City of
DEERFIELD
BEACH

COMPREHENSIVE PLAN

CONSERVATION ELEMENT

VOLUME 7.0



DEPARTMENT OF PLANNING AND GROWTH MANAGEMENT

CONSERVATION ELEMENT
OF THE
DEERFIELD BEACH COMPREHENSIVE PLAN

ADOPTED AUGUST 4, 2009

Prepared by the
City of Deerfield Beach

In compliance with the Local Government Comprehensive Planning and
Land Development Regulation Act and Florida State Statue 163

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7.1 INTRODUCTION

7.1.1 PURPOSE OF COMPREHENSIVE PLANNING

The purpose of the conservation element is to promote the conservation and protection of our ecosystems and natural resources within the City of Deerfield Beach.

Issues concerning conservation of natural resources are also addressed throughout the Comprehensive Plan. The Future Land Use Element provides mechanisms to preserve lands for conservation and to promote appropriate land uses to minimize the impacts of development on the environment. The Transportation Element promotes strategies to improve air quality. The Utilities Element strives to ensure the provision of clean water, preservation and conservation of the sources of that water, and the safe and efficient handling of wastewater and solid waste while protecting the City's air, water and soil resources. The Coastal Management Element identifies the natural resources in the coastal planning area, including off-shore reefs, dunes and beaches.

The following natural resources are identified and analyzed, including the identification of commercial, recreational or conservation uses: rivers and canals, bays and lakes, wetlands including estuaries, groundwater, air, floodplains, known sources of commercially valuable minerals, areas known to have experienced soil erosion problems, and areas which are recreationally and commercially important fisheries, wildlife, marine habitats and vegetative communities including threatened and endangered species.

Current and projected potable water needs and sources for the 2025 planning period, based on the demands for industrial and potable water use and the ability to meet those demands are identified and analyzed.

The service and planning area for air resources is the South Florida Airshed, which is comprised of the developed areas of Palm Beach, Dade and Broward Counties as defined by the U.S. EPA. The planning area for water resources is the Lower East Coast Area (LEC) as defined by the South Florida Water Management District (SFWMD). For biological resources, the planning area is comprised of the City and Broward County.

7.1.2 DEFINITIONS

The following terms used throughout this element are defined below for clarification. Original sources of definitions are given in parenthesis.

Airshed – an area of varying size that is dependent on a single air mass and that is uniformly affected by the same sources of air pollution. (Webster's New World Dictionary)

Aquifer – a stratum or formation of permeable material that will yield groundwater in useful quantities. (U.S. EPA)

Aquifer Recharge – the addition of water to the groundwater system by natural or artificial processes. (U.S. EPA)

Channelization – to straighten and deepen streams so water will move faster. (U.S. EPA)

Community - an assemblage of plants and animals living in a particular area or habitat. (Broward County 1997 Comprehensive Plan)

Desalinization – removing the salt from saline waters to produce potable water. (South Florida Regional Planning Council)

Dissolved Oxygen – a measure of the amount of oxygen available for biochemical activity in water. (U.S. EPA)

Ecosystem – the living and non-living components of the environment which interact or function together, including plant and animal organisms, the physical environment, and the energy systems in which they exist. All the components of an ecosystem are interrelated. (Florida Coastal Management Program)

Endangered Species – species whose numbers have declined to such a critically low level or whose habitats have been so seriously reduced or degraded that without active assistance their survival in Florida is questionable. (Rare and Endangered Biota of Florida)

Estuary – a semi-enclosed, naturally existing coastal body of water in which saltwater is naturally diluted by fresh water and which has a connection with oceanic waters, including bays, embayments, lagoons, sounds, and tidal streams. (Rule 9J-5, F.A.C.)

Evapo-transpiration – the transfer of water to the atmosphere by the combined processes of evaporation and plant transpiration. (U.S. EPA)

Exotic Species or Exotics – species not native to the region. (Fundamentals of Ecology)

Groundwater – subsurface water in the zone of saturation. (U.S. EPA)

Hazardous Substance- a substance that has one or more of the following characteristics: ignitable; corrosive; reactive; toxic. (Broward County Wellfield Protection Ordinance)

Listed Animal Species – means animal species listed as endangered, threatened, or of special concern by the Florida Fish and Wildlife Conservation Commission in Rule 68A-27, Florida Administrative Code.

Natural Communities – Natural Community means a community that is dominated by native plant species as described in the Florida Natural Areas Inventory publication, "Guide to the Natural Communities of Florida." A Natural Community generally possesses the following characteristics: the plant species composition includes most of the more common species typical of that natural community type; the community may contain small areas of exotic or invasive plants that could be easily controlled by prescribed burning or other forms of management; evidence of historical disturbance may be present but disturbance has not destroyed or prevented the re-establishment of a mature natural community type; and, the community is not substantially disturbed by recent human activities, except for such disturbance as low intensity forestry activities that allow the natural community to recover to previous conditions.

Preserve – to save from change or loss other than those caused by natural geological and evolutionary processes, and reserve for a special purpose. (Florida Coastal Management Program)

Protect – to save or shield from loss, destruction, or injury or for future intended use. (Florida Coastal Management Program)

Rare Species – species which, although not presently endangered or threatened are potentially at risk because they are found only within a restricted geographic area or habitat in the state or are sparsely distributed over a more extensive range. (Rare and Endangered Biota of Florida)

Raw Water – untreated potential drinking water. (U.S. EPA)

Species of Special Concern – a species that does not clearly fit into the endangered, threatened, or rare categories yet which, for certain reasons, warrants special concern. (Rare and Endangered Biota of Florida)

Storm Surge – the increase in normal water levels, driven by high winds, near the area where the storm center makes landfall. (South Florida Region Hurricane Loss Study)

Threatened Species – species that are likely to become endangered within Florida in the foreseeable future if current trends continue. Includes species which may still be abundant, but are being subjected to serious adverse pressure throughout their range. (Rare and Endangered Biota of Florida)

Toxic Substance – a chemical or mixture that presents an unreasonable risk of injury to health or the environment. (Broward County Wellfield Protection Ordinance)

Understory – assemblages of natural low-level woody, herbaceous, and groundcover species which exist in the area below the canopy of the trees. (South Florida Water Management District)

Wetlands – those areas that are inundated by surface water or ground water at a frequency and a duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils. Soils present in wetlands generally are classified as hydric or alluvial, or possess characteristics that are associated with reducing soil conditions. The prevalent vegetation in wetlands generally consists of facultative or obligate macrophytes that are typically adapted to areas having soil conditions described above. These species, due to morphological, physiological, or reproductive adaptations, have the ability to grow, reproduce, or persist in aquatic environments or anaerobic soil conditions. Florida wetlands generally include swamp, marshes, bayheads, bogs, cypress domes and strands, sloughs, wet prairies, riverine swamps and marshes, hydric seepage slopes, tidal marshes, mangrove swamps, and other similar areas. (Rule 9J-5, F.A.C.)

Zone of Saturation – the zone in which interconnected interstices are saturated with water under pressure equal to or greater than atmospheric. (U.S. EPA)

Zones of Influence – zones delineated by iso-travel contours around wellfields, within which toxic substances will be regulated to protect the quality of groundwater. (Broward County Wellfield Protection Ordinance)

7.2 GOALS, OBJECTIVES AND POLICIES

Goals and objectives are generally considered to be the stated ideals that a person or organization (in this case, the City) strives to ultimately achieve. After establishing goals and objectives, policies are formulated that will guide day-to-day City operations in a manner which quantitatively contributes to the achievement of measurable objectives, which in turn makes measurable progress toward the achievement of adopted goals.

Implementation of the Conservation goals, objectives and policies will also be achieved through the level of service standards adopted in the Capital Improvements Element (CIE). Capital improvements needed to protect the aquifer recharge areas and to provide the quantity and quality of water for the City is also listed in the stormwater management and potable water sub-elements of the Utilities Element. Level of service standards are used to identify the facilities, equipment and labor necessary to implement the Plan.

7.2.1 PURPOSE AND DEFINITION OF GOALS, OBJECTIVES AND POLICIES

The Florida Department of Community Affairs defines goals, objectives, and policies (for planning purposes) as follows:

GOAL, the long-term end toward which programs or activities are ultimately directed;

OBJECTIVE, a specific, measurable, intermediate end that is achievable and marks progress toward a goal;

POLICY, the way in which programs and activities are conducted to achieve an identified goal.

The goals, objectives and policies set forth in the Conservation Element are the general ends the City wants to achieve; the objectives that need to be accomplished to achieve them; and the positions, programs and level of service standards which need to be adopted in order to achieve the objectives. The goals of the City are designed to represent a picture of what the City will be as the plan is implemented. These goals represent both physical and non-physical ends. Some examples of non-physical ends are employment opportunities, economic vitality, community pride and public participation.

7.2.2 GOAL SETTING PROCESS

The Conservation goals, objectives and policies were developed over several months by numerous different groups and individuals. City staff provided the Local Planning Agency (LPA) with a description of existing and projected demographic and physical (geographic) conditions. These findings were discussed in depth during a series of workshop meetings and a list of the major concerns expressed by the LPA was compiled.

These concerns were then discussed with a Comprehensive Planning Task Force organized by the Greater Deerfield Beach Chamber of Commerce. Using the combined input from the Chamber's Task Force and the LPA, a draft of Goals and Objectives was developed and presented at a series of public hearings held by the LPA and, later the City Commission. Policies, needed to effectuate the goals and objectives, were then developed, relying upon input from workshops with the City Commission, and from the City Manager. Subsequently, final drafts of the Conservation Goals Objectives and Policies were prepared and presented at another series of public hearings. Ample opportunity for written and oral comments was given at each of these public hearings. Public comment was duly considered, and the drafts were appropriately modified.

In 2006, the goals, objectives and policies were amended base on the 2005 Evaluation and Appraisal Report. Updates were made based upon changes in Florida Statutes and Rules, changes to the South Florida Regional Planning Council's Strategic Regional Policy Plan and changes in City circumstances. These changes were made after comments were heard at a public workshop, a public hearing held by the LPA, and later the City Commission. A final draft of the Element was prepared based upon comments heard at these meetings.

7.2.3 CONSERVATION GOALS, OBJECTIVES AND POLICIES

GOAL CON 1.0: Conserve and protect the natural resources of the City of Deerfield Beach, so as to provide and maintain a level of environmental quality that ensures the public health, safety and sustainable environmental communities.

Objective CON 1.1: Meet or exceed minimum air quality levels established by the Florida Department of Environmental Protection (DEP).

Policy CON 1.1.1: The City shall cooperate with the State, the South Florida Regional Planning Council and Broward County in monitoring the existing Air Pollution Inventory System (APIS) facilities.

Policy CON 1.1.2: The City will promote activities that will result in strengthening the coordination between land use and transportation planning for air quality by participating in the planning process with local and regional agencies.

Policy CON 1.1.3: The City shall reduce the potential for automobile emissions pollution by the following means:

- supporting developments such as PUD's, Transit Oriented Development (TOD) and other multi-use centers.
- requiring vegetative buffer strips between arterial roadways and residential development; and
- promoting alternative transportation modes such as carpooling, public transit and bicycle and pedestrian paths.
- increasing the use of alternative fuels in City owned vehicles.

Objective CON 1.2: Ensure that commercial and industrial development complies with state and federal environmental quality standards.

Policy CON 1.2.1: Implement development regulations that limit air polluting uses and facilities on a given commercial or industrial site, and prohibit the issuance of development orders which will, when combined with the potential cumulative impacts of other properties designated for commercial or industrial on the Future Land Use Map, increase air contaminant levels to an extent that will put the City in non-conformance with state and federal air quality standards.

Policy CON 1.2.2: Require all applications for building permits to show proof that they have maintained compliance with Broward County Environmental Protection Department (EPD) requirements.

Objective CON 1.3: Conserve and protect the City's water quality and quantity of current and projected water sources, including surface waters, ground waters and waters that flow into estuarine or oceanic waters as measured by the County's Code of Ordinances.

Policy CON 1.3.1: The City shall continue its participation in developing the County's Integrated Water Resource Plan (IWRP), to coordinate water sources and users, and to bring about effective and efficient water management.

Policy CON 1.3.2: The City shall implement the 10-Year Water Supply Facilities Work Plan (Work Plan), and complete the capital improvements listed in the adopted Five Year Schedule of Capital Improvements in accordance with the Capital Improvements Element (CIE), to ensure that potable water level of service (LOS) are maintained.

Policy CON 1.3.3: The City shall implement Policy UT 5.2.1 through Policy UT 5.2.4 (inclusive) of the Natural Groundwater Aquifer Recharge Sub-Element, which protects aquifer recharge areas and regulates uses with the potential for causing groundwater contamination.

Policy CON 1.3.4: The City shall support the County's monitoring activities as they apply to the quality of waters to estuarine and oceanic waters.

Policy CON 1.3.5: The City shall not permit new septic systems.

Policy CON 1.3.6: The City shall continue to implement and maintain a comprehensive street sweeping program to limit surface water pollution caused by storm water run-off.

Policy CON 1.3.7: The City will enforce Broward County regulations for retention pond design and aquatic vegetation regulations.

Policy CON 1.3.8: The City shall continue its participation with the County's National Pollution Discharge Elimination System (NPDES) requirements.

Policy CON 1.3.9: The City shall continue its participation in the County's licensing and compliance program for hazardous material facilities, solid waste facilities, sewage haulers, solid waste transfer stations, filing of surface water bodies, storage tanks and utility electrical equipment to protect water quality.

Policy CON 1.3.10: The City shall continue to enforce zoning regulations which protect the surface waters, Biscayne Aquifer and wellfields cone of influence (zones 1-3) located within and beneath the City's municipal boundaries.

Policy CON 1.3.11: The City shall coordinate with Broward County in the implementation of the County Wellfield Protection Ordinance and notify the County of any potential violation.

Policy CON 1.3.12: Land development regulations shall monitor development in cones of influences, which could be in violation of the Broward County Wellfield Protection Ordinance.

Policy CON 1.3.13: The Drainage Sub-Element of the Utilities Element shall include plans to reduce discharges that degrade coastal water quality, including proposed drainage improvements

Policy CON 1.3.14: The City shall require proper water treatment and drainage for all new development, redevelopment and major renovation projects.

Policy CON 1.3.15: The City shall manage withdrawals from the eastern well field in accordance with the Work Plan, to prevent salt-water intrusion into the groundwater supply.

Objective CON 1.4: The City's wetlands shall be conserved and protected from physical and hydrologic alterations.

Policy CON 1.4.1: The City, in coordination with Broward County and the State, shall maintain the wetlands within the City, as indicated on the Future Land Use Plan Map (Series).

Policy CON 1.4.2: The City shall determine whether future land uses adversely impact wetlands in compliance with Broward County Code of Ordinances, Chapter 27, Article XI, Aquatic and Wetland Resource Protection. Those uses identified to be incompatible per Table 13-A of the County's Conservation Element with the protection and conservation of wetlands and wetland functions shall be directed away from wetlands. When compatible land uses, (wetlands with a wetland benefit index less than 0.80) are allowed to occur, they shall be mitigated or enhanced, or both, to compensate for loss of wetland functions, as determined through the County's environmental resource license process.

Policy CON 1.4.3: Wetlands and shorelines shall be protected, restored and enhanced by either public acquisition and/or environmental mitigation techniques. Wetlands may be utilized as water retention/detention and restoration areas, provided no hydrologic alterations occur on existing wetlands.

Policy CON 1.4.4: The future land use designation for wetlands that are to be preserved shall be either Conservation or Recreation Open Space.

Policy CON 1.4.5: The City shall cooperate with the Florida DEP, South Florida Water Management District (SFWMD) and the Army Corps of Engineers to improve compliance with the dredge and fill state permitting process.

Objective CON 1.5: Protect and conserve the natural functions of the various areas of concern addressed in the Conservation Element of the Deerfield Beach Comprehensive Plan.

Policy CON 1.5.1: All ordinances, land development regulations, and other regulatory devices adopted by the City in order to implement the goals, objectives and policies of the Conservation Element addressing the following areas of concern, shall provide for the protection and conservation of their natural function(s):

existing soils;
fisheries;
wildlife habitats;
rivers, bays, lakes, harbors;
floodplains;
wetlands (including estuarine marshes);
freshwater beaches and shores; and
marine habitats.

Policy CON 1.5.2: Consistent with the policies of the Future Land Use Element the City's Land Development Regulations shall contain floodplain protection provisions consistent with the criteria and mapping of the Federal Emergency Management Administration and Rule 17-25, Florida Administrative Code.

Policy CON 1.5.3: Consistent with the policies of the Future Land Use Element all redevelopment within identified floodplains shall be required to address existing flooding problems as identified in the Drainage Sub-Element of the Utilities Element.

Objective CON 1.6: The City shall maintain or reduce the average daily per capita water demand, as reflected in its current South Florida Water Management District's (SFWMD) consumptive use permit (CUP).

