

Surface Water Resource Protection, Enhancement and Management

WATERSHED PLANNING

Watershed management plans are developed in order to guide Pinellas County in protecting and managing environmental resources, achieving improvements in water quality, and providing flood protection when needed. Watershed management plans incorporate all aspects of the environmental condition and are not limited to simply addressing drainage issues. The diagnostic phase of watershed planning includes field surveys, flooding information, Digital Terrain Mapping technology, water quality and flow data, land use information and other available data to facilitate creation of a comprehensive plan for the management of a watershed, including the identification of required capital projects. These plans include structural and nonstructural management strategies, developed to meet goals dealing with flooding and environmental management, recreational and social opportunities, and educational components to inform citizens about the watershed, how they impact it and how they can help to protect it.

Watersheds are prioritized for the development of a watershed management plan during the annual capital improvements planning meetings. The prioritization is based on the greatest needs, including flooding problems, impaired water quality levels and other resource management issues that may arise. Information is gathered from the State on such items as TMDL issues, from the Public Works' highway and engineering sections, and from Department of Environmental Management (DEM) during the planning process to ensure that the most accurate data is being compiled for the development of a watershed management plan. Those waterbodies that do not qualify for a watershed management plan, but do experience significant flooding issues, may still be prioritized for a basin study. Belleair Creek, Bishop Creek and Mullet Creek all have completed basin studies which focus primarily on priority flooding problems.

As a Watershed Management Plan is completed and adopted by the BCC, it becomes the relied upon source of information concerning the individual watersheds. Using Geographic Information Systems (GIS)-based data, the Management Plans are detailed and have the ability to look at each project attribute separately by its parcel and location. To date, Pinellas County has completed three comprehensive watershed management plans and three basin studies, with two watershed management plans having been completed by other jurisdictions, and with two more Pinellas County plans nearing completion. It is the ultimate goal of Pinellas County to see the creation of Watershed Management Plans for each of the 52 drainage basins in the County, effectively updating, improving and replacing the original Master Drainage Plan. **Table 3**, below, displays the status of each of the Watershed Management Plans that have been completed, are under development, or are being planned, under the jurisdiction of Pinellas County.

TABLE 3

STATUS OF WATERSHED MANAGEMENT PLAN DEVELOPMENT AS OF OCTOBER 2007	
WATERSHED	STATUS OF WATERSHED MANAGEMENT PLAN
Allen's Creek	Completed, 1996.
Lake Seminole	Completed, 2001.
Lake Tarpon	Completed, 1999.
Cross Bayou Canal	Under Development. Anticipated Completion Date: late 2008
Brooker Creek	Under Development. Anticipated Completion Date: late 2008
Roosevelt Creek	Under Development. Anticipated Completion Date: mid 2008
Starkey Creek	Scheduled in the Pinellas County 2007/2008-2012/2013 Capital Improvements Program

Source: Pinellas County Department of Environmental Management, Pinellas County Capital Improvements Program, 2007.

Status of Comprehensive Watershed Management Plans - Overview

As of 2007, Allen's Creek, Lake Tarpon, Lake Seminole, Cross Bayou, Roosevelt Creek, Brooker Creek and Starkey Creek watersheds have been selected for the development of a watershed management plan, based on impaired water quality levels identified during monitoring, flooding problems, and other complex resource management and environmental issues. Allen's Creek, Lake Tarpon and Lake Seminole watershed management plans were completed first and are being used as prototypes for the development of the future watershed management plans for the County's remaining watersheds. Watershed management plans have also been developed for Alligator Creek and Stevenson's Creek. The Alligator Creek Plan was developed in a partnership between SWFWMD, Pinellas County, Clearwater and Safety Harbor, and was completed in 1997. The Stevenson's Creek plan was completed by the city of Clearwater in 2001. There are also watershed management plans under development for two sub-basins: Hollin Creek in the Anclote River watershed and the Lake Tarpon Outfall Canal in the Lake Tarpon watershed.

With the Allen's Creek Watershed Plan project, the first Management Plan to be completed, Pinellas County realized just how important public perception and public involvement is to the success of watershed planning. The County developed a strong partnership with the residents of the watershed so that all affected parties could work mutually and compatibly towards common watershed goals. The Allen's Creek task team included not only representatives from the engineering and environmental staffs of the County, the City of Clearwater and the City of Largo, but includes citizen representatives from the watershed itself. It became clear that the public, and public perception, would influence future watershed plan development. Additionally, it became apparent that flexibility in the approach to individual watersheds, and setting and attaining individual watershed goals is important.

Also as a result of the Allen's Creek Watershed Plan, the Board of County Commissioners modified its approach to watershed planning. Beginning with the Lake Seminole Watershed Plan, the County has been analyzing existing land use and developing computer models for two sets of conditions. The first will be for existing land use and channel conditions. The second will be for future land use and existing channel conditions. This will provide the flexibility to analyze various project proposals as needed.

Allen's Creek Watershed Management Plan

Background

Allen's Creek watershed, with a drainage basin of approximately 4,800 acres, is significant in that it was the first stream basin in Pinellas County for which a comprehensive surface water and ecosystem management plan was created. The Allen's Creek Watershed Management Plan was completed and adopted by the Board of County Commissioners in November of 1996 and by the city of Largo in May of 1997.

The watershed lies within three jurisdictions: Pinellas County, the City of Clearwater, and the City of Largo. Consequently, a management committee was established consisting of staff from the County Departments of Environmental Management, Public Works, the Cities of Clearwater and Largo, and a citizen representative from the watershed.

The Allen's Creek Watershed Management Plan was the first comprehensive, site specific, watershed-based surface water management plan to be completed. The plan was developed to address water quality, flooding, habitat restoration, and wildlife in a highly urbanized County watershed. As such, it represented a fully integrated management plan for the Allen's Creek drainage basin. The Watershed Management Plan was mandated by the Drainage and Conservation Elements of the Pinellas County Comprehensive Plan (1989).

The Allen's Creek Watershed Management Plan was a prototype surface water/ecosystem management plan that was intended to be used as a model for similar initiatives in urban watersheds throughout the County, and was followed by management plans for both Lake Tarpon and Lake Seminole in later years. The plan took a unique approach to setting goals for the restoration of water quality, as well as wetland and wildlife habitat in the watershed. For example, biological targets were created and used to provide benchmarks which evaluated the success of restoration efforts in the watershed.

Concerns

A consultant study conducted in 1981 identified flooding problems in the Allen's Creek watershed and recommended structural improvements aimed at reducing flood elevations. This study did not include a water quality element and did not assess water quality conditions or recommend any related mitigative measures. Similarly, the study did not address ecological impacts that may result from proposed structural improvements. Due to development in the headwater areas of the Creek, the Master Drainage Plan recommended numerous improvements including provisions for detention ponds.

A diagnostic study of Allen's Creek was conducted from 1987 through 1989. The study was very extensive, including water quality monitoring at 24 stations, sediment size and chemistry investigations, and flora/fauna field surveys. The study found that the watershed was deficient

in wetland and upland habitat, and that most segments of the tidal creek were impaired in terms of water quality. Non-point discharge in the form of urban runoff and septic tank seepage was suspected to be the major source of pollution in the Creek.

The problems being experienced in the Creek were largely attributable to the degree of urbanization and the surrounding land cover, which has only increased over time. Alteration of upland and wetland areas and increased paved or impervious surfaces which accompany urbanization, had contributed to the impaired capability of these ecosystems to function effectively. Continued redevelopment within the watershed has continued to have a negative impact on the watershed and the water quality of the creek. The lack of natural habitat is believed to be one of the reasons why water quality has been suffering in the watershed despite completed watershed management projects. While former projects focused mainly on flood control issues, the County realized that the restoration of natural habitats may be the key to water quality improvement and may also assist with the improved water quality of Old Tampa Bay, both of which were addressed with the development of the watershed management plan.

Status

Some of the types of projects already implemented in the watershed include: (1) Restoration of an old maple swamp off Lakeview Road, (2) Exotic plant control in Channel 1 around the Belcher Road bridge and on an island east of St Paul's Episcopal School, (3) Storm drain marking by community volunteers throughout the watershed, (4) Habitat landscaping projects, (5) Dry pond enhancement demonstration project at the fire station near the corner of Belcher Road and East Bay Drive, (6) Oligohaline habitat restoration project at the corner of Belleair and St Paul's Drive, and (7) the transitional habitat demonstration project in coordination with the School Board at Belcher Elementary School.

The County, in conjunction with the Cities of Clearwater and Largo has completed a site restoration project along the shores of Allen's creek, planting native vegetation on the shorelines for stabilization, removing exotic species and creating stormwater ponds for water treatment. The City of Largo has also supplied sanitary sewer treatment to over 200 additional properties within their service areas. There are hundreds of septic tanks remaining in the watershed, mainly within the Clearwater service area. Despite all of these efforts, Allen's Creek has seen little improvement in water quality in recent years. According to the Ambient Surface Water Quality Monitoring Report, water quality in the watershed has not improved over the 12-year monitoring period of 19994-2002, or for the 2003-2004 reporting period. Additional projects are being planned for the watershed, by the County, and the Cities of Clearwater and Largo, in hopes that additional effort will improve the water quality in the near future. Wildlife surveys have not been conducted in the watershed since 2000, and are not planned for several more years out in order to allow the restoration sites to mature and wildlife to thrive there. This watershed will continue to be monitored and the watershed management plan will continue to be revised to include new projects in order to improve the water quality of the watershed and the surrounding surface waters as a whole.

Lake Tarpon Watershed Management Plan

Background

Lake Tarpon is located in north central Pinellas County and is the largest of the County's lakes with a surface area of approximately 4 square miles. The lake is utilized both commercially and recreationally for activities ranging from walking on the nature trail to fishing and power boating. Pinellas County has purchased over 2,050 acres in the watershed and designated the land as preservation and preservation-resource management on the Pinellas County Future Land Use Map.

