APPENDIX B
ENVIRONMENTAL RESOURCES

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ACRONYMS AND ABBREVIATIONS

AADT	Annual Average Daily Traffic
ac	acre(s)
ACAM	Air Conformity Applicability Model
ACS	American Community Survey
Action Area	Approximately 302 square miles of managed upstream watersheds with nine water control structures owned and operated by the SFWMD
BEBR	Bureau of Economic and Business Research
BMP	best management practice
BOEM	Bureau of Ocean Energy Management
BWSER	Bureau of Workforce Statistics and Economic Research
C&SF	Central and Southern Florida
C&SF Project	Central and Southern Florida Project
CAA	Clean Air Act
CFR	Code of Federal Regulations
cfs	cubic foot (feet) per second
CGP	construction general permit
CLC	Florida Cooperative Land Cover Map
CO	carbon monoxide
dB	decibel
dBA	A-weighted decibel
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
FAC	Florida Administrative Code
FAS	Floridan Aquifer System
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEC	Florida East Coast
FEMA	Federal Emergency Management Agency
FLAM	Florida Landscape Assessment Model

FLCCS	Florida Land Cover Classification System
FNAI	Florida Natural Areas Inventory
FR	Federal Register
F.S.	Florida Statutes
ft	foot, feet
FWC	Florida Fish and Wildlife Conservation Commission
FWOP	Future Without Project
GCR	General Conformity regulations
GDP	gross domestic product
GHG	greenhouse gas
H&H	hydrologic and hydraulic
HP	horsepower
HTRW	hazardous, toxic, and radioactive waste
IBA	Important Bird Area
ICW	Intracoastal Waterway
IDE	industrial/commercial exposure limits
ISO	International Organization for Standardization
kg	kilogram
LEC	Lower East Coast
LPG	liquified petroleum gas
mg	milligram
MSA	metropolitan statistical area
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industry Classification System
NAVD88	North Atlantic Vertical Datum of 1988
NLCD	National Land Cover Database
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places

NSR	noise sensitive receptor
NWI	National Wetlands Inventory
O_3	ozone
OMRR&R	operation, maintenance, repair, replacement, and rehabilitation
Pb	lead
PEC	Probable Effective Concentrations
RDE	residential exposure limits
RO	resiliency optimized
ROI	region of influence
ROW	right-of-way
SAS	Surficial Aquifer System
SCTL	Soil Cleanup Target Level
Section 203 Study	Central and Southern Florida Flood Resiliency (Section 203) Study for Broward Basins
SFWMD	South Florida Water Management District
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SMCL	secondary maximum contaminant level
SPF	Standard Project Flood
SO_2	sulfur dioxide
SQAG	Sediment Quality Assessment Guidelines
Study Area	Approximately 420 square miles in eastern Broward County and southern Palm Beach County, encompassing 15 watershed basins, 7 primary canals, and 9 water control structures
SWPPP	stormwater pollution prevention plan
TEC	Threshold Effective Concentrations
TMDL	Total Maximum Daily Load
TSP	Tentatively Selected Plan
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
USFWS	U.S. Fish and Wildlife Service

USGS	U.S. Geological Survey
VHT	Vehicle-Hours Traveled
VMT	Vehicle-Miles Traveled
VRM	Visual Resource Management
UST	underground storage tank
WCA	Water Conservation Area
WCS	water control structure(s)

B.1 Affected Environment

This appendix outlines the affected environment, encompassing the natural, physical, and economic resources within the geographic area where the proposed actions and alternatives are expected to have an impact. It serves as a baseline for comparing the potential environmental and economic effects of these actions. The Section 203 Study Area (Study Area), also referred to as Reach A in the Central and Southern Florida (C&SF) Section 216 Flood Resiliency Study, spans approximately 420 square miles within the eastern portion of Broward County and a small portion of southern Palm Beach County. The Study Area includes nine upstream and six downstream watershed basins, interconnected by a network of seven primary canals managed by nine water control structures (WCS), seven of which are coastal structures, in additional to other existing WCS not directly relevant in this Section 203 Study. The Section 203 Action Area (Action Area) consists of 302 square miles of managed upstream watersheds with nine WCS owned and operated by the SFWMD. The nine upstream watersheds within the Action Area include Hillsboro Canal Basin, Pompano Canal Basin, C-14 West Basin, C-14 East Basin, C-13 West Basin, C-12 West Basin, North New River Canal West Basin, C-11 West Basin, and C-11 East Basin. The Section 203 Action Area is the area of emphasis for evaluating improvements to the WCS functionality and capacity to reduce flood damages.

Figure B.1-1 illustrates the Section 203 Study Area, where data on natural, physical, and economic resources were analyzed.

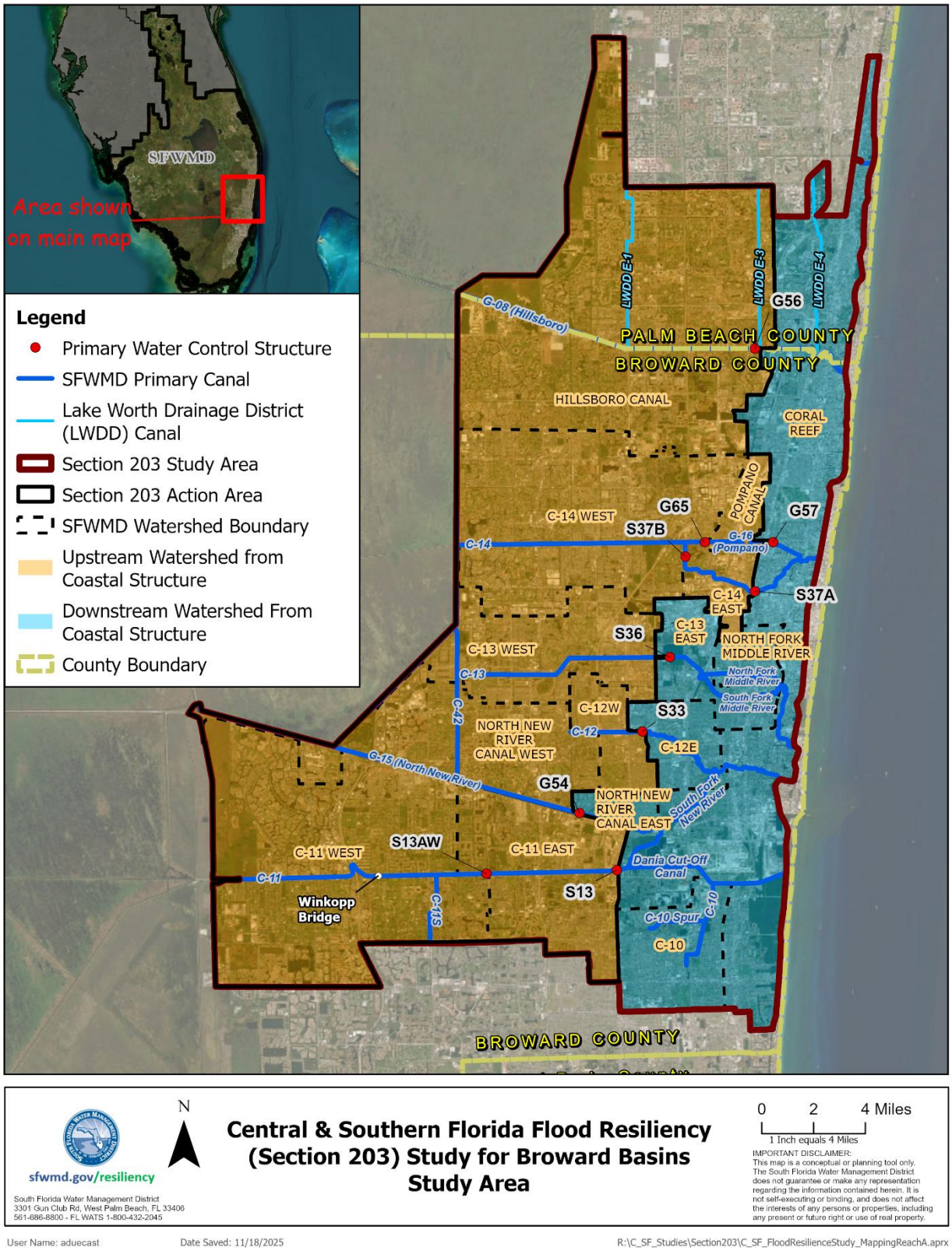


Figure B.1-1. Section 203 Study Area.

B.1.1 Air Quality

Air quality describes the level of contaminants in the air. Air pollution is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Individual air pollutants degrade the atmosphere by reducing visibility, damaging property, reducing the productivity or vigor of crops or natural vegetation, and/or harming human or animal health. The Clean Air Act (CAA) (42 USC §7401 et seq. (1970), as amended, is the basis for most federal air pollution control programs. The U.S. Environmental Protection Agency (EPA), under the CAA, regulates air quality nationally. Under the authority of the CAA, the EPA established a set of National Ambient Air Quality Standards (NAAQS) for various "criteria" air pollutants. The CAA requires states to develop a general plan to attain and maintain the NAAQS in all areas of the country and the State Implementation Plan (SIP) to attain the standards for each area that the EPA has designated nonattainment for a NAAQS.

The Study Area is in attainment for all criteria pollutants, meaning that air quality meets or is better than the NAAQS set by EPA. Although each state has the authority to adopt standards stricter than those established under the federal program, Florida has accepted the federal standards (Florida Administrative Code [FAC] Chapter 62-204 Air Pollution Control - General Provisions). The Florida SIP is a comprehensive plan developed by the state to ensure compliance with the NAAQS set by the EPA under the CAA. Florida's latest modification to the SIP was approved and adopted on October 1, 2023 (EPA 2023). It outlines how a state will monitor, control, and reduce air pollution from various sources to meet federal air quality standards. The SIP includes regulations, enforcement measures, emission limits, and strategies tailored to the state's specific air quality challenges. When approved by the EPA, the SIP becomes legally enforceable. States can update their SIPs as needed to address new pollution concerns or regulatory changes.

Figure B.1-2 illustrates the NAAQS CAA process, tracing its progression from federal legislation to SIPs, outlining key regulatory steps and compliance measures. Specifically, the EPA is responsible for setting the primary and secondary NAAQS (40 Code of Federal Regulations [CFR] Part 50), which defines the maximum permissible concentrations of six key air pollutants, known as criteria pollutants. These include particulate matter—both PM_{10} (particles with a diameter of 10 microns or less) and $PM_{2.5}$ (particles with a diameter of 2.5 microns or less)—as well as sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb) (Table B.1-1). These permissible concentrations address both acute and chronic health risks, the NAAQS include short-term exposure limits (covering 1-hour, 8-hour, and 24-hour periods) for pollutants that pose immediate health hazards, as well as long-term exposure limits (based on annual averages) for pollutants linked to prolonged health effects.

The General Conformity Rule mandates that a federal agency cannot take any action in a nonattainment or maintenance area that interferes with a state's ability to attain, maintain, or comply with the NAAQS. This rule, established under the CAA, ensures that federal projects do not contribute to air quality violations or hinder a state's efforts to meet air pollution reduction goals. Agencies must conduct conformity determinations to assess the potential air quality impacts of their proposed actions, demonstrating compliance with SIPs designed to achieve and sustain NAAQS levels.

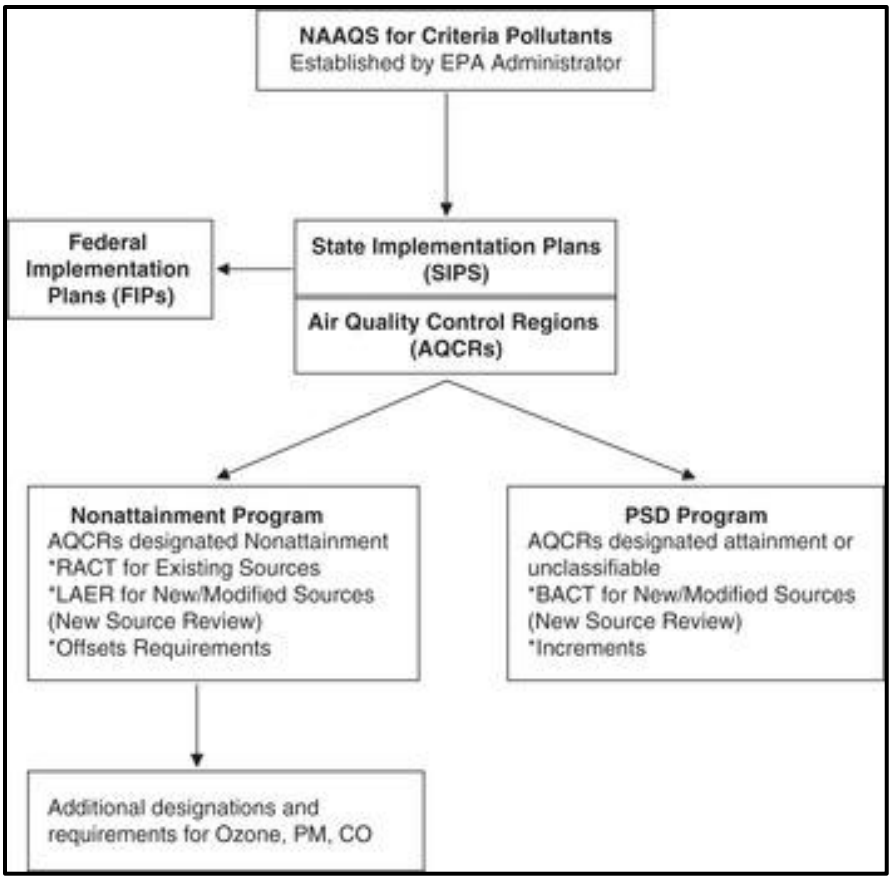


Figure B.1-2. National Ambient Air Quality Standards Process Flow Chart (EPA 2023).

Table B.1-1. National Ambient Air Quality Standards.

Pollutant	Primary/Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)	Primary	8-hour	9 ppm	Not to be exceeded more than once a year
Carbon Monoxide (CO)	Primary	1-hour	35 ppm	Not to be exceeded more than once a year
Lead (Pb)	Primary and Secondary	Rolling 3-month average	0.15 µg/m^3	Not to be exceeded
Nitrogen Dioxide (NO_2)	Primary	1-hour	100 ppb	98th percentile of 1- hour daily maximum concentrations, averaged over 3 years
Nitrogen Dioxide (NO_2)	Primary and Secondary	Annual	53 ppb	Annual mean
Ozone (O_3)	Primary and Secondary	8-hour	0.070 ppm	Annual fourth highest daily maximum 8-hour concentration, averaged over 3 years
Particulate Matter ($PM_{2.5}$)	Primary	Annual	12 µg/m^3	Annual mean, averaged over 3 years
Particulate Matter ($PM_{2.5}$)	Secondary	Annual	15 µg/m^3	Annual mean, averaged over 3 years
Particulate Matter ($PM_{2.5}$)	Primary and Secondary	24-hour	35 µg/m^3	98th percentile, averaged over 3 years
Particulate Matter (PM_{10})	Primary and Secondary	24-hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years

Source: 40 CFR 50.1-50.12, EPA 2024a
Note: ppb = parts per billion; ppm = parts per million; µg/m^3 = micrograms per cubic meter

Through ongoing monitoring, enforcement, and regulatory oversight, both the EPA and Florida Department of Environmental Protection (FDEP) work to ensure compliance with air quality standards, thereby safeguarding public health and the environment across the state. Federal regulations designate Air Quality Control Regions in violation of the NAAQS as nonattainment areas and Air Quality Control Regions with levels below the NAAQS as attainment areas. While the Study Area is currently in attainment, ongoing monitoring and regulatory efforts are essential to prevent future nonattainment, particularly in urban areas where pollution levels may fluctuate due to population growth and industrial activities. Florida's compliance is attributed to strict emissions regulations, clean energy initiatives, improved vehicle emissions technology, and consistent air monitoring managed by the FDEP and EPA. **Figure B.1-3** illustrates FDEP air monitoring locations in and near the Study Area.

The EPA NAAQS designate nitrogen dioxide (NO_2) as the primary indicator for the broader category of nitrogen oxides (NO_x), which includes both nitric oxide (NO) and NO_2. This designation is because NO_2 is the most harmful of the nitrogen oxides in terms of direct human exposure and environmental impact, including respiratory health effects and its role in forming ground-level ozone and fine particulate matter. For the purposes of this Section 203 Study, a 100 percent conversion rate of NO_x to NO_2 will be assumed as a conservative approach to estimating emissions and potential air quality impacts. NO_x emissions primarily consist of NO, which gradually converts to NO_2 in the atmosphere through chemical reactions with ozone (O_3) and other oxidants. However, since this conversion process is variable and influenced by environmental conditions such as sunlight, temperature, and atmospheric composition, assuming full conversion to NO_2 ensures that the Study does not underestimate potential air quality impacts. Throughout the analysis, all NO_x emissions will be expressed as NO_2 emissions, ensuring a worst-case scenario evaluation for regulatory compliance, impact assessments, and air quality modeling. This approach aligns with conservative environmental assessment practices, prioritizing public health and regulatory accountability.

Table B.1-1 summarizes these standards, and further information about these "criteria pollutants" is provided later in this section. The EPA established "primary" standards to protect the public health and "secondary" standards to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the general welfare.

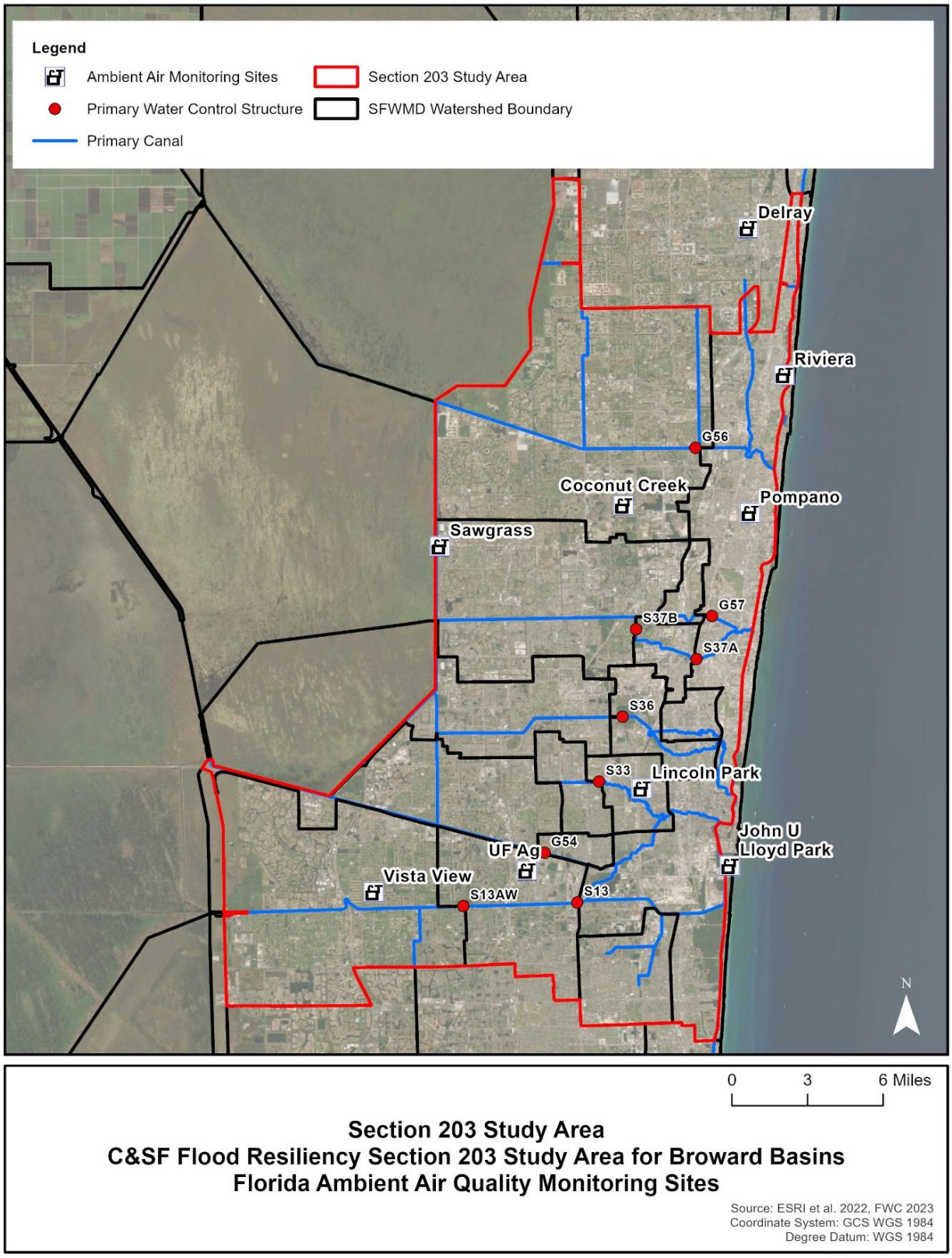


Figure B.1-3. Florida Department of Environmental Protection Air Quality Monitoring Locations in and near the Study Area.

B.1.2 Greenhouse Gases

Greenhouse gases (GHGs) such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) trap heat in the atmosphere and significantly influence global climate patterns. Since the Industrial Revolution began about 250 years ago, global GHG emissions have risen steadily, with rapid acceleration during the 20th century (Climate Watch 2022).

In 2023, the United States emitted an estimated 2.58 billion metric tons of carbon dioxide equivalent ($BMTCO_2e$) from human activities (EPA 2023). Broward County, home to approximately 1.94 million people in 2021 (U.S. Census), recorded per capita emissions of 10 metric tons of CO_2e—a 10 percent decrease from 2018 levels. This decline reflects ongoing efforts to cut emissions through local regulations and sustainability initiatives (Broward County 2023a). However, total countywide emissions still reached about 20 million metric tons ($MMTCO_2e$) in 2021, underscoring the need for continued action.

Broward County has adopted aggressive climate goals, aiming to reduce annual emissions to 3.4 $MMTCO_2e$ by 2050—a target that supports an 80 percent reduction based on projected population growth to 2.2 million residents by mid-century. **Figure B.1-4** illustrates the county's current emissions inventory and progress toward these goals (Broward County 2024a).

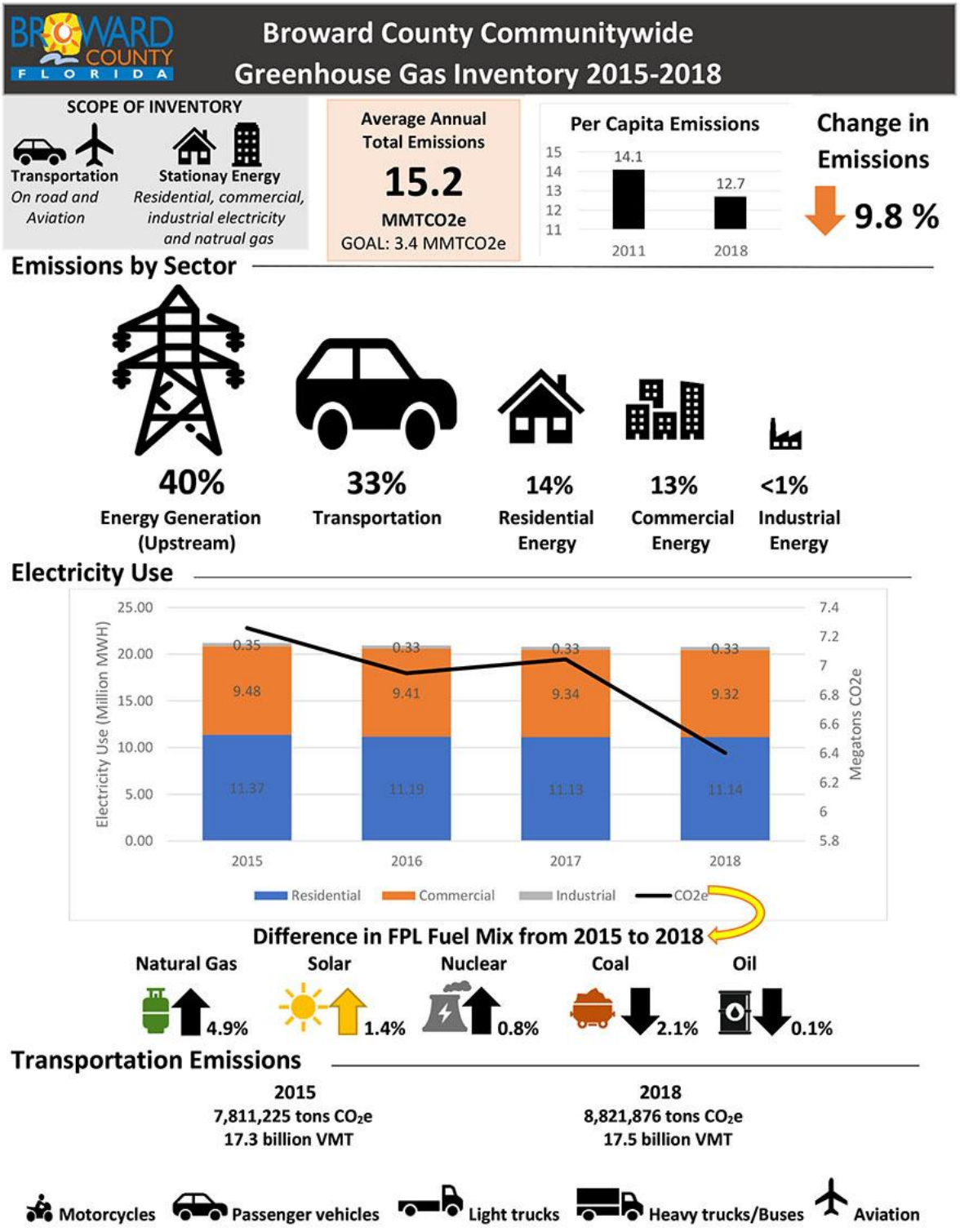


Figure B.1-4. Broward County Countywide Greenhouse Gas Inventory 2015-2018 (Broward County 2024a).

B.1.3 Climate

South Florida has a tropical climate with distinct wet and dry seasons. The wet season, from May to October, brings high humidity, warm temperatures, increased rainfall, frequent afternoon thunderstorms, and occasional tropical storm systems that help cool the region. During this period, yearly average temperatures range from 77°F to 88°F (NOAA 2025a). NOAA dubbed 2023 the warmest year on record by far, with persistent heat documented in Broward County and across the South Florida region. Local stations measured record-breaking temperatures at Miami International Airport with the total number of hours exceeding a heat index at or above 105°F surpassing 160 hours, compared to the historical average of just 9.3 hours across the period of record (Broward County 2023b). The dry season, from November to April, features cooler temperatures, lower humidity, and little rainfall—ideal conditions for outdoor activities. Average temperatures during the dry season range from 64°F to 77°F. Throughout the year, South Florida's location between the Gulf of America and the Atlantic Ocean helps maintain relatively moderate temperatures.

B.1.4 Noise

Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise intrusive. Human response to noise varies depending on the type and characteristics of the noise, distance between the noise source and the receptor, receptor sensitivity, and time of day. Noise is often generated by activities essential to a community's quality of life, such as construction and vehicular traffic.

Sound varies by both intensity and frequency. Sound pressure levels, measured in decibels (dB), are used to quantify sound intensity. The decibel is a logarithmic unit that expresses the ratio of a sound pressure level to a standard reference level. Hertz are used to quantify sound frequency. The human ear responds differently to different frequencies. "A-weighing," measured in A-weighted decibels (dBA), approximates a frequency response expressing the perception of sound by humans. **Table B.1-2** provides sounds encountered in daily life and their dBA levels.

Table B.1-2. Common Sounds and their A-weighted Decibel Levels

Sound Source	Sound Level (dBA)
Motorcycle, subway train	100
Steel Pile Driving	97
Tractor, garbage disposal	90
Noisy restaurant, blender	85
Downtown (large city), ringing phone	80
Pumps	77
Generator (<25KVA)	73
Freeway traffic, TV audio	70
Normal conversation, sewing machine	60
Rainfall, refrigerator	50
Quiet residential area, library	40

Source: Harris 1998, FHWA 2006, NRC 2020

The A-weighted decibel noise metric describes steady noise levels, although very few noises are, in fact, constant. Therefore, A-weighted day-night sound level has been developed. "Day-night sound level" is defined as the average sound energy in a 24-hour period with a 10-dB penalty added to the nighttime

levels (10:00 p.m. to 7:00 a.m.). Day-night sound level is a useful descriptor for noise because it averages ongoing yet intermittent noise and measures total sound energy over a 24-hour period. In addition, the equivalent sound level (L_{eq}) is often used to describe the overall noise environment. L_{eq} is the average sound level in decibels.

The Noise Control Act (42 USC §4901 et seq. (1972)) directs federal agencies to comply with applicable federal, state, and local noise control regulations. In 1974, EPA provided information suggesting continuous and long-term noise levels more than day-night sound level 65 dBA are normally unacceptable for noise-sensitive land uses such as residences, schools, churches, and hospitals. Broward County maintains a noise ordinance that prohibits any unreasonably loud noise originating from a facility authorized to operate with a Broward County air license or State of Florida air permit from which construction noise is exempt between 7:00 a.m. and 7:00 p.m. There is no measurement or noise level required for a violation of this ordinance.

Noise levels are associated with surrounding land use. No known ambient noise monitoring has been conducted in the Study Area; consequently, no quantitative data on noise levels within the Study Area are available for analysis.

The Study Area is primarily residential with some commercial businesses present. The S-37A Gated Spillway and G-54 Gated Spillway are located within a mile of schools, with the S-37A Gated Spillway approximately 2,000 feet from a school, and the G-54 Gated Spillway 2,300 feet away. The G-57 Gated Spillway is approximately 600 feet from a church with a highway to separate them, but no other sites have sensitive buildings nearby. Operational sound generated by the S-37A, G-54, and G-57 Gated Spillways is expected to be low level and likely at or below ambient sound levels during normal operation where sound sources are limited to that produced from the water flow and mechanical components. During infrequent atypical operation, a standby generator may be needed, which produces a sound pressure level of approximately 85 dBA at a distance of 23 feet from the generator. In the event of a power loss, if a standby generator must operate at the S-37A Gated Spillway, the resultant received sound level at the nearest school would be approximately 46 dBA. Similarly, for the G-54 and G-57 Gated Spillways, the resultant received sound levels would be 45 dBA at 2,300 feet and 57 dBA at 600 feet, respectively.

There are no significant noise generating land users within the Study Area. Existing sources of noise are limited to the vehicular traffic travelling on roads adjacent to and cutting through the Study Area. Sound levels are typically in the range of 85 to 100 dB for heavy duty trucks passing 15 feet away (Berger et al. 2010).

B.1.5 Hydrology

The major contributors to southeast Florida's hydrology include (1) local rainfall, which is the primary contributor of south Florida's fresh water; (2) evapotranspiration; (3) operation of WCS and canal levels; (4) low and flat topography in coastal areas subject to coastal risks including tidal elevations, surge, and sea level rise; and (5) the highly permeable and shallow Biscayne Aquifer allowing close interaction between surface water and subsurface/groundwater levels. Broward County is highly susceptible to flooding due to these factors (Decker 2022). Broward County has an average annual rainfall of over 57 inches, with most rainfall occurring during the wet season (May 1 to November 1).