Policy CON 1.6.1: The City shall continue to adhere and implement the Water Conservation Plan as required per its CUP, 10-Year Water Supply Facility Work Plan, and in concert with the LECWSP 2005-2006 Update .

Policy CON 1.6.2: The City shall continue and expand its water conservation practices to maintain a low per capita consumption of potable water by implementing the conservation programs and measures identified in the Work Plan including:

- Implementing a public information/education program targeting residential water conservation,
- Continuing to implement a City water conservation based rate structure,
- Adopting additional water restricting ordinances,
- Implementing and enforcing environmentally sound landscaping practices to reduce irrigation demand, including the principles of xeriscape and rain sensors, and encouraging the planting of "Florida Friendly defined plants,
- Expanding the City's water leak utility detection program and the water distribution system leakage programs; and
- Continuing to enforce the Florida Building Code and City regulations for ultra low volume plumbing flow restriction on new construction.

Policy CON 1.6.3: In order to protect and conserve the Biscayne Aquifer, and support Everglades restoration, the City in coordination with the SFWMD and BCWWS, shall pursue projects that enhance aquifer recharge and investigate the utilization of alternative potable water resources to supplement the region's future water supply. These sources may include the increased use of the Floridan Aquifer, Aquifer Storage and Recovery (ASR), desalination, capture and storage of excess storm water, reuse, and other technologies addressed in the LECWSP 2005-2006 Update.

Policy CON 1.6.4: The City shall continue to develop new wells, as identified in the Work Plan, including Floridan Aquifer wells and the expansion of the treatment capacity of the water treatment plants to meet water demands.

Policy CON 1.6.5: The City's Land Development Regulations shall recommend the use of xeriscape principles as listed in the Land Development Code, and the SFWMD's *Waterwise* plant guide.

Policy CON 1.6.6: The City shall coordinate with Broward County to explore additional opportunities to conserve water by targeting industries characterized by high rates of water consumption, and developing specific industry water conservation strategies.

Objective CON 1.7: The City shall conserve, appropriately use and protect its minerals, soils and vegetative communities.

Policy CON 1.7.1: The City shall coordinate with Broward County's regulation of lake excavation to address safety, water quality, reclamation of inactive mining excavations and the lake's compatibility with the surrounding land uses.

Policy CON 1.7.2: Implement the objectives in the Future Land Use Element which require the coordination of land development with soil conditions.

Policy CON 1.7.3: The City will continue to implement Broward County Beach Nourishment programs and adhere to Broward County environmental requirements concerning the conservation and protection of beach resources. These countywide programs ensure that activities along the coast do not promote beach erosion.

Policy CON 1.7.4: The City shall continue to preserve and protect native, rare, or threatened plant communities listed in the "Rare and Endangered Biota of Florida" from destruction by complying with Broward County's Environmental Sensitive Land (ESL) and Ecologically Concern Land regulations.

Policy CON 1.7.5: The City shall continue to promote the retention and management of the sites which have been designated by Broward County as Natural Resource Areas, Local Areas of Particular Concern, Upland Tree Resources, Urban Wilderness and Environmentally Sensitive Land in accordance with the goals and objectives of this Element and with the rules and regulations imposed by Broward County.

Policy CON 1.7.6: The City shall, on a continuing basis, cooperate and coordinate with adjacent local governments, including Broward County and Palm Beach County, to conserve, appropriately use, and protect unique vegetative communities which are identified as being within and extending outside of the boundaries of Deerfield Beach.

Policy CON 1.7.7: The City shall continue to implement regulations that protect and preserve trees, including those in areas of native vegetation and promote the use of native vegetation in landscape plans.

Policy CON 1.7.8: The City shall protect any natural reservation as identified in the Recreation and Open Space Element from inappropriate uses.

Objective 1.8: The City shall conserve, appropriately use and protect its fisheries, wildlife, and marine habitats.

Policy CON 1.8.1: The City shall maintain the Conservation land use designation on the two identified gopher tortoise habitats in the City, specifically: Deerfield Island Park, and Tivoli Sand Pine Preserve.

Policy CON 1.8.2: The City shall maintain the Recreation Open Space or Conservation land use designation on its beaches to protect the habitat and mating grounds for sea turtles.

Policy CON 1.8.3: The City shall continue to implement land use regulations that require lighting for developments near sea turtle nesting areas to be appropriately shielded.

Policy CON 1.8.4: The City, in coordination and cooperation with the Broward County Biological Resource Division, shall routinely survey the beaches for signs of sea turtle nesting and physically restrict recreation activity in areas where nesting is observed or known to occur during the nesting and incubation period.

Policy 1.8.5: Implement Policy FLU 6.3.3 of the Future Land Use Element which prohibits activities which may be detrimental to manatees.

Policy 1.8.6: The City shall continue to support the County's efforts to protect the natural communities and listed endangered or threatened animal species and their habitats.

Policy CON 1.8.7: The City shall coordinate with the State of Florida's Game and Freshwater Commission in the implementation of recovery plans and neo-tropical flyways for listed bird and fish species.

Objective 1.9: Protect the citizens and the natural environment of the City from the potential threats of hazardous waste materials.

Policy CON 1.9.1: The City shall continue to participate and support the County program for inspection, licensing and compliance of hazardous material facilities, solid waste facilities, sewage handlers, solid waste transfer stations, filling of surface water bodies, storage tanks and utility electrical equipment to protect water quality.

Policy CON 1.9.2: The City's Solid Waste Division, in coordination with the Deerfield Beach Fire Department Inspection Division, shall maintain and keep a routinely updated record of all businesses within the City which store and/or handle hazardous waste materials.

Policy CON 1.9.3: The City shall strictly enforce all regulations within the City's authority pertaining to hazardous waste storage, handling, and disposal.

Policy CON 1.9.4: The City shall continue to provide instruction and information on the proper methods of storage, handling and disposal of hazardous wastes to all businesses and households.

7.3 CONSISTENCY WITH STATE, REGIONAL AND COUNTY PLANS

Chapter 163, F.S. requires "coordination of the local comprehensive plan with the comprehensive plans of adjacent municipalities, the County, adjacent Counties, or the region and with the State Comprehensive Plan."

During development of the comprehensive plan, City staff was involved in a variety of activities to ensure consistency of the City's plan with the State Comprehensive Plan, the South Florida Regional Planning Council's Strategic Regional Policy Plan, and the Broward County Comprehensive Plan. These activities included attendance at Florida Department of Community Affairs workshops, meetings with adjacent local government membership on comprehensive planning committees and analysis of other plans.

City staff maintained membership of the Technical Advisory Committee of the Broward County Planning Council, until it was dissolved in 2004. The Council is involved in a variety of countywide planning issues and is the ultimate authority on land use throughout the County. The Technical Advisory Committee had closely followed the development of the County's Comprehensive Plan.

City staff attended meetings and workshops conducted by the Florida Department of Community Affairs. These meetings provided technical information and insight into the Department's expectations regarding the development of the comprehensive plan.

The City of Deerfield Beach submitted drafts of portions of its comprehensive plan to several state agencies which had provided funds for their development. The comments provided by these agencies assisted in ensuring comprehensive plan consistency. The City received technical memorandums from state agencies regarding preparation of the comprehensive plans. The ideas and recommendations from these memorandums were incorporated into the City's plan.

City staff met with the South Florida Regional Planning Council and South Florida Water Management District (SFWMD) to coordinate development of the comprehensive plan. The Regional Planning council provided a copy of the Comprehensive Review Process, (July 1988). This document describes the comprehensive planning process, lists ideas and expectations the Council has for the plans and provides checklists for information to be contained within the plans.

In 2006, the City adopted its 2005 Evaluation and Appraisal report (EAR). As a result, corrections, modifications of time frames and the addition of policies mandated by Chapter 163, F.S. have been included as EAR-based amendments.

7.4 BASELINE DATA

The purpose of the Conservation Element (CE) is to promote the conservation, wise use, and protection of the City's natural resources. These resources include water and water quality, air quality, floodplains and soils, natural resources including vegetative, marine and wildlife communities. Problems and opportunities related to the conservation of these resources have been identified in the Analysis Section.

7.4.1 WATER RESOURCES AND WATER QUALITY

7.4.1.1 Wetlands

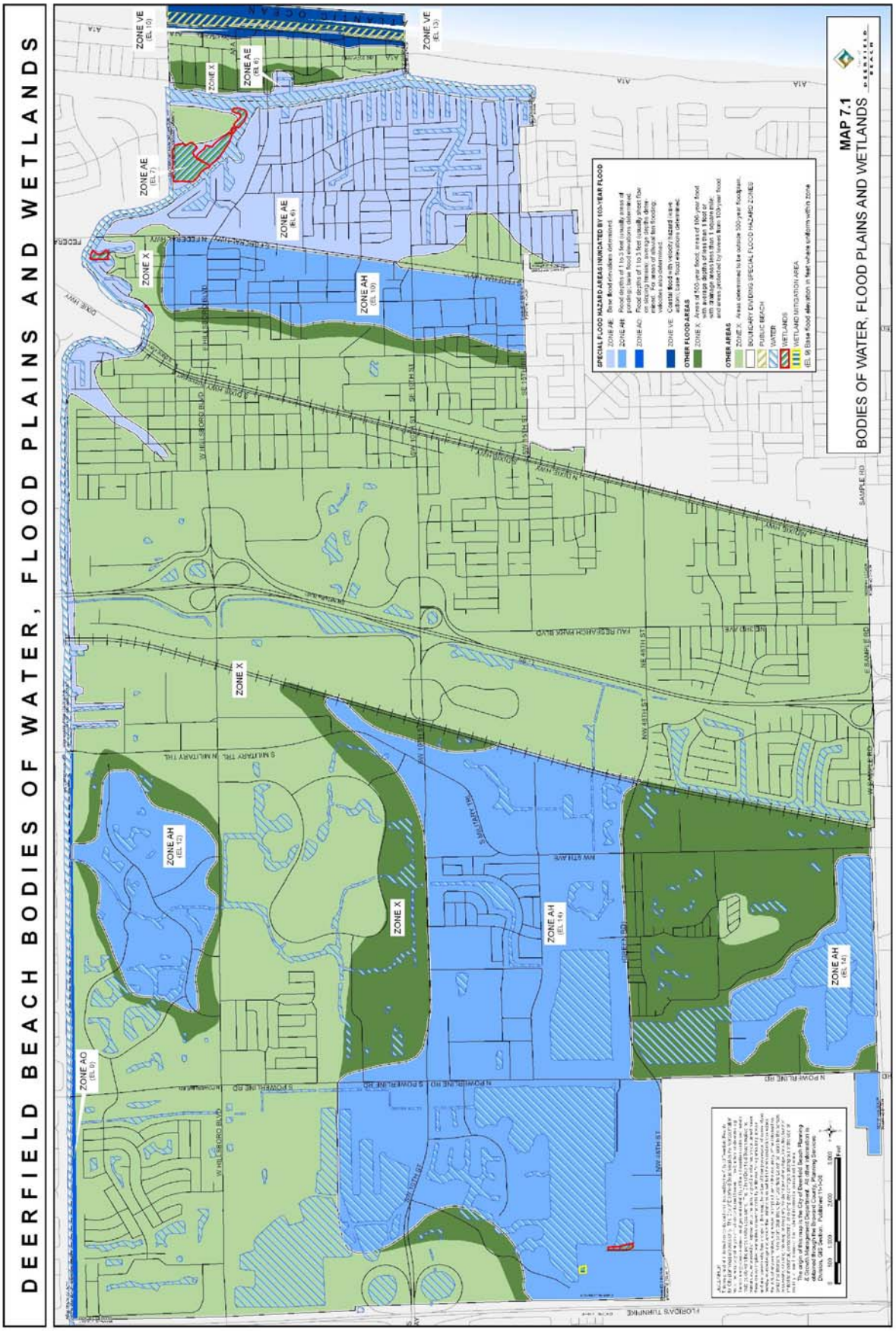
With less than 3.5 percent of its land vacant, the City's 3 wetland areas as illustrated on Map 7-1 have been degraded as a result of growth and development activities. The first wetland area is located north of Northwest 48th Street and is zoned heavy industrial. With the construction of a new roadway to service the surrounding properties, the wetland was partially filled and a wetland mitigation area was created adjacent to a nearby lake. This wetland is classified as a shrub and brushland wetland, with wax myrtle and willow vegetation. The second wetland area is located along the south bank of the Hillsboro Canal. It is considered a saltwater swamp, with red, white and black mangroves. It is surrounded by single family homes and a marina. The third wetland area is part of the Deerfield Island Park along the Hillsboro Canal and Intracoastal Waterway. It is also classified as a saltwater swamp wetland, protected by Conservation and Recreation Open Space land use designations. The total acreage of wetlands in the City is approximately 24 acres.

The County's Department of Environmental Protection (DPEP) administers a program to protect and preserve wetlands. A license must be issued by DPEP prior to the alteration of wetlands. Decisions to issue licenses are made by evaluating the quality and condition of the wetland as derived from a numerical ranking of wetland importance per federal guidelines.

7.4.1.2 Surface Water and Canals

The City's surface water bodies as shown on Map 7.1 are a complex system of fresh and brackish waterways, including freshwater ponds, stormwater management lakes, man-made canals and the Intracoastal Waterway (ICW). All surface waters in the City are designated Class III waters by the Florida Department of Environmental Protection (FDEP). Class III waters have fish and wildlife propagation as their designated use and are not suitable for public water supply use.

Primary drainage canals constructed by SFWMD provided flood protection to the low-lying areas of the lower east coast of Florida. They also aided in providing water supply, wetland enhancement, mitigate saltwater intrusion and recreation opportunities. The Hillsboro Canal is a designated primary canal. Its function per the County's Plan is to provide drainage for over 102 square miles of land, water for wellfield recharge, convey excess water from Water Conservation Area 1 (WCA 1) to tidewater via the Intracoastal Waterway, and to maintain ground water elevations west of the Deerfield Lock to prevent salt water intrusion.


DEERFIELD BEACH BODIES OF WATER, FLOOD PLAINS AND WETLANDS
MAP 7.1
BODIES OF WATER, FLOOD PLAINS AND WETLANDS
SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD
OTHER FLOOD AREAS
OTHER AREAS
BOUNDARY DIVIDING SPECIAL FLOOD HAZARD ZONES
PUBLIC BEACH
WATER
WETLANDS
WETLAND MITIGATION AREA
ZONE AE
ZONE AH
ZONE AO
ZONE VE
ZONE X
SE 10TH ST
SE 13TH ST
NE 48TH ST
NW 56TH AVE
N POWERLINE RD
S POWERLINE RD
W HILLSBORO BLVD
SAMPLE RD
A1A

Broward County Water Management Division (WMD) has divided the County into smaller drainage districts of manageable size. The City lies in a district approximately 12 square miles in size, bounded on the east by the Eastern Coastal ridge (about one-half mile west of the Florida East Coast railway), on the west by the Florida Turnpike, on the south by Sample Road and north by the Hillsboro Canal. Regional responsibilities of the WMD include a system of secondary and tertiary canals that connect with Crystal Lake, the Bonnie Loch Canals and several large retention ponds to form a drainage system west of Interstate I-95.

The City is responsible for local drainage facilities that are not a private system. Specific information concerning drainage jurisdictions, and locations of drainage features maybe found in the Drainage Sub-Element of the Utilities Element.

7.4.1.3 Rivers, Lakes and Bays

There are no water bodies classifieds as rivers or bays within the City. Lakes, the largest being Crystal Lake are primarily located west of Interstate I-95. They include a major lake used for water skiing in Quiet Waters Park, and three large lakes along the Powerline Road corridor. All of the existing lakes are manmade, usually formed as a by-product of excavation or mining activities for road construction.

7.4.1.4 Groundwater

Two major aquifer systems underlie the eastern part of the County and City: the deep Floridan Aquifer System and a shallower Biscayne Aquifer System. The Biscayne Aquifer is a high quality aquifer producing large quantities of water. The Floridan Aquifer is present throughout the State and is the deepest part of the active ground water flow system. The Floridan Aquifer water requires desalination treatment to be used for either irrigation or potable use.

Groundwater from the Biscayne Aquifer is the current source for all of the City's potable water supply. The City has begun the process of utilizing the Floridan Aquifer for an additional source of water. In some of the older areas of the City, shallow private wells supply water for landscape irrigation. However, these households encompass a small minority of properties and represent an insignificant amount of water consumption.

7.4.2 AIR QUALITY

The Broward County Department of Planning and Environmental Protection (DPEP) reported that the outdoor air quality was good ninety-two (92) percent of the time in 2003. The frequent occurrence of sea breezes helps to keep the pollutants levels well dispersed and contributes to good air quality. The County maintains air quality monitoring stations across the region and reports a daily pollution standard index (PSI). The PSI is determined by the day's highest pollutant (adjusted for toxicity) and based on a scale of 0-500 as follows: 0-50, good; 51-100, moderate; 101-200, unhealthful; 201-300, very unhealthful; 301-500, hazardous.

