



Coastal Management Element Support Document



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List of Acronyms

ACOE	U.S. Army Corps of Engineers
BCLUP	Broward County Land Use Plan
BOCC	Broward County Board of County Commissioners
CCCL	Coastal Construction Control Line
CME	Coastal Management Element
DEP	Florida Department of Environmental Protection
EPCRD	Environmental Planning & Community Resilience Division
EPGMD	Broward County Environmental Protection and Growth Management Department
EMD	Emergency Management Agency, Broward County
FAC	Florida Administrative Code
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency

GIS	Geographic Information System
ICW	Atlantic Intracoastal Waterway

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List of Definitions

Beach – means the zone of unconsolidated material that extends landward from the mean low water line to the place where there is marked change in material or physiographic form, or to line of permanent vegetation, usually the affective limit of storm waves. “Beach,” as used in the coastal management element requirements, is limited to oceanic and estuarine shorelines (Broward County Land Use Plan, 2017).

Beach Nourishment and Renourishment – The systematic augmentation by artificial means of the linear width and/or elevation of the beach exposed above the high tide line. Nourishment suggests the first augmentation project; Renourishment suggests maintenance projects thereafter (Section 161.021, Florida Statutes).

Coastal Planning Area – An area that encompasses all of the following: water and submerged lands of oceanic water bodies or estuarine water bodies; shorelines adjacent to oceanic waters or estuaries; coastal barriers; living marine resources; marine wetlands; water-dependent or water related facilities on oceanic or estuarine waters; or public access facilities to oceanic beaches or estuarine shorelines; and all lands adjacent to such occurrences where development activities would impact the integrity or the quality of the above (FEMA).

In Broward County, the Coastal Planning Area is the land and water eastward of the westward right-of-way of U.S. 1.

Coastal Construction Control Line (CCCL) – means the line established by the Florida Department of Natural Resources after a determination, through comprehensive engineering study and topographic survey, that the establishment of such control line is necessary for the protection of upland properties

and the control of beach erosion, pursuant to Section 161.053, Florida Statutes (Broward County Land Use Plan, 2017).

Coastal High Hazard Area – An area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources (FEMA).

The evacuation zone for a category 1 hurricane as established in the regional hurricane evacuation study applicable to the local government. Broward County has identified its Coastal High Hazard Area as the land and water eastward of the Atlantic Intracoastal Waterway to the Atlantic Ocean. Map WM-7 of the BrowardNEXT map series illustrates the Coastal High Hazard Area as Evacuation Zone A.

Coastal or Shore Protection Structures – Shore-hardening structures, such as seawalls, bulkheads, revetments, or rubble mound structures which are intended to protect other structures from wave and hydrodynamic forces, or erosion control structures, which are intended to prevent erosion, such as groins, breakwaters, and aggregates of materials other than natural beach sand used for beach or shoreline protection and other structures which are intended to prevent erosion or protect other structures from wave and hydrodynamic forces including beach and dune restoration (EPD, BRD).

Dune – A mound, bluff or ridge of unconsolidated sediment, usually sand-sized sediment, lying upland of the beach and deposited by any natural or artificial mechanism, which may be bare or covered with vegetation and is subject to fluctuations in configuration and location. Types of dunes include:

- a) "Primary dune" is a significant dune which has sufficient alongshore continuity to offer protective value to upland property. The primary dune may be separated from the frontal dune by an interdunal trough; however, the primary dune may be considered the frontal dune if located immediately landward of the beach.
- b) "Reconstructed dune" is a man-made dune feature that has a sand filled geotextile container as its core that is continuously covered with a minimum of three feet of sand, meets the specific design and siting criteria of this chapter, is contoured to minimize erosive effects, and is vegetated with native beach-dune plants.
- c) "Significant dune" is a dune that has sufficient height and configuration or vegetation to offer a level of protection to the beach-dune system (62B-56.020 (16) FAC).

Erosion – The wearing away of land or the removal of consolidated or unconsolidated material from the beach-dune system by wind, water, or wave action. Erosion includes:

- a) Landward horizontal movement of the line of mean high water or beach-dune system profile; and,
- b) Vertical lowering or volumetric loss of sediment from the beach-dune system or the offshore profile (62B-56.020 (16) FAC).

Erosion Control Line – The line determined in accordance with the provisions of Sections 161.141-.211, F.S., and recorded pursuant to Section 161.181, F.S., in connection with beach restoration projects. Where established, an erosion control line represents the landward extent of the claims of the state in its capacity as sovereign title holder of the submerged bottoms and shores of the Atlantic Ocean, the Gulf of Mexico, the Straits of Florida, and the bays, lagoons, and other tidal reaches thereof (62B-41.002 (15) FAC).

Estuary – A semi-enclosed, naturally existing coastal body of water which has a free connection with the open sea and within which seawater is measurably diluted with fresh water derived from riverine systems (Section 373.403, Florida Statutes).

Hurricane Vulnerability Zone – The areas (hurricane evacuation areas and mobile home parks) delineated by the regional or local evacuation plan as requiring evacuation (EMD).

Littoral Drift – Process whereby perpetual wave action transports sand in a longshore direction along the coastline.

Living Marine Resources – Oceanic or estuarine plants or animals. Such as mangroves, seagrasses, algae, coral reefs, and other marine habitat; fish, shellfish, Crustacea and fisheries; and sea turtles and marine mammals.

