including Clearwater and St. Petersburg – sponsor special “amnesty days” when residents are encouraged to bring wastes to mobile collection stations.

TBEP and the Southwest Florida Water Management District partnered to produce a general-interest, foldout poster listing all household chemical collection centers or services in the bay watershed, along with non-toxic alternatives to common household cleaners.

Hillsborough and Pinellas counties, as well as the City of Tampa, recently began accepting consumer electronics at their collection centers.

Used oil recycling stations are located in all three Bay Area counties.

Pinellas County offers a special disposal program for small businesses that generate hazardous waste. Manatee County provides residents and businesses with “milk-run” collection of household wastes with business wastes collected at a discounted cost for small-quantity generators.

The state Department of Environmental Protection sponsors an annual program called Operation Clean Sweep, which collects unused or recently banned pesticides from farmers, pest control operators and other targeted industries.

DEP’s Pollution Prevention (P2) Program, a non-regulatory initiative that encourages businesses to maximize efficiency while minimizing waste, now has a full-time coordinator in each of DEP’s six districts. The coordinators provide on-site assessments,

PH-1

Reduce the Occurrence of Municipal Sewer Overflows to the Bay

ACTION:

Reduce the occurrence of accidental municipal sewer overflows to the bay.

STATUS:

Ongoing.

BACKGROUND:

Significant strides have been made to address the problem of sewer overflows in Tampa Bay. Although spills will occur periodically as a result of equipment failures, especially during very heavy rains and storm events, extensive infrastructure and maintenance investments have abated the local problem and are enabling officials to better track trends and trouble spots. Some of the most significant upgrades have occurred in cities such as St. Petersburg and Clearwater, where millions of dollars have been invested to replace and improve aging infrastructure.

EPA conducted a workshop in 1999 to encourage municipal wastewater plants to perform self-audits on wastewater collection systems in lieu of state or federal agency audits. St. Petersburg and Clearwater were specifically targeted to participate and have since completed audits.

St. Petersburg completed the design on a long-term sanitary sewer overflow abatement program in 1998, including recommendations for immediate and long-term actions. A key conclusion was that the City should focus more resources on cleaning large-diameter lines. To address that, the City has procured three additional sewer-cleaning machines (vactors) and contracted with two sewer-cleaning companies for routine maintenance of critical segments in the collection system. Additionally, St. Petersburg has started to replace and reline sanitary sewer lines in critical areas throughout the city. A \$30 million bond issue in 1999 secured the money for design and construction of long-term improvements. In June 2003, a bond issue secured an additional \$30 million to complete implementation of the sewer overflow abatement program. The City continues to implement the recommendations of the Sanitary Sewer Evaluation Study completed in March 1998, budgeting over \$6 million a year in FY 2000, FY 2001, FY 2002 and FY 2003 to support maintenance. In addition, \$8 million a year has been designated in the 5-year Capital Improvement budget for sewer system rehabilitation and improvement.

The City of Clearwater is implementing a capital improvement plan to improve its wastewater collection system by reducing stormwater infiltration into the City's wastewater collection systems to prevent sewer overflows. Line infiltration, which causes flows that exceed system capacity, is the primary cause of wastewater discharges from treatment facilities. Phase 1 of the Sanitary Sewer System Evaluation Study and Self Audit was completed at a cost of \$2.3 million dollars with recommendations for manhole renovation, upgrading pump stations and sewer lining.

In 2005, the City of Tampa also embarked on a Sanitary Sewer Evaluation Study to

identify areas in need of pipe replacement to prevent infiltration and inflow, which can cause overflows. The study will take 18 months, and implementation of the recommendations will likely take five additional years. The City also is purchasing additional portable generators to reduce power outages, a key cause of sewer overflows during the 2004 hurricane season. Finally, Tampa is preparing an ordinance to restrict the dumping of grease into the sewer system – the single largest cause of overflows for the city.

Pinellas County Utilities is implementing a 5-year plan to correct problem areas within the Pinellas County south collection area. Additionally, an aggressive program to install inflow protectors on manholes began in 1999. The goal is to fit every manhole in both service areas with these devices. In severe inflow problem areas, manhole rings and covers are being replaced with watertight, lock-down ring and cover assemblies. Pinellas County Utilities has also voluntarily entered the self-audit phase of the USEPA Capacity, Management, Operations, and Maintenance Program effort.

Hillsborough County efforts include the procurement of a remote monitoring and control system (SCADA, or Supervisory Control and Data Acquisition). The SCADA system will identify and advise of pump station failures, and use upstream pump stations to hold flows in the event a downstream pump malfunctions. The system is being constructed in phases at a cost of nearly \$5 million. The County also has implemented improved maintenance and inspection procedures.

To better assess the impact of wastewater spills on nitrogen levels in Tampa Bay, Pinellas County conducted a one-year study of overflows throughout the bay watershed, covering September 2002-October 2003. Monthly nitrogen spill estimates were compared to modeled “best estimate” mean monthly nitrogen loads calculated for TBEP (from 1999-2003) by bay segment. The analysis showed that the monthly spill loads were minor relative to total external bay segment loads in Hillsborough ((0-2%) and Middle Tampa Bay (0-4%), but were potentially significant for at least one month in Old Tampa Bay (0-26%) and Boca Ciega Bay (0-20%). Because of the potential for localized water quality impacts resulting from sewer overflows, this action warrants ongoing monitoring to ensure continued progress.

STRATEGY:

STEP 1 Support local government efforts to gain grant funding to replace substandard or aging facilities.

Responsible parties: TBEP (through contracted grant writing services)

Schedule: Initiate in 2005

STEP 2 Consider implementing the recommendations of TBEP’s Technical Advisory Committee, as follows:

- Use standardized forms to report spills to FDEP, EPC and the public.
- Repeat the spill data collection and analysis for an additional year, since the period assessed by Pinellas County included abnormally high rainfall amounts.
- Check for bay water quality impacts from reported spills.
- Use same-day WWTP influent nitrogen concentration data to estimate loads from storm-related spills.

Responsible Parties: TBEP, local governments, FDEP

Schedule: Initiate in 2006

PH-1

Continue Source and Risk Assessments of Human and Ecosystem Health Indicators Suitable for Subtropical Marine Beaches and Waters

ACTION:

Continue source and risk assessments of human and ecosystem health indicators appropriate to detect bacteria and pathogens for subtropical marine beaches and waters.

STATUS:

Ongoing

BACKGROUND:

Clean beaches and the recreational activities associated with them form the backbone of Tampa Bay's tourism industry. Water quality at beaches ranges from excellent (Gulf beaches where warnings and health advisories are rare) to moderate (bay and inland waterway beaches where advisories are more frequent) to poor (lakes and other freshwater environments that are not suitable or approved for swimming). Of particular interest are the moderate quality beaches that have received heightened media exposure associated with advisories and closures. These beaches include Fred Howard Park in Tarpon Springs, R.E. Olds Park in Oldsmar, beaches along the Courtney Campbell and Gandy causeways, and St. Petersburg's North Shore beach. Swimming is not advised in canals and intercoastal waters, as well as Chestnut Park at Lake Tarpon, the Boy Scout Camp at Lake Chautauqua and Wall Springs in Palm Harbor, the latter representing a growing problem with springs in Florida driven by deteriorating groundwater quality.

Of key concern is the risk to swimmers and the necessity for establishing effective water quality indicators to detect harmful bacteria that can cause rashes, ear, nose and throat infections and gastrointestinal diseases. However, the finding that the most widely used indicator of human and animal fecal contamination — fecal coliforms and more specifically *E. coli* — grows naturally on vegetation in warm climates has raised questions about its efficacy as an indicator in Florida. Additionally, in recent years total and fecal coliform bacterial indicators have failed to consistently detect the persistence of pathogens, especially viruses in surface waters. That has led to a search for better indicators of human health risks.

Healthy Beaches Tampa Bay

Pinellas County established the first Healthy Beaches program in 1998 after a growing body of evidence suggested that reliance on traditional water quality standards, such as total and fecal coliform, may not be appropriate for sub-tropical waters. This raised the concern that beaches may be closed unnecessarily, while overlooking other potential health concerns. The St. Petersburg/Clearwater Convention & Visitors

Bureau recognized the implications, and together with the Pinellas County Health Department, brought the issue to the attention of the Tampa Bay Estuary Program. TBEP, along with Pinellas County and the Southwest Florida Water Management District, helped finance the first phase of the study through the University of South Florida College of Marine Science. Phase 1 was to recommend the best indicator for use in evaluating water quality at recreational beaches in Florida.

Phase 1, completed in 2001, found enterococci (*Enterococcus* species) to be the preferred test for marine waters because they tend to live longer than fecal coliforms and are more closely correlated with cases of gastroenteritis in recreational waters. However, enterococci share the same major disadvantage of the fecal coliform group in that they are shed in feces of all warm-blooded animals, providing no clues as to their source. Phase 1 ultimately recommended the use of enterococci, along with fecal coliform bacteria, while proposing source tracking of the fecal coliform to fingerprint the types of bacteria found (Rose et al 2001).

Those recommendations mirror state standards utilized since 2000, when Florida's 34 coastal counties began bi-weekly beach water sampling (weekly since 2002) as part of the Florida Healthy Beaches Program. Coastal counties analyze for bacteria indicating enterococci (as required by EPA) and fecal coliform (as required by DEP). County health departments issue health advisories or warnings based on these standards, although the link between exposure to these organisms and public health risk remains unclear. EPA funding now requires counties to use a five-sample geometric mean of the enterococcus indicator, resulting in more frequent exceedances and associated health advisories.

A proposed Phase 2 for the Healthy Beaches Tampa Bay project recommends a risk assessment of pathogens to establish the source and fate of these organisms, and to help develop a system and policies to better forecast and inform the public about health risks. The tidal modeling needed for Phase 2 is available through USF's PORTS system (Dr. Mark Luther), but the pathogen link remains unfunded to date.

Health advisories warning swimmers of potential risks due to high bacteria counts have risen significantly in recent years at the nation's beaches, according to the EPA. In Florida, beach warnings increased 30% to 686 in 2001, up from 527 the previous year. This can be attributed in part to an increase in the number of samples taken, the concurrent use of two indicators (fecal coliforms and enterococcus), and changes in the way results are calculated. Although beach water quality in Tampa Bay is generally good, some trouble spots remain.

STRATEGY:

STEP 1 Reconvene Healthy Beaches Tampa Bay partners through the USF College of Marine Sciences' Healthy Beaches/Healthy Coasts Center to evaluate health advisory standards and policies for public beaches and discuss development of sensors for rapid detection of viruses and bacteria. Provide results to federal, state and local health units.

PH-2

PH-2

Responsible parties: USF College of Marine Sciences' Healthy Beaches/Healthy Coasts Center

Schedule: 2004-2005

- STEP 2 Pursue Phase 2 Healthy Beaches Tampa Bay funding for an assessment of pathogens to aid in formulating more effective health advisories (including effective notification of the public), and to speed development of sensor technologies that could determine the specific pathogens present on our coastlines. Computer modeling and additional work is needed to:
- Better establish the link between exposure to certain organisms and risk of disease – with special emphasis on at-risk populations (elderly, immuno-compromised).
 - Identify sources (animal type, septic tank, boating, natural vegetation, insects).
 - Determine fate — how long an organism persists before the risk becomes negligible.
 - Predict weather and water conditions that will intensify or diminish the contamination.
 - Develop a “microbiological toolbox” for establishing standards and identifying potential mitigation strategies.

Responsible parties: USF College of Marine Sciences' Healthy Beaches/Healthy Coasts Center

Schedule: 2004-2005

- STEP 3 Increase public education and awareness of health and beach advisories by posting beach and health advisories on the Tampa Bay Estuary Atlas and www.HealthyBeaches.edu.

Responsible parties: TBEP; USF Healthy Beaches/Healthy Coasts Program

Schedule: 2005

- STEP 4 Identify measures to reduce contamination and provide results of research (1st and 2nd Steps) to EPA and the State of Florida.

Responsible parties: TBEP partners, other local governments

Schedule: Initiate following source identification in Step 2, or as sources become identified

- STEP 5 Provide side-by-side data on total coliforms, fecal coliforms, and enterococci information to the State of Florida for TMDL development.

Responsible Parties: local governments

Schedule: 2005-2006

- STEP 6 Track assessments conducted by EPCHC and the Hillsborough County Health Department for swimming in canals and evaluate for future bay-wide application.

Responsible parties: EPCHC, Hillsborough County Health Unit

Schedule: 2005-2006

- STEP 7 Update the “Is It Safe To Swim In The Bay?” fact sheet to include precautions against swimming in stormwater ponds and residential canals.

Responsible parties: TBEP

Schedule: 2006

Bay Habitats



Mangrove forests like this one are among the bay's most familiar habitats. Decaying leaves falling from these red mangroves create detritus that is a key element of the bay's food web, while barnacles and oysters grow along the fingerlike roots of the trees, and a variety of wading birds nest in the branches. Crabs, shrimp and popular sportfish like the snook seek shelter or food among the mangrove roots, while the sturdy trees themselves serve as natural storm buffers.

Photo by Donna Bollenbach

BH-1

Implement the Tampa Bay Master Plan for Habitat Restoration and Protection

ACTION:

Implement the Tampa Bay Master Plan to restore and protect key bay habitats.

STATUS:

Ongoing. Strategy revised in 2004 to incorporate hard bottom habitats, specific goals and targets for tidal rivers, streams and creeks, and a detailed Seagrass Restoration and Protection Plan.

BACKGROUND:

Significant progress has been made in restoring the historic balance of coastal habitats in Tampa Bay, a key goal of the Estuary Program's bay management blueprint. This strategy reflects efforts to provide a mosaic of habitats to support wildlife that rely on different habitats at various stages in their life cycles.

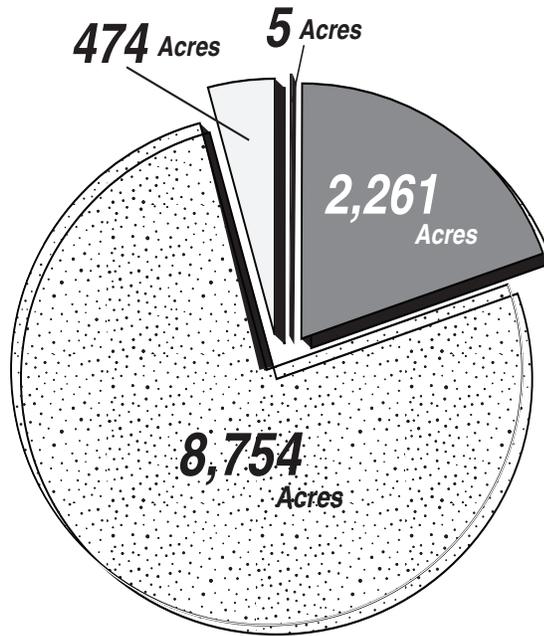
Restoration of low-salinity habitats was given highest priority in TBEP's Master Plan for Habitat Restoration and Protection because these habitats have declined faster than others, imperiling the species that depend upon them.

As reported by TBEP partners, nearly 380 acres of low-salinity habitat was restored from 1995 to 2001, far exceeding the initial goal of restoring 100 acres every five years. The 380 acres actually restored represents roughly one-fifth of the long-term restoration goal of 1,800 acres of low-salinity tidal marsh, areas that are vital to the survival of juvenile snook and mullet and numerous wading birds. TBEP partners also reported that another 2,018 acres of mangrove and salt marsh habitat were restored during this same period.

The upland element of the Master Plan is incorporated in the multi-agency Coastal Conservation Corridor Plan. It emphasizes the restoration of small freshwater ponds in the vicinity of white ibis and other wading bird rookeries, acquisition of lands with existing freshwater ponds in areas where the birds forage and along wildlife corridors, and exotic plant removal from low-salinity portions of creeks and streams that serve as juvenile fish nurseries and foraging stations for wading birds. While some progress has been made, the total impact of these upland-focused efforts has not yet been fully documented.

