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

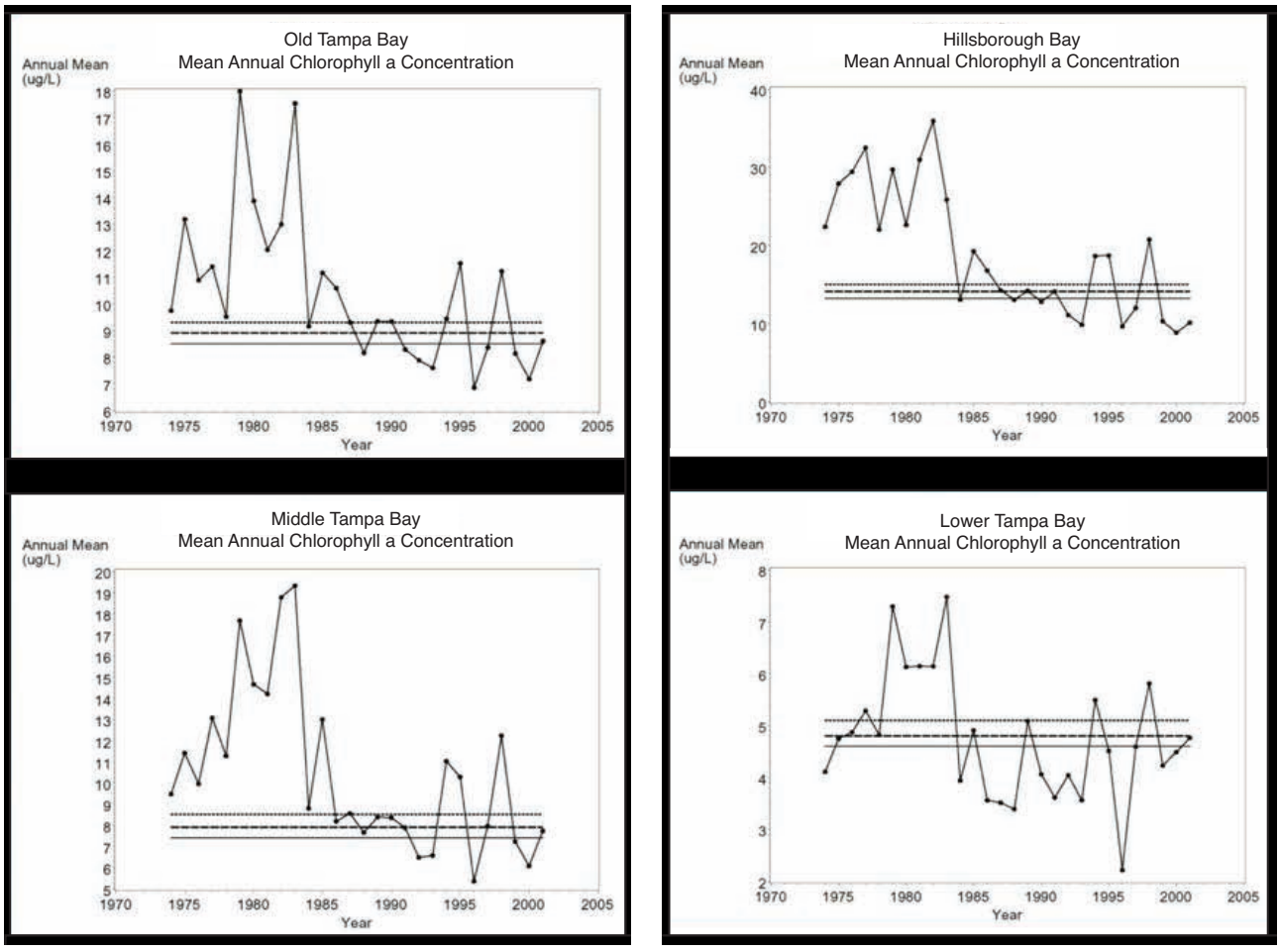
the water quality gains of recent decades will require more effort every year to compensate for increased pollution associated with growth. Actions we take both individually and collectively will increasingly influence the state of the bay.