Marine Habitat – Areas where living marine resources naturally occur, such as mangroves, seagrass beds, algae beds, salt marshes, transitional wetlands, marine wetlands, rocky shore communities, hard bottom communities, oyster bars or flats, mud flats, coral reefs, worm reefs, artificial reefs, offshore springs, nearshore mineral deposits, and offshore sand deposits. (Broward County Land Use Plan, 2017).

Public Access – means the ability of the public to physically enter or use recreation sites including beaches and shores (Broward County Land Use Plan, 2017).

Revegetated Dunes – Those dune areas that, for a variety of reasons, have previously been denuded of associated dune vegetation or are artificially elevated regions of the beach usually associated with beach renourishment projects; both types are sometimes artificially or naturally revegetated with pioneer zone plant species such as sea oats (*Uniola paniculata*).

Shoreline or Shore – The interface of land and water and, as used in the coastal management element requirements, is limited to oceanic and estuarine interfaces. (Broward County Land Use Plan, 2017).

Storm Surge – The rise of water above normal water level on the open coast due to a number of factors, including the action of wind stress on the water surface and the rise in water level due to atmospheric pressure reduction (62B-41.002 (43) FAC).

Water-dependent Use – Activities which can be carried out only on, in or adjacent to water areas because the use requires access to the water body for: waterborne transportation including ports or

marinas; recreation; electrical generating facilities; or water supply (Broward County Land Use Plan, 2017).

Water-related Uses – Activities which are not directly dependent upon access to a water body, but which provide goods and services that are directly associated with water dependent or waterway uses (Broward County Land Use Plan, 2017).

Wetlands – those areas which are inundated by water, with sufficient frequency to support, and normally do support an assemblage of organisms that is adapted to saturated or seasonally saturated soil conditions for growth and reproduction including, but not necessarily limited to, swamps, marshes, bogs, sloughs, potholes, wet meadows, river flood plains, mud flats and wet prairies (Broward County Land Use Plan, 2017).

Wildlife Habitat – Areas where wild animals and vegetation naturally reside.

Support Document

Coastal Management

Introduction

A. General

The purpose of the Coastal Management Element (CME) is to plan for, and where appropriate, limit development activities where such activities would damage or destroy coastal resources, protect human life, and limit public expenditures in areas that are subject to destruction by natural disaster. The Florida Administrative Code (FAC) requires the CME to address coastal management, natural disaster and deepwater port issues. This element primarily addresses the coastal management issues. Its goal is to manage development activities in Broward County's coastal area to maximize aesthetic, environmental, recreational, and economic values. Natural disaster and Deepwater Port issues are respectively addressed in the Natural Disaster and Deepwater Port Components. The CME Support Document provides data and analysis used as the basis for the goal, objectives, and policies included in the CME.

The CME Support Document is divided into five parts. Part I identifies the service area and planning horizons. Part II addresses the data requirements and includes inventories of land uses, natural resources, beaches and dunes, estuarine conditions, infrastructure, and natural disaster planning. Part III analyzes current coastal resources and management practices. Part IV addresses CME implementation and Part V is an appendix.

B. Service Area

The planning service area, as it relates to erosion and accretion trends, beach nourishment projects, beach conditions, vegetative coverings, marine resources, sea turtle protection, fisheries' management, and artificial reef, is Countywide.

C. Planning Horizon

The short-term planning horizons is five years or 2023. The long-term planning is 10 years or 2028.

Data Requirements

The CME is based upon the following data: inventories of existing land uses; natural resources; historic resources and sites; estuarine pollution; natural disaster concerns; beach and dune systems; public access facilities; existing infrastructures; and the Deepwater Port issues. CME part II addresses the above described rule requirements.

A. Inventory of Existing Land Use Coverages

This section addresses existing land use coverage, shore line uses, and water-dependent and water-related uses.

1. Inventory of Shoreline Uses

Shoreline uses are those uses along the shore of either the Atlantic Ocean or the Intracoastal Waterway.

2. Inventory of Water-Dependent and Water-Related Uses

Activities which can be carried out only on, in or adjacent to water areas because the use requires access to the water body for: waterborne transportation, recreation, electrical generating facilities, or water supply, are water dependent-uses.

Activities which are not directly dependent upon access to a water body, but which provide goods and services that are directly associated with water-dependent or waterway uses are water-related uses.

B. Inventories of Natural Resources

This section addresses vegetative cover, wetlands, areas subject to coastal flooding, wildlife habitats, and living marine resources.

1. Vegetative Cover

Vegetative communities, such as coastal strands, oak hammocks, and cypress swamps. Which are classified by the presence of certain soils, vegetation and animals.

Vegetation on, and in proximity to, the beach consists primarily of grasses, sea oats, non-woody perennials, and exotic species used and landscape materials.

2. Wetlands

Wetlands are those areas that are inundated or saturated 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. Florida wetlands generally

include swamps, marshes, Bayhead, riverine swamps and marshes, tidal marshes, mangrove swamps and other similar areas.

3. Areas Subject to Coastal Flooding

The term “areas subject to coastal flooding” refers to areas delineated in the local hurricane evacuation plan that require evacuation. In Broward County, it is defined as the area requiring evacuation in the event of a 100-year storm or a Category 3 storm event. Flood Zone Maps can be viewed [here](#).

Map ND-1 from the BrowardNEXT Map Series illustrates the evacuation zones for a Category 1-2 Hurricane and for a Category 3 or higher Hurricane.