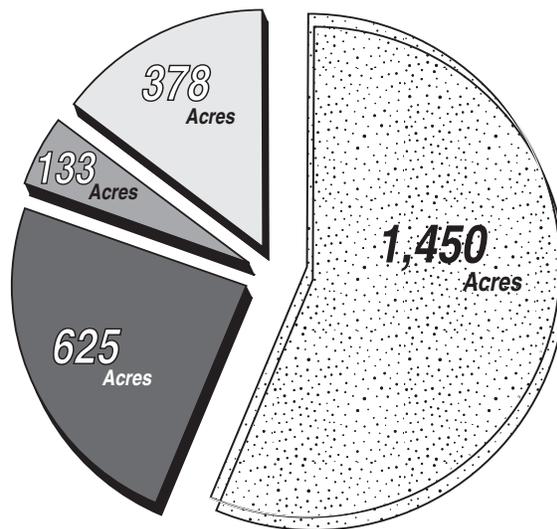
The Master Plan also identified 28 priority sites for protection to be managed or restored as necessary, either through direct purchase or other means such as conservation easements on private property. These sites were earmarked 'high priority' by the Southwest Florida Water Management District in the state's Save our Rivers and Florida Forever land acquisition programs. Nearly 1,900 of the 13,434 acres slated for protection in the Master Plan were acquired between 1995 and 2000.

Tampa Bay Habitat Protection/Aquisition 1996-2003



BH-1

Tampa Bay Habitat Restoration 1996-2003



SOURCE: SWFWMD

Critical habitats not included in the 1995 Bay Habitat Master Plan are hard bottom habitats, including both submerged areas and oyster bars. These important habitat types will be included in the Master Plan update. In addition, recent research results have indicated that water quality and restoration goals and targets for tidal rivers, streams and creeks may be different than those for open waters of the bay. A project to support development of these goals was included in the TBEP FFY 04 Annual Workplan.

Both Hillsborough and Pinellas counties have well-established and funded land acquisition and preservation programs. A sales tax referendum to create a similar program in Manatee County in 2003 was rejected by voters. However, commissioners there supported a .25 millage tax increase that raised about \$3.5 million to provide the local grant match needed to purchase the 443-acre Robinson Preserve along lower Tampa Bay and the Manatee River. The County Administrator plans to request keeping additional millage on the tax roll in the future to enable the purchase of other environmentally sensitive lands.

The concept of restoring an optimum balance of habitats continues to have important implications for Tampa Bay and other areas. Historically, habitat restoration and land acquisition have been largely opportunistic ventures, with agencies and communities purchasing and restoring what was most readily available or visibly connected to the bay. That approach helped build awareness of the environmental plight and needs of the bay at a critical time.

In recent years, the focus shifted to providing a mosaic of habitat types within a given project to maximize the benefits to fish and wildlife. The TBEP partners took this concept a step further by developing restoration and protection goals based on the needs of key wildlife guilds or groups that share common habitat and feeding preferences. These efforts have helped drive important gains in critical habitats that might otherwise have been overlooked.

Citizen advisors to the Estuary Program have developed a number of suggestions on ways this strategy might be expanded and enhanced. These recommendations will be considered as part of a comprehensive review and documentation of progress and priorities in habitat restoration and protection in 2005.

STRATEGY:

STEP 1 Update the Tampa Bay Habitat Restoration and Protection Master Plan, including the following elements:

- Assess and document progress on Tampa Bay’s Habitat Restoration and Protection Plan, “Restoring the Balance.” Include habitat restoration and land acquisition to date, and a list of remaining priority sites as identified in the 1995 “Restoring the Balance” document.
- Include hard bottom substrates (including submerged habitat and oyster bars) as critical habitat in the Update.

Responsible parties: TBEP

Schedule: 2004-2005

STEP 2 Develop restoration and protection goals and targets for tidal rivers, streams and creeks in the Tampa Bay system.

Responsible parties: TBEP

Schedule: 2004

STEP 3 Develop a Seagrass Restoration and Protection Plan for Tampa Bay, for incorporation into the “Restoring the Balance” update.

Responsible parties: Seagrass Working Group

Schedule: 2005

STEP 4 Continue to encourage restoration and protection of priority habitats, through acquisition and restoration programs.

Responsible parties: SWFWMD, local governments, EPA

Schedule: Ongoing

STEP 5 Reconvene TBEP’s habitat restoration subcommittee to evaluate progress and goals in restoring and protecting coastal and upland habitats, including recommendations from the Community Advisory Committee. Update and re-circulate maps highlighting priority restoration projects.

Responsible parties: TBEP and ABM

Schedule: Following update of the Habitat Master Plan

BH-1

BH-2

**Implement Mitigation Criteria for Tampa Bay
and Identify Priority Sites for Mitigation**

ACTION:

Implement mitigation criteria specific to Tampa Bay, and identify priority sites for off-site mitigation.

STATUS:

Ongoing.

BACKGROUND:

Mitigation is the process by which applicants compensate for impacts to natural wetlands by creating new or enhancing existing wetlands. Mitigation is required of private developers and governments in Florida. Typically, these manmade wetlands are established on the same site as the project in an area not slated for development.

Keeping track of these projects has proven difficult with limited government resources, although there have been improvements. A policy review of wetland mitigation conducted in 2000 by OPPAGA (Florida's Office of Program Policy Analysis and Government Accountability) indicates significant increases in compliance and monitoring. Based on data collected by SWFWMD staff, OPPAGA reported that District field audits in 1988 and 1989 found only a 33% success rate of constructed mitigation projects. District staff review of Environmental Resource Permits issued since 1995 found that 82% of completed mitigation projects were substantially in compliance.

In addition to the challenges of monitoring and enforcing mitigation requirements, some bay managers believe the mitigation criteria used by the state is insufficient to protect particularly vulnerable bay habitats.

Problems with mitigation and pressures from private interests who viewed it as cumbersome led to a new concept called "mitigation banking" in the early 1990s. It allows developers to compensate for wetland losses in one place by preserving, restoring or creating wetlands at another site so that there is no net acreage loss.

Proponents say mitigation banking can consolidate habitat restoration projects into larger units, increasing the odds for success and making permits easier to monitor and enforce. The ecological benefits of these larger systems are far greater, they say, than a tiny wetland in the middle of a shopping center or along a busy road. Critics contend mitigation banking makes it easier to destroy wetlands. If an applicant can simply pay to restore marshes somewhere else, there is little incentive to preserve wetlands on site. Many of the concerns stem from provisions (or lack thereof) in the state mitigation banking rule.

To address these complex issues, the Tampa Bay Estuary Program supported develop-

ment of mitigation criteria for the Tampa Bay region as part of the Comprehensive Conservation & Management Plan for Tampa Bay. An Agency on Bay Management workgroup convened in 1997 presented final recommendations in 1999.

Recommendations addressed how to determine when on-site or off-site mitigation was appropriate, as well as siting criteria for off-site mitigation. The group also identified a short list of areas suitable for banking.

Although the criteria were approved by the TBEP Policy Committee, it's unclear to what extent they have been incorporated into local government or agency programs. This updated action calls for redistributing the recommendations as a means to renew a dialogue on this important topic.

Mitigation banking has proceeded at a snail's pace in this region, as a result of land limitations and the complexity and costs involved in siting and operating banks. To date, the state has permitted only one mitigation bank in the Tampa Bay watershed, near Cockroach Bay. The 161-acre Tampa Bay Mitigation Bank is privately owned.

While this is the only state-permitted bank in the watershed, several local governments and agencies are mitigating for impacts at larger sites to maximize ecological benefits. A partnership between the FDOT and SWFWMD, in which the transportation department pays the District a per-acre fee to conduct its off-site mitigation, allows consolidation of smaller mitigation projects into larger, regionally significant projects. Additionally, FWC operates a species mitigation bank at Bullfrog Creek in Hillsborough County to mitigate impacts to gopher tortoises.

STRATEGY:

STEP 1 Redistribute mitigation criteria completed by TBEP workgroup in 1999 to agencies and local governments with request for comment, asking specifically: 1) are they aware of the criteria; 2) to what extent are they implementing recommendations; and 3) soliciting ideas on next steps. Report results at a joint ABM-TBEP meeting.

Responsible parties: TBEP

Schedule: 2004

STEP 2 Spotlight accomplishments with a forum that also helps outline next steps. Convene a meeting of habitat restoration experts, regulatory agencies and mitigation bankers to review agency feedback on mitigation criteria, discuss mitigation banking progress, and identify next steps, including review of "habitat trading" concept and a discussion of allowing land acquisition in lieu of mitigation. Provide technical information on how effective mitigation is in creating functional habitat and exchange information among experts.

Responsible parties: ABM

Schedule: 2005

STEP 3 Direct off-site mitigation to priority sites for habitat restoration when on-site mitigation is not feasible. However, mitigation that does not result in a net increase in habitat above the level of impact should not count toward restoration goals for Tampa Bay.

BH-2

BH-2

Responsible parties: FDEP, SWFWMD, EPCHC

Schedule: 2006-2007

STEP 4 Simplify and integrate lists identifying mitigation/restoration sites (TBEP Restoring the Balance list and SWIM), with the goal of identifying top mitigation sites for each bay sector.

Responsible parties: ABM and Tampa BayWatch

Schedule: 2006-2007

STEP 5 Continue to track progress in monitoring mitigation compliance and permit enforcement, including an estimate of how often agencies conduct follow-up visits, and determine whether level-of-service targets across agencies are consistent and sufficient. Incorporated from action BH-7.

Responsible parties: DEP, SWFWMD, EPCHC

Schedule: 2007

Reduce Propeller Scarring of Seagrass and Pursue Seagrass Restoration Opportunities at Select Sites

BH-3**ACTION:**

Reduce propeller scarring of seagrass, evaluate effectiveness of seagrass restoration techniques, and pursue seagrass restoration opportunities at appropriate sites.

STATUS:

Ongoing.

BACKGROUND:

Substantial progress has been made in addressing this action. No-motor zones that protect both seagrasses and manatees have been established in several areas of the bay, including Weedon Island, Cockroach Bay, Shell Key and adjacent to Port Manatee. In addition, slow speed zones have been established in other areas that also serve to protect seagrasses from propeller damage. The largest of these is a 7-mile-long shoreline zone in Hillsborough County (from Apollo Beach to E.G. Simmons Park) that requires boaters to go slow in waters less than 6 feet deep. A similar buffer zone designated in 2002 for Terra Ceia Bay requires boaters to go slow within 500 feet of shore. Pinellas County has enacted new ordinances that create or expand seagrass protection zones around Shell Key and Weedon Island. And in Cockroach Bay and Fort DeSoto Park, some areas that had been off-limits to internal combustion engines were re-opened because scarred seagrasses were recovering well.

A local rule review committee evaluated a state proposal for additional manatee protection areas in Tampa Bay, and issued its recommendations in mid-September 2003 (See FW-3). The FWC adopted new new manatee speed zones in 2004. Although aimed primarily at manatee protection, the new zones — which require boaters to travel at slow speed along several bay shorelines either year-round or seasonally — also serve to protect seagrasses in these shallow areas.

Educational efforts aimed at promoting safe boating also have contributed to boater awareness of this problem. Among these are the Tampa Bay Manatee Watch program, which was administered by Tampa BayWatch and the Fish and Wildlife Marine Research Institute under the guidance of the Tampa Bay Estuary Program's Manatee Awareness Coalition. Manatee Watch recruited and trained volunteers to provide information and safe boating tools such as polarized sunglasses and nautical charts to area boaters, both on the water and at area boat ramps. TBEP has been a major financial sponsor of Manatee Watch, which was initiated in 1999 and continued through March 2003.

Despite these accomplishments and successes, Tampa Bay continues to trail only the Florida Keys in percentage of seagrasses scarred by boat propellers. Additionally, results of a 3-year monitoring project conducted by FWRI as part of the Manatee

Watch program indicate that educational programs are generally not as effective as regulatory efforts in influencing or changing boater behavior. Further evaluation of techniques should include considering other seagrass protection programs such as the “four point program” developed for the Florida Keys in the 1990s. TBEP’s Manatee Awareness Coalition also revised its educational efforts in 2005 to refine target audiences, and bring in additional partners to help deliver its “Bay Friendly Boating” message.

A number of techniques have been proposed to assist in the restoration of seagrasses in Tampa Bay, including experimental offshore bar restoration in areas receiving high wave energy, understanding the effects of bioturbation (by rays and other animals) on seagrass transplant success or new colonization, and seagrass planting. Several methods of transplanting are now being tried in Tampa Bay; however, the verdict is still out on the long-term success of these techniques and a scientific monitoring program to compare the effectiveness of the different methods was just initiated in 2004 as part of an overall package of seagrass research.

Therefore, this action should remain a part of the CCMP for the next 5-year period. This will allow managers to refine boater education programs to more successfully reach target audiences and to assess the need for additional regulatory slow-speed zones or additional waterway markers to protect seagrasses. Also expected in this time frame are results of the research and monitoring programs assessing the success and future viability of various seagrass restoration techniques.

STRATEGY:

STEP 1 Assess the comparative success and viability of various seagrass restoration or mitigation techniques and scar reduction methods.

Responsible parties: FWRI, Southwest Florida Seagrass Working Group for recommendations

Schedule: FWRI transplant evaluation ongoing, finalized in 2004. Evaluation of other techniques in 2004-2005

STEP 2 Following adoption of new manatee speed zones in 2004 (see FW-2) specifically for those zones that are located in seagrass meadows, evaluate the need for expanded no-motor or slow speed zones for seagrass protection.

Responsible parties: TBEP Seagrass Working Group for recommendations; implementation by local governments

Schedule: 2005-2006

STEP 3 Develop a coordinated program that combines appropriate seagrass restoration techniques in priority areas, if proven successful, with no-motor or slow speed zones.

Responsible parties: TBEP Seagrass Working Group for recommendations; implementation by local governments

Schedule: Following FWRI evaluation of transplanting methods and evaluation of additional direct and indirect seagrass restoration techniques

ACTION PLAN

Bay Habitats

STEP 4 Revise existing boater education programs to more effectively reach target audiences.

Responsible parties: TBEP (through the Manatee Awareness Coalition), FWRI

Schedule: Ongoing. Strategy revised in 2005.

CHARTING
the **COURSE**
FOR TAMPA BAY

BH-3

Restrict Impacts to Hard-Bottom Communities and Evaluate the Ecological Effects of Artificial Hard-Bottom Habitat

ACTION:

Restrict impacts to natural hard-bottom communities and evaluate the ecological effects of artificial hard-bottom habitat.

STATUS:

Ongoing.

BACKGROUND:

While it is unclear how many acres of natural hard-bottom communities have been lost in Tampa Bay, impacts to these vital habitats are not easily mitigated, and greater recognition and protection is warranted. The rocky substrate provides an ideal surface for colonization by a wide variety of sponges, corals and other marine invertebrates, which in turn attract large numbers of fish.

In the original CCMP, this action called for a comprehensive benthic survey of Tampa Bay that would map natural hard-bottom communities, and an evaluation of the effectiveness of current permitting and mitigation rules in preserving hard bottom. Neither of these action steps was ever initiated.

However, USGS plans a benthic survey that will utilize both acoustic and laser technology to identify bottom habitat types, providing the first comprehensive look at natural hard-bottom communities in the bay. And ABM has agreed to host a workshop to evaluate the effectiveness of current permitting and mitigation rules related to hard-bottom impacts.

Using established sonar technology, USGS researchers will survey bay bottom grids by boat, running parallel track lines every 500-1000 meters. Additionally, the agency is contracting with a NASA researcher to conduct flyovers of the bay to take laser pictures of shallow coastal areas that boat-mounted instruments can't easily reach. Combined, these methods will provide maximum coverage and detail. The benthic survey is slated for completion in 2005-2006.

The flyovers are part of an experimental approach to see how easily habitats can be classified using laser light analyses of the coastline. Flying at about 1500 feet, the plane will fire about 2000 laser light beams per second across the flight path to produce a 500-foot-wide picture of each target area. USGS and NASA hope to extract habitat types from the LIDAR data by classifying each laser return signal.