The west side of Broward County is largely undeveloped and includes Water Conservation Areas (WCA) managed by the South Florida Water Management District (SFWMD) and U.S. Army Corps of Engineers (USACE). **Figure B.1-5** below illustrates the location of WCA one, two, and three. The eastern third of the county is highly urbanized and is separated from the WCAs (and the Everglades) by a protective levee, with water levels within the WCAs maintained approximately 4 feet higher than the east side of the levee. This allows for gravity to drain water from west to east (Broward County 2019). WCA-1, WCA-2, and WCA-3 are 218 square miles, 207 square miles, and 925 square miles respectively. WCA-1 is located adjacent to the northern portion of the study area. WCA-2 and WCA-3 are located immediately west of the levee. WCA-2 consists of a sawgrass wetland with an area of approximately 210 square miles. WCA-3 is located to the south of WCA-2 and contains an area of approximately 915 square miles. These WCAs provide crucial functions such as flood control, water supply, and natural habitat.

In Broward County, the SFWMD also manages a network of canals, spillways, dikes and levees, culverts, and pump stations to manipulate the flow of water to protect regional water supplies and provide flood control. The SFWMD manages the primary drainage system–the Central and Southern Florida Project (C&SF Project) features–in Broward County. Secondary canals are managed by local drainage and water control districts that are responsible for flood control within a specific jurisdiction that drain into the primary system. Tertiary canals move water into secondary canals from neighborhood surface water features (such as ponds), and are managed by local governments, homeowner's associations, or through coordination with a local drainage and water control district. The system is operated to prevent urban flooding while also maintaining sufficiently high groundwater levels to prevent saltwater intrusion near water-supply wells (Renken et al. 2005). However, urbanization, changing environmental conditions, sea level rise, and frequency of extreme rainfall and drought events are anticipated to impact the operation and long-term performance of the existing regional system.

Select primary canals and WCS in Broward County watersheds are the focus of this Section 203 Study. The Study Area is contained within Hydrologic Unit Code 03090206. The landscape is relatively flat, with an elevation slightly above sea level (2 to 10 feet on average). The Study Area consists of nine upstream and six downstream watershed basins with a network of seven primary canals managed by nine WCS (seven of which are coastal structures) (**Figure B.1-5**). The upstream watershed basins, primary canals, WCS within the Study Area, and a description of each WCS are provided in **Table B.1-3**.

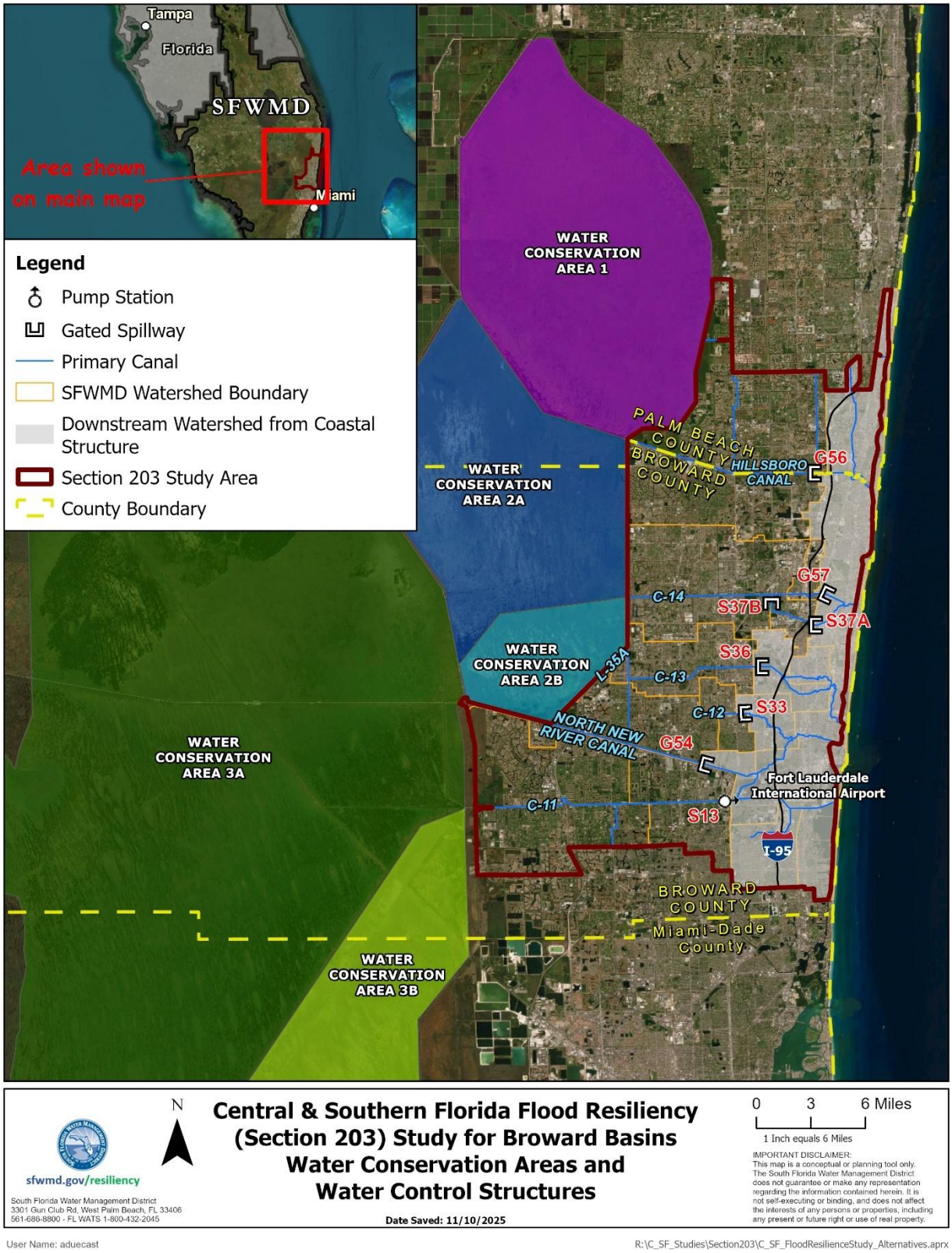


Figure B.1-5. South Florida's Water Conservation Areas (SFWMD 2024a).

Table B.1-3. Section 203 Study Area—Managed Upstream Watershed Basins, Primary Canals, and Water Control Structures.

Managed Upstream Watershed Basin	Primary Canal	Primary Water Control Structure	Description of Water Control Structure[b/]
Hillsboro Canal Basin	G-08 (Hillsboro) Canal	G-56 Gated Spillway	Built in 1991 to replace Deerfield lock structure Three gates, each 12.2 feet (ft) high (H) x 20.0 ft wide (W) Total Design Discharge Capacity is 3,760 cubic feet per second (cfs) Operated to maintain water level of 5.9 ft[c/]
Pompano Canal Basin	G-16 (Pompano) Canal	G-57 Gated Spillway	Built in 1987 Two gates, each 6.5 ft H x 14.7 ft W Total Design Discharge Capacity is 375 cfs Operated to maintain water level of 2.9 ft
C-14 West Basin	C-14 (Cypress Creek) Canal	S-37B Gated Spillway[a/]	Built in 1959 1 ft tall plate added to top of gates in 1990, and gate operators modified from stem to cable drum in 2004 Two gates, each 6.6 ft H x 25.75 ft W Total Design Discharge Capacity is 3,390 cfs Operated to maintain water level of 5.4 ft
C-14 East Basin	C-14 (Cypress Creek) Canal	S-37A Gated Spillway	Built in 1959 Two gates, each 12.8 ft H x 25.8 ft W Total Design Discharge Capacity is 3,890 cfs Operated to maintain water level of 2.4 ft
C-13 West Basin	C-13 (Middle River) Canal	S-36 Gated Spillway	Built in 1954 One gate, 14.0 ft H x 25.0 ft W Total Design Discharge Capacity is 1,090 cfs Operated to maintain water level of 2.9 ft
C-12 West Basin	C-12 (Plantation) Canal	S-33 Gated Spillway	Built in 1954 One gate, 9.0 ft H x 22.0 ft W Total Design Discharge Capacity is 920 cfs Operated to maintain water level of 1.9 ft
North New River Canal West Basin	G-15 (North New River) Canal	G-54 Gated Spillway	Built in 1992 to replace Sewell lock structure Three gates, each 9.5 ft H x 16.0 ft W Total Design Discharge Capacity is 1,600 cfs Operated to maintain water level of 2.4 ft
C-11 West Basin	C-11 (South New River) Canal	S-13AW Gated Culvert[a/]	Built in 2007 to replace S-13A Two gated concrete box culverts each 5.0 ft H x 10.0 ft W Total Design Gravity Discharge Capacity is 500 cfs Operated to maintain water level of 1.4 to 2.0 ft
C-11 East Basin	C-11 (South New River) Canal	S-13 Pump Station and Gated Spillway	Built in 1954 One gate, 11.0 ft H x 16.0 ft W Three 180-cfs pumps, each 60-inch diameter Total Design Gravity Discharge Capacity is 540 cfs Total Design Pump Discharge Capacity is 540 cfs Operated to maintain water level of 0.0 ft

Note: C = canal, G = gate, S = structure
a/ The S-37B Gated Spillway and S-13AW Gated Culvert are non-coastal structures; all others are coastal structures
b/ Source: SFWMD 2021a
c/ Water levels are measured using the North Atlantic Vertical Datum of 1988 (NAVD88)

A system-wide review of regional water management infrastructure was completed by the SFWMD for the nine upstream watershed basins in 2021 to determine the flood protection level of service provided under current and future conditions and identified deficiencies in the system (SFWMD 2021b). Several watershed canals are shown to be insufficiently capable of handling the recurrence interval of flooding respective to the design conditions. The flood protection level of service ratings identify current flood vulnerabilities in urban areas and signify the relevance and urgency of this Section 203 Study.

B.1.6 Groundwater

The majority of Broward County is low and flat, with most land-surface elevations between 2 and 10 feet above North Atlantic Vertical Datum of 1988 (NAVD88; Broward County 2009). Land-surface elevation and groundwater levels are generally higher to the north than to the south, which results in a historical groundwater surface that generally slopes from the northwest to the southeast. Localized cones of depression, which form around major production-well locations, are superimposed on a low-gradient water level surface (Renken et al. 2005).

Groundwater is produced from two major aquifer systems: the Surficial Aquifer System (SAS) and the underlying Floridan Aquifer System (FAS). The SAS, including the Biscayne Aquifer, is the primary source of fresh, potable water in southeastern Florida. It is approximately 300 feet thick, with the thickest deposits occurring at the coast that thins to the west under the Everglades. The Biscayne aquifer is highly permeable – composed of limestone and sandstone – and is the primary drinking water source for Broward County. Below the SAS is the Hawthorn Group sediments, which is considered a confining unit, meaning that it does not readily transmit water, with a thickness of 600 to 700 feet. Below the Hawthorn Group confining sediments are the geologic units (i.e., limestone, dolomite) that comprise the FAS with an approximate thickness of 2,500 feet. Some public supply utilities tap the FAS as a brackish, alternative water source and treat it with reverse osmosis to make it suitable for drinking water purposes.

Recharge to the Biscayne Aquifer is primarily by local rainfall and surface water flows, including groundwater seepage from the WCAs, and surface water deliveries from the WCAs. When sufficient water is available, surface water from Lake Okeechobee also can be routed to the WCAs, then to regional canals and local water control districts to maintain water levels and recharge the aquifer (SFWMD 2024b). Recharge is highest during the wet season from May to November. A water budget developed by the U.S. Geological Survey (USGS) for the Biscayne Aquifer in Broward County indicates that about 78 percent of the 60-inch annual average rainfall reaches the Biscayne Aquifer. Based on the calibrated model water budget, discharge from the Biscayne Aquifer is primarily into canals, accounting for roughly 54 percent of all discharge. Evapotranspiration and well withdrawals accounted for another 24 and 20 percent, respectively (Decker 2022).

The SFWMD developed the 2023-2024 Lower East Coast (LEC) Water Supply Plan to assess projected water demands and potential sources of water for the period from 2021 to 2045. The 2023-2024 LEC Water Supply Plan update was approved in September 2024. The LEC Water Supply planning area encompasses all of Palm Beach, Broward, and Miami-Dade counties. Counties within the LEC planning area rely on traditional water sources such as surface water and fresh groundwater to meet residential and agricultural demands. The Biscayne Aquifer produces high-quality fresh water from relatively shallow wells. In 2021, fresh groundwater supplied 81 percent of Broward County's total water demand

(SFWMD 2023). Alternative water supply sources include brackish groundwater from the Floridan Aquifer, reuse strategies, water conservation, and others. Fresh groundwater accounts for 91 percent of the region's public supply demand within the LEC Water Supply planning area in 2021 (SFWMD 2024b). To meet the 2045 projected demand of public supply utilities, the 2023-2024 LEC Water Supply Plan update identifies additional reverse osmosis water treatment plant projects to treat brackish water from the FAS. Currently, 15 operating reverse osmosis water treatment plants have a combined capacity of 79.5 million gallons per day and account for 6 percent of public supply utilities within the LEC planning area (SFWMD 2024b). Nine of these reverse osmosis water treatment plants are within the Section 203 Study Area.

B.1.7 Surface Water Quality

Urban development heavily influences water quality in the Study Area. Extensive levees and canals have disrupted natural drainage patterns, further degrading water quality. Nutrient pollution—primarily total nitrogen, total phosphorus, and fecal coliform bacteria—contributes to water quality impairment. The Biscayne Aquifer, Broward County's primary freshwater source, is highly permeable limestone, making it vulnerable to contamination from urban runoff and saltwater intrusion from the Atlantic Ocean. Its high transmissivity allows for rapid recharge from surface water sources like the Everglades but also makes it susceptible to quick drawdown during droughts. With limited freshwater storage capacity, Broward County has proposed redirecting surface water flow from canals that currently discharge into the Atlantic Ocean to help restore the southern Everglades, enhance storage, and improve water quality (Broward County 2019). To address nutrient pollution, FDEP has established numeric nutrient criteria for many state water bodies. FDEP also identifies impaired waters and develops Total Maximum Daily Loads (TMDLs) which set pollutant reduction targets. These targets are implemented through Basin Management Action Plans and regulatory programs including the National Pollutant Discharge Elimination System (NPDES). Additionally, FDEP administers the NPDES program to regulate point source discharges and ensure compliance with water quality standards. All seven primary canals and several additional canals in the Study Area are subject to state-adopted and EPA-approved TMDLs, as summarized in **Table B.1-4.**

Table B.1-4. Primary and Other WCA Canals TMDLs in the Study Area.

Primary Canal	WBID[a/]	WBID Area (acres/square miles)	TMDL Parameter	Pollutant	TMDL Status
G-08 (Hillsboro) Canal[b/]	3264A	12,982/20.3	Bacteria	Fecal coliform	State adopted and EPA approved TMDLs
G-16 (Pompano) Canal[c/]	3271	3,795/5.9	Nutrient	Total nitrogen and total phosphorous	State adopted and EPA approved TMDLs
C-14 (Cypress Creek) Canal[d/]	3270	35,884/56.1	Bacteria	Fecal coliform	State adopted and EPA approved TMDLs
C-13 (Middle River) Canal[d/]	3273	13,188/20.6	Bacteria	Fecal coliform	State adopted and EPA approved TMDLs
C-12 (Plantation) Canal[d/]	3276	5,621/8.8	Bacteria	Fecal coliform	State adopted and EPA approved TMDLs
G-15 (North New River) Canal[d/]	3277C	5,555/8.7	Bacteria	Fecal coliform	State adopted and EPA approved TMDLs
C-11 (South New River) Canal[d/]	3279	45.367/70.9	Bacteria	Fecal coliform	State adopted and EPA approved TMDLs

Primary Canal	WBID[a/]	WBID Area (acres/square miles)	TMDL Parameter	Pollutant	TMDL Status
C-11 (East) Canal[d/]	3281	14.623/22.8	Bacteria	Fecal coliform	State adopted and EPA approved TMDLs
Dania Cut-off Canal[d/]	3277E	4,719/7.4	Bacteria	Fecal coliform	State adopted and EPA approved TMDLs
New River Canal (South)[d/]	3277A	10,281/16.1	Bacteria	Fecal coliform	State adopted and EPA approved TMDLs
New River (North Fork)[d/]	3276A	4,523/7.1	Bacteria	Fecal coliform	State adopted and EPA approved TMDLs
C-13 (East Middle River) Canal[d/]	3274	9,723/15.2	Bacteria	Fecal Coliform	State adopted and EPA approved TMDLs

a/ WBID = Water Body Identification Number
b/ Source: FDEP 2012a
c/ Source: FDEP 2007
d/ Source: FDEP 2012b
Note: Additional information on the status and implementation of TMDLs within the Study Area can be found at https://www.dep.state.fl.us/water/tmdl/.

The Safe Drinking Water Act (42 USC § 300f et seq. (1974)) as amended, was established to protect the quality of drinking water in the United States. The Act authorizes EPA to establish minimum standards to protect tap water and requires all owners or operators of public water systems to comply with these primary (health-related) standards. The EPA regulates the National Primary Drinking Water Regulations, which set mandatory water quality standards for drinking water contaminants. These water quality standards are enforceable standards called maximum contaminant levels. The EPA also regulates National Secondary Drinking Water Standards, called secondary maximum contaminant levels (SMCLs). SMCLs are not enforceable but establish guidelines for 15 contaminants to assist public water systems in managing drinking water parameters. Exceedance of SMCLs for some of the 15 contaminants requires the public water supply to provide notice to persons served no later than 12 months from the day the exceedance is discovered (Dunn 2001).

To mitigate drinking water contamination, Broward County established the Wellfield Protection Program in 1984. Broward County's Environmental Permitting Division oversees and enforces the wellfield program. The program protects recharge areas within three wellfield zones. Zone One includes a 250-foot radius buffer around the well, Zone Two extends to 500 feet, and Zone Three reaches 1,320 feet. Businesses within these zones may need Hazardous Material Management Facility licenses and site-specific monitoring (Broward County 2022).

Broward County comprises over 266 miles of fresh and estuarine waterways. The Broward County Ambient Water Quality program includes 46 sites across canals and the Intracoastal Waterway (ICW), which are monitored quarterly to determine the overall water quality and impairment status of the county's water resources. The Broward County Environmental Monitoring Lab performs quarterly water quality testing for fecal bacteria and physical and biogeochemical parameters (total nitrogen, total phosphorous, turbidity, chlorophyll-a, salinity, and conductivity) at 46 sites from canals and intracoastal waterways throughout the county.

Fecal bacteria data and surface water quality data has been collected historically as part of the Environmental Monitoring Lab's Ambient Water Quarterly Monitoring Program, the goal of which is to establish baseline levels and characterize surface water pollution from agricultural and other land-based

sources including discharges from public sewer, septic systems, and stormwater pipes. The Water Quality Monitoring Program measures chemical, physical, and biological surface water conditions to establish baseline levels, and characterize pollution from public sewer, septic systems, and stormwater discharge pipes. Water quality samples are collected and analyzed using standard methods and utilize best practices assessing water pollution in ambient surface water. Samples for fecal testing utilize standard microbiological culture techniques and utilize best practices for assessing fecal pollution in ambient surface water. The laboratory operates in accordance with EPA and FDEP recommendations to characterize fecal pollution in saline or brackish waters by analyzing for enterococci and *E. coli* in freshwater, and in accordance with EPA and FDEP recommendations to characterize water quality in saline or brackish waters. The most recently published water quality data shows that *E. coli* exceedances of the FDEP statistical threshold value of 410 cfu/100 mL were found at 1 of the 46 sites monitored (Broward County 2024b). *Enterococci* exceedances were found at 14 monitoring stations during the same period.

Nutrients such as phosphorus and nitrogen compounds are also a concern in the WCAs to the west of the Study Area since they result in an imbalance of flora and fauna. WCA-2 and WCA-3 are classified as Class III waters, but they have additional phosphorus constraints that do not apply to other Class III waters. According to FAC 62-302.540, "the numeric phosphorus criterion for Class III waters in the EPA shall be a long-term geometric mean of 10 ppb but shall not be lower than the natural conditions of the EPA and shall take into account spatial and temporal variability. Achievement of the criterion shall be determined by the methods in this subsection. Exceedances of the provisions of this subsection shall not be considered deviations from the criterion if they are attributable to the full range of natural spatial and temporal variability, statistical variability inherent in sampling and testing procedures or higher natural background conditions." Total phosphorous is the primary nutrient of concern within WCA-3 (USACE 2020). In central and western Palm Beach and Broward counties, high salinities in the SAS are attributed to relict seawater (connate water) in less transmissive and deeper portions of the SAS. This underlying saline water affects some public supply wellfields and irrigation well withdrawals. Higher salinities also are found in some WCA canals where portions of the canals are within the aquifer (SFWMD 2024b).

B.1.8 Vegetation

The following section describes the biological characteristics of vegetation communities within the Section 203 Study Area. A discussion of regional and localized land use characteristics, including categories of land use and cover (e.g., agricultural, commercial, and residential), is presented in **Sections B.1.16 Land Use and Real Estate** and **B.1.17 Visual Resources**.

The vegetation communities within the Study Area have been greatly altered during the last century. Agriculture is Florida's second largest industry behind tourism, and it has influenced land use patterns and altered the natural landscape (Volk et al. 2017). Sugarcane crops and orange groves were originally planted predominantly in northeast and central Florida in the sixteenth century, but the industry began moving south in the twentieth century due to freezes and soil conditions (Volk et al. 2017). In addition to conversion of land for agricultural purposes, large areas of wetlands were drained and converted for other land uses, such as residential, transportation, commercial, and recreational use. Except for the historic coastal ridge, which runs along Dixie Highway and U.S. Federal Highway 1, most of Florida's

southern peninsula was once part of the Everglades ecosystem (Broward County 2021). The Everglades ecosystem is a mosaic of sawgrass marshes, freshwater ponds, prairies, and forested uplands. Historically, the natural vegetation was a mix of intra-tidal (mangrove) wetlands, beach/shore, hardwood swamp, medium-hydroperiod marsh, wet prairie, wet prairie with scattered trees, mesic hammock, mesic pine flatwoods, dry prairie, and scrub. Although some of these natural areas still exist within the Study Area, the introduction of controlled drainage for land development has resulted in a significantly different set of land cover types.

Currently, disturbed lands still occupy the majority of the Study Area (95 percent); however, agriculture accounts for only 2.3 percent of the Study Area (**Table B.1-5**). The top three land uses within the Study Area landscape are Urban land use (primarily residential) with 58.5 percent, Transportation (highways, airports, etc.) with 21.4 percent, and Cultural-Lacustrine (primarily artificial impoundments/reservoirs) with 6.2 percent. Natural land uses (unaltered wetlands, uplands, and lakes) occupy only 5 percent of the Study Area. **Sections B.1.8.1** and **B.1.8.2** below provide further detail on current land use.

Table B.1-5 Table B.1-5 lists the Florida Fish and Wildlife Conservation Commission (FWC) Florida Land Cover Classification System (FLCCS) class types by acreage and relative percent cover within the Study Area. The FLCCS was created to incorporate classifications currently used by the FWC, Florida Natural Areas Inventory (FNAI), and Florida's water management districts and can be cross walked among the currently used and maintained classifications (FWC 2018). The Florida Cooperative Land Cover Map (CLC) is a partnership between the FWC and FNAI to develop ecologically based statewide land cover from existing sources and expert review of aerial photography. The CLC map uses the FLCCS to classify land cover types. **Figure B.1-6**Figure B.1-6 through **Figure B.1-9** provide CLC map data showing the various FLCCS land cover types within the Study Area.

Table B.1-5. Florida Land Cover Classification System Class Names, Codes, Acreages, and Relative Coverage within the Study Area.

FLCCS Class Name	FLCCS Class Code	Area (acres)	Relative Percent Cover within Study Area (%)	FLCCS Class Code/Name[a/]
Mesic Hammock	1120	933	0.3	1100-Hardwood Forested Uplands
Prairie Mesic Hammock	1122	9	<0.1	1100-Hardwood Forested Uplands
Rockland Hammock	1130	180	0.1	1100-Hardwood Forested Uplands
Total Hardwood Forested Uplands Relative Coverage			**0.4**	
Scrub	1210	606	0.2	1200-High Pine and Scrub
Sand Pine Scrub	1213	1	<0.1	1200-High Pine and Scrub
Total High Pine and Scrub Relative Coverage			**0.2**	
Mesic Flatwoods	1311	413	0.2	1300-Pine Flatwoods and Dry Prairie
Scrubby Flatwoods	1312	132	<0.1	1300-Pine Flatwoods and Dry Prairie
Palmetto Prairie	1340	220	0.1	1300-Pine Flatwoods and Dry Prairie
Total Pine Flatwoods and Dry Prairie Relative Coverage			**0.3**	
Mixed Hardwood-Coniferous	1400	111	**<0.1**	**1400-Mixed Hardwood-Coniferous**

FLCCS Class Name	FLCCS Class Code	Area (acres)	Relative Percent Cover within Study Area (%)	FLCCS Class Code/Name[a/]
Shrub and Brushland	1500	719	**0.3**	**1500-Shrub and Brushland**
Cultural – Terrestrial	1800	391	**0.1**	**1800-Cultural - Terrestrial**
Mowed Grass	1810	141	<0.1	1810-Mowed Grass
Vegetative Berm	1811	197	0.1	1810-Mowed Grass
Highway Rights of Way	1812	0.18	<0.1	1810-Mowed Grass
Total Mowed Grass Relative Coverage			**0.1**	
Low Intensity Urban	1821	994	0.4	1820-Urban
Urban Open Forested	182111	21	<0.1	1820-Urban
Urban Open Land	18211	5419	2.0	1820-Urban
Residential, Low Density	18212	5626	2.1	1820-Urban
Grass	18213	156	0.1	1820-Urban
Parks and Zoos	182131	5073	1.9	1820-Urban
Golf courses	182132	10129	3.8	1820-Urban
Ballfields	182133	8	<0.1	1820-Urban
Cemeteries	182134	492	0.2	1820-Urban
Community rec. facilities	182135	210	0.1	1820-Urban
High Intensity Urban	1822	5	<0.1	1820-Urban
Residential, Med. Density - 2-5 Dwelling Units/AC	18221	62736	23.3	1820-Urban
Residential, High Density > 5 Dwelling Units/AC	18222	29512	11.0	1820-Urban
Commercial and Services	18223	25211	9.4	1820-Urban
Industrial	18224	2556	1.0	1820-Urban
Institutional	18225	8993	3.3	1820-Urban
Total Urban Relative Coverage			**58.5**	
Rural Open	1831	260	0.1	1830-Rural
Oak - Cabbage Palm Forests	183111	37	<0.1	1830-Rural
Rural Structures	1832	3281	1.2	1830-Rural
Total Rural Relative Coverage			**1.3**	
Row Crops	183311	2462	0.9	1833-Agricultural
Field Crops	183312	5	<0.1	1833-Agricultural
Improved Pasture	183313	1056	0.4	1833-Agricultural
Unimproved/Woodland Pasture	183314	267	0.1	1833-Agricultural
Orchards/Groves	18332	6	<0.1	1833-Agricultural
Citrus	183321	10	<0.1	1833-Agricultural
Pecan	183323	36	<0.1	1833-Agricultural
Fallow Orchards	183324	25	<0.1	1833-Agricultural
Vineyard and Nurseries	18334	5	<0.1	1833-Agricultural
Tree Nurseries	183341	649	0.2	1833-Agricultural
Ornamentals	183343	952	0.4	1833-Agricultural
Specialty Farms	183352	641	0.2	1833-Agricultural
Total Agricultural Relative Coverage			**2.3**	
Transportation	1840	57544	**21.4**	**1840-Transportation**

FLCCS Class Name	FLCCS Class Code	Area (acres)	Relative Percent Cover within Study Area (%)	FLCCS Class Code/Name[a/]
Communication	1850	131	**<0.1**	**1850-Communication**
Utilities	1860	2488	**0.9**	**1860-Utilities**
Extractive	1870	69	<0.1	1870-Extractive
Sand and Gravel Pits	1872	43	<0.1	1870-Extractive
Total Extractive Relative Coverage			**<0.1**	
Bare Soil/Clear Cut	1880	7	**<0.1**	**1880-Bare Soil/Clear Cut**
Mixed Scrub-Shrub Wetland	2112	1961	0.7	2100-Freshwater Non-Forested Wetlands
Marshes	2120	3149	1.2	2100-Freshwater Non-Forested Wetlands
Basin Marsh	21212	34	<0.1	2100-Freshwater Non-Forested Wetlands
Glades Marsh	2125	6	<0.1	2100-Freshwater Non-Forested Wetlands
Floating/Emergent Aquatic Vegetation	2140	132	<0.1	2100-Freshwater Non-Forested Wetlands
Total Freshwater Non-Forested Wetlands Relative Coverage			**2.0**	
Cypress/Tupelo (including mixed Cypress/Tupelo)	2210	199	0.1	2200-Freshwater Forested Wetlands
Cypress	2211	327	0.1	2200-Freshwater Forested Wetlands
Wet Flatwoods	2221	47	<0.1	2200-Freshwater Forested Wetlands
Hydric Pine Flatwoods	22211	35	<0.1	2200-Freshwater Forested Wetlands
Other Hardwood Wetlands	2230	0.10	<0.1	2200-Freshwater Forested Wetlands
Bay Swamp	22311	3	<0.1	2200-Freshwater Forested Wetlands
Hydric Hammock	2232	17	<0.1	2200-Freshwater Forested Wetlands
Cabbage Palm Hammock	22323	35	<0.1	2200-Freshwater Forested Wetlands
Mixed Wetland Hardwoods	2233	1331	0.5	2200-Freshwater Forested Wetlands
Mixed Hardwood-Coniferous Swamps	2240	295	0.1	2200-Freshwater Forested Wetlands
Total Freshwater Forested Wetlands Relative Coverage			**0.9**	
Cultural – Palustrine	2400	764	**0.3**	**2400-Cultural - Palustrine**
Lacustrine	3000	10	**<0.1**	**3000-Lacustrine**
Cultural – Lacustrine	3200	286	0.1	3200-Cultural - Lacustrine
Artificial/Farm Pond	3210	28	<0.1	3200-Cultural - Lacustrine
Aquacultural Ponds	3211	6	<0.1	3200-Cultural - Lacustrine
Artificial Impoundment/Reservoir	3220	15024	5.6	3200-Cultural - Lacustrine
Quarry Pond	3230	182	0.1	3200-Cultural - Lacustrine
Sewage Treatment Pond	3240	468	0.2	3200-Cultural - Lacustrine
Stormwater Treatment Areas	3250	28	<0.1	3200-Cultural - Lacustrine
Industrial Cooling Pond	3260	598	0.2	3200-Cultural - Lacustrine
Total Cultural – Lacustrine Relative Coverage			**6.2**	

FLCCS Class Name	FLCCS Class Code	Area (acres)	Relative Percent Cover within Study Area (%)	FLCCS Class Code/Name[a/]
Cultural – Riverine	4200	1	<0.1	4200-Cultural - Riverine
Canal	4210	4543	1.7	4200-Cultural - Riverine
Total Cultural – Riverine Relative Coverage			**1.7**	
Estuarine	5000	76	0.3	5000-Estuarine
Mangrove Swamp	5250	1434	0.5	5000-Estuarine
Total Estuarine Relative Coverage			**0.8**	
Cultural – Estuarine	5300	2802	1.0	5300-Cultural - Estuarine
Estuarine Ditch/Channel	5310	34	<0.1	5300-Cultural - Estuarine
Total Cultural – Estuarine Relative Coverage			**1.1**	
Exotic Plants	7000	147	0.1	7000-Exotic Plants
Australian Pine	7100	281	0.1	7000-Exotic Plants
Melaleuca	7200	884	0.3	7000-Exotic Plants
Brazilian Pepper	7300	1156	0.4	7000-Exotic Plants
Exotic Wetland Hardwoods	7400	606	0.2	7000-Exotic Plants
Total Exotic Plants Relative Coverage			**1.1**	
Natural Lands Total Relative Coverage			**5**	
Disturbed Lands Total Relative Coverage			**95**	
Total Acres	**~268,097 ac**			

a/ FLCCS class code/name as shown in **Figure B.1-6** through **Figure B.1-9.** Higher class level names were used (i.e., subclasses condensed) in figures to enhance visual clarity.