4. Wildlife Habitats

Wildlife habitats are areas where wild animals and vegetation naturally reside.

5. Living Marine Resources

Living marine resources are oceanic or estuarine plants or animals, such as mangroves, seagrasses, algae, coral reefs, fish, shellfish, Crustacea, fisheries, sea turtles, and marine mammals. Living marine resources adjacent to the Broward County coast include at least fifteen families of cartilaginous fishes such as sharks and rays, and 555 families of bony fishes such as tarpon, herring, snook, snapper, and other species typically inhabiting the coral reefs of Southeast Florida.

See Appendix CM-1 for a more complete marine resource listing.

C. Inventory of Historic Resources

Historic resources are areas, districts, or sites containing properties listed on the Florida Master Site File, the National Register of Historic Places, or designated by the County as historically, architecturally, or archeologically significant. The Hillsboro Inlet Lighthouse was first placed into service on March 7, 1907. In 1997, the Hillsboro Lighthouse Preservation Society was founded for the purpose of preserving the historic Hillsboro Light in its original form for the safety, enjoyment, and education of the public. The primary objectives of the society were to repair the Hillsboro Light’s original lens, to open the Lighthouse and its grounds for education and enjoyment of the public, and to support the community by maintaining the Lighthouse for future generations. Additional information on historic resources can be found in the Historic Reservation Component.

D. Inventory of Estuaries and Estuarine Conditions

An estuary is a semi-enclosed, naturally existing coastal body of water in which saltwater is naturally diluted by freshwater and which has an open connection with oceanic waters. There is only one estuarine system in Broward County, which can be found on the [Natural Resource Map Series](#) - Eastern Broward County: Beaches and Shores, Including Estuarine Systems, Rivers, Bays, Lakes, Harbors, and

Dredge Spoil Disposal Sites, Broward County Land Use Plan. Westlake Regional Park and the Anne Kolb Nature Center are both county facilities located within the estuarine system.

E. Natural Disaster Planning Issues

This section addresses natural disaster planning issues specifically, hurricane evacuation and post-disaster redevelopment planning. The Natural Disaster Component of the CME addresses natural disaster planning issues on a Countywide basis.

1. Hurricane Evacuation Planning

This subsection addresses the hurricane vulnerability zone, the number of persons requiring evacuation and public shelters, the number of shelter spaces available, evacuation routes, transportation and hazard constraints on the evacuation routes, and evacuation times.

- a) *Hurricane Vulnerability Zone:* The hurricane vulnerability zone includes the hurricane evacuation areas and mobile home parks in Broward County. Appendix H-D of the Housing Element Support Document lists all mobile home parks in Broward. Map WM-7 of the BrowardNEXT map series illustrates floodplains, flood prone areas, and evacuation zones. Map ND-1 displays shelter locations and evacuation routes, in addition to evacuation zones.
- b) *Persons Requiring Evacuation:* Mandatory evacuation zones for Category 1 and 2 hurricanes are all areas located east of the Intracoastal Waterway. All areas east of Federal Highway/U.S. 1 must be evacuated for a Category 3 storm or higher. In addition, all mobile homes must be evacuated.
- c) *Persons Requiring Public Hurricane Shelter:* Only a portion of the people requiring evacuation will use a public hurricane shelter. The quantity is unknown. Many will evacuate to the homes of friends or relatives inland.
- d) *Available Public Hurricane Shelter Spaces:* The School Board of Broward County makes several of its facilities available for public hurricane shelter spaces. A complete inventory of the spaces is included within the Natural Disaster Component.
- e) *Evacuation Routes:* S.R. A1A is a two-lane undivided highway. Hillsboro Boulevard is a four-lane divided highway with a moveable bridge. NE 14th street is a four-lane divided highway with a moveable bridge. These roadways provide access to important north and south roadways, such as Interstate 95 and Florida's Turnpike, and are critical to local and regional evacuation.
- f) *Transportation and Hazard Constraints on Evacuation Routes:* The normal travel speeds on evacuation routes will be reduced significantly due to the high number of evacuees using private automobiles. Hazard constraints include the unpredicted early arrival of gale force

winds blowing debris and sand onto evacuation routes, flooding, and falling objects, such as utility poles causing road blockages and thereby restricting vehicular movement out of evacuation areas.

- g) *Evacuation Time*: Evacuation time is the time in hours that evacuees reach their destinations. The estimated travel time includes 30 minutes loading time and 10 minutes unloading with a travel speed of 15 miles per hour.

2. Post Disaster Redevelopment

This subsection addresses existing and proposed land uses in the coast high hazard area, structures with a history of repeated damages in coastal storms, coastal or shore protection structures, and beach and dune conditions.

- a) *Existing and Proposed Uses in the Coastal High-Hazard Areas*: Broward County has identified its Coastal High Hazard Area as the land and water from the Intracoastal Waterway eastward to the Atlantic Ocean including any coastal protection structures.
- b) *Structures with a History of Repeated Damage*: No historical evidence has been found which identifies structures that have been affected by repeated storm damage.
- c) *Coastal or Shore Protection Structures*: Shore-hardening structures, such as seawalls, bulkheads, revetments, or rubble mound structures, which are intended to protect other structure from wave and hydrodynamic forces, or erosion control structures, which are intended to prevent erosion, such as groins, breakwaters, or aggregates of materials other than natural beach sand used for shoreline protection.