The watershed of Lake Tarpon is approximately 60 square miles in size and consists of three drainage basins stretching primarily eastward into Hillsborough County. The largest of these basins is Brooker Creek which covers approximately 40 square miles and consists of large expanses of undeveloped land including the Brooker Creek Preserve. With relatively little development, this drainage basin's cypress swamps, and upland areas provide important aquifer recharge functions for local county wellfields. The basin surrounding the lake is approximately 9 square miles and consists of primarily urbanized land. The South Creek drainage basin is the smallest of the three basins covering an area of 3.3 square miles.



View of Lake Tarpon

Lake Tarpon had long been known for its excellent water quality and abundant recreational potential. Studies conducted by the U.S. Environmental Protection Agency in 1973 found that Lake Tarpon ranked high in terms of water quality when compared with other lakes in the State; however, increased development pressures began affecting the northern parts of the County in the 1980s. Despite public acquisition of parkland, intensive recreational uses on the lake itself began to take a toll on the water quality and natural conditions of Lake Tarpon.

Despite efforts to reduce direct impacts to the lake through structurally engineered controls, exotic plant removal, and restrictions on water related recreational activities, water quality continued to decline. The sources of water quality problems were much broader in scope than the boundaries of the lake itself. The Brooker Creek inflow, for instance, was identified as a primary contributor of pollutants to Lake Tarpon. It became clear that any effort to improve the water quality of Lake Tarpon must involve the drainage basins that contribute significant amounts of surface water to the lake.

Concerns

Urban stormwater runoff from the surrounding drainage basins is a major concern in managing the watershed. The runoff is frequently laden with chemicals and nutrients from yards and streets. Rainfall washes these pollutants from the land to surrounding waterbodies such as creeks and streams. Many of these tributaries eventually discharge into Lake Tarpon, contributing significantly to a general degradation of water quality.

The extent of this degradation became apparent in the summer of 1987 when a major algal bloom composed of blue-green algae (*Anabeana circinalis*), indicative of eutrophic conditions, covered almost 80 percent of the lake. The resultant fish kills and citizen reports of noxious odors and health concerns prompted the Pinellas County Board of County Commissioners to pass a resolution creating the Lake Tarpon Management Committee (LTMC).



View of Lake Tarpon near Chesnut Park

The LTMC, consisting of state, regional and local agencies and citizen representatives, studied the problem and worked on developing a management plan for Lake Tarpon. The Pinellas County Board of County Commissioners requested that the Southwest Florida Water Management District (SWFWMD) make Lake Tarpon a Surface Water Improvement and Management (SWIM) priority waterbody. Funding was approved and a long range SWIM plan for Lake Tarpon was completed by the LTMC in May, 1989.

Funding from the SWFWMD was used to implement the first stage of the Lake Tarpon SWIM Plan, which involved a diagnostic study of the Lake Tarpon watershed. The diagnostic study identified areas that were potentially significant contributors of stormwater pollutant loads. Many of these areas were developed prior to stormwater treatment regulations and did not meet the stringent stormwater standards for new development set by current local, state, and federal regulations. The final report, prepared by a local consulting firm, recommended certain management actions including retrofitting of substandard stormwater facilities.

The diagnostic phase of the project included the development and calibration of a linked watershed/waterbody model that could be used to evaluate the effects of various activities and management alternatives on Lake Tarpon's water quality. The Pinellas County Department of Environmental Management utilizes the Lake Tarpon Management Model to evaluate various alternatives proposed by the Lake Tarpon Management Committee.

The watershed/waterbody model has enabled County staff and consultants to assess the impacts of development in Lake Tarpon's contributing watersheds on the lake itself. The Pinellas County Department of Environmental Management has incorporated findings from its monthly water quality monitoring program and watershed ecosystem model in a comprehensive watershed management plan for Lake Tarpon and its three contributing drainage basins. The recommendations based on these findings, combined with the ongoing public education program established by the Lake Tarpon SWIM Plan, formed the basis of the Lake Tarpon Watershed Management Plan, which was adopted by the BCC in 1999.

Status

In 2006, Pinellas County Department of Environmental Management released the Lake Tarpon Drainage Basin Management Plan Update. This report highlighted some of progress made in the Lake Tarpon Watershed over the course of the previous eight years.

The water quality of Lake Tarpon has shown modest improvement since the adoption of the Watershed Management Plan, but is not improving at the rate expected. This is due in part to the nutrient-rich runoff from surrounding residential developments. Many of the residents here are using fertilizers on their lawns, which is being flushed into the Lake when it rains which continues to be a concern for the viability of the Lake. There are currently three projects in the CIP list designed to improve water quality and reduce nutrient loading to the Lake, as outlined in the Watershed Management Plan. These three projects, alum injection facilities, are expected to decrease nutrient loading to the Lake. One project is in the design phase now, with construction scheduled for 2008. The other two are scheduled to go into construction in 2009. In terms of native vegetation, hydrilla coverage in the Lake is still under the ideal goal for acreage coverage, but is within the target range. Other native vegetation in the Lake, such as coontail, was present but not quantified in the survey, while cattails were at a desirable level. The results of 2003-2005 Ambient Monitoring Report found that Lake Tarpon did not meet several state standards for water quality. The sport fish populations are in good shape compared with their condition when the Management Plan was first adopted. The lone exception is the black crappie, which has seen poor recruitment and is currently the topic of research by several universities.

In 2007, the BCC authorized SWFWMD to develop an updated modeling system for the Lake Tarpon watershed, effectively updating the existing Watershed Management Plan by 2009. This updated modeling system will ensure that all development that has occurred within the watershed is being captured and taken into account in the implementation of projects and other improvements within the watershed. There are also some discussions taking place about creating a Lake Tarpon Watershed Management Area, creating a formal planning and management area for the watershed, with better coordination and consolidation of decision-making within the area. Specific policies could be crafted to guide land use decisions and other activities that take place within the watershed. With such a plan, the water quality of the watershed and the lake could continue to improve with more stringent environmental protections designed specifically for this watershed.

Lake Seminole Watershed Management Plan

Background

Lake Seminole is located in southwest Pinellas County, and at 648 acres in size, is the County's second largest lake after Lake Tarpon. Lake Seminole is used for a variety of recreational uses including, fishing, waterskiing, and jet skiing. Lake Seminole Park located on the lake's southeastern shore covers approximately 255 acres and provides many amenities such as nature and bicycle trails, picnic areas, a lakeside boardwalk, and boat launching facilities. Lake Seminole also supports extensive populations of fish and wildlife. Surveys of the lake have found various mammals and reptiles, and more than 120 species of birds.

A bypass canal was constructed in the 1970's to drain runoff from the areas north and east of the lake directly into Long Bayou. The primary external water source to the lake is rain water. The runoff from rain events drain through several large conveyance systems



View of Lake Seminole

and enter the lake on the west side of the lake. These drainage ways have been improved by the County and few structural improvements were anticipated by the Master Drainage Plan.

In January 1989, after receiving numerous complaints regarding the declining water quality of the lake, the Pinellas County Board of County Commissioners passed a resolution to initiate a study of Lake Seminole. The County initiated a cooperative effort to conduct a feasibility study for Lake Seminole which included participation by the Southwest Florida Water Management District, the Florida Department of Natural Resources, the Florida Game and Freshwater Fish Commission, the Cities of Largo and Seminole, the University of Florida, and the University of South Florida.

Study participants and citizen representatives formed the Lake Seminole Advisory Committee at the onset of the diagnostic study in 1989. This body was designed to allow for exchange of information and public participation. The Lake Seminole Diagnostic Feasibility Study, in addition to Committee input and a water quality computer model for the Lake formed the foundation of the Lake Seminole Watershed Management Plan.

Completed in 2001, the Lake Seminole Watershed Management Plan is similar in scope to the Lake Tarpon Drainage Basin Plan. The Lake Seminole Watershed Management Plan addresses the stormwater runoff issue in Lake Seminole and its impact on water quality, habitat, and recreational opportunities.

Concerns

The Lake Seminole Diagnostic Feasibility Study was completed in 1991, and revealed that the lake had elevated nutrient concentrations, resulting in the hypereutrophic designation. The study attributed the declining water quality of the lake to over 131 stormwater pipes that discharged into the waterbody. These stormwater pipes, most of which were constructed prior to any kind of stormwater regulations, collected runoff from the highly urbanized Lake Seminole watershed and dispensed fertilizer laden water into the Lake Seminole aquatic ecosystem.



Aerial View of Lake Seminole

The County, recognizing that certain actions would show immediate improvements and lasting benefits to water quality, was anxious to identify and undertake Immediate Action Projects (IAPs). Several IAPs had been completed by the Department of Environmental Management mainly revolving around aquatic vegetation management initiatives. These projects include the construction of an adjustable water level control structure, the designing and construction of a new retention pond, the refurbishment of an existing stormwater pond, cattail harvesting, and two aquatic habitat restoration projects.

Status

Pinellas County completed an aquatic habitat restoration project in the spring of 2002 and 2006. The 2006 restoration project covered nearly 3500 feet of shoreline and including the scraping of peat-like sediments, cattails, and other invasive plants from the eastern shoreline. The area was re-vegetated with native aquatic plants in the spring of 2007. In 2006, Pinellas County also restored the southern shoreline along Park Boulevard. A partnership with the City of Seminole allowed for the removal of multiple invasive species and restoration of the bank. The spring of 2008 will also include the start of construction for the Phase I Storm Water Improvement Project, which includes the construction of four treatment facilities to treat stormwater entering the lake. Lake Seminole has a long way to go in its recovery, but with continued commitment from the County, the Cities of Largo and Seminole, and the community it is well on its way to a new beginning. The results of the 2003-2005 Ambient Monitoring Report found that Lake Seminole did not meet several state standards for water quality, during the monitoring period, further emphasizing the need for additional monitoring and improvement projects within the watershed.

To address Total Maximum Daily Load (TMDL) issues within the Lake Seminole Watershed, Pinellas County also developed a Reasonable Assurance Plan for Lake Seminole in 2007, outlining additional steps that can be taken to improve water quality in the lake. Among the suggestions of the plan, is the recommendation to establish a Lake Seminole Watershed Management Area, in conjunction with the cities of Largo and Seminole. With this designation, the watershed would become a formal planning and management area, with better coordination and a consolidation of decision-making within the area. Specific policies could be crafted to guide land use decisions and other activities that take place within the watershed. With such a plan, the water quality of the watershed and the lake could continue to improve with more stringent environmental protections designed specifically for this watershed.