Source: FWC 2018, 2023a

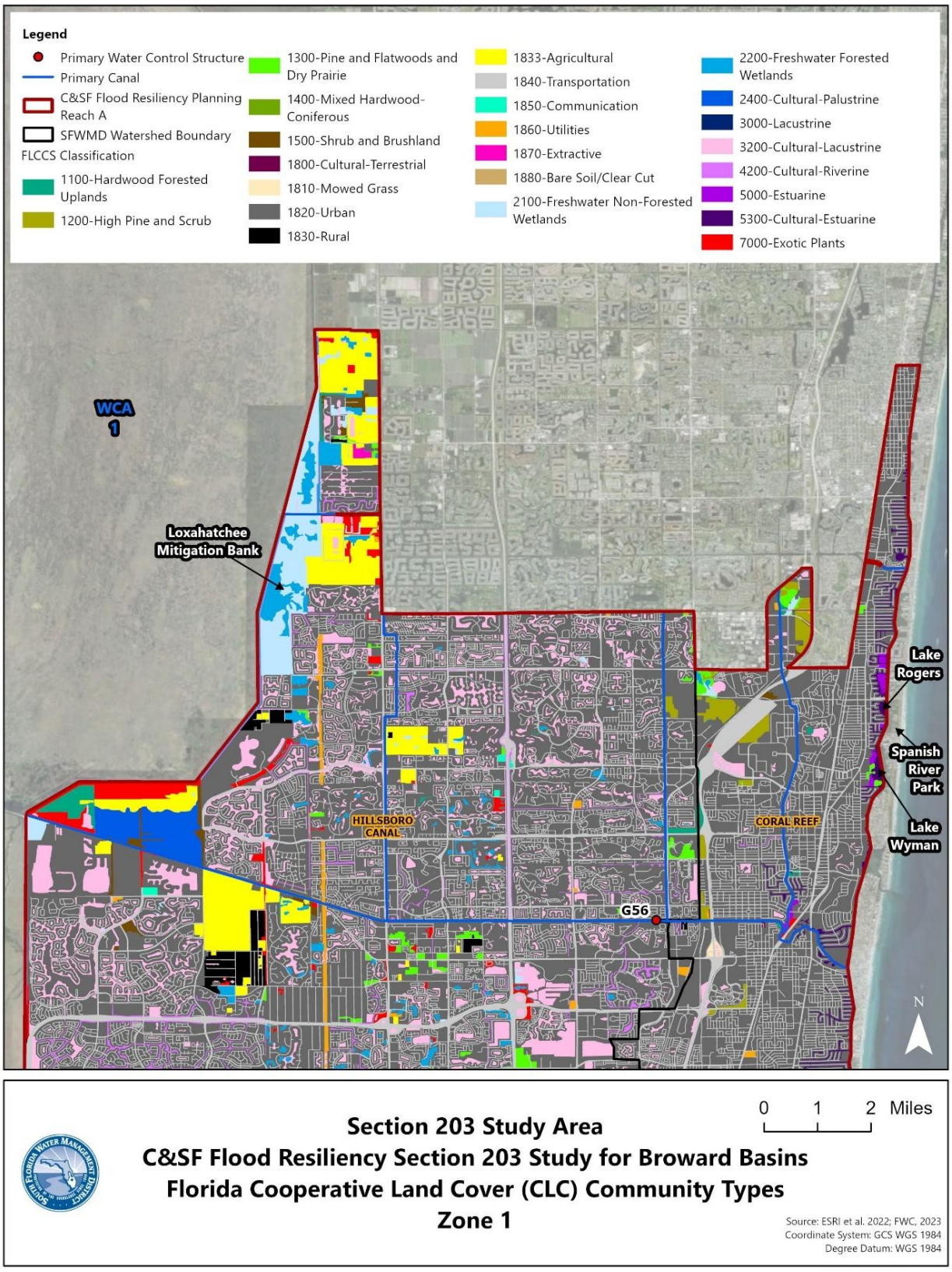


Figure B.1-6. Florida CLC Types within the Study Area (Northern).

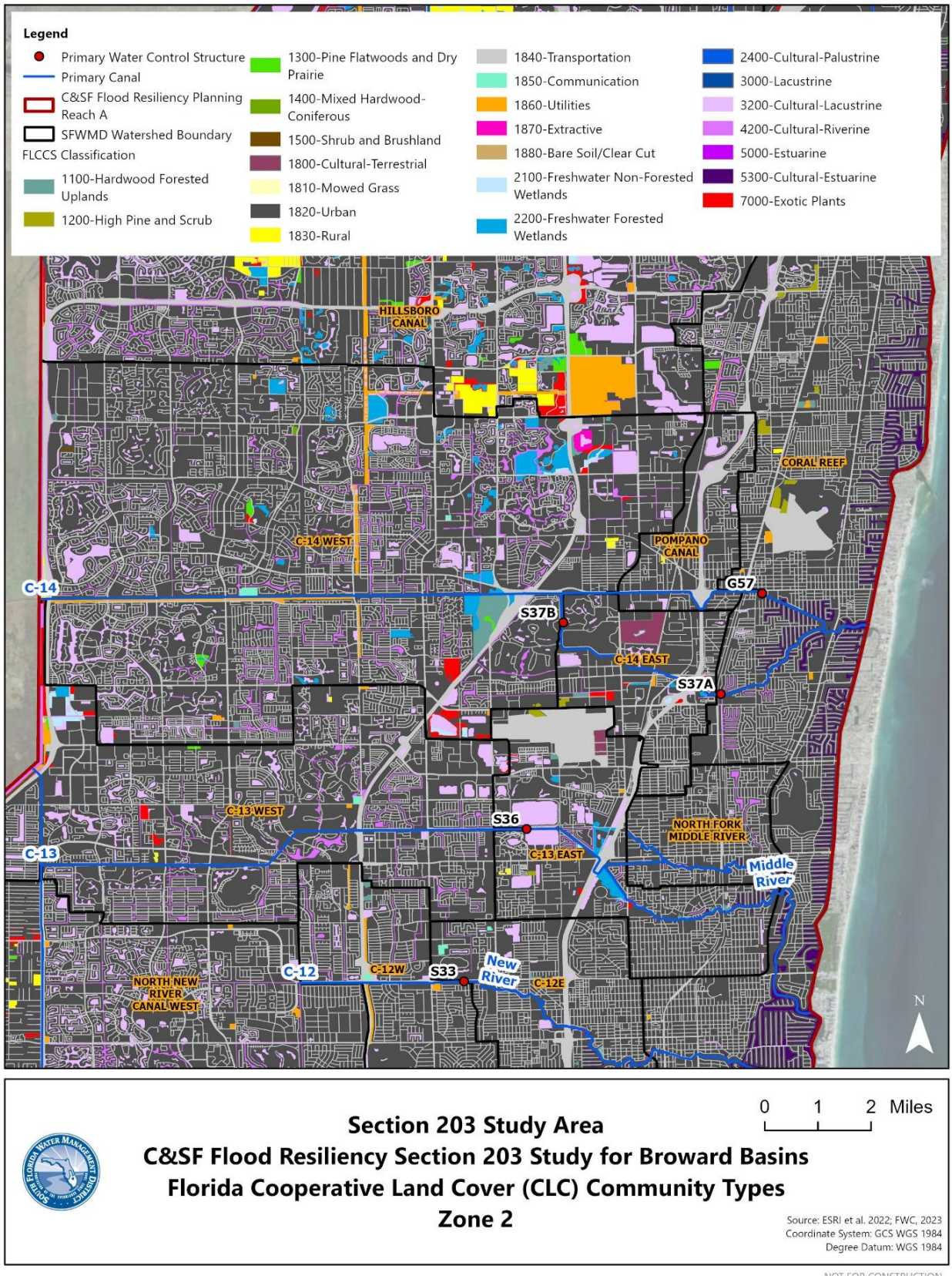


Figure B.1-7. Florida CLC Types within the Study Area (Central).

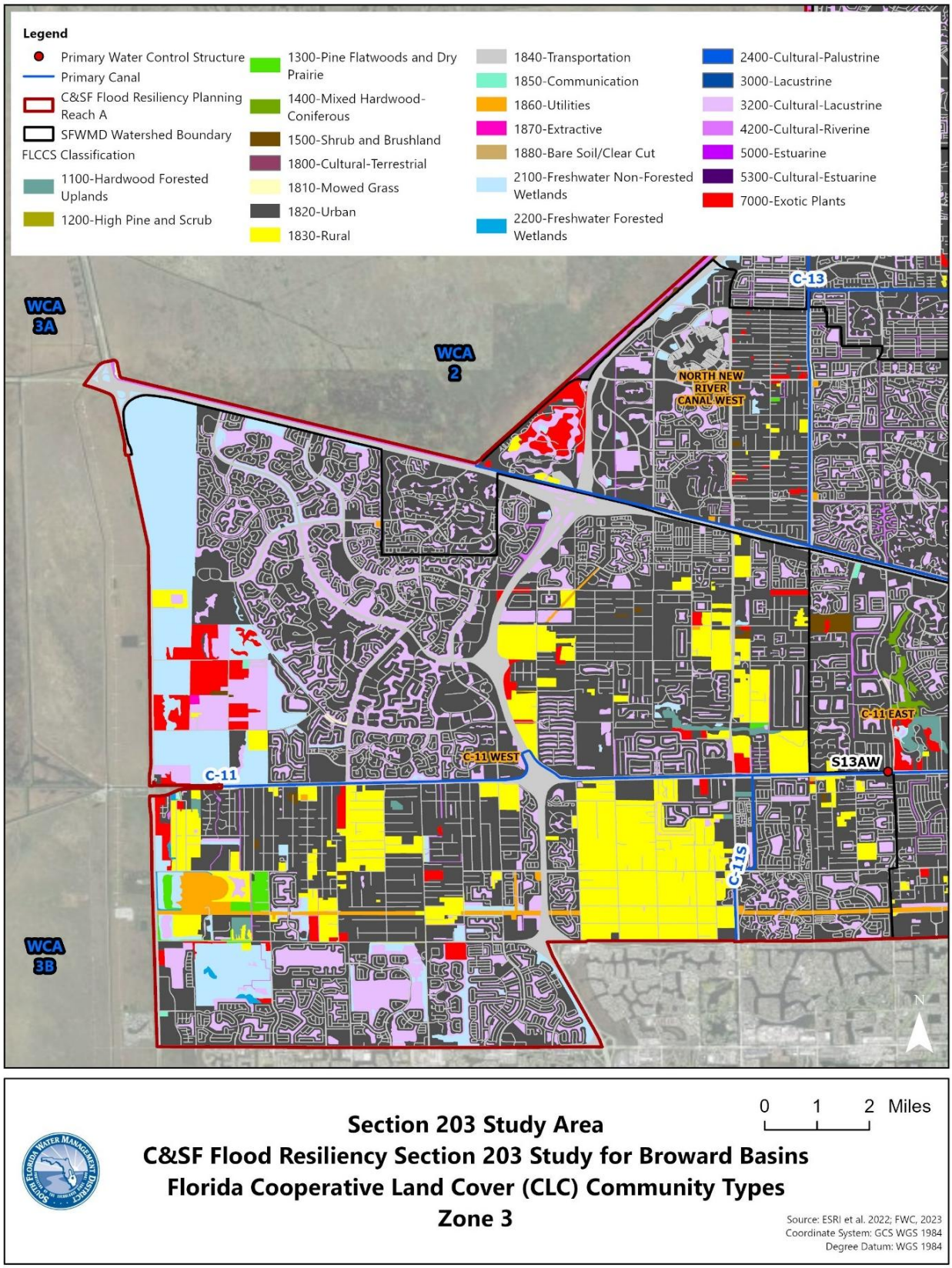


Figure B.1-8. Florida CLC types within the Study Area (Western).

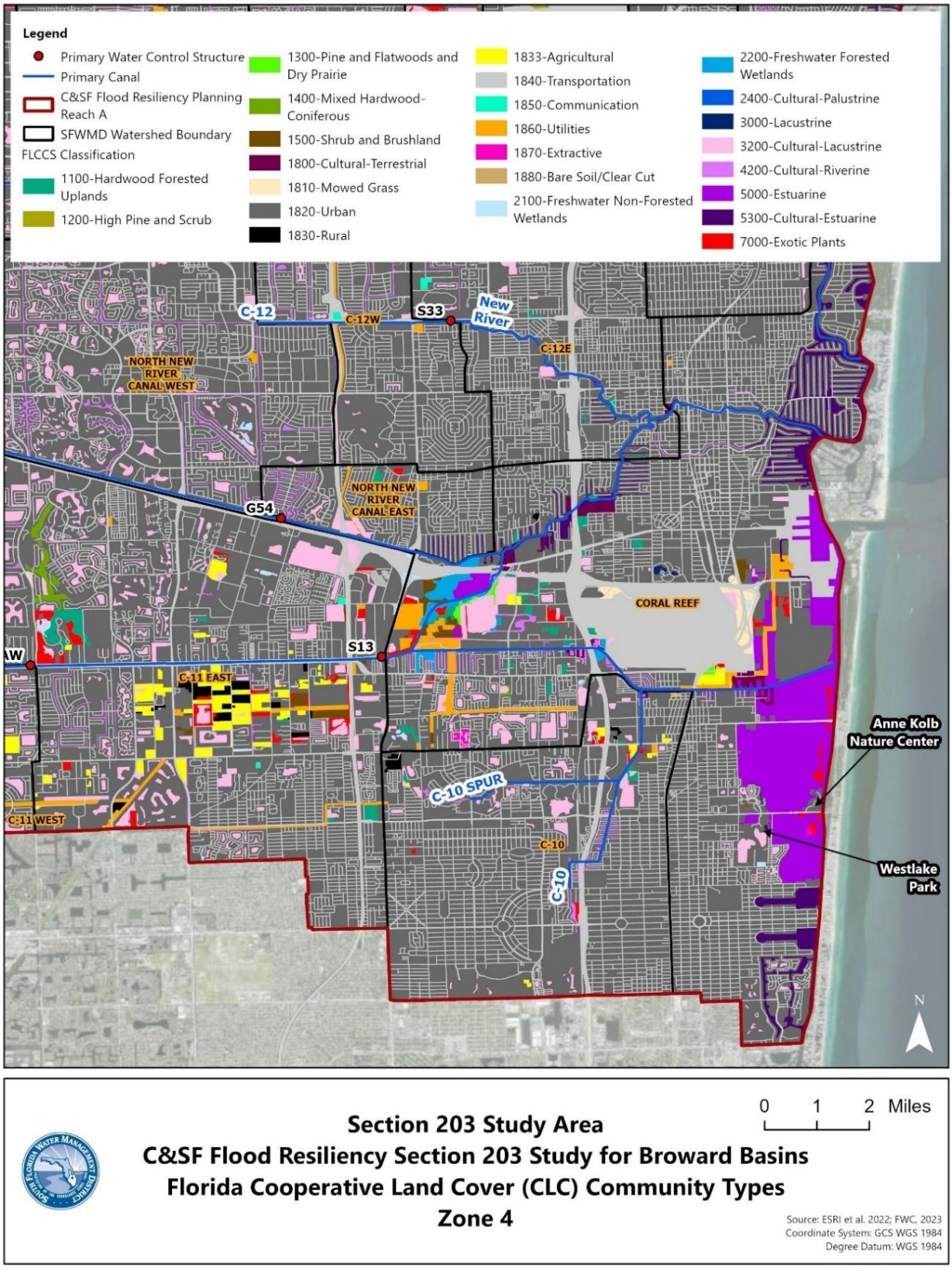


Figure B.1-9. Florida CLC types within the Study Area (Southern).

B.1.8.1 Disturbed Lands

Disturbed lands occupy approximately 95 percent of the total Study Area (**Table B.1-5**). Disturbed land uses within the Study Area are described below in decreasing order of abundance.

Urban land uses comprise the majority of the Study Area (approximately 58.5 percent **Table B.1-5**). Most Urban land use (23.3 percent) is in the Medium Density Residential (two to five dwelling units per acre) category and includes rural and recreational types of subdivisions (FWC 2018). The remaining Urban land uses constitute approximately 35.1 percent of the Study Area and include, in decreasing order of abundance: High Density Residential (more than five dwelling units per acre) (11.0 percent), Commercial and Services (9.4 percent), Golf Courses (3.8 percent), Institutional (3.3 percent), Low Density Residential (2.1 percent), Urban Open Land (2.0 percent), Parks and Zoos (1.9 percent), and Industrial (1.0 percent). All other Urban land uses have less than one percent cover and collectively account for 0.7 percent cover within the Study Aera.

The transportation class accounts for approximately 21.4 percent of the Study Area (**Table B.1-5**). Transportation land use includes highways and areas used for interchanges, limited access rights-of-way (ROWs), and service facilities; rail-oriented facilities (stations, roundhouses, repair and switching yards and related areas); airport facilities (including runways, intervening land, terminals, service buildings, navigational aids, fuel storage, parking lots and a limited buffer zone); and shipping facilities (ports, docks, shipyards, dry docks, locks and water course control structures designed for transportation purposes, associated buildings, piers, parking lots, and surrounding green areas [FWC 2018]).

Cultural-Lacustrine land uses occupy approximately 6.2 percent of the Study Area landscape (**Table B.1-5**). This classification includes the Artificial/Farm Pond, Aquacultural Ponds, Artificial Impoundment/Reservoir, Quarry Pond, Sewage Treatment Pond, Stormwater Treatment Areas, and Industrial Cooling Pond subclasses.

The Agricultural class accounts for approximately 2.3 percent of the Study Area (**Table B.1-5**). Agricultural land use includes the Row Crops, Improved Pasture, Ornamentals, Tree Nurseries, and Specialty Farms subclasses, among others.

Cultural-Riverine land uses constitute approximately 1.7 percent of the landscape. This classification includes the Canal subclass and other "communities that are either created and maintained by human activities or are modified by human influence on such a degree that stream flow, morphometry, water chemistry, or the biological composition of the resident community are substantially different from the character of the stream community as it existed prior to human influence" (FWC 2018).

Rural land use accounts for approximately 1.3 percent of the Study Area (**Table B.1-5**). Rural Structures (barns, residences, etc. in a rural setting), Rural Open (herbaceous or shrubby vegetated areas in a rural setting), and Oak-Cabbage Palm Forests (closed canopy of hardwood species, primarily Live Oak and Cabbage Palm that has been heavily impacted by human activity, primarily cleared for agriculture and urbanization) comprise the Rural class.

The Exotic Plants class occupies approximately 1.1 percent of the Study Area and includes the subclasses Australian Pine, Melaleuca, Brazilian Pepper, and Exotic Wetland Hardwoods. The 7000-Exotic Plants class accounts for upland and wetland areas dominated by non-native trees that were planted or have escaped and invaded native plant communities. This class includes sites known to be vegetated by non-native species but for which the actual species composition could not be determined (FWC 2018).

Cultural-Estuarine land uses occupy approximately 1.1 percent of the Study Area landscape. This classification includes the Estuarine Ditch/Channel subclass and other "communities that are either created and maintained by human activities or are modified by human influence on such a degree that the physical conformation of the substrate, or the biological composition of the resident community is substantially different from the character of the substrate or community as it existed prior to human influence" (FWC 2018).

The remaining seven disturbed land use classes each account for less than one percent relative cover within the Study Area; their cumulative cover is approximately 1.6 percent. These classes include, in descending order of abundance: Utilities, Cultural-Palustrine, Cultural-Terrestrial, Mowed Grass, Communication, Extractive, and Bare Soil/Clear Cut.

B.1.8.2 Natural Lands

Natural lands (i.e., unaltered uplands and wetlands) and open water (lakes) occupy approximately 5 percent of the total Study Area (**Table B.1-5**). Natural lands within the Study Area are described below in decreasing order of abundance.

Freshwater Non-Forested Wetlands account for approximately 2.0 percent of the Study Area landscape. Subclasses include Marshes, Mixed Scrub-Shrub Wetland, Basin Marsh, Glades Marsh, and Floating/Emergent Aquatic Vegetation.

The Forested Wetlands class constitutes approximately 0.9 percent of the Study Area. Forested Wetlands include Mixed Wetland Hardwoods, Mixed Hardwood-Coniferous Swamps, Cypress/Tupelo, Cypress, Wet Flatwoods, Hydric Pine Flatwoods, Other Wetland Hardwoods, Bay Swamp, Hydric Hammock, and Cabbage Palm Hammock.

Estuarine Wetlands occupy approximately 0.8 percent of the landscape. The Estuarine Wetlands class includes the Mangrove Swamps subclass and other "deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the ocean, with ocean-derived water at least occasionally diluted by freshwater runoff from the land" (FWC 2018).

The remaining six natural land use classes each account for approximately less than 0.5 percent relative cover within the Study Area; their cumulative cover is approximately 1.2 percent. These classes include, in descending order of abundance: Hardwood Forested Uplands, Pine Flatwoods and Dry Prairie, Shrub and Brushland, High Pine Scrub, Mixed Hardwood-Coniferous, and Lacustrine.

B.1.8.3 Upstream/Western Watershed Basins (Hillsboro Canal Basin, Pompano Canal Basin, C-14 West Basin, C-14 East Basin, C-13 West Basin, C-12 West Basin, North New River Canal West Basin, C-11 West Basin, and C-11 East Basin)

The nine upstream watershed basins have freshwater canals that discharge eastward to estuarine sections through coastal salinity control structures depending on water elevations. Therefore, the wetlands and waterbodies within the upstream basins are freshwater wetlands consisting primarily of freshwater marshes, mixed scrub-shrub wetlands, mixed wetland hardwoods, and cypress swamps and artificial/maintained freshwater lakes/ponds. The National Wetlands Inventory (NWI) indicates that there are 5,535 acres of riverine wetlands within the Study Area (**Figure B.1-10**); however, the FLCCS/CLC categorizes 4,544 acres of riverine wetlands as canals (**Figure B.1-6** through **Figure B.1-9**).

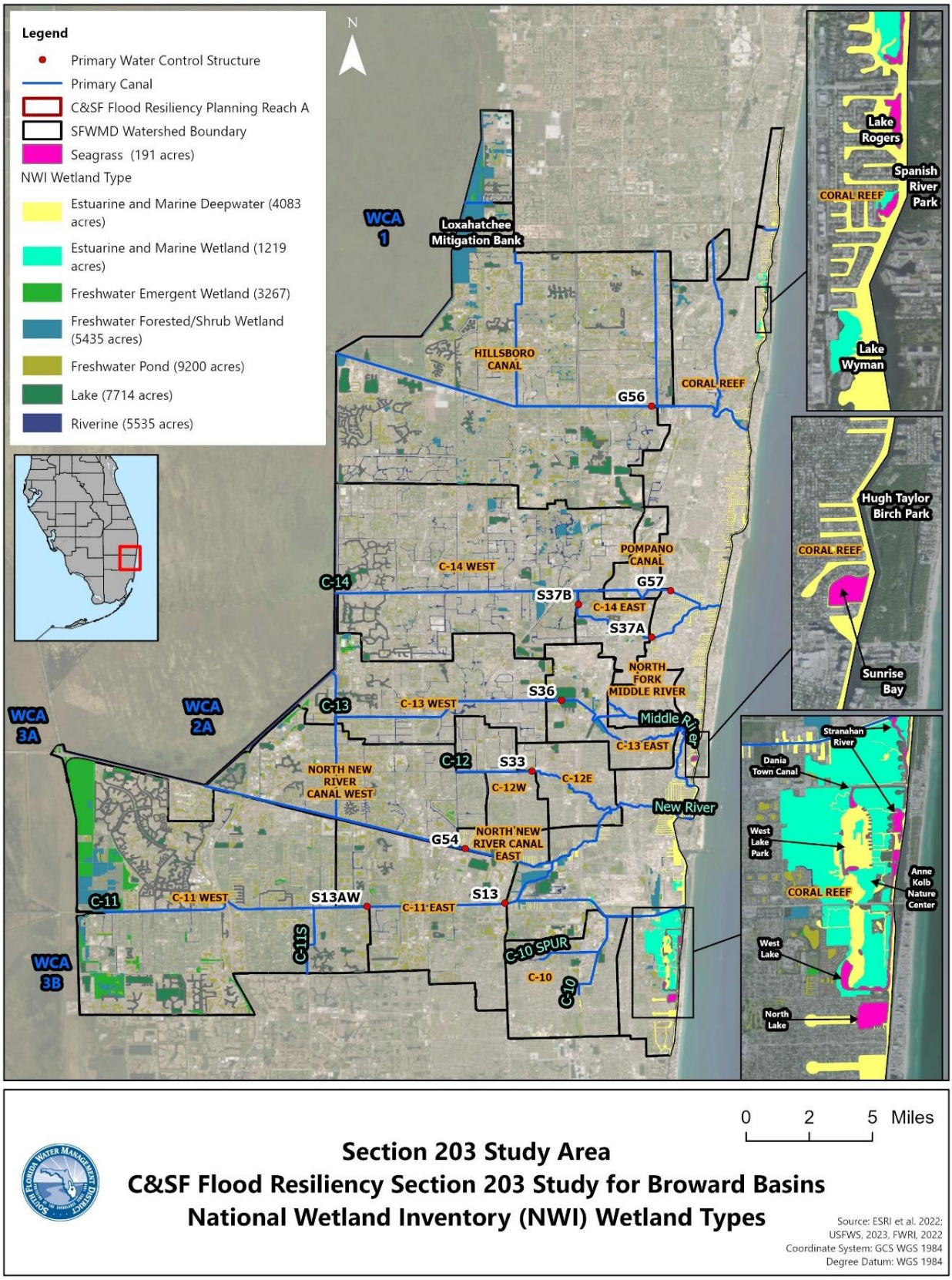


Figure B.1-10. National Wetland Inventory Wetland Types within the Study Area.

B.1.8.4 Downstream/Eastern Watershed Basins (Coral Reef Basin, C-14 East Basin, C-13 East Basin, North Fork Middle River Basin, C-12 East Basin, North New River Canal East Basin, C-11 East Basin, and C-10 Basin)

The eastern, non-managed watershed basins downstream of each WCS generally drain into the ICW through their respective canals. An exception is the western segment of the C-11 Canal, which is typically back-pumped into the WCAs (Broward County 2021).

Wetlands in these eastern basins are classified as estuarine—semi-enclosed water bodies with a free connection to the sea and a freshwater source. Some canals, such as the G-08 (Hillsboro) Canal, contain both freshwater and estuarine segments with direct or indirect connections to the ICW. However, estuarine wetlands, including mangrove swamps, are primarily located in the southeastern and northeastern extents of the Coral Reef Basin within the Study Area.

According to the NWI, the Study Area includes 4,083 acres of Estuarine and Marine Deepwater wetlands. However, the Florida Land Cover Classification System/Cooperative Land Cover (FLCCS/CLC) identifies 2,836 of those acres as artificial or maintained ditches and channels. These systems have been so extensively modified that the physical characteristics and biological communities differ significantly from their pre-disturbance state (FWC 2018).

Figure B.1-6 through **Figure B.1-9** show the CLC wetland types in the Study Area, while **Figure B.1-10** displays the NWI classifications.

Several structures—including the S-13 Pump Station and Gated Spillway, G-54 Gated Spillway, and S-33 Gated Spillway—connect to the ICW via the South Fork of the New River, South Fork New River/New River Main, and New River Main canals, respectively. In South Florida, the New River is considered a tidal estuary, though it is not a natural river. Instead, it is a network of artificial canals that connect to the Everglades and eventually discharge into the ICW and Atlantic Ocean at Port Everglades Cut in Fort Lauderdale.

The New River system forms from the junction of three primary canals originating in the Everglades:

The North New River Canal, which flows south from Lake Okeechobee along U.S. 27 and east along State Road 84/I-595

The South New River Canal, which flows east along Griffin Road and Orange Drive

A third canal that runs east along Sunrise Boulevard

Although the C-10 Basin lies within an estuarine system, the FLCCS does not identify any estuarine or freshwater wetlands within it. Other wetland types found in the downstream basins include Mixed Scrub-Shrub Wetland, Marshes, Cypress Swamp, Other Hardwood Wetlands, Hydric Hammock, Mixed Wetland Hardwoods, Basin Marsh, and Bay Swamp.

B.1.8.5 Upland Communities

The seven types of **vegetated** upland communities found within the Study Area are described below; **non-vegetated** land uses are described in **Section B.1.16**. The percent cover of all upland land use classes within the Study Area is presented in **Table B.1-5**. **Figure B.1-6** through **Figure B.1-9** illustrate the CLC upland community types within the Study Area.

Hardwood Forested Uplands

Hardwood Forested Uplands are Mesic or xeric forests dominated mainly by hardwood trees (FWC 2018). These uplands occupy approximately 0.4 percent of the Study Area landscape and contain the subclasses Mesic Hammock, Prairie Mesic Hammock, and Rockland Hammock. The FLCCS Hardwood Forested Uplands class and its subclasses are listed below and in **Table B.1-5**. **Figure B.1-6** through **Figure B.1-9** illustrate the CLC Hardwood Forested Uplands communities that occur throughout the Study Area.

Mesic Hammock

The mesic hammock community is found in small, scattered patches throughout the Study Area (accounting for 0.35 percent cover) in every basin except the North Fork Middle River and Pompano Canal Basins. Mesic hammock is a well-developed evergreen hardwood and/or palm forest on soils that are rarely inundated. The canopy is typically closed and dominated by live oak (*Quercus virginiana*), with cabbage palm (*Sabal palmetto*) generally common in the canopy and subcanopy. The overstory in southern Florida may contain a few tropical species such as gumbo limbo (*Bursera simaruba*) and satinleaf (*Chrysophyllum oliviforme*). Water oak (*Quercus nigra*) and laurel oak (*Quercus laurifolia*) may also be frequent in this community. The shrubby understory may be dense or open, tall or short, and is typically composed of a mix of saw palmetto, American beautyberry (*Callicarpa americana*), American holly (*Ilex opaca*), gallberry, sparkleberry (*Vaccinium arboreum*), hog plum *(Ximenia americana*), common persimmon (*Diospyros virginiana*), highbush blueberry (*Vaccinium corymbosum*), Carolina laurel cherry (*Prunus caroliniana*), yaupon (*Ilex vomitoria*), wild olive (*Osmanthus americanus*), and/or wax myrtle. In the central and southern peninsula, abundant epiphytes on live oaks and cabbage palms are a characteristic feature of mesic hammocks. In addition to Spanish moss (*Tillandsia usneoides*) and other air-plants (*Tillandsia* spp.), epiphytic ferns such as resurrection fern (*Pleopeltis michauxiana*), golden polypody *(Phlebodium aureum*), and shoestring fern (*Vittaria lineata*) are common in undisturbed stands (FNAI 2010).