F. Inventory of Beach and Dune System

The beach and dune system are important coastal features providing critical habitat for native flora and fauna while supporting robust economic activities associated with tourism and real estate investments throughout Florida. A healthy beach and dune system also provides vital nature-based coastal defenses against the impacts of storms and sea level rise. While beach nourishment has been a prominent shoreline protection strategy for many coastal communities, coastal dunes have often been deemphasized or even excluded from shoreline protection projects in favor of strategies that maximize vistas and the expanse of the beach. However, the restoration and preservation of coastal dunes has become an area of growing emphasis locally and nationwide as dunes have been increasingly recognized to significantly reduce the impacts of severe storms and coastal erosion, minimizing impacts to infrastructure and property. Coastal resilience will become increasingly important in the face of sea level rise and the increasing frequency of severe storms associated with climate change.

The Broward County coastline includes 24 miles of beaches, which are actively managed and nourished as part of ongoing local and regional beach nourishment projects. However, a 2014 assessment revealed that less than 65% of our beaches have an integrated dune system, that many existing dunes are degraded and that, in fact, some dunes have been actively removed. This is a tremendous impediment to the longer-term benefits of our beach nourishment projects given the importance of coastal dunes and vegetation in maintaining sand on the beach. Vegetated dunes help to trap and anchor windblown sand and, when well established, dunes enhance coastal defenses by absorbing additional wave energy and maintaining a sand reservoir that helps minimize erosion. Given the pressures on our shoreline, the magnitude of current investments in shoreline protection and the importance of building resilience to the impacts of climate change, it is necessary that we prioritize integration of coastal dune restoration and preservation as prominent component in our shoreline protection projects and work with local communities to build a shared appreciation for the importance of coastal dunes in improving community resilience to climate impacts. The County offers a grant program to civic associations, coastal property owners, municipalities, and non-profit groups to conduct dune restoration and enhancement projects. The purpose of the Coastal Dune Restoration Grant Program is to promote the restoration of dunes where they are absent and to enhance and preserve the quality of existing dunes along Broward County's shoreline. In addition, the program helps build community awareness about the importance of nature-based methods, such as dune restoration and enhancement, as essential and cost-effective management practices that will contribute to shoreline resilience. The program also enhances the quality of sea turtle nesting habitat by using dunes to reduce shorefront lighting impacts on nesting sea turtles and their hatchlings.

1. Past Trends in Erosion and Accretion

Erosion trends on Broward County's beaches were first documented in a U.S. Army Corps of Engineers study in 1961. At that time, it was determined that beaches had been experiencing erosion problems for decades and that 8.9 miles of these beaches required nourishment and coastal protection structures. Table CM-1 shows shoreline change trends in Broward County.

Table CM-1: Shoreline Change Trends, Broward County

Segment	Comments
Deerfield Beach (1980-1999)	Accretion 1.7 ft./yr.
Hillsboro Beach (1980-1999)	Accretion 1.2 ft./yr. (includes a beach nourishment project in 1998)
Pompano Beach/ Lauderdale-by-the-Sea (1983-1998)	Accretion in north Pompano Beach at about 1.0 ft./yr. due to increased sand by passing at Hillsboro Inlet. Recession at south Pompano Beach and Lauderdale-by-the-Sea at about 4 ft./yr. following the 1983 beach nourishment project.
Fort Lauderdale (1983-1998)	Accretion north Port Everglades Inlet; stable to moderate recession along middle of Segment II
John U. Lloyd State Park (1989-1998)	Recession, north 9.0 ft./yr.
Dania (1989-1998)	Recession, 0.5 ft./yr.
Hollywood/Hallandale (1989-1998)	Recession, 4.0 ft./yr.

Source: Broward County Environmental Planning and Community Resilience Division.

2. Identification of Existing and Potential Beach Renourishment Areas

Beach renourishment is a Countywide effort. The most recent renourishment project, Segment II, focused on reconstructing eroded areas of Lauderdale-By-the-Sea, Pompano, and Fort Lauderdale beaches. The project replaced approximately 750,000 cubic yards of sand through three access points along 4.9 miles of shoreline between Hillsboro Inlet and Broward County's Port Everglades. The County received permits for the project from both State and Federal resource agencies. Segment III, completed in February 2006, covered areas from John U. Lloyd State Park to the Miami-Dade County Line. Table CM-2 shows the construction history of beach renourishment projects in Broward County.

Table CM-2: Beach Renourishment Project Construction History, Broward County

Year	Project	Quantity (cy)	Length (mi)	Total Cost (\$M)
1970	Pompano (Segment II)	1,080,000	2.8	1.76
1971	Hallandale (Segment III)	360,000	0.75	0.78
1976	John U. Lloyd (Segment III)	1,090,000	1.5	2.96
1979	Hollywood/ Hallandale (Segment III)	2,000,000	5.2	7.83
1983	Pompano/ Lauderdale-by-the-Sea (Segment II)	1,800,000	5.3	9.99
1989	John U. Lloyd (Segment III)	604,000	1.6	5.68
1991	Hollywood/ Hallandale (Segment III)	1,100,000	5.2	9.47
2005-2006	John U. Lloyd/ Hollywood/ Hallandale/ Dania (Segment III)	1,900,000	6.8	44.5
2013	Fort Lauderdale A1A Emergency Project	19,000	0.38	1.24
2013	John U. Lloyd (PE Maintenance Dredging)	111,400	0.57	Unknown
2015-2016	Lauderdale-by-the-Sea/ Pompano/ Fort Lauderdale	750,000	4.9	44
2018*	PE Sand Bypass	-	-	25
2020	Segment III	980,000	6.8	42.2
	Total:	11,794,400	41.8	195.4

* Estimated

Source: Broward County Environmental Planning and Community Resilience Division.

