



Conservation Element Support Document



The associated BrowardNEXT2.0 Comprehensive Plan was adopted on March 28, 2019 (Ordinance No. 2019-11) by the Board of County Commissioners.

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List of Acronyms

ACOE	U.S. Army Corps of Engineers
ASC	Area of Special Concern
ASR	Aquifer Storage and Recovery
BCCO	Broward County Code of Ordinances
BOCC	Broward County Board of County Commissioners
BFSP	Boat Facility Siting Plan
BMP	Best Management Practice
BMSD	Broward Municipal Services District
CARL	Conservation and Recreational Lands
DEO	Department of Economic Opportunity
EMLEG	Enhanced Marine Law Enforcement Grant
EPGMD	Broward County Environmental Protection and Growth Management Department
ERL	Environmental Resource License
ERP	Environmental Resource Permit

EV	Electric Vehicle
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDHSMV	Florida Department of Highway Safety and Motor Vehicles
FEMA	Federal Emergency Management Agency
FIND	Florida Inland Navigation District
FIRM	Flood Insurance Rate Map
FPL	Florida Power and Light Company
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Florida Fish and Wildlife Research Institute
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information System
ICW	Atlantic Intracoastal Waterway
LAPC	Local Area of Particular Concern
LEED	Leadership in Energy and Environmental Design
MAC	Broward County Marine Advisory Committee
MAG	Manatee Awareness Group
MIASF	Marine Industries Association of South Florida
MPP	Manatee Protection Plan
NAAQS	National Ambient Air Quality Standards
NFC	Natural Forest Communities
NFIP	National Flood Insurance Program
NIS	NatureScape Irrigation Services
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRA	Natural Resource Area
NRCS	Natural Resource Conservation Service
OUI	Operating Under the Influence
PJA	Port Everglades Jurisdictional Area
SFWMD	South Florida Water Management District
USCG	U.S. Coast Guard
UWA	Urban Wilderness Area
WWS	Water and Wastewater Services

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List of Definitions

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.

Aquifer – A stratum or formation of permeable material that will yield groundwater in useful quantities.

Aquifer Recharge – The addition of water to the groundwater system by natural or artificial processes.

Channelization – To straighten and deepen streams so water will move faster.

Community – An assemblage of plants and animals living in a particular area or habitat.

Desalinization – Removing the salt from saline waters to produce potable water.

Dissolved Oxygen – A measure of the amount of oxygen available for biochemical activity in water.

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.

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. The most recent list can be found in Chapter 68A-27.003, Florida Administrative Code.

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.

Evapotranspiration – The transfer of water to the atmosphere by the combined processes of evaporation and plant transpiration.

Exotic Species or Exotics – Species not native to the region.

Groundwater – Subsurface water in the zone of saturation.

Hazardous Substance – A substance that has one or more of the following characteristics: ignitable; corrosive; reactive; toxic.

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

Natural Communities – 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.

Protect – To save or shield from loss, destruction, or injury or for future intended use.

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.

Raw Water – Untreated potential drinking water.

Sheet flow – Large volumes of shallow water moving very slowly.

Sole Source Aquifer – The sole or principal drinking water source for an area which, if contaminated, would create a significant hazard to public health.

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.

Storm Surge – The increase in normal water levels, driven by high winds, near the area where the storm center makes landfall.

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.

Toxic Substance – A chemical or mixture that presents an unreasonable risk of injury to health or the environment.

Unconfined Aquifer – An aquifer in which the water table defines the upper surface of the zone of saturation.

Understory – Assemblages of natural low-level woody, herbaceous, and groundcover species which exist in the area below the canopy of the trees.

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.

Zone of Saturation – The zone in which interconnected interstices are saturated with water under pressure equal to or greater than atmospheric.

Support Document

Conservation

Introduction

A. General

The purpose of the Conservation Element is to promote the conservation, wise use, and protection of Broward County's natural resources. The Conservation Element is a required element of the comprehensive plan as per Section 163.3177, Florida Statutes. Issues concerning conservation of natural resources are also addressed throughout this comprehensive plan. The Broward Municipal Services District (BMSD) Future Land Use Element provides implementation tools to preserve lands for conservation and promote appropriate land uses to minimize the impacts of development on the environment. The Transportation Element promotes strategies to improve air quality and protection of the Port's coastal environment. The Water Management and Solid Waste Elements ensure the provision of clean water, preservation of the sources of that water, and the safe efficient handling of wastewater and solid waste while protecting the county's air, water, and soil resources.

B. Service Area

The 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 of the Central and Southern Florida Flood Control System (C&SF) as defined by the South Florida Water Management District (SFWMD). For biological resources the planning area is the County.

Broward County Charter, Section 8.04, gives the Broward County Commission the authority to protect the county's environment by prohibiting or regulating air and water pollution and the destruction of natural resources. Therefore, the regulatory service area for this Element is considered to be the entire County to the extent that it addresses air quality, water quality, water quantity, and the protection of natural resources. Due to the fact that some state and federal agencies also have jurisdictional and

operational responsibilities concerning the conservation and protection of natural resources in the County, efforts have been made to achieve consistency with the plans of those outside agencies.

C. Planning Horizon

The short-term planning horizon is five years or 2022. The long-term planning is 10 years or 2027.

Data Requirements

A. Water Resources and Water Quality

1. Wetlands

The Water Conservation Areas (WCA), 797 square miles in size, are part of the surviving remnants of the historical Everglades, which originally spread from Lake Okeechobee south to Florida Bay. The WCAs are located west of Route 27 and the Sawgrass Expressway outside the developable area of the county. The WCAs 2 and 3 were created as a result of the construction of levees as part of the Central and Southern Florida Flood Control Project (C&SF) and are a major wetland of great importance. The WCAs serve a variety of purposes, including providing fish and wildlife habitat; supporting fish & wildlife propagation, including nesting grounds for waterfowl; storing regulatory releases of water from WCA 1 in Palm Beach County; conveying controlled water supply releases from Lake Okeechobee to eastern Broward County, Miami-Dade County, and Everglades National Park; detaining and storing water during the wet season for water supply purposes during the dry season; preventing water from flooding eastern Broward County; recharging ground water; and filtering and purifying water as it percolates into the aquifer or flows towards Florida Bay.

In 1996, there were approximately 5,300 acres of wetlands existing in the area of Broward County east of the WCAs. Approximately 4,300 acres comprise the 3A/3B Seepage Management Area located between WCA 3 and U.S. Highway 27. Most of the remaining 1,300 acres of wetlands have been severely degraded as a result of growth and development activities. A minimal amount of acreage exists which is considered to be in pristine condition. Major types of wetlands found in the county are melaleuca, cypress, mangrove, and sawgrass. Appendix A categorizes wetland types by community. Additional planning efforts are under way to enhance the protection of the WCAs.

As part of the Comprehensive Everglades Restoration Plan, the SFWMD and the U.S. Army Corps of Engineers are in process of developing the Broward Water Preserve Area (WPA) which will consist of two surface water reservoirs (the C-9 and C-11 Impoundments) and the 3A/3B Seepage Management Area. The purpose of the Broward WPA is to increase the spatial extent of functional wildlife habitat in the project area, help re-establish the natural timing of water deliveries and hydro patterns to the Everglades while maintaining flood protection and increasing aquifer recharge for urban areas. Water stored in these wetlands and reservoirs should also reduce seepage through and under existing levees, thereby reducing loss of water from the WCAs.

Broward County reaps many economic benefits from the protection of wetlands, particularly through the Water Conservation Areas. The continual processes of water filtration and purification as water percolates into the groundwater, especially the Biscayne Aquifer, translate into cost savings in terms of treatment levels required for potable water. Groundwater recharge is also

valuable in terms of stemming the tide of saline intrusion, which results from the withdrawal of groundwater more quickly than it can be replaced. Saline intrusion can lead to expensive desalinization of potable water through processes such as reverse osmosis. Map C-4 delineates areas of saline intrusion.

The natural ability of wetlands to absorb excess water during a flood provides an enormous financial value by protecting property and possessions, as well as unquantifiable benefits of protecting human life and societal well-being. The abundance and diversity of wildlife and aquatic life found in wetlands attracts tourists in pursuit of recreational opportunities for fishing, birding, and boating, among others. Tourism can significantly bolster the economy through the influx of new dollars from outside the community. The wetlands of Broward County also have a broader economic impact in terms of contributions to the region. Maintenance of the Water Conservation Areas provides flood protection in Miami-Dade County. The protection of the remaining Everglades assures a flow of water into Florida Bay, which, if the wetlands are performing the ecological functions they are supposed to will help ensure the biological productivity and diversity of the bay.

Alterations of existing wetlands may have an adverse environmental impact on the waters of Broward County and on the ecological functional values wetlands provide. The Environmental Protection and Growth Management Department (EPGMD) has administered a program to protect and preserve wetlands since 1993. Its purpose is to maintain the functions and values provided by aquatic and wetland resources so there will be no overall net loss and to strive for a net resource gain over present conditions. Adverse impacts must be regulated by avoidance as the first priority, minimization as a second priority, or mitigation as a third priority. Wetland resource alteration includes the dredging, filling, drainage, or flooding of jurisdictional wetland areas. A license must be issued by EPGMD prior to the alteration of wetlands. Decisions to issue licenses are made by evaluating the quality and condition of the wetland and deriving a numerical ranking of the wetlands importance.

There are many techniques for assessing wetland values. The best known are the U.S. Fish and Wildlife Service's Habitat Evaluation Procedure (HEP) and the U.S Army Corps of Engineer's Wetland Evaluation Technique (WET). Due to the limitations of these techniques, however, Broward County has established its wetland evaluation method. The Wetlands Benefit Index (WBI), codified in Chapter 27, Article XI. of the Broward County Code of Ordinances, is based upon 10 factors which include fish and wildlife values, hydrophyte dominance, intactness of wetland community, connectedness of surface water hydrology, connectedness of the location in the landscape, hydroperiod, soils, and habitat diversity. These 10 factors are used to develop a numerical ranking of wetlands, which range from 0.25 to 1.0. Conservation Element Objectives C10, C11 and C12 summarizes the key components of Broward County's Wetland Protection Ordinance and the WBI. It provides that property should be developed so that it avoids or minimizes, to the greatest degree

practicable, wetlands. It provides that for wetlands with a WBI ranking of 0.80 or higher, there is a rebuttable presumption against development. This presumption could be overcome, for example, if application of the ordinance resulted in a taking of private property. If a wetland has a WBI below 0.80, then development can occur, but the developer must mitigate or enhance, or both, wetlands to compensate for the loss of wetland functions.

Clean water is fundamental to the health of the County's environment and economy. Public and private water utilities across the County rely entirely upon groundwater sources, including the Biscayne and Florida Aquifers, for potable water supplies. Extreme well stimulation such as hydraulic and acid fracturing (also known as "fracking") pumps a complex mix of fluids and chemicals, including large volumes of water, under very high pressure into or below the surface of the ground to create fractures in oil- or gas-bearing geologic formations for the purpose of producing or recovering oil or gas. Many of the chemical constituents injected during fracturing have documented adverse effects on human health and the environment. Use of these well stimulation fracturing mixes exposes adjacent land and surface waters to the risk of contamination through open pit storage, truck transport on roadways, and activities during well development. Much of Florida's water supply comes from aquifers in highly-permeable limestone formations which are vulnerable to contamination from hydraulic rock-fracturing activities designed to extract hydrocarbons. On June 23, 2015, the Board of County Commissioners adopted Resolution 2015-340 opposing the use of hydraulic fracturing, acid fracturing and any form of extreme well stimulation for purposes of resource extraction.

2. Rivers and Canals

There are approximately 1,800 miles of waterways in the County. All the surface waters of the County are designated by the Florida Department of Environmental Protection as Class III waters. Class III waters have recreation and fish and wildlife propagation as the designated use. Class I waters have public water supply as the designated use. The [Figure III.F of the Natural Resource Map Series](#) shows all water features of Broward County.