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.

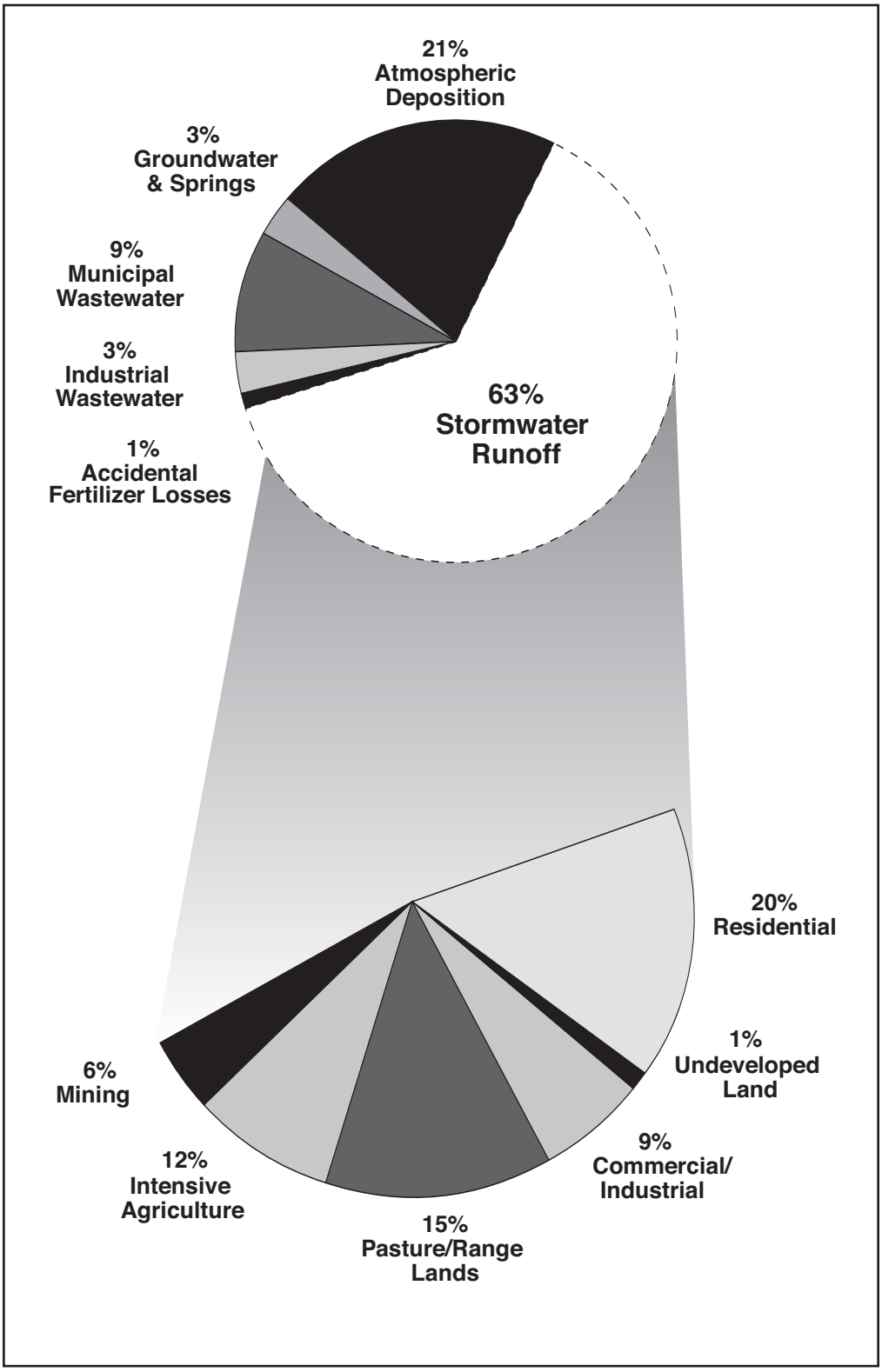
The Tampa Bay Estuary Program's Policy Board, along with TBEP's Nitrogen Management Consortium (NMC), a partnership of local governments and private industries with facilities along the bay, has adopted a goal of maintaining