Ozone has been the primary pollutant of concern in South Florida. The highest concentrations of ozone generally occur in the spring and fall. Motor vehicles are the responsible for more than 50 percent of ozone related emissions per the County's statistics.

7.4.3 FLOODPLAIN

Coastal and inland flooding continue to be integral aspects of the City's environment. Map 7-1 shows existing floodplains and flood prone areas in the City. Zones designated "A" are expected to flood during the 100-year storm event. Approximately 33 percent of the City lies in an "A" zone. Through concurrency management, all development must meet the stormwater management criteria established by SFWMD, Broward County Department of Environmental Protection (DEP) the City Code and the Florida Building Code. The City through its land development code reinforces these requirements, stating that in no cases shall the first floor elevation be set below the elevation established by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map.

7.4.4 COMMERCIALLY VALUABLE MINERALS

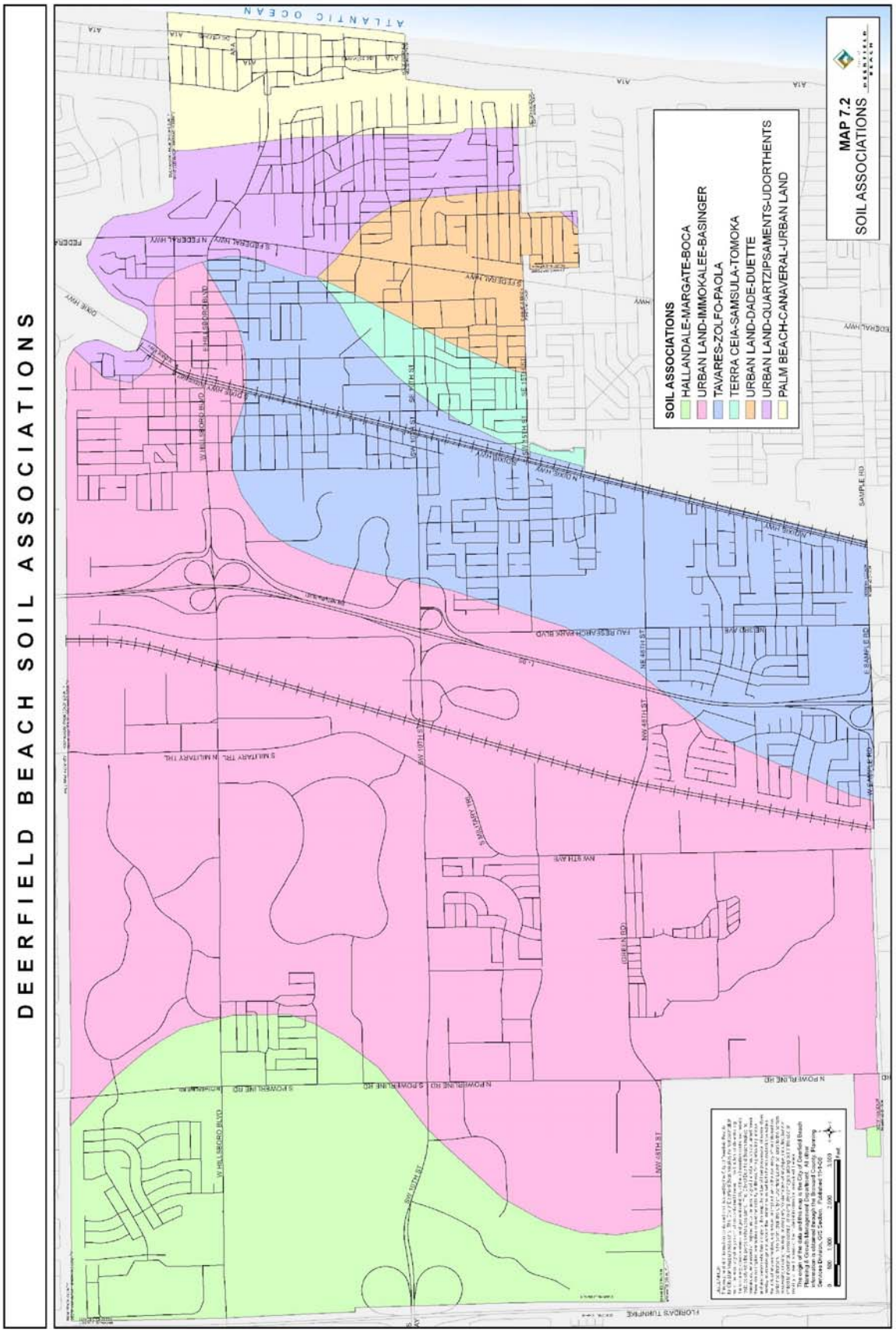
The City has two lakes which are zoned for commercial mining, however no commercial mining activity is occurring at this time. These lakes were mined for non–metallic minerals, mostly crushed limestone or gravel used in conjunction for roadways. Future mining activity of these lakes is considered limited, as urban uses (including residential) surround the areas and are encouraging recreational uses instead of mining or filling.

7.4.5 SOIL ASSOCIATIONS AND EROSION

The City of Deerfield Beach has elevations between 10 and 15 feet, with soils that are classified as urban, which means they have been significantly altered through dredge and fill activity. Seven different soil associations are located within the City as shown on Map 7-2. The Hallandale-Margate-Boca association is characterized by nearly level elevations and is considered not suitable for septic or drainfield use. The eastern portion of the City is made up of mostly sandy soil, some of which are poorly drained and others well drained. Sandy soils include the Tavares-Paola, and Palm Beach soil associations. Since the construction of drainage structures, the City has been almost entirely developed for urban use.

Per the U.S. Department of Agriculture, inland soil erosion is considered minimal except at construction sites. Coastal erosion by the natural low of sand, storm/wave action or man-made construction is a continuous concern along the City's Atlantic Ocean beachfront, Intracoastal Waterway and the Hillsboro Canal.

Beach erosion and wind driven sand occurs along the City shoreline during storm events. The City has a groin system in place which has helped to reduce these effects. The City participates in a beach vegetative and sand renourishmnet program to help stabilize the beach primary dune.


DEERFIELD BEACH SOIL ASSOCIATIONS
MAP 7.2
SOIL ASSOCIATIONS
SOIL ASSOCIATIONS
HALLANDALE-MARGATE-BOCA
URBAN LAND-IMMOKALEE-BASINGER
TAVARES-ZOLFO-PAOLA
TERRA CEIA-SAMSULA-TOMOKA
URBAN LAND-DADE-DUETTE
URBAN LAND-QUARTZIPSAMENTS-UDORTHENTS
PALM BEACH-CANAVERAL-URBAN LAND
ATLANTIC OCEAN

7.4.6 NATURAL RESOURCE AREAS

7.4.6.1 Recreationally Important Fish or Shellfish

Recreational fishing is one of the most important water activities off the City's coast. Charter boats, pleasure craft, tackle and bait businesses constitute a major part of the recreational fishing business. Commercial charter boat operations are based at the Cove Marina on the Intracoastal Waterway and the City provides deep-sea fishing from its 740-foot fishing pier.

7.4.6.3 Commercially Important Fish or Shellfish

Very little commercial fishing takes place in Broward County. Netting, fish traps and bottom longlines are prohibited by the State. The County's Comprehensive Plan stated that 1.6 million pounds of commercial fish and shellfish was caught in 1994, consisting of over fifty different species.

7.4.6.4 Wildlife

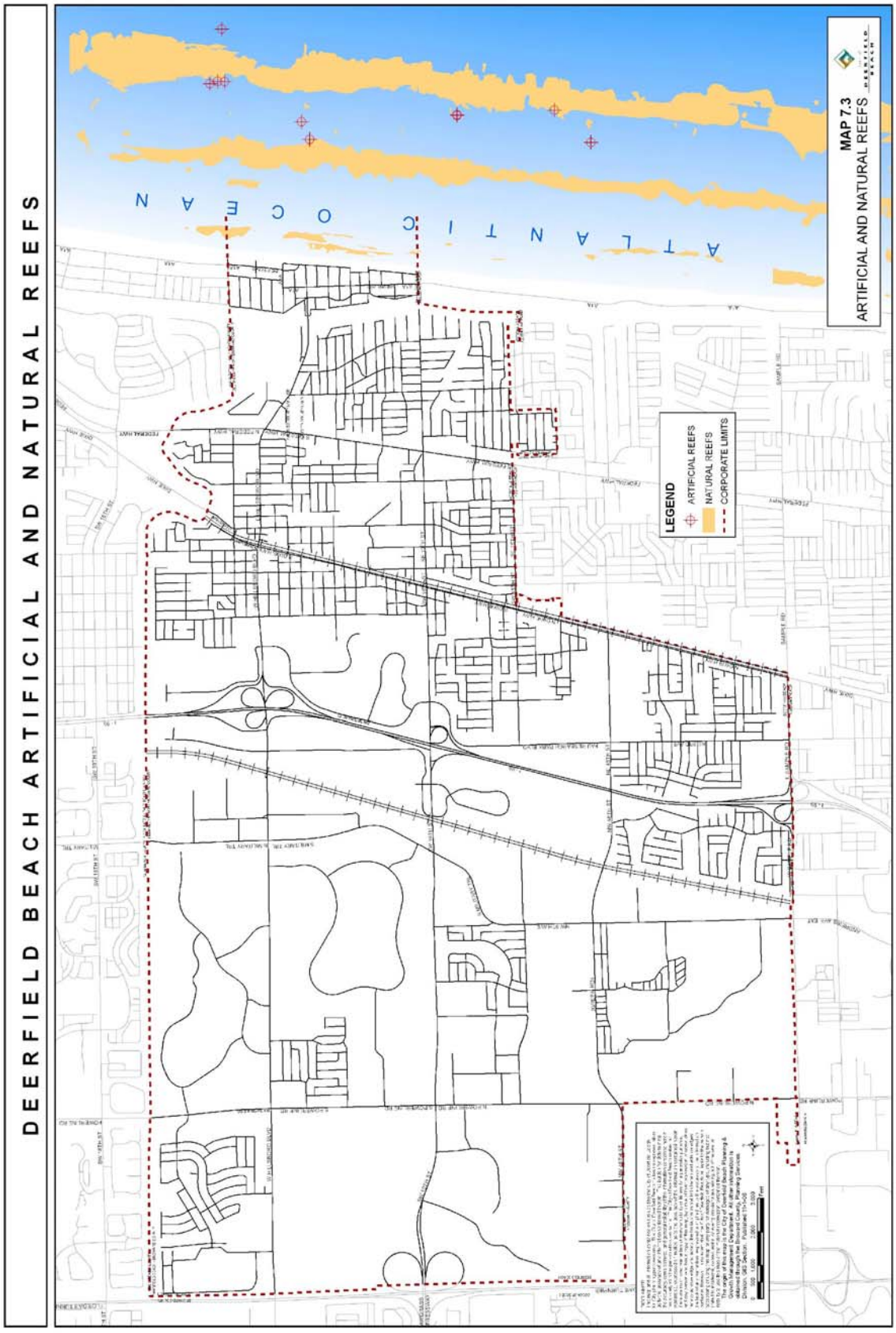
Broward County consists of nine ecological communities per Appendix A. The ecological communities found in the City of Deerfield include the beach and dune, coastal strand forest, mangrove, scrub, pine flatwoods, low hammock and cypress wetlands. Numerous species of plants and wildlife including twenty species of endangered, threatened or rare, plants, mammals, birds and reptiles inhabit those communities. A listing of dominant plants and wildlife including endangered, threatened and rare species found in each ecological community is attached in Appendix B. An inventory of birds sighted in the County's regional parks is included in Appendix C. The inventory consists of over 200 species and is representative of the birds which can be found throughout the County.

7.4.6.5 Marine Habitats

Most of the City's marine habitat is found in the shallow open ocean area along the coast. Broward County has conducted an artificial reef program to provide habitat for marine species and expand recreational diving and fishing opportunities. The location of the artificial and man-made reefs off the City's shore is illustrated in Map 7.3. Mangrove habitats also provide nesting areas and nurseries for many marine species and food for the manatees. The mangrove communities in the City are located along the Hillsboro Canal, east of the lock at Military Trail.

7.4.6.6 Significant Vegetative Communities

An inventory of vegetative communities found in Broward County and the City is incorporated in Appendix A, Ecological Communities. An inventory of endangered and threatened plants found in the County is included in Appendix B.


DEERFIELD BEACH ARTIFICIAL AND NATURAL REEFS
ATLANTIC OCEAN
MAP 7.3
ARTIFICIAL AND NATURAL REEFS
LEGEND
ARTIFICIAL REEFS
NATURAL REEFS
CORPORATE LIMITS

CURRENT WATER NEEDS AND SOURCES

7.4.7.1 Water Sources and Consumption Use permit

As part of annexation agreements, certain areas of the City that are currently served by Broward County Water and Sewer utilities (BCWWS), and will continue to be served by Broward County infrastructure have not been include in the data and analysis for water needs and sources in this element. This section will only address those areas of the City which are served by City utilities and infrastructure. The City's 10-Year Water Supply Facility Work Plan (Appendix A of the Utilities Element), addresses BCWWS ability to meet potable water standards for those areas of the City it serves to the 2030 planning horizon. The County's adopted Water Supply Plan 2008, provides details of the existing infrastructure and the water planning rational required to meet level of service standards countywide. Map 7-4 illustrates the areas served by each utility service area. These services include potable water, sanitary sewer, drainage and stormwater management.

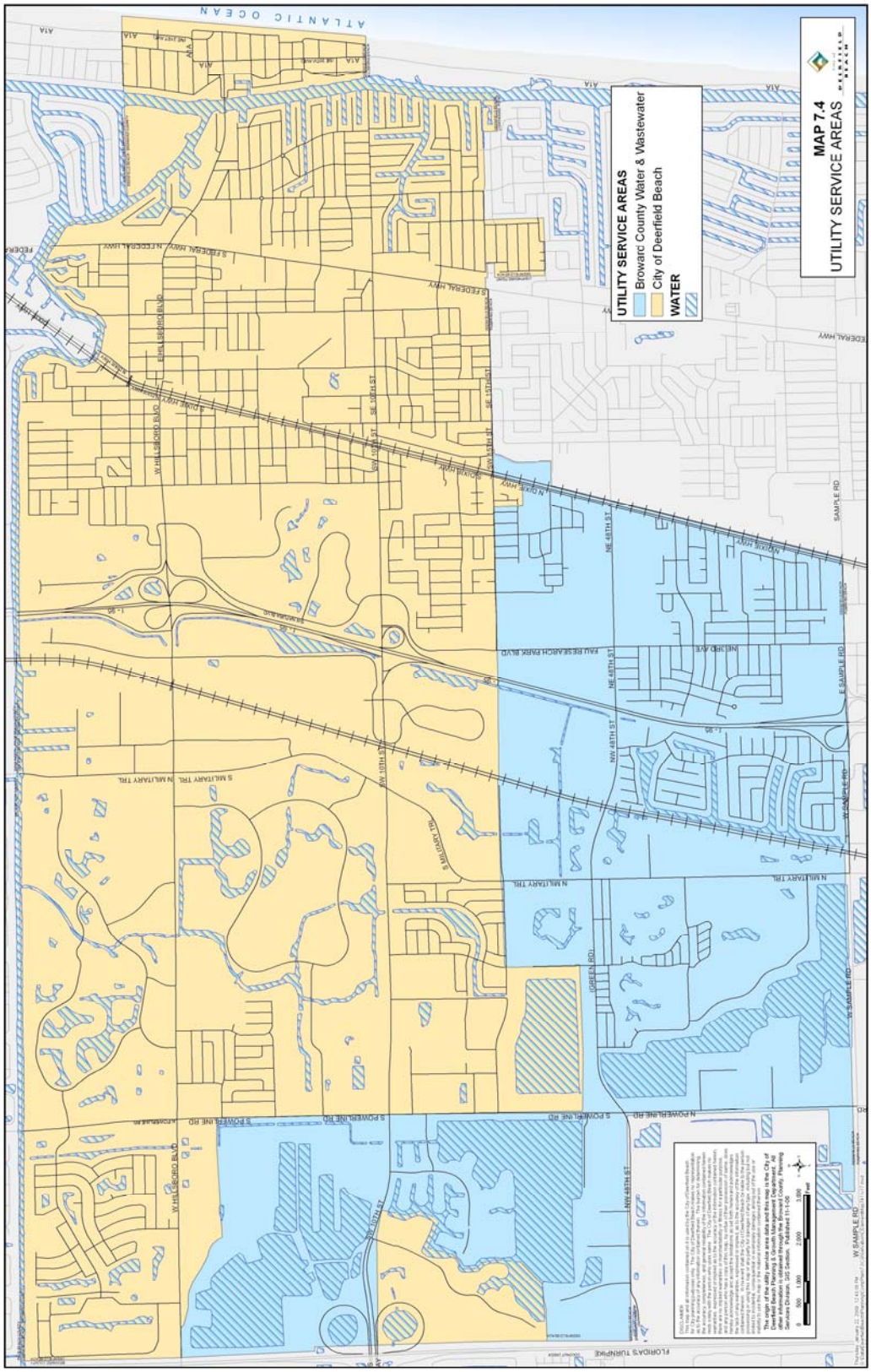
The Biscayne Aquifer is the main source of the public water in the City of Deerfield Beach. The aquifer is an unconfined aquifer which underlies the County. Aquifer recharge primarily occurs as a result of rainfall, although during the dry months SFWMD releases water from the Water Conservation Areas to recharge the aquifer. While the City receives an average of 60 inches of rainfall a year, due to evapo-transpiration and run-off discharged directly into the canals to the Atlantic Ocean, only 15-20 inches actually reach the aquifer.