Primary canals, maintained by the South Florida Water Management District, were originally constructed to provide drainage and flood protection in the low-lying areas of the Lower East Coast. Today, the operation of the primary canals has been expanded to aid in providing water supply, wetland rehydration, and mitigation of saltwater intrusion. These canals provide opportunities in some areas for recreational boating, canoeing, freshwater fishing, and water skiing. Water in the canals is replenished by rainfall, surface water runoff, and surface water discharges and groundwater seepage from Water Conservation Areas 3A and 3B. In drought conditions, local supplies can be supplemented by deliveries of water stored in Lake Okeechobee and transported via the canal system. However, during periods of water shortage, Lake Okeechobee may be unable to provide the necessary water deliveries as was experienced during the drought conditions of the late 1980's and again in 2007. Water management operations and

policies will limit future use of regional water deliveries for the purpose of providing recharge of urban canal systems. Water levels in Lake Okeechobee have been lowered by one foot due to concerns about the integrity of the 140-mile long Herbert Hoover Dike which surrounds the lake. This loss of storage capacity may reduce the amount of water that would otherwise be available for dry season deliveries, a condition likely to persist until rehabilitation of the Dike is completed in 2030. Furthermore, the Governing Board of the South Florida Water Management District adopted the Regional System Water Availability Rule in February 2007. This rule is designed to prevent increased urban reliance upon regional water resources, including the Everglades Water Conservation Areas, beyond levels measured prior to April 2006. Thus, alternative water sources will have to be developed to provide any recharge to urban areas in excess of this threshold. Primary canals are listed in [Appendix C-F](#).

The natural rivers of Broward County, listed in Table C-1, formed the natural drainage system for the Eastern part of Broward County. These rivers originally handled any eastward flow from the Everglades and drainage from low ridges, flatwood areas, and the Coastal Ridge. With the exception of Whiskey Creek, the Tarpon River, and the Stranahan River, the natural rivers of the county have been incorporated in the primary canal system providing conveyance to tidewaters in the Intracoastal Waterway (ICW).

Table C-1: Natural Rivers

Rivers	
Middle River	South Fork of the New River
North Fork of the Middle River	Tarpon River
South Fork of the Middle River	Stranahan River
New River	Whiskey Creek
North Fork of the New River	

3. Bays and Lakes

There are no water bodies classified as bays in Broward County. Lakes, the largest of which are West Lake, North Lake, and South Lake, are all located along or immediately west of the Intracoastal Waterway in the incorporated area. Most of the county's existing lakes are manmade, usually formed as a by-product of excavation or mining activity. There is, however, a natural fresh water lake called Bonnet Slough a portion of which lies within Hugh Taylor Birch State Recreation Area in Fort Lauderdale. There is also a small freshwater lake on the Bartlett Estate, a privately-owned property along Fort Lauderdale's beachfront.

4. Groundwater

Two major aquifer systems underlie the eastern part of the county: the deep Floridan Aquifer System and the shallow Surficial Aquifer System. These aquifers are separated by the low permeability sediments of the Intermediate Aquifer System. The principal water-bearing unit of the Surficial Aquifer System is the Biscayne Aquifer. The Biscayne Aquifer is a high-quality aquifer, producing large quantities of water in eastern Broward. The Intermediate Aquifer System serves to restrict the flow of water between the Surficial Aquifer and the Floridan Aquifer Systems. This system does not yield significant quantities of water. The Floridan Aquifer System is present throughout the state and is the deepest part of the active water flow system on mainland Florida. The Floridan contains brackish water in Broward County which requires desalination to be used for either irrigation or potable uses. The City of Hollywood is currently the only Broward County municipality with a permitted Floridan well, with withdrawals approximating one million gallons per day. The Regional System Water Availability Rule adopted by the South Florida Water Management District in February 2007 restricts future withdrawals from the Biscayne Aquifer, currently the primary source of drinking water for Broward County and the entire Lower East Coast of the South Florida Water Management District's service area. As a result, local governments and other water providers will be required to develop alternative water supplies to satisfy water demands that exceed groundwater withdrawals measured prior to April 2006.

B. Air Resources Quality

The air quality in Broward County is generally in the "good" range 78% of the time, in the "moderate" range over 21% of the time and in the "unhealthy for sensitive groups" range less than 1% of the time. Pressures on the air quality from mobile source emissions have decreased since 2007 due to a reduction in vehicle miles traveled and on-going federal regulations for cleaner vehicles and fuels, and the promotion of alternative modes of transportation such as carpooling, transit, etc.

C. Commercially Valuable Minerals

Mining is a relatively minor commercial activity in Broward County accounting for only about 0.1 percent of the county's economy. Non-metallic minerals, mostly crushed limestone and gravel used in construction, account for most of the mining activity. This activity is declining as urban uses encroach into the areas previously limited to mining operations.

D. Soil Associations and Areas with Soil Erosion Problems

Ten different soil associations are shown on [Figure III.G of the Natural Resource Map Series](#). The western portion of the developable area is represented by the Hallandale-Margate and Lauderdale-Dania soil associations. These two (2) soil associations are characterized by nearly level, generally sawgrass marsh and are considered to be unsuitable for septic tank and drain field use. The soils are

organic and overlies limestone. In many places, the soils are shallow (between 40-60 inches). As areas are developed, organic soils are removed (demucking process) and fill, consisting of rock or sand, is deposited.

The central portion of the developable area consists of nearly level, grassy areas, interspersed with small ponds. The Immokalee, Immokalee-Pompano, and Duette- Pomello soil associations are wet and sandy, underlain by limestone. This area is undergoing rapid urban development which requires the use of fill to raise surface elevations.

The eastern portion of the developable area is made up of sandy soils, some of which are poorly drained while other parts are excessively or well drained. Sandy soils include the Paola-St. Lucie, Palm Beach-Beaches, and Dade soils associations. Since the installation of drainage structures, the area has been almost entirely developed for urban use.

The U.S. Department of Agriculture, Natural Resource Conservation Service, indicates that inland soil erosion is minimal except at construction sites. With 24 miles of ocean shoreline, coastal erosion whether caused by the natural flow of sand, storm/wave action or man-made construction will always be a major concern for Broward County. (See Coastal Management Element for details on coastal erosion.)

E. Natural Resource Areas

1. Recreationally Important Fish or Shellfish

Recreational fishing is one of the most important activities off the County coast. It is also important in the freshwater areas of the county in-land, with fishing activities primarily occurring in the Water Conservation Areas. Charter boats, drift boats, pleasure craft, tackle and bait businesses constitute a major part of the recreational fishing industry. A large variety of aquatic life is supported in the county's inland and offshore waters. Salt and freshwater catches include bass, sailfish, dolphin, mackerel, bluefish, amberjack, black-fin, tuna, and swordfish. The Florida Fish and Wildlife Conservation Commission regulates freshwater fishing in unincorporated Broward.

2. Commercially Important Fish or Shellfish

Very little commercial fishing takes place in Broward County waters. Netting, fish traps, and bottom longlines are prohibited by the State. Commercial fishing and shell-fishing has declined to about half between 1994 and 2011 with total catch for Broward County of measuring 1.6 million pounds in 1994 and 894,093 pounds in 2011. Among the approximately fifty different species that were reported- Swordfish held the highest count with 301,769 pounds.

3. Wildlife

Broward County consists of a variety of diverse ecological communities. Nine ecological communities have been identified and described by the Interpretive Section of the Parks and Recreation Division. Numerous species of plants and wildlife inhabit those communities including

135 species of endangered, threatened, or rare plants, mammals, birds, and reptiles. Listings of dominant plants and wildlife can be found according to ecological community in Appendix C-A. Endangered, threatened, rare, and species of special concern can be seen in Appendix C-B.

4. Marine Habitats

Most of Broward marine habitat is shallow open ocean area along the coast. Since 1967 Broward County has conducted an artificial reef program to provide habitat for marine species and expand recreational diving and fishing opportunities. Artificial reef sites are listed in Appendix C-E. Estuarine and mangrove habitat areas provide nesting areas and nurseries for many marine species. An inventory and description of the mangrove community is provided in Appendix C-A. See the Coastal Management Element for more information on management of estuarine and mangrove habitats.

The aquatic environment also supports threatened and endangered species such as the West Indian Manatee which, as of February 2017, had a minimum population count of 6,620 in Florida. As a result, the U.S. Fish & Wildlife Service issued its final rule to downgrade the status of the West Indian Manatee from endangered to threatened under the Federal Endangered Species Act.

Three endangered or threatened species of sea turtle nest in Broward County: Loggerheads (*Caretta caretta*), Atlantic Green Turtles (*Chelonia mydas*), and Atlantic Leatherbacks (*Dermochelys coriacea*). EPGMD's Sea Turtle Conservation Program involves delineating major nesting areas, identifying nests, and relocating endangered nests either to hatcheries or safer areas of the beach. The most recent list of Florida endangered species can be found in Chapter 68A-27.003, Florida Administrative Code.

5. Vegetative Communities

An inventory of vegetative communities is incorporated in Appendix C-A Ecological Communities and an inventory of endangered and threatened plants is included in Appendix C-B. [Figure III.B of the Natural Resource Map Series](#) shows the environmentally sensitive lands in Broward County.

F. Current Water Needs and Sources

The total average daily raw water demand in Broward County in 2015 was 215 million gallons per day (mgd) or 120.8 gallons per capita per day. More than 2,600 miles of canals and levees, 1,300 water control structures and 66 pump stations make up the regional water management system. The Biscayne Aquifer is an unconfined aquifer that underlies all of Broward County, Miami-Dade County and the southeastern Palm Beach County and is the primary water source for public water supply in these areas. Aquifer recharge primarily occurs as a result of local rainfall and recharge from the County's expansive canal network which provides a direct connection between surface waters and groundwater in the Biscayne Aquifer. Recharge of the County's canal network is provided through rainfall and surface water deliveries from the Water Conservation Areas located to the west of urban

Broward County. Water Conservation Areas also provide aquifer recharge through groundwater seepage. The relative importance of the Water Conservation Areas as a source for aquifer recharge increases during the dry winter months and periods of drought. (See Drainage/Natural Groundwater Aquifer Recharge Element). While the County receives an average of sixty inches of rainfall a year, because of evapo-transpiration and runoff discharged directly from canals to the Atlantic Ocean, only fifteen to twenty inches actually reach the Aquifer.

The South Florida Water Management District (SFWMD) regulates the withdrawal of potable water from the Biscayne Aquifer through the issuance of a consumptive use permit. The standard consumptive use permit is valid for up to five (5) years although permits can be issued for a period of up to twenty (20) years if certain conditions are met. Significant changes in regional water policy occurred with the adoption of the Regional System Water Availability Rule by the South Florida Water Management District's governing board in February 2007. The rule is designed to ensure that water needed for Everglades restoration and natural system function is retained within the Everglades and will require that local water providers and managers develop strategies to meet future water supply needs without creating additional demands on the regional system through surface water management or wellfield operations. Potential alternative water supplies include the Floridan Aquifer, reclaimed water, desalination, and aquifer storage and recovery. Alternative water supplies may be used to provide direct offsets for potable water demands or wellfield operations through recharge of the canal system and aquifer.

Consistent with regional water policy and as part of water resource planning efforts and as part of the Countywide Integrated Water Resources Plan, Broward County is developing a Countywide water management master plan with the application of the County's integrated surface water and groundwater model. The project will include a Countywide assessment of water demands and the identification, sizing, and cost estimates for various alternative water supply projects and management strategies capable of fulfilling the County's water supply needs and water resource goals through 2025.

The water quality status of our surface water resources in Broward County is generally good. In the last year, phosphorus levels at the S-9 Pump Station increased along with a decrease in urban water quality in the C-13 Canal. Pressures on water quality, such as building permits and locations without surface management regulation, have a decreasing trend. Efforts to improve water quality, such as street sweeping, certification of NatureScape Sites and education on environmentally-friendly landscaping, continue to increase. Groundwater wells for public water supply continue to meet standards. A trend toward increasing groundwater levels reversed in 2011. However, a growing number of wells are showing saltwater intrusion. Pressures on groundwater quality, such as septic systems, solid waste, number of contaminated sites and reported hazardous material discharges, are decreasing. Many water conservation efforts, such as the NatureScape Irrigation Service, Conservation Pays toilet rebates, and NatureScape educational programs, coupled with the Countywide 2-day per week limit on landscape irrigation, have resulted in a decrease in potable water well withdrawals and per capita consumption.