Cross Bayou Canal Watershed

Background

Located in central Pinellas County, the Cross Bayou Canal Watershed encompasses approximately 7,697 acres and is bisected by the 10.5 mile long Cross Bayou Canal. This Canal connects to both Old Tampa Bay and Boca Ciega Bay on its northeastern and southwestern ends, respectively. The water from the Cross Bayou Canal can flow in either direction, depending upon tidal conditions, but normally water from the northern and southern halves do not mix.

The Cross Bayou Canal was created in the early 1900's to provide drainage and transportation for those living in the area now roughly defined as Pinellas Park and Largo. This area was not suitable for farming because of Lake Largo and the surrounding swampland. The Canal was so successful in draining the area that it completely drained Lake Largo and provided dry land for agricultural uses. This dry land became a haven for settlers, and over the last century, has seen a dramatic increase in development, including a large industrial area, which has had a negative impact on the quality of the water in Cross Bayou Canal. The Cross



Cross Bayou Canal

Bayou Canal Watershed consists of highly developed land in Largo, Pinellas Park and in unincorporated Pinellas County. Surface water runoff has contributed greatly to the degradation of water quality on this canal and Pinellas County began receiving complaints regarding the increasing problem.

Concerns

Since 1991, water quality samples have been collected at three fixed sites on the Cross Bayou Canal as part of the County's monthly water quality monitoring program. Cross Bayou Canal has poor water quality relative to other water bodies in Pinellas County. A significant number of the monthly surface water quality samples collected from this canal have exceeded state water quality standards and reference water quality values developed for the State by the Florida Department of Environmental Protection.

Status

A diagnostic feasibility study and the development of a watershed management plan for the Cross Bayou watershed began in September 2003. The study should be complete in mid 2008 at the earliest. The management plan will be used as a tool in the planning, regulation, and management of Cross Bayou for future development and as a basis for determining and prioritizing capital improvements. This objective will be met in part, by conducting an analysis of the watershed to characterize the existing conditions and recommend improvements for flood protection, natural systems, habitat, water quality, erosion control, public awareness and involvement, and regulatory control. To help with public awareness and involvement, a website has been developed for posting public announcements, meeting minutes, and providing access to project information.

Brooker Creek Watershed

Background

The Brooker Creek Watershed occupies an area of approximately 40 square miles within Pinellas, Hillsborough and Pasco counties, and is significant because it is the last natural system in Pinellas County. The hydrology within this watershed has been greatly altered due to development in the surrounding areas, even though the watershed itself is only about 17% developed. A large portion of the watershed consists of the Brooker Creek Preserve. The Preserve, which encompasses portions of six hydrologic basins, has been established by the Pinellas County Board of County Commissioners to preserve Florida's native flora and fauna. While a Management Plan has been created to guide any development within the Preserve, Pinellas County has been working with SWFWMD in order to create a Watershed Management Plan for the entire watershed.



The Watershed Management Plan will be able to define the effects of potential restoration projects and best management practices within the uneven pattern of developed areas and publicly owned lands, in a watershed where very little of the land is privately owned, and even less is developed. This Plan will be especially important because this watershed is part of the

Pinellas County Wellhead Protection Area and is subject to development restrictions. The Plan will also focus heavily on aquifer recharge and water conservation in the area.

Concerns

One of the greatest concerns surrounding the Brooker Creek Watershed is the pace of development within it. Being part of the Wellhead Protection Area, Brooker Creek Watershed provides a vital source of freshwater to the residents in Pinellas, Hillsborough and Pasco counties. The soils in the watershed are generally sandy, allowing water to quickly pass from the surface to the aquifer, but do not thoroughly filter pollutants from the water. Nitrogen and bacteria are easily able to pass through the ground and into the aquifer, and becoming more of an issue as development brings more of these two pollutants into the watershed.



Wildlife within the Brooker Creek Watershed

Status

In 2004, Pinellas County entered into an agreement with the Southwest Florida Water Management District (SWFWMD) to develop a watershed management program for the Brooker Creek Watershed. This project will include five major elements: Digital Topographic Information, Watershed Evaluation, a Watershed Management Plan, the Implementation of Best Management Practices (BMPs), and the Maintenance of Watershed Parameters and Models. The Watershed Management Plan will include a floodplain analysis and delineation, level of service determination, surface water resource assessment, and BMP alternative analysis. At this time, the Brooker Creek Watershed Management Plan is still under development. SWFWMD estimates that the Plan will be completed and ready for implementation in late 2007, with the goal of identifying restoration projects and best management practices (BMPs) to improve water quality and flood protection within the watershed.

Roosevelt Creek Watershed

Background

Roosevelt Creek Watershed is located in the Gateway area of Pinellas County and outfalls directly to Tampa Bay. The watershed occupies approximately 13 square miles in cities of Largo, Pinellas Park, and St. Petersburg and in unincorporated Pinellas County, 5 square miles of which are tidal marsh or drain to tidal marshes along Old Tampa Bay. This area has a variety of land uses, including residential and commercial areas along Roosevelt Blvd., and heavy industrial areas such as the Pinellas County solid waste facility and the St. Petersburg/Clearwater International Airport. The watershed has recently been the site of rapid development along the Gandy Blvd., I-275, Ulmerton Rd., and Roosevelt Blvd. corridors. Because of this rapid development and heavy industrial land uses, Roosevelt Creek has experienced problems with water quality over the years. This watershed is also where much of the County's light industrial lands are located. Because of this, significant redevelopment is anticipated within the watershed boundaries in the coming years, creating opportunities for improved stormwater treatment.

Concerns

Heavy development activity and years of heavy industrial uses within the Roosevelt Creek watershed have led to problems with water quality. Runoff from commercial, residential and industrial properties has created water quality issues in the creek, where waters outfall directly into Tampa Bay. The development of the Watershed Management Plan may help to improve water quality not only in Roosevelt Creek, but also in Tampa Bay where the polluted water flows to.

Status

In 2003, Pinellas County began a partnership with SWFWMD to develop a Watershed Management Plan for Roosevelt Creek. The project would produce digital topographic information on the watershed, create a watershed evaluation to determine the conditions within the watershed, and develop a watershed management plan to guide future decision making related to the watershed. The development of the Roosevelt Creek Watershed Management Plan is anticipated to reach completion in mid 2008.

WATER QUALITY/HABITAT PROTECTION AND RESTORATION

The County also implements projects directed at habitat restoration and enhancement associated with the overall surface water system. While these types of projects would typically be identified in an overall watershed plan, it will take years for all of the watersheds to be re-evaluated and for the new plans to be in place. Therefore, when the opportunities and funding are available, the County implements these types of projects to complement the overall watershed planning goals.

Even though Pinellas County is highly urbanized, the County, including the municipalities, have made great strides since the 1970s in acquiring, preserving and restoring large tracts of land previously threatened by development. Where lands cannot be acquired, however, the County recognizes that an opportunity exists, through public education, to effect significant individual contributions to habitat restoration and protection, and to foster compatibility between wildlife and humans in the urban setting.

Below is a description of the current monitoring efforts surface water conditions in Pinellas County, including an inventory of known point-source discharges into surface waters and a brief summary of the pollutants of concern. By understanding where the pollutants are coming from, Pinellas County will be better able to improve the quality of the surface waters in the County and enhance and restore the plant and wildlife diversity of the various watersheds.

Surface Water Quality Monitoring

Neither the State nor the Southwest Florida Water Management District (SWFWMD) conducts routine ambient surface water monitoring in Pinellas County. Prior to 1990, ambient surface water monitoring in Pinellas County was limited and sporadic. However, the Hillsborough County Environmental Protection Commission has been monitoring throughout Tampa Bay, including eight stations in Pinellas County, since 1972. The City of St. Petersburg monitored extensively from 1973 through 1982, and the City of Clearwater monitored sites within its corporate limits from 1973 through 1989, and is monitoring today.

In 1990, directed by its recently adopted Comprehensive Plan, Pinellas County initiated a comprehensive water quality monitoring program. As of 2006, the Water Resources Section of the Pinellas County Department of Environmental Management (PCDEM) manages the only comprehensive ambient surface water monitoring program in Pinellas County and in 2006, monitored 684 sites in Gulf coast waters from the Anclote River to Ft. DeSoto, in Tampa Bay from Oldsmar to Pinellas Point and in Lake Tarpon and Lake Seminole. PCDEM also monitors approximately 50 sites in creeks and streams, covering many of the watersheds in the County, with the exception of those located within the City of St. Petersburg. Pinellas County is currently working on developing an interlocal agreement with St. Petersburg in order to begin monitoring within City limits. Operating consistent with its DEP-approved Quality Assurance (QA) Plan, data is analyzed at the County's Utilities Laboratory located on Ridge Rd. in Largo. As has been required by the State since 1982, and to facilitate data sharing among local, regional, State and federal agencies and governments, the Department of Environmental Management enters all of its water quality data into the STORET database, and provides its data to DEP for inclusion in their 305(b) Reports.



Water Quality Monitoring in Pinellas County

In 2003, Pinellas County re-designed its ambient water quality monitoring program, with a focus on providing long-term assessments of water quality, measuring the success of management programs, meeting National Pollutant Discharge Elimination System (NPDES) permit requirements, supporting local efforts to maintain or improve water quality, determining the status and trends of water quality, and estimating the nutrient and sediment loads from selected streams and drainage ditches. This new program also provides better geographical coverage of County waters and provides more statistically defensible results compared to the original (1991-2002) program. Most of the County's 30 upland drainage basins covered by its NPDES permit contain at least one fixed sample site just upstream of the freshwater/saltwater mixing zone within streams and drainage systems. At sites in 20 of the basins, water quality and flow data are collected. Data from these sites are used to estimate nutrient and sediment loads to receiving water bodies. Additional monitoring sites include Alligator Lake and Lake Chautauqua and estuarine sites within the Cross Bayou Canal, Allen's Creek, and Long Branch Creek. In total, 45 of the County's 52 drainage basins have been monitored by PCDEM since 1990, with additional sites being located in the bays and lakes serving as ultimate receiving waters where longer term trends are being measured.