G. Inventory of Infrastructure

Infrastructure means those human structures which serve the common needs of the population, such as: roadways, bridges, causeways, sewage disposal systems, potable water systems, solid waste disposal sites, storm water systems, utilities, piers, docks, breakwaters, bulkheads, revetments, marinas, seawalls, and navigation channels.

1. **Roadways.** The main coastal road is State Road A1A. Local roads extend from State Road A1A to service the residential neighborhoods.
2. **Bridges or Causeways.** There are no causeways or bridges to the mainland. For hurricane evacuation purposes, the bridges or causeways that would be affected include Hillsboro Boulevard to the north and NE 14th Street to the south.
3. **Sanitary Sewer Facilities.** Wastewater treatment is accomplished by septic tanks or sanitary sewer service.
4. **Man-made Drainage Facilities.** Storm water runoff east of S.R. A1A Highway flows to the Atlantic Ocean.
5. **Public Shore Protection Structures.** There are no public shore protection structures.

H. Post-Disaster Redevelopment

The CEMP Recovery Plan specifically addresses the recovery phase of a disaster and includes specific recovery actions from the response stage through the long-term recovery stage of a disaster, enabling a rapid and efficient delivery of recovery operations following a natural disaster. In 2019, Broward County will initiate a Vulnerability Analysis that will help inform the requirements of the 2015 Peril of Flood legislation, described below.

1. Peril of Flood Legislation

In 2015, the State Legislature adopted "Peril of Flood" legislation that was added to Section 163.3178 Coastal management, F.S. Subsection (2)(f) adds the requirement for, "A redevelopment component that outlines the principles that must be used to eliminate inappropriate and unsafe development in the coastal areas when opportunities arise." The component must:

1. Include development and redevelopment principles, strategies, and engineering solutions that reduce the flood risk in coastal areas which results from high-tide events, storm surge, flash floods, stormwater runoff, and the related impacts of sea-level rise.
2. Encourage the use of best practices development and redevelopment principles, strategies, and engineering solutions that will result in the removal of coastal real property from flood zone designations established by the Federal Emergency Management Agency.

3. Identify site development techniques and best practices that may reduce losses due to flooding and claims made under flood insurance policies issued in this state.
4. Be consistent with, or more stringent than, the flood-resistant construction requirements in the Florida Building Code and applicable flood plain management regulations set forth in 44 C.F.R. part 60.
5. Require that any construction activities seaward of the coastal construction control lines established pursuant to s. 161.053 be consistent with chapter 161.
6. Encourage local governments to participate in the National Flood Insurance Program Community Rating System administered by the Federal Emergency Management Agency to achieve flood insurance premium discounts for their residents.”

These requirements are being met through multiple policies that appear in the Climate Change, Coastal Management, Intergovernmental Coordination, Natural Disaster, and Water Management Elements, in addition to the Broward Municipal Services District Land Use and Community Planning Element. A new objective has been added to the Coastal Management Element that focuses on flood mitigation and post disaster redevelopment issues related to flooding.

Broward County will continue to further explore other planning and post disaster strategies and policies, which address:

1. Expediting demolition of abandoned significantly damaged structures;
2. Requiring utility and infrastructure improvements that reduce vulnerability to storms and disasters;
3. Promoting energy efficient, heat reduction, and storm resilient features in the redevelopment of neighborhoods, including solar farms and replanting trees;
4. Improving drainage and raising structures, driveways and streets to avoid flooding damages;
5. Restricting redevelopment of properties in areas prone to repeat flood, wind or fire damage;
6. Addressing resiliency of mobile homes and other types of manufactured homes;
7. Transferring of title of abandoned properties within a reasonable time frame to promote expedited redevelopment.

Analysis Requirements

The CME is based upon the following analyses: existing land use coverage analysis; natural resource analysis; analysis of estuarine pollution; analysis of natural disaster planning issues; beach and dune system analysis; and Deepwater Port analysis. This analysis is provided below, except for the Deepwater Port analysis, which is addressed in the Deepwater Port Component.

A. Existing Land Use Coverage Analysis

1. Conflicts among Shoreline Uses

Land use conflicts center on the proximity of structures to the CCCL. Additional information can be found in the [Broward County Land Use Plan](#).

B. Natural Resource Analysis

The following analyzes the natural resources in the areas of vegetation, wetland, wildlife habitat, and living marine resources.

1. Vegetative and Wetland Analysis

Vegetation on and in proximity to the beach consists primarily of sea oats. Sea grapes. Grasses. Non-woody perennials, and exotic species used as landscape materials. This vegetation helps to protect upland property during storm conditions.

2. Wildlife Habitat and Living Marine Resources

The EPGMD has been involved in a variety of research projects that are aimed at improving the coastal environment. The Manatee Protection Plan implements additional manatee protection measures throughout the County's waterways that are accessible to manatees. Since the inception of the plan, the county has been successfully implementing these protection measures which include: increased law enforcement, manatee monitoring, as well as educational and awareness. Additional information on the Manatee Protection Plan can be found in the Conservation Element.