Analysis Requirements

A. Water Resources and Water Quality

1. Wetlands

Wetlands acreage in Broward County continues to decline due to development pressure primarily in southwest Broward. To compensate for unavoidable wetland impacts, EPGMD has required appropriate levels of mitigation for these impacts dependent upon the quantity and quality of wetlands that are dredged or filled. These mitigation areas are designed to replace the functions and values lost through development. Conservation Element Objective C8 summarizes the County's policies toward wetlands. [Figure III.E of the Natural Resource Map Series](#) is a map of wetlands within Broward County developed by EPGMD and updated annually (See Water Management Element Element).

The WCAs do provide opportunities for recreational opportunities for fishing, air boating, and limited hunting. Access points for these activities are located along I-75 and U.S. 27.

The largest pollution threat to wetlands in the WCAs is agricultural runoff from the Everglades Agricultural Area around Lake Okeechobee and within Palm Beach County. Another potential source of pollution is from the back pumping of storm water runoff from the developed areas. This activity can deliver storm water runoff from parking lots, roadways, commercial and agricultural operations, and residential lawns into the conservation areas. Agricultural and storm water runoff contain pollutants such as heavy metals, nutrients (nitrogen and phosphorus), and toxic substances. The S-9 pump station located at the western-most point on the C-11 Canal, adjacent to the WCA 3B has been a major source of urban pollution from Broward County to the Everglades. As part of flood protection operations, urban storm water runoff is discharged to WCA 3B through the S-9 pump station following storm events. Additional pumping from the C-11 occurs to return seepage lost from the WCA. The South Florida Water Management District has installed the S-381 structure to separate urban runoff in the C-11 Canal from WCA seepage so that more frequent back pumping with the smaller S-9A pump station returns only clean water to the WCA. The South Florida Water Management District is also developing the Broward Preserve Areas (WPA) as part of the Comprehensive Everglades Restoration Plan. The WPAs will include two impoundments that will store urban storm water to lessen the need for operation of the S-9 pump station during heavy rain events.

Another threat to wetlands in the developed area, though not necessarily pollution, is the loss of viability of wetlands that are used as on-site mitigation through lack of maintenance or the original quality of the wetland was poor and was not suitable for sustained on-site mitigation.

Water utilities across the County rely entirely upon groundwater sources, including the Biscayne and Florida Aquifers, for potable water supplies. Use of well stimulation fracturing techniques and mixes exposes adjacent land and surface waters to the risk of contamination through open pit storage, truck transport on roadways, and activities during well development. On June 23, 2015, the Board of County Commissioners adopted Resolution 2015-340 opposing the use of hydraulic fracturing, acid fracturing and any form of extreme well stimulation for purposed of resource extraction. Policy C3.4 prohibits oil, gas, and mineral extraction and exploration, through drilling, core testing, fracking, and any other methods, in areas designated for Conservation future land use on the Broward County Land Use Plan or the BMSD Future Land Use Map Series.

2. Rivers and Canals

During the summer months or rainy season, urban runoff (nonpoint source pollution) from rainfall, combined with high water temperature, creates a concentrated nutrient environment that promotes the growth of aquatic pests such as bacteria, algae, water hyacinths, hygrophyta and cattail which deplete water of dissolved oxygen. Urban runoff also transports toxic materials such as pesticides, heavy metals, hydrocarbons and dissolved inorganic materials. Objective C3 addresses water quality.

As development activity increases, the total amount of polluted urban runoff concurrently increases. Therefore, urban development and storm water runoff have a serious negative impact on surface water quality (see Water Management Element). Map C-3 shows storm water outfalls regulated by a National Pollutant Discharge Elimination System permit.

There are approximately 29 miles of rivers and canals within the BMSD of Broward County. This represents two (2) percent of the nearly 1,800 miles located in the county. The potential for the protection and conservation of rivers and canals is limited because most of the land surrounding the rivers and canals in the BMSD is developed.

Water quality in rivers and canals is important to the county. The Broward River Trails Program establishes linear parks and greenways along rivers and canals which serve as buffers filtering pollutants and preserving water quality. Land is secured by utilizing techniques such as conservation easements, purchase of development rights and donations. Several pitfalls associated with the implementation of the River Trails Program include property owners concerns over issues such as liability, crime and litter.

The Middle and New River systems are mainly used by private boat owners for dockage and access to the ICW and the ocean. Major commercial yacht building, repair, and marina facilities are located along the New River as it flows through Fort Lauderdale and along the South Fork of the New River just west of I-95.

The largest pollution threat to surface waters in the county is storm water runoff from roadways, parking lots, golf courses and residential lawns. In canals where marinas and private boat dockage are located, a major pollution threat is point source pollution from live aboard boats/vessels and ship repair facilities. Live aboard vessels are known to illegally release raw sewage, degrading the water with pollutant inputs such as floatable debris and coliform bacteria. Marinas contribute debris from construction and repair of vessels. The combination of these factors makes the New River the most contaminated in the county.

The EPGMD has monitored surface water quality in Broward County since 1972. The long-term water quality monitoring program involves the sampling and testing of a network of 46 surface water stations located on major waterways of the county. Map C-1 depicts surface water monitoring sites. Each station is selected to represent the water typically found within a specific drainage basin. The tests measure general water quality and are used to characterize the overall ecological health of the system and to evaluate any potential human health risks. The network is sampled quarterly. The results and data of this testing program are currently being used by state and federal agencies to assess the water quality condition of the County's surface waters per the United States Clean Water Act and state of Florida's Watershed Restoration Act.

The EPGMD also conducts special project tests such as drainage basin characterizations which include general water quality testing; testing for metals, pesticides, herbicides, and other organic compounds; and chemical and biological evaluations of bottom sediments.

All sampling and analyses are performed by the Laboratory Services Section of the Environmental Planning & Community Resilience Division. The laboratory is certified by the U.S. EPA, the Florida DEP and the Florida HRS as a full-service air and water quality testing facility.

3. Lakes

Lake excavation in the County is regulated by Chapter 27 of the Broward County Code. Licenses are required by EPGMD for the creation of lakes, canals and other water bodies.

To obtain a license, the planned lake must meet the requirements presented in Ordinance 93-49 for minimum side slope and vegetation. Previously, many lakes and borrow pits were constructed with little or no side slope, which were dangerous for children and non-swimming adults. Earlier designs also rendered them biologically dysfunctional and provided direct access of polluted runoff to the Biscayne Aquifer. Poorly designed rock pits increased the opportunity for unfiltered or untreated urban runoff to enter the aquifer. Erosion from excavated material contributed to the siltation of the associated rock pit. Further, open rock pits and slag piles became hazards to the public if not properly safeguarded. Since the licensing program's inception in 1993 newly created lakes have been successfully designed to meet certain side slope and vegetative requirements. Some problems have been encountered with property owners who find vegetation in lakes objectionable and do not allow it to grow. Objective C5 addresses soils and soil erosion.

4. Groundwater

Protection of groundwater quality in Broward County is dependent upon proper management of the Biscayne Aquifer. Saltwater intrusion is one of Broward County's most serious water quality problems threatening groundwater supplies in eastern portions of the County. The saltwater intrusion line has been moving steadily westward for the past few decades. Saltwater intrusion is caused by historical drainage of freshwater wetlands and resultant loss of freshwater head and can be exacerbated by increased pumping of groundwater and diversion of surface water flows for drinking water, irrigation, and other purposes.

Saltwater intrusion currently threatens ten major wellfields operated by Broward County and the municipalities of Dania Beach, Deerfield Beach, Fort Lauderdale, Hallandale Beach, Hillsboro Beach, Hollywood, and Pompano Beach. Those wellfields include 155 wells with a combined pump capacity of 350 mgd, representing 48% of total wellfield pump capacity Countywide. The U.S. Geological Survey, SFWMD, WWS, and EPGMD operate a groundwater monitoring system designed to track the extent of saltwater intrusion in the County.

Another serious water quality issue is the potential for contamination of the public drinking water supply by industrial/commercial pollution. The Broward County Board of County Commissioners adopted the original Wellfield Protection Ordinance in August 1984. The current version of the Wellfield Protection Ordinance, No. 93-7, was enacted on November 23, 1993. The purpose of the Ordinance is to safeguard public health by providing criteria for the regulation of storage, handling, use and production of hazardous and toxic substances within the protected areas of water supply wells.

Implementation of the Hazardous Material Regulations and Storage Tank Regulations prevents discharges to the air, soil, groundwater and surface water by providing specifications for facility design, construction, operation, maintenance and closure which include early detection, containment and recovery of discharges. Approximately 5,830 facilities are currently licensed and are inspected at least biennially. EPGMD maintains a response program to investigate threats of contamination, participate in the cleanup and prepare enforcement cases as appropriate. The current version of the Hazardous Materials and Storage Tank Regulations include Ordinance Nos. 93-7 and 93-6, respectively.

More than 23,000 tests are performed each year to comply with national standards in WWS' NELAP certified drinking water laboratory. WWS also employs certified water treatment operators who conduct more than 317,000 process control tests annually. These tests ensure that the water treated and delivered to Broward County customers meets or exceeds all federal requirements for safe drinking water under the Safe Drinking Water Act. Table C-2 lists the parameters set by the Safe Drinking Water Act, the levels detected in potable water for Districts 1A, 2A, 3A and 3B/C and includes the results of monitoring for the period of January 1 to December 31, 2015. Data obtained before January 1, 2015, and presented in this report, are from the most recent testing done in accordance with drinking water laws, rules and regulations.

Table C-2: 2015 Water Quality Report

WHAT IS IN MY WATER? - 2015 TEST RESULTS (3A and 3BC water supplied by the City of Hollywood)

MICROBIOLOGICAL CONTAMINANTS									
Contaminant	Dates of Sampling (mo/yr)	MCL Violation Y/N	1A Highest Monthly % Positive	2A Highest Monthly % Positive	3A Highest Monthly % Positive	3BC Highest Monthly % Positive	MCLG	MCL	Likely Source of Contamination
Total Coliform Bacteria (treated water in the distribution system)	01/15 - 12/15	N	4.7%	1.6%	4.2%	4.9%	0.0%	> 5.0%	Naturally present in the environment
INORGANIC CONTAMINANTS									
Contaminant	Dates of Sampling (mo/yr)	MCL Violation Y/N	1A	2A	3A	3BC	MCLG	MCL	Likely Source of Contamination
Arsenic (ppb)	05/14-08/15	N	ND	ND	0.81	0.81	0	10	Erosion of natural deposits; runoff from orchards; runoff from glass and electronics production wastes
Barium (ppm)	05/14-08/15	N	0.004	0.006	0.0033	0.0033	2	2	Erosion of natural deposits; runoff from orchards; runoff from glass and electronics production wastes
Fluoride (ppm)	05/14-08/15	N	0.87	0.849	0.48	0.48	4	4	Erosion of natural deposits; discharge from fertilizer and aluminum factories. Water additive which promotes strong teeth when at the optimum level of 0.7 ppm
Nitrate (ppm)	05/14-08/15	N	0.284	0.417 (ND-0.417)	0.064	0.064	10	10	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Nitrite (ppm)	05/14-11/15	N	ND	0.442 (ND-0.884)	ND	ND	1	1	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Sodium (ppm)	05/14-08/15	N	42.2	30.5	28.9	28.9	NA	160	Salt water intrusion; leaching from soil
DISINFECTANTS and DISINFECTION BY-PRODUCTS									
Contaminant	Dates of Sampling (mo/yr)	MCL Violation Y/N	1A (range)	2A (range)	3A (range)	3BC (range)	MCLG or MRDLG	MCL or MRDL	Likely Source of Contamination
Chlorine (ppm)	01/15 - 12/15	N	3.1 (0.4-4.1)	3.4 (0.5-4.1)	3.6 (1.1-4.1)	3.1 (0.9-4.0)	4.0	4.0	Water additive used to control microbes
HAAs-haloacetic acids (ppb)		N	43.63 (12.3-68.1)	15.05 (ND-24.4)	7.02 (5.64-7.02)	12.3 (7.22-12.3)	NA	60	By-product of drinking water disinfection
THM-total trihalomethanes(ppb)		N	58.77 (34.2-71.5)	14.08 (8.73-18.5)	5.45 (4.57-5.45)	13.8 (10.6-13.8)	NA	80	By-product of drinking water disinfection
LEAD and COPPER (Tap Water)									
Contaminant (90th Percentile Value)	Dates of Sampling (mo/yr)	AL Violation Y/N	1A	2A	3A	3BC	MCLG	Action Level (AL)	Likely Source of Contamination
Copper (Tap Water) (ppm)	08/13	N	0.06800	0.04500	0.09900	0.03700	1.3	1.3	Corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives
# of Sites exceeding the AL			0	0	0	0			
Lead (Tap Water) (ppb)		N	8.48	1.89	1.79	2.45	0	15	Corrosion of household plumbing systems
# of Sites exceeding the AL			0	0	0	0			
UNREGULATED CONTAMINANTS									
Contaminant	Dates of Sampling (mo/yr)	MCL Violation Y/N	1A (range)	2A (range)	3A (range)	3BC (range)	Draft Reference Concentration (RC)	Likely Source of Contamination	
Chlorate (ppb)	01/15-02/15	NA	NA	325 (320-330)	230 (230-230)	NA	210	Agricultural defoliant; disinfection by-product	
Chlorodifluoromethane (ppf)	01/15-02/15	NA	NA	110 (110-110)	170 (170-170)	NA	Not Available	Refrigerant; solvent; fluorocarbon resins	
Chromium (ppb)	01/15-02/15	NA	NA	0.43 (0.42-0.43)	0.235 (0.23-0.24)	NA	100	Naturally occurring element	
Hexavalent Chromium (ppb)	01/15-02/15	NA	NA	0.18 (0.16-0.19)	0.053 (0.0560-0.056)	NA	Not Available	Release of industrial chemicals	
Molybdenum (ppb)	01/15-02/15	NA	NA	ND	ND	NA	40	Naturally occurring element	
Strontium (ppb)	01/15-02/15	NA	NA	410 (400-420)	225 (220-230)	NA	4000	Naturally occurring element	
Vanadium (ppb)	01/15-02/15	NA	NA	0.87 (0.85-0.88)	0.435 (0.43-0.44)	NA	21	Naturally occurring element	