nitrogen loadings to the bay at the average calculated for the 1992-1994 timeframe. 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

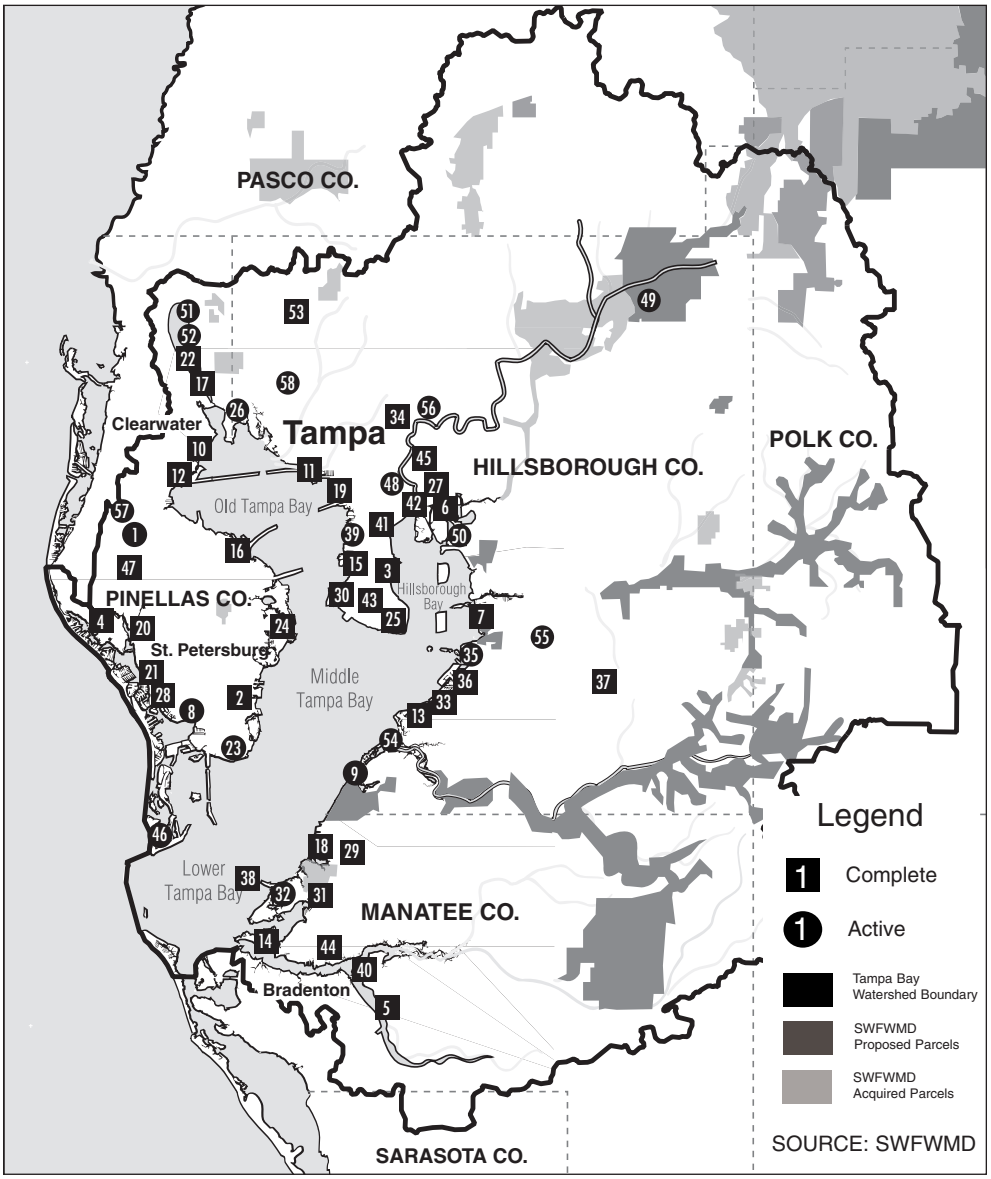
Tampa Bay boasts a diverse palette of habitats, from open-water rubble and reef communities to lush seagrass meadows and coastal hardwood hammocks.