Gulfstream's new natural gas pipeline stretching across the Gulf of Mexico and into lower Tampa Bay impacted nearly 20 acres of bay hard bottom. To mitigate impacts from the pipeline, the company installed about 100 20x24' shallow water reef modules

in Lower Tampa Bay and transplanted 150 soft corals. The limestone in the modules comes from an ancient reef site — now a limestone quarry — north of Tampa and was designed to mimic natural hard bottom. Another 150 6x8' deep-water reef modules, and 20,000 tons of limestone boulders, were placed in the Gulf to mitigate for impacts in Federal waters. EPC now requires mitigation of hard-bottom habitats in permitting.

Additional hard-bottom impacts are likely as a result of future harbor improvements. The Corps of Engineers is in the preliminary stages of a Tampa Harbor General Re-evaluation Study to evaluate recommendations for expanding and improving navigation, including the widening of the main ship channel to create a passing lane. The Cut B widening is likely to make the final list. The Corps has established a Steering Committee to assist with recommendations on the study, including hard bottom mitigation, and will coordinate with USGS in the final design of the bottom-mapping study to ensure it gets the information it needs to assess environmental impacts of any harbor improvements.

But along with impacts there have been gains stemming from the efforts of organizations such as Tampa BayWatch to restore oyster reefs along seawalls. The bay stewardship group plans to construct 300-500 oyster reef balls each year for placement in front of residential and park seawalls. Assuming an average of three to five units at each site, the program is expected to enhance about 1.25 miles of hardened shoreline in the bay each year. Tampa BayWatch has already installed about 1000 of the units along the waterfront in St. Petersburg and Tampa's Bayshore Boulevard. The Manatee County Artificial Reef program has installed another 500 reef balls at three locations near Emerson Point and to the west in lower Tampa Bay.

A related project is the construction of oyster reefs on natural shorelines in the bay using clean, fossilized oyster shells as a base on which live oysters will recruit to form natural oyster bars. BayWatch plans four community oyster bar construction events each year. Bars already have been installed at Whiskey Stump and Green Keys, as well as Fantasy Island. Projects are slated for Palomis Park in Tampa and the Davis Tract in south Hillsborough County. The ecological effects (including the spread of Asian green mussels) of these and other artificial hard-bottom habitats installed in the bay, as well as natural hard-bottom habitats, have not yet been documented.

STRATEGY:

STEP 1 Assist in the development of recommendations to minimize or mitigate hard-bottom impacts from the proposed Tampa Harbor Project.

Responsible parties: ACOE THP Steering Committee

Schedule: Ongoing

STEP 2 Undertake a comprehensive benthic survey of Tampa Bay in order to map the current and historic distribution of natural hard-bottom communities, including oyster reefs and rocky limestone outcroppings.

Responsible parties: USGS (for current) and TBEP (for historic)

Schedule: 2004-2005

BH-4

- STEP 3 Evaluate the ecological impacts and/or benefits of hard-bottom habitat installed in the bay, including reef balls, oyster reefs, seawalls and artificial reefs. The potential effect of natural and artificial hard-bottom habitats on the spread of invasive species such as the Asian green mussel will be an important aspect of this effort.
Responsible parties: County artificial reef programs; Florida Sea Grant or other research entity
Schedule: 2004-2005
- STEP 4 Evaluate the effectiveness of existing mitigation for hard-bottom substrate impacts in Tampa Bay.
Responsible parties: FDEP Beaches and Coastal Systems; FWC Artificial Reef Group
Schedule: 2004-2005
- STEP 5 Evaluate the effectiveness of current permitting and mitigation rules, and recommend improvements. Establishment of no fishing “reserves” and buffer areas around hard-bottom substrates should be considered.
Responsible parties: ABM
Schedule: Following evaluation of existing mitigation
- STEP 6 Implement the recommendations to increase protection of hard-bottom habitats.
Responsible parties: FDEP
Schedule: To be determined from ABM evaluation
- STEP 7 Develop bay-wide goals for protection and restoration of hard-bottom communities. Incorporate into the Bay Habitat Master Plan.
Responsible parties: TBEP
Schedule: Following benthic survey

Encourage Waterfront Residents to Enhance Shorelines and Limit Runoff from Yards

BH-6**ACTION:**

Encourage waterfront residents to enhance shorelines and limit runoff from yards to protect and improve water quality.

STATUS:

Redirect focus to educational efforts.

BACKGROUND:

This action originally focused on the creation of property tax or other financial incentives to encourage habitat enhancement along seawalls, and the establishment of cost-sharing programs to promote group-permit shoreline enhancement projects.

There appears to be little interest among local governments in providing tax breaks for waterfront homeowners who enhance their shorelines, although most permitting agencies now encourage or even require such enhancements instead of hardened seawalls, where an alternative is viable. For example, the Tampa Port Authority – which is the landlord of submerged lands in Hillsborough County – has revised its permitting rules to encourage shoreline stabilization via native plants, rip-rap materials, etc. as opposed to vertical seawalls. Other permitting agencies do the same.

Educational efforts in recent years also have heightened awareness of the benefits of alternatives to traditional seawalls. Tampa BayWatch has launched a successful program to install reef balls or small oyster reefs off seawalls and docks. These small reefs provide important habitat for barnacles, crabs, mussels and other marine creatures. BayWatch has set a goal of installing 300 seawall oyster reefs a year in the bay, for a total of 1.25 miles of enhanced shoreline annually. The oyster reef program is also heavily promoted by the Marine Extension Agent for this area.

Additionally, a wide variety of educational materials are available to inform residents of the benefits of enhanced shorelines. TBEP's Tampa Bay Repair Kit, and waterfront property owners' manuals developed by Pinellas County and the Florida Department of Environmental Protection both promote the use of softened shorelines over vertical seawalls. The FDEP manual offers detailed information about various alternative stabilization techniques. Additionally, DEP offers no-charge permits for property owners who want to plant native vegetation along their shore to reduce erosion and provide habitat.

The Florida Yards & Neighborhoods Program provides technical assistance to waterfront homeowners who want to reduce stormwater runoff, improve water quality in residential canals and enhance wildlife habitat through environmentally friendly landscaping.

FDEP would be the lead agency in coordinating and implementing any rule revisions necessary to streamline permitting for shoreline restoration projects, or to mandate that habitat enhancement features be incorporated when seawalls are constructed or repaired. Because of limited resources and other rulemaking priorities within the agency, DEP prefers that priority be given to actions that do not require rulemaking.

A realtor certification program is one logical way to expand messages about environmentally friendly waterfront development to a targeted audience. Realtors could receive required continuing education credits for attending workshops organized by TBEP and other partners. The workshops would explain wetlands, conservation easements, mangrove trimming restrictions, and other issues specifically associated with living along the shore, as well as present information on the financial benefits to homeowners of retaining natural shorelines and limiting yard runoff. The realtors could use this knowledge as both a marketing tool and an information service for their clients. An existing program developed by the Cooperative Extension Service, "Sell Green and Profit," could be expanded to address these concepts.

Another, existing program directed at a targeted audience is the Manatee Awareness Coalition's "Manatee Friendly Neighborhood" Program. This voluntary educational program encourages waterfront homeowners to complete a minimum number of environmental activities from a broad menu of actions. Neighborhoods that complete five of the activities receive a handsome sign to display at their community entrance designating them as a "Manatee Friendly Neighborhood." Although this program is directed at manatee protection, it encompasses many water quality and habitat protection activities that are relevant to this CCMP action.

STRATEGY:

STEP 1 Redirect action, from creation of financial incentives to educational efforts and programs, including targeted distribution of existing materials such as FDEP's Waterfront Property Owners Guide.

Responsible parties: FDEP, Florida Sea Grant, TBEP

Schedule: Ongoing

STEP 2 Explore options for development of a Realtors Environmental Certification Program.

Responsible parties: TBEP, County Extension Offices

Schedule: Initiate in 2005

STEP 3 Expand participation in the Manatee Friendly Neighborhood Program.

Responsible parties: Manatee Awareness Coalition

Schedule: Ongoing

Expand Habitat Mapping and Monitoring Programs

ACTION:

Expand habitat mapping and monitoring programs to assess extent and quality of emergent coastal habitats.

STATUS:

Ongoing.

BACKGROUND:

While long-running assessments of water quality, seagrasses and a benthic sampling program created in 1993 have helped make Tampa Bay one of the best studied estuaries in the world, bay managers still lack an effective program for monitoring the extent and quality of emergent coastal habitats, including the conversion of habitat type (i.e. marsh to mangrove).

This update calls for renewed efforts to establish that monitoring component, while continuing seagrass and benthic monitoring initiatives.

SWFWMD continues to map seagrass acreage every two years using aerial photography, while local government partners help ground-truth seagrass quality at selected transects throughout the bay. While coverage has increased by about 350 acres per year since 1992, almost 2000 acres were lost baywide in a two-year period in the late 1990s when El Nino rains caused a dramatic upswing in bay nitrogen loadings. Seagrass acreage recorded in January 2002 and again in 2004 showed a baywide rebound, but seagrass continues to decline in parts of Old Tampa Bay, most notably in the Feather Sound area, despite improving water quality. An intensive monitoring program to examine this area more closely is now underway.

The Environmental Protection Commission of Hillsborough County coordinates benthic, or bay bottom, monitoring with participation from Manatee and Pinellas counties. About 120 samples are analyzed each year for the presence of contaminants and to determine the abundance and diversity of organisms living in the sediments. Bay sediment samples taken from 1995 to 2000 show no significant changes in contamination in the bay since 1993 when intensive sediment sampling began, although additional hot spots in rivers and some bay areas were identified. Most of these hot spots are in the lower Hillsborough and Palm rivers, where targeted sampling didn't commence until 1997.

Since no significant changes in bottom contamination have been apparent in most areas, the benthic sampling program was revised slightly beginning in 2002. The sampling program revisions resulted in a reduction of the number of sites sampled in each bay segment per year. Since 2002, the balance of program resources has been diverted to sample identified hot spots more intensely. After two or three years of sampling hot spots, the overall annual level of effort for baywide benthic quality sampling is expected to be reduced.

BH-8

Monitoring results are released every 3-5 years in a Baywide Environmental Monitoring Report (BEMR). The Baywide Environmental Monitoring Program is a collaboration of the Estuary Program, Manatee and Pinellas counties, the Environmental Protection Commission of Hillsborough County, the City of Tampa, the Florida Department of Environmental Protection, Fish and Wildlife Research Institute, the Southwest Florida Water Management District, National Audubon Society, Tampa Bay Water, and the University of South Florida. All partners participate in field collection and research, but each partner has a unique niche or area of specialization to provide baywide analyses for a specific monitoring element.

STRATEGY:

STEP 1 Develop and implement a monitoring program to track habitat quantity and quality in coastal marshes and mangrove forests, oligohaline habitats and isolated freshwater wetlands, hard bottom and oyster reef communities, and associated uplands, including natural, restored or created habitats. Also, implement a mapping program for invasive plants.

Responsible parties: TBEP Habitat Subcommittee for program development, particularly how to measure and track habitat quantity and quality; include Sarasota Bay NEP and Mote Marine Laboratory.
Implementation to be determined.

Schedule: 2004 for program development

STEP 2 Continue seagrass aerial mapping and transect monitoring to assess habitat quality.

Responsible parties: SWFWMD for seagrass aerial mapping; participants in Seagrass Working Group for transect monitoring; City of Tampa for data analyses of transect monitoring.

Schedule: Ongoing

STEP 3 Continue benthic monitoring program to analyze sediments for contaminants and assess the health of benthic communities.

Responsible parties: EPCHC, Pinellas County, Manatee County

Schedule: Ongoing

STEP 4 Map priority seagrass restoration areas, including seagrass protection areas.

Responsible parties: FWRI

Schedule: Following identification of successful seagrass planting techniques

Maintain Seasonal Freshwater Flows in Rivers

ACTION:

Establish and maintain minimum seasonal freshwater flows in rivers.

STATUS:

Ongoing.

BACKGROUND:

State legislation enacted in 1996 directs Water Management Districts to set “minimum flows” for rivers that define the limits at which further withdrawals would be “significantly harmful to the water resources or ecology of the area.”

Scientists considered the need for a separate minimum flow for the bay at a 1999 TBEP workshop, but concluded that minimum flows for the rivers should be adequate to protect the bay’s health. Janet Llewellyn, FDEP state lead on MFLs, stated that ideally it is best to start in the estuaries and work upstream when developing flow requirements, but estuaries are the most difficult water bodies for which to set MFLs. She suggests that, since SWFWMD is currently doing MFLs on a river-by-river basis, the agency should complete the MFL work and then do a composite analysis addressing effects on the bay. If the cumulative effect of MFLs from the rivers does not protect the bay, then the tributary MFLs should be revisited.

A minimum flow for the lower Hillsborough River set in 2001 stipulates that flows below the dam shall not drop below 10 cubic feet per second or about 6.5 million gallons a day. About half of the time over the past 10 years there has been no water flowing over the dam. USGS and SWFWMD scientists are collecting data that will be used to reevaluate the minimum flow beginning in 2005.

For now, the City of Tampa is meeting the flow requirements by re-routing water upstream from Sulphur Springs to the base of the dam. However, the city hopes to supplement river flows beginning in 2007 with 6 mgd of the average of 50 mgd of treated wastewater now discharged into Hillsborough Bay from the Howard Curren treatment plant – while piping most of the balance north to New Tampa, Northwest Hillsborough and Pasco counties for irrigation. Construction began in late 2004 on a pipeline that will carry water from the plant to the river and through New Tampa to the Hillsborough-Pasco line, with ultimate connections to reclaimed water systems in Pasco County, Northwest Hillsborough County and Temple Terrace.

SWFWMD expects to finalize recommendations on minimum flows for Sulfur Springs and the estuarine portion of the Alafia River in 2006. Minimum flows also are scheduled for the Tampa Bypass Canal and upper Hillsborough River in 2006, to be followed by the Manatee (including the Braden River estuary), Little Manatee and Anclote rivers in 2007.

FI-1

Regional water supply development and reuse plans illustrate the challenges of balancing water supply and ecological concerns. Meeting demand for drinking water in the fast-growing region and reducing groundwater pumping at overstressed well fields requires new water supplies that cannot be met through conservation alone. Tampa Bay Water, the region's largest water supplier, approved a strategic plan in 1995 to address those needs.

Many projects in the first phase of the Master Water Plan began operating in 2002 and early 2003, allowing groundwater pumping at 11 long-producing well fields to be reduced ahead of schedule. The first phase of the Master Water Plan includes pumping stations to harvest drinking water from the Alafia and Hillsborough Rivers and Tampa Bypass Canal for treatment and distribution through Tampa Bay Water's regional system. Excess water from these sources is stored in a regional reservoir in southeast Hillsborough County that was completed in 2005. The plan also includes a new 25 mgd seawater desalination plant near Apollo Beach that began operating in March 2003 and has operated intermittently since then.

Tampa Bay Water board members will evaluate possible projects for Configuration 2 of the Master Water Plan, including a second desal plant on the Gulf Coast near the Anclote River, after reviewing updated future water demand projections. Configuration 2 projects would potentially add another 15 mgd of water.

While modeling studies suggest that recently implemented surface water withdrawals will have a negligible impact on the bay, independent monitoring will be critical in detecting any cumulative or long-term impacts.

Surface water withdrawals are being closely evaluated by a comprehensive hydro-biological monitoring program (HBMP) funded by Tampa Bay Water and a separate Hillsborough Independent Monitoring Program (HIMP) funded by Hillsborough County. Both monitoring programs were implemented in 2000 to collect baseline data prior to new surface water withdrawals and the startup of the region's new desalination plant. Researchers are also incorporating historical data from long-running water quality and fisheries monitoring programs to identify long-term trends.

The HBMP tracks water quality, plankton, fisheries, benthic invertebrates, vegetation and bird use to detect shifts that might be associated with changes in freshwater flows. Field work is extensive with scientists evaluating an estimated 11,000 water grab samples, 800 benthic samples and 720 fisheries samples per year. Hillsborough's HIMP seeks to corroborate those results with water sampling at 30 sites on the Hillsborough River, 43 on the Alafia River and 60 near the desalination plant at Big Bend.