Source: Broward County Water and Wastewater Services, 2015 Water Quality Report.

B. Air Resources

Ambient air monitors continue to report that the air quality in Broward County is about 78% in the good range (i.e. Air Quality Index in the 0 – 50 range). However, Broward County's air quality exceeded the U.S. Environmental Protection Agency (EPA) National Ambient Air Quality Standards (NAAQS) less than one percent (1%) in the past 5 years, indicating that continued growth rates could pose a challenge in the future to meet these standards, unless the County is environmentally vigilant when approving land use and transportation plans. Broward County is within eight to ten years of using all of its available land and the impact of future growth should be carefully planned to determine the detrimental effect, if any, on air quality. Exceeding the EPA NAAQS due to excessive emissions could result in facilities having to spend more money to install costly pollution control equipment and state and local agencies having to implement costly transportation control measures.

In accordance with EPA, Florida Department of Environmental Protection (DEP) and local air regulations, EPGMD issues air permits and performs air compliance inspections of facilities that cause, contribute or have the potential to emit significant air pollution. EPGMD will continue to enforce EPA, DEP and local asbestos regulations to protect the public from exposure to asbestos fibers that may result from the disturbance and/or removal of asbestos containing building products and systems during the renovation or demolition of public, commercial, industrial and certain types of residential structures and building systems. In addition, EPGMD has representation in the Metropolitan Planning Organization Technical Committee (MPOTC). As part of the active role in the MPOTC, EPGMD promotes alternative modes of transportation, transit-oriented development and walkable communities to alleviate traffic congestion and air pollution. The Department is also involved in the promotion and implementation of alternative fuel vehicles through participation in local, state and federal initiatives and public-private partnerships.

C. Floodplains

In general, the County has been managing floodplains successfully since 1977 through the review and permitting process. Flooding problems have been greatly alleviated, by the creation of 19 drainage/water control districts which have developed a system of secondary canals and small manmade lakes (see Water Management Element). Even with the existence of flood control regulations and structures, flooding is still a major issue. As a result, Broward County is a recognized participant community in the Federal Flood Insurance Program. This program requires the adoption of a resolution of intent to participate and cooperate with FEMA and submit a floodplain management ordinance that meets or exceeds the minimum NFIP criteria and of which also adopts any Flood Insurance Rate Map or Flood Hazard Boundary Map for the community.

D. Commercially Valuable Minerals

Mining activities by their nature of operation have a negative impact upon surface water quality. All such activities in the County are surface extractions resulting in open rock pits and slag piles. Rock pits increase the opportunity for unfiltered or untreated urban runoff to enter the Aquifer. Erosion from excavated material contributes to the siltation of the associated rock pit. Further, open rock pits and slag piles become hazards to the public if not properly safeguarded. Newly adopted state reclamation requirements as specified within the Resource Extraction Reclamation Act of 1986 (Chapter 378, FS) address some of these concerns. Requirements for reclamation, trash and unusable equipment disposal, erosion control and revegetation provide these safeguards. In addition, the U.S. Army Corps of Engineers and the SFWMD have adopted standards for the creation of littoral slopes which may introduce biological function to reclaimed rock pits. Objective C4 manages mineral resources.

E. Soil Associations and Areas with Soil Erosion Problems

Of Broward County's ten (10) soils associations, only the Hallandale-Margate and Lauderdale-Dania soil associations are generally unsuitable for septic tank usage. In these two (2) soil associations, septic tank usage could potentially cause adverse impacts to groundwater or surface waters if residential densities or non-residential intensities are too high, as shown in the [Broward County Land Use Plan's Natural Resource Map Series](#).

Objective C5 provides for the County to maintain its land development codes allowing septic tanks where a centralized wastewater system is not available, provided all legal requirements are met. The term—available as used herein is intended to be interpreted consistent with the Section 64E-6.002(9), FAC. The land development codes governing septic tank usage are codified in Chapter 34, Article II½, Broward County Code of Ordinances (Code).

The land development codes mandating that all premises which abut a sanitary sewer main be connected to the sanitary sewer main, unless exempted, are codified in Chapter 34, Article II, Code. The Code provides for two (2) exceptions. The first exception is for connection charges that are not just or unreasonable. The second exception, adopted into Chapter 34 on July 14, 1998, is for areas designated with a rural residential designation (1 dwelling unit per acre or less). These two (2) articles, which are considered environmental regulations and thus apply Countywide, supplement the standards for onsite sewage treatment and disposal system provisions codified in Chapter 64E-6, Florida Administrative Code (FAC).

The U. S. Department of Agriculture, Natural Resource Conservation Service (NRCS) has indicated that inland erosion is minimal except for siltation at construction sites. Coastal erosion continues to be the main concern. The Broward County Erosion Prevention District was established in 1963 by special act of the Florida Legislature and given the authority to implement a beach preservation program for the twenty-four miles of ocean shoreline in Broward County. In 1992, DPEP took over the functions of the

Erosion Prevention District. (See the Coastal Management Element). Soil erosion is addressed through Objective C5.

F. Natural Resource Areas

1. Recreationally Important Fish and Shellfish

Opportunities to enhance or improve recreational saltwater fishing are extremely limited because there is only approximately 1.2 miles of coast line in unincorporated Broward. However, because recreational saltwater fishing is considered to be so important to the County, the EPGMD created the Artificial Reef Program, which is described in the marine habitat category of the natural resource section. Marine habitat and fisheries are addressed by Objective C7.

2. Commercially Important Fish and Shellfish

Opportunities to enhance or improve commercial saltwater fishing are extremely limited because there is only approximately 1.2 miles of coast line in the BMSD. However, because commercial saltwater fishing is considered to be so important to the County's economy, the EPGMD created the Artificial Reef Program, which is described in the marine habitat category of the natural resource section. Marine habitat and fisheries are addressed by Objective C7.

3. Wildlife

Conservation of wildlife species is dependent upon the conservation of the vegetative resources that provide them with food, shelter and nesting areas. In 2009, the Broward County Commission designated 46 Native Vegetation Category Local Areas of Particular Concern (LAPC) and 79 Natural Resource Areas (NRA), many of which are also LAPCs. Appendix C-C lists NAPCs, LAPCs and NRAs. These areas represent historic remnants of the vegetative communities that once flourished in Broward County. While these designations do not preclude development, they do limit activities that may occur on the site until a certain level of development approval is received. Development is preceded by an environmental impact report and, potentially, mitigation measures if they are required. During the development review of the LAPC sites, all or a portion of the designated resource can be set aside as a private or public preservation area.

Of the methods for protecting existing natural resource areas, only designation as an Urban Wilderness Area assures preservation. Designated Urban Wilderness Areas, acquired with public funds, are maintained as passive recreation areas in perpetuity. Appendix C-D lists the Urban Wilderness Areas.

Development will continue in Broward County for the foreseeable future, therefore, pressures to develop environmentally sensitive areas shall continue. It is assumed that state grants, such as the Conservation and Recreational Lands (CARL) program, and locally generated funds, such as regional park impact fees, will be utilized for acquiring sites on the Urban Wilderness Inventory.

Appendix C-D contains the Urban Wilderness Inventory. Additionally, through the 1989 Environmentally Sensitive Land Bond Issue that was approved by the voters of the County, nearly 1000 acres of the most endangered sites have been purchased for conservation and passive park usage. Wildlife is addressed by Objective C7.

4. Marine Habitats

To create additional habitat for marine life, the EPGMD manages an active artificial reef program. Through this program, objects such as derelict ships, oil platforms and engineered structures are introduced into the marine environment. These underwater structures provide shelter and foraging areas for fish, substrate for benthic organisms and nursery areas. The effectiveness of the Artificial Reef Program is inconclusive. Certainly, more habitat is being provided. It is not known whether providing an increased quantity of habitat actually leads to an increased abundance of aquatic life or biodiversity, although that is the presumption of many leaders in the field of marine biology and oceanography. According to NOAA, research suggests that in some instances, artificial reefs may divert some pressure away from natural reefs while still allowing visitors to enjoy diverse marine life. Because many of these divers, snorkelers and anglers charter through local businesses, artificial reefs can have a positive impact on local economy as well. In some instances, however, the negative ecological impacts of artificial reefs may outweigh potential economic gains. For example, development of artificial reefs may cause an increase in overall visitation to an area, meaning more visitors to both artificial and natural reefs. Or, if artificial reefs are not carefully planned or constructed, they can potentially damage natural habitats. In addition, monitoring observations indicate that many artificial structures are quickly becoming habitat and possibly a spawning source for invasive species such as the orange-cup coral. Marine habitat is addressed by Objective C7.

Manatees, which inhabit rivers, shallow estuaries, and saltwater bays, are found year-round in Broward County. In 1993 the State of Florida approved County-recommended speed restrictions along most major waterways for manatee protection. Manatee numbers increase during the winter months when migration from the central part of the State occurs.

A portion of Port Everglades remains designated as a "Manatee Sanctuary" by the Florida Legislature. Additionally, the cooling lakes connected to the inland FPL power plant have been designated "essential manatee habitat" by Broward County and as a "no entry zone" by the State.

Manatees have no known predators however principal threats to the manatees' existence in Broward County are boat or barge collisions and crushing or drowning in canal locks. Although manatees are protected under the Endangered Species Act and the Marine Mammal Protection Act, a slow decrease in their population is projected by experts in the field.

In 2007, the Environmental and Growth Management Department developed the Manatee Protection Plan to ensure the long-range protection of the manatee species and its habitat by

implementing additional manatee protection measures and including increased law enforcement, manatee monitoring, education and awareness throughout the County's waterways that are accessible to manatees.

As part of the Plan, the Board adopted Ordinance No. 2007-34, which, beginning October 1, 2008:

1. Established a \$400 (with a 4% annual increase) per new slip fee for new marine facilities or existing marine facilities undergoing expansion.
2. Sets an annual manatee conservation fee of \$20 (with a 4% annual increase) per slip for all facilities with five or more slips (multi-family residential, commercial, municipal and private marinas, and/or boat ramps).
3. To help document and track the number of slips in the County, requires facilities with five or more slips to apply for an annual Marine Facility Operating License.