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



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. Simmions 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
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.

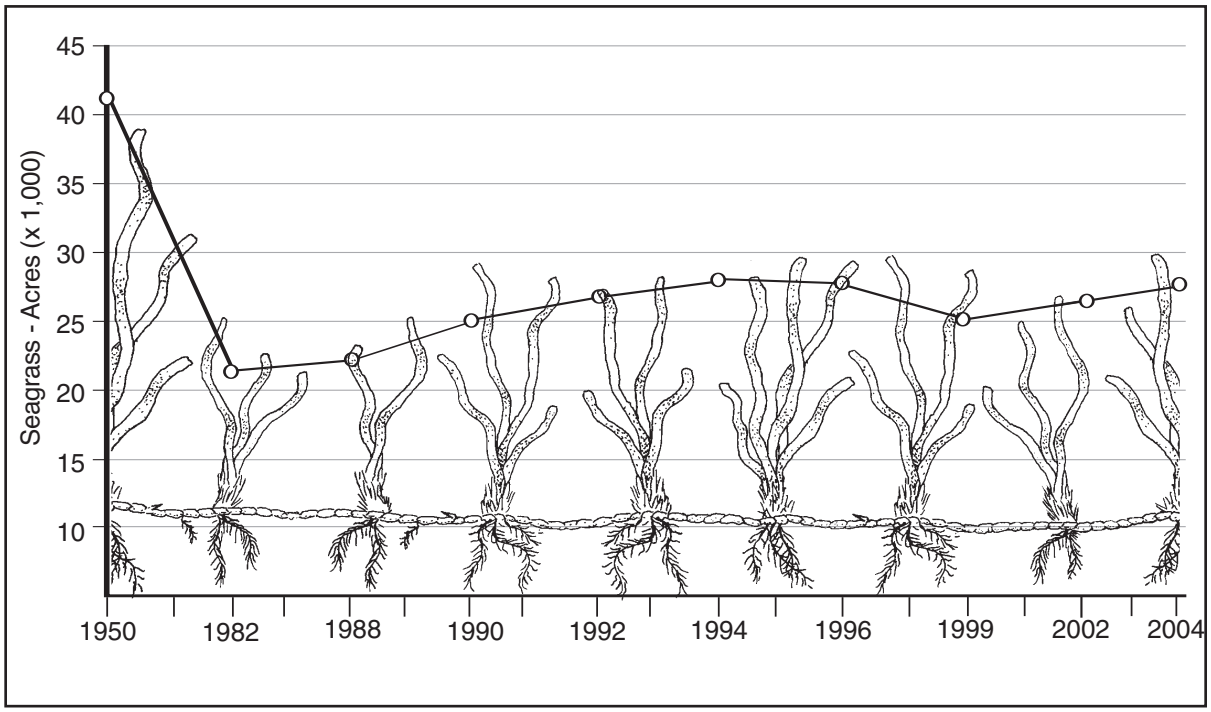
TBEP and its partners have established a seagrass recovery goal of approximately 12,000 acres, while preserving the bay's existing 26,000 acres, for a total of 38,000 acres baywide. By 1997, about 4,000 new acres of seagrass were documented. However, record-setting El Nino rains from 1997-1999 erased 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
Acipenser oxyrhynchus (Gulf sturgeon)	Atlantic sturgeon	Fish	SSC	T*	* Applicable only to the subspecies *A.o. desotoi*
Rivulus marmoratus	Mangrove rivulus; rivulus	Fish	SSC		
Rana capito	Gopher (=crawfish) frog	Amph	SSC		
Alligator mississippiensis	American alligator	Rept	SSC	T(S/A)	
Caretta caretta	Atlantic loggerhead turtle	Rept	T	T	
Chelonia mydas mydas	Atlantic green turtle	Rept	E	E	
Dermochelys coriacea	Leatherback (=leathery) turtle	Rept	E	E	
Drymarchon corais couperi	Eastern indigo snake	Rept	T	T	
Eretmochelys imbriccata imbratica	Atlantic hawksbill turtle	Rept	E	E	
Gopherus polyphemus	Gopher turtle	Rept	SSC		Associated primarily with uplands.