This action calls for an evaluation of the potential effects that MFLs may have on meeting protection and restoration goals for oligohaline areas in rivers, with an initial focus on those water bodies which are scheduled for MFL adoption in 2006. Other potential indicators for changes in freshwater inflow, such as oyster bars, will also be examined. The action also calls for close evaluation of the results of ongoing monitoring initiatives to assess cumulative impacts, including reclaimed water projects, while continuing to move forward with the establishment of minimum flows for major tributaries to Tampa Bay.

STRATEGY:

- STEP 1 To assist with the evaluation of progress towards TBEP habitat restoration and protection goals, convene a workshop to assess potential effects of proposed MFL determinations (Minimum Flows and Levels determinations) on existing and potential oligohaline habitat (water column and vegetation), initially for Sulfur Springs and the Alafia River. Include discussion of Southern Water Use Caution Area in Alafia River evaluation.
Responsible parties: TBEP and SWFWMD
Schedule: workshop held in November 2003
- STEP 2 Establish seasonal flow requirements for Tampa Bay tributaries in accordance with schedule adopted by SWFWMD Governing Board, considering recommendations from advisors in previous step.
Responsible parties: SWFWMD
Schedule: As adopted by SWFWMD Governing Board
- STEP 3 Evaluate results of Tampa Bay Water's hydro-biological monitoring program (HBMP) and Hillsborough County's independent monitoring program (HIMP) for impacts to area tributaries and the bay from surface water with drawals.
Responsible parties: Tampa Bay Water and EPCHC
Schedule: Annual Science Review Committee meeting convened by Tampa Bay Water
- STEP 4 Periodically estimate total freshwater flow from all sources to the bay.
Responsible parties: SWFWMD and TBEP
Schedule: Every 5 years, starting in 2005

Bay Fish & Wildlife



A belted kingfisher prepares to enjoy a hard-won killifish breakfast. Kingfishers are common inhabitants of low-salinity wetlands bordering the bay, where they are often seen diving for small fish and crustaceans.

Photo by Bryon Chamberlin

Increase On-Water Enforcement of Environmental Regulations on the Bay

FW-1**ACTION:**

Continue to seek ways to improve enforcement of environmental regulations on the bay.

STATUS:

Ongoing.

BACKGROUND:

In the original CCMP, strategies for implementing this action focused on increasing the percentage of revenues from the Saltwater Fishing License allocated to marine law enforcement – an objective which has not yet been achieved, and for which prospects appear dim in the near future.

Despite this, some progress has been made in improving on-water enforcement of environmental laws in the Tampa Bay region. For example, the merger of fresh and saltwater law enforcement agencies within the relatively new Florida Fish and Wildlife Conservation Commission has expanded the pool of officers trained to enforce both salt and freshwater regulations, and provided officials the flexibility to shift officers around to target “hot spots” or priority problems, such as illegal gill-netting. And the revamping of the Wildlife Alert program to offer rewards to citizens who report marine – as well as inland – fishing violations also has helped to boost compliance with on-water laws.

Additionally, an unusual coalition was formed between traditional adversaries on the question of enforcing manatee speed zone laws. Marine manufacturers and boat owners joined conservationists in supporting a bill that redirected part of the fuels tax paid at marinas to the Fish and Wildlife Conservation Commission. The money will grow from \$2 million in 2004 to \$12 million after five years and will pay for an increase in law enforcement on the water. This should save both manatee and human lives as boats slow down in some coastal waters in response to a greater presence of wildlife officers.

Local governments have generally expanded their on-water enforcement presence, as well as assuming a larger role in resource protection and regulation in general. In fact, two substantial manatee/seagrass protection zones have been created by local ordinance in the last three years – one expanding the Weedon Island Preserve in Pinellas County, and another creating a 7-mile-long slow speed buffer in southeastern Hillsborough County. Additional manatee protection zones were established by the state in Terra Ceia Bay and the Alafia River in 2002, and can be enforced by both state and local marine enforcement personnel. Pinellas County expects to adopt yet another seagrass protection zone in 2004, a slow speed zone stretching from the Courtney Campbell Causeway north to the Safety Harbor area. Additionally, several

FW-1

new state manatee protection zones, both year-round and seasonal, were adopted in 2004, including an extensive slow-speed zone along the shoreline of eastern Tampa Bay from the Courtney Campbell Causeway to the Gandy Bridge.

But, as with the state, local communities also have limited resources to devote to on-water law enforcement, and the recent shift in focus to Homeland Security has further strained existing capabilities.

To maximize manpower commitments, FWC is piloting a program called “Trained Eyes – Coastwatch” with members of the Florida Guides Association in Tampa Bay. FWC law enforcement officers train professional guides to recognize and report fisheries violations – especially netting infractions. Participating guides are equipped with mobile phones that allow them to contact law enforcement officers directly without having to go through emergency operators. Local FWC officials report that this system has resulted in several arrests and citations of net fishermen violating state law. The program has been so successful that it may be expanded to other parts of the state.

A promising potential substitute for law enforcement may be the increasing number of community-driven boater education initiatives, such as those developed by Tampa BayWatch and TBEP’s Manatee Awareness Coalition. These efforts help to foster good environmental stewardship among boaters and anglers, while also serving as additional eyes on the water to report violations.

Adequate marine enforcement in a water body as large as Tampa Bay will remain a challenge for the foreseeable future. Currently, there are only 28 full-time state marine patrol officers in the Tampa Bay region – or about one officer for every 3,867 registered boats. That is triple the statewide average of one officer for every 1,200 boats – and the Tampa Bay area remains one of the state’s fastest growing.

This action is being redirected to support expansion of boater education initiatives to reduce the need for enforcement, and to promote increased cooperation among federal, state and local law enforcement agencies to maximize effectiveness. Additionally, TBEP will encourage the utilization of new Homeland Security personnel at area ports to identify and investigate fisheries and other marine violations.

STRATEGY:

STEP 1 Continue support for boater and angler education initiatives which reduce the need for enforcement.

Responsible parties: TBEP, Tampa BayWatch, local governments, FWC, FDEP

Schedule: Ongoing

STEP 2 Train homeland security personnel at area ports and waterfront military installations to report and/or investigate fish and wildlife law violations as part of their duties.

Responsible parties: FWC Law Enforcement, Tampa Port Authority, Manatee Port Authority, St. Petersburg Port

Authority, MacDill AFB, US Coast Guard
Auxiliary

Schedule: If this option proves to be feasible, training could begin in late 2006

STEP 3 Convene a workshop for federal, state and local law enforcement officials to encourage joint enforcement of new manatee zones, and to discuss efficient methods of maximizing enforcement of marine laws in general.

Responsible parties: TBEP, FWC

Schedule: Workshops for local and state law enforcement personnel were held in summer 2005 to familiarize them with new state manatee zones in Upper Tampa Bay. Additional workshops will be scheduled in 2006 as manatee zones elsewhere in the bay are posted.

FW-1

FW-2

Establish and Enforce Manatee Protection Zones

ACTION:

Increase manatee protection around the bay.

STATUS:

Complete. Continue to monitor implementation and support boater education programs.

BACKGROUND:

This action appears to be complete as outlined in the original CCMP. Substantial manatee protection zones have been established by local ordinance or state rule near Weedon Island in Pinellas County, around TECO's Big Bend and Port Sutton power plants in Hillsborough County, along the southeastern shore of Tampa Bay from Apollo Beach to Ruskin, and in Terra Ceia Bay. Additional state manatee protection zones were adopted by the FWC in September 2004 and should be posted sometime in 2005. These zones protect shallow-water manatee habitat in the Manatee and Braden rivers, Anna Maria Sound, the Rocky Creek area of Hillsborough County, the South Tampa area between the Courtney Campbell and Gandy Bridges, and Pinellas County from the Courtney Campbell north to Oldsmar.

The Tampa Bay Estuary Program's Manatee Awareness Coalition (MAC) has played a key role in this issue, as has a lawsuit agreement between several environmental groups and state and federal wildlife agencies that has accelerated the creation of manatee refuges and sanctuaries throughout Florida. The counties surrounding Tampa Bay have led the way statewide in manatee protection efforts, opting to designate many protection zones proactively through community negotiation and consensus rather than waiting for state or federal mandates.

Initiated in 1998, the Manatee Awareness Coalition has served as a community forum for open discussion of manatee protection issues, bringing together often-conflicting interests in a cooperative atmosphere. The MAC also spearheaded the creation of the Tampa Bay Manatee Watch program, an innovative education effort that recruited and trained more than 100 volunteers to provide safe boating information and tools to boaters, both on the water and at key boat ramps.

From 1999-2002, Manatee Watch volunteers contributed more than 1,500 volunteer hours and distributed some 1,000 boater kits (containing polarized sunglasses, nautical charts and other useful tools) to area boaters, encouraging boaters to "go slow, pole or troll" in shallow waters where manatees feed or rest. A companion 3-year monitoring program conducted by the Florida Marine Research Institute assessed the effectiveness of the program compared to regulatory initiatives.

Other accomplishments of the MAC include:

- Forging a partnership with U.S. Coast Guard Auxiliary flotillas in Tampa Bay wherein Auxiliary instructors were trained by MAC members to incorporate key messages about manatee and seagrass protection in their popular Safe Boating Course.
- Expanding the Manatee Watch program to waterfront neighborhoods with a high percentage of boat owners. “Neighborhood Manatee Watch” encourages communities to protect manatees by selecting from a menu of activities, such as posting manatee caution signs on docks or creating a neighborhood manatee sighting network. Neighborhoods completing a minimum number of activities are designated “Manatee Friendly Communities” and receive a special sign to post at their entrance. A MAC member serves as a personal advisor for each neighborhood to help them implement their Manatee Watch program.

FW-2

Despite this intensive educational effort, monitoring of boater compliance with voluntary go-slow zones indicates that regulation is generally more effective than education in changing boater behavior. While it is possible that more official manatee speed zones may be designated in Tampa Bay in the future, it is not feasible to expect that all areas of Tampa Bay used by manatees will be placed under regulatory protection. Therefore, education will continue to be an important component of manatee protection strategies. The MAC continues to support boater education as a valuable tool in protecting manatees and encouraging bay stewardship in general, and in 2005 launched a new “Bay Friendly Boater” education campaign to provide safe boating tools and information specifically to new boaters.

STRATEGY:

STEP 1 Continue to monitor implementation.

- Support local government initiatives to designate additional manatee protection zones if warranted.

Responsible parties: TBEP, FWC

Schedule: Ongoing, as needed

- Work with the Manatee Awareness Coalition, Tampa BayWatch and other education-oriented groups to refine educational materials and messages to improve boater compliance with non-regulatory manatee protection efforts.

Responsible parties: TBEP, all member organizations of the Manatee Awareness Coalition

Schedule: Ongoing. The MAC revised its boater education strategy in 2005 and will be producing new programs and materials as a result.

FW-3

Support Bay Scallop Restoration

ACTION:

Continue to support and monitor bay scallop restoration.

STATUS:

Ongoing.

BACKGROUND:

While water quality in lower Tampa Bay appears to be sufficient to allow bay scallops to survive, efforts at restoring a viable recreational scallop fishery in the bay have not yet been successful after a decade of work. Possible reasons for this include: high rates of predation on juvenile and adult scallops; historic loss of preferred seagrass habitats; susceptibility to red tide; and mortality caused by excessive turbidity from boat wakes and roller trawls used by bait shrimpers in areas where scallops have been transplanted. The Great Bay Scallop Search, an annual Tampa BayWatch event that recruits volunteers to snorkel grass beds in the lower bay looking for scallops, was halted when the number of scallops reported during the event dipped over time to only a handful and finally to none. The event was revived in 2004 and volunteers found 12 scallops in the bay, giving hope to restoration efforts and incentive to continue the community monitoring survey on an annual basis. However, a severe and prolonged red tide that reached into the lower bay in 2005 impacted scallop survival, and only one live scallop was found in the 2005 Scallop Search.

Previous research efforts have vastly increased scientific knowledge of the water quality and habitat needs of bay scallops, and improved techniques for successfully rearing scallops in hatcheries such as those operated by the University of South Florida.

Currently, the Fish and Wildlife Research Institute, Tampa BayWatch and USF are collaborating on another study of scallop survival in Tampa Bay, funded through the Pollution Recovery Trust Fund. This one-year study will expand transplanting efforts – concentrated in past years on the waters between Tierra Verde and the Sunshine Skyway Bridge — to other areas of the bay where good scallop habitat remains and boat access is restricted. Study sites in this new project include Weedon Island, Cockroach Bay, Coquina Key and waters around MacDill Air Force Base.

Scallops will be placed in these areas in both protected cages within seagrass beds, and in mesh bags suspended from nearby homeowner docks. Scientists will track and compare growth, survival, mortality, and recruitment of scallops in both the cages and the mesh bags, to assess which method works best and which locations appear favorable for scallop survival and reproduction. Funding to expand this project is being sought from the National Marine Fisheries Service.

Recognizing that the factors that led to the bay scallop's decline in Tampa Bay occurred over a long period, and that efforts to bring scallops back to the bay will

likely take a comparable period of time, the Tampa Bay Estuary Program will continue to encourage and support research and restocking efforts.

STRATEGY:

- STEP 1 Continue to monitor restocking efforts in the bay. Assist in identifying potential funding sources for research and restocking, and lend support to grant requests for transplanting of scallops in Tampa Bay.
Responsible Parties: TBEP
Schedule: Ongoing
- STEP 2 Continue to support the Great Bay Scallop Search and other scallop monitoring programs.
Responsible Parties: Tampa BayWatch, TBEP, FWC, Mote Marine Laboratory
Schedule: Ongoing, annually or whenever the Scallop Search is held

FW-3

FW-4

Assess the Need to Investigate the Cumulative Impacts of Power Plant Entrainment on Fisheries

ACTION:

Assess the need to investigate cumulative impacts of power plant entrainment and impingement on fisheries.

STATUS:

Complete. Monitor implementation of new EPA power plant intake rule.

BACKGROUND:

New rules proposed by EPA under section 316b of the Clean Water Act could significantly reduce the number of aquatic creatures killed in power plant cooling water intakes. The proposed rule would require new and aging power plants to install technology to reduce impacts or demonstrate to permitting authorities that protecting wetlands or restoring degraded habitat provides a comparable environmental benefit. The new standards will apply unless a power plant can show its costs for compliance are significantly higher than EPA estimates and outweigh environmental benefits.

Few large power plants in the U.S. have installed the technology necessary to combat significant mortality from entrainment. TECO's Big Bend power plant — where some equipment and screens have been installed to keep organisms from washing through — is an exception.

Most casualties are fish eggs and larvae that pass through the power plant cooling systems (entrainment). Others aquatic animals die after hitting metal screens or racks designed to keep debris outside the plant (impingement). EPA estimates that the rule would affect 550 facilities nationwide and cost \$265 million annually to implement, while producing an economic benefit to recreational and commercial fisheries of as much as \$700 million per year.

EPA expects to finalize the new rule in early 2005, but implementation will not occur all at once. Power plants would be required to comply as their permits come up for renewal.

The rule would affect 25 of 43 power plants in Florida including three in Tampa Bay — TECO's Big Bend and Gannon/Bayside complexes on Tampa Bay's eastern shore and the Progress Energy Bartow Plant at Weedon Island. Collectively, these plants use more than 2 billion gallons of bay water per day to cool power plant boilers that generate steam to produce electricity.

While it is difficult to assess the impact of power plant entrainment and impingement on fisheries because of the absence of baseline studies, estimates from power plant monitoring in the 1980s suggest that more than 350 billion fish eggs and larvae are

lost annually in Tampa Bay. What actual impact that represents, however, is uncertain since only a fraction of larval fish survive to adulthood under natural conditions.

A case study of Tampa Bay conducted as part of the technical review for the new EPA rule estimates that power plants cost the bay almost \$22 million annually in recreational fish losses. Information on the proposed rule and the Tampa Bay case study is available online at www.epa.gov/waterscience/316b.

Further studies on entrainment and impingement in Tampa Bay are unwarranted at this time.

STRATEGY:

STEP 1 Track implementation of new EPA power plant intake rule, expected to be finalized in 2005.

Responsible parties: EPA

Schedule: Report annually after implementation is initiated

STEP 2 Provide an overview of the new power plant intake rules to the TAC and Management Board, including entrainment and temperature requirements.