Sea turtle research projects include fish predation on the hatchery released sea turtle hatchlings and hatchling disorientation from urban beach-front lighting. The Broward County EPGMD will maintain the guidelines for local government with implementation of sea turtle conservation programs developed in conjunction with the Florida Wildlife Research Institute. The Mooring Buoy program enables Broward County to further protect its reefs with a mooring buoy system, which was installed so that boaters can moor on the reefs without using an anchor, and avoid violating the law prohibiting dropping anchors on living coral reefs. Artificial reef studies include mechanisms of recruitment of reef fish to artificial reefs, effects of artificial reef construction and the effect of water depth on fish abundance at artificial reefs.

Broward County's coastal marine habitats include shallow and deep hard bottom communities and pelagic fish populations. These habitats are important from an ecological and economic perspective. According to EPGMD, new threats have created the need for response plans to minimize and assess damage from such events. To aid in creating response plans, it is necessary to develop offshore resource maps to serve as baseline data. Although fisheries' management is carried out by the State, Broward County's Artificial Reef Program creates an opportunity for involvement in stock restoration.

The initiation of reef fish recruitment studies by the EPGMD has demonstrated a need for such studies to the extent that artificial reefs may prove to be a valuable tool for increasing fish populations. While further scientific studies are very important, it is also important to understand the economic value of artificial reefs as well as natural habitats to justify funding of further projects and studies. A high level of boating activity in Broward County can result in an increased risk of anchor damage to reefs. The on-going installation and maintenance of permanent small boat moorings on the reefs allow divers and fishermen an opportunity to enjoy the resources without the risk of damaging hard bottom habitats.

C. Impacts of Development/Redevelopment on Historic Resources and Sites

Information on development/redevelopment activities and impacts on historic resources and sites can be found in the Historic Preservation Component.

D. Analysis of Estuarine Pollution

There is only one estuarine system in Broward County, which can be found on the [Natural Resource Map Series](#) - Eastern Broward County: Beaches and Shores, Including Estuarine Systems, Rivers, Bays, Lakes, Harbors, and Dredge Spoil Disposal Sites, Broward County Land Use Plan. Westlake Regional Park and the Anne Kolb Nature Center, both county facilities located in the City of Hollywood, lie within the estuarine system. The EPGMD and the Development Management Division assess the potential development impacts on estuaries through the development review process, including site plan and plat applications. Also, the EPD coordinates efforts and existing resource protection plans where possible, and of other agencies through participation in the development review process, to protect estuaries within the jurisdiction of more than one local government.

E. Analysis of Natural Disaster Planning Issues

The following natural disaster planning concerns are analyzed, but a more detailed analysis is founded in the Natural Disaster Component.

1. Hurricane Evacuation Planning

Hurricane evacuation planning is based on the hurricane evacuation plan contained in the local emergency management plan and the Coastal Hurricane Evacuation Plans. The hurricane vulnerability zone, the number of persons requiring evacuation, the number of hurricane shelter spaces available, evacuation routes, transportation and hazard constraints on the evacuation routes, and evacuation times are discussed below:

- a) *Hurricane Vulnerability Zones:* There are two evacuation zones in Broward County. Due to the limited number bridges over the Intracoastal Waterway, there are not many alternatives to change the zones or evacuation routes
- b) *Persons Requiring Evacuation:* More than 190,000 persons are estimated to live in coastal areas and mobile homes vulnerable to storm surges and winds in Category 3 through 5 hurricanes. With such a large amount of people evacuating within a short period of time, there is a need for better land use control to direct population concentrations away from the coastal high-hazard areas.
- c) *Available Hurricane Shelter Spaces:* Broward County has a total of more than 67,000 hurricane shelter spaces. There are 12 primary shelter sites containing approximately 37,000 spaces. All shelters have been selected for safety features and location to serve the most vulnerable sections of the community. There are currently enough spaces for those who wish to evacuate. If additional shelter spaces are needed, more schools could be opened.
- d) *Evacuation Routes:* Evacuees will use S.R. A1A and either NE 14th Street or Hillsboro Boulevard causeways to evacuate to the mainland.
- e) *Transportation and Hazard Constraints on Routes:* NE 14th Street and Hillsboro Boulevard causeways have four-lane draw bridges. In the event of a hurricane, both boat and vehicle traffic will be hectic; thus, creating transportation constraints. Another hazard constraint will be potential flooding of roadways. The maintenance of good traffic flow is critical, especially along S.R. A1A, which is the main North-South thoroughfare east of the Intracoastal Waterway.
- f) *Evacuation Time:* To ensure that all evacuees could reach their destination prior to a landfall, the County's Mayor would issue an evacuation order. Measures to maintain or reduce evacuation times were incorporated into the Broward County Emergency Operations Plan, which identifies tasks and assigns responsibility to specific County divisions for their timely implementation. The measures devised to reduce evacuation times include: public information, traffic control, debris removal, and public transit.

2. Post-Disaster Redevelopment

The Emergency Management Division along with other county agencies and municipalities shall develop a county wide post-disaster redevelopment and mitigation plan which reduces exposure to life and property to natural hazards. The EPMGD assists state agencies in the enforcement and monitoring of compliance with the Florida Department of Environmental Protection CCCL regulations. The EPGMD also assists in monitoring development in the coastal areas to ensure proper compliance with state and local regulations. In addition, structures with a history of repeated damages in coastal storms may be required to relocate westward of the CCCL to reduce exposure.