While not in operation, the City is in the process of constructing a 3.0 MGD reverse osmosis treatment plant and two Floridan Aquifer wells due to concerns and expected limitations on the Biscayne Aquifer. The City's CIE, and Five-Year Schedule of Capital Improvements includes the capital improvements required to implement the 10-Year Water Supply Facilities Work Plan (Work Plan).

As part of the Lower East Coast-Water Supply Plan (LECWSP), SFWMD requires the planning and implementation of water conservation measures, (by the public water supply utility and associated governments) be in place before a consumptive use permit may be issued. Examples of requirements include the adoption of local ordinances that affect irrigation hours, landscaping, plumbing fixtures, leak detection, rate structures and public education. The City's Land Development Code, Work Plan and CIE incorporate these requirements.

The SFWMD regulates the withdrawal of potable water from the Biscayne Aquifer through the issuance of a consumption use permit (CUP). The consumption use permit is valid for 5 years. In 2004 SFWMD allocated to the City's utility district a maximum monthly (MG/M) raw water withdrawal of 102.00 from the east wellfield and 335.4 MG/M from the west wellfield for a total of 437.4 MG/M. The City also purchases a maximum of 0.89 million gallons per day (MGD) of potable water from the County. The City's current CUP permit expires September 9, 2009. Therefore the City is diligently working with SFWMD to meet all requirements, to ensure the feasibility of the new CUP.

DEERFIELD BEACH UTILITY SERVICE AREAS



Current Water Allocation:

2004 LEC permitted raw water withdrawal**:** 12.07 MGD/or Max. monthly 437.4 MG/M
(Annual Aver. Permitted Daily Wellfield)

Water purchased from County: 0.89 MGD
(Maximum Day Bulk Purchase)

Total 2004 raw water availability: **12.96 MGD**

7.4.7.2 Current Water Needs

The Potable Water Sub-Element of the Utilities Element provides details on the City's potable water supply system, including wellfield pumpage and equipment, treatment plant capacity, storage and distribution. From the Utilities Element (UE), wellfield pumpage rates and total of raw water used for 2003 through 2005 are shown on Table 7.1

Table 7.1 Annual Totals Wellfield Pumpage (million gallons)

Year	East Wells	West Wells	Total Wellfield Withdrawal	County Interconnect	Total Raw Water Used
2003	930.48 2.79 (mgd)	2663.20 7.97 (mgd)	3593.68 (mg) 10.76 (mgd0	194.05 (mg) 0.58(mgd)	3787.73 (mg) **11.34 (mgd)**
2004	1366.01 3.74 (mgd)	2824.12 7.74 (mgd)	4190.12 (mg) 11.48 (mgd)	236.92 (mg) 0.65 (mgd)	4427.04 (mg) **12.13 (mgd)**
2005	1081.73 2.96 (mgd)	2930.36 8.03 (mgd)	4012.08 (mg) 10.99 (mgd)	262.03 (mg) 0.72 (mgd)	4274.11 (mg) **11.71 (mgd**)

Hazen and Sawyer 2006

The level of service (LOS) provided by the City is 175 gallons per capita per day (GPCD) on an average day basis for residential service. The system-wide LOS (including irrigation and non-residential uses) is 200 GPCD on an average day and 265 GPCD on a maximum day basis.

As part of their 10-year water supply plan, SFWMD has adopted a water shortage plan which is put into effect during drought emergencies. The plan is designed to produce an immediate reduction in pumpage from the Biscayne Aquifer. As part of the requirements for consumption use permits, SFWMD has developed a conservation program involving irrigation restrictions, xeriscaping, ultra-low volume plumbing devices, conservation rate structures, utility leak detection and public education. The City of Deerfield Beach participates in this program through the Code of Ordinances, CIE and utility operations.

7.5 ANALYSIS REQUIREMENTS

This section identifies problems and opportunities that relate to the conservation of natural resources. Issues of concern relate to the cause and effects of pollution, deterioration and depletion of natural resources. Natural resources of particular concern are surface water, groundwater, soil and wildlife habitats. Specific conservation issues analyzed are surface water and groundwater quality, potable water availability and conservation, soil and beach erosion, protection of vegetative communities and wildlife habitats.

7.5.1 WATER RESOURCES AND WATER QUALITY

7.5.1.1 Wetlands

The City has approximately 24 acres of wetlands, predominately found along the Hillsboro Canal at Deerfield Island Park. These wetlands are protected with a conservation future land use designation and a recreation and open space zoning designation. Other wetlands in the City have been incorporated into a single family development or have been previously mitigated to allow for industrial development. The largest threat to wetlands in developed areas is the loss of their vitality through lack of maintenance or becoming compromised with exotic vegetation from neighboring properties.

The City and County monitor wetland impacts through the development plan and building permit review and concurrency processes. The County compensates for unavoidable wetland impacts by requiring appropriate levels of mitigation depending upon the quantity and quality of wetlands to be impacted.

7.5.1.2 Surface Water and Canals

Surface water quality declines during the summer months when urban runoff from rainfall, combines with high water temperature and creates a concentrated nutrient environment. These nutrients promote the growth of aquatic pests such as bacteria, algae and hyacinth, which depletes water of dissolved oxygen. Urban runoff also transports toxic materials such as pesticides, heavy metals, and hydrocarbons and dissolved inorganic materials. As development activity increases, the total amount of polluted urban runoff concurrently increases. Therefore urban development and the drainage waters it produces can have a serious negative impact on surface water quality (Broward Conservation Element, 1988).

The volume of stormwater runoff is governed primarily by infiltration characteristics and is related to the land use, soil type, topography and vegetative cover. Thus, runoff is directly related to the percentage of the area covered by roofs, streets, and other impervious surfaces. Water intercepted by vegetation and evaporated or transpired is lost from runoff. Water infiltrated into the soil and groundwater is delivered as delayed flow to the stream and does not contribute directly to peak stormwater run off. Impervious surfaces normally contribute almost all of the total rain immediately to stormwater runoff.

Since 1972, the County has monitored the surface and ground water quality throughout the County, including 3 surface water sites along the Hillsboro Canal and Intracoastal Waterway as shown on Map 7.5. The County's Plan states that these tests measure the general water quality and are used to characterize the overall ecological health of the system and to evaluate any potential human health risks. The stations are sampled quarterly. The County also conducts special project tests such as drainage basin characterization, where testing for metals, pesticides, herbicides and other organic compounds are performed.

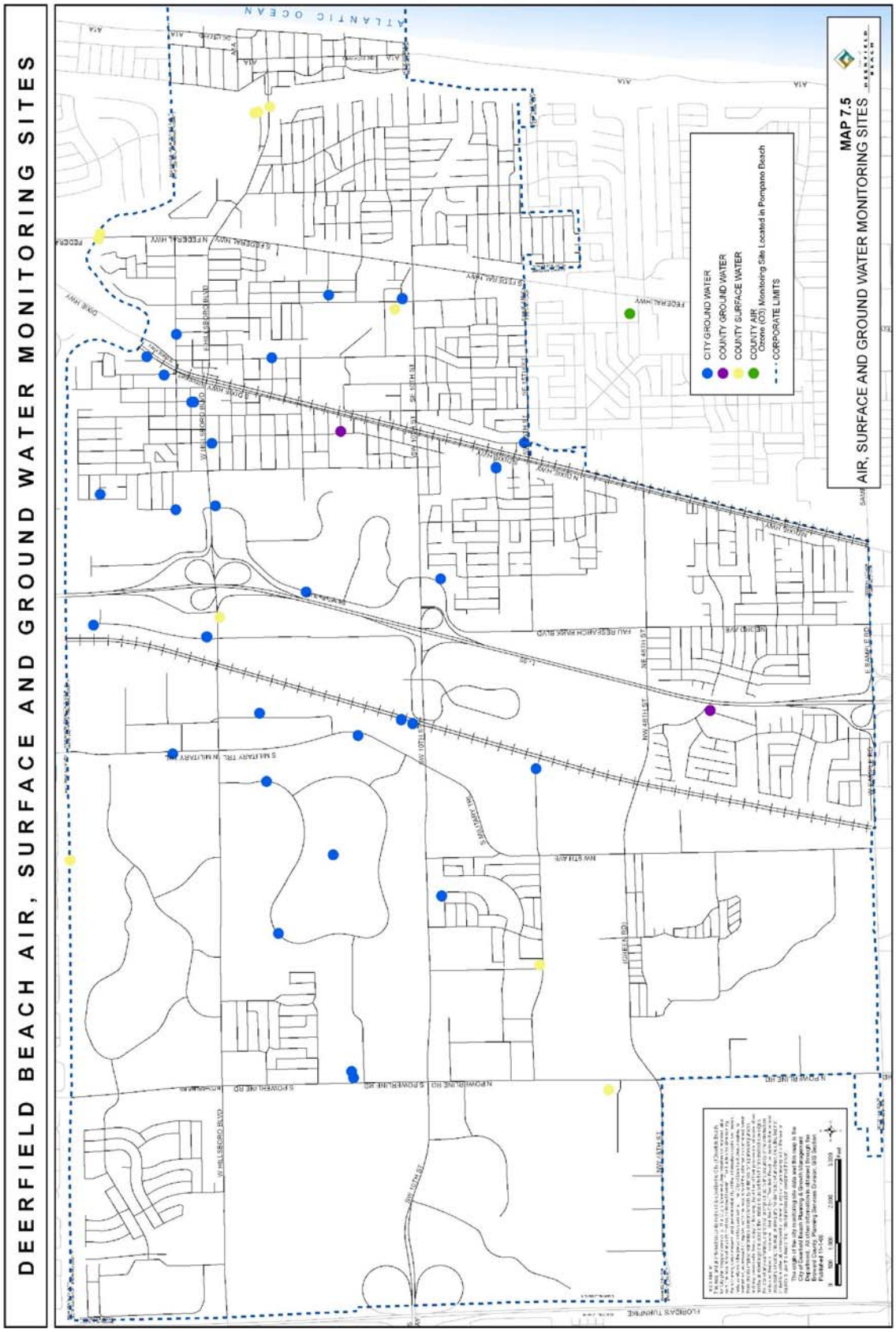
Urban runoff also causes the build-up of sediment in canals, restricting flow and navigation. In the Hillsboro Canal, sediment accumulates wherever the water slows up – at bends, around bridges and at the mouths of feeder canals. This build-up of sediment reduces the facility's ability to move water and to provide flood protection given a heavy rainstorm or hurricane.

The Hillsboro Canal is an original Everglades Drainage District canal built in the 1920s and controlled by the South Florida Water Management District (SFWMD). In 1990 a new flood control lock was constructed west of Military Trail. The main benefit of this project was to provide flood control; however, adverse environmental impacts on the estuarine system could occur, due to higher freshwater discharges, higher levels of nutrients and the potential for lower water quality.

Sediment build-up is also a problem in the finger canals, which connect to the Intracoastal Waterway. In 2005 the City performed a bathometric survey of all the finger canals south of Hillsboro Boulevard. and east of Federal Highway. The Kingfisher and Tern waterways were found to have the most sediment and were dredged in 2005. Dredging for the remaining finger canals was completed in 2006.

Properly designed, constructed, operated and maintained drainage systems remove pollutants from storm runoff prior to discharging into surface waters and provide the requirement levels of flood protection in accordance with established criteria for proposed developments. SFWMD Surface Water management Rules require that projects be designed to meet State water quality standards as described in Chapter 62, F.A.C. and Broward County Standards as described in the County Code. This means that the City of Deerfield Beach may not accept a building permit unless it is stamped and approved by Broward County DEP. In the older areas of City, which were developed before onsite storage of stormwater regulations, the City promotes the reservation of green space, golf course and lawns as potential recharge sites. Recent redevelopment of commercial and residential properties east of I-95 has helped to bring these areas into stormwater compliance.

In general, retention provides two main benefits for water quality. First, it requires non-point source pollution to be collected to a point suitable for treatment. Secondly, retention and detention increases water quality by allowing sediment, a predominant stormwater pollutant to settle. It is expected that the City's drainage impact on adjacent bodies of water will not increase significantly in the future because the City is near built-out and future development requires on-site storage of run-off volumes that exceed the SFWMD discharge rate.


DEERFIELD BEACH AIR, SURFACE AND GROUND WATER MONITORING SITES
MAP 7.5
AIR, SURFACE AND GROUND WATER MONITORING SITES
CITY GROUND WATER
COUNTY GROUND WATER
COUNTY SURFACE WATER
COUNTY AIR
Ozone (O3) Monitoring Site Located in Pompano Beach
CORPORATE LIMITS
ATLANTIC OCEAN

7.5.1.3 Rivers, Lakes and Bays

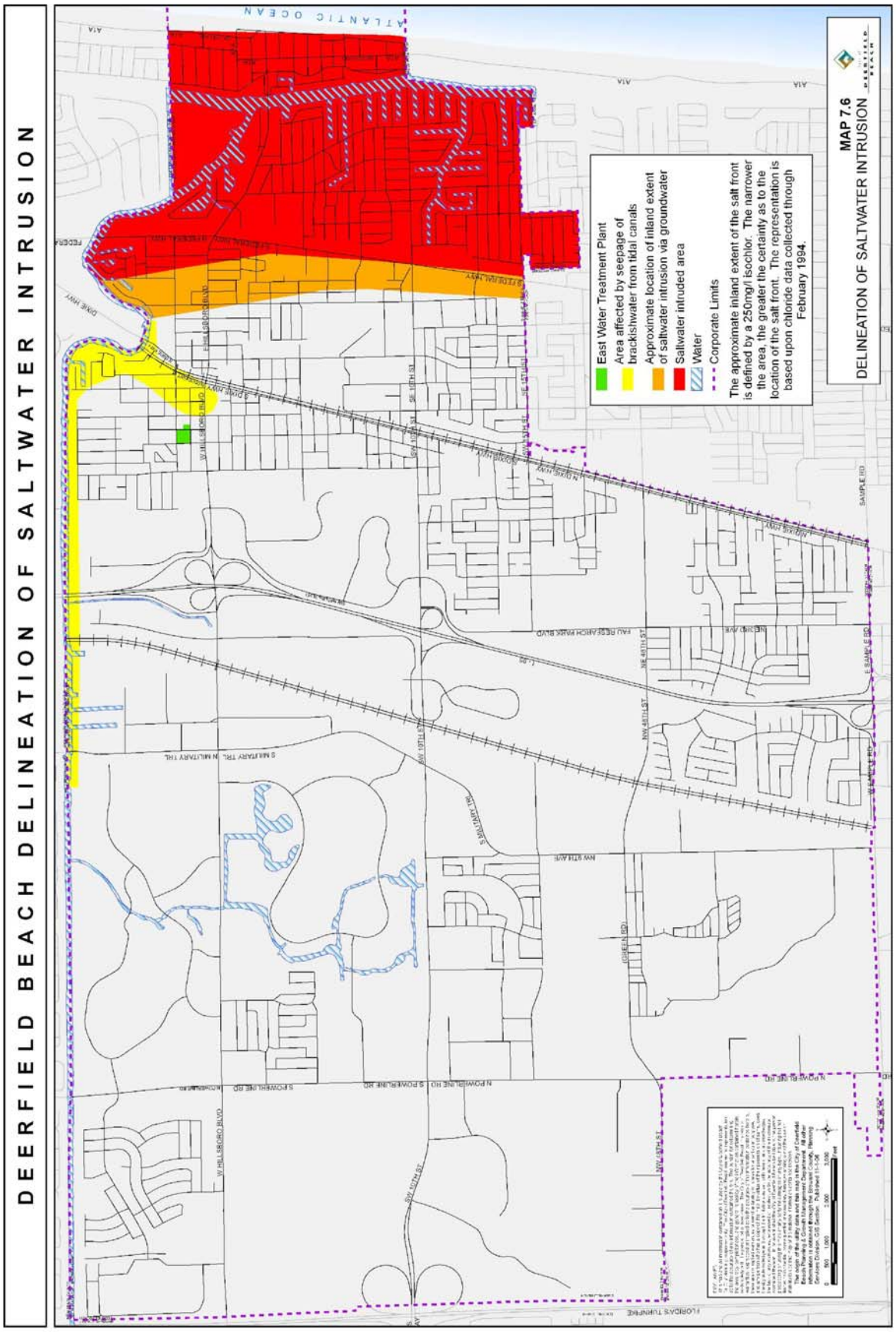
There are no water bodies classified as rivers or bays within the City. Lake excavation and filling is regulated by Chapter 27 of the County's Code. The creation of new lakes, canals or other water bodies must meet the minimum side slope and vegetation requirements of this Chapter. Many of the existing lakes and borrowed pits were constructed with little or no side slope making them dangerous for children and nonswimming adults. This is true of the borrow pit lakes along Powerline and Sample Roads which are deep and have steep side slopes. The County's Plan states "that earlier designs of lakes rendered them biologically dysfunctional and provided direct access of polluted runoff to the Biscayne Aquifer. Erosion from excavated material contributed to the siltation of the associated rock. Lower Crystal Lake, at Sample Road still shows signs of siltation from excavation. All of the City lakes were created prior to the County's 1993 lake requirements. However, side slope, drainage and vegetation requirements are enforced when new development is approved though the City's development plan review and the County's building permit concurrency approvals.