All three species of sea turtles known to nest in Broward County are designated as either endangered or threatened. There are numerous reasons for the decline in the turtles' populations. Coastal development activities have the greatest negative impact. The Sea Turtle Conservation Program, administered by EPGMD, serves to mitigate the negative effects of development activities by marking and recording nesting sites, and when necessary, relocating turtle eggs to non-hazardous areas. This program is funded and administered by the Board through the Environmental Planning and Community Resilience Division (EPCRD) and carried out by Nova Southeastern University to conduct sea turtle nesting surveys daily from March 1, 2015 – October 31, 2015 for all Broward County beaches except John U Lloyd State Park (Index Beach, monitored by Park staff). All loggerhead, green and leatherback turtle crawls (nests and false crawls) were identified to species and recorded by Geographic Positioning System (GPS). All nests were marked using wooden stakes and Red-Glo flagging tape and monitored throughout the season until they hatched or were determined to be non-viable. Reproductive success was investigated for a total of 2,172 nests after hatch-out (2,087 in situ, 41 Relocated, 44 Restraining Cage nests). The 2015 sea turtle nesting season had the second highest nest numbers since the inception of the project/surveys in 1981, although earlier years may have slightly varied in survey area and season length. Nesting Success (Nests/(Nests + False Crawls)) averaged 41.2% for all species combined, 39.6% for loggerheads, 51.0% for greens, and 97.2% for leatherbacks. The combined species nesting success was 10% lower than the 2014 season and nearly 7% lower than the 5-year average of 48.0%.

5. Vegetative Communities

The Tree Preservation Ordinance has provisions for the protection of Natural Forest Communities (NFC). Sites designated as an NFC must preserve portions of their property through a conservation easement to receive a Tree Removal License. Municipalities which have their own Tree Ordinances

are required to have similar provisions. However, in some cases enforcement of Municipal Tree Ordinances is less stringent and may not provide adequate protection.

Preservation of the native understory vegetation within native communities is accomplished, in part, by the Natural Resource Area provisions of the code which limits the clearing activities that may occur on the site until a certain level of development approval is received. There are 79 sites that have been designated by the Board as NRAs.

To re-establish the benefits provided by native plants within the developed environment, a certain percentage of native plants is required within landscape plans reviewed by the County. Broward County also administers the NatureScape Broward program with the goal of protecting water quality and quantity, and creating wildlife habitat through appropriate landscaping practices, the prudent use of our water resources, and the planting of native, non-invasive and other drought tolerant plants in Broward County. Policy C6.8 references the implementation of the NatureScape Broward program and program principles as part of the County's efforts to achieve water conservation as landscape irrigation accounts for up to 50% of water consumption in Broward County. Additionally, plant species known to invade natural vegetative communities are precluded from use by the landscape ordinance. Objective C8 conserves and protects native vegetative communities.

Table C-3: Broward County Projected Water Demand

Demand Type	2016	2025	2035	2045
Population	1,909,632	2,000,000	2,100,000	2,200,000
Projected Required Allocation (mgd)	318.0	246.7	261.9	272.9
Projected Required Additional Pumpage (mgd)	239.4	7.3	22.5	33.5

**Projected Broward County water demands based on current BEBR and PCUR measured in 2016 provided by the Environmental Planning and Community Resilience Division.*

6. Projected Water Needs and Sources

Broward County's population is projected to increase by 13.2% between 2012 and 2027, from 1.76 to 2 million people. The Biscayne Aquifer is currently the primary drinking water source for all of Broward County and even under current demands has been subject to restrictions during periods of water shortage. In the absence of alternative water supply development, raw water demands on the Biscayne Aquifer would be expected to increase at a rate commensurate with population growth, assuming that the treatment technology and the per capita rate of consumption were to remain the same. However, Broward County's overall raw water demands are likely to increase at a rate that surpasses that of population growth since many water utilities are expected to upgrade their treatment technologies from lime softening to membrane filtration, the latter of which has lower recovery of finished water but produces a higher water quality. Membrane filtration systems will also allow utilities to utilize the brackish Floridan Aquifer as a source water for potable

treatment systems through upgrading of filtration skids, thereby providing diversification in water sources, increasing overall treatment capacity to meet growing demands, and achieving consistency with the Regional System Water Availability Rule.

Recognizing the potential value of water conservation programs, the Board instituted a variety of measures in 1991 to reduce per capita water use. The key components of these plans are discussed below. As shown, the water conservation programs developed on a Countywide basis are focused on ordinances that require specific irrigation hardware, restriction of outdoor uses of water, low-flow fixtures for indoors and public education.

1. The Board adopted an ordinance that requires the installation of rain sensor devices on all irrigation systems installed after May 1, 1991 (Chapter 39, Broward County Code of Ordinances, Article VII). These sensors prevent irrigation systems from turning on when it is raining. The ordinance does not affect systems installed prior to 1991.
2. The Board adopted a Countywide ordinance (Ordinance 91-8, Chapter 36, Broward County Code of Ordinances, Article II) limiting hours of irrigation from 5:00 PM to 9:00 AM. The primary focus of the ordinance is to allow irrigation only during night time hours and to encourage the use of low flow watering by providing exemptions for low volume irrigation systems.
3. The Board adopted a Countywide ordinance (Chapter 39, Broward County Code of Ordinances, Article VIII) adopting the principles of Florida Friendly Landscaping. This ordinance is intended to conserve water by promoting the use of native plant communities that require less frequent watering.
4. The Board adopted a Countywide ordinance (Chapters 5 and 39, Broward County Code of Ordinances, Article III) applying the South Florida Building Code, which requires water conservation fixtures and low flow volume irrigation. The ordinance applies to all construction occurring after the date of ordinance passage but does not address retrofitting of buildings prior to the data of the ordinance.
5. The Board approved Resolution 85-867 to adopt FAC Chapter 40E-21 by reference at such time the South Florida Water Management District declares a water shortage condition exists. Graduated, detailed and specific water reductions are mandated in such an emergency and are fully enforceable by law enforcement agencies.

In addition to the Countywide ordinances adopted by the Board, the EPGMD has implemented a Countywide water conservation and educational outreach program called Water Matters, designed to inform homeowners, professional property managers, and children about the need for water conservation and the connection between urban water practices and the quality of our

natural resources. Several Water Matters program initiatives are implemented in partnership with municipal governments, drainage districts, businesses and other governmental agencies.

1. EPGMD annually coordinates and administers the celebration of Water Matters Day, a Countywide water conservation event to educate residents about the need for water conservation, water management in Broward County and ways they can help conserve and protect local water resources.
2. EPGMD implements the nationally recognized Naturescape Broward program which promotes the use of native and other drought tolerant and low-maintenance plants in landscaping to protect the quality and quantity of water resources.
3. EPGMD operates a NatureScope Irrigation Service (NIS) designed to achieve significant reductions in landscape irrigation through landscape site evaluations that assist property managers in providing more efficient maintenance and operation of large volume irrigation systems.
4. EPGMD provides Know-the-Flow training to landscape professionals, property managers, public works staff and others on a monthly basis. Know-the-Flow is a 4-hour course in surface water management and best management practices to protect the quality and quantity of local water resources.
5. EPGMD staffs the Broward Everglades Working Group with representation from municipalities, drainage districts, agricultural and other interest groups, which was convened to develop a pollution reduction action plan for the C-11 West Basin as part of local efforts to increase source controls on pollution in support of Everglades restoration.

EPGMDs programs are intended to make the public, policy makers and governmental agencies more aware of the value of conserving both the quality and quantity of water resources and increasing their active participation in water conservation efforts as part of daily activities.

Broward County's water utility, Water and Wastewater Services (WWS), is also focused on achieving significant water savings through more efficient operations, water conservation and educational programs. WWS originally prepared a Water Conservation Plan to comply with the requirements of the South Florida Water Management District in April 1988. The plan has been updated on a regular basis since that time to reflect the latest conservation measures and policies in the water supply industry. Current elements of the plan include the following programs:

1. Since 1991, WWS has maintained a three-tiered rate structure for water pricing. In 2003, the rate structure was amended to further enhance conservation.

2. WWS has implemented a plan for mitigating unaccounted for water losses, which includes a leak detection program utilizing surveillance techniques, certification and calibration of water meters.
3. WWS has developed a public education program that includes the development and distribution provision of brochures and educational materials for elementary and high school students, and presentations to homeowner and condominium associations regarding water supply, treatment and conservation issues.
4. WWS continues to pursue opportunities to increase the amount of reclaimed water used from the North Regional Waste Water Treatment Facility to offset irrigation demands.
5. WWS is partnering with EPGMD to fund the operation of a NatureScape Irrigation Service within its service area to help customers implement improved irrigation practices on their property.
6. WWS is currently developing a water use profile for each of its four service areas. The profile is designed to identify specific demographic, operational, engineering and fiscal characteristics of each service area that allows WWS to determine area specific customer patterns within each service area. The proposed data will be used to develop a targeted conservation program for each district. Elements of the program may include revised educational programs, demand management by testing the impact of gradual pressure reductions, rebate programs, or increased use of reclaimed water. Upon completion of the profile, the existing conservation program will be updated.

Implementation

A. Authority

Programs, policies, and standards related to environmental protection and conservation in Broward County are developed and implemented by federal, state, regional and county public agencies. A list of responsible agencies is provided in Appendix C-H, which identifies the enabling legislation and authority granted to each public agency. The primary agencies charged with the enforcement of environmental regulations in Broward County are the Florida Department of Environmental Protection (DEP), the South Florida Water Management District (SFWMD), the Broward County Environmental Protection and Growth Management Department (EPGMD), Florida Fish and Wildlife Conservation Commission (FWC), and the Broward County Water and Wastewater Services (WWS).

B. Regulatory Efforts to Promote Conservation and Protection of Natural Resources

The Tree Preservation Ordinance, Section 27-340, Broward County Code of Ordinances, has provisions for protecting Broward's remaining upland habitat. The Ordinance requires a License for tree removal. The Ordinance is enforced by the EPGMD.

Under the provisions of the ordinance, EPGMD reviews site plans or construction plans for impacts to trees through a license application. The applicant is required to preserve trees if possible and to relocate or replace trees if not possible. There are additional requirements for the preservation of Natural Forest Communities and Specimen Trees, as well as standards for the protection of trees during construction. The Ordinance is countywide; however, it is not enforced in a municipality if that municipality has certified that it has an ordinance as stringent as the county's ordinance and is capable of enforcement.

The County also has an ordinance that regulates the pruning of trees. Section 27-421-425 of the Broward County Code prohibits improper pruning of trees, such as topping. This ordinance is enforced Countywide and has similar municipal exemption language.

Broward County's Countywide protective land clearing ordinance is designed to regulate removal of native vegetation in designated areas. An owner may only clear property of existing understory in accordance with Ordinance 89-6. Indiscriminate land clearing can, and often does, destroy valuable trees by disturbing root systems as well as diminishing the integrity of the resource. Such activity contributes to the loss of natural areas and habitats in the County and, thereby, negatively impacts the quality of life. This Ordinance protects the understory vegetation until appropriate development permits have been issued.

The County has review authority over an environmentally sensitive area if the area has been designated as a Local Area of Particular Concern (LAPC) or has been included in the Urban Wilderness

Inventory. Sites so designated or included cannot be developed until an environmental impact report has been completed in accordance with the Broward County Land Development Code. If, upon review of the environmental impact report, the Broward County Commission determines that acquisition of all or part of the land is necessary to prevent adverse environmental impact, the Board may defer action on the development permit application for a period of up to one year. At that time, approval will be granted subject to specific conditions unless the land has already been acquired by the County.

LAPC's may be designated in six categories according to the types of resources present. LAPC's must have one or more of the characteristics for the respective category. The categories are as follows:

- **Marine Resource Category**

Coastal areas of unique, scarce, fragile or vulnerable natural habitat, physical features and scenic importance, or; Coastal areas of high natural productivity or essential habitat for fish, wildlife and the various trophic levels in the food web critical to their well-being, or; coastal areas of substantial recreational value and/or potential, or; areas needed to protect, maintain, or replenish coastal flood plains, coral and other reefs, beaches, offshore sand deposits and mangrove stands.