Prairie Mesic Hammock

Prairie mesic hammock accounts for less than 0.1 percent cover within the Study Area and is found in the Coral Reef Basin downstream from the S-13 Pump Station and Gated Spillway along the southern branch of the New River Canal. Prairie mesic hammock consists of isolated patches of mesic hammock occurring within a larger matrix of pyrogenic vegetation, usually dry prairie, or mesic flatwoods, but occasionally on higher rises within a basin marsh, wet prairie, or wet flatwoods. These hammocks may experience low intensity fires on a regular basis, leading to canopy of low species diversity, such as cabbage palm, live oak, or a mixture of the two species, with saw palmetto common in the understory (FWC 2018).

Rockland Hammock

The entirety of the Rockland hammock community (0.1 percent of the Study Area) is in one area within the C-14 West Basin upstream of the S-37B Gated Spillway on the south side of the C-14 (Cypress Creek) Canal. The forest floor is largely covered by leaf litter with varying amounts of exposed limestone and has few herbaceous species. Rockland hammocks typically have larger more mature trees in the interior,

while the margins can be almost impenetrable in places with dense growth of smaller shrubs, trees, and vines (FNAI 2010). Characteristic species include gumbo limbo, pigeon plum (*Coccoloba diversifoli*), and stoppers (*Eugenia* spp.) (FNAI 2010).

High Pine and Scrub

Scrub/Sand Pine Scrub

Scrub habitat occupies approximately 0.2 percent of the Study Area and is in the C-13 East, C-14 East and West, Hillsboro Canal, and Coral Reef Basins. Scrub is a community composed of evergreen shrubs, with or without a canopy of pines, and is found on dry, infertile, sandy ridges. The signature scrub species are Florida rosemary (*Ceratiola ericoides*) and sand pine (*Pinus clausa*). The most common form of scrub is oak scrub, dominated by myrtle oak (*Quercus myrtifolia*), sand live oak (*Quercus geminate)*, and Chapman's oak (*Quercus chapmanii)*, interspersed with rusty staggerbush (*Lyonia ferruginea*) and saw palmetto (FNAI 2010).

Sand Pine Scrub is a variant of the Scrub community type. It is present in the northern extent of the Coral Reef Basin (less than 0.1 percent cover within the Study Area) between Interstate 95 and Congress Avenue and accounts for only 1 acre. Sand pine scrub is found on ridges throughout the state with a canopy of sand pine and an understory of the three shrubby oaks (myrtle oak, Chapman's oak, sand live oak), or less commonly, Florida rosemary (FWC 2018).

Pine Flatwoods and Dry Prairie

Mesic Flatwoods

The mesic flatwoods community (0.2 percent cover) occurs in the C-13 West, C-14 West, Hillsboro Canal, and Coral Reef Basins within the Study Area. Mesic flatwoods are characterized by an open canopy of tall pines and a dense understory of low shrubs, grasses, and forbs. Longleaf pine is the principal canopy tree in northern and Central Florida, and South Florida slash pine forms the canopy south of Lake Okeechobee. Characteristic shrubs include saw palmetto, gallberry, coastalplain staggerbush *(Lyonia fruticosa*), and fetterbush (*Lyonia lucida*). The herbaceous layer is predominantly grasses, including wiregrass (*Aristida stricta*), dropseeds (*Sporobolus curtissii*), panicgrasses (*Dichanthelium* spp.), and broomsedges (*Andropogon* spp.), plus many showy forbs. Mesic flatwoods is the most widespread natural community in Florida, covering the flat sandy terraces left behind by former high stands of sea level during the Plio-Pleistocene (FNAI 2010).

Scrubby Flatwoods

Scrubby flatwoods account for less than 0.1 percent cover within the Study Area and occur in the Hillsboro Canal Basin and Coral Reef Basin, just north and south of the G-08 (Hillsboro) Canal and G-56 Gated Spillway. The scrubby flatwoods community has an open canopy of widely spaced pine trees and a low, shrubby understory dominated by scrub oak (*Quercus inopina)* and saw palmetto, often interspersed with areas of barren white sand. Characteristic species include longleaf pine, slash pine (or South Florida slash pine), sand live oak, myrtle oak (or scrub oak), Chapman's oak, saw palmetto, and wiregrass (FNAI 2010).

Palmetto Prairie

Palmetto prairie occupies 0.1 percent cover within the Study Area and is present within the C-11 West, C-13 West, C-14 West, Hillsboro Canal, and Coral Reef Basins. The palmetto prairie occurs in areas that are seldomly flooded with a substrate of dry sand, and characterized by a dominance of saw palmetto. Other species common in the palmetto prairie include fetterbush, tar flower (*Bejaria racemosa*), gallberry, wiregrass, and brown grasses (FWC 2018).

Mixed Hardwood-Coniferous

The mixed hardwood-coniferous communities occupy less than 0.1 percent of the Study Area and occur in the C-11 East and C-14 West Basins. These upland forests occur on sandy clay soils with a mixture of mature pine and oak trees. Groundcover vegetation is often absent under the dense canopy and is replaced by a thick layer of leaves that retains moisture. This habitat may represent either area of natural pinelands into which hardwoods have invaded because of fire suppression, or floodplain forest and other hardwood-dominated systems into which pines have invaded due to drainage and altered hydrology. These communities contain well developed associations of longleaf pine, slash pine, and loblolly pine (*Pinus taeda*) in mixed company with live oak, laurel oak, and water oak, together with other hardwood species (FWC 2012).

Shrub and Brushland

The shrub and brushland community type accounts for approximately 0.3 percent cover within the Study Area and occurs in small, scattered patches in the C-11 West, C-11 East, Coral Reef, North New River Canal West, C-13 West, C-14 West, and Hillsboro Canal Basins. The scrub and brushland community type typically occurs in areas that have been disturbed from clear-cutting commercial pinelands, land clearing, or fire, and are recovering through natural successional processes. The shrub and brushland community type is characterized by an early condition of old-field succession, and various shrubs, tree saplings, and lesser amounts of grasses and herbs dominate the community. Common species include wax myrtle, saltbush (*Baccharis* spp.), sumac (*Rhus* spp.), elderberry (*Sambucus nigra*), saw palmetto, blackberry (*Rubus* spp.), gallberry, fetterbush, staggerbush, broomsedge, dog fennel (*Eupatorium capillifolium*), and other tree seedlings or saplings (FWC 2018).

Oak-Cabbage Palm Forests

The oak-cabbage palm community occurs within the Study Area (less than 0.1 percent cover) in two locations: one in the southern portion of the Coral Reef Basin and one within the southern extent of the Hillsboro Canal Basin. The oak-cabbage palm community characterized by a closed canopy of hardwood species, primarily live oak, and cabbage palm, which are naturally protected from fire by its position on the landscape. The community has been heavily impacted by human activity, primarily clearing for agriculture and urbanization. Soils and understory vegetation, which are often the only shaded habitat in a landscape of prairie, pasture, pineland, or marsh, are often trampled and compacted by cattle (FWC 2018). FLCCS categorizes Oak-Cabbage Palm Forests under the Rural class due to its disturbed nature; therefore, it is depicted as “Rural” along with the other Rural subclasses in the FLCCS Figure B.1-9.

Exotic Plants

The Exotic Plants class consists of upland and wetland areas dominated by non-native trees that were planted or have escaped and invaded native plant communities. These exotics include melaleuca, Australian pine, Brazilian pepper, and eucalyptus. This class includes sites known to be vegetated by non-native but for which the actual species composition could not be determined (FWC 2018). The Exotic Plants class (subclasses not included) accounts for approximately 0.1 percent within the Study Area. The subclasses Australian Pine, Melaleuca, Brazilian Pepper, and Exotic Wetland Hardwoods cumulatively contribute another 1.1 percent relative cover. Exotics are found in every basin in the Study Area except for the Pompano Canal, North Fork Middle River, and C12-West basins. Exotic plants are discussed in further detail in the following section.

B.1.9 Wetlands

The wetland communities found within the Study Area are described below, along with their respective subclasses. Their percent cover within the Study Area is presented in **Table B.1-5**. **Figure B.1-6** through **Figure B.1-9** illustrate the seven collective CLC wetland community types (Freshwater Non-Forested Wetlands, Freshwater Forested Wetlands, Estuarine, Cultural-Estuarine, Lacustrine, Cultural-Lacustrine, and Cultural Riverine) within the Study Area; **Figure B.1-10** depicts the NWI wetland types and the FWC-mapped seagrass habitat within the Study Area.

Freshwater Non-Forested Wetlands

Freshwater Non-Forested Wetlands are herbaceous or shrubby palustrine communities in floodplains or depressions; canopy trees, if present, are very sparse and often stunted (FWC 2018). These wetlands occupy approximately 2.0 percent of the Study Area landscape. The FLCCS freshwater non-forested wetland classes/subclasses are listed below and in **Table B.1-5**. **Figure B.1-6** through **Figure B.1-9** illustrate the CLC Freshwater Non-Forested wetland types that occur throughout the Study Area while **Figure B.1-10** depicts the NWI Freshwater Emergent Wetlands.

Marshes

Freshwater marshes cover about 1.2 percent of the Study Area, primarily along the western edge of the C-11 West Basin near WCA 3B (WCA-3B) (**Figure B.1-6** through **Figure B.1-9**). These low-elevation wetlands have long hydroperiods and fall into two subclasses: Basin Marsh and Glades Marsh. They typically feature grasses, sedges, broadleaf emergents, floating aquatic plants, or shrubs. Common species include wiregrass (*Aristida stricta*), Gulf Coast spikerush (*Eleocharis cellulosa*), beaksedges (*Rhynchospora* spp.), yellow-eyed grasses (*Xyris* spp.), St. John's wort (*Hypericum* spp.), and pitcherplants (*Sarracenia* spp.).

Basin Marshes, covering less than 0.1 percent of the Study Area, appear in the northern part of the Coral Reef Basin (**Figure B.1-6** through **Figure B.1-9**). These freshwater herbaceous wetlands form in isolated or semi-isolated depressions and remain regularly inundated. Their diverse plant communities include submerged, floating-leaved, emergent, and grassy species arranged by water depth. Shrubs may grow in small patches. Typical plants include American white waterlily (*Nymphaea odorata*), maidencane (*Panicum hemitomon*), sawgrass (*Cladium jamaicense*), bulltongue arrowhead (*Sagittaria lancifolia*), pickerelweed (*Pontederia cordata*), and sand cordgrass (*Spartina bakeri*) (FNAI 2010).

Glades Marshes, also covering less than 0.1 percent of the Study Area, are found only in the North New River Canal West Basin adjacent to WCA-3A and WCA-3B (**Figure B.1-6** through **Figure B.1-9**). These marshes occur in broad, shallow depressions or channels with peat or marl overlying limestone. They are seasonally inundated, support stagnant or slow-moving water, and are common in the Everglades region south of Lake Okeechobee (FNAI 2010). Glades marshes are primarily herbaceous and often dominated by dense, tall stands of sawgrass. Deeper areas may support a mix of emergent vegetation, including sparse sawgrass, maidencane, Tracy's beaksedge (*Rhynchospora tracyi*), and Gulf Coast spikerush.

Mixed Scrub-Shrub Wetland

Mixed scrub-shrub wetland communities account for 0.73 percent cover within the Study Area and are found in the western portions of the C-11 West and North New River Canal basins, the eastern portion of the C-14 West Basin, and nearly exclusively within the Loxahatchee Mitigation Bank in Palm Beach County abutting WCA-1 in the Hillsboro Canal Basin, included in the Study Area. Mixed scrub-shrub wetlands are dominated by woody vegetation less than 20 feet in height and are often located in transitional or disturbed communities on drier sites.

Floating/Emergent Aquatic Vegetation

Floating/emergent aquatic vegetation communities are present in the C-11 West, North New River Canal West, and C-14 West basins within the Study Area and account for less than 0.1 percent cover (**Table B.1-5**; **Figure B.1-6** through **Figure B.1-9**). Floating/emergent aquatic vegetation includes both floating vegetation and vegetation which is found either partially or completely above the surface of water (FWC 2018). This community type includes the subcategories slough and pond apple slough. Sloughs are described as broad, shallow channels with flowing water, which are inundated except during droughts. Sloughs are sparsely canopied or with emergent or floating plants such as alligator flag (*Thalia geniculata*) and American white waterlily (*Nymphaea odorata*) and have a substrate of peat (FNAI 2010). Pond apple sloughs are canopied sloughs dominated by pond apple (*Annona glabra*), often with abundant epiphytes (FNAI 2010). Additional floating/emergent aquatic subcategories are differentiated by dominant species such as water-lettuce (*Pistia stratiotes*), spatterdock (*Nuphar advena*), common water-hyacinth (*Eichhornia crassipes*), duckweed (*Lemna* spp.), American white waterlily, and other species.

Freshwater Forested Wetlands

Freshwater Forested Wetlands are floodplain or depression wetlands dominated by hydrophytic trees (FWC 2018). These wetlands occupy approximately 0.9 percent of the Study Area landscape. The FLCCS Freshwater Forested wetland classes/subclasses are listed below and in **Table B.1-5**. **Figure B.1-6** through **Figure B.1-9** illustrate the CLC Freshwater Forested wetland types that occur throughout the Study Area; the NWI classifies these wetlands as Freshwater Forested/Shrub Wetlands in **Figure B.1-10**.

Other Hardwood Wetlands

The Other Hardwood Wetlands class cumulatively accounts 0.5 percent of the Study Area and is in the western portion of the Coral Reef Basin. These wetlands are dominated by a mix of hydrophytic

hardwood trees with cypress (*Taxodium* spp.) or tupelo (*Nyssa* spp.) occasionally occurring in the canopy and have a short hydroperiod (FWC 2018). Other Hardwood Wetlands include the Bay Swamp, Hydric Hammock, Cabbage Palm Hammock, and Mixed Wetland Hardwoods subclasses (discussed below).

The Mixed Wetland Hardwoods subclass alone constitutes the majority of Other Hardwood Wetlands having 0.5 percent cover within the Study Area. They are scattered throughout the C-11 West Basin, Coral Reef Basin (near the S-13 Pump Station and Gated Spillway), C-13 East Basin (near the S-36 Gated Spillway), C-14 East Basin (near the S-37A Gated Spillway), C-14 West Basin (upstream of the S-37B Gated Spillway), C-13 West Basin, and Hillsboro Canal Basins. Mixed Wetland Hardwoods are composed of a large variety of hardwood species that are tolerant of hydric conditions yet exhibit an ill-defined mixture of species (FWC 2018). These communities are often connected or adjacent to a riverine community and occasionally inundated.

The Bay Swamp, Hydric Hammock, and Cabbage Palm Hammock subclasses each account for less than 0.1 percent cover within the Study Area. Bay Swamp is found within the Hillsboro and Coral Reef basins while Hydric Hammock and Cabbage Palm Hammock only occurs within the Coral Reef Basin.

Cypress/Tupelo (including Mixed Cypress/Tupelo)/Cypress

The Cypress/Tupelo and Cypress communities cumulatively account for approximately 0.2 percent cover in the Study Area and are in the C-14 West, C-13 East, and Hillsboro basins. They are dominated entirely by cypress and/or tupelo and have a long hydroperiod (FWC 2018). Air plants (*Tillandsia* spp.), ferns, orchids (*Bauhinia* spp., *Dendrophylax porrectus, Eltroplectris calcarata, Encyclia tampensis, Epidendrum* spp., etc.) and lilies (*Crinum americanum, Hymenocallis* spp.) are often found attached to cypress tree buttresses and limbs within these swamps.

Mixed Hardwood-Coniferous Swamps

Mixed hardwood-coniferous swamps account for approximately 0.1 percent cover in the Study Area and are found in the C-14 West and Hillsboro basins. They are a mixture of hardwoods and conifers, and neither achieve a 66 percent dominance of the crown canopy composition (FWC 2018). They are often found in low-lying areas that are flooded at least part of the year (short hydroperiod), and are characterized by a dense, shady canopy that reduces air circulation and traps humidity, further contributing to the damp conditions.

Wet Flatwoods/Hydric Pine Flatwoods

Wet Flatwoods and Hydric Pine Flatwoods community types make up less than 0.1 percent of the Study Area and only exist in the C-14 West Basin. Wet flatwoods are pine forests with a sparse or absent midstory and a dense groundcover of hydrophytic grasses, herbs, and low shrubs. The pine canopy typically consists of one or a combination of longleaf pine (*Pinus palustris*) and/or slash pine (*Pinus elliottii*). The subcanopy, if present, consists of scattered sweetbay (*Magnolia virginiana*), swamp bay (*Persea palustris*), loblolly bay (*Gordonia lasianthus*), pond-cypress (*Taxodium ascendens*), dahoon (*Ilex cassine*), titi (*Cyrilla racemiflora*), wax myrtle (*Morella cerifera*), saw palmetto (*Serenoa repens*) and gallberry (*Ilex glabra*). Herbs include wiregrass, blue maidencane (*Amphicarpum muhlenbergianum*), and/or hydrophytic species such as toothache grass (*Ctenium aromaticum*), coastalplain yellow-eyed

grasses, Carolina redroot (*Lachnanthes caroliana*), beaksedges (*Rhynchospora* spp.), and pitcherplants (FNAI 2010).

Estuarine

The Estuarine class is characterized as deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partly obstructed, or sporadic access to the ocean, with ocean-derived water at least occasionally diluted by freshwater runoff from the land (FWC 2018). These wetlands occupy 0.3 percent of the Study Area and are only found in the Coral Reef Basin. The Estuarine class includes the Mangrove Swamp subclass (described below), which combined cover 0.8 percent within the Study Area. **Figure B.1-6** through **Figure B.1-9** illustrate the CLC Estuarine communities that occur throughout the Study Area. The NWI classifies these wetlands as Estuarine and Marine Wetlands in **Figure B.1-10**.

Mangrove Swamp

Mangrove swamps account for approximately 0.5 percent of the Study Area and are found in five locations, all within the Coral Reef Basin: Westlake Park and Anne Kolb Nature Center and downstream of the S-13 Pump Station and Gated Spillway in the southern portion of the basin, along the west side of the ICW; just north of Lake Rogers, across from Spanish River Park, and west of Lake Wyman; and south of the G-56 Gated Spillway near the termination of the G-08 (Hillsboro) Canal in the northern portion of the basin. Mangrove swamps are estuarine wetlands on muck, sand, or limestone substrate that are inundated with saltwater by daily tides (FWC 2018). Mangroves typically occur in dense stands occurring along relatively flat, low wave energy, marine and estuarine shorelines but may be sparse, particularly in upper tidal reaches where salt marsh species predominate. The dominant plant species are red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), white mangrove (*Laguncularia racemosa*), and buttonwood (*Conocarpus erectus*). Mangrove swamps often exist with no understory, although shrubs such as seaside oxeye (*Borrichia arborescens, B. frutescens*) and vines including gray nicker (*Caesalpinia bonduc*), coinvine (*Dalbergia ecastaphyllum*), and rubbervine (*Rhabdadenia biflora*), and herbaceous species such as saltwort (*Batis maritima*), shoregrass (*Distichlis littoralis*), and nodding pinweed (*Lechea cernua*) can occur in the understory (FNAI 2010).

Cultural-Estuarine

The Cultural-Estuarine land cover type consists of communities that are either created and maintained by human activities or are modified by human influence on such a degree that the physical conformation of the substrate, or the biological composition of the resident community is substantially different from the character of the substrate or community as it existed prior to human influence (FWC 2018). This cover type accounts for approximately 1.0 percent of the Study Area and is found within the Coral Reef, Pompano Canal, C-12 East, C13-East, North Fork Middle River, and North New River Canal East basins. The Cultural-Estuarine class includes the Estuarine Ditch/Channel subclass (described below), which combined cover 1.1 percent within the Study Area. **Figure B.1-6** through **Figure B.1-9** illustrate the CLC Cultural-Estuarine communities that occur in the Study Area; the NWI classifies these communities as Estuarine and Marine Deepwater in **Figure B.1-10**.

Estuarine Ditch/Channel

The Estuarine Ditch/Channel subclass is defined as an aquatic community of a ditch or narrow channel excavated in an estuarine marsh (FWC 2018). This subclass accounts for less than 0.1 percent of the Study Area and is primarily found within the eastern portion of Coral Reef Basin. Estuarine wetlands and estuarine ditches/channels are found in the vicinity of mangrove swamps and/or submerged aquatic vegetation habitat (described below) along the southeast and northeast portions of the Coral Reef Basin.

Lacustrine

The Lacustrine class is defined by FLCCS as wetlands and deepwater habitats situated in a topographic depression or dammed river channel; lacking trees, shrubs, persistent emergents, emergent mosses, or lichens with greater than 30 percent areal coverage; and whose total area exceeds 8 hectares (20 acres); or area less than 8 hectares if the boundary is active wave-formed or bedrock or if water depth in the deepest part of the basin exceeds 2 meters (6.6 feet) at low water (FWC 2018). This classification accounts for less than 0.1 percent cover in the Coral Reef Basin of the Study Area (**Table B.1-5**). **Figure B.1-6** through **Figure B.1-9** illustrate the CLC Lacustrine communities that occur throughout the Study Area. The NWI classifies Lacustrine communities as Lakes and Freshwater Ponds (**Figure B.1-10**).

Cultural-Lacustrine

Cultural-Lacustrine communities are either created and maintained by human activities or are modified by human influence on such a degree that the trophic state, morphometry, water chemistry, or biological composition of the resident community are substantially different from the character of the lake community as it existed prior to human influence. The Cultural-Lacustrine class is found in every basin within the Study Area and accounts for approximately 6.2 percent of the Study Area, the majority of which are artificial impoundments/reservoirs (5.6 percent). Other subclasses include Sewage Treatment Pond, Industrial Cooling Pond, and Quarry Ponds. The Cultural-Lacustrine class and subclasses are listed in **Table B.1-5**. **Figure B.1-6** through **Figure B.1-9** illustrate the CLC Cultural-Lacustrine land use types that occur throughout the Study Area. The NWI classifies the Cultural-Lacustrine communities as Lakes and Freshwater Ponds (**Figure B.1-10**).

Cultural-Riverine

Cultural-Riverine communities are either created and maintained by human activities or are modified by human influence on such a degree that stream flow, morphometry, water chemistry, or the biological composition of the resident community are substantially different from the character of the stream community as it existed prior to human influence (FWC 2018). Canals are a subclass of the Cultural-Riverine class and are found in every basin within the Study Area, accounting for approximately 1.7 percent of the Study Area. The Cultural-Riverine class and its subclass, Canals, are listed in **Table B.1-5**. **Figure B.1-6** through **Figure B.1-9** illustrate the CLC Cultural-Riverine communities that occur throughout the Study Area. The NWI classifies the Cultural-Riverine communities as Riverine (**Figure B.1-10**).

Seagrass Habitat

The FWC "Seagrass Habitat in Florida" GIS dataset was developed to represent the most recent seagrass mapping available in Florida for current statewide display and analysis. This data set represents a compilation of statewide seagrass data from various source agencies and scales. Not all data in this compilation are mapped from photography; some are the results of field measurements (FWC 2025).

Patchy, discontinuous seagrass habitat accounts for 0.1 percent cover within the NWI Estuarine and Marine Deepwater and Estuarine and Marine Wetland types (**Figure B.1-10**). Seagrass occurs in discontinuous patches of small beds along the eastern portion of the Coral Reef Basin within the following locations: the northeastern extent of the basin in the ICW; just north of and within Lake Rogers and west of Spanish River Park within the ICW; numerous locations south of the G-56 Gated Spillway and termination of the G-08 (Hillsboro) Canal in the northern portion of the basin; within Sunrise Bay, west of Hugh Taylor Birch State Park and the ICW; and in the Stranahan River, Dania Town Canal, West Lake, and North Lake south of the terminus of the C-11 (South New River) Canal and downstream of the S-13 Pump Station and Gated Spillway in the southern portion of the basin, along the west side of the ICW.

Seagrass beds provide food and habitat for fish, sea turtles, manatees, myriad invertebrates, and other species and improve water quality by removing nutrients, dissipating the effects of waves and currents, and stabilizing bottom habitats (thereby reducing suspended solids). Many commercial and recreational fisheries (e.g., clams, shrimp, lobster, and fish) are associated with healthy seagrass beds. Currently, many seagrass beds are stressed by extreme salinity fluctuations, increased turbidity, sedimentation, dredging, damage from boats, and nutrient enrichment, the latter which may cause cyanobacteria blooms that restrict light penetration (USACE 2024).

B.1.10 Invasive Species

Executive Order 13112 defines an invasive species as a non-native organism—plant, animal, fungus, or pathogen—that, when introduced into an ecosystem, causes or is likely to cause environmental, economic, or human health harm. In contrast, native species are those that occur naturally within a given ecosystem and are not the result of human introduction.

Extensive research shows that invasive plants have severely degraded South Florida's ecosystems (Doren et al. 2001). These species crowd out native plants, alter soil and water chemistry, disrupt natural processes such as nutrient cycling, fire regimes, and carbon sequestration, and reduce genetic diversity. Although the full impact of invasive animals is less documented, their harmful effects are increasingly evident across the region. Invasive species also threaten public health, reduce agricultural yields and property values, degrade recreational and scenic resources, and compromise infrastructure such as navigation channels, levees, dams, and WCS (USACE 2024).

Florida is especially vulnerable to biological invasions due to its subtropical climate, major ports of entry, dense urban areas, and thriving pet, aquarium, and ornamental plant industries. Human-driven disturbances—such as urban development, agriculture, and flood control—further increase susceptibility. On average, 10 new non-native species establish themselves in Florida each year, often with harmful consequences. About 90 percent of these introductions enter the United States through

the Port of Miami (SFWMD 2024c). One estimate puts the number of exotic species introduced to Florida at over 32,000—eight times the number of native terrestrial species in the state (USACE 2024).

Florida is home to more than 4,700 native or naturalized plant species, with around 3,200 considered native and 230 endemic. Roughly 1,500 are non-native and self-sustaining. The Florida Invasive Species Council classifies 83 of these as Category I, meaning they actively invade and disrupt native ecosystems, and 89 as Category II, meaning they show potential to do so (Wunderlin et al. 2024).

In Broward and Palm Beach counties, the University of South Florida's Atlas of Florida Plants identifies 525 non-native plant species, including 136 invasives—67 in Category I and 69 in Category II (**Table B.1-6**)[1]. Thirty-five of these species are also listed as Florida Noxious Weeds. Under the FLCCS, habitats are first categorized as Upland, Wetland, or Exotic. The Exotic subclass includes areas dominated by invasive trees such as melaleuca (*Melaleuca quinquenervia*), Australian pine (*Casuarina equisetifolia*), Brazilian pepper (*Schinus terebinthifolia*), and eucalyptus (*Eucalyptus* spp.). Some sites are vegetated by exotics with unidentified species (FWC 2018). The FWC Florida Cooperative Land Cover map (Figure B.1-6 through Figure B.1-9) identifies FLCCS Exotic class code areas, and **Table B.1-7**Table B.1-7 provides FLCCS invasive community types by acreage and percent cover within the Study Area, including:

- Brazilian pepper (Category I)
- Melaleuca (Category I)
- Exotic Wetland Hardwoods (Category I/II)
- Australian pine (Category I)
- Unidentified exotic species (Category I/II)

Invasive vegetation occurs in nearly every basin except C-12 West, North Fork Middle River, and Pompano Canal. The highest concentrations appear in:

- C-11 West Basin (Exotic Wetland Hardwoods)
- North New River Canal West Basin (Melaleuca, Australian pine, Brazilian pepper)
- Hillsboro Canal Basin (Melaleuca)

FLCCS data show most invasive vegetation lies upstream of WCS, concentrated in the central and western parts of the Study Area (**Figure B.1-11**). A notable exception is the S-13 Pump Station and Gated Spillway, located between the C-11 East and Coral Reef Basins, which has a high downstream concentration of invasive species.

Table B.1-6. Invasive Vegetation and Noxious Weeds within Broward and Palm Beach Counties.

Common Name	Scientific Name	Category I[a/] (Y/N)	Category II[a/] (Y/N)	Florida Noxious Weed[b/] (Y/N)
Air-potato	*Dioscorea bulbifera*	Y	N	Y
Alexander palm; solitaire palm	*Ptychosperma elegans*	N	Y	N
Alligatorweed	*Alternanthera philoxeroides*	N	Y	Y
American evergreen	*Syngonium podophyllum*	Y	N	N
Arrowleaf elephant's ear	*Xanthosoma sagittifolium*	N	Y	N

[1] Since only a portion of each of Broward and Palm Beach counties are included in the Study Area, some county-level data presented in this section may be over- or under-represented.