7.5.1.4 Groundwater

Protection of groundwater quality in the City is dependent upon proper management of the Biscayne and Floridan Aquifers. Saltwater intrusion and the threat of wellfield contamination are the City's most serious water quality issues. Several studies have been conducted to ascertain the condition of the aquifers from a potable water perspective. Water quality is tested daily at the City's two water treatment plants (WTP). The City also operates a total of 37 monitoring wells positioned throughout the City to gather data on water quality and groundwater levels as shown on Map 7.6. These wells are of two types: salt water intrusion monitoring and multi-depth potentiometer head measuring. A report containing any changes in the quality or quantity of groundwater is published monthly.

Historically groundwater wells were located in the eastern sections of coastal cities. The groundwater found along the sand ridge was clean, with good water quality. Due to the threat of saltwater intrusion into the wells, SFWMD limited the amount of water the City may pump from the eastern wellfield. The designed pumping capacity of the East Wellfield is 16 MGD; however, because of problems with saltwater intrusion, the safe yield averages a maximum withdrawal of 3.35 MGD. The City's principal objective in supplying potable water has now become the development of a one-plant scenario at the west water plant, and to convert the east water plant to a pump/station storage facility. The located of the east well field and its relationship to the area affected by seepage of brackish water from tidal canals is illustrated in Map 7.6.

Another serious water quality problem is wellfield contamination by industrial/commercial pollution. To limit future contamination of the groundwater by point sources of pollution, the City and County adopted the Wellfield Protection Ordinance in August 1984. The purpose of the Ordinance is to safeguard public health by providing criteria for the regulation of storage, handling, use, or production of hazardous or toxic substances within the zones of influence of water supply wells. The Broward County's Wellfield and Environmental Services Team (W&EST) is governed by Article XIII of the Natural Resource Protection Code and provides monitoring, inspection and licensing services of well zone properties.


DEERFIELD BEACH DELINEATION OF SALTWATER INTRUSION
ATLANTIC OCEAN
A1A
MAP 7.6
DELINEATION OF SALTWATER INTRUSION
East Water Treatment Plant
Area affected by seepage of brackishwater from tidal canals
Approximate location of inland extent of saltwater intrusion via groundwater
Saltwater intruded area
Water
Corporate Limits
The approximate inland extent of the salt front is defined by a 250mg/l isochlor. The narrower the area, the greater the certainty as to the location of the salt front. The representation is based upon chloride data collected through February 1994.
SAMPLE RD
W HILLSBORO BLVD
S POWERLINE RD
N POWERLINE RD
FLORIDA TURNPIKE

In order to provide protection to the water supply, the County has established zones of influence around each wellfield. Zones are delineated by the theoretical time it takes for contaminants to travel from the point they enter the ground to the Wellfield Information System to store and process the information.

Broward County has three protection zones: Zone1, Zone 2, and Zone 3. Restrictions are highest in Zone 1. These protected areas act as safety buffers against accidental contaminant release, where known containments are used, stored, produced or handled before they reach the public supply wells. A summary of criteria for each well zone is as follows:

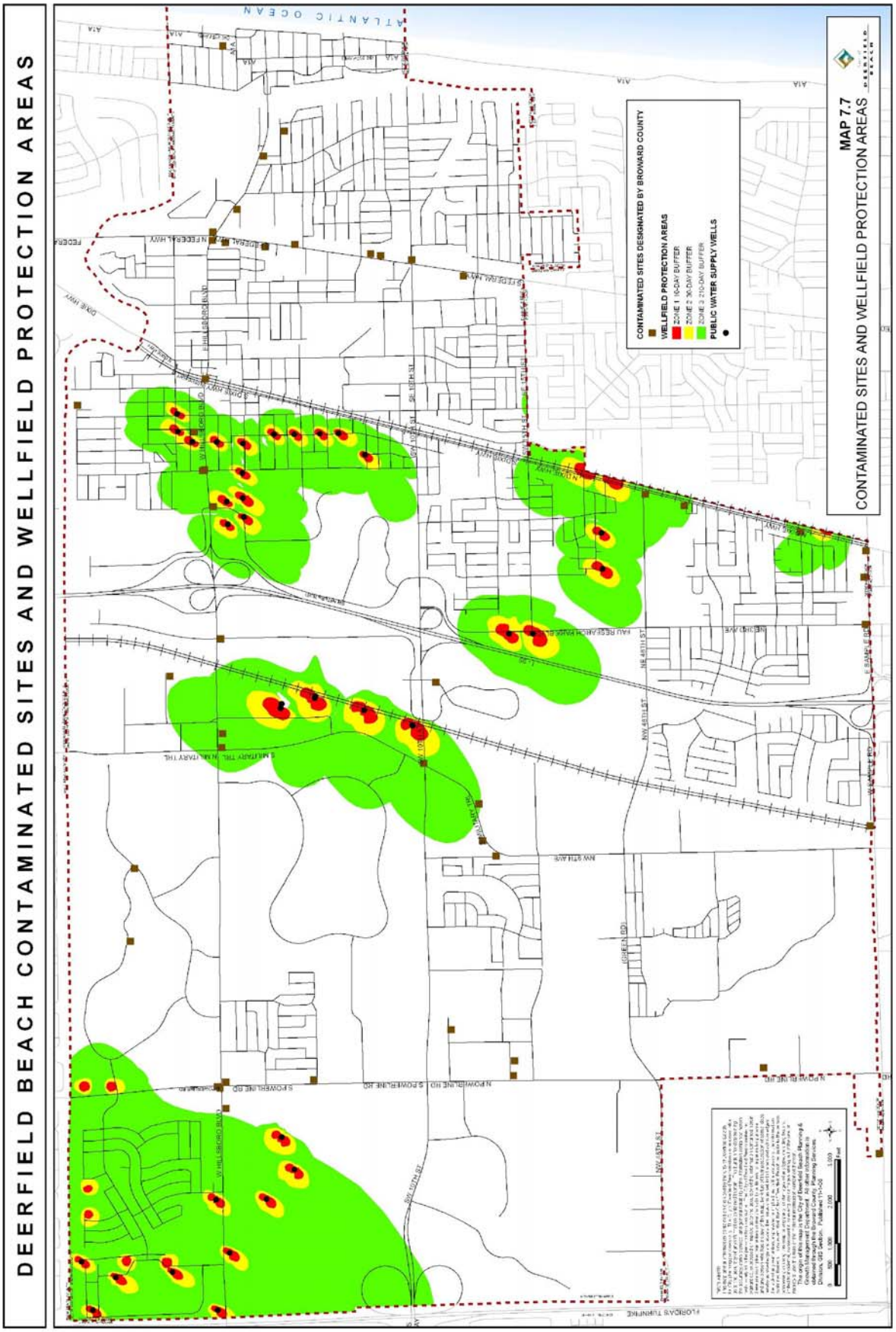
- Zone 1 provides a 10-day buffer around the wellfield.
- Zone 2 provides a 30-day buffer.
- Zone 3 provides a 210-day buffer.

Within these zones of influence certain uses are restricted.

- Zone 1 – No non-residential activity, which includes the storage, handling, usage or production of any hazardous or toxic substances, is permitted.
- Zone 2 – Non-residential activity, which includes the storage, handling, use or production of hazardous or toxic substances, requires a permit with certain restrictions. The restrictions relate to specific and timely well water tests for the accumulation of hazardous wastes. If an increase of 10 percent occurs in the tests for those hazardous materials stored, handled or used, specific consequences are delineated.
- Zone 3 – Those activities involving the storage, handling, production or use of hazardous or toxic substances shall obtain a Wellfield Protection Operating Permit to operate unless specifically exempted by the Broward County "Potable Water Supply Wellfield Protection Ordinance."

The County also monitors the groundwater with a system of 61 wells surrounding major wellfields and undeveloped areas of high aquifer recharge.

Map 7.7 illustrates the wellfield protection zones around the City's wells and identifies contaminated sites per County regulations. Through the City's Land Development Code, development review process and licensing requirements, all development plans are reviewed to insure that land uses and hazardous substances are not used in violation of the County's Wellfield Protection Ordinance. The City will notify the County of any known or suspected violations.


DEERFIELD BEACH CONTAMINATED SITES AND WELLFIELD PROTECTION AREAS
ATLANTIC OCEAN
CONTAMINATED SITES DESIGNATED BY BROWARD COUNTY
WELLFIELD PROTECTION AREAS
ZONE 1 10-DAY BUFFER
ZONE 2 30-DAY BUFFER
ZONE 3 210-DAY BUFFER
PUBLIC WATER SUPPLY WELLS
MAP 7.7
CONTAMINATED SITES AND WELLFIELD PROTECTION AREAS

Septic tanks systems are also a possible point for ground water pollution. There are only 13 septic tank systems in the City. The City monitors these parcels for any redevelopment in the area and will promote property compliance as it becomes feasible. Objective 1.5 of the Utility Element states that all pollution-causing septic tank systems will be eliminated within the City limits by the year 2010. To advance this objective, the City has enforced policy UT 1.5.2: New septic tanks will not be permitted in the City after June 1, 1989.

7.5.2 AIR QUALITY

In order to keep the regional clean air attainment status as determined by the EPA, the County is required to keep organic compounds (VOC) and nitrogen oxides (NOX) emissions associated with vehicle emissions at 1990 levels. The consequences of exceeding emission levels could result in the implementation of costly pollution control measures and federal sanctions for Broward County and the region.

The 2004 County's Environmental Benchmark Report affirmed, "The pressures on the state of our air quality from industrial and vehicular emissions are increasing. Residents are using more electricity per capita, increasing the need for power generation. As a community we are driving a greater total number of miles per year, although as individuals we are driving fewer. In response to the pressures on our air quality, government fleets are increasingly using alternative fuels. The miles of greenways and bicycle friendly roadways are increasing each year to encourage use of alternative modes of transportation. The number of community shuttles and their ridership is also increasing to reduce high traffic congestion in downtown areas".

With the implementation of the Transit Concurrency System, the County has taken a major step in expanding the regional mass transit system and offering people a bona fide alternative to using their car.

The City of Deerfield Beach has 10 alternative fuel vehicles that are used in the daily operation at the public works facility. The City also uses bio-diesel B-20 vegetable oil fuel in their diesel only vehicles. The City's three community buses serve the programs of our community agencies and have established a popular public transit connection between the beach area and the areas west of I-95. The City will continue to participate in the County's and MPO's Transit Development Plan and the expansion of the regional mass transit system to reduce the dependency of vehicular use. The City will strive to promote transit oriented developments that capture vehicular trips. This would lead to a response-type performance measure such as the number of mass transit trips per year.

7.5.3 FLOODPLAINS

All development in the City is permitted and reviewed through the Broward County Concurrency Management System. With the creation of the County's 22 water control districts, a system of secondary canals and manmade lakes have been developed to alleviate flooding problems. Even with the existence of regional flood control regulations and structures, water storage during a major storm event could still be a serious problem for flood prone areas. As a result, the City participates in the Federal Emergency Management Agency (FEMA) Federal Flood Insurance

Program. The City's Land Development Code states, "that in no case shall the first floor elevation be set below the elevation established by FEMA maps."

7.5.4 COMMERCIALLY VALUABLE MINERALS

There is no active mining operation in the City. However, former mining operations have had an impact upon surface water quality. As stated in the lakes analysis, former borrow pits increase the opportunity for untreated urban run-off to enter the aquifer and are a potential danger to the general public. These private, borrow pit lakes are under more pressure to be filled than to be excavated or mined. Due to a court settlement, 11 acres of the Crystal Lake was recently filled and is in the process of changing its future land use designation from recreation-open space to industrial. A fill permit was also issued to property located on the Ledds Enterprises II Plat to expand its industrial acreage.

Adopted state reclamation requirements address some of these concerns, as well as the U.S. Army Corps of Engineers and the SFWMD permit requirements.

7.5.5 SOIL ASSOCIATIONS AND EROSION

Unlike the County, the City does not allow new septic tanks. The ability of a soil type to be suitable for septic tank usage is not an issue in the City. The U.S. Department of Agriculture has indicated that inland erosion is minimal with the exception of siltation at construction sites. As a coastal City, soil and sand erosion is always an issue along the City's 3,175 linear feet of Atlantic beachfront, the Intracoastal Waterway and the Hillsboro Canal.

In 1955, a seawall was constructed between Blocks 3 and 4 of the Ocean Vue Subdivision to prevent residential yards from being covered by water. In 1960 the seawall was extended southward to the fishing pier. In 1957, a study by the University of Florida's Coastal Engineering Laboratory determined that the annual erosion for the previous 4 years had been from 9 to12 feet per year, with lesser erosion experienced on the southern beaches. It was also determined that from 1927 to 1957 approximately 30 acres were lost to the sea along Deerfield Beach's coastline. To alleviate this problem, the City built timber groins designed to collect and retain the sand. They were replaced by concrete piling groins between 1964 and 1967. The groins have been a very effective in collecting sand, especially when neighboring cities nourish their beaches and the City can capture drifting sand.

By a special act of the Florida Legislature, the County was given the authority to implement a beach renourishment program for the County's entire ocean shoreline. While the City protested, Broward County began dredging sand off its shoreline as a sand source for other cities as far south as the City of Hollywood. This is a great concern for the City of Deerfield Beach due to the potential change in the ocean floor bottom, and the loss of a nearby sand resource should its beaches need to be renourished. The first phase of the County's beach renourishmnet project is scheduled to be completed in 2006.

7.5.6 NATURAL RESOURCE AREAS

7.5.6.1 Recreationally Important Fish or Shellfish

With the City's central location between the Boca Raton and Hillsboro inlets, boating access to the Atlantic Ocean and fishing grounds can be achieved in a timely manner. With 5 marinas, two fueling docks and a public boat launch, the City stores, docks and service the marine industry. For those that don't own boats, the City operates a fishing pier. Anglers using the pier are often awarded by the catch of a wide variety of fish, such as bluefish, mackerel, kingfish, dolphin, grouper and snapper. The operation has a minimal charge and is open 24 hours a day, seven days a week. The pier users are also provided with bait and tackle shop. The opportunities for recreation boating and fishing are an important recreational component for the citizens of Deerfield Beach.

The County administers an artificial reef program, with nines sites located off the City's shoreline. The County's Plan stated that the effectiveness of the artificial reef program was in conclusive. "Certainly more habitat is provided. It is not known whether providing an increased quantity of habitat actually leads to an increased abundance of aquatic life or biodiversity". The artificial reefs are used as dive sites for local dive companies.