- **Natural Landforms and Features Category**

A geological, hydrological, or physiographical feature confined to a small area of Broward County and considered quite rare locally or regionally, or; a representative natural ecosystem and/or its units existing in a few isolated locations but extirpated from most of the County.

- **Native Vegetation Category**

Areas containing native plant communities of unique character and/or rare, threatened, or endangered species or species of special concern, or; native vegetative communities exceptionally outstanding in growth, structure, and/or variety, or; isolated or well developed native vegetative communities in urban or rapidly urbanizing areas.

- **Wildlife Category**

Existing wildlife refuges, reserves, and sanctuaries, or; known habitats of rare, threatened or endangered species or species of special concern, or; major wildlife intensive use areas such as well-developed hammock communities, highly productive coastal tidelands and mangroves, or; areas used for scientific study and research on wildlife.

- **Economic Resource Category**

Existing ports, marinas, piers, energy resources and artificial reefs or; areas noted for scientific study and research concerning economic development.

- **Cultural Resource Category**

Sites designated on the National Register of Historic Places or on the Florida Master Site File, or; sites related to the general development of the local area, region or State, or; buildings which are significant examples of the architectural design of their period, or; sites associated with the life/lives

of important person(s) or social, political, cultural, or economic movements or with historical events, or; archaeological sites which have yielded useful information on the area's past.

Unique Natural Areas were first identified in the Broward County Land Use Plan in 1977. These areas were considered to be the last remains of Broward County's natural landscape, having unique and/or ecological significance. Since that time, Unique Natural Areas have been designated LAPC's and are subject to environmental review prior to development.

The Urban Wilderness Inventory is a list of natural areas proposed by the Urban Wilderness Advisory Board for preservation as Urban Wilderness Areas. The Urban Wilderness Advisory Board was established by Chapter 25 ½, Broward County Code of Ordinances. The Advisory Board is composed of nine members each having expertise in either biology, botany, zoology or physical or environmental science. The purpose of the Advisory Board is to maintain an inventory of existing natural areas and to make recommendations to the Board on acquisition and regulation of those areas. Currently, there are 38 Urban Wilderness Area sites on the Inventory. Exact locations and descriptions of the sites are provided in Appendix C-D.

Water utilities across the County rely entirely upon groundwater sources, including the Biscayne and Florida Aquifers, for potable water supplies. Use of well stimulation fracturing techniques and mixes exposes adjacent land and surface waters to the risk of contamination through open pit storage, truck transport on roadways, and activities during well development. The Board of County Commissioners adopted in 2015 a resolution (Resolution 2015-340) opposing the use of hydraulic fracturing, acid fracturing and any form of extreme well stimulation for purposed of resource extraction. Policy C3.4 prohibits oil, gas, and mineral extraction and exploration, through drilling, core testing, fracking, and any other methods, in areas designated for Conservation future land use on the Broward County Land Use Plan or the BMSD Future Land Use Map Series.

Appendices

Appendix C-A: Broward County Ecological Communities, 2017

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.

Human 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.

Human 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.

Human 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 (*Borrchia 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, well-drained 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.

Human Influences: Industrial and residential development; dumping; off-road vehicles; human-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.

Human 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 (*Hypericum 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.

Human 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 Busic (*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 (*Dasyus 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 near 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.

Human 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.

Human 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.

Human 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 C-B: Broward County Endangered and Threatened Plants and Animals, 2005

Plant Species		Designated Status*		
Scientific Name	Common Name	FGFWFC	FDA	USFWS
<i>Acrosichum aureum</i>	Gold leather fern		E	
<i>Acrostichum danaeifolium</i>	Giant leather fern		T	
<i>Anemia adiantifolia</i>	Pine fern		T	
<i>Asclepias curtissii</i>	Curtiss' milkweed		T	
<i>Asplenium abscissum</i>	Spleenwort (unnamed)		T	
<i>Asplenium serratum</i>	Bird's nest spleenwort; wild birdnest fern		E	
<i>Asplenium trichomanes-dentatum</i>	Spleenwort (unnamed)		T	
<i>Bletia purpurea</i>	Pinepink		T	
<i>Campyloneurum phyllitidis</i>	Strap fern (unnamed)	T		
<i>Catopsis floribunda</i>	Air plant (unnamed)		E	
<i>Chrysophyllum olivaeforme</i>	Satinleaf		E	
<i>Coccothrinax argentata</i>	Silver palm		C	
<i>Cocos nucifera</i>	Coconut palm	T		
<i>Ctenitis sloanei</i>	Comb fern (unnamed)	T		
<i>Ctenitis submarginalis</i>	Comb fern (unnamed)	T		
<i>Encyclia cochleata</i>	Shell orchid; clamshell orchid		T	
<i>Encyclia tampensis</i>	Butterfly orchid		T	
<i>Epidendrum difforme</i>	Unbelled epidendrum		T	
<i>Epidendrum nocturnum</i>	Night-scent orchid; night-smelling		T	
<i>Epidendrum rigidum</i>	Rigid epidendrum		T	
<i>Ernodia littoralis</i>	Beach creeper	T		
<i>Eulophia alta</i>	Wild coco; ground coco		T	
<i>Habenaria odontopetala</i>	Rein orchid (unnamed)		T	
<i>Monotropa brittonii</i>	Scrub Indian pipes; Britton's pinesap			UR2
<i>Myrcianthes fragrans</i> var. <i>simpsonii</i>	Simpson's stopper; twinberry			UR2
<i>Nephrolepis biserrata</i>	Boston fern (unnamed)		T	
<i>Okenia hypogaea</i>	Burrowing four-o'clock		E	
<i>Ophioglossum palmatum</i>	Hand adder's tongue fern		E	UR5
<i>Osmunda regalis</i>	Royal fern		C	
<i>Peperomia floridana</i>	Everglades peperomia	E		UR2
<i>Phlebodium aureum</i>	Golden polypody		T	
<i>Pleopeltis revoluta</i>	Star-scale fern	T		
<i>Polypodium ptilodon</i>	Polypody fern (unnamed)		T	
<i>Psilotum nudum</i>	Whisk fern; fork fern	T		
<i>Pteris longifolia</i>	Ladder brake fern		T	

Plant Species		Designated Status*		
Scientific Name	Common Name	FGFWFC	FDA	USFWS
<i>Pteris tripartite</i>	Giant brake fern		T	
<i>Pteris vittata</i>	Brake fern (unnamed)	T		
<i>Remirea maritima</i>	Beach star		E	
<i>Sabal etonia</i>	Scrub palmetto		T	
<i>Scaevola plumieri</i>	Inkberry		T	
<i>Selaginella arenicola</i>	Sand spikemoss		T	
<i>Suriana maritima</i>	Bay cedar		E	
<i>Tectaria heracleifolia</i>	Halberd fern (unnamed)		T	
<i>Tectaria incisa</i>	Halberd fern (unnamed)		T	
<i>Thelypteris dentate</i>	Downy shield fern		T	
<i>Thelypteris interrupta</i>	Aspidium fern (unnamed)		T	
<i>Thelypteris kunthii</i>	Aspidium fern (unnamed)		T	
<i>Thelypteris ovata</i>	Aspidium fern (unnamed)		T	
<i>Thelypteris palustris</i>	Marsh fern		T	
<i>Thelypteris reptans</i>	Creeping fern	T		
<i>Tillandsia balbisiana</i>	Wild pine; air plant (unnamed)		T	
<i>Tillandsia fasciculata</i>	Common wild pine		C	
<i>Tillandsia flexuosa</i>	Twisted air plant		T	
<i>Tillandsia paucifolia</i>	Wild pine; air plant (unnamed)		T	
<i>Tillandsia polystachia</i>	Wild pine; air plant (unnamed)		T	
<i>Tillandsia setacea</i>	Wild pine; air plant (unnamed)		T	
<i>Tillandsia utriculata</i>	Giant wild pine; giant air plant		C	
<i>Tillandsia valenzuelana</i>	Wild pine; air plant (unnamed)		T	
<i>Trismeria trifoliata</i>	Bracken fern (unnamed)		T	
<i>Vittaria lineata</i>	Shoestring fern		T	
<i>Zamia integrifolia</i>	Florida arrowroot		C	UR5

* See Acronym definitions below.

Source: See below.

Animal Species		Designated Status*		
Scientific Name	Common Name	FWC	FDACS	USFWS
<i>Chenille mydas</i>	Atlantic green turtle	E	E	
<i>Eretmochelys imbricate</i>	Atlantic hawksbill turtle	E	E	
<i>Caretta</i>	Atlantic loggerhead turtle	T	T	
<i>Dermochelys coriacea</i>	Leatherback turtle	E	E	
<i>Gopherus polyphemus</i>	Gopher tortoise	SSC	UR2	
<i>Alligator mississippiensis</i>	American alligator	SSC	T(S/A)	
<i>Trichechus manatus latirostris</i>	West Indian manatee	E	T	T

Animal Species		Designated Status*		
Scientific Name	Common Name	FWC	FDACS	USFWS
Rana areolate	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	Southern American kestrel	T	UR2	
Haenatopus palliatus	American oyster catcher	SSC		
Sterna antillarum	Least tern	T		
Aphelocoma coerulescens	Florida scrub jay	T	UR2	
Egretta caerulea	Little Blue Heron	T		
Athene cunicularia	Burrowing Owl	T		
Eudocimus albus	White ibis	SSC		

* See Acronym definitions below.

Source: See below.

Animal list was updated by the Broward County Cooperative Extension.

FWC - Florida Fish and Wildlife Conservation Commission

FDACS - Florida Department of Agriculture and Consumer Services

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-C: Broward County Local Areas of Particular Concern (LAPC) and Natural Resource Areas (NRA), 2009

Site Name	Municipality	Section/Township/Range	Designation
Highlands Scrub Natural Area	Pompano Beach	134842	LAPC, NRA
Military Trail	Deerfield Beach	144842	LAPC, NRA
Tall Cypress Natural Area	Coral Springs	134841	LAPC, NRA
Crystal Lake Sand Pine Scrub	Pompano Beach	234842	LAPC, NRA
Woodmont Natural Area	Tamarac	44941	LAPC, NRA
Warbler Wetland	Fort Lauderdale	174942	LAPC
Hillsboro Pineland Natural Area	Coconut Creek	314742, 064842	LAPC, NRA
Pine Island Ridge	Davie	175041, 205041	LAPC, NRA
Pond Apple Slough	Davie	195042, 305042, 255041	NRA
Secret Woods Nature Center	Dania Beach	205042	LAPC, NRA
Long Key Nature Center	Davie	235040, 265040	LAPC, NRA
Anne Kolb Nature Center	Hollywood, Dania Beach	265042, 255042, 355042, 365042, 025142, 015142, 115142, 125142	LAPC, NRA
Tradewinds Park	Coconut Creek	174842, 204842	LAPC, NRA
Lyons Creek Cypress Preserve	Coconut Creek	54842	NRA
Cypress Creek Sand Pine Preserve	Fort Lauderdale	94942	LAPC, NRA
Mills Pond Park Addition	Fort Lauderdale	284942	LAPC, NRA
Lakeside Sand Pine Preserve	Oakland Park	294942	LAPC, NRA
Coconut Creek Green Space	Coconut Creek	324742	NRA
Site 31	Deerfield Beach	124842	NRA
Site 29	Deerfield Beach	114842	NRA
Site 47	Hillsboro Beach	84843	LAPC, NRA
Site 72	Wilton Manors	264942	NRA
Site 67	Fort Lauderdale	114942	NRA
Site 82A	Fort Lauderdale	15042	NRA
Site 92	Fort Lauderdale	215042	NRA
Site 36	Margate	194842	NRA
Site 78	Unincorporated	135041	LAPC, NRA
Site 94	Dania Beach	235042	NRA
Site 93	Dania Beach	235042	LAPC, NRA
Site 66	Fort Lauderdale	104942	LAPC, NRA
Site 62	Fort Lauderdale	94942	NRA
Site 63	Fort Lauderdale	94942	NRA
Site 60	Fort Lauderdale	84942	NRA
Site 61	Fort Lauderdale	84942	LAPC, NRA