Common Name	Scientific Name	Category I[a/] (Y/N)	Category II[a/] (Y/N)	Florida Noxious Weed[b/] (Y/N)
Asian sword fern	*Nephrolepis brownii*	Y	N	N
Australian almond	*Terminalia muelleri*	N	Y	N
Australian umbrella tree; octopus tree	*Heptapleurum actinophyllum*	Y	N	N
Australian-pine; horsetail casuarina	*Casuarina equisetifolia*	Y	N	Y
Balsampear	*Momordica charantia*	N	Y	N
Bamboo palm	*Chamaedorea seifrizii*	N	Y	N
Basketplant	*Callisia fragrans*	N	Y	N
Beach naupaka	*Scaevola taccada*	Y	N	Y
Black mimosa	*Mimosa pigra*	Y	N	Y
Bowstring hemp; mother-in-law's tongue	*Dracaena hyacinthoides*	N	Y	N
Brazilian jasmine; jazmin de trapo	*Jasminum fluminense*	Y	N	N
Brazilian pepper	*Schinus terebinthifolia*	Y	N	Y
Britton's wild petunia; Mexican bluebell	*Ruellia simplex*	Y	N	N
Browne's blechum; green shrimp plant	*Ruellia blechum*	N	Y	N
Burmareed; silkreed	*Neyraudia reynaudiana*	Y	N	Y
Burrnut; Jamaican feverplant	*Tribulus cistoides*	N	Y	N
Caesarweed	*Urena lobata*	Y	N	N
Carrotwood	*Cupaniopsis anacardioides*	Y	N	N
Castorbean	*Ricinus communis*	N	Y	N
Catclawvine	*Dolichandra unguis-cati*	Y	N	Y
Cathedral bells; life plant	*Kalanchoe pinnata*	N	Y	N
Chinaberrytree	*Melia azedarach*	N	Y	N
Chinese fan palm	*Livistona chinensis*	N	Y	N
Chinese ladder brake	*Pteris vittata*	N	Y	N
Chinese violet	*Asystasia gangetica subsp. gangetica*	N	Y	N
Coat buttons	*Tridax procumbens*	N	N	Y
Cogongrass	*Imperata cylindrica*	Y	N	Y
Common water-hyacinth	*Eichhornia crassipes*	Y	N	Y
Coral vine; queen's jewels	*Antigonon leptopus*	N	Y	N
Council tree	*Ficus altissima*	N	Y	N
Creeping oxeye	*Sphagneticola trilobata*	N	Y	N
Crested floatingheart	*Nymphoides cristata*	Y	N	Y
Cuban bulrush	*Cyperus blepharoleptos*	Y	N	N
Dayflowering jessamine	*Cestrum diurnum*	N	Y	N
Deviltree	*Alstonia macrophylla*	N	Y	N
Downy maiden fern; downy shield fern	*Thelypteris dentata*	N	Y	N
Durban crowfootgrass	*Dactyloctenium aegyptium*	N	Y	N
Dwarf papyrus; miniature flatsedge	*Cyperus prolifer*	N	Y	N
Dwarf rotala; roundleaf toothcup	*Rotala rotundifolia*	N	Y	N
Earleaf acacia	*Acacia auriculiformis*	Y	N	N
Elegant dutchman's-pipe; calico flower	*Aristolochia elegans*	N	Y	N
Elephantgrass; napiergrass	*Cenchrus purpureus*	Y	N	N

Common Name	Scientific Name	Category I[a/] (Y/N)	Category II[a/] (Y/N)	Florida Noxious Weed[b/] (Y/N)
Flamegold	*Koelreuteria elegans subsp. formosana*	N	Y	N
Fountaingrass	*Cenchrus setaceus*	N	Y	N
Giant brake	*Pteris tripartite*	N	Y	N
Gold coast jasmine	*Jasminum dichotomum*	Y	N	N
Governor's plum	*Flacourtia indica*	N	Y	N
Gray sheoak; suckering Australian-pine	*Casuarina glauca*	Y	N	Y
Guava	*Psidium guajava*	Y	N	N
Guineagrass	*Urochloa maxima*	N	Y	N
Incised halberd fern	*Tectaria incisa*	Y	N	N
Indian laurel	*Ficus microcarpa*	Y	N	N
Indian rosewood	*Dalbergia sissoo*	N	Y	N
Indian swampweed	*Hygrophila polysperma*	Y	N	N
Itchgrass	*Rottboellia cochinchinensis*	N	N	Y
Japanese climbing fern	*Lygodium japonicum*	Y	N	Y
Japanese honeysuckle	*Lonicera japonica*	Y	N	Y
Jaragua	*Hyparrhenia rufa*	N	Y	N
Java plum	*Syzygium cumini*	Y	N	N
Javanese bishopwood	*Bischofia javanica*	Y	N	N
Kudzu	*Pueraria montana var. lobata*	Y	N	Y
Lantana; shrubverbena	*Lantana strigocamara*	Y	N	N
Largeflower Mexican clover	*Richardia grandiflora*	N	Y	N
Latherleaf; Asian nakedwood	*Colubrina asiatica*	Y	N	Y
Limpograss	*Hemarthria altissima*	N	Y	N
Little bell	*Ipomoea triloba*	N	N	Y
Madagascar rubbervine	*Cryptostegia madagascariensis*	N	Y	N
Malabar plum; rose apple	*Syzygium jambos*	N	Y	N
Molassesgrass	*Melinis minutiflora*	N	Y	N
Moses-in-the-cradle; oyster-plant; boatlily	*Tradescantia spathacea*	Y	N	N
Mother-of-millions	*Kalanchoe x houghtonii*	N	Y	N
Nettleleaf velvetberry	*Stachytarpheta cayennensis*	N	Y	N
Orange jessamine	*Murraya paniculata*	N	Y	N
Orchid tree; mountain ebony	*Bauhinia variegata*	Y	N	N
Paper mulberry	*Broussonetia papyrifera*	N	Y	N
Paragrass	*Urochloa mutica*	Y	N	N
Peruvian primrosewillow	*Ludwigia peruviana*	Y	N	N
Pink tabebuia; white cedar	*Tabebuia heterophylla*	N	Y	N
Portia tree	*Thespesia populnea*	Y	N	N
Princess-of-the-night	*Selenicereus pteranthus*	N	Y	N
Punktree	*Melaleuca quinquenervia*	Y	N	Y
Queen palm	*Syagrus romanzoffiana*	N	Y	N
Red beadtree; red sandalwood	*Adenanthera pavonina*	N	Y	N
Redflower ragleaf	*Crassocephalum crepidioides*	N	Y	N
River sheoak	*Casuarina cunninghamiana*	N	Y	Y
Rosary pea; blackeyed susan	*Abrus precatorius*	Y	N	Y
Rose myrtle	*Rhodomyrtus tomentosa*	Y	N	Y
Rose natalgrass	*Melinis repens*	Y	N	N
Santa maria; galba; Antilles calophyllum	*Calophyllum antillanum*	Y	N	N
Sapodilla	*Manilkara zapota*	Y	N	N
Scratchthroat	*Ardisia crenata*	Y	N	Y

Common Name	Scientific Name	Category I[a/] (Y/N)	Category II[a/] (Y/N)	Florida Noxious Weed[b/] (Y/N)
Sea hibiscus; mahoe	*Talipariti tiliaceum var. tiliaceum*	N	Y	N
Senegal date palm	*Phoenix reclinata*	N	Y	N
Serpent fern; wart fern	*Microsorum grossum*	Y	N	N
Sessile joyweed	*Alternanthera sessilis*	N	N	Y
Sewervine	*Paederia cruddasiana*	Y	N	Y
Shoebutton	*Ardisia elliptica*	Y	N	Y
Shrubby false buttonweed	*Spermacoce verticillata*	N	Y	N
Silverthorn; thorny olive	*Elaeagnus pungens*	N	Y	N
Simpleleaf chastetree	*Vitex trifolia*	N	Y	N
Sisal hemp	*Agave sisalana*	N	Y	N
Skunkvine	*Paederia foetida*	Y	N	Y
Small leaf climbing fern	*Lygodium microphyllum*	Y	N	Y
Spanish arborvine; yellow morning-glory	*Distimake tuberosus*	N	Y	N
Sprenger's asparagus-fern	*Asparagus aethiopicus*	Y	N	N
Spurgecreeper	*Dalechampia scandens*	N	Y	N
Staghorn fern	*Platycerium bifurcatum*	N	Y	N
Strawberry guava	*Psidium cattleianum*	Y	N	N
Surinam cherry	*Eugenia uniflora*	Y	N	N
Torpedograss	*Panicum repens*	Y	N	N
Trompetilla; west Indian marshgrass	*Hymenachne amplexicaulis*	Y	N	N
Tropical nutrush	*Scleria macrocarpa*	Y	N	N
Tropical soda apple	*Solanum viarum*	Y	N	Y
Trumpet tree	*Cecropia palmata*	N	Y	N
Tuberous sword fern	*Nephrolepis cordifolia*	Y	N	N
Turkeyberry	*Solanum torvum*	N	Y	Y
Twoleaf nightshade	*Solanum diphyllum*	N	Y	N
Twolobe passionflower	*Passiflora biflora*	N	Y	N
Umbrella plant	*Cyperus involucratus*	N	Y	N
Valamuerto	*Senna pendula var. glabrata*	Y	N	N
Washington fan palm	*Washingtonia robusta*	N	Y	N
Water spangles	*Salvinia minima*	Y	N	N
Water-lettuce	*Pistia stratiotes*	Y	N	N
Waterthyme; hydrilla	*Hydrilla verticillata*	Y	N	Y
Wax begonia; club begonia	*Begonia cuullata*	N	Y	N
West Indian almond	*Terminalia catappa*	N	Y	N
West Indian dropseed	*Sporobolus jacquemontii*	Y	N	N
West Indian pennisetum; missiongrass	*Cenchrus polystachios*	N	Y	N
White leadtree	*Leucaena leucocephala*	N	Y	Y
White yam	*Dioscorea alata*	Y	N	Y
Wild bushbean	*Macroptilium lathyroides*	N	Y	N
Wild taro; dasheen; coco yam	*Colocasia esculenta*	Y	N	N
Woman's tongue	*Albizia lebbeck*	Y	N	N
Wright's nutrush	*Scleria lacustris*	Y	N	N
n/a	*Eulophia graminea*	Y	N	Y
Totals		**67**	**69**	**35**

a/ Source: Wunderlin et al. 2024

b/ Source: FAC Rule 5B-57.007, Noxious Weed List. The total number of Florida noxious weeds is included within the combined totals of Category I and II Exotics.

Note: Since only a portion of each of Broward and Palm Beach counties are included in the Study Area, some county-level data presented in this section may be over- or under-represented.

Table B.1-7. FLCCS Invasive Community Types within the Study Area

FLCCS Class Name[a/b/]	FLCCS Class Code[a/b/]	FLCCS Description[/]	Acreage (ac)[b/]	Percent Cover within Study Area (%)
Brazilian pepper	7300	Exotic, pestilent tree species found in Florida from the Tampa Bay area southward. Commonly found on disturbed sites, aggressive invader of Florida's plant communities. Communities often established along borrow-pits, levees, dikes, and old disturbed fields.	1,156	0.4
Melaleuca	7200	Exotic tree species occurring in almost pure stands. Aggressive competitor, invading and often taking over a site. Forms dense, impenetrable stands. Canopy closure must be 25% or more with at least 67% or more dominance.	884	0.3
Exotic wetland hardwoods	7400	Wetland with dominant exotic species such as Brazilian pepper, melaleuca, or other exotic species. Dominant species not specified.	606	0.2
Australian pine	7100	Canopy closure is 25% or more with at least 67% dominance by Australian pine trees. Trees average at least 20 feet tall and form tall, dense monocultures that preclude other vegetation.	281	0.1
Exotic Plants[c/]	7000	Upland and wetland areas dominated by non-native trees that were planted or have escaped and invaded native plant communities.	147	0.1

a/ Source: FWC 2018

b/ Source: FWC 2023

c/ While the description for FLCCS Class Code 7000, Exotic Plants, notes that exotics include melaleuca, Australian pine, Brazilian pepper, and eucalyptus, this class code is used for sites known to be vegetated by non-native plants (including those species) but for which the actual species composition could not be determined. Therefore, the total acreage and percent cover within the Study Area for FLCCS Class Code 7000 is not inclusive of the total acreage and percent cover for Class Codes 7100, 7200, 7300, and 7400.

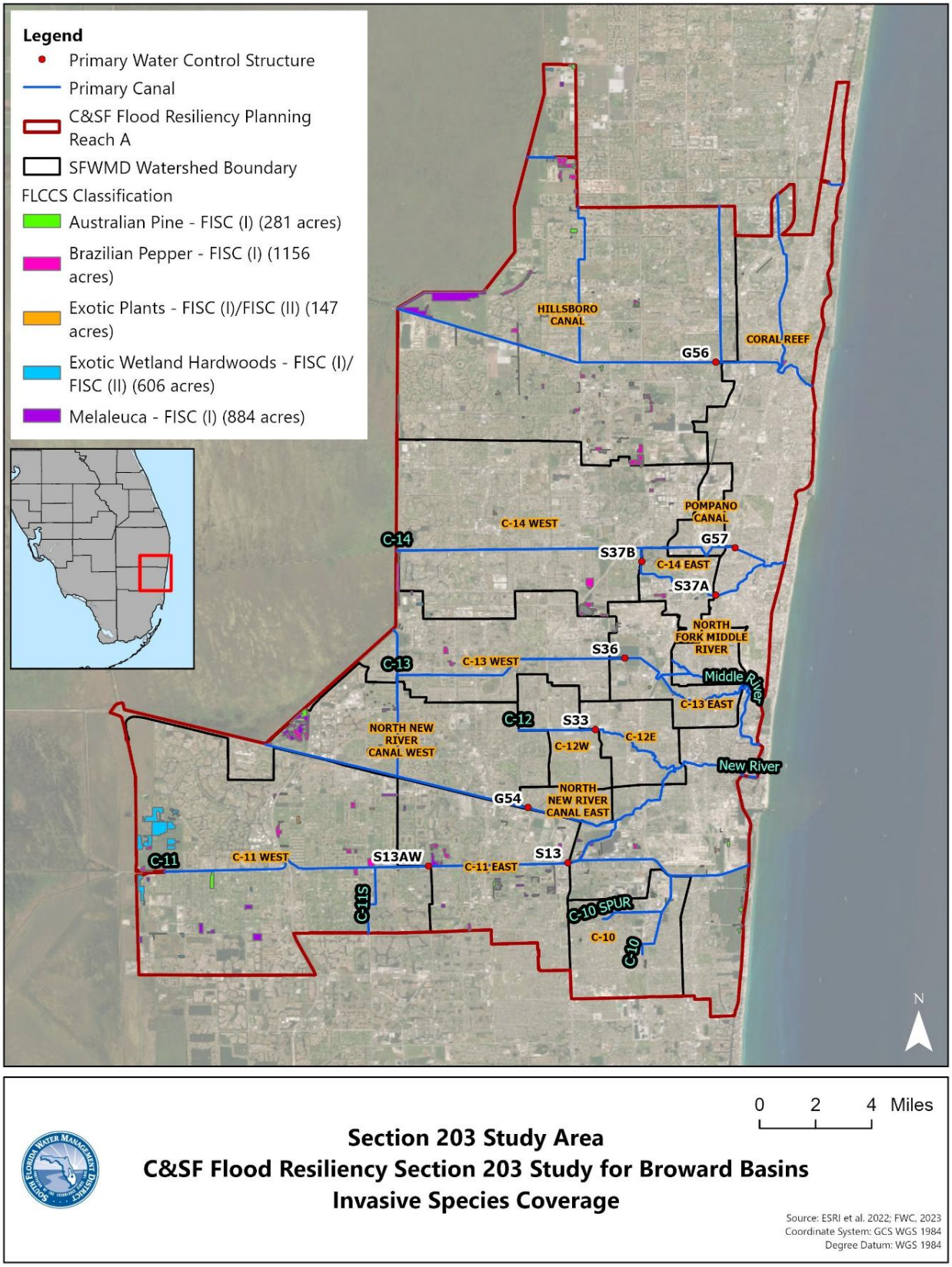


Figure B.1-11. Invasive Species Coverage within the Study Area.

B.1.11 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act of 1976 (16 U.S.C. §§ 1801 et seq.) as amended, is the primary law governing marine fisheries in U.S. federal waters. It defines Essential Fish Habitat (EFH) as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. § 1802[10]). The Act applies to federally managed species, even within state waters, and requires federal agencies to identify and assess potential impacts on EFH from proposed projects.

Section 302 of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1852) established eight regional fishery management councils. The Study Area falls under the jurisdiction of the South Atlantic Fishery Management Council (SAFMC), which manages eight fisheries along the Atlantic Coast from North Carolina to Key West, in waters from 3 to 200 nautical miles offshore. These include:

- Coastal migratory pelagics (e.g., mackerel and cobia)
- Coral and live bottom habitat
- Dolphin and wahoo
- Golden crab
- Sargassum
- Shrimp
- Snapper-grouper complex
- Spiny lobster

Using the NOAA Fisheries Essential Fish Habitat Mapper (2024), EFH has been identified within tidal waters of the Study Area, which include the Atlantic ICW and connecting inland canals. Species with designated EFH in these waters include snapper and grouper complex; spiny lobster; penaeid shrimp; and coastal migratory pelagics (**Figure B.1-12**). A fragment of Atlantic Highly Migratory Species EFH (restricted to blacktip, bull, lemon, nurse, spinner, and tiger sharks) occurs in the easternmost fringe of the Study Area at Port Everglades (5.8 miles downstream of the nearest project WCS [S-33 Gated Spillway]). Additionally Coral and Hardbottom EFH occurs in the easternmost fringes of the Study Area nearby the ocean inlets, but intermittently low salinity prevents Coral and Hardbottom EFH upstream of the ICW. No portions of the Study Area meet the definitions for any HAPC.

The four EFH within tidal waters of the Study Area include Penaeid Shrimp EFH, Snapper-Grouper EFH, Spiny Lobster EFH, and Coastal Migratory Pelagic EFH. Tidal waters of the Study Area provide only a limited number of EFH habitat constituents. These constituents include tidal creeks; estuarine scrub/shrub (mangrove fringe); unconsolidated bottom; attached macroalgae; submerged rooted vascular plants (seagrasses); estuarine emergent vegetated wetlands (saltmarshes, brackish marsh); oyster reefs and shell banks; and flood tide shoal complexes.

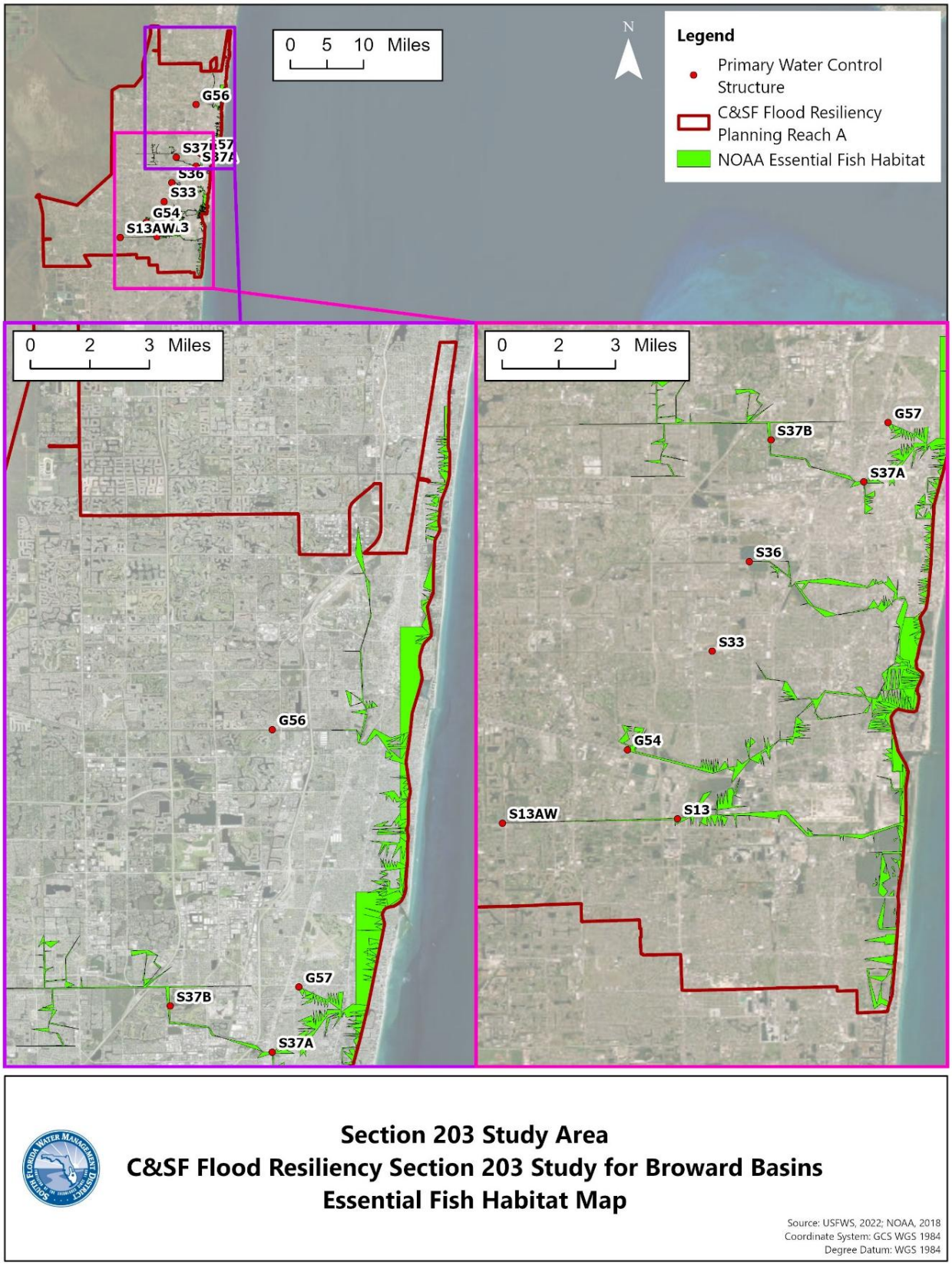


Figure B.1-12. Essential Fish Habitat within the Study Area.

Habitat loss has already impacted many managed fisheries and their habitats through overfishing, land conversion, altered hydroperiods, invasive species, and water quality decline. Within the Study Area, important EFH habitat constituents like mangroves are impacted from storm surges, drought, and lack of space for inland migration. Future changes will degrade these habitat constituents and may affect their viability as EFH.

The WCS are situated at the inshore-most ends of their associated canals, at the inshore-most limit of tidal influence. The nine WCS and their approximate distance from the ICW (i.e., tidal influence) are as follows:

- G-56 Gated Spillway located 4 miles upstream of the ICW
- G-57 Gated Spillway located 2 miles upstream of the ICW
- S-37B Gated Spillway located 6 miles upstream of the ICW
- S-37A Gated Spillway located 2.9 miles upstream of the ICW
- S-36 Gated Spillway located 6.8 miles m upstream of the ICW
- S-33 Gated Spillway located 6 miles upstream of the ICW
- G-54 Gated Spillway located 8.5 miles upstream of the ICW
- S-13AW Gated Culvert located 10.7 miles upstream of the ICW
- S-13 Pump Station and Gated Spillway located 6.2 miles upstream of the ICW

B.1.12 Threatened and Endangered Species

The Endangered Species Act (ESA) 16 U.S.C. § 1531 *et seq.* (1973), as amended, protects species at risk of extinction and conserves the ecosystems they depend on. The U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) administer the ESA, which authorizes the listing of species as “endangered” or “threatened” and the designation of “critical habitat” under 50 CFR Part 424. Critical habitat includes areas essential for the survival and recovery of listed species. The ESA also prohibits unauthorized “take” of any listed species.

Federally listed threatened and endangered species are either known or likely to occur within the Study Area and may be affected by the Section 203 Study. Many listed species in Florida have already experienced habitat loss from land conversion, wetland drainage, altered hydroperiods, and water quality degradation.

A list of potentially affected federally listed species was generated using the USFWS Information for Planning and Consultation (IPaC) database (USFWS 2024a) and the National ESA Critical Habitat Mapper (NOAA 2023) is provided in Table B.1-8. **Figure B.1-13** shows the Protected Species Consultation Areas within the Study Area.

Species identified to have a moderate or high potential of occurrence to occur in the Study Area will be carried forward for further analysis.

Table B.1-8. Federally Listed Species with the Potential to Occur in the Study Area.

Common Name	Scientific Name	Federal Status	Species-Habitat Associations	Likelihood of Occurrence[a/]
Mammals				
Florida bonneted bat	*Eumops floridanus*	Endangered	Forages in open habitats including pine and hardwood forests, agricultural areas, golf courses, and neighborhoods. Roost in natural pine tree cavities, under barrel roofing tiles, and in bat houses. Commonly use forests, wetlands, open water, and residential and urban areas. In Florida, most likely to occur in semitropical forests with tropical hardwood, pineland, and mangrove habitats, as well as man-made areas such as golf courses and neighborhoods.	High
Florida panther	*Puma (=Felis) concolor coryi*	Endangered	Utilizes a diversity of warm climate habitat, living in wetlands, swamps, upland forests, and strands of saw palmetto. In South Florida, panthers prefer mature upland forests (hardwood hammocks and pinelands). Upland forests provide dry ground for resting and denning, and prey density is higher.	Low
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	Threatened	Inhabits sand dunes along the Florida Atlantic Coast from Volusia south to Martin County.	Low
Tricolored bat	*Perimyotis subflavus*	Proposed Endangered	Forages near or directly over water, in fields, and along forest edges. Common in Pine Rocklands in the Greater Everglades during the warm-wet season. Roosts in caves, culverts, bridges, trees, and other structures. Will also roost in Spanish moss and dead tree leaves.	Moderate
West Indian (Florida) manatee	*Trichechus manatus*	Threatened	Inhabits Florida's coastal waters, rivers, and springs year-round. Migrates to Florida's warm water habitats including artesian springs and power plant discharge canals during colder months. Found where their food sources (seagrasses and other marine or freshwater vegetation) are abundant.	High
Birds				
Crested caracara (Note the listed entity is Audubon's crested caracara)	*Caracara plancus* (Note the listed entity is: *Polyborus plancus audubonii*)	Threatened	Inhabits wet prairies with cabbage palms. Also found in wooded areas with saw palmetto, cypress, scrub oaks, and pastures.	High
Eastern black rail	*Laterallus jamaicensis ssp. jamaicensis*	Threatened	Requires dense vegetative cover that allows movement underneath the canopy. Occurs in a variety of marsh habitats that can be tidally or non-tidally influenced. Typically found in salt and brackish marshes with dense cover and in upland areas of these marshes. Shrub densities that become too high become unsuitable for the species. Soils are moist to saturated with very shallow water.	Low[b/]
Everglade snail kite	*Rostrhamus sociabilis plumbeus*	Endangered	Inhabits shallow freshwater marshes and shallow grassy shorelines of lakes, especially areas with high volumes of apple snails. Primarily found in WCA-2A, -2B, -3A, and -3B in Broward, Palm Beach, and Dade counties. Also found in the Kissimmee Valley, St. Johns River headwaters, Lake Okeechobee, Loxahatchee National Wildlife Refuge, and sections of Big Cypress National Preserve and Everglades National Park.	High
Florida grasshopper sparrow	*Ammodramus savannarum floridanus*	Endangered	Inhabits dry open prairies that contain bunch grasses, low shrubs, and saw palmetto. Found in south-central Florida in Polk, Osceola, Highlands, and Okeechobee County.	Low
Florida scrub-jay	*Aphelocoma coerulescens*	Threatened	Inhabits sand pine and xeric oak scrub, and scrubby flatwoods, which occur in some of the highest and driest areas of Florida – ancient sandy ridges that run down the middle of the state, old sand dunes along the coasts, and sandy deposits that contain large quantities of oak shrubs. Only bird species endemic to Florida.	Moderate
Piping plover	*Charadrius melodus*	Threatened	Inhabits sandy beaches, sand flats, and mudflats along coastal areas.	High
Wood stork	*Mycteria americana*	Threatened	Nests in mixed hardwood swamps, sloughs, mangroves, and cypress domes/strands in Florida. Forage in wetlands including freshwater and estuarine marshes that are limited to depths less than 10-12 inches.	High
Reptiles				
American crocodile	*Crocodylus acutus*	Threatened	Occurs at the northern end of their range in south Florida. Inhabit brackish or saltwater areas, and can be found in ponds, coves, and creeks in mangrove swamps. Occasionally encountered inland in freshwater areas of southeast Florida coast due to the extensive canal system.	High
Eastern indigo snake	*Drymarchon couperi*	Threatened	Inhabits pine flatwoods, hardwood forests, moist hammocks, and areas that surround cypress swamps. Found throughout Peninsular Florida.	High
Green sea turtle	*Chelonia mydas*	Threatened	Found in subtropical and temperate oceans of the world. Florida hosts one of the largest groupings of green sea turtle nests in the western Atlantic. Occupy shallow flats and seagrass meadows during the day. Rests in rock ledges, oyster bars, and coral reefs during evenings.	Moderate
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	Found in subtropical and temperate oceans of the world. Common in warm tropical seas where sponges are found. In Florida, the species is mostly found on reefs in the Florida Keys and along the southeastern Atlantic coast.	Low
Kemp's Ridley	*Lepidochelys kempii*	Endangered	Inhabit nearshore coastal habitats with muddy or sandy bottoms and nest in northeastern Mexico; after hatching, the young swim offshore, spending 1 to 2 years in the Gulf of Mexico or drifting via the Gulf Stream to the Atlantic, then settling into shallow coastal areas of the Gulf of Mexico or the northwestern Atlantic.	Moderate
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	Found in marine waters throughout the Atlantic, Pacific, and Indian Oceans, where they nest along sandy beaches. Nesting in the United States usually occurs in Florida, Puerto Rico, and St Croix. Found in Florida's coastal waters, with a small number nesting here, mostly along the Atlantic coast. Nesting occurs on sandy beaches from late February and peaks in May.	Low
Loggerhead sea turtle	*Caretta caretta*	Threatened	Found in subtropical and temperate oceans of the world. Florida's sandy Atlantic and Gulf of Mexico beaches host one of the largest loggerhead nesting aggregations in the world. Mates in shallow marine waters near nesting beaches and along migratory corridors between April and September.	Moderate
Fish				
Giant manta ray	*Mobula birostris*	Threatened	Found worldwide in tropical, subtropical, and temperate bodies of water and is commonly found offshore, in oceanic waters, and in productive coastal areas. Have also been observed in estuarine waters, oceanic inlets, and within bays and intercoastal waterways	Low

Common Name	Scientific Name	Federal Status	Species-Habitat Associations	Likelihood of Occurrence[a/]
Smalltooth sawfish	*Pristis pectinata*	Endangered	Most often found off the southwest coast of Florida, from about Charlotte Harbor through the Everglades and Florida Keys region at the southern tip of the state. Juveniles live in estuaries and the smaller habitats within them, such as shallow portions of bays, lagoons, and rivers. They begin moving out of the shallow estuaries into more coastal habitats as they reach adulthood.	Moderate
Invertebrates				
Miami blue butterfly	*Cyclargus thomasi bethunebakeri*	Endangered	Inhabits tropical hardwood hammocks, tropical pine rocklands, and beachside scrub in Miami-Dade and Monroe Counties, Florida.	Low
Monarch butterfly	*Danaus plexippus*	Proposed Threatened	Occurs in a variety of habitats where milkweed plants grow. The species relies on milkweed during all life stages and breeds year-round in southern Florida (including the Study Area), but there also are migrating populations that come to southern Florida.	High
Queen conch	*Aliger gigas*	Threatened	Occur throughout the Caribbean Sea, the Florida Keys, and around Bermuda. In the Gulf of Mexico, they can be found in the Flower Garden Banks National Marine Sanctuary. They use different habitat types including seagrass beds, sand flats, algal beds, and rubble areas.	Low
Flowering Plants				
Beach jacquemontia	*Jacquemontia reclinate*	Endangered	Restricted to southeastern coast of Florida. Primary habitats include beach coastal strand and maritime hammock.	Low
Florida prairie-clover	*Dalea carthagenensis floridana*	Endangered	Grows in pine rocklands, edges of rockland hammocks, coastal uplands, marl prairie, and disturbed portions of these areas such as roadsides. Found in Miami, Dade and Monroe counties and the Collier County portion of the Big Cypress National Preserve.	Low
Four-petal pawpaw	*Asimina tetramera*	Endangered	Grows in sand pine scrub habitats in Martin and Palm Beach counties on the Atlantic Coastal Ridge in southeast Florida. Inhabits sand pine scrub and open scrub on excessively drained sands of Pleistocene dunes. Plants may persist under the canopy of pines and in dense oaks and palmettos until the overstory is removed by fire or mechanical means.	Low
Tiny polygala	*Polygala smallii*	Endangered	Found in Florida's pine rocklands and scrub ecosystems along the southeastern coast of the peninsula. Thrives when these areas are maintained by regular fire cycles. Only found in quartz sand soils (also known as sugar sands).	Low
Lichen				
Florida perforate cladonia	*Clandonia perforate*	Endangered	Found in high, well-drained sands in white sand rosemary and sand pine scrub. Restricted to a handful of scattered populations in Palm Beach, Martin, St. Lucie, Broward and Miami-Dade Counties.	Low

a/ Likelihood of Occurrence: Low–species range overlaps with Study Area and marginally suitable habitat in Study Area vicinity; Moderate–species range overlaps with Study Area and suitable habitat present in Study Area, or species known to occur in habitat similar to Study Area; High–highly suitable habitat present in Study Area, known populations exist in Study Area, USFWS Critical Habitat within or adjacent to Study Area, or USFWS Consultation Area overlaps the Study Area.

b/ Species is discussed further in section below, due to the limited information on species distribution/occupancy within their range

Note: Since only a portion of each of Broward and Palm Beach counties are included in the Study Area, some county-level data presented in this section may be over- or under-represented.