Monitoring parameters include total suspended solids, ammonia, nitrate+nitrite, total Kjeldahl Nitrogen, total and ortho-phosphorus, chlorophyll, turbidity, temperature, conductivity, dissolved oxygen, pH, fecal coliforms, Enterococci, Biochemical Oxygen Demand, and flow.

PCDEM has designed the station network to characterize the relative priority of each receiving water for the development of management plans, to identify those tributaries contributing the greatest amount of pollutants, and to provide a baseline for activities on receiving waters and water quality.

The Water Resources Division of PCDEM also publishes an annual ambient surface water monitoring report which summarizes monitoring results and current conditions for that data year. The Department of Environmental Management has recently completed the Ambient Monitoring Program Annual Report 2003-2006 (available from the Pinellas County Department of Environmental Management at www.pinellascounty.org/environment), which provides an assessment of general water quality conditions and trends at each of the surface water monitoring sites. The information from these reports is used to determine sites that may have continued impairments, identify new impairments, distinguish water quality trends between inland and open water sites, to compare quality trends over a period of time, and to look at seasonal differences. Results from the 2003-2005 Report suggest that water quality is typically better during the dry season compared to the wet season, water quality is better in open water areas compared to semi-enclosed areas, approximately 38% of land sites (streams, creeks, canals) did not meet State water quality standards for one or more parameters, Lake Seminole and Lake Tarpon did not meet water quality standards for five parameters, and land sites with the lowest flow were typically associated with the lowest nitrogen loadings.

The Water Resources Division also coordinates closely with the monitoring efforts of the Florida Department of Environmental Protection (DEP), the United States Geological Survey (USGS), the Environmental Protection Agency (EPA), Pinellas County Utilities, and Pinellas County Solid Waste Operations. The information collected and analyzed by the Water Resources Division has become an integral component of the County's surface water management planning and watershed ranking efforts.

Pinellas County began a program of seagrass monitoring in 1998 to ensure the vitality of our marine environment was not being compromised. This monitoring program looks at a variety of aspects of seagrasses, including the measurement of the types and densities of seagrass beds, water depth where the beds are located and the surrounding water quality. As of 2003, the annual monitoring program has show stable seagrass population and densities in Clearwater Harbor/St. Joseph Sound and Boca Ciega Bay areas. That the seagrasses have not been declining in vitality and in quality, is a positive sign that our surface water quality is not further degrading our seagrass populations, and negatively impacting our vital marine environment. For more information on seagrass protection, see the [Natural Resource Conservation and Management Element](#).

Pinellas County has also developed the Water Atlas, in conjunction with the University of South Florida, the Tampa Bay Estuary Program (TBEP) and other partners, to provide one place for information for both citizens and scientists. The Water Atlas receives information and data from a number of sources, including SWFWMD, DEP and USGS. This data was formerly available from a number of agencies, making it difficult for anyone to track down all of the information they were looking for. With the creation of the Water Atlas, water quality data is now compiled into one location for all interested parties to view as they need it.

Future Monitoring of Tampa Bay

As mentioned above, most studies on toxics in the Tampa Bay area to date have concentrated on specific media (sediments, air) or specific geographic areas. Efforts are now being oriented toward identifying responsible sources and further clarifying their relative impacts on the bay.



***Water Quality Monitoring
at a Pond in Pinellas County***

In 1996, Pinellas County Environmental Management began sampling for benthic macroinvertebrates in Boca Ciega Bay and lower Tampa Bay as part of another TBEP collaborative bay-wide monitoring effort to assess sediment quality. This program is patterned after US Environmental Protection Agency's (EPA) Environmental Monitoring and Assessment Program (EMAP), which includes sediment grain-size analysis, sediment toxicity, water chemistry, water clarity, and benthic macroinvertebrates. Station locations are assigned using a random design based on EMAP protocols. In addition, special study areas are often included in the program. These areas are added to provide data on areas

where benthic communities are significantly stressed. Special study areas have included Bayboro Harbor, the Bayside Bridge, and Riviera Bay. Sampling takes place each year in August and September. In 2005, the Pinellas County Department of Environmental Management began providing statistical analysis of monitoring data collected from all areas of the Bay. This program focuses more on the health and diversity of habitats within Tampa Bay, instead of focusing on compliance with strict standards for water quality.

The Florida Fish and Wildlife Research Institute's Fisheries Independent Monitoring program (FIM) is responsible for the monitoring of fish species within the Bay. Random sampling methods are conducted monthly to determine abundance and distribution of both adult and juvenile species, and to inspect for lesions and mercury levels. Every month, 200 samples are taken at random locations instead of at fixed monitoring sites. Every year, approximately \$600,000 is allocated to the Tampa Bay area for fishery monitoring, with funding coming from state saltwater fishing license revenues and supplemental federal and local funds.

Monitoring Associated with National Pollutant Discharge Elimination System (NPDES) Program

The Pinellas County Department of Environmental Management (PCDEM) has conducted surface water quality monitoring since 1990. The 1990-2002 monitoring program was designed to collect monthly surface water quality data at a series of fixed stations in County streams, creeks, lakes and marine waters. In addition, yearly dry and wet weather samplings were conducted to spot potential illicit discharges from residential and industrial areas. A characterization study was completed in 1993 in conjunction with the Part II NPDES application to obtain better loading estimates.

In 2002, in response to the growing NPDES and Total Maximum Daily Loads needs, Pinellas County and its co-permittees entered into an Interlocal agreement to re-design and share the costs of the Ambient Water Quality Monitoring Program. The new program is a three-tiered monitoring approach consisting of a probabilistic monitoring design for open water bodies and a fixed site design for stream sites. In addition, data collection is ongoing at multiple locations

to determine BMP efficiency and develop new Event Mean Concentrations. This new program is designed to provide statistically valid and defensible results and to fill gaps in geographic coverage. For more information on the NPDES and TMDL programs, please see the 'Regulatory Influences on the Surface Water Management Program' section of this Element.

U.S. EPA Great Waters Program and the Bay Regional Air Chemistry Experiment

In the 1990's, TBEP received a number of grants from the Environmental Protection Agency's Great Waters Program to conduct an atmospheric deposition monitoring program in Tampa Bay, at a site located at the eastern end of the Gandy Bridge. Pinellas County Air Quality employees assisted with this program, and a number of other local municipalities were also involved. While funding for this program ended in 2000, the program continued as the Bay Regional Air Chemistry Experiment (BRACE), funded by FDEP and Tampa Electric Company. BRACE ended in early 2007 and results are expected late in 2007.

SUMMARY OF SURFACE WATER CONDITIONS

According to the Ambient Monitoring Report 2003-2006, prepared by the Pinellas County Department of Environmental Management, water quality along the east coast of the County generally improves from north to south, with the best conditions in the coastal waters of southern St. Petersburg and poorer conditions from Weedon Island northward to Safety Harbor. Water quality along the west coast is relatively poor in the mid-county regions from Gulfport northward to Clearwater compared to the good water quality conditions observed both north and south of this region. The County's coastal water quality is better in open water areas compared to enclosed or semi-enclosed areas. Major drainage features in Pinellas County can be found on **Figure 2**.

Overall, it appears that water quality improvement will continue to result from comprehensive approaches to watershed planning and surface water management. From the individualized diagnostic studies that can now be carried out because of the County's monitoring program, to the utilization of the monitoring results as a variable in the County's watershed and waterbody ranking and prioritization model, to the conduct of the actual management plan, and finally to the implementation of both early action plans and large scale projects, it is clear that surface water programs in Pinellas County are making a difference. It is also clear that improvements will be mostly incremental, without dramatic or immediate results, and will be largely attributable to a wide range of management activities. The opportunities presented by redevelopment may also be a significant contributor to the improvement of surface water quality in Pinellas County. Redevelopment allows the County to re-examine surface water management requirements for individual parcels, and consider changing stormwater control and treatment methods for those parcels that are redeveloping. This allows the County to improve overall surface water quality as much of the County is facing redevelopment in light of the built-out nature of this urban area. Also, it is important to recognize that the County's commitment to water quality improvement represents just one component of its broader commitment to the improvement or restoration of not only the chemical, but also the physical and biological parameters of overall surface water system function. Water quality improvement is truly a long term project.

SPECIAL WATER CLASSIFICATIONS IN PINELLAS COUNTY

All of Pinellas County's coastal waters are classified as Outstanding Florida Waters (OFWs) according to Ch. 62-302, F.A.C., and are considered to be waters of exceptional recreational and/or ecological significance. These waters are afforded the highest level of protection by this designation. For the purposes of surface water regulation this means that no new direct surface water discharges are allowed to the OFW unless ambient water quality is maintained, and indirect discharges must not significantly degrade water quality. Pinellas County's waters are also considered to be an Aquatic Preserve. This designation was established under the Florida Aquatic Preserves Act of 1975 (Chapter 258, F.S.). The purpose of the designation is to set aside areas that have exceptional biological, aesthetic, and scientific value for the benefit of future generations. To achieve this goal, the designated submerged lands and associated waters are to be maintained in their natural or existing condition, or restored.

In the late 1990's, the Pinellas County Aquatic Preserve became the first waterbody in the State to receive the special designation of Urban Aquatic Preserve by the Florida Legislature. This designation recognizes the reality of the level of development in the County, the degree of development which occurred prior to surface water regulation, the multi-jurisdictional influences on water quality conditions, and sets more realistic guidelines for surface water discharge and surrounding water quality conditions in Pinellas County. For a map of the Pinellas County and Boca Ciega Aquatic Preserves, please see the Natural Resource Conservation and Management Element.

FIGURE 2
MAJOR DRAINAGE FEATURES IN PINELLAS COUNTY

ESTUARINE CONDITIONS AND POTENTIAL FOR CONSERVATION

Estuaries are areas where fresh and salt water mix, creating a dynamic environment of fluctuating salinities. It is this interaction of freshwater and saltwater that makes estuaries one of the most productive ecological systems in the world. The degree of dilution of sea water is dependent upon such factors as the time of year, the amount of water circulation, and human-induced alterations to the freshwater flow regime. Because of its value, Pinellas County must try to balance the consequences of urban development and nonpoint source pollution with the desire to protect, preserve and restore its productive estuarine systems.