Lepidochelys kempi	Atlantic ridley turtle	Rept	E	E	
Pituophis melanoleucus mugitus	Florida pine snake	Rept	SSC		Confined to xeric sites
Pseudemys concinna suwanniensis	Suwannee cooter	Rept	SSC		
Stilosoma extenuatum	Short-tailed snake	Rept	T		Ranges S to uplands west of Kissimmee River
Ajaia ajaja	Roseate spoonbill	Bird	SSC		
Aphelocoma coerulescens	Florida scrub-jay	Bird	T	T	Confined to oak scrub habitat
Aramus guarauna	Limpkin	Bird	SSC		
Charadrius alexandrinus tenuirostris	Southeastern snowy plover	Bird	T		
Charadrius melodus	Piping plover	Bird	T	T	
Dendroica kirtlandii	Kirtland's warbler	Bird	E	E	Migrates through uplands along FL's coast
Egretta caerulea	Little blue heron	Bird	SSC		
Egretta rufescens	Reddish egret	Bird	SSC		
Egretta thula	Snowy egret	Bird	SSC		
Egretta tricolor	Tricolored (=Louisiana) heron	Bird	SSC		
Eudocimus albus	White ibis	Bird	SSC		
Falco peregrinus tundrius	Arctic peregrine falcon	Bird	E		Migratory
Falco sparverius paulus	Southeastern American kestrel	Bird	T		Primarily observed in sandhill or sand pine-scrub habitats.
Grus americana	Whooping crane	Bird	SSC	T(E/P)	
Grus canadensis pratensis	Florida sandhill crane	Bird	T		
Haematopus palliatus	American oystercatcher	Bird	SSC		
Haliaeetus leucocephalus	Bald eagle	Bird	T	T	
Mycteria americana	Wood stork	Bird	E	E	
Pelecanus occidentalis	Brown pelican	Bird	SSC		
Picoides borealis	Red-cockaded woodpecker	Bird	SSC	E	
Polyborus plancus audubonii	Audubon's crested caracara	Bird	T	T	
Rynchops niger	Black skimmer	Bird	SSC		
Speotyto cunicularia	Burrowing owl	Bird	SSC		Prefer open, well-drained areas, such as dry prairies, canal banks, and road berms.
Sterna antillarum	Least tern	Bird	T		
Sterna dougallii	Roseate tern	Bird	T	T	FL breeding range confined to Keys and Dry Tortugas.
Felis concolor coryi	Florida panther	Mamm	E	E	
Podomys floridanus	Florida mouse	Mamm	SSC		Restricted to xeric habitats such as interior and coastal dunes.
Sciurus niger shermani	Sherman's fox squirrel	Mamm	SSC		Optimal habitat is mature longleaf pine-turkey oak sandhills and flatwoods.
Trichechus manatus	West Indian (=Florida) manatee	Mamm	E	E	
Ursus americanus floridanus	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.