Responsible parties: EPA and TBEP

Schedule: 2005, following finalization of rule

FW-5

Continue and Expand the Critical Fisheries Monitoring Program

ACTION:

Continue the Critical Fisheries Monitoring Program.

STATUS:

Complete. Continue to support long-term funding of the program.

BACKGROUND:

The Florida Fish and Wildlife Research Institute's Fisheries Independent Monitoring program (FIM) evaluates the status and trends of fisheries in Tampa Bay and is a key component of the bay's overall monitoring program. The FIM program employs stratified random sampling to determine the abundance and distribution of adult and juvenile species. Two hundred samples are collected monthly at randomly selected sites. Surveys record the number, species and length of fish captured, and other environmental indicators. Researchers also sample fish flesh for mercury contamination and conduct a quick visual inspection for lesions. Monthly fixed-station monitoring has been discontinued in lieu of continuing year-round random sampling, which is a better method for assessing changes in the status of fisheries baywide.

The program is financed by state saltwater fishing license revenues, supplemented by federal dollars from the Sport Fish Restoration Fund and local funding from Tampa Bay Water and SWFWMD. Each year, about \$3 million is allocated for the FIM program statewide, with roughly \$600,000 dedicated to sampling in Tampa Bay.

The FIM program was expanded in 2000 as a result of a comprehensive hydro-biological monitoring program (HBMP) funded by Tampa Bay Water to assess impacts from freshwater withdrawals. Additional monitoring also has been supported by the Southwest Florida Water Management District as a part of the field work being conducted to establish minimum flows and levels.

Sampling has increased substantially in the Alafia River, and the Hillsborough and Palm rivers have been added to the monitoring program. These rivers are being sampled up to the fresh water regions or water control structure. Fisheries monitoring continues in the Little Manatee and Manatee rivers.

Expansion of the program to include sampling further upstream and in under-sampled rivers is yielding a better overall picture of the status of bay fisheries. Permitted water withdrawals from these rivers have made monitoring a key priority. However, the funding for the expanded monitoring is available only for a few years and no long-term sources have been identified.

The pre-operational phase of the HBMP is now complete and a baseline report was submitted to SWFWMD in July 2003. The first post-operational report is due in July 2006.

STRATEGY:

STEP 1 Continue the Critical Fisheries Monitoring Program, and evaluate sampling near the new seawater desalination plant to assess potential fisheries impacts. Ensure long-term funding to maintain the program so that it continues to include oligohaline regions.

Responsible parties: FWC-FWRI

Schedule: Ongoing

FW-5

FW-6

Preserve the Diversity and Abundance of Bay Wildlife

ACTION:

Protect important wildlife populations in the Tampa Bay watershed.

STATUS:

New action to support research, management and education to protect populations of listed species and other important wildlife in the Tampa Bay watershed.

BACKGROUND:

The Tampa Bay watershed supports more than 40 species currently listed as rare or endangered by the Florida Fish and Wildlife Conservation Commission. These animals span the range of bay habitats, from those that dwell in the bay or its major tributaries, to those that reside in the marshes, tidal streams, freshwater wetlands, sandy beaches and upland forests surrounding the bay proper.

Several of these species have been well-documented; the status of others is unclear and warrants further investigation. Additionally, many other species not currently listed as rare or endangered may deserve protection, based on best available information.

For example:

- Recent landings data for blue crabs, a commercially and recreationally important species, indicate a decline in crabs of harvestable size in the bay. However, whether this decline represents a long-term trend, or a temporary downturn based on rainfall, fishing pressure, or other factors, is uncertain. Researchers with the Fish and Wildlife Research Institute are currently conducting a study of blue crabs in the bay which may lead to harvest restrictions – such as a closed season on harvests – by the FWC in the near future.
- Population estimates of horseshoe crabs also are unknown, and this species may face increased pressure from harvest for medical purposes as well as continued loss of spawning beaches due to development. FWRI currently is compiling an inventory of important nesting beaches for horseshoe crabs in Tampa Bay as an important step toward assessing the status of this species.
- Anecdotal reports indicate that seahorses were once common in the seagrass meadows of the bay, and may have declined significantly in recent decades due to loss of habitat or water quality. But no census of seahorses has been conducted, and this species also may face pressure from harvest for the aquarium or medicinal trades. A small survey of seahorses was

conducted in 2004-2005 by University of Tampa researchers with a grant from the Tampa Bay Estuary Program. This study provides important baseline data on abundance, species composition, and habitat utilization.

- Diamondback terrapins are a shy, infrequently seen reptile that inhabits mangrove forests in the bay. Mortality of terrapins in crab traps is thought to be a significant threat to the long-term health of this species throughout its range, but research in Tampa Bay is lacking. As part of a planned derelict crab trap removal program to be launched in Tampa Bay in 2004, herpetologist George Heinrich is documenting terrapin deaths in crab traps, providing important baseline data that may assist in developing effective management strategies for this species.

FW-6

A key theme of the October 2003 Bay Area Scientific Information Symposium was the need to better define the role and function of small tidal streams in the bay ecosystem. Although FWRI has documented the importance of the major rivers in the bay system to commercially and recreationally important fish, a similar effort is needed to assess the use of smaller streams and creeks by juvenile or adult fish and shellfish. There are an estimated 100 of these smaller streams flowing into the bay. A two-year Tidal Tributaries Habitat Assessment project will address four tidal tributary systems in 2005-2007.

In addition to these emerging research and management needs, the bay's spectacular bird populations warrant additional monitoring. Audubon of Florida manages and posts some 15 critically important natural or manmade islands in the bay system that annually host as many as 40,000 pairs of approximately 25 species; however, as restoration of manmade spoil islands continues through the efforts of local governments and the Florida Department of Environmental Protection, additional efforts will be needed to protect these expanded nesting areas. Beach-nesting species such as terns, plovers and black skimmers also warrant special attention as their habitat is increasingly limited by coastal development, as do species such as the white ibis which are especially vulnerable to losses of freshwater wetlands that provide food for their young.

This action will serve as an umbrella action to encourage protection of all bay wildlife, and to support research and land acquisition/restoration efforts aimed at preserving the abundance and diversity of Tampa Bay's wildlife.

STRATEGY:

- STEP 1 Continue to implement the Tampa Bay Habitat Restoration Master Plan.
Responsible parties: Local governments, state and federal agencies, private entities
Schedule: Ongoing; Updated Habitat Masterplan due in 2006
- STEP 2 Convene a TAC workshop to identify key species at risk and in need of management action in Tampa Bay.
Responsible parties: TBEP, FWC and USFWS
Schedule: 2005

ACTION PLAN

- STEP 3 Support research/assessment of existing populations of key indicator species.
Responsible parties: FWC-FWRI, USFWS
Schedule: Ongoing
- STEP 4 Solicit TBEP Mini-Grants for specific education, research, or management projects that address key species.
Responsible parties: TBEP Mini-Grant program
Schedule: Initiated in 2005 Mini-Grant cycle
- STEP 5 Increase awareness of bird rookeries with signs, PSAs, and at boat and jet ski rental businesses. Recruit citizen groups and neighborhoods to monitor nesting areas through the Project Colony Watch program.
Responsible parties: Audubon of Florida and local Audubon chapters; local governments; TBEP MAC; FDEP Aquatic Preserves; FWC
Schedule: Ongoing

Dredging & Dredged Material Management



Dredging to maintain Tampa Bay's shipping channels generates about a million cubic yards of material each year, enough to fill Raymond James Stadium 10 times.

Photo courtesy of the Tampa Port Authority

DR-1

Manage Dredging and Dredged Material in Tampa Bay

ACTION:

Implement the long-term dredging and dredged material management strategy for Tampa Bay.

STATUS:

Complete as written.

BACKGROUND:

This action is essentially complete as written in the original CCMP.

The U.S. Army Corps of Engineers completed the long-term dredge material management plan for Tampa Bay in July 2000. The report outlined dredging projections, spoil placement options, and capacity shortfalls, noting that existing dredge disposal sites may be full to capacity within five to ten years unless steps are taken soon to expand storage areas or find beneficial uses for the material.

The long-term plan will be updated to incorporate new projections for capacity, short-fall and timing based on reassessments and recent surveys of islands 2D and 3D, along with updates on beneficial use projects.

Dredging to maintain the bay's nautical highways – up to 43 feet deep in places – generates about a million cubic yards of material each year, enough to fill Raymond James Stadium 10 times. Sediment dredged from the upper portions of the bay, where most dredging occurs, has traditionally been piped onto two manmade islands in Hillsborough Bay but they are rapidly reaching capacity. An offshore dredged material site with unknown capacity receives sediment material from the lower bay.

Plans are being finalized now to double the height of the dikes on the Hillsborough Bay spoil islands to 40 feet using dredged material already stored inside the dikes. That will increase total capacity to about 30 million cubic yards each, extending the life of the dikes until at least 2030. Another option calls for raising the dikes again, this time to 50 feet, when additional capacity is needed.

Since 1999, the Corps has found beneficial uses for all material from federal dredging projects in the bay, reflecting its strong commitment to alternative options. Beneficial use projects – including stabilizing the shoreline at Egmont Key— helped redirect almost 2 million cubic yards of sediment. Another 200,000 cubic yards of sediment from maintenance dredging in the Alafia River is being used to create a series of habitats at abandoned shell pits near Cockroach Bay.

One of the challenges in identifying beneficial uses is that the Corps must find “the least-cost environmentally acceptable” option, which limits alternatives. Another is that most dredged material from Tampa Bay is not suitable for beach renourishment,

and even when it is, the cost of transporting the material is too high.

Finding non-federal partners to help support and fund beneficial use projects will be critical for these projects to materialize in the future.

One possible use for material from maintenance dredging may be filling manmade holes dug decades ago for fill material used to create residential finger canals, but only in cases where filling or partially filling the holes will improve habitat value. The Tampa Bay Estuary Program, Fish and Wildlife Research Institute and EPC spearheaded an effort to assess habitat value in existing holes, with the assistance of local fishermen. That research project identified three holes where filling or partial filling might enhance water quality and habitat, while concluding that eight holes should be left intact. Another beneficial use the Corps is considering is re-creating longshore bars in areas where tidal flows may be restricting seagrass recovery. Habitat restoration projects such as the one at Cockroach Bay also are attractive, saving taxpayers money that would otherwise be spent on fill material.

Another idea in the formative stages is to use rocky dredged material to enhance hard bottom habitat in Tampa Bay.

While discussions of dredged material often focus on new construction, material from maintenance dredging currently outpaces new work by a ratio of 3:1. According to the Corps, maintenance dredging will create an estimated 30 million cubic yards of material through 2030, compared with about 11 million cubic yards in planned construction projects. That doesn't include projections from the expansion at Port Manatee, which has its own upland disposal site.

The ratio may change as the Corps completes its projections related to the Tampa Harbor and St. Petersburg Harbor Re-evaluation studies. For instance, widening the shipping channel to create a "passing zone" for ships near the turnoff to Port Manatee might generate from 1.5 to 2.8 million cubic yards of material. Along with the costs – estimated at \$20 million – scientists must also consider the environmental impact of further widening the channel (including the impacts of ship wakes) and other projects being pursued.

STRATEGY:

STEP 1 Complete annual updates to the long-term dredging and dredged material management plan, including new projections on capacity and shortfalls.

Responsible parties: U.S. Army Corps of Engineers

Schedule: Annual updates

STEP 2 Continue to pursue beneficial uses for dredged material to facilitate and accelerate bay habitat restoration and enhancement supporting the CCMP, identify cost-sharing sponsors, and encourage expedited permitting for beneficial uses.

Responsible parties: U.S. Army Corps of Engineers; FDEP

Schedule: Ongoing

STEP 3 Identify critical environmental issues and potential impacts associated with

ACTION PLAN

the Tampa and St. Petersburg Harbor Re-evaluation studies for delivery to ACOE.

Responsible parties: ABM and TBEP TAC joint workshop

Schedule: Comments submitted in 2005

STEP 4 Ensure that environmental impacts are adequately addressed in the U.S. Army Corps of Engineers Tampa and St. Petersburg Harbor Reevaluation studies.

Responsible parties: U.S. Army Corps of Engineers

Schedule: Ongoing

Spill Prevention & Response



Tampa Bay is a bustling center of maritime commerce, with more than 4,000 large vessel transits each year supporting three deepwater ports. Petroleum products accounted for 38% of the cargo traffic at the Port of Tampa in 2005, followed by products related to the fertilizer industry.

Photo by Mary Kelley Hoppe

Establish an Integrated Vessel Traffic Information System for Tampa Bay and Permanently Fund the PORTS System

ACTION:

Establish an integrated vessel traffic information system for Tampa Bay and secure permanent funding for the PORTS navigational system.

STATUS:

Ongoing.

BACKGROUND:

A significant portion of this action has been completed, with the establishment of a coordinated Vessel Tracking Information System (VTIS) for the bay financed by a consortium of maritime interests, including the Tampa Port Authority. And, although a permanent funding source for PORTS has not yet been found, current contributions from all three bay counties will secure PORTS funding through 2008.

VTIS has equipped all harbor pilots with shipboard laptop computers linked to a differential GPS system using Automated Identification System (AIS) technology that provides real-time information on shipping traffic in Tampa Bay. The pilots can see precisely where they and all other ships nearby are located at any given time, and coordinate that information with weather and current data to guard against collisions or groundings. Since installation of AIS/VTIS, there have been no serious ship-to-ship collisions in the bay.

Up-to-the-minute information about tides, winds and currents in Tampa Bay is available to all mariners (recreational boaters included) through the Physical Oceanographic Real-Time System (PORTS), a network of data collection buoys and sensors located at key positions around the bay.

PORTS was created by NOAA and is maintained by the University of South Florida Department of Marine Science. The system can be accessed online or by telephone.

Hillsborough County has committed to partially fund PORTS for six years from its share of phosphate severance tax revenue. The City of St. Petersburg made a one time financial payment to PORTS. Pinellas County has not yet agreed to financial support. Manatee County has secured a one-time grant of \$150,000 through FDEP from NOAA to support PORTS.

TBEP should continue to follow implementation of the VTIS and support a secure funding source for PORTS.

STRATEGY:

STEP 1 Continue to monitor implementation of VTIS system.

Responsible Parties: Tampa Port Authority, Coast Guard, TBEP, ABM

Schedule: Ongoing

STEP 2 Continue to track and support permanent funding of PORTS through local, state, federal or private funding sources. Funds are also needed for technical upgrades.

Responsible Parties: Local governments, USF, TBEP, FDEP, ABM

Schedule: Ongoing

SP-1

SP-2

Evaluate and Update Oil and Hazardous Material Spill Response Plans for Priority Areas

ACTION:

Monitor implementation of oil and hazardous material spill response plans.

STATUS:

Complete.

BACKGROUND:

The U.S. Coast Guard Area Contingency Plan (ACP), the strategic plan for responding to oil spills in Southwest Florida, was first completed in 1993, just one month before a three-vessel collision at the entrance to Tampa Bay left more 300,000 gallons of oil in its wake. Formal updates to the behemoth document – which spells out response protocols, identifies response equipment and personnel, and sensitive areas and resources – are required every five years, but revisions to individual sections occur more frequently as critical new information becomes available.

One of the most significant efforts of the last decade has been to convert the paper plan into an interactive, electronic tool. That feat was accomplished in 2001 when the Fish and Wildlife Research Institute, together with the U.S. Coast Guard, Florida Bureau of Emergency Response and NOAA, released the nation's first electronic ACP. The online version eases the complicated process of planning for spills with internal and external hotlinks that simplify navigation and access to critical maps, information and real-time data.

The computer version also includes a Geographic Information System (GIS) that allows spill planners to view digital maps depicting sensitive ecological resources, public beaches and populations – or create custom maps to see what types of plants and animals might be affected by a potential spill. One of the most powerful GIS tools is the Florida Marine Spill Analysis System (FMSAS), which allows users to coordinate spill planning activities and manage response and mitigation efforts during an actual spill. FMSAS uses layers of geographic data, imagery and specialized tools to provide spatial analysis that can be distributed quickly as maps, tables and charts, enabling decision-makers to direct containment and cleanup operations and minimize ecological and economic loss.