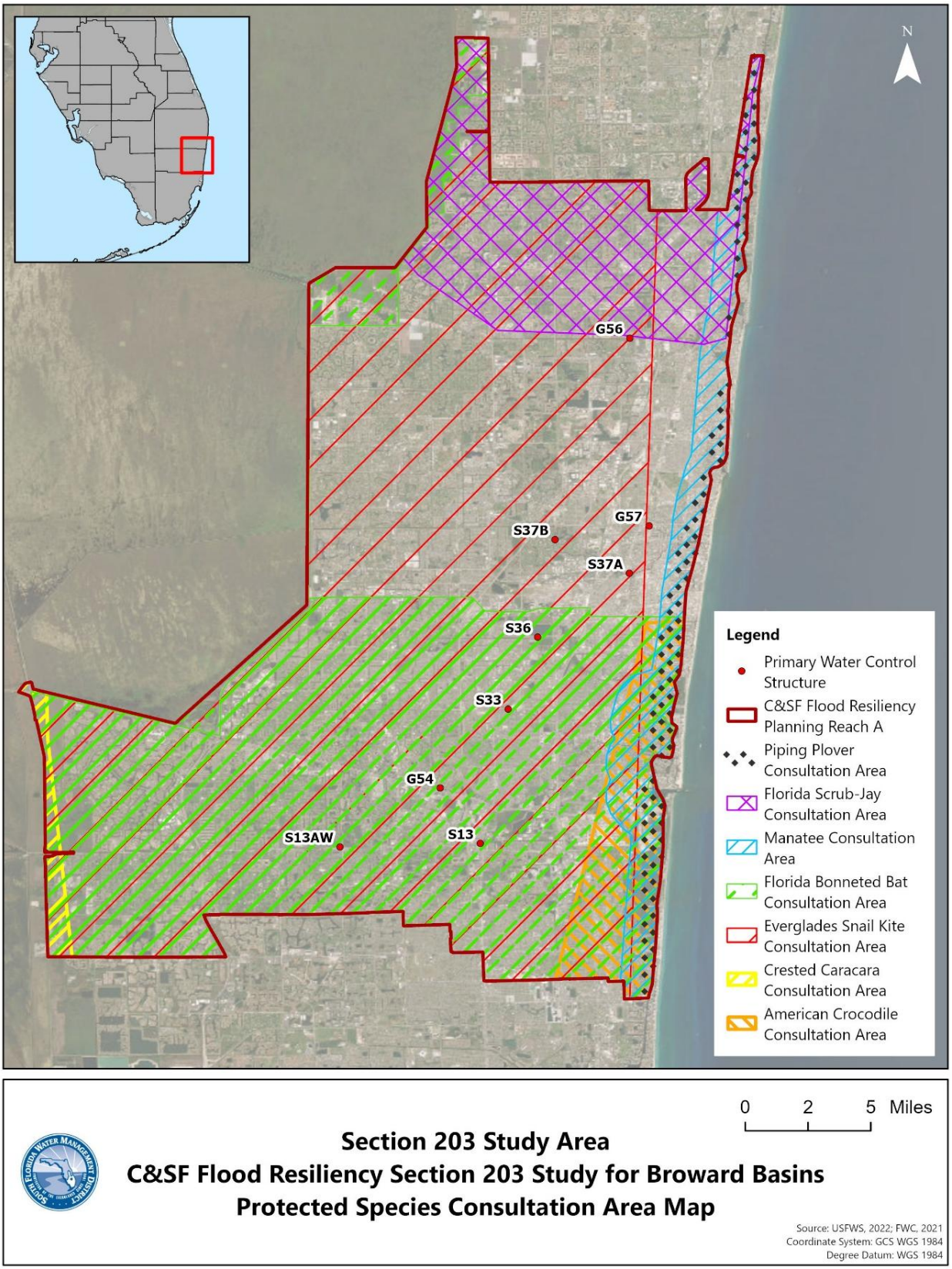


Figure B.1-13. Protected Species Consultation Areas within the Study Area.

B.1.12.1 American Crocodile

The federally threatened American crocodile is a large, saltwater-tolerant species which inhabits coastal waters of south Florida, as well as waters further south outside the territorial bounds of the United States. The American crocodile was listed primarily because of hunting, nest disturbance, and loss of habitat. The American crocodile was listed as endangered in 1975, when only about 300 adults were inhabiting Florida waters. Their listing was reclassified as threatened in 2007, and there are now over 2,000 adults today (Harvey et al. 2019).

In Florida, American crocodiles primarily inhabit mangrove swamps, though the species can be found in other areas such as shorelines, mudflats, nearshore salt waters, and both fresh water and estuarine swamps. Crocodiles have a higher salinity tolerance than alligators and tend to inhabit more estuarine waters, though they can be found in fresh water (IFAS 2024). Crocodiles have adapted well to development and urbanization in Florida and are now commonly observed in artificial habitats such as canals and man-made ponds in commercial and residential areas (USFWS 2022). The canals provide suitable travel corridors and prey for crocodiles, and canal banks, along with seawalls, piers, and other structures, provide suitable basking habitat. The crocodile's diet includes fish, crabs, birds, turtles, snakes, and small mammals (FWC 2024a).

Nesting habitat includes creek banks, sandy beaches, and human-made structures such as canal banks, earthen berms, and marl canal plugs. American crocodiles are not known to nest north of Virginia Key on the eastern coast of Florida. Current nest locations are concentrated between northeast Florida Bay and southern Biscayne Bay, over 40 miles south of the Study Area. American crocodiles begin courting in late January and early February and nesting occurs in late April and early May. Their soil nests are built on land and above high tide markings.

Figure B.1-13 shows the American crocodile's USFWS Consultation Area within the Study Area. The Study Area also overlaps the current range for American crocodiles**.**

B.1.12.2 Audubon's Crested Caracara

The federally threatened Audubon's crested caracara (*Polyborus plancus audubonii*) is a unique raptor in the family *Falconidae* that reaches the northern limit of its geographic range in the southern United States. In Florida, this raptor occurs as an isolated populations in the south-central region of the state.

Currently, much of the caracara population is found almost exclusively in cabbage palms on improved or semi-improved pastures on private cattle ranches in the south and central portion of Florida. Available evidence suggests that the most serious threat to Florida's caracara population is loss or degradation of nesting and feeding habitat. Such loss is most commonly due to conversion of pasture and other grassland habitats and wetlands to citrus, sugar cane, other agriculture, and urban development.

Adult caracaras exhibit high site and mate fidelity; therefore, extensive loss of habitat within their home range, particularly of the nesting site itself, may cause the pair to abandon that home range, or at least the nesting site (Morrison and Humphrey 2001). Nests are constructed with sticks, dry weed stalks, and long and narrow segments of vines typically well concealed in a cabbage palm tree that are over 15 feet in height, with large, full, closed crowns. New nests are constructed each year, but often in the same tree. Egg laying has been documented as early as September and as late as June; peak activity occurs

from late December through February (Morrison Humphrey 2001). Clutch size is two to three eggs, with an incubation period of 32 to 33 days. Double brooding can occur if a nest is lost early in the season. Fledging occurs at 8 weeks. Young are dependent on parents for at least 2 months post-fledging and may remain in the natal territory for up to 10 months. Most juveniles leave their natal territory after 4 to 6 months and form groups of up to 30 individuals.

The caracara is an opportunistic feeder, preying on insects, small reptiles and amphibians, small mammals, eggs, and carrion. Caracaras often walk through pastures searching for prey items, particularly after disturbance, such as mowing or plowing, or in recently burned areas. Hunting takes place from conspicuous perches or while in flight (Morrison 1996; Morrison and Humphrey 2001). **Figure B.1-13** shows the crested caracara's USFWS Consultation Area within the Study Area. One crested caracara occurrence was documented in 2015 along the northwest boundary of the Study Area, along an active agricultural site (**Figure B.1-14**). Potential habitat for the crested caracara is in the northwest and southwest portions of the Study Area.

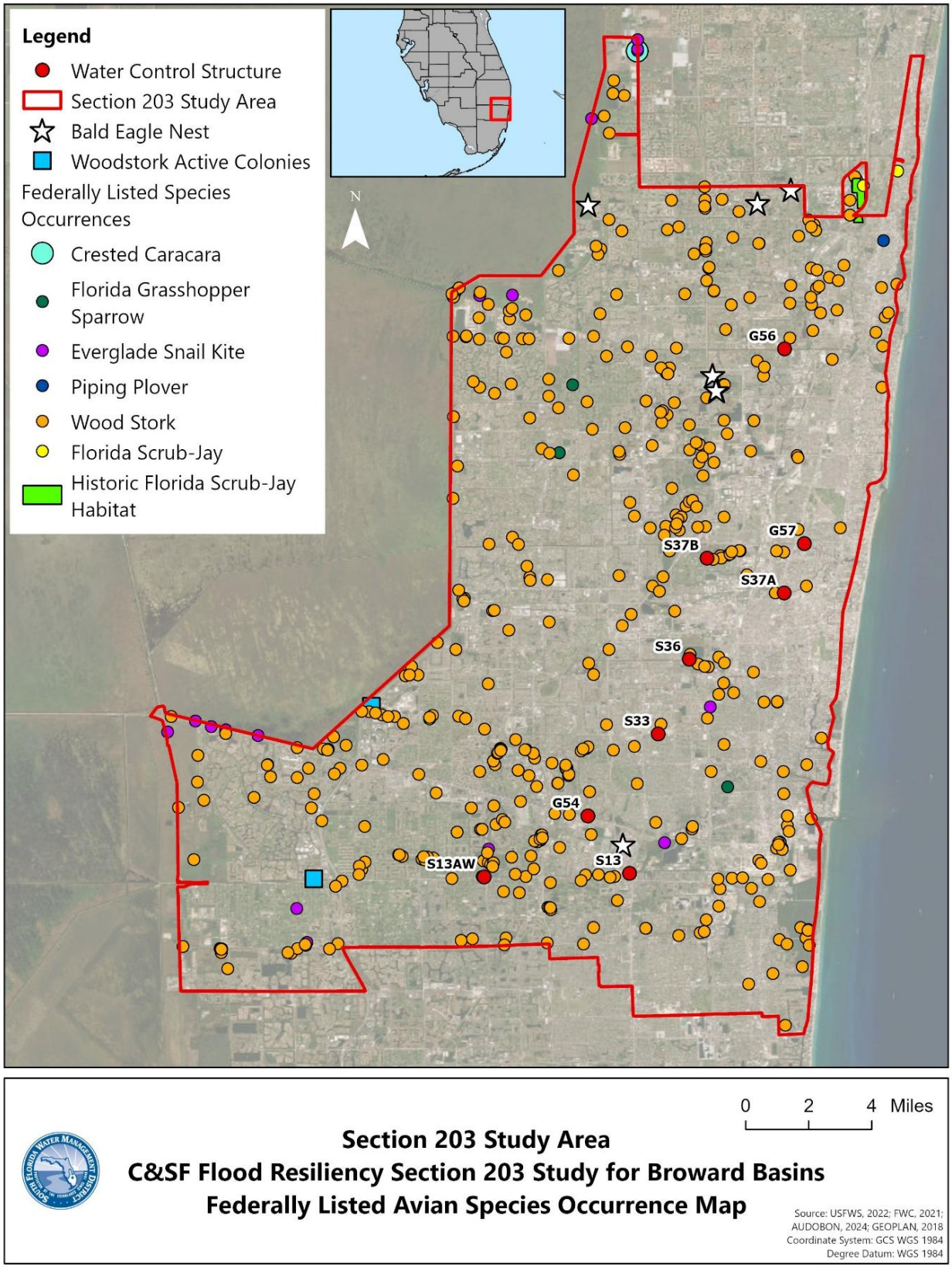


Figure B.1-14. Federally Listed Species Occurrences within the Study Area.

B.1.12.3 Bald Eagle

Bald eagles (*Haliaeetus leucocephalus*) are federally protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Bald eagles are opportunistic foragers that feed on a wide variety of prey that primarily includes fish, but they may also feed on other aquatic and terrestrial vertebrates and carrion (Buehler 2022). Foraging habitat for bald eagles has a diversity and abundance of prey, including access to shallow water and tall trees or structures for perching. Bald eagles typically nest near large bodies of open water with adequate prey and tall trees for nesting and roosting, such as lakes, marshes, seacoasts, and rivers. Florida has one of the densest concentrations of nesting bald eagles in the lower 48 states, and their nesting territories are concentrated around inland lake and river systems. Nesting occurs from December or early January through late April or May. Most of Florida's breeding bald eagles remain in the state year-round. Potentially suitable nesting and foraging habitat for bald eagles occur within the Study Area. **Figure B.1-14** shows six known bald eagle nests located within the Study Area.

B.1.12.4 Eastern Black Rail

The federally threatened eastern black rail (*Laterallus jamaicensis ssp. Jamaicensis)* is a sparrow-sized bird and is the rarest and smallest of all rail species. Eastern black rail is a highly secretive bird that resides in marsh habitats, is rarely seen in flight, and will walk or run throughout their marsh habitat along narrow paths created by rodents. No critical habitat has been designated for the eastern black rail.

Eastern black rail range in the United States extends along the coastal areas of the eastern states, from New Jersey to the southern tip of Florida, along the gulf coast from Florida to Texas, and in the midwestern states, extending from Michigan to eastern Colorado (USFWS 2023a). Within its range, the species has historically been most concentrated along the Atlantic Coast, along coastal salt marshes from Connecticut to Florida.

In Florida, eastern black rail is a year-round resident throughout the coastal areas and the full southern half of the state. Habitat for the species is characterized by shallow, densely vegetated, marshes in salt, brackish, and freshwater environments (USFWS 2023a). The species appears to be limited to specific habitat characteristics in marsh environments, including persistent water coverage and depth, very dense herbaceous vegetation, and topographic variation (ACJV 2020). Habitats supporting black rail typically have water levels around 3 centimeters (0.4 inch) in depth, which is persistent. If water levels pool up seasonally or become too low or dry up in the summer months, the species will abandon the site. Vegetation structure is also an important habitat characteristic, and typically includes greater than 80 percent grasses, and includes bulrushes, sedges, and cattails. Topographic variation is an important characteristic in black rail habitat to allow for escape when water levels rise and to allow greater foraging opportunity for invertebrate food sources that rails depend on. Small numbers of black rails have also been documented in impoundments, freshwater wetlands, coastal prairies, and grassy fields, where there are suitable habitat conditions present.

Nesting occurs from mid-March through August, and the species constructs their nests on or near the ground in very dense vegetation over water or moist soil or in shallow water (Watts 2022). Clutch size is typically around seven eggs, and the eggs are incubated for 17 to 20 days. The nestlings leave the nest within 1 day and the parents are believed to care for the young and feed them.

Freshwater marshes are primarily found along the western portion of C-11 West Basin of the Study Area, adjacent to WCA-3B (**Figure B.1-6** through **Figure B.1-9**). They contain low-growing species such as grasses, sedges, rushes, and forbs. These areas could provide potentially suitable habitat for the eastern black rail.

B.1.12.5 Eastern Indigo Snake

The threatened eastern indigo snake (*Drymarchon couperi*) is the largest native non-venomous snake in North America. It is an isolated subspecies occurring in southeastern Georgia and throughout peninsular Florida. The eastern indigo snake prefers drier habitats but may be found in a variety of habitats from xeric sandhills to cabbage palm hammocks, to hydric hardwood hammocks (Schaefer and Junkin 1990). The species has also been found in citrus groves and sugar cane. Eastern indigo snakes need relatively large areas of undeveloped land to maintain their population. In warm months, eastern indigo snakes use a variety of natural areas and have large home ranges (Moler 1992; USFWS 1999). Eastern indigo snakes occupy larger home ranges in the summer than in the winter. Information on snakes in Florida indicates adult males have home ranges as high as 553 acres (224 hectares) in the summer (Moler 1992). Because it is such a wide-ranging species, the eastern indigo snake is especially vulnerable to habitat fragmentation that makes travel between suitable habitats difficult. The main reason for its decline is habitat loss due to development. Further, as habitats become fragmented by roads, eastern indigo snakes become increasingly vulnerable to highway mortality as they travel through their large territories (Schaefer and Junkin 1990).

In South Florida, the eastern indigo snake is thought to be widely distributed. Given their preference for upland habitats, eastern indigo snakes are not commonly found in great numbers in wetland complexes, although they have been found in pinelands, tropical hardwood hammocks, and mangrove forests in extreme South Florida (Duellman and Schwartz 1958; Steiner et al. 1983).

Within the range of the gopher tortoise, tortoise burrows are favorite refugia for eastern indigo snakes. They are known to use burrows made by cotton rats and land crabs, hollows at bases of trees and stumps, ground litter, trash piles and rock piles lining banks of canals, and pipes or culverts. Breeding occurs from November to April with females laying 4 to 12 eggs in May through June (Moler 1992). Most hatching of eggs occurs from August to September, with yearling activity peaking in April and May (USFWS 1999).

Potentially suitable habitat for eastern indigo snake occurs in cabbage palm hammocks and hydric hardwood hammocks within the Study Area. **Figure B.1-15** shows the eastern indigo snake's USFWS Range within the Study Area.

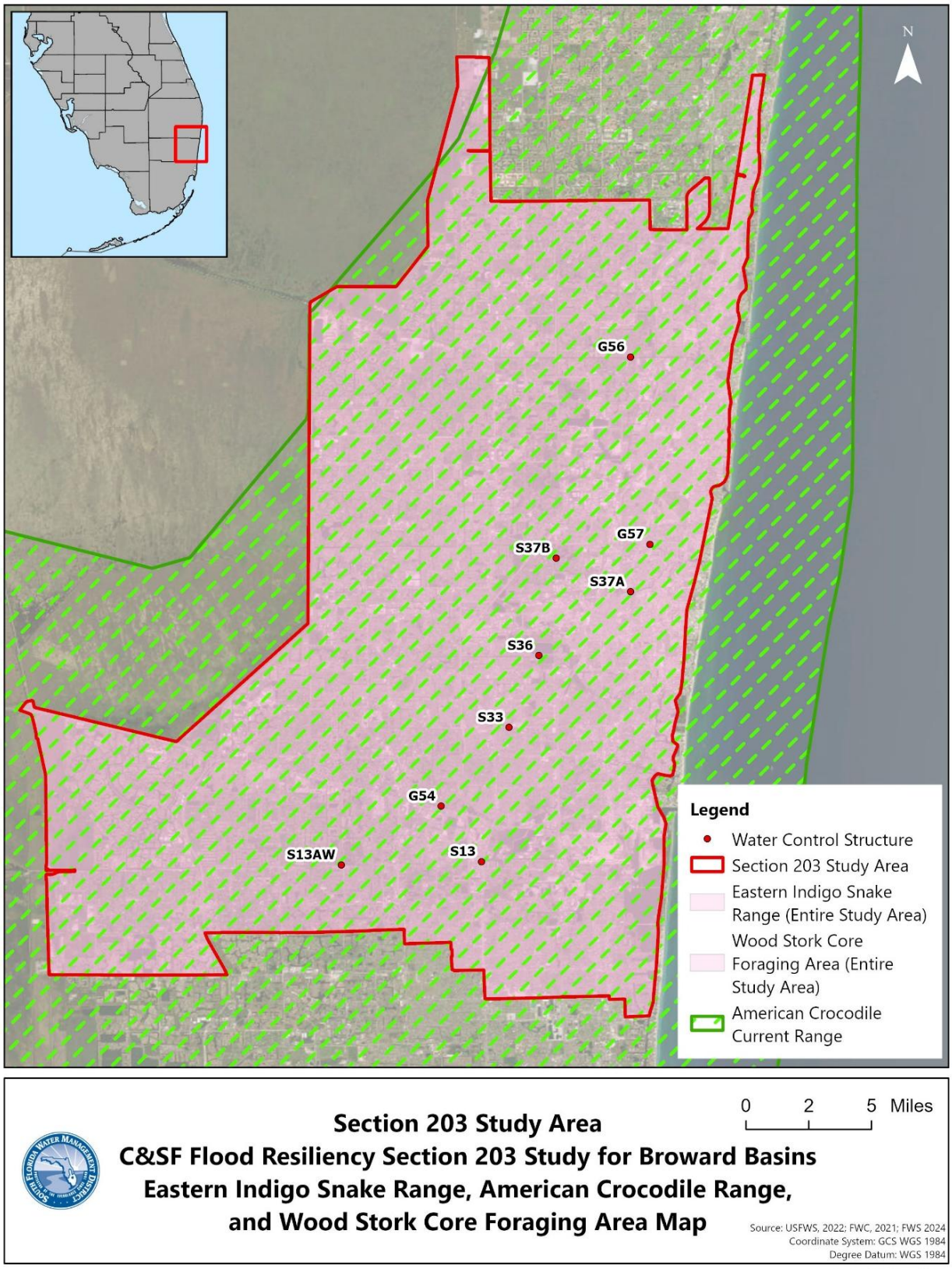


Figure B.1-15. Protected Species Range within the Study Area.

B.1.12.6 Everglade Snail Kite

The Everglade snail kite (*Rostrhamus sociabilis plumbeus*) is listed as an endangered species by the USFWS. It is a medium-sized raptor characterized by its long, narrow wings and distinctive hooked beak, which is adapted for extracting apple snails (*Pomacea* sp.) from their shells. Adult males typically exhibit a dark gray plumage with a lighter, almost white head and a distinctive red eye. Females and juveniles are generally browner and have streaked underparts. Although previously located in freshwater marshes over a considerable area of peninsular Florida, the range of the snail kite is now limited to central and southern portions of Florida. Six large freshwater systems are located within the current range of the snail kite: Upper St. Johns marshes, Kissimmee Chain of Lakes, Lake Okeechobee, Loxahatchee Slough, the Everglades, and the Big Cypress basin (FWC 2024b).

The Everglade snail kite's apple snail diet is dependent on the hydrology and water quality of the watersheds. Foraging habitat requires shallow open-area ponds with low marsh areas; nesting/roosting sites are located over water. Foraging conditions have expanded recently due to the increase in exotic apple snail population (since about 2010). As a result, the Everglade snail kite breeding season has lengthened (sometimes into fall) and some previous unsuitable foraging areas now have the exotic apple snail and are being used by kites. Everglade snail kite nests are built in tall vegetation near water with nesting season usually occurring from late winter to early summer, with females laying two to four eggs. Both parents participate in incubating the eggs and feeding the chicks once they hatch.

Figure B.1-13 shows the Everglade snail kite's USFWS Consultation Area within the Study Area, and **Figure B.1-16** shows designated critical habitat for the Everglade snail kite, which is located outside the Study Area, adjacent to the western boundary. **Figure B.1-14** shows occurrences of the Everglade snail kite within the western and southern portions of the Study Area.

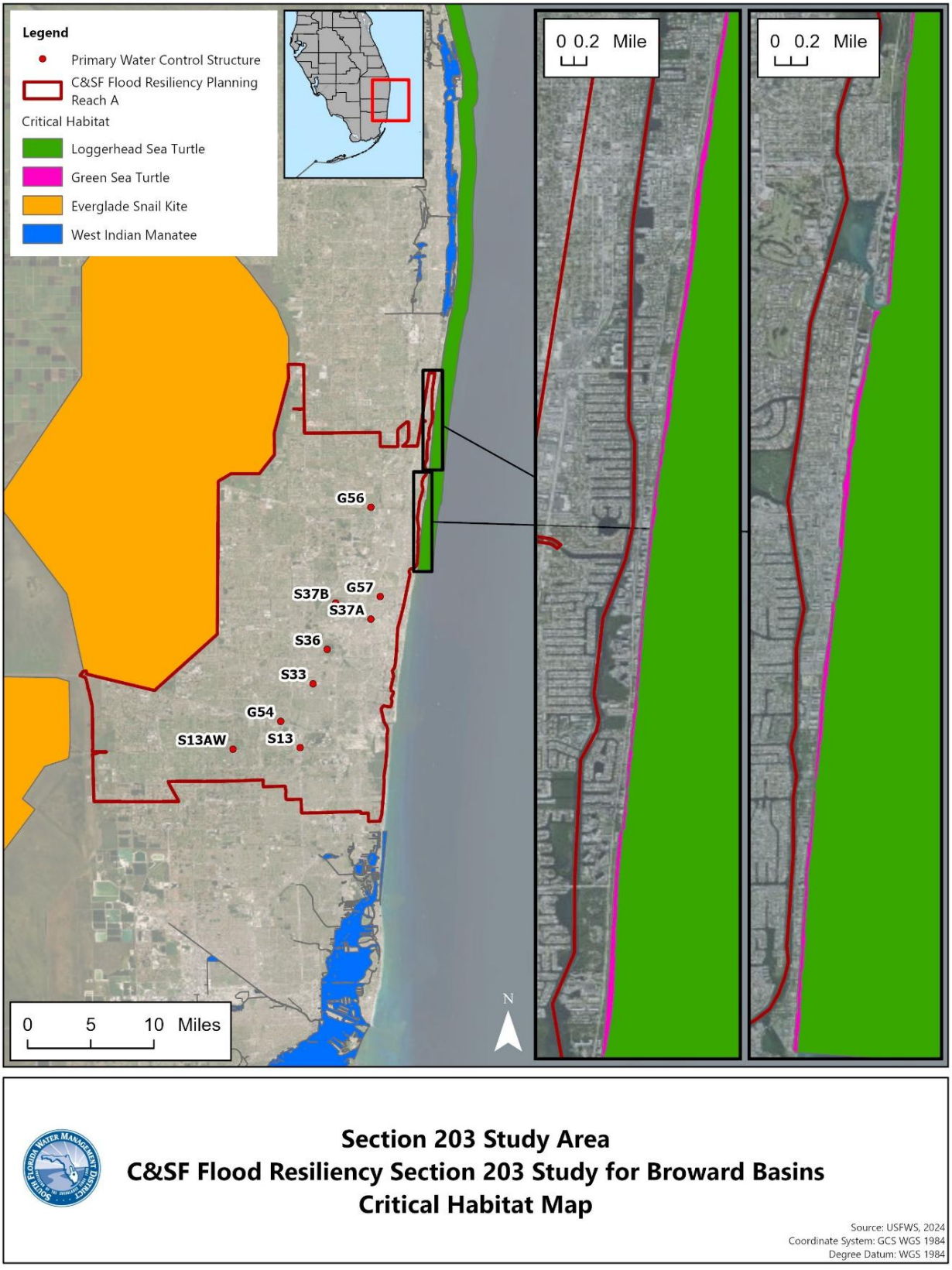


Figure B.1-16. Species Critical Habitat within the Study Area.

B.1.12.7 Florida Bonneted Bat

The endangered Florida bonneted bat (*Eumops floridanus*) is Florida's largest bat, weighing approximately 1.1 to 2.0 ounces, with a 19- to 21-inch wingspan and a body length of 5.1 to 6.5 inches. The species has dark brown fur and large broad ears that join and slant forward over the eyes. Roosting habitat in central and southern Florida include pine rocklands (South Florida rockland, rockland pine forest, rockland hammock); cypress communities (cypress swamps, strand swamps, domes, sloughs, ponds); hydric pine flatwoods (wet flatwoods); mesic pine flatwoods; and high pine. Florida bonneted bats roost in tree cavities, rocky outcrops, and foliage (FWC 2013) . In residential communities, the bats roost in Spanish tile roofs, but have also been found in attics, rock or brick chimneys, and fireplaces of old buildings (FWC 2011a). Colonies are small, with the largest reported as just a few dozen individuals. Diverse, open foraging habitats (e.g., prairies, riverine habitat) are also important. This large bat relies on swarms of larger insects for feeding; thus, foraging habitat for the Florida bonneted bat consists of areas that hatch and concentrate insects of this size, including vegetated areas and waterways. These bats also frequently feed on insects from agricultural areas and golf courses (Bailey et al. 2017). Female bats give birth to a single pup from June through September (FWC 2011a); however, limited data suggests that a female may undergo a second birthing season possibly in January or February.

The Florida bonneted bat is Florida's only endemic bat. Based on the results of numerous surveys conducted across southern Florida since 2003, this species appears to occur predominately in central, southwest, and extreme south (mainland) Florida, with the core range primarily consisting of habitat within Polk, Charlotte, Lee, Collier, Monroe (mainland), and Miami-Dade counties. Recent data also indicate use of portions of Highlands, Okeechobee, Glades, Palm Beach, and Broward counties and possible use of areas within Osceola, Sarasota, and De Soto counties (USFWS 2018). Loss of suitable habitat is believed to be the primary cause of population declines. Other perceived threats include pesticide and herbicide use, which decrease populations of insects, the bat's primary prey.

Potentially suitable habitat for Florida bonneted bat occurs in the rockland hammock, cypress swamps, and hydric and mesic pine forests within the Study Area. **Figure B.1-13** shows the Florida bonneted bat's USFWS Consultation Area within the Study Area.

B.1.12.8 Florida Grasshopper Sparrow

The Florida grasshopper sparrow (*Ammodramus savannarum floridanus)* is federally listed as endangered and is one of four subspecies of grasshopper sparrows in North America. The Florida grasshopper sparrow is a year-round resident of Florida and is endemic to the dry prairie of central and southern Florida. This subspecies is extremely habitat specific and relies on fire every 2 to 3 years to maintain its habitat. Florida grasshopper sparrow is named for one of its calls, a quiet buzz that sounds much like a grasshopper. Male sparrows sing only a few months of the year during the nesting season, for a few hours each day. The Florida grasshopper sparrow nests in spring (April to July) on the ground, under palmettos, or in grass clumps. The female lays three to five eggs, and young fledge within 9 to 10 days. The male sings from a low perch to defend its territory—about the only time they are readily visible--and helps raise the young. Diet includes seeds and invertebrates. It is thought that most individuals live their entire lives within a few miles of their place of birth.

Florida grasshopper sparrow habitat consists of large (greater than 123 acres [50 hectares]), treeless, relatively poorly drained grasslands that have a history of frequent fires (Delany et al. 2007; USFWS 1988). The dry prairie habitats where grasshopper sparrow occurs are typically characterized by the presence of bluestem grasses, St. John's wort, and wiregrasses (*Aristida* spp.; Delany et al. 1985) and interspersed with saw palmetto and dwarf live oaks (*Quercus minima*) ranging from 12 to 28 inches in height. These dry prairies are relatively flat and are moderately to poorly drained. Thus, dry prairies may become flooded for short periods during the rainy season but remain dry for the remainder of the year. The water table in these prairies is normally found between several centimeters and a meter below the soil surface.

Grasshopper sparrows cannot tolerate tree densities as high as one tree per acre. Some dry prairies may be artifacts of clearcutting, unnaturally frequent burning, livestock grazing, and alteration of hydrology (Abrahamson and Hartnett 1990). Prairie habitat may also have disappeared due to infrequent burn regimes from fire prevention and from planting of slash pine.

When compared with habitat of other grasshopper sparrows, habitat used by Florida grasshopper sparrow is characterized by a larger percentage of shrub and bare ground, a smaller percentage of tall vegetation, and less litter (Delany et al. 1985). Because the sparrows are ground-dwelling birds, they usually require at least 20 percent bare ground for unrestricted movement and foraging but need enough vegetation to provide nesting cover (Whitmore 1979; Vickery 1996). Large areas of prairie habitat between 593 to 3,331 acres (240 to 1,348 hectares) are needed to maintain populations of 50 breeding pairs (Delany et al. 2007). Florida grasshopper sparrows are also documented to be reproductively successful in pastures that are overgrown or ungrazed. As pastures become more heavily grazed, however, sparrow populations have been documented to decrease or disappear.

Historically, Florida grasshopper sparrows were distributed across Collier, Miami-Dade, DeSoto, Glades, Hendry, Highlands, Polk, Okeechobee, and Osceola counties (USFWS 1999). As reported in the species 5-year status review in 2023, the subspecies range had become restricted to Highlands, Okeechobee, Osceola, and Polk counties (USFWS 2023b). Notably in recent years, the number of locations where the species was known to occur has increased. Previously, the species had been documented at three discrete locations: the Three Lakes Wildlife Management Area, Kissimmee Prairie Reserve State Park, and Avon Park (USFWS 2023b). In recent years, the DeLuca Preserve and Corrigan Ranch were protected for the species, both of which share a common border with Kissimmee Prairie Preserve State Park (USFWS 2023b). Species occurrence in the Study Area for the grasshopper sparrow were last documented from 2007 to 2016 and known locations for the Florida grasshopper sparrow today are more than 100 miles from the Study Area. The absence of recent observations combined with the distance from known populations suggests a minimal to unlikely potential for species occurrence within the Study Area.