Identification of Nonpoint Estuarine Water Pollutant Sources: Known **Nonpoint Sources** of Pollution to Estuarine Waters

Many pollutants enter surface waters as fine grained particulates, or total suspended solids (TSS), and other contaminants in stormwater runoff. Suspended solids are known to reduce water clarity and can contribute to seagrass decline. Toxic contaminants can also be found in stormwater runoff (see the Toxic Contamination section for additional information). Some common non-point source constituents include fertilizers, pesticides, oils, as well as toxics like zinc, mercury, lead and chromium. **Figure 3** depicts nitrogen load sources to Tampa Bay, much of which is contributed by non-point sources. In the urban landscape, while stormwater treatment associated with conventional wetland detention and retention systems is highly effective for the removal of sediments from runoff, they are not as effective in reducing nitrogen levels. While Pinellas County does not have many agricultural lands, residential lands and golf courses still contribute to the nitrogen load via fertilizer applications and related landscape practices. The development of a fertilizer ordinance for both residential and commercial properties is one way Pinellas County can to curb non-point source discharges into the surface waters of the County.

Estuarine and Marine Water Quality

In older developed areas of Pinellas County, most nonpoint source pollution continues to result from urban runoff, which is discharged primarily during, and shortly after, rain events. Water and sediment quality in Tampa Bay and surrounding coastal waters are impacted by nutrients, and potentially toxic contaminants carried in this runoff. Recent studies indicate that atmospheric deposition is also a contributor to the contaminant load of our surrounding waters.

The degree to which atmospheric deposition contributes to the urban runoff load is currently being studied by the Tampa Bay Estuary Program (TBEP) and participating governments. Studies have determined that the atmosphere can contribute dust, nutrients, and heavy metals, to stormwater runoff during rainfall events, as well as dryfall. According to TBEP's *Charting the Course, the Comprehensive Conservation and Management Plan for Tampa Bay, 2006*, it is estimated that approximately 21 percent of the nitrogen in Tampa Bay is deposited directly by rainfall. According to the U.S. EPA, approximately 10-40% of the nitrogen that reaches Gulf Coast estuaries such as Tampa Bay, is transported and deposited there via the atmosphere. While atmospheric deposition does not contribute to a majority of the nitrogen loadings in Tampa Bay, its impact does significantly contribute to water quality issues and should continue to be addressed so as to improve the water quality of the Bay to the greatest extent possible.

According to TBEP, one common atmospheric contaminant locally is nitrogen oxide, most closely linked to power plant and vehicle emissions. Additionally, toxic substances such as cadmium, copper, lead and zinc also contribute to air, and subsequently, water pollution in the Tampa Bay watershed. These contaminants are most commonly associated with industrial emissions. For example, cadmium is associated with electroplating and battery production.



Swale on the side of an urban street that allows for the percolation and filtration of stormwater before it reaches a body of water.

Much of this nitrogen pollution in the waters surrounding Pinellas County is believed to be from roadways that run adjacent to water bodies. Future planning should increase the linkages between transportation and surface water planning. One possibility for this would be to increase the number and size of swales and other vegetated buffers next to and in between roadways, so that additional stormwater runoff can be absorbed into the ground before reaching the waterways. Counties and Municipalities in other parts of the country are already increasing the number of swales in the center medians of roadways and in between the roadways and sidewalks, as seen in the image to the left, for the purpose of absorbing stormwater in the inner-city areas. By designing urban roadways so that stormwater runoff is directed to these

depressed center-median and road-edge swales through curb cuts, impacts on the storm sewer system can be alleviated and pollutants can be filtered out of the stormwater before they are able to reach a body of water.

Septic tanks are another source of nonpoint source pollutant load. This load is probably more or less continuous, but may increase or decrease based on ground saturation. The majority of Pinellas County is serviced by regional sewer systems and not septic, but septic systems still remain in many areas. Allen's Creek, Lake Tarpon, the Anclote River, and Curlew Creek watersheds are four watersheds, for example, whose water quality is impacted by septic tanks. As septic tanks continue to be phased out throughout the County, it is anticipated that water quality within these watersheds will show continued improvement because of the removal of septic tank contaminants.

According to TBEP in 2006, the contaminants of primary concern to Tampa Bay at this time, due to their impact on water quality are: (1) nitrogen, (2) suspended solids which can increase turbidity and inhibit light penetration, (3) materials that deplete the dissolved oxygen within the receiving waters, (4) pathogenic bacteria, (5) organic pesticides and other toxic materials that enter the food chain.

While certain waters in and surrounding Pinellas County have shown significant improvement since the 1970s as a result of improved sewage treatment, and reduced or eliminated discharge from point sources, many areas still exhibit poor water quality due to nonpoint source pollution associated with commercial and industrial development, and the residential and commercial use of fertilizers.

In general, the waters most impacted by nonpoint source pollution are the near shore areas; that is, partly enclosed embayments and bayous, and inland streams and ponds. More open waters tend to be less affected. In some areas of Tampa Bay, however, the cumulative nitrogen load from numerous small incremental sources has been shown to be excessive, and will need to be reduced in order to meet long-term nitrogen management resource goals for the area, outlined in the Comprehensive Conservation and Management Plan for Tampa Bay (CCMP).

Impact of Land Uses, including Transportation, Sanitary Sewer, Solid Waste, Drainage, and Potable Water Facilities on Surface Water and Estuarine Conditions

Land Use

Runoff from the Tampa Bay watershed is affected by various factors, including topography, soils distribution, hydrogeology, land use, and rainfall. A primary factor impacting runoff patterns is land use. As urbanization increases, activities that affect surface hydrology occur: canals are dug, tributaries are straightened, and land surface is paved over. However, strict stormwater management regulations affecting the design, construction and operation of stormwater management facilities have been in effect in this part of Florida since the 1970s. While not always the case, new development tends to have less of an impact on water quality degradation than older areas because of the enhanced development regulations that newer development is subject to. Negative impacts from new development often stem from excessive fertilizer use on landscaping which can contribute large amounts of nitrogen and phosphorus to the surface waters of the County. The problems that persist with older development lie with older drainage systems that do not provide any treatment, and in many cases, discharge directly to the surrounding surface waters. As redevelopment occurs and the County enforces its land development regulations requiring redeveloped sites to meet current stormwater management standards, this problem becomes addressed incrementally. With the County also considering an ordinance regulating fertilizer use, problems associated with polluted runoff from residential landscaping practices can also be addressed.

Please refer to the Future Land Use and Quality Communities Element for a more detailed discussion of land use. Additionally, a basin by basin discussion of predominant land uses and degree of urbanization is contained within the Basin Inventory Summary.

Traffic Circulation

The Bayside Bridge, as pictured below spanning a portion of Old Tampa Bay on the eastern shore of Pinellas County from St. Petersburg to Clearwater, represents an innovative and award winning stormwater engineering commitment, concept and design. Unlike most other bridges, stormwater runoff from the Bayside Bridge is actually piped to treatment ponds on either side of the Bridge. This eliminates the discharge of untreated stormwater to Tampa Bay. The County has also utilized this concept in constructing the Lake Seminole Bridge at 102nd Ave., and treats all of the stormwater runoff from the Bridge before it reaches a body of water.

In regards to construction of other transportation facilities, every transportation project continues to be carried out in compliance with all applicable stormwater management regulations. However, pollutant-laden road runoff continues to be a problem for the surface waters of Pinellas County. Many older roads do not currently have treatment systems in place to capture and treat stormwater before it reaches surface waters. As these older roadways are updated and retrofitted, the opportunity exists for innovative methods of stormwater control and treatment to be utilized in their design. Such improvements will help to contribute to the improving water quality conditions in Pinellas County.



Bayside Bridge

Sanitary Sewer

Currently, Pinellas County operates two regional wastewater treatment plants: South Cross Bayou Water Reclamation facility (pictured below) and the William E. Dunn Water Reclamation Facility. Treated effluent from the South Cross Bayou and Dunn facilities is being disposed of through the use of reclaimed water. South Cross Bayou is a permitted Advanced Wastewater Treatment Facility utilizing a tertiary treatment process. By the end of a four step cleaning process, the water is 99.9 % pure. During emergencies, such as the influx of groundwater into the sanitary sewer system due to a high water table, excess water that is not able to be distributed by the reclaimed water system is released into nearby Joe's Creek. The water that is released into the creek receives the additional AWT treatment. The chlorine is removed (neutralized) through the addition of sulfur dioxide. The release water is also re-aerated to

enrich it with additional oxygen through the use of a cascade system. The sludge, or biosolids, that is removed during the water treatment process undergoes additional stages of treatment and is processed into a very high grade



South Cross Bayou Water Reclamation Facility

organic fertilizer that is sold on the commercial market. The Dunn facility is currently an advanced wastewater treatment (AWT) plant with treatment achieved through the Bardenpho process. Achievement of AWT means that strict quality criteria will have been met, including the removal of phosphorus and nitrogen nutrients which contribute to excessive plant and algal growth in surface waters. Surface water discharge of treated effluent is allowed only after AWT. Consequently, treated wastewater discharges from the County's treatment plants do not appear to be contributing to the degradation of estuarine conditions.

The majority of the County is served by a regional wastewater treatment system, with less than one percent of the County remaining on septic systems. Some of the older septic systems, depending upon their location, continue to be contributors to water quality problems, particularly in the Allen's Creek, Lake Tarpon, Anclote River, and Curlew Creek watersheds.

Solid Waste

Pinellas County Solid Waste Operations is responsible for operation of a landfill and an incinerator. The landfill is lined, and the facility's permitted stormwater management system is largely a self contained system. The landfill does have an NPDES permit which allows it to discharge to the Roosevelt Creek system through Channel 5, but the discharges are not continuous. In regard to the Resource Recovery facility, atmospheric deposition is traditionally associated with the incineration process, but there is not enough data to determine the specific impacts of one facility over other contributors to atmospheric deposition in the region. The County's facility does operate under a current permit from DEP, and the facility has been retrofitted in recent years to ensure that the facility now exceeds all Federal and State air pollution control requirements.