7.5.6.2 Commercially Important Fish or Shellfish

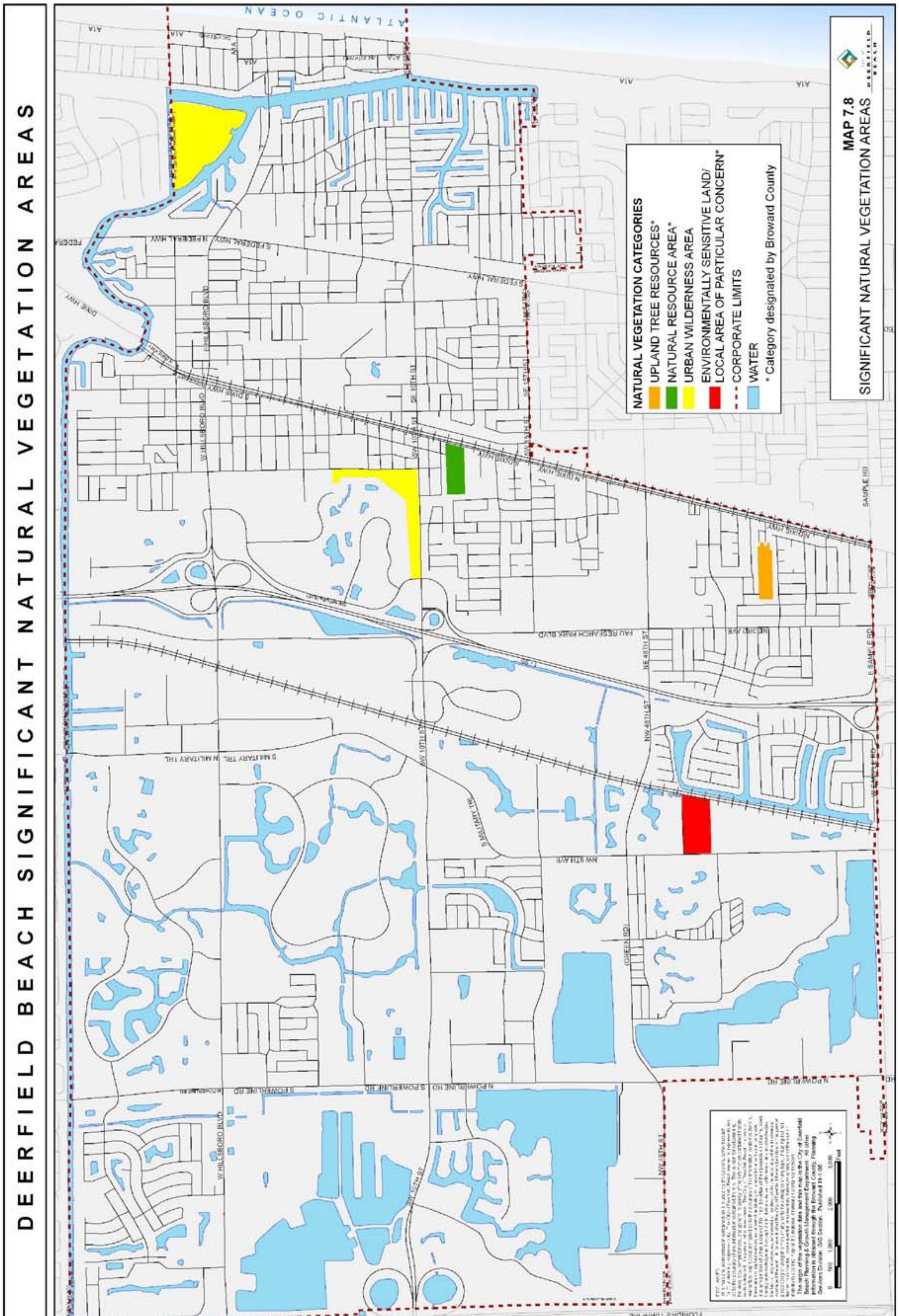
Opportunities to enhance commercial saltwater fishing are limited, as the City does not have a public marina. Commercial fishing charter boats have traditionally operated from the Cove Marina along the Intracoastal Waterway. This marina became "dockominiums" and the charter fleet was dispersed to other locations. Dive charter boats use the docking facilities of two marinas along the Hillsboro Canal. The expansion of commercial use of the Hillsboro Canal is restricted, due to low clearance of fixed ridges and the size of the vessels which can navigate underneath them.

7.5.6.3 Wildlife and Significant Natural Vegetation Areas

Conservation of wildlife species is dependent upon the conservation of vegetative resources to provide them with food, shelter and nesting areas. With less than 3.5 percent of its land vacant, the City has few remaining areas of significant natural vegetation. Through the Land Development Code, the City participates in the County's designation of natural resources areas as illustrated on Map 7-8. These areas represent vegetative communities that once flourished in the City. The County's designations do not necessarily preclude development on the properties, but limit activities which may occur. All development is preceded by an environmental impact report and mitigation measures may be required.

Of the four designated natural resource areas in the City, only a 12-acre parcel is under pressure for development, since it is the only parcel privately owned. This parcel is the City's last vacant residential parcel over ten acres. Its designation as a Natural Resource Area has helped it to remain vacant, due to mitigation measures which may be imposed by the County.

The upland tree resource property located off Dixie Highway, has recently been purchased by the County and will become a passive park.


DEERFIELD BEACH SIGNIFICANT NATURAL VEGETATION AREAS
NATURAL VEGETATION CATEGORIES
UPLAND TREE RESOURCES*
NATURAL RESOURCE AREA*
URBAN WILDERNESS AREA
ENVIRONMENTALLY SENSITIVE LAND/
LOCAL AREA OF PARTICULAR CONCERN*
CORPORATE LIMITS
WATER
* Category designated by Broward County
MAP 7.8
SIGNIFICANT NATURAL VEGETATION AREAS
ATLANTIC OCEAN

Another method for protecting existing natural resource areas is to have them designated as an Urban Wilderness Area (UWA). UWAs are acquired by public funds and maintained as passive recreational areas. The city has two-designated wilderness areas including the Tivoli Sand Pine Preserve and the Deerfield Island Park.

Tivoli Sand Pine Preserve

This Urban Wilderness Site is located north of Southwest 10th Street between Southwest Natura Boulevard and Southwest 3rd Avenue. Approximately 23 acres in size, this Scrub Community includes one of the largest remaining stands of Sand Pine in Broward County.

The Sand Pine Scrub Community is the most ancient south Florida habitat. It is also one of the most rare. Scrub plant species have been able to survive poor soils, limited water and fire. They are unable to survive what man usually deems "progress". These twenty-three acres of fine scrub habitat have been preserved through the cooperation of a developer, the City and the County.

Tours of Tivoli Sand Pine Preserve can only be made by appointment. The tours are especially useful as an educational tool for area schools.

Deerfield Island Park

Located on the northern border of the City immediately west of the Intracoastal Waterway, this 56-acre marine resource includes developing Coastal Hammock and Mangrove Communities. The marsh areas of the park are actively preserved wetlands.

Deerfield Island was connected to the mainland until the 1950's, when the Royal Palm Waterway was dug by a private developer. Most of the vegetation is native to the area and Deerfield Island includes both freshwater and saltwater environments. The Park is owned by the State of Florida and leased to Broward County.

A Mangrove Community occupies approximately 8 acres of the saltwater swamp with species of red, white and black mangrove trees. This mangrove hammock is flushed out twice daily by the tides. An elevated wooden walkway through this area allows easy access.

Two-thirds of the island has some amount of spoil (dredged material from canals and the Intracoastal Waterway) covering it with invasive Australian Pines. The weight of this material causes damage to the root system of most trees, particularly the Slash Pine. Five acres on the northeast corner are reserved for spoil from the Intracoastal Waterway.

The park is open 7 days per week, but is only accessible by boat. The County operates a pontoon boat (at no charge) to transport visitors to the island. A picnic and a 15-acre camping area (for non-profit youth groups) are also available to visitors. Private tours for groups of from 15 to 50 may be arranged.

Tree Preservation

The City has had a Tree Preservation Ordinance in effect since October 1972. The ordinance establishes rules and regulations governing the protection of the City's trees. It established a permit system for tree removal on a city-wide basis. Trees are not to be damaged or removed without a permit. In September of 2005, the tree preservation ordinance was amended in accordance with Broward County's revised tree preservation rules.

Endangered or Threatened Species

The aquatic environment of Broward County supports endangered species such as the West Indian Manatee and three species of sea turtles (Atlantic Loggerhead, Atlantic Green and Atlantic Leatherback). The loggerhead turtle is listed as a threatened species while the green and leatherback turtles are listed as endangered under the U.S. Endangered Species Act, 1973 and Chapter 370, F.S. The City's beaches are a nesting area for all three types of sea turtles. The Broward County Department of Environmental Protection (DEP) reported in its 2003 sea turtle nesting report that 2,425 nests were found, representing a small increase of 4.9 percent from 2002. Found on the Deerfield Beach to Hillsboro Beach shoreline (7.0 KM in length), were 55 green, 7 leatherback and 708 loggerhead turtles nests. Beach activities such as beach cleaning are curtailed during nesting season to facilitate the turtles and protect their nests. The Florida Building Code also sets lighting limits for buildings to help ensure that hatchlings are not disoriented and may find their way back to the ocean.

The West Indian Manatee has been seen along the Hillsboro Canal and the Intracoastal Waterway. The Florida Fish and Wildlife Research Institute estimated the 2005 West Indian Manatee population to be 3,143 animals statewide. Approximately 1,594 of these manatees live in the waters found along the Atlantic Coast. It is not known how many manatees live in the County year-round, however their numbers increase during the winter months when migration from the central part of the State occurs.

State manatee protection speed zones established on the Intracoastal help reduce the number of manatee deaths from boating interactions. The Florida Fish and Wildlife Research Institute reported 6 manatees were killed in Broward County in 2004. One manatee's probable cause of death was probably by watercraft interaction.

In January 2006, the Florida Fish and Wildlife Conservation Commission recommended that the Gopher Tortoise be reclassified from species of special concern to threatened species. The continued population and habitat decline of the tortoise contributed to this assessment. Deerfield Island Park is an approved State of Florida refuge for the Gopher Tortoise in which there are 27 burrows. Tivoli Sand Pine Preserve is also a Gopher Tortoise habitat with at least 3 burrows.

Appendix B lists the endangered and threaten plants and animals found in Broward County. Many of the listed plants are found in the western rural areas of the County and can not live to the urban areas of the City. Satin Leaf (an endangered plant) can be found at a special City xeriscape project in the median of Powerline Road north of Hillsboro Boulevard. In addition, Satin Leaf has been planted by private citizens. Coconut palms

are listed as a threatened species. With the development of new varieties of coconut palms, coconuts palms have made a come-back in their use for beach and residential plantings.

7.5.7 PROJECTED WATER NEEDS AND SOURCES

7.5.7.1 Future Potable Water Demands

The City's Potable Water Sub-Element of the Utilities Element was revised in 2009 along with the adoption of a 10-Year Water Supply Facilities Work Plan. The water consumption data represented in Table 7.2 represent the most current estimates for the average and maximum future day demand on the potable water system.

The 224 gallons per capita per day (gpcd) annual average day demand and the 265 gpcd maximum day demand take into account all consumers within the City's service area, including commercial and industrial users such as the Publix distribution facility. For a more accurate indication of residential per capita consumption, the SFWMD and the City agreed to subtract large water users from the total annual consumption and then dividing by the population, resulting in an annual average residential consumption rate of 175 gpcd.

Table 7.2 Historical and Projected Finished Water

Year	Population (Utility Dist.)	Annual Average Day Demand (mgd)	Average Annual Per Capita Consumption (gpcd)	Max. Day Demand (mgd)	Max. Day Per Capita Consumption (gpcd)
Historical					
2000	53,484	11.94	223	15.19	284
2001	53,952	9.86	183	14.80	274
2002	54,420	10.93	201	14.66	269
2003	54,889	10.71	195	13.55	247
2004	55,357	10.88	197	14.18	256
2005	55,825	11.19	201	14.36	257
Projected					
2010	58,457	13.08	224	15.49	265
2015	62,347	13.95	224	16.52	265
2020	65,616	14.68	224	17.39	265
2025	68,662	**15.36**	224	18.20	265

Source: Hazen and Sawyer, Utilities Element

Due to the concerns and limitations expected on the Biscayne Aquifer raw water supplies, the City will need additional capacity to meet adopted level of service standards. The City is moving forward with securing raw water from a second raw water source, the Floridan Aquifer and treating it with reverse membrane osmosis softening.

The City will construct one new Floridan well and equip one existing Floridan well for a total raw water yield of 5.0 ~~1.5~~ MGD. The City will construct two new Biscayne Aquifer wells for a total yield of 4.0 MGD to meet the need for additional water in 2025.

The City's plan for providing future potable water also includes correcting existing deficiencies in the system, and expanding the water conservation program focusing on the wise use of water and irrigation.

7.5.7.2 Water Conservation

The need to conserve water in South Florida is becoming increasingly important as both the population and the cost of providing water increase. In addition to emergency short-term conservation during drought periods, long-term conservation measures are desirable to help ensure that adequate affordable water will continue to be available. The City prepared a water conservation plan for the SFWMD with the issuance of its 2004 use permit

One method of water conservation practiced by the City is the use of a rate structure that gives the consumer an incentive to reduce water demand (constant price per gallon). Since water bills are based on consumption, consumers can save money by using less water.

The City Commission also amended the City Code, in concert with Broward County and F.A.C. Chapter 40E-21 rules, so that if SFWMD declares a water shortage condition, special water deductions are implemented and fully enforced.

Irrigation demand for the City was estimated in the 1989 Plan independently as the difference between total billed water consumption and total wastewater flows measured at the master pump station. The results confirm that a significant amount of irrigation occurs, especially during the months of April through August. At that time, more than half of all billed water consumption is not returned to the sewer because of irrigation or other outside uses.

The irrigation is primarily for the maintenance of lush lawns and other water-hungry plants. By replacing water hungry plants with drought tolerant plants, a significant volume of water could be conserved. Xeriscaping is creative landscaping using drought tolerant plants and reduced grass areas. The result is low maintenance and low irrigation. The City has a xeriscape ordinance as part of the landscape code. The misuse of irrigation or over watering is also a public practice that should be corrected. It is not uncommon to see yards with their sprinklers on in a rain storm. The use of rain gauges in all irrigation applications not just commercial properties should be promoted.

Education of consumers on the importance of water conservation and water reduction practices is an effective program to limit water usage. This could be accomplished by enclosing information pamphlets with or adding conservation messages to the monthly utility bills. Signs and announcements or articles in local papers are also effective. Utility employees could make

presentations to local civic organizations about water conservation to provide longer-range conservation awareness.

The City's Building and Inspection Services Division also includes in its inspection procedures that all new construction have water conservation control devices installed per the Florida Energy Code as a condition for granting certificates of occupancy.

7.5.8 SUMMARY OF CONSERVATION MEASURES

The following are conservation measures brought up in this section:

- Urban runoff related to the protection of surface and groundwater quality;
- Sediment accumulation in canals;
- Meeting current and future potable water needs with alternative water supply resources;
- Wellfield protection by locating businesses using hazardous waste away from wellfields;
- Water conservation measures needed so supply of groundwater is preserved;
- Development of a one-plant scenario at the west water plant, and converting the eastern water plant to a pump station/storage facility to eliminate salt water intrusion conflicts,
- Development in the floodplain in such a way to minimize flood damage;
- Use of alternative fuels and transit oriented concurrency to help eliminate problems with high concentrations of carbon monoxide and ozone in the air;
- Beach planting to reduce soil erosion caused by tidal activity;
- Preservation of natural areas by ordinance and enforcement mechanisms; and
- Endangered species protection.

7.6 IMPLEMENTATION STRATEGIES

The City's goals, objectives and policies (GOPs) for natural resource conservation are presented in Section 7.2 of this element. To meet them, the Comprehensive Plan must be properly implemented. Implementation of the Conservation Element is the responsibility of the Departments of Public Works and Environmental Services, Building and Inspection Services, Planning and Growth Management, and the Development Review Committee (DRC). The DRC is composed of the Department Heads (or their designees) of Public Works and Environmental Services, Building, Fire, Police, and Planning and Growth Management. This will be an ongoing, day-to-day process.

Compliance with regulatory programs stated in the Conservation Element is achieved through the Land Development Code, which addresses zoning, landscaping, tree preservation, natural resource areas, flood plain and elevations, water quality, consumption and conservation, development review regulations and procedures and through the cooperation and coordination with the Broward County Concurrency Management approval process.

The City's Land Development Code specifies that the City shall approve no plat, site plan, or building permit until it has made a positive determination of consistency with the Comprehensive Plan and concurrency in the following:

1) local transportation network,
2) regional road network,
3) stormwater management,
4) potable water,
5) wastewater,
6) solid waste,
7) local parks and recreation facilities,
8) fire protection, and
9) police protection.

This Concurrency Management System establishes the administrative procedures necessary to ensure that the necessary infrastructure facilities are available concurrent with the impacts of development.

7.7 MONITORING AND EVALUATION PROCEDURES

The monitoring and evaluation of the progress of the composite comprehensive plan will be coordinated by the City's Planning and Growth Management Department, working through the City's Development Review Committee.

In addition, as required by Rule 9J-5, F.A.C., an Evaluation and Appraisal Report (EAR) will be prepared every seven years to assess the long range progress of the plan. The Planning and Growth Management Department will submit the EAR to the City Manager, City Commission and to the State as necessary and required.

Appendix A

Ecological Communities
Broward County
1996

1. Beach and Dune Community

General Description: Composed of unconsolidated sand facing the open ocean and shaped by the wind, waves, currents, and tides. Behind the beach, sand may be piled up by the wind forming dunes. The key to pronounced dune growth is adequate sand supplies and the existence of pioneer vegetation.

Geology and Soils: Ancient coral reef substrate; surface deposits of shell fragments, calcium carbonate and silica sands; soils infertile and unstable; elevation 0-5 feet MSL.

Natural Influences: Wave action; longshore and offshore currents; tides; storm surges; sea level changes; wind; salt spray; sunlight; hurricanes; vegetative colonization.