B.1.12.9 Florida Scrub-Jay

The federally listed threatened Florida scrub-jay (*Aphelocoma coerulescens*) is a is a medium-sized bird, measuring about 9 to 12 inches in length. It is characterized by its blue plumage on the wings, tail, and head, with a grayish-brown body and a white throat and forehead (FWC 2024c).

The Florida scrub-jay is endemic to Florida and primarily inhabits scrub habitats, including scrub oak and sand pine ecosystems, which occur in some of the highest areas in Florida. These areas are characterized by low-growing vegetation and sandy soils, which are essential for the species foraging and nesting behaviors. It is highly dependent on fire-maintained ecosystems, as periodic fires help to rejuvenate their habitat.

Florida scrub-jays are social birds that often live in family groups that consist of a breeding pair and their offspring. They exhibit cooperative breeding behavior, where non-breeding individuals assist in raising the young of their parents. Breeding typically occurs from March to June. The female lays a clutch of two to five eggs, which are incubated for about 16 to 18 days. Both parents participate in feeding the chicks, which fledge approximately 25 to 30 days after hatching (Cornell Lab 2024).

Florida scrub-jays are omnivorous and have a varied diet that includes insects, fruits, seeds, and small vertebrates (FWC 2024c). They are known for their caching behavior, where they store food items in the ground for later consumption, which is crucial for their survival, especially during food-scarce periods (Cornell Lab 2024)

The Florida scrub-jay's USFWS Consultation Area overlaps the northern section of the Study Area, **Figure B.1-13.** Florida scrub-jay historical habitat was documented in the north section of the Study Area (**Figure B.1-14**), within the Yamato Scrub Natural Area, which is a 217-acre natural area consisting of native scrub habitat atop the Atlantic Coastal Ridge in Palm Beach County. The Florida scrub-jay has also been recorded at the Yamato Scrub Natural Area (Palm Beach County 2024a), and therefore, has a moderate likelihood to occur within the Study Area with minimal effects.

B.1.12.10 Piping Plover

The piping plover (*Charadrius melodus*) is federally listed as threatened. Piping plover is a small migrant shorebird that occurs along the gulf coast states and Mexico, along the Atlantic Coast from Florida to Newfoundland, and in the Great Lakes region of Michigan and Wisconsin, as well as the northern Great Plains from Nebraska to Canada. There are no piping plover breeding pairs documented in Florida, but the species winters along the eastern and gulf coasts of Florida and in the Florida Keys. The main threat to piping plovers is habitat loss due to coastal development and predation (USFWS 2024b).

Wintering habitat includes sandy beaches, mudflats, sandflats, barrier island beaches, dredged material islands, dunes, and sand or algal flats in protected bays of coastal areas (Wilkinson and Spinks 1994). Primary foraging habitats include sandy mud flats, ephemeral pools, and seasonally emergent seagrass beds with abundant invertebrates. On the Atlantic Coast, the species is most often found foraging in areas adjacent to large inlets and passes. Piping plover diet consists primarily of insects, crustaceans, and marine worms (FWC 2024d), and the species forages by running along the beach and using their bills to probe the sand for food.

Figure B.1-13 shows the piping plover's USFWS Consultation Area within the Study Area. One piping plover occurrence was documented in 2014 in an urban area within the northeast section of the Study Area, depicted in **Figure B.1-14**.

B.1.12.11 Sea Turtles (Green Sea Turtle, Kemps's Ridley Sea Turtle, , Loggerhead Sea Turtle)

Sea turtles (*Cheloniidae* spp.) are marine reptiles with streamlined shells and large, paddle-like flippers that are well-adapted to life in the ocean. Sea turtles are known for their unique behaviors including long migrations between feeding grounds and beach nesting sites, where females return to the same nesting sites to lay their eggs. Females tend to return every 2 or more years, depositing multiple nests (clutches) per season.

In U.S. waters, there are six species of sea turtles, of which three have the potential to occur in the Study Area. This includes the federally listed threatened green sea turtle (*Chelonia mydas*, federally listed endangered Kemp's ridley sea turtle (*Lepidochelys kempii*),, and the federally listed threatened loggerhead sea turtle (*Caretta caretta*).

Green sea turtle nesting occurs primarily from June through late September. Females return to the nesting beach and lay an average of 3.6 nests in a season (Witherington et al. 2006). A nest averages about 128 eggs. Nesting activity has been recorded in almost every coastal county in Florida but is most concentrated along the southeast coast of Florida. Kemp's ridley sea turtles are the smallest sea turtles and primarily occupy nearshore coastal habitats that include muddy or sandy bottoms where their preferred prey of small animals and plants are found. Kemp's ridley sea turtles nest in northeastern Mexico from April through July. After emerging from the nests, hatchlings enter the water and swim offshore, remaining in the Gulf of Mexico while others are swept out of the Gulf, around Florida, and into the Atlantic Ocean by the Gulf Stream where they take refuge, rest, and feed on small prey and plants among floating Sargassum algae for 1 to 2 years or until they reach about 8 inches in length. After this oceanic stage, Kemp's ridley sea turtles move into nearshore waters of the Gulf of Mexico or the northwestern Atlantic, where they settle into shallow coastal areas and predominantly feed on crab. In Florida, the majority of the loggerhead sea turtle nesting occurs in five counties on the east coast (Brevard, Indian River, St. Lucie, Martin, and Palm Beach Counties) and they typically nest from April to September with each nest containing an average of 114 eggs (Brost et al. 2015).

Sea turtle populations are at risk due to loss and degradation of nesting and foraging habitats due to coastal development, shifting climate patterns, and pollution. Other threats include bycatches in commercial and recreational fisheries, poaching, vessel strikes, and entanglement in marine debris (NOAA 2024). The aquatic portions of the Study Area, including the Atlantic ICW, potentially can provide foraging habitats for sea turtles. Beach habitats have the potential to provide nesting grounds for the sea turtles but are located outside the Study Area. Critical habitat for green sea turtle and loggerhead sea turtle are located directly to the east of the Study Area along the Atlantic Coast shoreline. Additionally, coastal areas directly east of the Study Area are mapped as having a medium nesting density for the loggerhead sea turtle, medium and high nesting density for the leatherback sea turtle, and low and medium nesting density for the green sea turtle (**Figure B.1-17**). No data has been mapped for the hawksbill sea turtle.

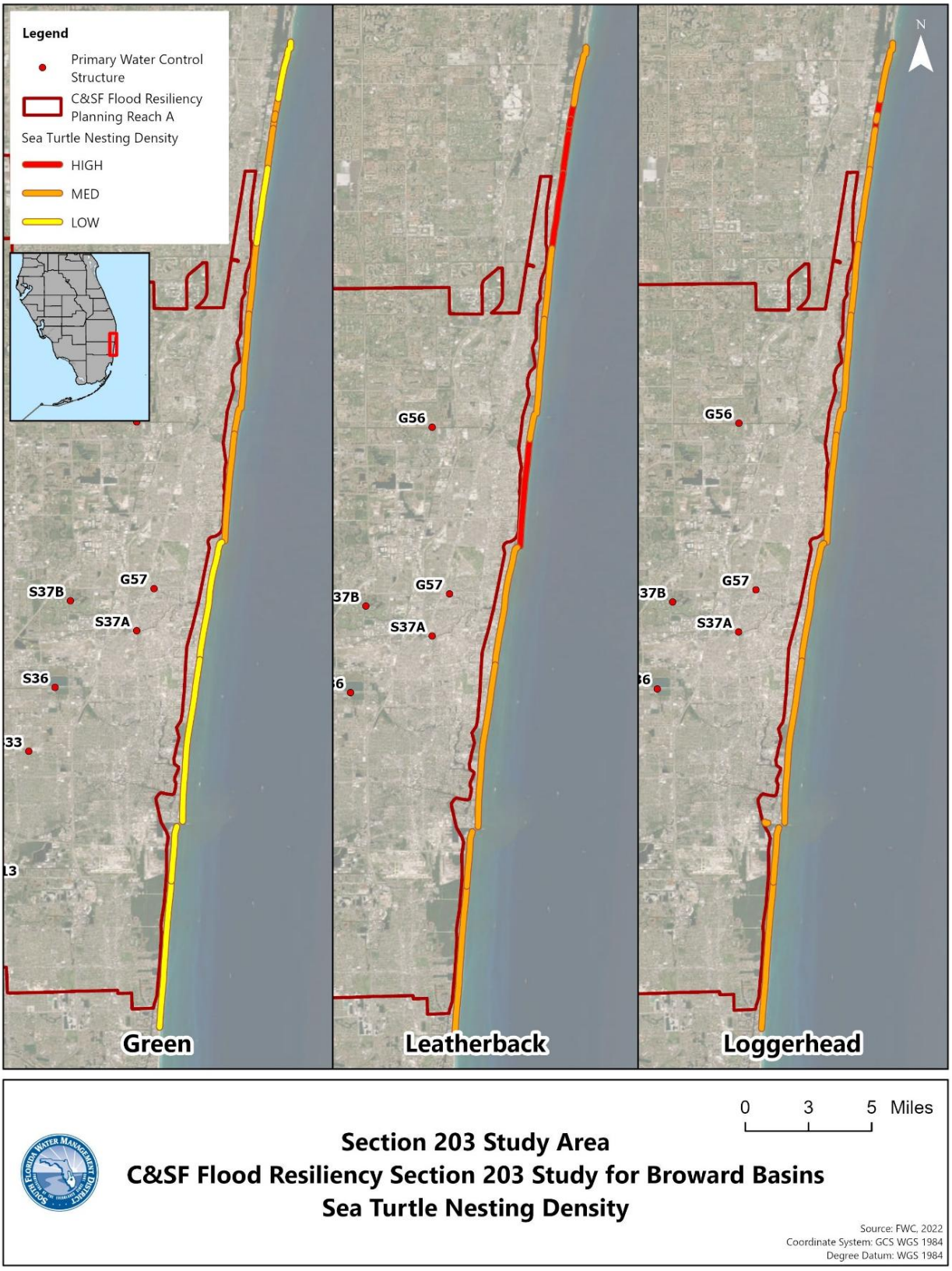


Figure B.1-17. Sea Turtle Nesting Density within the Study Area.

B.1.12.12 Smalltooth Sawfish

The federally listed endangered smalltooth sawfish (*Pristis pectinata*) are large, cartilaginous rays in the elasmobranch family distinguished by a long, toothed rostrum used both to slash and electro-detect prey. Adults, olive-gray above and white below, reach lengths of 11 to 20 feet and carry 22 to 29 teeth on each side of their "saw" (NOAA 2025b).

Historically distributed from North Carolina through Texas and across the tropical Atlantic, they now persist mainly in Florida's coastal and estuarine waters, with juveniles, less than 3 years old, inhabiting shallow, mangrove-lined bays and rivers and adult fish moving into deeper coastal and offshore reefs. They feed chiefly on fish and invertebrates, use yolk-sac viviparity to birth litters of seven to fourteen 2-foot length pups, and reach sexual maturity at about 7 years (NOAA 2025b).

Smalltooth sawfish declined precipitously in the late twentieth century due to coastal development that destroyed nursery habitat and heavy bycatch in gill nets, trawls, and longlines (NOAA 2025b). The aquatic portions of the Study Area, including the Atlantic ICW, potentially can provide foraging habitats for smalltooth sawfish.

B.1.12.13 West Indian Manatee

The West Indian (Florida) manatee (*Trichechus manatus latirostris*) is a large, plant-eating aquatic mammal that can be found in the shallow coastal waters, rivers, and springs of Florida. The West Indian manatee was listed as endangered throughout its range for both the Florida and Antillean subspecies (*T. manatus latirostris* and *T. manatus manatus*) in 1967 and received federal protection with the passage of the ESA in 1973. The manatee was designated as an endangered species prior to enactment of the ESA; therefore, no formal listing package identifying threats to the species was required by ESA Section 4(a)(1). On January 14, 2025, the USFWS published in the Federal Register (90 FR 3131) a proposed rule to maintain the federal listing of threatened for the Florida manatee and extend the ESA's protection to the Florida manatee.

Florida manatees can be found throughout the southeastern United States; however, within this region, they are at the northern limit of their range (Lefebvre et al. 2000; USFWS 2001). Because they are a subtropical species with little tolerance for cold, they remain near warm water sites in peninsular Florida during the winter. During periods of intense cold, Florida manatees will remain at these sites and will tend to congregate in warm springs and outfall canals. During warm interludes, Florida manatees move throughout the coastal waters, estuaries, bays, and rivers of both coasts of Florida and are usually found in small groups. During warmer months, Florida manatees may disperse great distances. Florida manatees have been sighted as far north as Massachusetts and as far west as Texas and in all states in between (Rathbun et al. 1982; Fertl et al. 2005). Warm weather sightings are most common in Florida and coastal Georgia. They will once again return to warmer waters when the water temperature is too cold (Hartman 1979; Stith et al. 2006). Florida manatees live in freshwater, brackish, and marine habitats, and can move freely between salinity extremes. They can be found in both clear and muddy water. Water depths of at least 3 to 7 feet (1 to 2 meters) are preferred and flats and shallows are avoided unless adjacent to deeper water. They also depend on canals as transit from one habitat to another, sources of freshwater, and resting sites.

Figure B.1-13 shows the Florida manatee's USFWS Consultation Area within the Study Area. The species has the potential to occur within the ICW and throughout the extensive canal system in the Study Area; see **Figure B.1-18** for the approximate extent of waters that can be accessible to the Florida manatee. Critical habitat has been designated for the Florida manatee, which is located south of the Study Area, depicted in **Figure B.1-16**. On September 24, 2024, the USFWS published in the Federal Register (89 FR 78134) a proposed rule to revise the critical habitat for the Florida manatee under the ESA. The new proposed critical habitat is within the Study Area and will require Section 7 consultation with the USFWS.

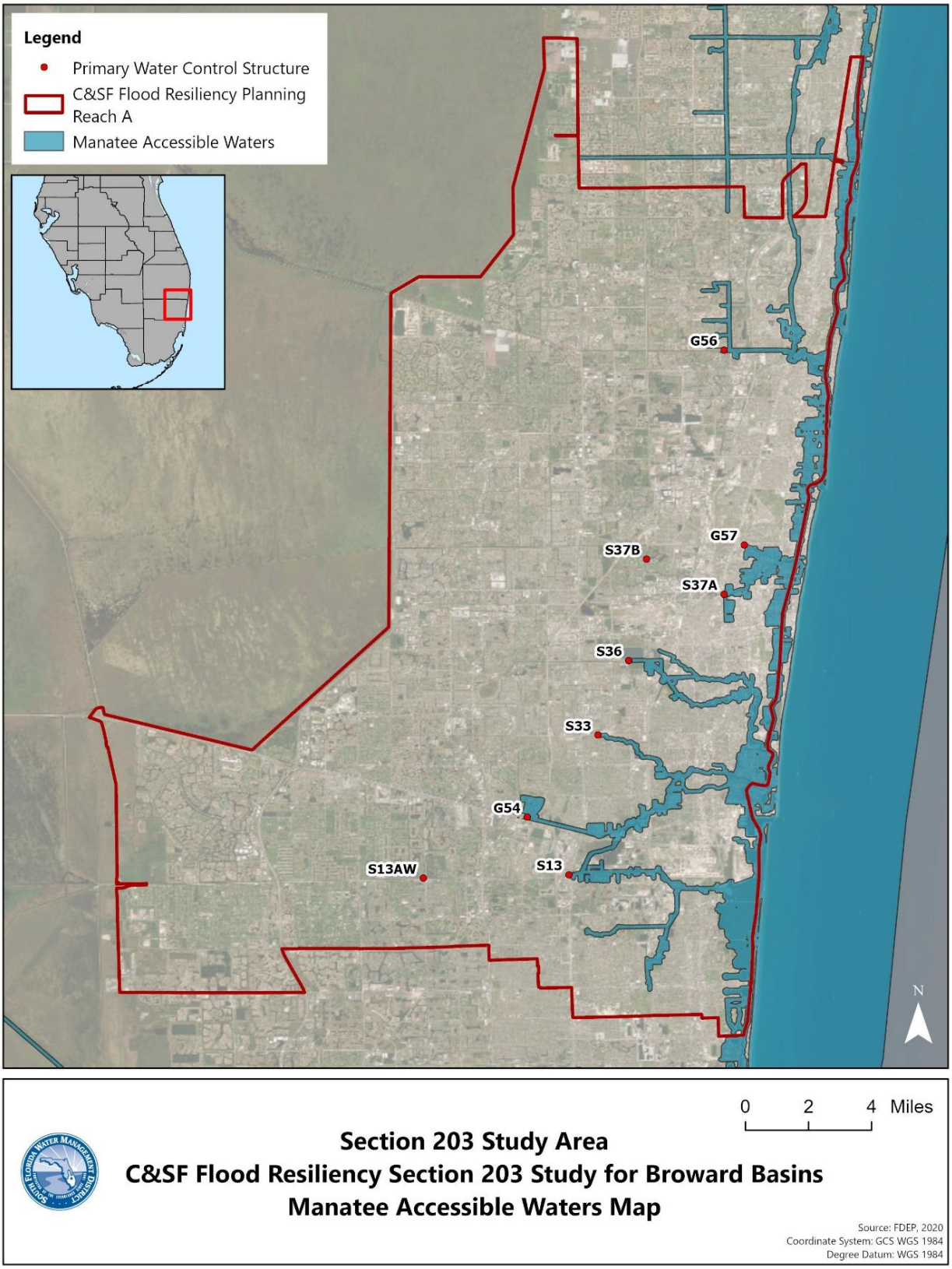


Figure B.1-18. Manatee Accessible Waters within the Study Area.

B.1.12.14 Wood Stork

The wood stork (*Mycteria americana*) is a large, white, long-legged wading bird that relies on shallow freshwater wetlands for foraging. It primarily uses shallow wetlands where prey is concentrated and movements during the breeding and non-breeding seasons are typically in response to the availability of such shallow wetlands. As a wading bird, wood storks are a wetland dependent species and rely on a mosaic of wetlands for nesting, roosting, and foraging (USFWS 2021). This species was federally listed as endangered under the ESA on February 28, 1984. In February 2023, the USFWS proposed to delist the southeast district population segment of wood stork (88 FR 9830). No critical habitat has been designated for the wood stork.

In the United States, wood storks were historically known to nest in all coastal states from Texas to South Carolina (Bent 1926). Dahl (1990) estimates these states lost about 38 million acres, or 45.6 percent, of their historic wetland habitat between the 1780s and the 1980s. However, it is important to note that wetlands and wetland losses are not evenly distributed in the landscape. Hefner et al. (1994) estimated 55 percent of the 2.3 million acres of the wetlands lost in the southeastern United States between the mid-1970s and mid-1980s were in the Gulf-Atlantic coastal flats. These wetlands were strongly preferred by wood storks as nesting habitat. Currently, wood stork nesting is known to occur in Florida, Georgia, South Carolina, and North Carolina from March to late May. However, in South Florida, wood storks lay eggs as early as October and fledge in February or March. Breeding colonies of wood storks are currently documented in all southern Florida counties except for Okeechobee County.

The wood stork population in the southeastern United States appears to be increasing. Preliminary population totals indicate that the wood stork population has reached its highest level since it was listed as endangered in 1984. In 2019, 17,398 wood stork pairs were recorded across Florida, Georgia, South Carolina, and North Carolina (USFWS 2021). Wood stork nesting was first documented in North Carolina in 2005, and wood storks have continued to nest in this state since (USFWS 2021). This suggests that the northward expansion of wood stork nesting may be continuing.

The primary cause of the wood stork population decline in the United States is loss of wetland habitats or loss of wetland function resulting in reduced prey availability. Almost any shallow wetland depression where fish become concentrated, either through local reproduction or receding water levels, may be used as feeding habitat by the wood stork during some portion of the year; however, only a small portion of the available wetlands support foraging conditions (i.e., high prey density, suitable water depths for foraging, and favorable vegetation structure) that wood storks need to maintain growing nestlings. Browder et al. (1976) documented the distribution and the total acreage of wetland types occurring south of Lake Okeechobee for the period 1900 through 1973. They combined their data for habitat types known to be important foraging habitat for wood storks (e.g., cypress domes and strands, wet prairies, scrub cypress, freshwater marshes and sloughs, and sawgrass marshes) and found these habitat types have been reduced by 35 percent since 1900.

Wood storks forage primarily within freshwater marsh and wet prairie vegetation types but can be found in a wide variety of wetland types, if prey is available, and the water is shallow and open enough to hunt successfully (Ogden et al. 1978; Coulter 1987; Gawlik et al. 2004). Calm water, approximately 5 to 25 centimeters (1.8 to 9.8 inches) in depth, and free of dense aquatic vegetation is ideal; however, wood storks have been observed foraging in ponds up to 40 centimeters (15.7 inches) in depth (Coulter

and Bryan 1993; Gawlik et al. 2004). Typical foraging sites include freshwater marshes, ponds, hardwood and cypress swamps, narrow tidal creeks or shallow tidal pools, and artificial wetlands, such as stock ponds, shallow, seasonally flooded roadside or agricultural ditches, and managed impoundments (Coulter et al. 1999; Coulter and Bryan 1993). During nesting, these areas must also be sufficiently close to the colony to allow wood storks to efficiently deliver prey to nestlings.

Wood stork core foraging areas, which cover the entirety of the Study Area, are shown in **Figure B.1-15**. Wood stork occurrences are located throughout the Study Area (**Figure B.1-14**).

B.1.13 Fish and Wildlife

Florida has high ecological diversity and is home to approximately 16,000 native species (across all phyla) owing to its geography and climate (Muller et al. 1989; FWC 2019a) of which the Study Area is within the tropical rainforest Köppen climate zone (FWC 2019a). Furthermore, the Study Area is primarily within the Miami Ridge/Atlantic Coastal Strip EPA Level IV Ecoregion (Griffith et al. 2001), which is heavily urbanized and where the elevation ranges from sea level to 25 feet above mean sea level, and which meets up with the Everglades Level IV ecoregion in the west. Habitat in the Study Area was originally part of the Everglades ecosystem (except for the historic coastal ridge), which had extensive habitat for aquatic macroinvertebrates, marsh fish, sportfish, mammals, amphibians and reptiles, and birds (especially wading birds). Over the last century, wetlands were drained for agricultural purposes, followed by conversion to residential and other urban uses. As mentioned in **Section B.1.8**, natural lands and open water occupy only 5 percent of the Study Area while developed land areas occupy about 95 percent. Generally, biodiversity has suffered in southern Florida (SFWMD 2010) with these large-scale ecosystem changes. Additionally, urbanization coupled with low elevations leaves wildlife more susceptible to risks from changing weather patterns (e.g., sea level rise and increased storm intensities). Some species require niche habitats that make them even more vulnerable (e.g., the Florida grasshopper sparrow, which utilizes wet and dry prairies), while others can use a wider range of habitat (e.g., Florida black bear [*Ursus americanus floridanus*]) or adapt better to urban areas (e.g., mallards [*Anas platyrhynchos*]).

Remaining wildlife habitat is made up of Everglades ecosystems in the western part of the Study Area (sawgrass marsh, freshwater ponds, prairies, and forested uplands) to others spread throughout such as estuarine wetlands, mangrove swamp, and parks/urban open lands (**Figure B.1-6** through **Figure B.1-9** for vegetation community types and **Figure B.1-10** for wetland types in the Study Area). The Study Area basins discharge into the Atlantic Ocean, where a unique coral habitat is found. An overview of this suitable habitat is provided by the Florida Landscape Assessment Model (FLAM), which ranks landscape based on both natural resources and fish and wildlife habitat, with the highest value of 10 indicating the highest quality landscape (FWC 2019b). Most of the Study Area WCS have a ranking of 1, though the S-13 Pump Station and Gated Spillway falls within a FLAM ranking of 2. Higher FLAM rankings are generally found downstream of the structures along the coast and upstream adjacent to the WCAs. Two areas with FLAM rankings of 5 and 7 are downstream of the G-54 Gated Spillway and S-13 Pump Station and Gated Spillway, which are made up of mangroves and other habitat. Areas with a higher FLAM ranking are found along the western edge of the managed upstream watershed basins, especially Hillsboro Canal Basin and C-11 West Basin, corresponding with natural areas like marshes and wetlands.

FWC is responsible for protecting and managing native fish and wildlife species. In 2019, the FWC published the *State Wildlife Action Plan* as required by any states aiming to receive funds from Congress' State and Tribal Wildlife Grant Program. The State and Tribal Wildlife Grant Program is designed to help states manage populations proactively in hopes they do not become imperiled and end up being listed under the ESA. The 2019 *State Wildlife Action Plan* details habitat types and associated Species of Greatest Conservation Need (SGCN), which have been identified as potentially becoming imperiled in the future but do not currently receive any regulatory protection. Species lists that contribute to the designation of SGCN include federal and state listed species, International Union for Conservation of Nature Red List Ranked species ("vulnerable" or above), NatureServe rankings (S1, G1, or S2G2), and taxa of concern. The FNAI rare animal list contributes to the SGCN list. FNAI's species lists by county (FNAI 2024) are shown in **Table B.1-9** with those that qualify as SGCN specified. In Broward County, the FNAI list includes 25 invertebrates and 29 vertebrates, and in Palm Beach County, the list includes 31 invertebrates and 50 vertebrates[2].

Table B.1-9. Florida Natural Area Inventory Rare Species List for Broward and Palm Beach Counties.

Common Name	Scientific Name	Broward County FNAI List	Palm Beach County FNAI List	SGCN Species
Amphibians				
Gopher frog	*Lithobates capito*	N	Y	Y
Ants, Bees, and Wasps				
Florida Panurgine Bee	*Perdita (Hexaperdita) graenicheri*	N	Y	Y
Beetles				
Ataenius beetle	*Ataenius brevicollis*	N	Y	Y
Bicolored burrowing scarab beetle	*Bolbocerosoma hamatum*	N	Y	N
Dark tiny sand-loving scarab	*Geopsammodius fuscus*	N	Y	Y
Elizoria June beetle	*Phyllophaga elizoria*	N	Y	Y
Elongate June beetle	*Phyllophaga elongata*	Y	Y	N
Fig seed diving beetle	*Desmopachria cenchramis*	Y	Y	Y
Florida intertidal firefly	*Micronaspis floridana*	Y	N	N
Gopher tortoise copris beetle	*Copris gopheri*	N	Y	Y
Gopher tortoise hister beetle	*Chelyoxenus xerobatis*	N	Y	N
Little gopher tortoise scarab beetle	*Alloblackburneus troglodytes*	N	Y	N
Little silky June beetle	*Serica tantula*	N	Y	N
Miami chafer beetle	*Cyclocephala miamiensis*	Y	N	Y
Punctate gopher tortoise Onthophagus beetle	*Onthophagus polyphemi polyphemi*	N	Y	N
Sand pine scrub Ataenius beetle	*Haroldiataenius saramari*	N	Y	N
Scrub tiger beetle	*Cicindela scabrosa*	Y	N	N
Three-spotted pleasing fungus beetle	*Ischyrus dunedinensis*	Y	N	N
Birds				
American redstart	*Setophaga ruticilla*	N	Y	N
Bachman's sparrow	*Peucaea aestivalis*	Y	Y	Y
Bald eagle	*Haliaeetus leucocephalus*	Y	Y	N
Black-crowned night-heron	*Nycticorax nycticorax*	Y	Y	N
Black-whiskered vireo	Vireo altiloquus	Y	N	Y
Black rail	*Laterallus jamaicensis*	Y	Y	Y

[2] Since only a portion of each of Broward and Palm Beach counties are included in the Study Area, some county-level data presented in this section may be over- or under-represented.

Common Name	Scientific Name	Broward County FNAI List	Palm Beach County FNAI List	SGCN Species
Crested caracara	*Caracara plancus*	Y	Y	Y
Florida burrowing owl	*Athene cunicularia floridana*	Y	Y	Y
Florida sandhill crane	*Antigone canadensis pratensis*	N	Y	Y
Florida scrub-jay	*Aphelocoma coerulescens*	N	Y	Y
Glossy ibis	*Plegadis falcinellus*	Y	Y	N
Hairy woodpecker	*Dryobates villosus*	N	Y	Y
Least tern	*Sterna antillarum*	Y	Y	Y
Limpkin	*Aramus guarauna*	Y	Y	Y
Little blue heron	*Egretta caerulea*	Y	Y	Y
Osprey	*Pandion haliaetus*	N	Y	N
Painted bunting, eastern population	*Passerina ciris* pop. 1	N	Y	Y
Red-cockaded woodpecker	*Dryobates borealis*	N	Y	Y
Roseate spoonbill	*Platalea ajaja*	Y	Y	Y
Sandwich tern	*Thalasseus sandvicensis*	N	Y	N
Snail kite	*Rostrhamus sociabilis*	Y	Y	N
Snowy egret	*Egretta thula*	Y	Y	Y
Swallow-tailed kite	*Elanoides forficatus*	N	Y	Y
Tricolored heron	*Egretta tricolor*	Y	Y	Y
White ibis	*Eudocimus albus*	Y	Y	Y
White-tailed kite	*Elanus leucurus*	Y	Y	Y
Wood stork	*Mycteria americana*	Y	Y	Y
Yellow-crowned night-heron	*Nyctanassa violacea*	N	Y	N
Butterflies and Moths				
Amethyst hairstreak	*Chlorostrymon maesites*	Y	N	Y
Atala	*Eumaeus atala*	Y	Y	N
Cuban crescent	*Anthanassa frisia*	N	Y	Y
Florida white	*Appias drusilla*	N	Y	Y
Helicta satyr	*Neonympha helicta dadeensis*	Y	Y	N
Lyside sulphur	*Kricogonia lyside*	Y	N	Y
Malachite	*Siproeta stelenes*	Y	N	N
Martial scrub-hairstreak	*Strymon martialis*	Y	Y	N
Pink-spot sulphur	*Aphrissa neleis*	Y	Y	N
Statira sulphur	*Aphrissa statira*	Y	Y	N
Tropical buckeye	*Junonia zonalis*	Y	N	N
Caddisflies				
Tavares white miller caddisfly	*Nectopsyche tavara*	N	Y	N
Clams and Mussels				
Florida rainbow	*Villosa amygdala*	Y	Y	N
Corals and Allies				
Boulder star coral	*Orbicella annularis*	Y	Y	Y
Large flower coral	*Mussa angulosa*	Y	Y	N
Staghorn coral	*Acropora cervicornis*	Y	N	Y
Crabs, Crayfishes, and Shrimps				
Mangrove root crab	*Goniopsis cruentata*	Y	Y	N
Dragonflies and Damselflies				
Blue striped spreadwing	*Lestes tenuatus*	Y	Y	Y
Lucifer swampdamsel	*Leptobasis lucifer*	Y	N	N
Purple skimmer	*Libellula jesseana*	N	Y	Y
Fishes				
Bigmouth sleeper	*Gobiomorus dormitor*	N	Y	N
Mangrove rivulus	*Rivulus marmoratus*	Y	N	Y
Opossum pipefish	*Microphis brachyurus*	N	Y	N

Common Name	Scientific Name	Broward County FNAI List	Palm Beach County FNAI List	SGCN Species
Spottail goby	*Ctenogobius stigmaturus*	N	Y	Y
Striped croaker	*Corvula sanctaeluciae*	N	Y	N
Grasshoppers and Allies				
East Coast scrub grasshopper	*Melanoplus indicifer*	N	Y	Y
Mammals				
Florida Black bear	*Ursus americanus floridanus*	Y	Y	N
Florida manatee	*Trichechus manatus latirostris*	Y	Y	Y
Florida mouse	*Podomys floridanus*	N	Y	Y
Florida panther	*Puma concolor coryi*	Y	Y	Y
Round-tailed muskrat	*Neofiber alleni*	N	Y	Y
Southeastern fox squirrel	*Sciurus niger niger*	N	Y	N
Reptiles				
American alligator	*Alligator mississippiensis*	Y	Y	N
Eastern diamondback rattlesnake	*Crotalus adamanteus*	N	Y	N
Eastern indigo snake	*Drymarchon couperi*	N	Y	Y
Florida kingsnake	*Lampropeltis getula floridana*	Y	Y	N
Florida scrub lizard	*Sceloporus woodi*	Y	Y	Y
Gopher tortoise	*Gopherus polyphemus*	Y	Y	Y
Green sea turtle	*Chelonia mydas*	Y	Y	Y
Hawksbill sea turtle	*Eretmochelys imbricata*	Y	Y	Y
Kemp's Ridley sea turtle	*Lepidochelys kempii*	N	Y	Y
Leatherback sea turtle	*Dermochelys coriacea*	Y	Y	Y
Loggerhead sea turtle	*Caretta caretta*	Y	Y	Y
Pine snake	*Pituophis melanoleucus*	N	Y	N
Snails and Allies				
Caribbean birddrop	*Sterkia eyriesii*	Y	N	Y
Queen conch	*Aliger gigas*	Y	Y	N
Stock Island tree snail	*Orthalicus reses reses*	N	Y	Y
Truncate urocoptid	*Cochlodinella poeyana*	Y	N	Y
Spiders				
Red widow spider	*Latrodectus bishopi*	N	Y	N

Note: Since only a portion of each of Broward and Palm Beach counties are included in the Study Area, some county-level data presented in this section may be over- or under-represented.