Site Name	Municipality	Section/Township/Range	Designation
Site 70	Fort Lauderdale	174942	NRA
Site 41	Pompano Beach	244842	NRA
Site 37	Pompano Beach	214842	NRA
Site 42B	Pompano Beach	254842	LAPC
Site 42D	Pompano Beach	254842	LAPC
Site 42C	Pompano Beach	254842	LAPC
Site 57	Pompano Beach	44942	NRA
Site 42A	Pompano Beach	254842, 264842	LAPC
Site 81	Davie	295041	NRA
Site 77B	Davie	255040	LAPC, NRA
Site 77A	Davie	255040	LAPC, NRA
Site 112	Dania Beach	335042	NRA
Site 110	Dania Beach	325042	NRA
Site 114	Dania Beach	345042	NRA
Site 95	Hollywood	255042	LAPC, NRA
Site 5	Parkland	24841	NRA
Site 2	Parkland	364741	NRA
Site 124B	Coral Springs	114841	LAPC, NRA
Site 124A	Coral Springs	114841	LAPC, NRA
Site 10A	Coral Springs	124841	NRA
Site 10B	Coral Springs	124841	NRA
Site 10C	Coral Springs	124841	NRA
Site 11	Coral Springs	124841	NRA
Site 12	Coral Springs	124841	NRA
Site 14	Coral Springs	154841	LAPC, NRA
Site 13D	Coral Springs	134841	NRA
Site 15	Coral Springs	224841	NRA
Site 13C	Coral Springs	134841	NRA
Site 20B	Coconut Creek	324742	NRA
Site 21A	Coconut Creek	54842	NRA
Site 21C	Coconut Creek	54842	NRA
Site 24	Coconut Creek	64842	NRA
Site 26	Coconut Creek	74842	LAPC, NRA
Site 28B	Coconut Creek	174842	LAPC, NRA
Site 35	Coconut Creek	184842	LAPC, NRA
Site 43A	Coconut Creek	304842	LAPC, NRA
Site 43B	Coconut Creek	304842	LAPC, NRA
Site 44B	Coconut Creek	314842	LAPC, NRA

Site Name	Municipality	Section/Township/Range	Designation
Site 45	Coconut Creek	314842	LAPC, NRA
Site 27	Coconut Creek	084842, 054842	LAPC, NRA
Site 20A	Coconut Creek	324742	NRA
Site 20C	Coconut Creek	324742	NRA
Site 44A	Coconut Creek	314842	LAPC, NRA
Site 97	Dania Beach	265042	LAPC, NRA
Site 117	Hollywood	15141	LAPC, NRA
Site 122	Miramar, Weston, Southwest Ranches, Pembroke Pines	334939, 344939, 035039, 045039, 095039, 105039	LAPC
Site 98	Hollywood, Dania Beach	265042, 355042	LAPC, NRA

Source: Broward County Natural Resources Planning and Management Division, Land Preservation Program, 2009.

Appendix C-D: Broward County Urban Wilderness Areas, 2009

Site Name	Municipality	Section/Township/Range
Doris Davis Forman Preserve	Parkland	354741
Coconut Creek Maple Swamp	Coconut Creek	54842
Site 39	Coconut Creek	54842
West Creek Pineland	Coconut Creek	64842
Helene Klein Pineland Preserve	Coconut Creek	64842
Saw Palmetto Natural Area	Coconut Creek	64842
Holmberg Road Site	Parkland	34842
Highlands Scrub Natural Area	Pompano Beach	134842
Helwig Natural Area	Deerfield Beach	134842
Military Trail	Deerfield Beach	144842
Tall Cypress Natural Area	Coral Springs	134841
Crystal Lake Sand Pine Scrub	Pompano Beach	234842
Woodmont Natural Area	Tamarac	44941
Shooster Preserve	Margate	14941
Warbler Wetland	Fort Lauderdale	174942
Hillsboro Pineland Natural Area	Coconut Creek	314742, 064842
Pine Island Ridge	Davie	175041, 205041
Pond Apple Slough	Davie	195042, 305042, 255041
Secret Woods Nature Center	Dania Beach	205042
Long Key Nature Center	Davie	235040, 265040
Anne Kolb Nature Center	Hollywood, Dania Beach	265042, 255042, 355042, 365042, 025142, 015142, 115142, 125142
Fern Forest Nature Center	Coconut Creek	064942, 054942
Easterlin Park	Oakland Park	214942
Miramar Pineland Preserve	Miramar	285141
Hollywood North Beach Park	Hollywood	015142, 125142
Tradewinds Park	Coconut Creek	174842, 204842
Deerfield Island Park	Deerfield Beach	54843
Site 67	Fort Lauderdale	114942
Site 78	Unincorporated	135041
Site 66	Fort Lauderdale	104942
Site 61	Fort Lauderdale	84942
Site 42A	Pompano Beach	254842, 264842
Site 117	Hollywood	15141
Fern Glen Park	Coral Springs	124841

Site Name	Municipality	Section/Township/Range
Woodside Estates Park	Coral Springs	144841
Red Lichen Preserve	Coral Springs	334841
Tivoli Sand Pine Preserve	Deerfield Beach	14842
Hacienda Flores/NNRB	Davie	195042

Source: Broward County Natural Resources Planning and Management Division, Land Preservation Program, 2009.

Appendix C-E: Broward County Artificial Reef Program, List of Sites, 2017

Reef Name	Latitude	Longitude	Depth	Year
Mt. Deerfield II	26° 19.065' N	80° 03.720' W	67'	2016
Lady Luck	26° 13.807' N	80° 03.807' W	130'	2016
Mt. Deerfield	26° 19.043' N	80° 03.752' W	65'	2015
Rapa Nui	26° 19.007' N	80° 03.720' W	70'	2015
BioRock Reef Project	26° 11.196' N	80° 05.561' W	12'	2011
NOVA Reef Roc Artificial Reef	26° 09.100' N	80° 05.195' W	43'	2009
C2-Eternal Reef	26° 08.553' N	80° 04.916' W	65'	2005
Miss Dania Beach	26° 00.605' N	80° 05.502' W	71'	2004
Eternal Reef	26° 08.553' N	80° 04.894' W	65'	2004
Eternal Reefs	26° 08.551' N	80° 04.894' W	65'	2002
Bulk Trader	26° 08.551' N	80° 03.835' W	313'	2002
Eben-Ezer-2	26° 00.398' N	80° 05.589' W	70'	2002
Dantor	26° 00.590' N	80° 04.990' W	128'	2002
Grady Hopper Barge	26° 00.615' N	80° 05.644' W	70'	2001
Summerfield	26° 00.601' N	80° 05.599' W	70'	2000
Qualman Barge	26° 17.977' N	80° 03.709' W	69'	2000
Grady Barges	26° 06.764' N	80° 04.228' W	191'	2000
Dog Pile Reef	26° 08.559' N	80° 04.852' W	66'	1999
Ft. Lauderdale, C-1 Reef	26° 08.206' N	80° 04.967' W	25'	1999
Ken Vitale, Formerly The "Tracy"	26° 09.559' N	80° 04.763' W	70'	1999
Lauderdale Site, C-2	26° 09.635' N	80° 04.747' W	72'	1998
Donald G Mcallister	26° 00.548' N	80° 05.565' W	70'	1998
Peter B. Mcallister	26° 10.149' N	80° 04.718' W	69'	1998
Guy Harvey	26° 12.647' N	80° 03.944' W	135'	1997
Site C – Corky Micco Reef	26° 10.085' N	80° 04.709' W	65'	1997
NOVA Deep Reefballs	26° 07.620' N	80° 04.890' W	69'	1997
Coffin Memorial Reefballs	26° 07.460' N	80° 05.880' W	23'	1996
NOVA/Swiss Cheese-Deep	26° 11.190' N	80° 04.950' W	70'	1996
NOVA/Swiss Cheese-Shallow	26° 08.130' N	80° 05.790' W	24'	1996
Rodeo Site – Johnny Morris	26° 14.383' N	80° 03.411' W	200'	1996
Site C – Bruce Mueller Reef	26° 10.116' N	80° 04.706' W	65'	1996
Site D – Joe's Nightmare Barge	26° 04.225' N	80° 04.225' W	217'	1996
Site E – Emmi Boggs	26° 00.606' N	80° 05.617' W	75'	1995
Site C - Eagle Scout Reefballs	26° 07.496' N	80° 05.889' W	23'	1995
Curry Reef	26° 00.648' N	80° 05.606' W	75'	1995
Site C - Deep Reef Balls	26° 07.807' N	80° 04.390' W	144'	1995

Reef Name	Latitude	Longitude	Depth	Year
Rodeo Site – Boating Magazine	26° 14.056' N	80° 03.666' W	156'	1995
Rinker Deep Site	26° 07.461' N	80° 04.894' W	65'	1995
Site E - Hollywood Reef Site	26° 00.459' N	80° 05.620' W	70'	1995
Site E - Hollywood	26° 00.459' N	80° 05.623' W	65'	1995
Four Reef Balls	26° 07.462' N	80° 05.885' W	24'	1994
Rinker Experimental Deep	26° 07.350' N	80° 05.490' W	70'	1994
Rinker Experimental Shallow	26° 07.462' N	80° 05.380' W	23'	1994
Jim Torgerson	26° 13.642' N	80° 03.896' W	120'	1994
Site E - Curry Reef	26° 00.486' N	80° 05.606' W	75'	1994
NOVA Reefballs-Midwater	26° 07.494' N	80° 04.912' W	45'	1994
Pennel's Reef	26° 19.180' N	80° 04.080' W	30'	1993
Captain Dede's	26° 00.575' N	80° 05.591' W	74'	1993
Seacon - NSWC Array's	26° 00.601' N	80° 05.624' W	74'	1993
Mariner 2	26° 13.353' N	80° 03.189' W	125'	1993
Mariner 2	26° 14.110' N	80° 03.807' W	125'	1993
NOVA Tire Chip	26° 07.490' N	80° 05.890' W	23'	1993
Old Deerfield Pier Reef	26° 18.932' N	80° 03.756' W	67'	1992
Mariner 1	26° 14.074' N	80° 03.869' W	108'	1992
Wendy Rosshiem	26° 09.183' N	80° 04.820' W	65'	1991
Site D - NSWC Cable Spools	26° 07.950' N	80° 04.630' W	150'	1991
Noula Express	26° 19.278' N	80° 03.448' W	71'	1991
Paul Sherman Reef	26° 09.197' N	80° 04.831' W	70'	1991
Imor Reef	26° 13.048' N	80° 03.760' W	165'	1991
Ancient Mariner	26° 18.121' N	80° 03.729' W	70'	1991
Rodeo 25	26° 13.878' N	80° 03.813' W	122'	1990
Captain Dan Garnsey	26° 13.857' N	80° 03.960' W	110'	1990
Kornahrens Reef	26° 12.480' N	80° 03.190' W	140'	1990
Robert Edmister	26° 09.193' N	80° 04.837' W	76'	1989
Bud Krohn Reef	26° 10.260' N	80° 02.420' W	400'	1989
Chuck-A-Luck	26° 18.088' N	80° 03.684' W	70'	1989
Papa's Reef	26° 14.102' N	80° 03.383' W	265'	1989
Moonshot, River Bend	26° 06.641' N	80° 03.830' W	70'	1989
Port Everglades Reef	26° 06.760' N	80° 04.040' W	145'	1989
Ronald B. Johnson	26° 13.880' N	80° 03.445' W	240'	1988
Rodeo Site - Jay Dorman	26° 13.859' N	80° 04.027' W	78'	1988
Alpha, Rodeo Divers Reef	26° 13.857' N	80° 04.027' W	78'	1988
Pipe And Pontoon	26° 08.105' N	80° 04.786' W	70'	1988
Rodeo Site -Buddy Merrit	26° 14.150' N	80° 03.360' W	414'	1987