Man's Influences: Coastal development; jetties; seawalls; beach nourishment; recreational activities; pedestrian and vehicular traffic; beach cleaning equipment; oil spills; ocean dumping.

Dominant Plant Species: Sea Oats (Uniola paniculata); Sea Grape (Coccoloba uvifera); Beach Sunflower (Helianthus debilis); Beach Star (Remirea maritima) (E); Beach Creeper (Ernodea littoralis) (T); Spanish Bayonet (Yucca aloifolia); Cocoplum (Chrysobalanus icaco); Railroad Vine (Ipomoea pes-caprae); Beach Peanut (Okenia hypogaea)(E); Beach Croton (Croton punctatus); Beach Bean (Canavalia humifusa); Saw Palmetto (Serenoa repens); Prickly-pear Cactus (Opuntia humifusa); Nickerbean (Caesalpinia bonduc).

Dominant Animal Species: Atlantic Green Turtle (Chelonia mydas mydas) (E); Atlantic Hawksbill (Eretmochelys imbricata imbricata) (E); Atlantic Loggerhead (Caretta caretta caretta) (T); Atlantic Leatherback (Dermochelys coriaceo) (E); Ghost Crab (Ocypade quadrata); variety of shorebirds; variety of fishes.

Current Status: Few native beaches and dunes remain along Broward County's 24-mile coastline. The 1.1 mile North Beach Park in the City of Hollywood is the largest. Additional parcels of vegetated beach and dunes exist in John U. Lloyd State Recreation Area and in the Town of Hillsboro Beach

2. Coastal Strand Forest Community

General Description: Behind the beach and dunes, forest trees are able to grow protected from salt spray and in soils with some accumulation of organic material. Most of the species

are of Caribbean origin brought to our shores as seeds by tropical currents, storms, and migrating seed-eating birds. The tropical hardwood hammock which develops is more specifically called the coastal strand forest.

Geology and Soils: Ancient coral reef substrate; sandy soils from former dunes; thin layer of organic material; decreased salinity of soil; elevation 10-12 MSL.

Natural Influences: Occasional storm surges; humidity; warming influence of the ocean; proximity to tropical seed sources; hurricanes, protection from wind and salt spray; protection from fire.

Man's Influences: Land development; introduction of exotic plant species; recreational overuse and abuse; illegal collection of native plants.

Dominant Plant Species: Sea Grape (Coccoloba uvifera); Poisonwood (Metopium toxiferum); Mastic (Mastichodendron foetidissimum); Black Ironwood (Krugiodendron ferreum); Paradise Tree (Simarouba glauca); Torchwood (Amyris elemifera); Spanish Stopper (Eugenia foetida); Silver Palm (Coccothrinax argentata); Inkwood (Exothea paniculata); Gumbo-limbo (Bursera simaruba); Sabal Palm (Sabal palmetto); Live Oak (Quercus virginiana); Strangler Fig (Ficus aurea); Red Mangrove (Rhizophora mangle); White Mangrove (Languncularia racemosa); Marlberry (Ardisia escallonioides); White Stopper (Eugenia axillaris); Wild Coffee (Psychotria spp.); Snowberry (Chiococca alba).

Dominant Animal Species: Raccoon (Procyon lotor); Gray Fox (Urocyon cinereoargenteus); migrating Passerines; various squirrels.

Current Status: The last remnants of Broward County's coastal strand forests are contained within Hugh Taylor Birch State Recreation Area and the Bartlett Estate in the City of Fort Lauderdale.

3. Mangrove Community

General Description: Mangrove swamps occur in estuaries, on sheltered coasts, and in protected bays and waterways of tropical and subtropical shallow waters. Mangroves are comprised of salt tolerant trees and shrubs which grow as far inland as the tide ranges. The term "mangrove" encompasses not only a community of plants of several unrelated families/genera, but also the entire habitat including animals and highly organic soils.

Geology and Soils: Oolitic limestone substrate; highly organic mud which may cover marl deposits; elevation approximately MSL.

Natural Influences: Highly saline to fresh water; tidal inundation increases salinity, rain and freshwater runoff decreases salinity; high humidity; protection from wave action; hurricanes; nearly frost-free climate; wood-boring crustaceans.

Man's Influences: Degradation of water quality; dredge and fill operations; construction of marinas and seawalls; coastal development; litter; boat wakes.

Dominant Plant Species: Red Mangrove (Rhizophora mangle); White Mangrove (Languncularia racemosa); Black Mangrove (Avicennia nitida); Buttonwood (Conocarpus erectus); Sea-oxeye Daisy (Borrichia frutescens).

Dominant Animal Species: Mangrove and fiddler crabs, herons, egrets, spoonbill, osprey, mangrove gribble; mollusks, crustaceans, and other mud animals; juveniles of several game and commercial fish; West Indian Manatee (Trichechus manatus latirostris).

Current Status: Although the pressures for coastal development are great, the economic importance of mangrove communities to fish and shrimp industries has led to some protection. Broward County has preserved 1500 acres of mangrove-lined estuary within West Lake Tract Park.

4. Scrub Community

General Description: Scrub is a plant community found on deep, welldrained sand deposits, almost exclusively in Florida. Because of the excessive drainage and intense sunlight, Florida scrub is a harsh, desert-like environment inhabited by specially adapted plants and animals.

Geology and Soils: Ancient sand dunes atop oolitic limestone ridge; deep, fine, well-drained sand deposits; acid soil; very low organic content; elevation 10-20 MSL.

Natural Influences: Desert-like conditions; little soil moisture; rainwater percolates quickly through sand; water table deep beneath the surface, unavailable to plants; intense sunlight; intense reflection; high temperatures; little shade; occasional fire.

Man's Influences: Industrial and residential development; dumping; off-road vehicles; man-caused fires; well fields for drinking water.

Dominant Plant Species: Sand Pine (Pinus clausa); Rosemary (Ceratiola ericoides); Paw-paw (Asimina reticulata)(E); Gopher Apple (Licania michauxii); Scrub Mint (Conradina grandiflora)(T); Spike Moss (Selaginella arenicola) (T); Sand Live Oak (Quercus geminata); Myrtle Oak (Quercus myrtifolia); Chapman Oak (Quercus chapmanii); Rusty Lyonia (Lyonia fruticosa); Tarflower (Befaria racemosa); Saw Palmetto (Serenoa repens); Shiny Lyonia (Lyonia lucida); Tallowwood (Ximenia americana); Curtiss' Milkweed (Asclepias curtissi) (T); Nodding Pinweed (Lechea cernua); terrestrial lichens (Cladonia spp.); associated wildflowers; vines.

Dominant Animal Species: Gopher Tortoise (Gopherus polyphemus)(T); Florida Scrub Lizard (Sceloporus woodi); Florida Scrub Jay (Aphelocoma coerulescens coerulescens)(T).

Current Status: Scrub occurred in Broward County west of the Intracoastal Waterway to the Everglades from Palm Beach County to Dade County and was transversed by swamps and marshes. Only a few remnants remain of this once extensive natural system; examples of this community are the Jungle, Crystal Lake and Military Trail sites preserved through the Broward County 1989 Environmentally Sensitive Land Bond Issue.

5. Pine Flatwoods Community

General Description: Pine flatwoods occur where soils are poorly to well-drained and are fairly uniform in elevation. Slash pine and saw palmetto predominate in this fire-adapted community. Fire eliminates dense vegetation and allows sunlight to penetrate to the understory, which in turn encourages the growth of pine seedlings, grasses, herbs, and shrubs.

Geology and Soils: Oolitic limestone substrate; limestone may be exposed or covered with a thin layer of marl or sand; organic material may accumulate in limestone pockets; elevation 10-15 MSL.

Natural Influences: Low humidity; frequent low-intensity fires; lightning; open sunny environment.

Man's Influences: Industrial and residential development; logging; introduction of exotic plants; disruption of the frequency and increase in the intensity of fires; drainage; off-the-road vehicles.

Dominant Plant Species: Slash pine (Pinus elliotii); Saw Palmetto (Serenoa repens); Gallberry (Ilex glabra); Rusty Lyonia (Lyonia fruticosa); St. John's Wort (Hypercicum spp.); Tickseed (Coreopsis leavenworthii); Pennyroyal (Piloblephis rigidus); Cabbage Palm (Sabal palmetto); Shiny Lyonia (Lyonia lucida); Wax Myrtle (Myrica cerifera); associated herbs, shrubs, and grasses.

Dominant Animal Species: Great Horned Owl (Bubo virginianus); Southern Toad (Bufo terrestris terrestris); Box Turtle (Terrapene carolina bauri); Tree Frog (Hyla spp.); various woodpeckers; various snakes and lizards.

Current Status: No pristine pine flatwoods remain in Broward County. Pinelands have been preserved within Tradewinds Park, Fern Forest Nature Center, Hampton Pines Park, Hillsboro Pineland ESL and Miramar ESL.

6. High Hammock Community

General Description: High hammock forests are among the most diverse systems in south Florida, containing more than 100 species of trees and shrubs. They are widely distributed and develop only where conditions of favorable land elevation and fire protection occur. Hammocks develop slowly as organic material accumulates building up the land. This

association represents the climax community in south Florida. Temperate and tropical plant species are present, accounting for the diversity of high hammocks.

Geology and Soils: Oolitic limestone substrate; exposed or covered by consolidated marl limestone or thin layer of highly organic material; organic soils accumulate within pockets in the highly eroded limestone; elevation 10-15 MSL.

Natural Influences: High humidity; moisture retention of soil; capillary action of limestone from groundwater to surface; protection from fire; protection from frost and wind; shaded understory; tornadoes.

Man's Influences: Residential and commercial development; introduction of exotics; drainage; fire; agriculture; drying effects of roadways; illegal collection of plants; human overuse and abuse.

Dominant Plant Species: Live Oak (Quercus virginiana); Pigeon Plum (Coccoloba diversifolia); Paradise Tree (Simarouba glauca); Gumbo-Limbo (Bursera simaruba); Willow Bustic (Bumelia salicifolia); Lancewood (Nectandra coriacea); Mastic (Mastichodendron foetidissimum); Strangler Fig (Ficus aurea); Satinleaf (Chrysophyllum olivaeforme) (E); Mulberry (Morus rubra); Simpson Stopper (Myrcianthes fragrans); Marlberry (Ardisia escallonioides); Wild Coffee (Psychotria spp.); various ferns.

Dominant Animal Species: Bobcat (Lynx rufus); Opossum (Didelphis marsupialis); Raccoon (Procyon lotor); Armadillo (Dasypus novemcinctus); various owls, squirrels, foxes; migrating passerines, raptors.

Current Status: Historically higher elevations were the prime areas for development. In Broward County, Fern Forest, Snyder Park, and the Pine Island Ridge system remain as examples of the high hammock community.

7. Low Hammock Community

General Description: Low hammocks are areas of dense forest vegetation dominated by tree species, such as laurel oak, strangler fig, and cabbage palm. Low hammocks develop on land that is of sufficient elevation to be seldom flooded, but in close proximity to water environments, and is protected from fire. They frequently occur in transitional areas between drier upland communities and lowland vegetation types, such as marsh, wet prairie, cypress swamp, or mangrove.

Geology and Soils: Oolitic limestone substrate exposed or covered by fine sands; highly organic, moisture-retaining surface soils; elevation 8-10 MSL.

Natural Influences: High humidity; moisture retention of soil; proximity to groundwater and surface water environments; protection from fire; protection from frost and wind; shaded

understory.

Man's Influences: Residential and commercial development; introduction of exotics; drainage; salt water intrusion; fire; illegal collection of plants; filling.

Dominant Plant Species: Laurel Oak (Quercus laurifolia); Strangler Fig (Ficus aurea); Cabbage Palm (Sabal palmetto); Red Maple (Acer rubrum); Cocoplum (Chrysobalanus icaco); Wild Coffee (Psychotria spp.); Marlberry (Ardisia escallonioides); Slash Pine (Pinus elliotii); various ferns.

Dominant Animal Species: Raccoon (Procyon lotor); Gray Fox (Urocyon cinereoargenteus); Turkey Vulture (Cathartes aura); migratory passerines, raptors; various squirrels.

Current Status: In Broward County low hammocks were associated with the Hillsboro River, Cypress Creek, Middle River, and New River systems. Extensive areas of hammock forests have been destroyed by urban development. Remnants are preserved within Secret Woods and Fern Forest Nature Centers.

8. Cypress Wetland Community

General Description: Cypress wetlands occupy the freshwater lowlands of the Atlantic Coastal Plain from the Carolinas to Florida, and along the Gulf of Mexico west to Texas. Temperate deciduous trees dominate areas which are seasonally flooded. Flooding is necessary for the germination of cypress seeds; however, once established young trees can grow in the absence of seasonal inundation.

Geology and Soils: Oolitic or bryozoan limestone substrate covered by a thin layer of sand and/or marl; organic soils accumulate in depressions; elevation 4-12 MSL.

Natural Influences: Seasonal flooding; poorly-drained land; seasonal changes in light intensity; drought; fire.

Man's Influences: Drainage; urbanization; agriculture; logging; salt water intrusion; introduction of exotics; illegal collection of plants.

Dominant Plant Species: Bald-cypress (Taxodium distichum); Red Maple (Acer rubrum); Cocoplum (Chrysobalanus icaco); Wax-Myrtle (Myrica cerifera); Dahoon Holly (Ilex cassine); Pond-apple (Annona glabra); Leather Fern (Acrostichum danaeifolium); Royal Fern (Osmunda regalis); various bromeliads.

Dominant Animal Species: Raccoon (Procyon lotor); Opossum (Didelphis marsupialis); Armadillo (Dasypus novemcinctus); Screech Owl (Otus asio); Water Moccasin (Agkistrodon

piscivorus); Box turtle (Terrapene carolina bauri); various woodpeckers; various tree frogs.

Current Status: Large strands of cypress swamp existed in central Broward County along the historic Hillsborough, Cypress Creek, and New River floodways. Although drainage has allowed for the development of much of our freshwater wetlands, examples of this plant community remain preserved within Tradewinds, Secret Woods, Easterlin, and Fern Forest county parks.

9. Everglades Community

General Description: The Everglades is a flat expanse of freshwater wetland dominated by sawgrass and dotted with tree islands. Lake Okeechobee lies at the head of this shallow, water-filled basin. Before drainage canals were constructed, the water from the lake overflowed into the northern Everglades and, augmented by rainfall, moved slowly southward. Although this sheetflow has been manipulated by man, freshwater remains the key to the survival of the Everglades.

Geology and Soils: Miami limestone or Ft. Thompson formation covered with a thin layer of marl limestone, surface soil a rich organic muck or peat; elevation in Broward County 7-8 MSL.

Natural Influences: Seasonal inundation for approximately six months; sheet flow; drought; fire; alligator holes.

Man's Influences: Water management practices; agriculture; introduction of exotic plants; roadways which impede sheet flow; salt-water intrusion; elimination of deer predators; man-made fires; airboats; swamp buggies.

Dominant Plant Species: Sawgrass (Cladium jamaicensis); Coastal Plain Willow (Salix caroliniana); Wax-Myrtle (Myrica cerifera); Elderberry (Sambucus canadensis); Cattail (Typha spp.); Canna Lily (Canna flaccida); periphyton; various ferns.

Dominant Animal Species: Alligator (Alligator mississippiensis) (T); Snail Kite (Rostrhamus sociabilis); Apple Snail (Pomocea paludosa); Largemouth Bass (Micropterus salmoides); bream (Lepomis spp.); gar (Lepisosteus spp.); crayfish; various water snakes and frogs.

Current Status: The Everglades is a unique ecosystem occurring only in south Florida. Historically the Everglades covered an area of 3,900 square miles from Lake Okeechobee to the Gulf of Mexico and Florida Bay. But its great size alone cannot protect this ecosystem from the disruptive effects of water management practices and commercial agriculture. Approximately 500,000 acres of sawgrass have been destroyed; the remaining sawgrass communities have been impacted in varying degrees. The Conservation Areas and the

Everglades Buffer Strip in western Broward County are representative of the Everglades Community.

Source: Interpretive Section of the Broward County Parks and Recreation Division, 1987.