Continued monitoring of updates to the ACP, along with spill training exercises that test readiness and response, will help maintain the region's preparedness.

NOAA's Damage Assessment Center is also forming a Cooperative Trustee-Industry Pre-Spill Coordination Team, and is currently enlisting electric utilities and petroleum and chemical handlers to participate. The objective of the Pre-Spill Coordination Team is to equip the participants with a standardized set of equipment and train them

in approved NOAA techniques to allow the collection of “ephemeral data” just prior to the impact of spills. These data provide characterization of baseline conditions which both NOAA and the industries can agree exist in an area expected to be impacted.

STRATEGY:

- STEP 1** Continue to monitor the updating of the Area Contingency Plan and spill drills designed to test response capabilities. Incorporate individual facility response plans into the ACP database.
Responsible parties: US Coast Guard, local governments/agencies, industries
Schedule: Ongoing
- STEP 2** Periodically incorporate unannounced drills, withholding announcement of the spill scenario until the day of the exercise but providing advance notification of the timing of the drill.
Responsible parties: US Coast Guard
Schedule: Ongoing
- STEP 3** Encourage petroleum product handlers to participate in a Cooperative Trustee-Industry Pre-Spill Coordination Team.
Responsible parties: Petroleum product handlers, NOAA, US Coast Guard, Industry Trade Groups
Schedule: Upon formation of the Coordination Team
- STEP 4** Encourage other hazardous materials handlers to consider a similar program.
Responsible parties: Hazardous material handlers, LEPC, EPA, US Coast Guard, Industry Trade Groups
Schedule: Upon formation of the Coordination Team
- STEP 5** Report traffic patterns, tonnage and changes in ship traffic to the Agency on Bay Management on a regular basis.
Responsible parties: Tampa Port Authority, Port Manatee, ABM
Schedule: Yearly annual report

SP-2

Invasive Species



“Give A Day For The Bay” workdays recruit citizens to help eradicate invasive plants on public lands all over the Tampa Bay region. Here, a volunteer carries an armload of air potato vines to the disposal pile. Air potatoes are one of the most pervasive invasive plants in the bay watershed.

Photo by Nanette Holland

Assess the Extent of Existing Marine Bio-invasions in Tampa Bay

IS-1

ACTION:

Identify existing invasive species in Tampa Bay and expand current bay monitoring programs to facilitate early detection of new invasives.

STATUS:

New action.

BACKGROUND:

Research in marine bio-invasions in the United States has focused until recently on the Pacific Coast states and the Northeast. Very little research has been conducted on aquatic invasive species in the Gulf of Mexico, including Tampa Bay. In the first literature survey of Florida invasions, Carlton and Ruckelshaus (1997) found several non-indigenous species in Florida, mistakenly believed by researchers to be native.

This action supports research to identify the numbers, types and relative risks of invasive species found in Tampa Bay. The effort will provide a basic understanding of the types of invasives occurring in the bay, their relative ecological risks, and habitats most vulnerable to invasion. Results of the study can be used to expand existing bay monitoring programs – such as field seagrass monitoring, benthic sampling or fisheries assessments – so they may serve more effectively as an early warning system to track the arrival or spread of invasive species.

TBEP funded a literature and field survey by the University of Florida and the U.S. Geological Survey, completed in 2004 (Baker et al 2004). This work documented 55 known, suspected or likely marine invaders in the Tampa Bay ecosystem. This was the first baywide assessment of marine invasives in Tampa Bay, and serves as an important foundation to guide future education, research and prevention programs.

STRATEGY:

STEP 1 Support research to facilitate a better understanding of the extent of existing bio-invasions in Tampa Bay.

Responsible parties: TBEP, U.S. Geological Survey, University of Florida, Florida Sea Grant

Schedule: Complete. Literature review and field survey conducted in 2003.

STEP 2 Incorporate research findings into existing bay monitoring programs to track the movement of existing invasives and provide early warning of new invasives.

Responsible parties: TBEP, EPCHC, Pinellas County, Manatee County, FDEP, FWC

Schedule: Initiate in 2006

IS-2

Implement a Public Education Program to Enlist Citizen Help in Preventing Marine Bio-invasions

ACTION:

Develop a public awareness campaign highlighting the threats posed by invasive species, and actions residents can take to prevent accidental introductions of plants and animals.

STATUS:

New action.

BACKGROUND:

Accidental introductions of invasive plants and animals by a public unaware of the potential ecological impacts is a growing problem. Aquarium owners may release unwanted fish, frogs or skinks into local rivers and streams; boaters may take their boat from one waterway to another without cleaning off the hull and propeller; and immigrant communities may import and cultivate plants and animals from their homeland as foods. Recreational boaters are at least partly responsible for the epidemic spread of the zebra mussel throughout the Midwest and Northeast, and Asian immigrants may have imported and released mitten crabs – a traditional food – in the San Francisco Bay system. Homeowners may cultivate invasive plants in their own backyards that can spread unchecked into adjacent wildlands.

An informed public is critically important in preventing introductions of invasive plants and animals. To increase public awareness of the consequences of bio-invasions – and enlist citizen help in preventing new invasions — a campaign called “Eyes On The Bay” is being implemented by the Estuary Program. The campaign will utilize public service messages, videos, printed materials, the Internet, and other tools to provide information about invasive species already in the bay system, as well as those likely to flourish in Tampa Bay.

STRATEGY:

STEP 1 Convene an advisory committee to help develop the “Eyes On The Bay” program.

Responsible parties: TBEP with various partners including FWRI, Sea Grant, Tampa Port Authority, U.S. Coast Guard, USGS, Eckerd College, The Ocean Conservancy, The Florida Aquarium and Tampa BayWatch

Schedule: Complete. Committee was organized in 2002 and met several times to formulate education campaign.

- STEP 2 Support development of a comprehensive public exhibit on invasive species at The Florida Aquarium.
- Responsible parties:** TBEP, The Florida Aquarium and other “Eyes On The Bay” partners
- Schedule:** “Invaders” exhibit opened in 2002 and will remain at the Aquarium in some form for several years.
- STEP 3 Develop and distribute educational materials and tools.
- Responsible parties:** TBEP, with partners listed above and any other collaborators engaged in Invasive Species education.
- Schedule:** Initiated in 2003; continue to expand education programs in subsequent years. Products include an extensive section of the TBEP website devoted to invasive species information (“Eyes On The Bay”); a Divers Alert laminated card with photos and information about marine invaders and a phone number and website to report sightings; development of a middle-school level Teaching Guide to invasives; and a field guide and companion video showing homeowners how to identify and effectively eradicate invasive plants from their landscapes.

Public Education & Involvement



Volunteers prepare trees for planting at area preserves during a "Give A Day For The Bay" workday

Photo by Nanette Holland

Promote Public Involvement in Bay Restoration and Protection

PE-1**ACTION:**

Educate the public about the Tampa Bay watershed and involve citizens in activities that help improve and restore Tampa Bay.

STATUS:

Ongoing.

BACKGROUND:

The Tampa Bay Estuary Program continues to emphasize the importance of environmental education to the long-term health of the bay by creating a constituency of informed, involved citizens. This mission is aided by a Community Advisory Committee composed of residents from a variety of backgrounds and interests who share a common concern for the future of the bay.

CAC activities from 1998-2004 included co-sponsoring community forums on land and water linkage and desalination; serving as judges for the annual Bay Mini-Grants program; participating in several field trips to learn about issues affecting the bay; assisting staff by manning the TBEP exhibit at area events; and developing an action plan addressing stormwater ponds as part of the Program's first revision of the CCMP. The CAC doubled in size in 2002 when TBEP issued an open call for residents interested in participating, ultimately adding 18 new members with diverse interests and backgrounds.

In addition to serving as the staff coordinator for the CAC, the Program's Public Outreach Coordinator served as chair of the Manatee Awareness Coalition, an alliance of scientists, conservationists, industry representatives and others concerned about protection of Tampa Bay's population of endangered manatees. A community-based monitoring and education program called Manatee Watch, initially launched in Spring 1999, recruited and trained more than 150 community volunteers by January 2001 to assist scientists in boater activity research or provide safe boating information to area boaters. Tampa BayWatch coordinated the Manatee Watch program with oversight from the MAC. TBEP funding support for the program included purchase of materials for safe boating kits, such as polarized sunglasses and decals containing important manatee protection information, as well as support for a full-time program coordinator for the first year of the project. Staff support included assistance with press conferences, preparation of grant applications and promotional materials and other related tasks.

TBEP provided additional opportunities for citizens to become directly involved in helping the bay by launching a series of volunteer workdays in 2001. From 2001-2005, these "Give A Day For The Bay" events involved nearly 1,000 people in invasive plant removal, tree planting, litter cleanups and oyster reef installations. "Give A

ACTION PLAN

Day For The Bay” is held quarterly in partnership with local governments and non-profit organizations.

The Bay Mini-Grant program also provides a forum for public participation in bay restoration. Grants of up to \$7,500 are awarded yearly to neighborhoods, schools, and non-profit organizations for environmental education, restoration and pollution prevention projects.

The approval of the Tampa Bay Estuary license plate in 1999 has provided a steady source of revenues for the Bay Mini-Grant program, financing more than \$500,000 in community-based bay restoration and improvement projects as of 2005.

Other public outreach accomplishments during the 1998-2004 time frame included:

- Producing, in partnership with the Southwest Florida Water Management District, a colorful pull-out poster brochure emphasizing the need for safe disposal of hazardous household chemicals and promoting non-toxic cleaning and gardening alternatives.
- Redesigning TBEP’s website, adding special quarterly features and interactive components such as a user-driven calendar of events and community bulletin board. A companion listserv was created that allows TBEP staff to notify mailing list members of important meetings and news about Tampa Bay.
- Coordinating design of an educational poster on the wildlife of Tampa Bay and the importance of protecting the habitats that support those creatures. The poster, called “Wild and Wonderful Tampa Bay: Habitat Is Where It’s At” featured a photo montage on the front and lesson plans, field trips extensions, critter descriptions and a resource list on the back.
- Coordinating design, production and distribution of nearly 1 million inserts promoting the Tampa Bay Estuary license plate. The inserts were distributed in City of Tampa utility bills and auto tag renewal notices in Manatee and Pinellas counties.
- Coordinating production of a poster promoting the license plate, and distributing the poster to every marina and bait shop in the region.
- Coordinating design and production of a revamped Tampa Bay Boater’s Guide offering several new information layers, including manatee zones, fishing piers, anchorages and marine towing companies.
- Creating the Video Lending Library, which allows anyone to borrow an environmental video from TBEP’s extensive collection for up to a month.
- Developing and implementing the “Eyes on the Bay” invasive species awareness program, including a special section on the TBEP website, a slide show, a reporting network and a video showing residents how to eradicate invasive plants in their backyards.

- Producing the “Tampa Bay Ethical Angler Wallet Card,” which promotes responsible angling in the bay by listing important resource numbers along with regulations governing harvest of the 12 most commonly targeted fish species in the bay. The card is available in both English and Spanish.
- Sponsoring summer teacher training workshops, with USGS, on the use of aerial and satellite imagery to detect changes in area wetlands.

PE-1

With a wealth of outstanding environmental education initiatives and providers in the region, TBEP’s Public Outreach strategy seeks to address gaps in existing efforts – audiences and issues that other organizations are not addressing – to minimize duplication. Areas of particular interest to TBEP in recent years have included boater education and invasive species awareness and prevention. Future education campaigns are planned to raise citizen awareness of the water quality impacts of pet waste and air pollution.

As education will always be needed, this action should remain in the CCMP in perpetuity. Future implementation should capitalize on existing programs and partnerships wherever possible, but TBEP should also continue its leadership role in identifying areas of need and developing innovative, effective programs to inform citizens about the bay and involve them in its protection.

STRATEGY:

STEP 1 Continue to reproduce and update successful existing materials, such as the Tampa Bay Boater’s Guide, localized boating guides, and invasive species identification and removal guides and videos.

Responsible parties: TBEP

Schedule: Ongoing

STEP 2 Invest in educational programming that will reach a wider audience, specifically through production of a PBS-quality documentary on Tampa Bay that could be broadcast statewide as well as regionally.

Responsible parties: TBEP

Schedule: PBS film initiated in 2004 through contract with film producer; production and post-production to take place in 2005-2006; broadcast planned for 2006.

STEP 3 Expand the use of the Internet to provide information to bay residents, through upgrades and additions to TBEP’s website as well as development of the Tampa Bay Estuary Atlas, an Internet-based, highly graphical compendium of maps, resource links, historical information and real-time data about Tampa Bay.

Responsible parties: TBEP for TBEP website; University of South Florida’s Center for Community Design and Research for development and maintenance of the Estuary Atlas

Schedule: TBEP website updates are completed quarterly; USF launched Estuary Atlas website in Fall 2005

ACTION PLAN

- STEP 3 Provide more educational products in Spanish for the large Hispanic community in Tampa Bay.
Responsible parties: TBEP, local governments, SWFWMD
Schedule: Ongoing; TBEP has produced a Spanish version of the Ethical Angler Wallet Card and contributed funds for a Spanish version of the monofilament recycling brochure.
- STEP 4 Allocate a portion of the annual Bay Mini-Grant funding to help meet priority outreach needs identified in TBEP's workplan.
Responsible parties: TBEP, TBEP's Community Advisory Committee
Schedule: Beginning in 2005, TBEP's Community Advisory Committee, which selects each year's Mini-Grant recipients, authorized an increase in the maximum grant funding, from \$7,500 to \$10,000, for up to three priority projects identified as priorities by TBEP staff. The 2005 special RFP topics are community monitoring of invasive species, pet waste education and awareness of the link between air pollution and water quality. The projects must meet all regular Mini-Grant criteria for eligibility, and selection of recipients will be made by the CAC with input from staff.
- STEP 5 Improve tracking of distribution of educational materials, and evaluation of the effectiveness of products and programs.
Responsible parties: TBEP, all partners engaged in education and outreach
Schedule: TBEP initiated tracking database for its materials in 2005; pre- and post-surveys being developed for "Bay-Friendly Boater" program to assess audience and effectiveness of messages; social marketing concepts being incorporated by SWFWMD, TBEP and other organizations. into existing and new programs as appropriate.

Public Access



A hiker prepares to set out on the Paul Getting Memorial Trail at Weedon Island Preserve in St. Petersburg

Photo by Ron Putnam

PA-1

Reduce Human and Pet Waste in Traditional Bay Recreation Areas

ACTION:

Reduce human and pet waste in recreation areas around Tampa Bay.

STATUS:

New action, replacing original action BH-5.

BACKGROUND:

Several traditional recreational areas along the bay, including the Courtney Campbell Causeway in Clearwater and the Gandy Causeway in northern St. Petersburg, are enjoyed by thousands of people and their pets year-round. However, most of these traditional-use beach playgrounds lack bathroom facilities, and studies indicate that bacterial contamination of the water may result from human or dog waste in specific, localized areas.

This action seeks to gain a better understanding of the impacts of human and pet waste from recreation areas on both nutrient loadings and pathogen levels in the bay; to identify priority target areas where impacts are greatest; and to implement solutions. The action encompasses recreational areas directly on the bay, as well as those located on bay tributaries such as the Hillsborough River.

In the case of human waste, the solutions are likely to be construction of restroom facilities served by central sewer. In the case of dog waste, the solution may be a combination of increased enforcement of existing “poop-scoop” ordinances and an aggressive educational program highlighting the connection between fecal matter, stormwater runoff and water quality, and promoting proper disposal of pet wastes.

According to recent research, non-human waste represents a significant source of bacterial contamination in urban watersheds. Genetic studies by Alderiso et al (1996) and Trial et al (1993) both concluded that 95 percent of the fecal coliform found in urban stormwater was of non-human origin. Bacterial source tracking studies in a watershed in the Seattle area also found that nearly 20 percent of the bacteria isolates that could be matched with host animals were matched with dogs. A 1993 USEPA report estimated that, for coastal watersheds of up to 20 square miles draining to small coastal bays, two to three days of droppings from a population of about 100 dogs would contribute enough bacteria and nutrients to temporarily close a bay to swimming and shellfishing.

Several communities around the country have instituted specific public education campaigns aimed at reducing pet waste in stormwater runoff, including Philadelphia, Seattle, Ventura, California and Williston, Vermont.