Reef Name	Latitude	Longitude	Depth	Year
Hydro Atlantic	26° 19.500' N	80° 03.043' W	166'	1987
Atria (Jim) Atria Reef	26° 09.870' N	80° 04.225' W	112'	1987
Berry Patch	26° 18.083' N	80° 03.703' W	65'	1987
Rodeo Site - Miller Lite	26° 12.394' N	80° 02.749' W	155'	1987
Hog Heaven	26° 08.102' N	80° 04.786' W	69'	1986
Jay Scutti	26° 09.520' N	80° 04.760' W	67'	1986
Site C - Bill Boyd Reef	26° 09.088' N	80° 03.842' W	265'	1986
Site C - Fla. League Of Anglers	26° 10.150' N	80° 03.360' W	388'	1986
Rodeo Site - Corey & Chris	26° 13.863' N	80° 03.432' W	244'	1986
Powell Barge	26° 07.888' N	80° 03.445' W	314'	1986
Reuben Reef	26° 07.250' N	80° 04.600' W	70'	1986
Mako	26° 10.905' N	80° 02.740' W	240'	1986
Tote Machines	26° 11.810' N	80° 03.310' W	200'	1986
Site D - Marriott Reef	26° 05.479' N	80° 03.946' W	71'	1985
Caicos Express	26° 12.502' N	80° 03.663' W	240'	1985
Site C - Rebel	26° 10.253' N	80° 04.332' W	110'	1985
Rodeo Site - Renegade	26° 13.360' N	80° 03.620' W	190'	1985
Mercedes	26° 09.370' N	80° 04.513' W	97'	1985
Rodeo-Lowrance	26° 13.202' N	80° 03.640' W	200'	1984
Great Lakes	26° 07.690' N	80° 03.910' W	170'	1983
Site D - Te Amo	26° 05.187' N	80° 03.211' W	215'	1983
NOVA A.R. (No County)	26° 07.198' N	80° 03.865' W		1983
NOVA A.R. (No County)	26° 07.025' N	80° 04.120' W	70'	1983
Qualmann Barge	26° 07.058' N	80° 03.337' W	145'	1983
US Concrete Pipe	26° 07.280' N	80° 04.500' W	70'	1983
Osborne	26° 06.449' N	80° 03.896' W	65'	1983
Chevron / Rodeo	26° 10.545' N	80° 02.818' W	170'	1983
Grouper Grotto	26° 08.382' N	80° 04.328' W	150'	1983
Chevron 1	26° 07.400' N	80° 04.550' W	73'	1983
Trio Bravo	26° 08.727' N	80° 04.293' W	145'	1982
Site D - Tracor/Navy Drydock	26° 06.765' N	80° 04.233' W	210'	1982
DNR Barges	26° 08.557' N	80° 04.637' W	70'	1982
Chris Craft Molds	26° 04.850' N	80° 03.237' W	210'	1978
Osborne Tire Reef	26° 08.322' N	80° 04.897' W	64'	1977
Houseboat	26° 06.677' N	80° 03.716' W	95'	1974
Spaghetti Barge	26° 07.760' N	80° 04.220' W	105'	1972
Unnamed Barge	26° 08.520' N	80° 04.886' W	70'	1970
Monomy	26° 07.520' N	80° 04.350' W	60'	1970

Reef Name	Latitude	Longitude	Depth	Year
Erojacks Dania	26° 03.738' N	80° 06.435' W	12'	1967
Erojacks Ft. Lauderdale	26° 05.950' N	80° 05.376' W	25'	1967

Source: Florida Fish and Wildlife Conservation Commission, Artificial Reef Program, 2016

Appendix C-F: Primary Canals

Primary Canals	Purpose
Hillsboro Canal	Provide drainage for 102 square miles in northern Broward County, water for wellfield recharge, convey excess water from WCA 1 to tidewater, control seepage from WCA 2A, and maintain ground water elevations west of Deerfield Lock adequate to prevent saltwater intrusion.
L-36, L-37, L33, L-35A, L-35B, L-67A, L-67C, L-68A, C-6 (Miami) Canals	Provide water level control and conveyance in the WCA's.
Pompano Canal	Provide flood protection to seven square miles in northeastern Broward County, water for wellfield recharge, and maintain ground water elevations west of G-57 (a sheet pile dam with a controlled weir) adequate to prevent saltwater intrusion.
Cypress Creek (C-14) Canal	Provide flood protection to 59 square miles in northeastern Broward County, water to recharge wellfields, convey excess water from WCA 2A to tidewater, controls seepage from WCA 2A, and maintain ground water elevations west of S-37A (a gated spillway) adequate to prevent saltwater intrusion.
Middle River Canal (C-13)	Provide flood protection to 39 square miles in eastern Broward County, water to recharge wellfields, control seepage from WCA 2B, and maintain ground water elevations west of S-36 (a gated spillway) adequate to prevent saltwater intrusion.
Plantation (C-12) Canal	Provide flood protection to 19 square miles in eastern Broward County, maintain ground water elevations west of S-33 (a gated spillway) adequate to prevent saltwater intrusion.
North New River (L-35) Canal	Provide flood protection to 30 square miles in eastern Broward County, water to recharge wellfields, convey excess water from WCAs 2A, 2B, and 3A to tidewater, and controls seepage from WCA 2B.
Dania Cut-off Canal	Convey water from the C-11 and C-10 canals to tidewater and provide drainage for the area south and east of the Fort Lauderdale-Hollywood International Airport.
South New River (C-11) Canal	Provide flood protection to 104 square miles in south central Broward County, water to recharge wellfields, control seepage from WCA 3a, and maintain ground water elevations west of S-13 (a spillway) adequate to prevent saltwater intrusion.
Hollywood (C-10) Canal	Provide flood protection to 15 square miles in southeastern Broward County.
Snake Creek (C-9) Canal	Provide flood protection to 59 square miles in southeastern Broward County and 39 square miles in northeastern Dade County, water to recharge wellfields, irrigation, control seepage from WCA 3B, and maintain ground water elevations west of S-29 (a gated spillway) adequate to prevent saltwater intrusion.

Source: South Florida Water Management District, April 1995.

Appendix C-G: Flood Zone Designations

Zone	Description
A	Special Flood Hazard Area Inundated by 100-Year Flood. No base flood elevations determined.
AE	Special Flood Hazard Area Inundated by 100-Year Flood. Base flood elevations determined.
AH	Special Flood Hazard Area Inundated by 100-Year Flood. Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
AO	Special Flood Hazard Area Inundated by 100-Year Flood. Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
A99	Special Flood Hazard Area Inundated by 100-Year Flood. To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
V	Special Flood Hazard Area Inundated by 100-Year Flood. Coastal flood with velocity hazard (wave action); no base flood elevations determined.
VE	Special Flood Hazard Area Inundated by 100-Year Flood. Coastal flood with velocity hazard (wave action); base flood elevations determined.
X	There are two areas designated as Zone X on the FEMA Flood Insurance rate map. Shaded: Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile and areas protected by levees from 100-year flood. Unshaded: Areas determined to be outside 500-year flood plain.

Source: Flood Insurance Rate Map, Broward County.

Appendix C-H: Environmental Legislation and Responsible Public Agencies

Water		
Agency	Legislation	Functions
U.S. Army Corps of Engineers Act of 1972	Federal Water Pollution Control Act Amendment of 1977 (Clean Water Act)	Dredge & fill permitting for navigable waters
U.S. Environmental Protection Agency	Federal Water Pollution Control	Establish water quality standards for navigable waters
Florida Department of Natural Resources Control Act	Florida Air and Water Pollution	Establish water quality standards
Florida Department of Environmental Protection	Florida Air and Water Pollution	Regulate water pollution discharges, including groundwater, surface water, and coastal waters
Florida Department of Environmental Protection	Federal Water Pollution Control Act Amendment of 1977 (Clean Water Act)	Regulate public water systems
Florida Department of Environmental Protection	Florida Safe Drinking Water Act	Establish and enforce drinking water standards
Broward County Water Management Division	Broward County Administrative Code Section 40.11	Implement county water resource management program
Broward County Water and Wastewater Services	Broward County Administrative Code Section 40.10	Maintain potable water distribution and wastewater collection systems
Broward County Environmental Protection & Growth Management	Broward County Charter, Section 8.17	Surface water quality monitoring; dredge and fill permitting
South Florida Water Management District	Water Quality Assurance Act of 1983	Assume permitting authority for water projects from DEP

Notes: See Below.

Air		
Agency	Legislation	Functions
U.S. Environmental Protection Agency	Clean Air Act of 1970	Establish list of hazardous air pollutants; establish pollutant standards; establish vehicle emission standards; regulate fuels, fuel additives
Florida Department of Environmental Protection	Florida Air and Water Pollution Control Act	Regulate air pollution
Florida Department of Environmental Protection	Florida Electrical Power Plant Siting Act	Regulate siting of power plants
Florida Division of Forestry	Chapter 5I-2, FAC	Prohibits open burning on rural lands
Broward County Environmental Protection and Growth Management	Broward County Charter, Section 8.17	Monitor air quality

Notes: See Below.

Land Use		
Agency	Legislation	Functions
Florida Department of Environmental Protection	Florida Outdoor Recreation and Conservation Act of 1963	Acquire lands, including public beaches
Florida Department of Environmental Protection	Chapter 377, FS	Regulate oil and gas exploration
Florida Department of Environmental Protection	Chapter 378, FS	Regulate mineral extraction activities
Florida Department of Environmental Protection	Chapter 258, FS	Establish and protect state-owned park lands
Florida Department of Environmental Protection	Chapter 253, FS	Permitting of use of submerged and state-owned lands
Florida Division of Forestry	Chapter 589, FS	Acquire and manage land for state purposes
Florida Fish and Wildlife Conservation Commission	Chapter 379, FS	Control and management of state game lands
Florida Department of Environmental Protection	Chapter 378, FS	Adopt a master land reclamation plan consistent with local comprehensive plans
Florida Department of Environmental Protection	Florida Resource Recovery and Management Act	Regulate solid waste disposal
Broward County Environmental Protection and Growth Management Department	Broward County Administrative Code Section 110.01	Implementation of Comprehensive Plan and Land Development Code
Urban Wilderness Advisory Board	Chapter 25 ½ of Broward County Code of Ordinances	Advise Board of County Commissioners on acquisition and development of Urban Wilderness Area
Broward County Parks and Recreation Division	Broward County Administrative Code Section 30.09	Acquire and maintain land for recreation, preservation, and conservation purposes

Notes: See Below.

Wildlife/Plant Preservation		
Agency	Legislation	Functions
U.S. Fish and Wildlife Service	Endangered Species Act of 1972	Identify and protect threatened and endangered species; regulate offshore marine fisheries
Florida Fish and Wildlife Conservation Commission	Marine Mammal Protection Act, Chapter 379, FS (also see endangered species list in Chapter 68A-27.003, Florida Administrative Code)	Prohibit taking of marine mammals Prohibit taking of marine mammals Regulate hunting and fishing activities; -protect endangered and threatened species
Florida Department of Agriculture and Consumer Services	Chapter 581, FS (Also see Chapter 5B-40, Florida Administrative Code for state-listed plants)	Prohibit the willful destruction, sale, harvest, or transplant of plants listed on the state endangered or threatened plant list
Florida Fish and Wildlife Conservation Commission	Chapter 379, FS	Protection of marine turtles, manatees, porpoises, manta rays Regulate saltwater fishing activities
Florida Fish and Wildlife Conservation Commission	Broward County Code of Ordinances, Chapter 13	Prohibits use of nets in salt water
Broward County Environmental Protection and Growth Management Department	Broward County Charter, Section 8.17	Implementation of Sea Turtle Conservation Program
Broward County Environmental Protection and Growth Management Department	Broward County Administrative Code, Section 20.04	Implementation of the County Tree Ordinance
Broward County Environmental Protection and Growth Management Department	Tree Preservation Ordinance (Sec. 27-340)	Regulates Tree Removal
Florida Department of Environmental Protection	Florida Resource Recovery and Management Act	Regulate solid waste disposal
Broward County Environmental Protection and Growth Management Department	Broward County Administrative Code Section 110.01	Implementation of Comprehensive Plan and Land Development Code
Broward County Environmental Protection and Growth Management Department	Tree Abuse Ordinance (Sec. 27-421-425)	Regulates Tree Pruning
National Marine Fisheries Service within the National Oceanic and Atmospheric Administration	Magnuson-Stevens Fishery Conservation and Management Act	Protects Marine Species

Notes: Section 8.04 of the Broward County Charter gives the County authority to protect the environment by prohibiting or regulating air or water pollution, or the destruction of the resources of the County.