Appendix B

Endangered and Threatened Plants and Animals
Broward County
1996

Scientific Name	Common Name	Designated Status FGFWFC	FDA	USFWS
Plants				
Acrosichum aureum	Gold leather fern		E	
Acrostichum danaeifolium	Giant leather fern		T	
Anemia adiantifolia	Pine fern		T	
Asclepias curtissii	Curtiss' milkweed		T	
Asplenium abscissum	Spleenwort (unnamed)		T	
Asplenium serratum	Bird's nest spleenwort; wild birdnest fern		E	
Asplenium trichomanes-dentatum	Spleenwort (unnamed)		T	
Bletia purpurea	Pine pink		T	
Campyloneurum phyllitidus	Strap fern (unnamed)	T		
Catopsis floribunda	Air plant (unnamed)		E	
Chrysophyllum olivaeforme	Satinleaf		E	
Coccothrinax argentata	Silver palm		C	
Cocos nucifera	Coconut palm	T		
Ctenitis sloanei	Comb fern (unnamed)	T		
Ctenitis submarginalis	Comb fern (unnamed)	T		
Encyclia cochleata	Shell orchid; clamshell orchid		T	
Encyclia tampensis	Butterfly orchid		T	
Epidendrum difforme	Unbelled epidendrum	T		
Epidendrum nocturnum	Night-scent orchid; night-smelling epidendrum		T	
Epidendrum rigidum	Rigid epidendrum		T	
Ernodia littoralis	Beach creeper	T		
Eulophia alta	Wild coco; ground coco		T	
Habenaria odontopetala	Rein orchid (unnamed)		T	
Monotropa brittonii	Scrub Indian pipes; Britton's pinesap			UR2
Myrcianthes fragrans var. simpsonii	Simpson's stopper; twinberry			UR2
Nephrolepis biserrata	Boston fern (unnamed)		T	
Okenia hyopgaea	Burrowing four-o'clock		E	

Ophioglossum palamatum	Hand adder's tongue fern		E	UR%
Osmunda regalis	Royal fern		C	
Peperomia floridana	Everglades peperomia		E	UR2
Phlebodium aureum	Golden polypody		T	
Pleopeltis revoluta	Star-scale fern	T		
Polypodium ptilodon	Polypody fern (unnamed)		T	
Psilotum nudum	Whisk fern; fork fern	T		
Pteris longifolia	Ladder brake fern		T	
Pteris tripartita	Giant brake fern		T	
Pteris vittata	Brake fern (unnamed)	T		
Remirea maritima	Beach star		E	
Sabal etonia	Scrub palmetto		T	
Scaevola plumieri	Inkberry		T	
Selaginella arenicola	Sand spikemoss		T	
Suriana maritima	Bay cedar		E	
Tectaria heracleifolia	Halberd fern (unnamed)		T	
Tectaria incisa	Halberd fern (unnamed)	T		
Thelypteris dentata	Downy shield fern		T	
Thelypteris interrupta	Aspidium fern (unnamed)		T	
Thelypteria kunthii	Aspidium fern (unnamed)		T	
Thelypteris ovata	Aspidium fern (unnamed)		T	
Thelypteris palustris	Marsh fern		T	
Thelypteris reptans	Creeping fern	T		
Tillandsia balbisiana	Wild pine; air plant (unnamed)		T	
Tillandsia circinata	Wild pine; air plant (unnamed)		T	
Tillandsia fasciculata	Common wild pine		C	
Tillandsia flexuosa	Twisted air plant		T	
Tillandsia paucifolia	Wild pine; air plant (unnamed)		T	
Tillandsia polystachia	Wild pine; air plant (unnamed)	T		
Tillandsia setacea	Wild pine; air plant (unnamed)		T	
Tillandsia utriculata	Giant wild pine; giant air plant		C	
Tillandsia valenzuelana	Wild pine; air plant (unnamed)		T	
Trismeria trifoliata	Bracken fern (unnamed)		T	
Vittaria lineata	Shoestring fern		T	
Zamia integrifolia	Florida arrowroot		C	UR5

Animals

Chenille mydas mydas	Atlantic Green Turtle	E	E
Eretmochelys imbricata imbricata	Atlantic Hawksbill Turtle	E	E
Caretta caretta caretta	Atlantic Loggerhead Turtle	T	T
Dermochelys coriacea	Leatherback Turtle	E	E
Gopherus polyphemus	Gopher Tortoise	SSC	UR2
Alligator mississippiensis	American alligator	SSC	T(S/A)
Trichechus manatus latirostris	West Indian Manatee	E	E
Rana areolata	Florida gopher frog	SSC	UR2
Crocodylus acutus	American crocodile	E	E
Drymarchon corais couperi	Eastern Indigo snake	T	T
Tantilla oolitica	Miami Black-headed snake	T	UR2
Falco peregrinus	Peregrine Falcon	E	E
Pelecania occidentalis carolinensis	Eastern Brown Pelican	T	E
Pandion halieotus	Osprey	SSC	
Falco sparverius paulus	Southeastern American kestrel	T	UR2
Haenatopus palliatus	American oyster catcher	SSC	
Sterna antillarum	Least tern	T	
Aphelocoma coerulescens coerulescens	Florida Scrub jay	T	UR2

Plant list was updated by the Broward County Parks and Recreation Division in 1988.

Animal list was updated by the Broward County Cooperative Extension.

FGFWFC - Florida Game and Fresh Water Fish Commission
FDA - Florida Department of Agriculture
USFWS - U.S. Fish and Wildlife Service
C - Commercially exploited
E - Endangered
T - Threatened
T(S/A) - Threatened Due to Similarity of Appearance
SSC - Species of Special Concern
UR1 - Under review for federal listing, with substantial evidence in existence indicating at least some degree of biological vulnerability and/or threat.
UR2 - Under review for listing, but substantial evidence of biological

vulnerability and/or threat is lacking.

Sources: Official Lists of Endangered and Potentially Endangered Fauna and Flora in Florida, Florida Game and Fresh Water Fish Commission, 1987.

Florida Cooperative Extension Service.

Appendix C

Birds Sighted in Regional Parks
Broward County
1996

The vast diversity of plant habitats found in South Florida provide either temporary or permanent homes for over 250 species of birds. More than 200 species of birds have been sighted in the Broward County Regional Parks. Hardwood hammocks, cypress wetlands and pine flatwoods are among the habitats preserved in the parks for human recreation and wildlife habitat.

Following is a list of birds which have been sighted in Broward County regional parks. The specific parks in which sightings have taken place are noted.

Park abbreviations are as follows:

M - Markham
E - Easterlin
T - Tradewinds
S - Secret Woods
TT - Tree Tops
F - Fern Forest
W - West Lake
Q - Quiet Waters
D - Deerfield Island
H - Heritage

The abundance notations are in accordance with "Checklist of Southern Florida Birds" compiled by Dr. Ira Joel Abramson and Dr. Oscar T. Owre for the Tropical Audubon Society. The abundance symbols are:

C - common; often seen or heard in appropriate habitat.
U - uncommon; usually present, but not always heard or seen.
R - rare; present in appropriate habitats only small numbers, and seldom seen or heard.
r - resident; present all year, although abundance may vary seasonally.
s - summer visitor (includes spring and fall).
w - winter visitor (includes spring and fall).
m - migrant; present ordinarily only in migration.
o - occasional or casual visitor.

Source: Interpretive Section of the Broward County Parks and Recreation Division.

Bird	Abd.	Parks
Common Loon	Uw	W, H
Pied-billed Grebe	Cw	M,E,T,TT,W,Q,H
Brown Pelican	Cr	W, D
Double-crested Cormorant	Cr	M,T,W,Q,D,H
American Anhinga	Cr	M,E,T,S,TT,W,Q,H
Magnificent Frigatebird	Cr	W
Great Blue Heron (Great White)	Cr	W, H
Great Blue Heron	Cr	M,E,T,S,TT,W,Q,D,H
Green-backed Heron	Cr	M,E,T,S,TT,F,W,Q,H
Little Blue Heron	Cr	M,E,T,S,TT,W,Q,D,H
Cattle Egret	Cr	M,E,T,S,TT,F,W,Q,H
Reddish Egret	Ur	W
Great Egret	Cr	M,E,T,TT,F,W,Q,D,H
Snowy Egret	Cr	M,E,S,TT,W,H
Tri-color Heron	Cr	M,E,T,S,TT,W,Q,D,H
Black-crowned Night Heron	Ur	M,W,H
Yellow-crowned Night Heron	Cr	E,S,W,D,H
Least Bittern	Ur	M,H
American Bittern	Ur	M,H
Wood Stork	Cr	M,T,TT,W
Glossy Ibis	Cr	M,H
White Ibis	Cr	M,T,W,D,H
Scarlet Ibis	Rr	W
Roseate Spoonbill	Cr	W
Fulvous Whistling Duck	Cr	W
Mottled Duck	Cr	M,H
Blue-winged Teal	Cw	M,E,W
American Wigeon	Cw	M
Northern Shoveler	Cw	M
Ring-necked Duck	Cw	M,E,W,Q
Lesser Scaup	Cw	M,W,H
Ruddy Duck	Uw	M
Red-breasted Merganser	Cw	S,W
Turkey Vulture	Cr	All
Black Vulture	Cr	M,S,TT,F,H
Snail Kite	Rr	M
Sharp-shinned Hawk	Uw	All
Cooper's Hawk	Uw	M,H
Red-tailed Hawk	Ur	M,E,T,S,TT,F,W,H
Red-shouldered Hawk	Cr	M,E,T,S,TT,F,W,Q,H
Broad-winged Hawk	Cm	M,E,S,TT,W,Q,H
Bald Eagle	Ur	T
Northern Harrier	Cw	M,T,H

Osprey	Cr	E,S,F,W,Q,D,H
Peregrine Falcon	Uw	E,W
Merlin	Uw	M,E,S,TT,W,Q,H
American Kestrel	Cw	All
Common Bobwhite	Cr	M,T,S,TT,F,H
Sandhill Crane	Ur	H
Limpkin	Cr	M,H
King Rail	Cr	M
Clapper Rail	Ur	W
Sora	Cw	M
Purple Gallinule	Cr	M
Common Moorhen	Cr	M,E,T,S,TT,F,W,Q,H
American Coot	Cw	M,E,T,F,W,Q,H
American Oystercatcher	Rw	W
Semipalmated Plover	Cw	W
Piping Plover	Uw	W
Wilson's Plover	Ur	W
Killdeer	Ur	M,E,T,S,F,W,H
Black-bellied Plover	Cw	W
Common Snipe	Cw	M,H
Whimbrel	Rm	W
Spotted Sandpiper	Cw	M,E,T,S,W,Q,D,H
Solitary Sandpiper	Um	M,E,W
Willet	Cr	W
Ruddy Turnstone	Cw	W
Greater Yellowlegs	Cw	E,W,H
Lesser Yellowlegs	Cw	E,W,H
Red Knot	Uw	W
Pectoral Sandpiper	Um	M,H
White-rumped Sandpiper	Um	W
Least Sandpiper	Cw	M,E,W
Dunlin	Cw	W
Short-billed Dowitcher	Cw	W
Stilt Sandpiper	Um	W
Semipalmated Sandpiper	Cw	W
Western Sandpiper	Cw	W
Sanderling	Cw	W
Black-necked Stilt	Cs	M,E,T,W,H
Greater Black-backed Gull	Uw	W
Herring Gull	Dw	W,D,H
Ring-billed Gull	Cw	E,S,W,D,H
Laughing Gull	Cr	E,S,W,D,H
Bonaparte's Gull	Uw	W
Gull-billed Tern	Ur	M,W

Forster's Tern	Cw		M,E,W
Common Tern	Uw		W
Little Tern	Cs		E,F,W,D,H
Royal Tern	Cr		S,F,W,D
Sandwich Tern	Cr		W
Caspian Tern	Uw		M,W,H
Black Tern	Cm		M,W,H
Black Skimmer	Cr		E,W,Q,H
Rock Dove	Cr		M,E,T,S,TT,F,Q,H
White-winged Dove	Rr		TT,H
Mourning Dove	Cr		All
Ground Dove	Cr		M,E,W,H
Canary-winged Parakeet	Cr		S,H
Red-fronted Amazon	Rr		E
Yellow-billed Cuckoo	Cs		All
Black-billed Cuckoo	Um		E
Smooth-billed Ani	Cr		M,E,T,S,TT,F,W,Q,H
Barn Owl	Cw		M,TT,F,H
Common Screech Owl	Cr		M,E,T,S,TT,F, H
Great Horned Owl	Ur		T,F,Q,D
Burrowing Owl	Ur		M,H
Chuck-will's-widow	Cr		M,E,T,S,TT,F,H
Whip-poor-will	Cw		E
Common Nighthawk	Cs		All
Chimney Swift	Rm		E,H
Ruby-throated Hummingbird	Uw		E,T,S,TT,F,H
Belted Kingfisher	Cw		All
Common Flicker	Cr		M,E,T,S,TT,F,W,Q,H
Pileated Woodpecker	Ur		E,T,S,TT,F,W,D,H
Red-bellied Woodpecker	Cr		All
Yellow-bellied Sapsucker	Cw		All
Downy Woodpecker	Ur		M,E,T,S,TT,F,W,H
Eastern Kingbird	Cm		M,E,T,S,W,H
Gray Kingbird	Cs	S,W	
Western Kingbird	Uw		E
Eastern Phoebe	Cw		M,E,H
Great Crested Flycatcher	Cr		E,S,D,H
Eastern Pewee	Um		M,E,T,S,TT,F,H
Tree Swallow	Cw		All
Bank Swallow	Um		M
Rough-winged Swallow	Cw		All
Barn Swallow	Cm		All
Cliff Swallow	Um		M
Purple Martin	Cm		M,E,T,S,TT,F,Q,H

Blue Jay	Cr	M,E,T,S,TT,F,D,H
Fish Crow	Cr	All
House Wren	Cw	M,E,T,S,TT,F,W,Q,H
Carolina Wren	Cr	M,E,T,S,TT,F,H
Northern Mockingbird	Cr	All
Gray Catbird	Cw	All
Brown Thrasher	Ur	M,E,T,S,TT,F,W,H
American Robin	Cw	M,E,T,S,TT,F,W,Q,H
Wood Thrush	Rm	E
Hermit Thrush	Uw	M,E,F
Swainson's Thrush	Um	E,S,F
Gray-cheeked Thrush	Rm	E,T,S,TT
Veery	Um	M,E,T,S,TT,F
Blue-gray Gnatcatcher	Cw	All
Ruby-crowned Kinglet	Uw	M,E,T,S,TT,F
Cedar Waxwing	Cw	All
Loggerhead Shrike	Cr	M,T,H
European Starling	Cr	E,T,S,TT,F,H
White-eyed Vireo	Cr	M,E,T,S,TT,F,W,Q,H
Yellow-throated Vireo	Cm	M,E,T,S,TT,F
Solitary Vireo	Cm	M,E,T,S,TT,F,H
Black-whiskered vireo	Cs	E,TT,W,H
Red-eyed Vireo	Um	M,E,T,S,TT,F,W,H
Black-and-White Warbler	Cw	All
Prothonotary Warbler	Um	M,E,S
Swainson's Warbler	Rm	E
Worm-eating Warbler	Um	M,E,T,S,TT,F,W,H
Tennessee Warbler	Rm	E,S,H
Orange-crowned Warbler	Uw	M,E,T,S,TT,F,H
Nashville Warbler	Rm	E
Northern Parula Warbler	Cw	All
Yellow Warbler	Ur	E,F,W,H
Magnolia Warbler	Um	E,H
Cape May Warbler	Cm	All
Black-throated Blue Warbler	Cm	All
Yellow-rumped Warbler	Cw	All
Black-throated Green Warbler	Um	E,S,TT
Blackburnian Warbler	Rm	E,S,H
Yellow-throated Warbler	Ur	E,S,H
Chestnut-sided Warbler	Um	E,S
Bay-breasted Warbler	Um	E

Blackpoll Warbler	Cm	All
Pine Warbler	Ur	M
Prairie Warbler	Cw	All
Palm Warbler	Cw	All
Ovenbird	Cw	All
Northern Waterthrush	Uw	All
Louisiana Waterthrush	Rw	E
Kentucky Warbler	Um	E
Connecticut Warbler	Rm	M,E,H
Common Yellowthroat	Cr	All
Yellow-breasted Chat	Uw	E,S
Hooded Warbler	Uw	E,H
Wilson's Warbler	Um	E
Canada Warbler	Um	E
American Redstart	Cm	All
House Sparrow	Cr	All
Bobolink	Cm	M,E,H
Eastern Meadowlark	Cr	M,TT,H
Red-winged Blackbird	Cr	All
Spotted Oriole	Cr	E,T,S,H
Northern Oriole	Cw	E,S,H
Boat-tailed Grackle	Cr	M,E,T,S,T,D,H
Common Grackle	Cr	All
Brown-headed Cowbird	Uw	M,H
Stripe-headed Tanager	Ro	E
Western Tanager	Rm	E
Scarlet Tanager	Um	E,S
Summer Tanager	Ur	E,S,H
Northern Cardinal	Cr	All
Rose-breasted Grosbeak	Cm	E,S,H
Blue Grosbeak	Um	E
Indigo Bunting	Cw	E,T,S,TT,F,H
Painted Bunting	Cw	E,T,S,TT,F,H
American Goldfinch	Cw	All
Rufous-sided Towhee	Ur	M,E,T,H
Savannah Sparrow	Cw	M,E,F,H
Grasshopper Sparrow	Ur	M,F,H
Chipping Sparrow	Rw	M
Swamp Sparrow	Cr	M