Stormwater Control and Treatment Facilities

Current Federal, State, and local regulatory requirements do not allow the design of new stormwater facilities that would negatively impact water quality, including estuarine conditions. Some facilities, however, affect the estuary indirectly and contribute to improved conditions. For example, the Alligator Creek Channel H Stormwater Pond at Old Coachman Road has provided for offline stormwater treatment and flow attenuation. This project was built in cooperation with the Southwest Florida Water Management District's (SWFWMD) Surface Water Improvement and Management (SWIM) program. Another project which has indirectly contributed to the improvement of the estuary is the Allen's Creek Floodplain Restoration at Lakeview Road and Hercules Avenue. It provides for stormwater treatment, flow attenuation and habitat restoration. This was a joint project between the County, SWFWMD and the City of Clearwater. The completion of the reconstruction of Bayside Bridge Treatment pond contributed to the improved water quality in Old Tampa Bay by filtering pollutants from the Bridge before they enter the Bay.

Direct improvement to the estuarine system is expected to result from improvements within the Allen's Creek watershed. These projects were completed by 2001 in cooperation with the City of Largo and SWFWMD, and included the creation of an Oligohaline habitat restoration project, removal of septic tanks and the installation of reclaimed water service. Additionally, the County has been involved in other wetland restoration projects like one at the mouth of Joe's Creek which will improve estuarine conditions in Long Bayou, and future plans to restore the coastal habitat in St. Joseph Sound through both capital projects and through the development of the Northwest Pinellas Resource Protection Plan, a Comprehensive Watershed Management Plan to protect the natural resources of St. Joseph Sound and Clearwater Harbor (for more information on this plan, see the Intergovernmental Coordination section of this Element). In general, it can be expected that as the County continues to build new stormwater facilities to current regulatory standards, and to design and construct various habitat restoration projects, the impact on the estuary will be positive.

Potable Water

The provision of potable water to the County has not historically impacted estuarine conditions. However, with the recent development of a desalinization plant by regional water supplier, Tampa Bay Water, conditions will need to be monitored. To date, it is unclear what impacts would be associated with large scale offshore or near shore brine disposal from a desalinization plant producing up to, or over 30 to 50 mgd. Additionally, and perhaps more importantly, the County has concern over the air quality degradation that could be associated with producing the power/energy necessary to operate a large scale desalinization plant operation, an energy intensive use. As described earlier, the relationship between air quality and water quality has been determined to be significant and is currently the subject of increasing and ongoing study by the TBEP and member governments and agencies. For more information on air quality, see the Natural Resource Conservation and Management Element.

Condition of the Tampa Bay Estuary

As already discussed, the Tampa Bay watershed is designated as a National Estuary of the U.S. EPA's National Estuary Program. Established in 1991, the work of the Tampa Bay Estuary Program (TBEP) has culminated in the development of a comprehensive plan directed at the management and restoration of Tampa Bay. The information collected in association with the TBEP program and the resultant technical recommendations are pertinent and applicable to the entire Tampa Bay Watershed, including the estuarine areas in Pinellas County.

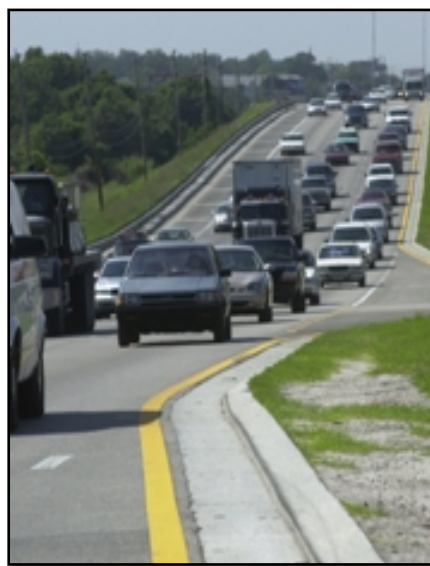
Monitoring results indicate that water quality has generally improved in Tampa Bay since 1984. Improvement in water clarity is believed to be the primary reason for an increase of almost 4000 acres of seagrasses in the Bay between 1982 and 1992. Since 1998, surveys have recorded an additional 2,000 acres of seagrasses in Tampa Bay. While there has been an overall increase, some portions of Tampa Bay, specifically the western portion of Old Tampa Bay, have continued to see a decrease in the coverage of seagrasses. Additional studies are required to explain this decline. The most recent aerial surveys assess changes from 2002-2004 and show a slower, but continued recovery of 946 acres of seagrasses, or about 4%. Old Tampa Bay was the only segment to see decreases, with a documented loss of 636 acres, or 12% during this same two-year period. Reductions in nitrogen loads over the last few decades are believed to have resulted in the declines in the frequency and duration of deleterious algal blooms, and in the increase in the coverage of seagrasses. Monitoring data also indicates that gamefish populations (e.g., snook and red drum) within Tampa Bay are on the upswing. However, according to the Ambient Monitoring Report 2003-2006, water quality data compared to the TBEP water quality targets, showed that the five monitoring locations from Weedon Island northward were potentially impaired, showing that while water quality is improving, there is still much work to be done to ensure the highest possible water quality for the Tampa Bay Estuary. For more information on seagrass protection, see the Natural Resource Conservation and Management Element.

Primary Pollutants of Concern: Nitrogen and Phosphorus

Because Tampa Bay has been determined by TBEP to be nitrogen-limited, nitrogen has been designated as the primary pollutant target in the Bay. Improvements in municipal wastewater treatment processes and industrial treatment processes at agricultural fertilizer production

plants contributed to significant reductions in nitrogen loadings into Tampa Bay in the early 1980's. From 1980 to 1982, reported domestic discharges to Tampa Bay evidenced a decrease of 35 percent in total annual nitrogen and 18 percent in the total annual phosphorus loads to the Bay. Stormwater runoff is the primary source of nitrogen found in Tampa Bay waters, with power plants and automobiles also being considered significant contributors of the pollutant. The conversion of one major bay area power plant from coal to natural gas, combined with increased fuel economy standards for vehicles, the development of cleaner-burning fuels, and the continued development of mass transit, it is believed that the amount of nitrogen loadings into Tampa Bay will continue to decline in the coming decades, according to TBEP.

From 1999 to 2003, there is evidence that stormwater runoff constituted 18% more to nitrogen loadings in Tampa Bay than it did from 1992-1994, for a total of 63% of total nitrogen loadings. The overall total tons/year of nitrogen loadings has increased from 3,800 tons/year from 1992-1994 to 4,131 in the period of 1999-2003, and an increased percentage is coming from such sources of stormwater runoff as residential runoff (+10%) and commercial and industrial runoff (+4%). Stormwater runoff associated with intensive agriculture within the Tampa Bay Estuary (although not necessarily in Pinellas County) has also seen a 6% increase, compared with 1992-1994 averages. On a positive note, there appears to be a significant decrease in nitrogen loadings due to atmospheric deposition and accidental fertilizer losses. **Figure 3** depicts the 1999-2003 nitrogen loadings average for Tampa Bay, as determined by TBEP. TBEP has adopted the goal of maintaining nitrogen loadings into Tampa Bay at 1992-1994 average calculated levels. This is referred to as the 'hold the line' approach, and was also committed to by local governments and industrial interests involved in TBEP's Nitrogen Management Consortium (NMC). As of 2004, goals set by NMC partners to reduce their total nitrogen loadings into Tampa Bay, actually exceeded the agreed-upon reduction goals. Because of population growth, however, nitrogen loadings into the Bay are expected to increase at the rate of 17 tons/year, through 2010.



***Automobile Traffic in
Pinellas County***

FIGURE 3
NITROGEN LOAD SOURCES TO TAMPA BAY

Toxic Contaminants in Tampa Bay

Monitoring of toxic contaminants in Tampa Bay has been done by a number of parties, including local governments and TBEP. Toxic contaminants include various trace metals, pesticides, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs). Generally, contamination appears to be concentrated around large urban centers, ports and marinas, and concentrations generally diminish going from Old Tampa Bay towards Lower Tampa. The 2006 update to the Comprehensive Conservation and Management Plan for Tampa Bay (CCMP) by TBEP, confirmed that some contaminants are at concentrations high enough to be harmful to fish and wildlife, either directly or via the food chain. The primary contaminants include metals, PAHs, PCBs, and chlorinated pesticides. The nature of the contaminants would seem to indicate that stormwater runoff and atmospheric deposition may be primary contributors to the toxic contamination of certain portions of Tampa Bay. Also in the CCMP, TBEP acknowledged that over time, the release of hazardous pollutants into the air by coal plants, automobiles, and other sources, may have a potentially significant threat to the health of the Bay, as approximately 20-30% of the nitrogen in the Bay is documented as coming directly from the atmosphere. The study also found that while PAH concentrations in Tampa Bay are lower than in other industrialized areas, PAHs are negatively impacting aquatic ecosystems in the bay.

With the implementation of the National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater Regulations (40 CFR part 122) in the early 1990's, Bay area jurisdictions were tasked with determining the runoff loads from various land use types. While higher concentrations of toxics were detected at some runoff sites, it has not yet been determined if this is the result of typical runoff from these specific land uses or simply resulted from specific sources within the sampled areas.

Overall, as of 2007, Tampa Bay ranks among the middle in a ranking of toxic contaminants in estuaries sampled across the U.S. According to TBEP, less than 1% of Tampa Bay is contaminated, with the contamination focused mainly in industrial and port areas, or 'hotspots,' such as the Bayboro Harbor in St. Petersburg. While toxic contamination is much lower than in the estuaries surrounding other major cities, such as Boston or New York, TBEP reports that Tampa Bay contains more toxics than other Gulf Coast estuaries, and that oysters in Tampa Bay have an average of 10 times the amount of copper and zinc concentrations than those found in any other coastal area of the Gulf.

TBEP has also developed the *Tampa Bay Benthic Index*, which determines the severity of toxic contamination in segments of the Bay based upon the health and diversity of benthic organisms there, low dissolved oxygen concentrations, or the exceedance of contamination thresholds for heavy metals, PAHs, or other toxics. TBEP and local governments have taken steps to treat and contain stormwater runoff near these hotspots, in an effort to address any toxic runoff into the Bay. Samples taken in 1995 and 2002, however, do not show much difference in the level of toxic contamination at these hotspots, but do confirm the presence of additional hotspots. Future monitoring is scheduled to take place over the coming years and action plans are currently being developed for those areas with the highest concentrations of toxic contamination. The Tampa Bay Benthic Index will continue to be utilized to identify and analyze toxic contamination in the Bay, and to develop strategies to deal with the contamination.