According to the Natural Disaster Component, if a structure was damaged by a natural disaster more than 75 percent of its replacement cost, any post-disaster redevelopment would need to meet the design criteria established pursuant to the designation of the CCCL. Measures to reduce exposure to hazards during a hurricane consist of a beach renourishment program and revegetation of an area on the beach to create sand dunes. The presence of sand dunes prevents sand from being blown onto upland property and moderates wave overtopping. Since most dunes were destroyed by coastal development, the replenishment of the dune system could help mitigate the impact of storms.

3. Coastal High-Hazard Areas

The only potentially threatened infrastructures are streets and highways; therefore, no potential for relocation exists. Relocating infrastructures owned or operated by the County was analyzed and deemed unnecessary because the County is responsible for maintaining local roadway networks. State Road A1A is maintained by FDOT.

F. Beach and Dune Analysis

1. Past Trends in Erosion and Accretion

The EPGMD is charged to monitor and restore eroded beaches. The EPGMD regularly conducts Countywide beach surveys to identify areas where nourishment projects would generate the greatest benefits. Data repeatedly confirm that the County should continue its beach renourishment program as one means of conserving the barrier island's resources. The beaches should be maintained to a width of approximately 75 to 125 feet.

Segment III of the Shore Protection Project (John U. Lloyd State Park to the Miami Dade-County Line) was completed in February 2006. The most recent project, Segment II, was completed in 2017. Any development and redevelopment in the coastal area should not degrade or destroy existing natural beaches or berm areas. Also, Broward County will continue to encourage local governments and property owners to protect existing beach vegetation, to revegetate the beach,

where appropriate, and to encourage landscaping with native trees, shrubs, and ground covers in areas of historic beaches or berm communities through the distribution of educational pamphlets.

Inlet management plans were carried out for Hillsboro Inlet and Port Everglades in accordance with cost sharing agreements with FDEP. The plans provided analyses and recommendations on strategies to improve sand bypassing, and stabilization of down drift beach sand using jetty modifications.

2. Measures Which Could Protect or Restore Beaches

Certain structural measures have been used to stabilize beach sand from erosion. These include inlet sand by bypassing, groins and breakwaters. In conjunction with beach renourishment, methods such as these could help stabilize sand and reduce the frequency or magnitude of renourishment. Engineering and economic studies should be undertaken to determine the feasibility of such measures.

G. Infrastructure Analysis

S.R. A1A is the main roadway on the barrier island and is under State jurisdiction. The following infrastructure issues are analyzed;

1. **Demands upon Existing Infrastructures.** The traffic demand on A1A has its seasonal change from higher in the winter to lower in the summer.
2. **Area Served by Existing Infrastructure.** There are no existing infrastructures under county jurisdiction.
3. **Estimated Future Need for Infrastructure.** There is no need for additional infrastructure under county jurisdiction.
4. **Fiscal Impacts in Terms of Estimated Costs, Funding Sources, and Phasing of Infrastructure.** See the Capital Improvements Element for information on beach renourishment programs and budget.

H. Post-Disaster Redevelopment

[Need to add analysis supporting Peril of Flood policies recently added to the GOPS.]

Implementation

A. Authority

Managing coastal resources in Broward County is the responsibility of several State and County Agencies. Table CM-3 lists these agencies, their responsibilities concerning coastal area management, and existing regulatory programs to protect environment quality in the coastal area.

B. Sources

The EPGMD is the primary source for the data and analysis included in this Element. Other sources include the Broward County EMD and EPCRD.

Table CM-3: Coastal Management Legislation and Responsible Agencies, Broward County

Agency	Enabling Legislation	Responsibility
U.S. Department of Interior	Federal Coastal Zone Management Act of 1972, Public Law 92-583	Provide financial assistance to participating coastal states. Identifies general coastal zones and defines permissible land and water uses within.
	Water Pollution Control Act, Public Law 92-500	Prohibits coastal pollution.
	Coastal Barrier Resources Act, Public Law 97-348	Restricts federal subsidies in undeveloped designated coastal areas.
Florida Department of Environmental Protection	Florida Coastal Management Act of 1978, Chapter 380, Part II, Florida Statutes	Coordinates the Florida Coastal Management Act of 1978; Implements the Federal Coastal Management Act of 1972.
	Chapter 403, Florida Statutes	Develops and enforces pollution controls on waters of the State. Permits dredge and fill activities in wetlands.
	Chapter 161, Florida Statutes	Established coastal construction control lines. Regulates coastal constructions. Oversees Erosion Control Trust Fund. Enables establishment of Beach and Shore Preservation Districts.
Broward Soil and Water Conservation District	Chapter 582, Florida Statutes	Control or prevent soil erosion and further the conservation of soil and water resources.
South Florida Water Management District		Manages estuarine pollution through water control and timing of fresh water delivery.
Broward County Environmental Protection & Growth Management Department	Section 8.17, Broward County Chapter	Monitor water quality and permits dredge and fill activities. Develops and implements Beach Management Program. Implements Sea Turtle Conservation Program; manages Artificial Reef Program.