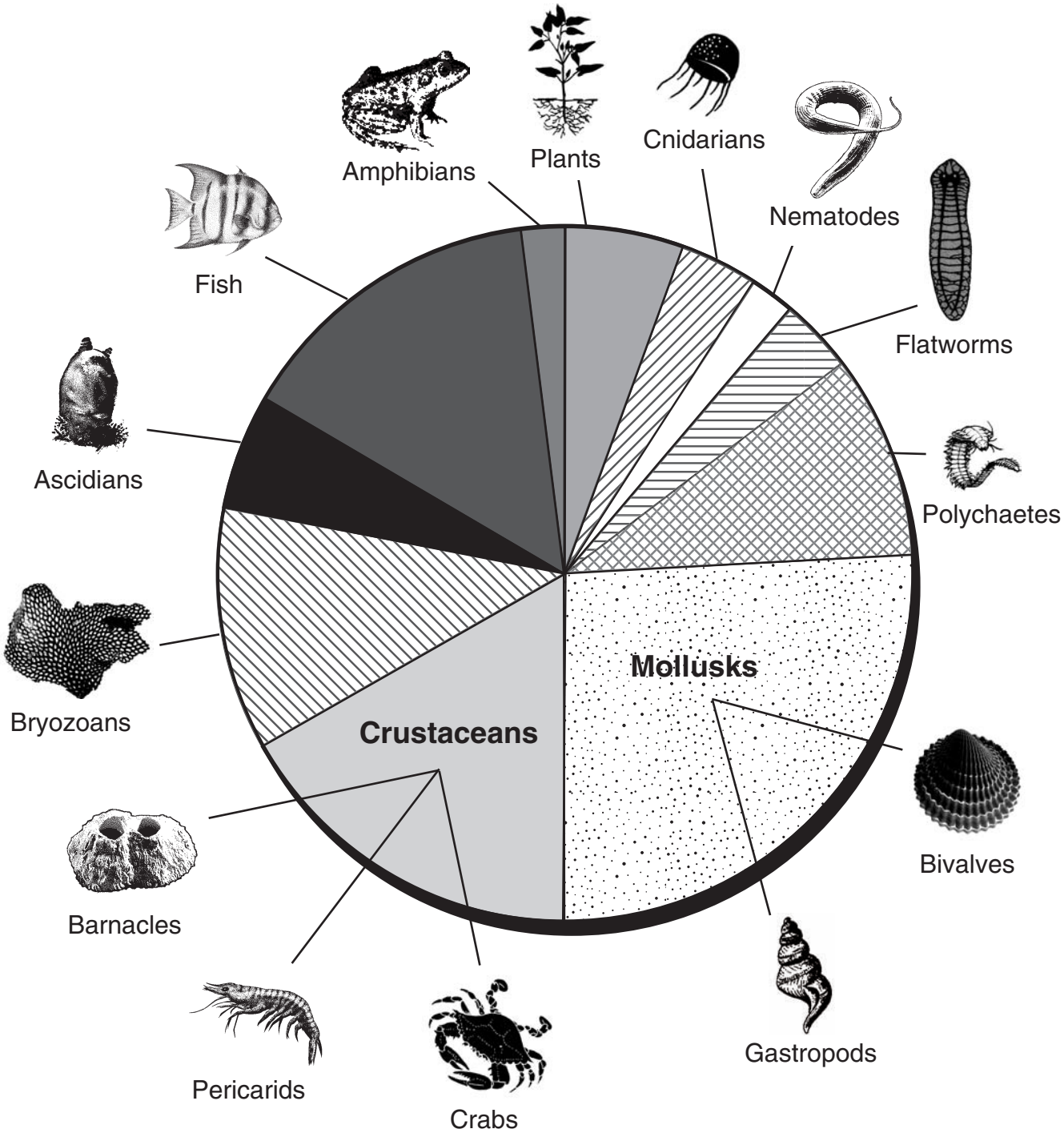
The excellent response record of the seabird rehabilitation organization Save Our Seabirds – which returned to the wild an impressive 85% of the birds rescued and treated during the 1993 spill – has been further enhanced by a comprehensive volunteer training program and the addition of a mobile hot-water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

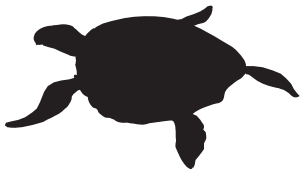
- Reducing bacterial contamination now present in the bay to levels safe for swimming and shellfish harvesting.

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.