More information on water quality and impairments in Pinellas County can be found in the Total Maximum Daily Loads section of this Element.

Identification of Point Estuarine Water Pollutant Sources:
 Known **Point Sources** of Pollution to Estuarine Waters

Point source pollutant sources are pollutants that discharge directly into the waters of Pinellas County from a single source. Unlike nonpoint sources that come from a variety of undefined sources, point source discharges are known and inventoried by the state of Florida. **Table 4**, and associated **Figure 4**, are derived from the 2007 Surface Water Discharge Detail Report provided by the Florida Department of Environmental Protection (DEP), and represent a current depiction of known permitted point sources in Pinellas County. **Figure 4** indicates whether the source is domestic or industrial.

TABLE 4
PERMITTED POINT SOURCE SURFACE WATER DISCHARGES
IN PINELLAS COUNTY
(JANUARY 2008)

MAP NO.	NAME	OWNERSHIP	RECEIVING WATER BODY	CAPACITY	PROCESS OR TREATMENT
D1	City of Clearwater-- East	Municipal	Tampa Bay	4.3 MGD	AWT, To Discharge & Part III Reuse
D2	City of Clearwater-- Marshall St.	Municipal	Stevenson's Creek, Clearwater Harbor, Gulf of Mexico	10 MGD	Activated Sludge & AWT
D3	City of Clearwater-- Northeast	Municipal	Possum Branch, Tampa Bay	13.5 MGD	Activated Sludge AWT
D4	City of Dunedin-- Mainland	Municipal	St Joseph's Sound, Gulf of Mexico	6 MGD	Advanced Treatment/ Type IRO
D5	City of Largo	Municipal	Feather Sound Lakes, Tampa Bay	15 MGD	Advanced Treatment
D6	Mid-County Services Inc. (Dyna-Flow)	Private	Curlew Creek, St. Joseph's Sound, Gulf of Mexico	0.9 MGD	Extended Aeration

MAP NO.	NAME	OWNERSHIP	RECEIVING WATER BODY	CAPACITY	PROCESS OR TREATMENT
D7	City of Oldsmar	Municipal	Mobbly Bay, Old Tampa Bay	2.25 MGD	Extended Aeration
D8	South Cross Bayou WRF**	Municipal	Boca Ciega Bay, Gulf of Mexico	33 MGD	Advanced Domestic Wastewater
D9	City of Tarpon Springs	Municipal	Anclote River, Gulf of Mexico	4 MGD	Type I/Bardenpho Bnr
D10	William E Dunn WRF**	Municipal	St. Joseph's Sound, Gulf of Mexico	9 MGD	Activated Sludge, Advanced Domestic Wastewater
I1	Bridgeway Acres Class I Landfill*	Municipal	Roosevelt Creek	0	Not Available
I2	Cardinal Health 409, Inc.	Private	Roosevelt Creek	0	Not Available
I3	City of Oldsmar	Municipal	Safety Harbor, Mobbly Bayou	0	AWT
I4	Coca Cola Foods	Private	St. Joseph's Sound, Gulf of Mexico	0	Complete Mix Activated Sludge and reverse osmosis system
I5	Progress Energy Florida-Bartow Plant	Private	Tinney Creek, Tampa Bay	0	Low Volume Wastes are Treated by Neutralization as Necessary

Source: Florida Department of Environmental Protection, January 2008 and Pinellas County Planning Department, 2008.

D = Domestic Point Source Surface Water Discharge

I = Industrial Point Source Surface Water Discharge

*Owned and operated by Pinellas County.

**Pinellas County Regional Wastewater Treatment/Water Reclamation Facility.

Revised as of January, 2008.

FIGURE 4
PERMITTED POINT SOURCES IN PINELLAS COUNTY --DOMESTIC AND INDUSTRIAL

The Future of Estuarine Conservation, Restoration and Management

Estuarine wetlands include marshes and mangroves, with salt marshes being the dominant natural habitat along Tampa Bay's major tributaries. A continual threat to the health and sustainability of these marsh and mangrove forests in the Tampa Bay region remains exotic invasive species (e.g., Australian Pine, Brazilian Pepper, etc.).

Lower salinity surface water habitats are associated with the riverine systems, and the numerous tributaries to the Bay and Gulf which provide low to medium salinity conditions critical to juvenile fish and shellfish. For example, these systems represent prime nursery habitat for juvenile snook, tarpon, and red drum, as well as non-game species such as black mullet. Some of the most productive habitat is actually where these salinity regimes interact with the adjacent stationary wetland habitat.

Low salinity areas are typically associated with the upper reaches of a tributary, while the medium salinity conditions occur downstream. The protection and restoration of these oligohaline systems is considered to be a priority by the Tampa Bay Estuary Program.

Important shore and wading bird colonies in the area are also largely dependent on the integration of multiple surface water habitats. For example, the white ibis nests along the shore, but prefers to forage inland freshwaters to feed its young. At this time, the white ibis population of Tampa Bay is in serious decline. Some Bay managers attribute this decline to the disappearance of the Bay's freshwater habitats through development. Consequently, the protection of freshwater ponds and lakes becomes all the more critical to sustaining the white ibis population.

Pinellas County's economy depends heavily on the County's water-based recreational and commercial amenities for both fishing and other recreational opportunities. Estuaries are among the world's most productive ecosystems, with more than 70 percent of all commercially important species of fish dependent upon estuaries at some stage in their development. The Tampa Bay estuary provides shelter, nursery and feeding habitat for snook, red drum, sea trout, shrimp and the bay scallop. Both commercial and recreational fishing are economically impacted by declines in fish, shellfish and associated marine life populations. Habitat decline, pressure from fishing, and water quality are considered the primary factors responsible for the changes in fish population.

While the physical deterioration of drainage facilities can have an effect on the operation of the treatment aspects of the stormwater design, and thereby contribute to the pollutant load, the County's ongoing stormwater system maintenance programs, and the ongoing capital improvements program commitment to rehabilitation, refurbishment, or replacement of the drainage system, are intended to address this problem.

Tampa Bay's mangrove islands near shore provide some of the most important wading and shorebird nesting areas in the nation. Among the many species that nest in and around Tampa Bay are great blue herons, snowy and great egrets, roseate spoonbills, brown pelicans, reddish egrets, cormorants, white ibis, and various terns. The Bay's bird population has also been impacted by habitat loss and long term water quality degradation. While the bird population has been making improvements in recent years, there is still much work to be done in order to improve their habitat quality and ensure their future viability.

Intergovernmental coordination is, and will remain, an integral component of managing the estuary around us. For example, coordination and cooperation in monitoring efforts is essential to the study of our estuarine system. This not only eliminates duplication of effort, but also reflects sound financial sense. Coordination and cooperation also provide the foundation for implementing TBEP's CCMP, described in greater detail later in the Intergovernmental Coordination section of this Element.

Intergovernmental coordination can also contribute to consistent land planning activities. Signatories to the TBEP Action Plans have agreed to take certain actions in response to environmental issues in Tampa Bay. Those actions include working to prevent increases in nitrogen flows into Tampa Bay, working to reduce the number of toxic pollutants in bay sediments, improving on-the-water enforcement of fishing and environmental activities, implement a long-range dredging plan for the Bay that would minimize environmental impacts, and reducing human and pet waste to ensure the continued viability of traditional bay recreation areas. Additional actions that are being considered include fertilizer ordinances regulating the amount and type of fertilizers used in close proximity to waterbodies, and pledges by local governments to reduce their future nitrogen contributions to the Bay.

Recreational and Commercial Surface Water Uses and the Local Economy

Pinellas County continues to support many water-related and water-dependent uses. With the exception of Lake Tarpon and Lake Seminole, there are few commercial uses associated with the **County's freshwater lakes**. Lake Tarpon continues to have an excellent reputation as a fishing lake, and still supports a small cadre of professional fishing guides and commercial boat docks. At Lake Seminole, the availability of boat docks and ramps provides access to the Lake for fishing.

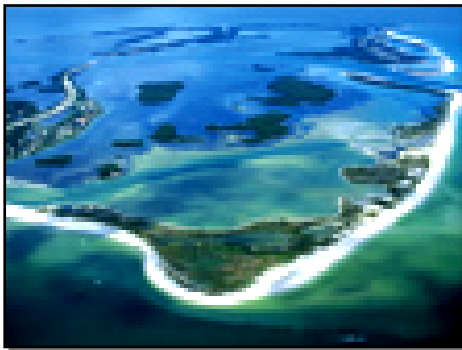
Many of the **County's park facilities** remain centered on a surface water body. Some of the freshwater attractions include: A.L. Anderson Park which frequently hosts bass fishing tournaments; John Chestnut Park which provides boat ramps, canoe trails and boardwalks; Ridgecrest Park which features several small lakes in this busy urban park; and Sawgrass Lake Park which contains one of the County's hallmark environmental education centers in association with an elevated walkway winding among maple and hardwood hammocks and Sawgrass Lake itself. Such parks are a haven for both residents and tourists alike, adding to the quality of life in the County and ensuring that tourists visiting the area will have an excellent experience and enjoy our numerous natural areas.

The park facilities in association with beach and shore access remain a primary recreational attraction in Pinellas County. As with the freshwater oriented parks, the preservation and protection of surrounding surface water quality and inter-related habitats is emphasized in park design and practice. Fort De Soto Park is an approximately 900-acre park on both the Gulf and Tampa Bay that provides both recreational and commercial benefit to the County. This park includes beaches, boat ramps, a fishing pier, a bait shop, a campground, nature and bike trails, historical amenities, and has recently been the site of filming for several major television network productions. North Beach, located within the Park, was named the number one beach in the continental United States in the 2004 annual survey by "Dr. Beach", Professor Stephen Leatherman of Florida International University.