A study currently underway in Pinellas County on McKay Creek may help to quantify the impact of animal waste on a localized bay segment. Additionally, local health departments also may have monitoring information that would help to identify potential problem areas where untreated human or pet waste is suspected to be a culprit in bacterial contamination.

STRATEGY:

- STEP 1 Evaluate the relative importance of uncontrolled pet and human waste from recreation areas, including tributaries, to overall nutrient loading and pathogen levels in the bay.
Responsible parties: local health departments
Schedule: 2005-2006
- STEP 2 Identify recreational areas on the bay or its tributaries where pet and human waste may result in localized pollution problems.
Responsible parties: local health departments, TBEP TAC and CAC
Schedule: 2005-2006
- STEP 3 Implement a public education and enforcement campaign to reduce pet waste in priority areas and educate the public about the link between pet wastes and local water quality and public health issues.
Responsible parties: local health departments, stormwater departments, TBEP, NPDES Stormwater Committee (coordinated by TBRPC and DOT)
Schedule: Initiate in 2006
- STEP 4 Encourage local governments to construct restroom facilities at recreational beaches now lacking them.
Responsible parties: local governments, local health departments, TBEP (to assist in obtaining funding for the facilities)
Schedule: Ongoing

Implementation & Financing

Implementing the plan

This chapter describes how the Comprehensive Conservation and Management Plan (CCMP) for Tampa Bay will be implemented by local governments, agencies and other bay stakeholders, and discusses financing mechanisms to ensure that the goals of the Plan are achieved.

Action Plans

Charting the Course presents a comprehensive slate of actions to assist TBEP's partners in selecting bay improvement strategies that are the most cost-effective and environmentally beneficial for their communities. The original *Charting the Course* document included action plans for five key areas: Water & Sediment Quality, Bay Habitats, Fish & Wildlife, Dredging & Dredged Material Management and Spill Prevention & Response. A sixth action plan outlined strategies for continued Public Education and Involvement.

This updated version of *Charting the Course* features revised strategies for many of the 41 original actions in the Plan, reflecting progress toward implementing the original objectives of the action or, in some cases, a recognition that a different approach is needed. Some similar actions with common themes, strategies or target audiences have been merged and a few have been eliminated altogether – either because they are now considered complete as originally written or because they are no longer deemed necessary or feasible.

Two additional action plans were added to this update of *Charting the Course*: Invasive Species and Public Access. These additions reflect new or emerging issues not identified as priorities during the development of the original Plan.

Action plans for Tampa Bay identify a range of strategies that allow local communities to maximize return on their investment in bay recovery and protection. Many actions also achieve multiple objectives, such as pollution prevention and water conservation. Each action plan summarizes the topic and its present status, presents specific management objectives, and includes Next Steps to guide implementation of the action over the next five years.

The Interlocal Agreement

In 1998, local government and regulatory partners of the Tampa Bay Estuary Program formally affirmed their commitment to implementing the goals of *Charting the Course* through the adoption of a precedent-setting Interlocal Agreement.

The agreement, the first of its kind among the nation's 28 NEPs, represents a binding pledge by TBEP's major partners to work together to achieve bay recovery targets.

Key highlights of the landmark agreement include:

- Participation by 13 local governments, regulatory agencies and other organizations with a vested interest in the bay's health. The six largest local governments in the Tampa Bay region – the counties of Hillsborough, Pinellas and Manatee and the cities of Tampa, St. Petersburg and Clearwater — are parties to the agreement, along with the Southwest Florida Water Management District, and the Florida Department of Environmental Protection. The Tampa Port Authority, Environmental Protection Commission of Hillsborough County, Florida Game and Freshwater Fish Commission, Florida Marine Research Institute and Tampa Bay Regional Planning Council were also signatories. Separate agreements were signed by the U.S. Environmental Protection Agency and U.S. Army Corps of Engineers, defining their support for implementing the Plan.
- The adoption of measurable and achievable goals for nitrogen management and habitat restoration and protection. Progress in achieving these goals will be assessed every two years, with a formal update of the CCMP every five years.
- Identification of specific projects, through detailed action plans that each signatory pledges to undertake to achieve the goals of the management plan.
- Incorporation of bay management goals into local government comprehensive plans and specific action plans into local Capital Improvement Programs.
- A commitment by regulatory agencies to allow permitting flexibility, when appropriate, to achieve maximum environmental benefit for the bay in the most cost-effective manner.

The Interlocal Agreement also establishes the Tampa Bay Estuary Program as an Independent Special District under Florida Statutes; spells out the governance structure of the program, and establishes funding contributions by the signatories based on population.

The Tampa Bay Nitrogen Management Consortium

One of the Tampa Bay Estuary Program's most prominent initiatives addresses controlling the bay's nitrogen intake in order to restore vital underwater seagrass beds. Facilitating this effort is a unique alliance of public and private sector institutions known as the Nitrogen Management Consortium.

Established in 1996, the Consortium brought together local governments, regulatory agencies and key industries impacting the bay to develop an equitable and cost-effective

tive plan for achieving the recommended nitrogen reduction goal for Tampa Bay. The Nitrogen Management Action Plan adopted by the group includes estimates of expected reductions associated with various nitrogen-decreasing projects. Additionally, the Action Plan outlines the responsibilities of TBEP and other Consortium members for monitoring and tracking the impact of nitrogen management efforts on seagrass recovery and associated water quality.

Because of population growth and related development in the Tampa Bay region, nitrogen loading to the bay is expected to increase seven percent from 1995 to 2010, an amount equal to about 17 tons per year. Consequently, local governments and industries must reduce or preclude annual loadings to the bay by this amount to maintain water quality sufficient to promote seagrass recovery.

The Nitrogen Management Action Plan adopted by the Consortium spells out specific projects each participant has completed or plans to complete to help meet the nitrogen management goals.

The Plan adopted by the Consortium seeks to ensure that the combined amount of nitrogen entering the bay through stormwater, wastewater, smokestack and vehicle emissions and other sources does not increase in the future — even with the continued growth expected in the region. Commitments made by the government and industry partners participating in the Consortium resulted in a reduction of 135 tons of nitrogen from 1996-2000 – far exceeding the 5-year cumulative reduction goal of 85 tons. The Plan was revised again in 2005 to reflect new sources and nitrogen management projects necessary to “hold the line” on nitrogen loadings to the bay to facilitate seagrass recovery.

Member governments of TBEP’s Management Committee implement a significant portion of the Consortium Action Plan through the Interlocal Agreement (IA) via individual action plans for the achievement of the CCMP goals. Private sector members of the Consortium have pledged to implement nitrogen reduction plans for which they are solely or jointly responsible through an accompanying Resolution. From 1995-2000, half of the load reduction goal was achieved by the public sector partners, and an equal amount by the private sector partners of the Consortium.

Action Plan Database

The adoption of measurable and achievable goals is a critical component of *Charting the Course*. An important new tool for tracking progress in reaching the benchmark goals of the Plan – especially for nitrogen loadings – is a customized computer database developed specifically for the Tampa Bay Estuary Program.

The Action Plan Database, a searchable Microsoft Access-based program, documents partner contributions toward implementation of the major goals of the CCMP, as well as the individual actions within the Plan. Partners periodically submit action plans detailing bay-related projects, programs and strategies to TBEP’s database manager, who enters the information in the database. Reports can be produced in a variety of formats to assist TBEP in assessing collective progress toward bay restoration.

A unique aspect of the database is its ability to calculate nutrient reduction loads based on land use type, location and treatment method. The database assigns a reduction value (estimated from local research and monitoring data) for various land uses and nutrient reduction methods, allowing TBEP to estimate annual nutrient loadings baywide and by specific bay segment. This capability will help to provide regulatory agencies with reasonable assurance that the Tampa Bay nitrogen management strategy is meeting water quality goals.

The database is expected to be fully operational in 2005.

Financing The Plan

TBEP has historically and will continue to pursue at least eight separate avenues to secure funding or in-kind support to finance operation of the base program and to advance implementation of the CCMP. The updated financing plan includes a balance of both dedicated and variable funding sources at federal, state, and local levels as well as private and non-profit sources.

The major objectives of the financing strategy are:

- Developing dedicated sources of funding to sustain the base operations of the TBEP, including personnel, administrative cost, community outreach, environmental monitoring, and technical support.
- Securing dedicated and variable sources of funding that enhance implementation of the CCMP and maintain adequate progress toward bay restoration goals.

DEDICATED FUNDING SOURCES

Currently, the following four funding sources provide dedicated or reasonably secure funding to support the base program and/or enhance CCMP implementation.

Federal NEP Funding. Congress has authorized a spending level in Sec. 320 of the Clean Water Act of up to \$35-million each year to support the National Estuary Program. The amount appropriated by Congress for each of the last three years has been level at about \$24.5-million, equating to about \$520,000 for each of the 28 NEPs. For several years prior to that, federal funding for NEPs was about \$310,000 per program. In view of the popularity of the NEP within Congress, it is reasonably safe to expect that TBEP will not receive less than \$300,000 each year in federal funding through Sec. 320 CWA.

Funding Commitments in Interlocal Agreement. The Interlocal Agreement through which the CCMP is implemented obligates local government and agency partners to fund all TBEP costs approved by the Policy Board in the annual program budget. One-third of the cost is allocated to the Southwest Florida Water Management District (SWFWMD) and two-thirds to the six local government partners. The SWFWMD share is paid equally from five separate river basin boards. When coupled with the federal NEP allocation administered through EPA, local government and agency cash contributions have met or exceeded the amount required to operate the program at the full-service level.

Specialty License Plate. Revenue from the Tampa Bay Estuary specialty license plate generated a total of \$145,305 in calendar year 2003, of which \$116,305 was allocated to TBEP for CCMP implementation. Total annual revenue from license plate sales has steadily climbed from \$50,265 in 2000, the first full year of plate sales. Although the TBEP Policy Board has thus far allocated its share of the revenues for Bay Mini-Grant projects, the Board is authorized under the state law that created the Tampa Bay Estuary plate to use those funds for any types of projects that contribute to CCMP implementation. Bay Mini-Grants generate tens of thousands of dollars in matching funds and in-kind services.

Pinellas County Environmental Fund. PCEF is a partnership of Pinellas County and the National Fish and Wildlife Foundation, created to raise funds for projects that help advance implementation of the CCMP. From 2000-2005, PCEF awarded more than \$7.2 million in grants for projects throughout the bay area that contribute to CCMP implementation. These projects were leveraged with \$10.8 million in matching funds. PCEF officials are actively exploring opportunities to increase contributions to the Fund from public and private entities in the Tampa Bay region.

VARIABLE FUNDING SOURCES

The following funding sources supplement CCMP implementation through local action plans of TBEP partners, grants, cooperative agreements, and other mechanisms. While variable from year to year, they represent significant funding sources for TBEP and its partners.

Local Action Plans of TBEP Partners. The TBEP Interlocal Agreement calls on each of the 13 signatory parties to develop and periodically update local action plans describing projects they propose to undertake that will help advance CCMP goals. The countless monetary and in-kind expenditures by TBEP's local government and agency partners in the course of implementing their local action plans represent by far the largest source of contributions to CCMP implementation. Habitat restoration and protection projects alone conducted by TBEP partners from 2001 to 2003 enhanced or preserved more than 14,000 acres of habitat at a cost of \$100 million. Sustaining the partners' commitment made in the Interlocal Agreement to achieving the goals of the CCMP through local action plans is arguably the most critical element of this financing strategy.

Contracted Grant Writing Services. Beginning in 2003, TBEP contracted with a professional grant writer to assist TBEP staff and its partners in preparing grant applications for projects that help implement the CCMP. In her first two years, the grant writer has assisted TBEP partners in securing over \$3 million in 319(h) grants for stormwater management projects. TBEP plans to continue offering these services to its local government and agency partners.

Other Grants and Cooperative Agreements. TBEP staff has partnered with federal, state and local agencies to secure hundreds of thousands of dollars in grants for developing management tools and for research and environmental monitoring projects as called for in the CCMP. TBEP has teamed with local government environmental management departments, EPA, USGS, NOAA, and the ACOE to leverage TBEP funds for priority plans and studies ranging from a dredged material management plan with the ACOE to atmospheric deposition monitoring with EPA to developing an

online information atlas of Tampa Bay with the USGS. TBEP will continue to pursue these opportunities as a means of financing priority research, monitoring, and resource management needs.

Non-Federal Overmatch Fund. TBEP maintains a Non-Federal Overmatch Fund that provides a source of matching funds for grants helping to implement the CCMP and serves as a contingency fund for continuing program operations in the event a major funding source is lost. Expenses which cannot be paid for with federal money such as the program's dues to the Association of National Estuary Programs are also funded from the Overmatch Fund. The fund balance as of May 2004 was about \$224,000.



Fisheries are a major component of the Tampa Bay Monitoring Program, which also tracks and analyzes trends in water quality, benthos/sediment quality, seagrass and atmospheric deposition.

Photo courtesy of the Florida Fish and Wildlife Conservation Commission.

Research and Monitoring

MONITORING BAY IMPROVEMENT

Effective monitoring is essential to a successful bay restoration effort because it allows communities to measure return on investment, assess progress and fine-tune priorities. The baywide monitoring program, initiated through a TBEP effort and based on EPA's EMAP statistical design, is implemented by several of the TBEP partners and builds upon existing monitoring data to more clearly assess progress in the bay's recovery. Rather than emphasizing compliance with rigid laboratory standards for water quality, the monitoring program for Tampa Bay seeks to measure instead the

health and diversity of bay habitats and the animals that inhabit them. Elements of the Tampa Bay Monitoring Program include water quality, benthos/sediment quality, fisheries, seagrass, and atmospheric deposition monitoring programs.

The baywide water quality monitoring program is not run by one agency, but is a combined effort of Manatee and Pinellas counties, Hillsborough's Environmental Protection Commission, the City of Tampa, the Florida Department of Environmental Protection, the Fish and Wildlife Research Institute and the Southwest Florida Water Management District.

This cooperative approach coordinated through TBEP has resulted in a much more comprehensive monitoring program than any of the partners would be capable of independently. All partners provide field collection efforts (using standardized techniques and methods), but each partner contributes specialized services and expertise to provide baywide analyses for a specific monitoring element.

Continuous coordination between the various local governments and agencies participating in this combined effort is essential. Coordination of the water quality element is accomplished through the Regional Ambient Monitoring Program (RAMP), which was initiated by TBEP in 1992, but is now coordinated by the local governments that run the monitoring programs. RAMP participants meet quarterly to collect water samples from a common container. Each program has its own laboratory run the samples for a core group of parameters (TN, nitrate+nitrite, ammonia, TSS, TP, orthophosphate, color, turbidity, and chlorophyll *a*), and the RAMP participants compare the results. To date, the RAMP participants have worked out differences between laboratories for several critical parameters (chlorophyll, TN, TP, TSS) and continue to work on others (color, for example).

An important step in the Baywide Environmental Monitoring Program was the agreement in 2001 by one of the partners, Pinellas County's Department of Environmental Management, to take the lead in providing statistical analyses of water quality and benthic data collected baywide using the EMAP-based algorithms currently being finalized for Tampa Bay by EPA's Gulf Breeze Laboratory. This effort completes the elements needed for long-term maintenance of a baywide monitoring plan, and builds upon the protocols developed by the Environmental Protection Commission of Hillsborough County for the benthic sample analyses; Manatee County's Department of Environmental Management for administering RAMP and baywide grain size analyses; the City of Tampa's Bay Study Group for analyses of baywide seagrass transect data; the Southwest Florida Water Management District for aerial photographs and GIS maps of seagrass extent; and the Florida Fish and Wildlife Commission's Fish and Wildlife Research Institute for baywide fisheries monitoring.

This successful coordination effort has recently been joined by monitoring programs in Charlotte, Sarasota, Lee and Polk counties, as well as the U. S. Geological Survey, and has been recognized by the State of Florida as a core group for inclusion in the developing statewide program.

RESEARCH PRIORITIES FOR TAMPA BAY

Technical advisors to the Tampa Bay Estuary Program have identified several new research projects to be pursued as funding becomes available. These priorities reflect emerging issues and newly identified gaps in information.