Appendix

Appendix CM-A: Marine Resources, Broward County, 2017

A. Myctophiformes

Family:

- Clupeidae – Herrings
- Engraulidae – Anchovies
- Synadontidae – Lizard fishes
- Chlorophthalmidae – Greeneyes
- Alepisauridae – Lancet Fish

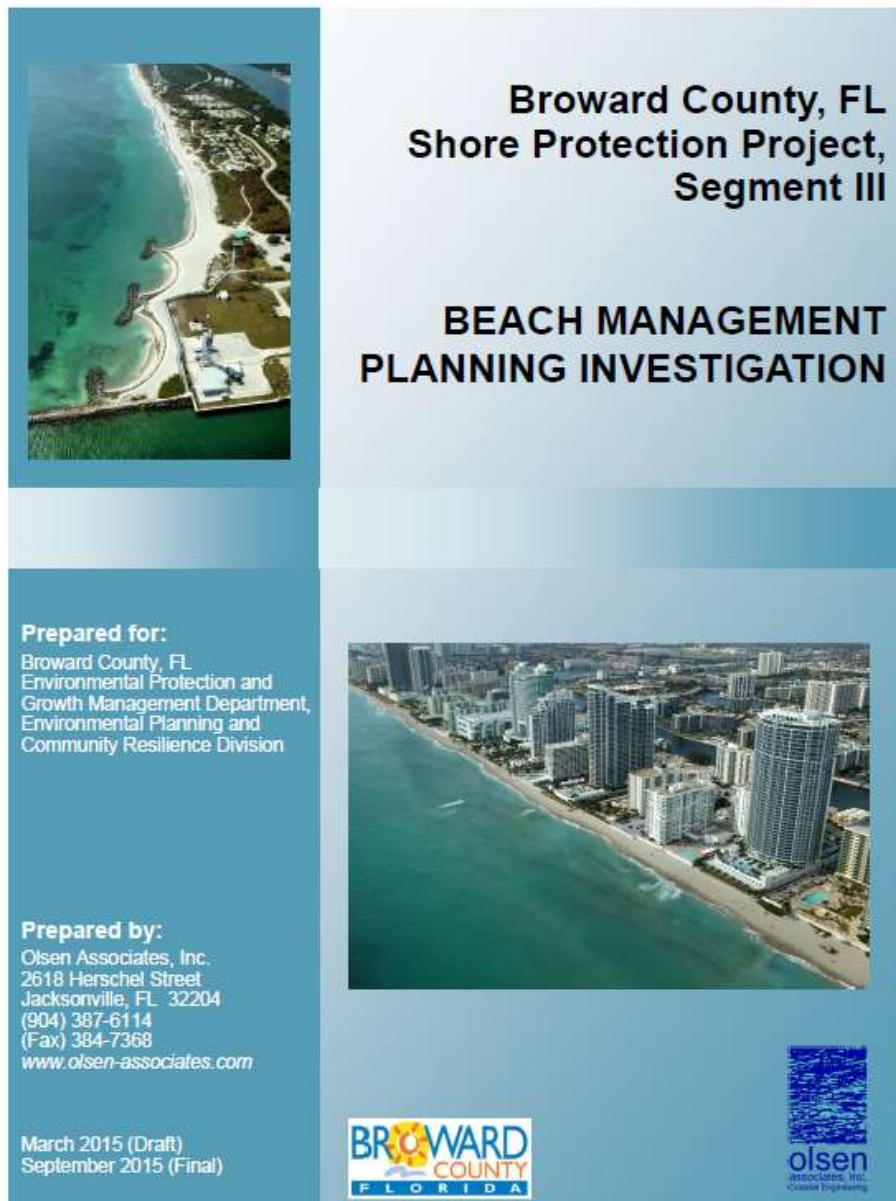
B. Perciformes

Family:

- Centropomidae – Snooks
- Serranidae – Sea basses
- Grammistidae – Soapfishes
- Priacanthidae – Bigeyes
- Apogonidae – Cardinal fishes
- Branchiostegidae – Tilefishes
- Pomatomidae – Bluefishes
- Rachcentridae – Cobias
- Echeneidae – remoras
- Carangidae – Jacks and pompanos
- Corphaenidae – dolphins
- Lutjanidae – Snappers
- Lobotidae – Tripletails
- Gerreidae – Mojarres
- Pomadasyidae – grunts
- Sparidae – porgies
- Sciaenidae – drums
- Mullidae – Goatfishes
- Pempheridae – Sweepers
- Kyphosidae – Sea Chubs
- Ephippidae – Spadefishes
- Chaetodontidae – Butterflyfishes
- Pomacentridae – Damselfishes
- Cirrhitidae – Hawkfishes

Labridae – Wrasses
Scaridae – Parrotfishes
Mugilidae – Mulletts
Sphyraenidae – Barracudas
Polynemidae – Threadfins
Opistognathidae – awfishes
Percophididae – Flatheads
Dactyloscopidae – Sand Stargazers
Uranoscopidae – Stargazers
Clinidae – Clinids
Blenniidae – Combtooth blennies
Gobiidae – gobies
Acanthuridae – Surgeonfishes
Trichiuridae – Cutlassfishes
Scombridae – Mackerels and tunas
Xiphiidae – Swordfishes
Istiophoridae – billfishes
Stromateidae – butterfishes
Scorpaenidae – Scorpionfishes
Triglidae – Searobins

Source: Broward County Environmental Protection Department, 1996.



Appendix CM-B can be found at the following webpage:

[http://www.broward.org/BeachRenourishment/Documents/2015-09 BC SPP Segment III Beach Management Study.pdf](http://www.broward.org/BeachRenourishment/Documents/2015-09_BC_SPP_Segment_III_Beach_Management_Study.pdf)

Appendix CM-C: Beach Renourishment Program Information

[Beach Renourishment Video 2017](#)

[Segment II Beach Renourishment Project Community Presentation](#)