The **Weedon Island Preserve** is another example of high quality open space in the County that is heavily dependent upon the water. This Preserve features miles of trails and boardwalks through the various environmental habitats, including palmetto and mangrove systems. Visitors to the preserve commonly hike the trails and kayak throughout the Preserve boundaries in the mangrove tunnels and among the natural spoil islands. Access to coastal surface waters makes this Preserve a popular destination for both tourists and local citizens.



Kayaker at Weedon Island Preserve



Aerial View of Shell Key Preserve

The approximately 1,800 acre **Shell Key Preserve** protects sensitive marine habitats and includes one of the County's largest undeveloped barrier islands and numerous unnamed mangrove islands. The Preserve allows for both diverse wildlife habitat and provides active and passive recreational opportunities. The Preserve has been designated as one of the State's most important areas for shorebird nesting and wintering and is being restored for migratory songbird habitat. As of 2007, 117 species of birds have been observed and over 169,000 individual birds counted within the Preserve, including the Least Tern and the American Oystercatcher. Other wildlife has been observed in the Preserve as well, including the manatee, the bottlenose

dolphin, the occasional sea turtle, butterflies, moths, marsh rabbits, raccoons, and three non-venomous snakes. The same features that attract a diverse wildlife and vegetative population, also attracts thousands of human visitor annually. The challenge for Pinellas County is to balance the demands for recreation in the Preserve, including camping, boating, swimming, shelling, and fishing, with the high level of sensitivity to the management of natural resources in the Preserve. For example, 2800 people and 350 boats were counted at the northeast tip of the Preserve by noon on Sunday during the Memorial Day Weekend in 2006. Such pressures from crowds seeking recreation have put a strain on the Preserve in terms of water quality and wildlife protection. In 2007, the Pinellas County Board of County Commissioners adopted an update to the Shell Key Preserve Management Plan, to provide direction for the future of management and public use within the boundaries of the Preserve. For more information on the Shell Key Preserve Management Plan, see the Natural Resource Conservation and Management Element.

Another important component to the County's recreational facilities is the **blueways trail system**. These canoe and kayak paddling trails are centered upon the approximately 48 launching locations available in the parks and preserves throughout Pinellas County. The County also comprises a section of the Florida Saltwater Circumnavigational Paddling Trail, potentially drawing a number of kayakers from around the State and the Country to experience Pinellas County's waters. Pinellas County has some of the very best waterways and scenic vistas available to canoe and kayakers, which can be attributed to the high quality of the surface waters surrounding the County. For more information on the blueways trail system, see the Recreation, Open Space and Culture Element.

The health of the local seagrass beds is also vital to both the tourism and fishing industries in Pinellas County. This vegetation provides vital fish habitats that appeal to **recreational fishing** and canoeing/kayaking enthusiasts alike. Nature lovers of all kinds are drawn to the waters surrounding Pinellas County as they are home to a diverse population of both fish and wading birds.

Although Bay fisheries have declined, Tampa Bay continues to support **recreational and commercially important fishing industries**. The shell fishing industry (e.g., oyster and clam harvesting), however, has been impacted significantly by contamination problems. It is hoped, however, that recent seagrass recovery efforts and improvements in water quality will not only contribute to the health of these marine populations, but will also support the return of the bay scallop. At this time, the commercial shellfish industry is virtually non-existent, with the exception of bait shrimping. For more information on Bay fisheries, see the Fisheries Resources section of the Natural Resource Conservation and Management Element.

The quality of Pinellas County's surrounding waters is vital to the local economy. A large percentage of our local economy is driven by the tourism industry. Surface waters in Pinellas County are used for both commercial and recreational fishing, boating, kayaking and canoeing, beach access, and other recreational and commercial activities.

Many parks are located along a body of water. With poor surface water quality, these parks would likely no longer be a major recreational destination for both citizens and tourists alike. Such places as the Weedon Island Preserve and Fort DeSoto rely heavily upon the quality of the surface water in order to thrive as a preserve and recreational destination, respectively. For more information on water-dependent and water-related land uses, see the Coastal Management Element.

EDUCATION AND OUTREACH

Pinellas County recognizes that education is integral to the protection of surface water quality. Not only is education and outreach a priority, it is also a requirement for National Pollutant Discharge Elimination System (NPDES) permit compliance. An NPDES education committee has been in place since 2002, comprised of representatives from the County, the municipalities included in the Pinellas County NPDES permit, and the Florida Department of Transportation, to identify and address education and outreach needs around the County. An increasing area of emphasis in this County is education regarding how choices our citizens make can affect the quality of surface water. For example: choosing whether to add a patio to their backyard or to landscape with native vegetation could make a significant difference on surface water runoff at the neighborhood level; backyard structural improvements can contribute to the higher percentage of impervious surfaces on individual parcels, and non-native vegetation requires significantly more watering and fertilization than native alternatives.

Pinellas County also participates in a number of educational partnerships. This includes participation in the Tampa Bay Regional Planning Council's (TBRPC) -sponsored regional stormwater education committee. This group has been able to attain funding for a number of educational items, including a stormwater coloring book, brochures and magnets; adopt-a-pond project books and CDs, storm drain marking plaques, and construction information door

hangers. Educational activities are also taking place within the public and private school systems, as well, in conjunction with SWFWMD and TBEP. These groups facilitate the distribution and creation of educational activities and items for the youth. Pinellas County has also committed to begin to develop educational materials for citizens about the impacts that backyard improvements can have on surface water management. Below are some of the educational programs that the County participates in to inform the citizens of the County about how their actions affect surface water management.

Florida Yards and Neighborhoods

Florida Yards and Neighborhoods (FYN), a program in partnership with the University of Florida, plays an essential role in the education of local residents in regard to how their landscaping choices affect the environment and can be Florida-friendly. FYN seeks to address the problems of pollution in stormwater runoff, disappearing habitats and water shortages by educating the public and teaching conservation practices that can be utilized by every resident. By landscaping individual properties with native vegetation, the individual property-owner can contribute to controlling the quantity of surface water runoff and improving the quality of that runoff into surrounding bodies of water.



Example of a Florida-Friendly Yard in Pinellas County.

Pinellas County is also working on encouraging, or eventually requiring, that a Florida-Friendly landscape plan be included with the submission of each new permit application that is filed with the County. This plan will outline how the landscaping on the property will be developed and maintained, consistent with FYN program.

Adopt-a-Pond

Beginning in 2004 Pinellas County staffed an adopt-a-pond program, intended to help residents better manage their privately owned stormwater ponds. While this program is not currently operational due to budget constraints, it may be re-instated in the future depending upon the availability of funding. Common problems with stormwater ponds include algae blooms, fish kills, and non-native vegetation. Often these problems are made worse by a lack of native buffer and aquatic vegetation. Pinellas County selected applications from candidate ponds located in the unincorporated County, participants in the Department of Environmental Management's Lakes and Ponds Education Day workshops, complaints, and from referrals from other agencies.



Volunteers working on a stormwater pond in Pinellas County.

If necessary, the County would then provide an initial invasive plant treatment, inspections, and conduct an educational meeting with homeowners or volunteer groups. Participants worked with County staff to design a planting

scheme and install plants in and around their pond. This program has served to educate citizens about the importance of stormwater ponds to the stormwater management system, and about the impacts that individual actions can have on the quality of surface water runoff and the quality of the surrounding ecosystem.

Storm Drain Marking

The storm drain marking program was initiated by the Department of Environmental Management in 1997 to educate citizens about what does and does not belong in storm drains. In Pinellas County, storm drains along the side of the street drain directly to a body of water. These drains are designed to channel stormwater from the roads directly to a receiving body of water. In an urban area such as Pinellas County, water flowing into the storm drains often takes a number of pollutants with it. Many citizens do not realize that storm drains do not flow to the sanitary sewer system, as many do in other parts of the country, and are not aware that the litter they leave on the streets and the fertilizers they apply to their lawns, can make their way into the storm drains and impact the quality of nearby surface waters, as well as impede flows and exacerbate flooding.



Example of a storm drain marker used in Pinellas County.

The storm drain marking program allows citizens to place placards on the storm drains within their communities that state that these drains flow directly to a body of water. This program is designed to educate people that their actions can have a direct impact on the quality of surface water in their communities. Pinellas County has developed a number of different placards to state that a drain may flow to a bay, lake or creek (and some markers are also in Spanish).

Audubon Program

The Audubon Cooperative Sanctuary and the Audubon Signature Programs are designed to assist golf courses to meet certain environmental standards which may decrease their impact on the surface water management system. Pinellas County is evaluating the impact of these programs and determining whether or not they could be implemented within the unincorporated areas of the County in the future.

Fertilizer Use

As discussed previously, both nitrogen and phosphorous are considered to be pollutants of concern to the water quality in Pinellas County. These pollutants can be found in great amounts in fertilizers that are applied to lawns and sports fields. Fertilizers contribute to degraded water quality when the pollutants run off into surrounding waterways during rain events. In 2007, the State of Florida developed the Urban Turf Rule, restricting nitrogen and phosphorus application rates for urban turf and lawns within the State. Pinellas County is currently evaluating the impact that his Rule may have on nitrogen and phosphorus runoff into the surface waters of the County and whether a fertilizer use ordinance would be beneficial to water quality in the area. Such an ordinance could extend the Urban Turf Rule to sports turf in

the unincorporated area, limit the use of phosphorus fertilizer, and could require a buffer zone around waterbodies in the County, where the application of fertilizers would be restricted.

Pinellas County Environmental Foundation

The Pinellas County Environmental Fund (PCEF) is a unique partnership between the Pinellas County Board of County Commissioners, the National Oceanic and Atmospheric Administration (NOAA), and the National Fish and Wildlife Foundation. These three groups share the common goals of actively pursuing the protection, restoration, and enhancement of Tampa Bay's natural resources. PCEF is funded by the Pinellas County Board of County Commissioners, the National Oceanic and Atmospheric Administration, and corporate and individual sponsors. The National Fish and Wildlife Foundation administers all grant awards on behalf of PCEF. Projects funded by PCEF support the Tampa Bay Estuary Program's Comprehensive Conservation and Management Plan. In 2006, PCEF provided partial funding for 15 projects, with additional monies leveraged for a total of \$4.6 million to support Tampa Bay-focused restoration efforts.



Joe's Creek Preserve