High Priority Projects

The following research needs have been assigned high priority status by TBEP's Technical Advisory Committee. An update on actions taken on these issues also is provided.

- Assess the water quality, sediment quality and habitat of tidal rivers, streams and creeks in Tampa Bay.

Update: TBEP and multiple partners have been awarded a PCEF/NFWF grant entitled Tampa Bay Tidal Tributaries Habitat Initiative. Work was initiated in summer 2005. The outcomes of the proposed project will be a concise set of management objectives (e.g., measurable natural resource restoration and protection targets for water and sediment quality, habitat structure, freshwater inflow and/or tidal exchange) and data to address natural resource issues such as the importance and contribution of tidal tributaries to estuarine fish production. The proposed project will provide empirical data to support necessary management actions for certain resources. In particular, data will indicate unique resources represented by tidal tributaries as compared to main-stem rivers or the open estuary (e.g., critical nursery habitat). A draft management plan, including recommended restoration and protection targets, will be developed based upon these data.

- Examine the effects of changes in offshore bars, ship wakes and wave energy on seagrass recovery.

Update: TBEP and multiple partners have been awarded several grants to conduct a pilot Longshore Bar Restoration Project, including funds from the Hillsborough County Pollution Recovery Trust Fund to examine wave energy effects; from FDEP to examine historical changes in offshore bars; and from the U.S. Fish and Wildlife Service to support engineering studies. In-kind services will be provided by USGS, the Tampa Port Authority, Mote Marine Lab and Coastal Resources Group, Inc. Work on this large project was initiated in early 2005, and is expected to result in construction of a demonstration longshore bar restoration project by 2008.

- Identify and map the location of historic hard bottom and oyster bar communities.

Update: TBEP and USFWS are funding a GIS-based examination of historic and existing oyster bars in Tampa Bay, to be completed by FWRI in 2005. TBEP will be examining how to identify and map deeper-water hard bottom substrate over the following year.

- Evaluate the ecological effects of artificial hard bottom habitat installed in the bay, including reef balls, oyster reefs, and artificial reefs. The potential effect of artificial hard bottom habitats on the spread of invasive species such as the Asian green mussel will be an important aspect of this effort.

Update: TBEP has contracted with Delta Seven, Inc. to conduct a pilot program to compare and contrast the faunal inhabitants of artificial reefs to those of natural hard bottom in Tampa Bay. The results from the evaluation will be used to assist in the design of a large-scale project for the restoration of hard bottom habitats. Results of the pilot project are expected in early 2006.

- Determine the important resources affected by changes in freshwater inflow.

Update: The Tidal Tributaries Habitat Initiative will include an evaluation of salinity “targets” for small tidal streams communities, including fishes and invertebrates.

- Assess the comparative success and viability of various seagrass restoration or mitigation techniques and scar reduction methods.

Update: FWRI has recently completed a four-year evaluation of the effectiveness of various seagrass planting techniques in Tampa Bay (Penny Hall, PI). Initial results indicate that, if environmental conditions are adequate to support seagrass recovery (i.e., adequate light, appropriate sediment conditions, protection from wave energy, etc), most planting techniques can be moderately successful. Costs of the various techniques vary, as does the appropriate scale of the plantings.

Adoption of slow speed zones for manatee protection may also help to reduce scarring of seagrass meadows, but this has not yet been evaluated.

- Mine existing data sources to examine effects of freshwater inflow changes on fisheries and other biological resources. Develop new databases of fisheries information (recruitment, etc.) linked to circulation and freshwater inflow.

Update: Ongoing studies funded by SWFWMD to support development of Minimum Flows and Levels for major Tampa Bay tributaries will include evaluations of various freshwater inflow scenarios on fisheries and other biological resources.

- Quantify unaged streamflow and groundwater flow to Tampa Bay, and develop estimates of surface and groundwater flux to Tampa Bay.

Update: USGS is conducting a number of studies on groundwater and streamflow in Tampa Bay, as part of their Tampa Bay Pilot Integrated Science Project.

Medium Priority

The following research needs have been assigned medium priority status by TBEP's Technical Advisory Committee:

- Assess the effects of intensity of boat use and seagrass scarring on degradation of habitat.
- Collect data and develop information for smaller tributaries in Tampa Bay.
- Provide more emphasis on shallow water monitoring.
- Deploy additional continuous water quality and flow monitors in the Bay, considering new instruments.
- Assess potential effects of Minimum Flows and Levels determinations on existing and potential oligohaline habitat (water column and vegetation).
- Further develop habitat suitability models, and link them to circulation and streamflow.
- Conduct research on the basic ecology of oysters and oyster bars in Tampa Bay.
- Develop and implement a monitoring program to track habitat quantity and quality in coastal marshes and mangrove forests, oligohaline habitats and isolated freshwater wetlands, and associated uplands, including natural, restored or created habitats.
- Evaluate the effects of land use changes on groundwater and surface water flows.
- Conduct research on the basic ecology of freshwater vegetation species in the Tampa Bay watershed.
- Develop better hydrodynamic models for shallow waters.
- Evaluate how productivity of marsh and mangrove systems is related to freshwater inflow.
- Use aerial photographs and imagery for use in evaluating biological changes.
- Coordinate water quality and Submerged Aquatic Vegetation restoration efforts.
- Provide seasonal tracking of natural seagrass beds.
- Collect adequate salinity and current data to support models.
- Identify causes of seagrass recovery slowdown or seagrass loss in “problem

areas” representing at least 10% of a bay segment.

- Initiate and support work to better understand seagrass ecology and biology.
- Identify and quantify how changes in freshwater inflow impact seagrasses and macroalgae.
- Conduct long-term monitoring of restoration, including relevant reference sites and sufficient funding.
- Use experimental transplants of submerged aquatic vegetation in tidal rivers to evaluate effects of freshwater inflow.
- Consider ecological implications of seagrass fragmentation.
- Develop a structured synthesis/storyline of information about Tampa Bay.
- Investigate seagrass “halos” near discharges.
- Identify critical water quality levels for seagrass recolonization and sustainable populations.
- Undertake a comprehensive benthic survey of Tampa Bay in order to map the current (and if possible, historic) distribution of natural hard bottom communities, including oyster reefs and rocky limestone outcroppings.
- Examine the differences, benefits and issues related to natural recovery of seagrasses versus planting efforts.
- Examine food web impacts of introducing artificial hard bottom substrates (i.e., reef balls or other materials) into areas that historically do not have hard substrates.
- Coordinate data collection efforts for simultaneous biology/chemical/physical parameters.

Additional Information/ General References

Unless otherwise noted, all references are from:

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WATER & SEDIMENT QUALITY

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DETECTION AND CHARACTERIZATION OF MALE-SPECIFIC RNA COLIPHAGES IN A NEW YORK CITY RESERVOIR TO DISTINGUISH BETWEEN HUMAN AND NON-HUMAN SOURCES OF CONTAMINATION.

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BACTERIAL SOURCE TRACKING; STUDIES IN AN URBAN SEATTLE WATERSHED. W. Trial. From Puget Sound Notes. 30:1-3

Glossary

- ALGAE - simple plants that grow in aquatic environments. Excess nutrients may accelerate the growth of algae, resulting in an algal bloom.
- ATMOSPHERIC DEPOSITION - refers to materials discharged to the atmosphere from natural sources and anthropogenic (man-made) sources, such as automobiles, power plants and industries that fall on the surface of water or land in rainfall or as dry particles.
- BENTHOS - the community of animals living in and on the bottom sediments of a body of water.
- CRUSTACEANS - a group of mostly aquatic invertebrates with a hard, jointed shell (exoskeleton); examples include crabs, lobsters and shrimp.
- DETRITUS - small particles of organic matter, largely derived from the decomposition of vegetation; an important food source for many small marine animals.
- DREDGE-AND-FILL - commonly refers to the removal of bottom sediments (dredging) to construct and maintain canals and ship lanes, and the use of dredged material (spoil) as fill for development.
- ECOSYSTEM - the system of ecological relationships between organisms (plants and animals) and their physical and chemical environment; a functional unit that includes both the organisms and their nonliving surroundings.
- ESTUARY - a partially enclosed body of water where fresh water from rivers and streams mixes with salt water from the sea.
- EUTROPHIC - refers to water that is rich in nutrients such as nitrogen and phosphorous, but often deficient in dissolved oxygen. Excess nutrients promote the growth of algae; as the algae dies and decomposes, it depletes the water of oxygen. Eutrophication occurs naturally in many bodies of water, but can be accelerated by pollution.
- EXOTIC - refers to non-native plants and animals that have been introduced (accidentally or intentionally) to a region. Some exotic species establish and grow quickly, crowding out native species.
- HABITAT - the sum of environmental conditions in a place where a plant or animal lives.
- INVERTEBRATES - animals without backbones; examples include insects, worms, crustaceans, mollusks and sponges.
- MANGROVES - a salt-tolerant tropical or subtropical tree that grows near the shoreline. Mangroves provide food and habitat for many types of wildlife, stabilize shorelines and filter pollutants that run off the land.
- MARSH - a wetland where the dominant plants are grasses and sedges, as opposed to a swamp, where woody plants like shrubs and trees are the dominant vegetation.

- MOLLUSKS** - a group of invertebrates including clams, snails, oysters, conchs and other soft-bodied animals. Most mollusks have a thick, hard outer shell; squid and octopus are exceptions.
- NON-POINT SOURCE POLLUTION** - refers to pollution that comes from many sources and cannot be traced to one specific point, such as pollution from stormwater runoff and the atmosphere.
- OLIGOHALINE** - refers to water with a very low salinity (salt content), ranging from 0.5 to 10 parts per thousand (ppt). Fresh water is characterized by salinity of less than 0.5 ppt; sea water contains about 35 ppt.
- PHYTOPLANKTON** - free-floating aquatic plants and plant-like organisms, usually algae; an important food source for many animals.
- POINT-SOURCE POLLUTION** - refers to pollution that comes from a specific source or point of origin, such as a discharge pipe or outfall.
- RUNOFF** - water from rain or irrigation that flows over land. Runoff often carries pollutants such as oils, fertilizers and pesticides and is frequently a major component of non-point-source pollution.
- SALT MARSH** - a marsh growing in the intertidal and upper coastal zone, where salt water from the sea has a strong influence on the types of plant life. Salt marshes are important wetland habitats for many kinds of fish and wildlife.
- SEAGRASSES** - true flowering plants (not grasses) that grow underwater in shallow bays and estuaries. Seagrass meadows provide food and refuge for many marine animals.
- SHELLFISH** - a generic term that includes both crustaceans and mollusks, especially those used for food. The term finfish, by contrast, refers to true fishes.
- SPOIL** - sediments removed during dredging. Spoil may be deposited underwater or on islands created specifically for spoil disposal.
- TOXIC** - poisonous or directly harmful.
- TURBIDITY** - cloudiness of water from suspended material or particles. As the cloudiness increases, so does the turbidity; low turbidity indicates clear water and may be associated with good water quality.
- WASTEWATER TREATMENT** - processes that help remove solids, nutrients and other pollutants from water before it is discharged or reused.
- WATER COLUMN** - an inclusive term, covering the area that extends from the bottom sediments to the surface for the water in a lake, estuary or ocean.
- WATERSHED** - the geographic region that drains into a particular stream, river or body of water. The Tampa Bay watershed covers more than 2,200 square miles in six counties.
- WETLAND** - land where the water table is usually at or near the surface. Some wetlands contain water year-round; others may remain relatively dry for months, becoming moist only during periods of heavy rain. Wetlands are vital habitats for many species of plants and animals; they are protected by local, state and federal regulations.
- ZOOPLANKTON** - free-floating aquatic animals ranging in size from microscopic, single-celled organisms to large jellyfish. Zooplankton are an important source of food for many types of fish and animals.

Acronyms

ACP	AREA CONTINGENCY PLAN
AWT	ADVANCED WASTEWATER TREATMENT
BEMR	BAYWIDE ENVIRONMENTAL MONITORING REPORT
BMP	BEST MANAGEMENT PRACTICE
CAC	COMMUNITY ADVISORY COMMITTEE (TBEP)
CCMP	COMPREHENSIVE CONSERVATION & MANAGEMENT PLAN
CES	COOPERATIVE EXTENSION SERVICE
CFMP	CRITICAL FISHERIES MONITORING PROGRAM
CIP	CAPITAL IMPROVEMENT PROGRAM
DDT	DICHLORODIPHENYL-TRICHLOROETHYLENE
ELM	ENVIRONMENTAL LANDSCAPE MAINTENANCE
EPA	ENVIRONMENTAL PROTECTION AGENCY
EPC	ENVIRONMENTAL PROTECTION COMMISSION (HILLSBOROUGH COUNTY)
ERP	ENVIRONMENTAL RESOURCE PERMIT
FAC	FLORIDA ADMINISTRATIVE CODE
FDACS	FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES
FDEP	FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
FDOT	FLORIDA DEPARTMENT OF TRANSPORTATION
FERC	FEDERAL ENERGY REGULATORY COMMISSION
FPL	FLORIDA POWER & LIGHT
FWPCA	FEDERAL WATER POLLUTION CONTROL ACT
FWC	FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
FWRI	FISH AND WILDLIFE RESEARCH INSTITUTE
FY	FISCAL YEAR
FY&N	FLORIDA YARDS AND NEIGHBORHOODS
GPS	GLOBAL POSITIONING SYSTEM
IPM	INTEGRATED PEST MANAGEMENT
LID	LOW IMPACT DEVELOPMENT
MAC	MANATEE AWARENESS COALITION (TBEP)
MGD	MILLION GALLONS PER DAY
MSSW	MANAGEMENT AND STORAGE OF SURFACE WATERS
NMC	NITROGEN MANAGEMENT CONSORTIUM (TBEP)
NOAA	NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION
NO _x	NITROGEN OXIDES
NPDES	NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM
O & M	OPERATING AND MAINTENANCE (BUDGET)
OSDS	ON-SITE DISPOSAL SYSTEMS
PAH	POLYNUCLEAR AROMATIC HYDROCARBONS
PCB	POLYCHLORINATED BIPHENYLS

PEL	PROBABLE EFFECTS LEVEL
PORTS	PHYSICAL OCEANOGRAPHIC REAL-TIME SYSTEM
PRTF	POLLUTION RECOVERY TRUST FUND
RCRA	RESOURCE CONSERVATION & RECOVERY ACT
SWFWMD	SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
SWIM	SURFACE WATER IMPROVEMENT AND MANAGEMENT PROGRAM (SWFWMD)
TAC	TECHNICAL ADVISORY COMMITTEE (TBEP)
TBBI	TAMPA BAY BENTHIC INDEX
TBEP	TAMPA BAY ESTUARY PROGRAM
TBRPC	TAMPA BAY REGIONAL PLANNING COUNCIL
TBW	TAMPA BAY WATER
TECO	TAMPA ELECTRIC COMPANY
TKN	TOTAL KELDAHL NITROGEN
TN	TOTAL NITROGEN
TPA	TAMPA PORT AUTHORITY
TSS	TOTAL SUSPENDED SOLIDS
USACOE	UNITED STATES ARMY CORPS OF ENGINEERS
USDOT	UNITED STATES DEPARTMENT OF TRANSPORTATION
USEPA	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
USF	UNIVERSITY OF SOUTH FLORIDA
UST	UNDERGROUND STORAGE TANKS
VTIS	VESSEL TRACKING INFORMATION SYSTEM
WAFR	WASTEWATER FACILITY REGULATION DATABASE
WWTP	WASTEWATER TREATMENT PLANT

CHARTING THE COURSE PRESENTS GOALS AND STRATEGIES TO KEEP TAMPA BAY ON THE ROAD TO RECOVERY. THIS DOCUMENT WAS PRODUCED BY THE TAMPA BAY ESTUARY PROGRAM.

THE MISSION OF THE TAMPA BAY ESTUARY PROGRAM IS TO BUILD PARTNERSHIPS TO RESTORE AND PROTECT TAMPA BAY THROUGH IMPLEMENTATION OF A SCIENTIFICALLY SOUND, COMMUNITY-BASED MANAGEMENT PLAN.



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