Within or near the WCS, rare wildlife listed by FNAI with documented occurrences are Florida burrowing owl (*Athene cunicularia floridana*), Miami chafer beetle (*Cyclocephala miamiensis*) at the G-54 Gated Spillway, and statira (*Aphrissa statira*) at the S-36 Gated Spillway. The Florida manatee has a documented historical occurrence at the S-13 Pump Station and Gated Spillway; however, research-grade volunteer observations have documented manatee occurrences across the Study Area within the last 5 years (iNaturalist 2025). Two species, wood stork and gopher tortoise, were listed as likely to occur, since both are known to occur. Numerous wood stork occurrences have been documented within the Study Area, as can be seen on **Figure B.1-14**. Gopher tortoise has also been found throughout the Study Area according to research-grade volunteer observations (iNaturalist 2025). Other species listed with the potential to occur across multiple WCS including spottail goby (*Ctenogobius stigmaturus*), truncate urocoptid (*Cochlodinella poeyana*), eastern indigo snake, rim-rock crowned snake, gopher frog, Florida scrub lizard (*Sceloporus woodi)*, Florida bonneted bat, Florida mouse (*Podomys floridanus*), elongate June beetle (*Phyllophaga elongata*), and scrub tiger beetle (*Cicindela scabrosa*). Florida burrowing owl, gopher tortoise, and rim-rock crowned snake are state listed species. Wood stork,

Florida manatee, Florida bonneted bat, and eastern indigo snake are federally listed species (see **Section B.1.12** for more information).

B.1.13.1 Marine/Estuarine Wildlife

Coral reefs form some of the most biodiverse ecosystems on earth and are important for protecting shorelines from wave energy, which is particularly notable in the context of sea level rise and increased storm frequency impacts (NOAA 2020). The coastal area adjacent to the Study Area is made up of the Kristin Jacobs Coral Aquatic Preserve and is a conservation area that has over 6,000 marine species including fish, stony corals, gorgonians, sponges, and marine invertebrates (FDEP 2024a). The following coral species found within coastal marine waters are listed as federally threatened: staghorn coral (*Acropora cervicornis*), elkhorn coral (*Acropora palmata*), boulder star coral (*Orbicella franksi*), lobed star coral (*Orbicella annularis*), mountainous star coral (*Orbicella faveolata*), pillar coral (*Dendrogyra cylindrus*), and rough cactus coral (*Mycetophyllia ferox*). Pillar coral is also proposed to be listed as endangered under the ESA (FWC 2022; NOAA 2025a).

Coral ecosystems allow for sediment accumulation, which helps form mangrove ecosystems, another important habitat for wildlife within an estuarine environment. Mangroves provide habitat for fish, crustaceans, and shellfish, and food for various species like tarpon (*Megalops atlanticus*) and mangrove tree crab (*Aratus pisoni*). It is estimated that 75 percent of game fish and 90 percent of commercial species in southern Florida rely on mangrove ecosystems during their lifespan (FMNH 2024). Saltwater intrusion has been an ongoing issue in the Study Area and creates increased saline conditions that decreases suitable habitat for juvenile sport fish like spotted seatrout (*Cynoscion nebulosus*), tarpon, and red drum *(Sciaenops ocellatus* [USACE 1999]). Estuarine environments are also important for shellfish like blue crabs, hard clams, oysters, and shrimp species.

B.1.13.2 Fish

Fish are found throughout the Study Area's canal system and natural water habitats. The canal system in the Study Area is a mixture of Canal, Cultural–Riverine, and Cultural–Estuarine land classes, as defined by the Florida Cooperative Land Cover Map (**Figure B.1-6** through **Figure B.1-9**). The "cultural" part of the definition refers to habitats that are influenced by human disturbance or maintained in a non-natural manner (FWC 2023). Natural water habitats for fish in the Study Area include estuarine and marine waters (deepwater and wetlands), freshwater emergent wetlands, and freshwater ponds, lakes, and rivers **(Table B.1-5**). The canals within the Study Area support freshwater and saltwater fish that provide unique sportfishing opportunities for residents and tourists. Common sportfish species known to occur in the Study Area include Florida largemouth bass (*Micropterus salmoides floridanus*), snook (*Centropomus undecimalis)*, tarpon, channel catfish *(Ictalurus punctatus*), bluegill (*Lepomis macrochirus*), black crappie/speckled perch (*Pomoxis nigromaculatus*), butterfly peacock (*Cichla ocellaris*), and exotic species such as Goldline snakehead (*Channa* spp.), oscar (*Astronotus ocellatus*), spotted tilapia (*Tilapia mariae*), and Mayan cichlid (*Mayaheros urophthalmus* [FWC 2015a,b,c, 2024e]). Fish are stocked in two locations within the Study Area: Central Broward Regional Park South Lake just north and adjacent to the S-33 Gated Spillway, and Plantation Heritage Park Lake Fish Management Area less than a mile north of the G-54 Gated Spillway (FWC 2024f).

Largemouth bass is a widely popular game fish species across North America, and this is especially true for Florida. The FWC published the *Black Bass Management Plan* in 2011 to ensure Florida remains the "Bass Fishing Capital of the World" in the long-term (FWC 2011b). In the Study Area, Florida largemouth bass is present and unique because of its rapid growth, making it a trophy fish species for anglers. Largemouth bass typically thrive in warmer eutrophic systems with high amounts of vegetation (Procopio 2019). The C-14 (Cypress Creek) Canal, which runs just north of the S-37B Gated Spillway, holds more largemouth bass than most other canals within southeast Florida (FWC 2015a).

Smaller marsh fishes are intermediate trophic level species that provide food for larger fish, alligators, and wading birds. These smaller fish process algae, plankton, macrophytes and macroinvertebrates, contributing to the food chain. Marsh fish have been negatively impacted over time by the region's large-scale hydrologic alterations, causing diminished populations of species. In and near the Study Area, marsh fish include golden topminnow (*Fundulus chrysotus*), bluefin killifish (*Lucania goodei*), sailfin molly *(Poecilia latipinna*), mosquitofish (*Gambusia holbrooki*), oscar, flagfish *(Jordanella floridae*), and smaller sunfish (e.g., bluegill). Associated aquatic macroinvertebrates that play roles in the cycling of energy and nutrients include amphipods (*Hyallela aztecus*), freshwater prawn (*Palaemonetes paludosus*), crayfish (*Procambarus alleni*), and apple snail (*Pomacea paludosa* [USACE 1999]).

B.1.13.3 Birds

Native birds are protected under the Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712), which prohibits the "take" (i.e., killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the USFWS and is an international conservation measure aimed at maintaining sustainable bird populations (USFWS 2024c). According to a comprehensive regional list provided by eBird verified records, there are 355 bird species that have been documented in Broward County and 410 bird species in Palm Beach County (Cornell University 2024). The slow-moving waters of the Everglades from its headwaters to its outlets historically provided abundant wetland habitat for wading birds, which have seen a 90 to 95 percent reduction in their populations (SFWMD 2010). Remaining wetland habitat in the Study Area provides home for several wading bird species, including wood stork, white ibis (*Eudocimus albus*), roseate spoonbill, little blue heron, tri-colored heron, black-crowned night heron (*Nycticorax nycticorax*), and snowy egret (*Egretta thula*). Secretive marsh birds found in similar habitats include species such as king rail (*Rallus elegans*), American bittern (*Botaurus lentiginosus*), and limpkin (*Aramus guarauna*). Critical food and habitat for these birds are fishes that occupy marshes and lower salinity/estuarine mangroves.

Other birds present in the Study Area include waterfowl, shorebirds, birds of prey, songbirds, and pelagic species. The Study Area falls within the Atlantic Flyway, acting as a critical rest stop for migratory passerines like warblers; examples include prothonotary warbler (*Protonotaria citrea*) and Cape May warbler (*Setophaga tigrina*), as well as vireos like the yellow-throated vireo (*Vireo flavifrons*). The distribution of birds of prey is dependent on suitable nest and perch sites and availability of prey. Common birds of prey in the Study Area include black vulture (*Coragyps atratus*), turkey vulture (*Cathartes aura*), osprey (*Pandion haliaetus*), cooper's hawk (*Astur cooperii*), and red-shouldered hawk (*Buteo platypterus*). Birds have already been responding to changing weather patterns by changing the timing of their migration and biological life cycle. Sea level rise and storm surges are expected to impact

coastal habitats, directly impacting wading birds. Additionally, there may be a northern shift in species ranges as temperatures rise and habitat and resources change with climate impacts (Pearlstine 2009).

Important Bird Areas (IBAs) are designated by National Audubon Society as places that birds are critically dependent upon for migration, breeding, or nonbreeding habitat. Within the Study Area, there are two IBAs. Along the coast is the Southern Atlantic Migrant Stopover IBA, which encompasses three coastal parks (Hugh Taylor Birch State Park, John U. Lloyd Beach State Park, and Spanish River Park), providing stopover habitat for neotropical migrants. The Northern Everglades IBA, providing vast areas of marshes for birds, borders most of the Study Area to the west, and one portion extends into the C-11 West Basin (Audubon 2024).

Like the SGCN-designated species at a state level, Birds of Conservation Concern are identified by the USFWS as birds that are likely to become candidates under the ESA. Birds of Conservation Concern that have the potential to occur in the Study Area (USFWS 2024a) include American kestrel (*Falco sparverius paulus*), black skimmer, chimney swift (*Chaetura pelagica*), Florida burrowing owl, great blue heron (*Ardea herodias*), gull-billed tern (*Gelochelidon nilotica*), king rail, least tern, lesser yellowlegs (*Tringa flavipes)*, magnificent frigatebird (*Fregata magnificens*), mangrove cuckoo (*Coccyzus minor*), painted bunting (*Passerina ciris)*, prairie warbler (*Setophaga discolor*), red-headed woodpecker (*Melanerpes erythrocephalus*), reddish egret, ruddy turnstone (*Arenaria interpres morinella*), semipalmated sandpiper (*Calidris pusilla*), short-billed dowitcher (*Limnodromus griseus*), swallow-tailed kite (*Elanoides forficatus*), white-crowned pigeon (*Patagioenas leucocephala*), willet (*Tringa semipalmata*), and Worthington's marsh wren (C*istothorus palustris griseus*).

B.1.13.4 Mammals

Mammals are susceptible to habitat loss and changes in prey availability due to shifting climate patterns (Pearlstine et al. 2009). There are a variety of FNAI-listed mammals that have the potential to occur in the Study Area, such as the Florida black bear and southeastern fox squirrel (*Sciurus niger niger*) (FNAI 2024). Common species that occur in the Study Area include eastern gray squirrel (*Sciurus carolinensis*), river otters (*Lontra canadensis*), raccoons (*Procyon lotor*), gray fox (*Urocyon cinereoargenteus*), Virginia opossums (*Didelphis virginiana*), and coyotes (*Canis latrans* [iNaturalist 2025]). Threatened or endangered mammals in the Study Area, like Florida bonneted bat and West Indian manatee, are discussed in **Section B.1.12**.

Florida black bears are currently protected under FAC 68A-4.009 Florida Black Bear Conservation Rule. An estimated 4,000 bears are present in the state. Encountering a bear within the Study Area would be rare; however, there has been a road mortality of a black bear along the western edge of the Study Area as well as a bear capture, and numerous bear-related calls in Broward County within the Study Area. Black bears can be found across a diversity of habitats but generally prefer habitats containing trees and shrubs that provide fruits and nuts, and those with dense understories (FWC 2024g).

Mammals that use aquatic habitats include river otters (living in burrows along the banks of water bodies, where they feed on fish and crustaceans [FWC 2024h]). Other species found near water include raccoons and white-tailed deer (*Odocoileus virginianus* [iNaturalist 2025; Appendix C, SFWMD 2024d]). White-tailed deer are Florida's most important game species with an approximate population of 700,000 in the state. They typically occur in forest edge habitats and open areas in grasslands or oak

hammocks. There is no hunting of white-tailed deer permitted in the Study Area, and there are no Wildlife Management Areas present (FWC 2024i).

B.1.13.5 Amphibians and Reptiles

There is a great diversity of amphibians and reptiles throughout the Study Area, and they are an important food source for wading birds, alligators, and predatory fish. According to the Atlas of Amphibians and Reptiles in Florida (Krysko et al. 2011), there are 66 verified native species and 38 non-native species that have been documented in Broward County and 72 verified native species and 22 non-native species found in Palm Beach County. Generally, native amphibian and reptile species diversity decreases moving southward along the peninsula of Florida. Freshwater wetlands (i.e., marshes, swamps, mangrove estuaries) are one of the primary habitats for amphibians and reptiles. Terrestrial habitats like forests and grasslands are also important for certain species of amphibians like toads and reptiles like lizards.

Species that have the potential to occur within the Study Area include, for example, brown anole (*Anolis sagrei*), green anole (*Anolis carolinensis*), northern curly-tailed lizard (*Leiocephalus carinatus*), Florida softshell turtle (*Apalone ferox*), common snapping turtle (*Chelydra serpentina*), loggerhead sea turtle, gopher tortoise, banded/southern watersnake (*Nerodia fasciata)*, Brahminy blindsnake (*Indotyphlops braminus*), eastern narrow-mouthed toad (*Gastrophryne carolinensis*), southern leopard frog, and American alligator *(Alligator mississippiensi)*. The American alligator is a keystone species, leaving holes and trails that turn into ponds, which creates habitat for fish and resultant food for wading birds. Alligators in turn prey on fish, invertebrates, amphibians, birds, and mammals. They are also an indicator species as they are very sensitive to changes in hydrological conditions (USACE 1999). Overall, amphibians and reptiles are some of the most sensitive groups of species to shifting weather patterns, particularly in response to changes in temperature and hydro patterns (Pearlstine et al. 2009).

B.1.14 Geology and Soils

The region of influence (ROI) for geology and soils is generally limited to the operational footprint for nine WCS within the Study Area, and the adjacent upgradient and downgradient areas of the primary canals associated with these structures. This discussion of geology and soils includes general geology, geological resources, geological hazards, and soils. General geology refers to topography, structural geology, and stratigraphy. Geological resources include aggregate deposits, minerals, and oil production. Geological hazards include a discussion of sinkholes and seismicity (earthquake potential). The discussion of soils includes a description of soils present at the WCS.

B.1.14.1 Geology

The WCS are in the Everglades Geomorphic District, which encompasses the southernmost portion of the Florida peninsula. The Everglades District includes some of the youngest geologic strata and landscapes in Florida and is underlain by Pliocene-Pleistocene sediments (deposited 5.4 million to 11,700 years ago) to Holocene sediments (deposited 11,700 years ago to present). The Everglades District is characterized by the following: (1) geologically young, (2) landforms are closely related to Pliocene-Pleistocene coastal and marine shelf sedimentation and Holocene wetland development, and

(3) drainage is largely by way of sloughs[3], sheet flow in wetlands, and poorly defined stream systems (FGS 2022).

Elevations within the Everglades District gradually decrease from north to south. Lowest elevations in the Everglades District are at sea level along the coastlines. The Everglades District is further divided into 11 provinces, of which the Atlantic Coastal Ridge Province contains nearly all the project ROI. The Atlantic Coastal Ridge Province parallels and, over much of its extent, is adjacent to the Atlantic Ocean (FGS 2022).

The Atlantic Coastal Ridge Province includes a larger Pleistocene coastal ridge and associated smaller ridges. In Broward County, the ridge is interrupted by low, west to east channels with wetlands. These low areas were late Pleistocene tidal channels that have been modified by karst processes. These ancient tidal channels, known as transverse glades, drain overflow from the Everglades eastward toward the Atlantic Ocean. Although elevations in the Atlantic Coastal Ridge Province range from sea level to approximately 40 feet above mean sea level, nearly 95 percent of the land-surface elevations range between 5 feet and 20 feet above mean sea level. The median elevation is 10 feet above mean sea level. Six of the project WCS are located within the Atlantic Coastal Ridge Province and three are located within the Everglades Province, immediately adjacent to the western boundary of the Atlantic Coastal Ridge Province (FGS 2022).

The surficial geology of Atlantic Coastal Ridge Province in the Study Area is predominantly composed of shelly quartz sand, coquina, and limestone, identified as the Miami Limestone. This geologic material also comprises the SAS, including the Biscayne Aquifer, which is the primary source of fresh, potable water in southeastern Florida. The surficial Holocene to Pliocene aged units associated with the Miami Limestone and Biscayne Aquifer are approximately 300 feet in thickness, with the thickest deposits occurring at the coast that thins to the west under the Everglades. Below this, the Hawthorn Group sediments consist of interbedded sand, silt, gravel, clay, carbonate, and phosphatic sand and carbonate mudstone, claystone, and dolomite, approximately 800 feet in thickness. Most of the Hawthorn Group is considered a confining unit, meaning that it does not readily transmit water. Below this are the geologic units that comprise the FAS that include the Oligocene-aged Suwannee Limestone and the Eocene-aged Ocala Limestone, Avon Park Formation, and Oldsmar Formation. The FAS consists of a range of fossil-containing deposits, limestone (mud, packstone, grainstone), and dolomitic limestone approximately 2,500 feet in thickness. The underlying Paleocene-aged Cedar Keys Formation forms the base of the FAS. (USGS 2013).

Southeastern Florida has not been seismically active in recent times, with no earthquakes recorded since 1900 (USGS 2024a). No faults at land surface are identified within southeastern Florida (USGS 2021). The USGS rates ground motions using peak ground acceleration, which is the maximum acceleration experienced during an earthquake and is measured in units of acceleration due to gravity (“g”). USGS data indicate that an earthquake causing 0.02g peak horizontal ground acceleration has a 2 percent probability of exceedance in 50 years; and an earthquake causing 0.006g peak horizontal ground acceleration has a 10 percent probability of exceedance in 50 years (USGS 2024b). Earthquakes of that magnitude would be unlikely to cause any damage (FEMA 2020).

[3] A slough is a low-lying area of land that channels water through the Everglades.

Karst is a type of landscape formed from the dissolution of soluble rocks, primarily limestone and dolomite. It is characterized by unique features such as sinkholes and subsidence, caves, underground drainage systems, and springs. Within the Study Area, sinkhole features are present; however, they are few, shallow, of small diameter, and develop gradually. Cover-subsidence sinkholes dominate (FDEP 2024b).

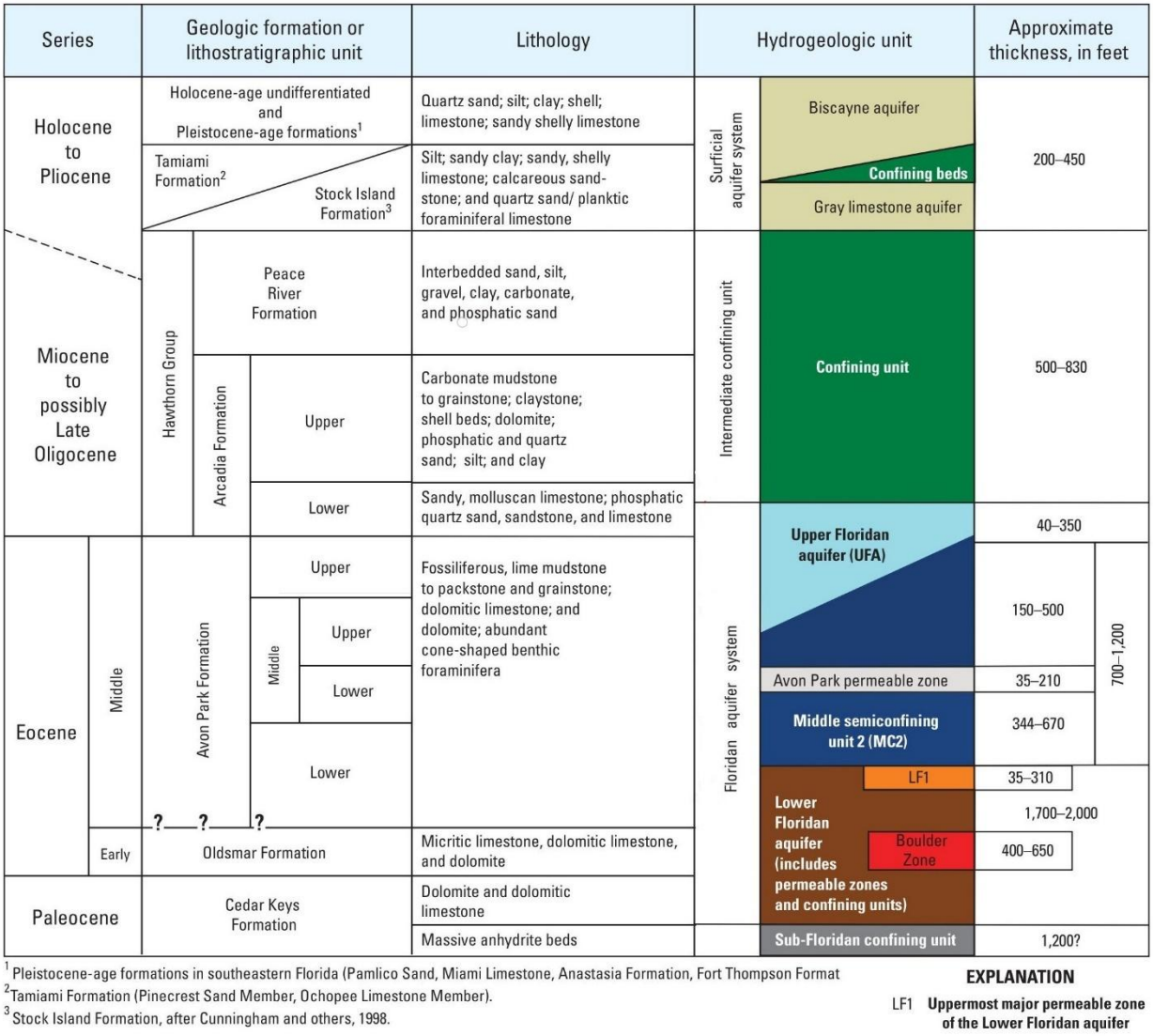
The Study Area does not contain any active mining or oil/gas extraction wells (FDEP 2024c,d).

Table B.1-10 summarizes geomorphology province, ground elevation, surficial geology, and karst risk for the WCS. **Figure B.1-19** shows the generalized stratigraphic column for Broward County.

Table B.1-10. Geologic Summary for the Water Control Structures in the Study Area.

Water Control Structure	Ground Elevation (ft) (MSL)	Geomorphology Province	Surficial Geology	Lithology	Age	Florida Sinkhole Types
G-56 Gated Spillway	12	Atlantic Coastal Ridge Province	Miami Limestone	Limestone, sand	Pleistocene	Cover is 30 to 200 ft thick. Consists mainly of incohesive and permeable sand. Sinkholes are few, shallow, of small diameter and develop gradually. Cover-subsidence sinkholes dominate.
G-57 Gated Spillway	8	Atlantic Coastal Ridge Province	Miami Limestone	Limestone, sand, medium fine sand and silt	Pleistocene	Cover is 30 to 200 ft thick. Consists mainly of incohesive and permeable sand. Sinkholes are few, shallow, of small diameter and develop gradually. Cover-subsidence sinkholes dominate.
S-37B Gated Spillway	8	Atlantic Coastal Ridge Province	Miami Limestone	Limestone, sand	Pleistocene	Cover is 30 to 200 ft thick. Consists mainly of incohesive and permeable sand. Sinkholes are few, shallow, of small diameter and develop gradually. Cover-subsidence sinkholes dominate.
S-37A Gated Spillway	7	Atlantic Coastal Ridge Province	Miami Limestone	Limestone, sand	Pleistocene	Cover is 30 to 200 ft thick. Consists mainly of incohesive and permeable sand. Sinkholes are few, shallow, of small diameter and develop gradually. Cover-subsidence sinkholes dominate.
S-36 Gated Spillway	10	Atlantic Coastal Ridge Province	Miami Limestone	Limestone, sand	Pleistocene	Cover is 30 to 200 ft thick. Consists mainly of incohesive and permeable sand. Sinkholes are few, shallow, of small diameter and develop gradually. Cover-subsidence sinkholes dominate.
S-33 Gated Spillway	5	Everglades Province	Miami Limestone	Limestone, sand	Pleistocene	Cover is 30 to 200 ft thick. Consists mainly of incohesive and permeable sand. Sinkholes are few, shallow, of small diameter and develop gradually. Cover-subsidence sinkholes dominate.
G-54 Gated Spillway	8	Everglades Province	Miami Limestone	Limestone, sand	Pleistocene	Bare or thinly covered limestone. Sinkholes are few, generally shallow and broad and develop gradually. Solution sinkholes dominate.
S-13AW Gated Culvert	7	Everglades Province	Miami Limestone	Limestone, sand	Pleistocene	Bare or thinly covered limestone. Sinkholes are few, generally shallow and broad and develop gradually. Solution sinkholes dominate.
S-13 Pump Station and Gated Spillway	6	Atlantic Coastal Ridge Province	Miami Limestone	Limestone, sand	Pleistocene	Cover is 30 to 200 ft thick. Consists mainly of incohesive and permeable sand. Sinkholes are few, shallow, of small diameter and develop gradually. Cover-subsidence sinkholes dominate.

Note: MSL = mean sea level
Source: FGS 2022, FDEP 2024b



Source: USGS 2013

Figure B.1-19. Generalized Stratigraphic Column for the Study Area.

B.1.14.2 Soils

Soils adjacent to the WCS consist of the following soil types: Udorthents; Immokalee-Urban land complex; Urban land; Basinger fine sand; Immokalee, limestone substratum-Urban land complex; Margate fine sand; and Lauderhill muck. In general, these soil types consist of fine, gravelly, and cobbly sands (NRCS 2024). None of these soils are considered prime farmland. Soil characteristics for these soil units are summarized in **Table B.1-11**.

There are no FDEP cleanup sites in the vicinity of the WCS (FDEP 2024e).

Table B.1-11. Soil Characteristics at the Water Control Structures.

Water Control Structure	Soil Unit Name	Drainage	Frequency of Flooding/Ponding	Depth to Restrictive Layer	Depth to Water Table	Runoff Potential	Hydric	Susceptibility to Water Erosion	Susceptibility to Wind Erosion	Construction Suitability	Farmland Classification	Typical Profile
G-56 Gated Spillway	Udorthents	Well-drained	None	>80 inches	>80 inches	Negligible	No	Low	High	Very Limited	Not prime farmland	0 to 57 inches: cobbly sand
	Udorthents, 2 to 35 percent slopes	Well-drained	None	>80 inches	>80 inches	Negligible	No	Low	High	Very Limited	Not prime farmland	0 to 80 inches: gravelly sand
G-57 Gated Spillway	Immokalee-Urban land complex	Poorly drained	None	>80 inches	6 to 18 inches	High	No	Low	High	Very Limited	Not prime farmland	0 to 72 inches: fine sand
	Urban land, 0 to 2 percent slopes	No rating	No rating	No rating	No rating	No rating	No rating	No rating	No rating	No rating	Not prime farmland	No rating
S-37B Gated Spillway	Udorthents, shaped	Somewhat poorly drained	None	40 to 72 inches to paralithic bedrock	24 to 48 inches	Low	No	Low	High	Not limited	Not prime farmland	0 to 30 inches: gravelly sand; 30 to 50 inches: sand; 50 to 54 inches: weathered bedrock
S-37A Gated Spillway	Urban land, 0 to 2 percent slopes	No rating	No rating	No rating	No rating	No rating	No rating	No rating	No rating	No rating	Not prime farmland	No rating
	Basinger fine sand, 0 to 2 percent slopes	Poorly drained	None/frequent	>80 inches	0 to 12 inches	Negligible	Yes	Low	High	Very Limited	Not prime farmland	0 to 80 inches: fine sand
S-36 Gated Spillway	Udorthents	Well-drained	None	>80 inches	>80 inches	Negligible	No	Low	High	Very Limited	Not prime farmland	0 to 57 inches: cobbly sand
S-33 Gated Spillway	Immokalee, limestone substratum-Urban land complex	Poorly drained	None	40 to 72 inches to paralithic bedrock	6 to 18 inches	High	No	Low	High	Very Limited	Not prime farmland	0 to 5 inches: fine sand; 5 to 48 inches: fine sand; 48 to 58 inches: fine sand; 58 to 62 inches: weathered bedrock
	Margate fine sand, occasionally ponded, 0 to 1 percent slopes	Poorly drained	None	20 to 40 inches to lithic bedrock	0 to 18 inches	Negligible	Yes	Low	High	Very Limited	Not prime farmland	0 to 8 inches: fine sand; 8 to 16 inches: fine sand; 16 to 28 inches: fine sand; 28 to 32 inches: very gravelly fine sand; 32 to 42 inches: bedrock
G-54 Gated Spillway	Margate fine sand, occasionally ponded, 0 to 1 percent slopes	Poorly drained	None	20 to 40 inches to lithic bedrock	0 to 18 inches	Negligible	Yes	Low	High	Very Limited	Not prime farmland	0 to 8 inches: fine sand; 8 to 16 inches: fine sand; 16 to 28 inches: fine sand; 28 to 32 inches: very gravelly fine sand; 32 to 42 inches: bedrock
	Udorthents	Well-drained	None	>80 inches	>80 inches	Negligible	No	Low	High	Very Limited	Not prime farmland	0 to 57 inches: cobbly sand
S-13AW Gated Culvert	Hallandale fine sand, 0 to 2 percent slopes	Poorly drained	None	2 to 20 inches to lithic bedrock	About 3 to 18 inches	Very high	Yes	Low	High	Very Limited	Not prime farmland	0 to 12 inches: fine sand; 12 to 22 inches: bedrock
	Plantation, ponded-Matlacha-Urban land complex, 0 to 2 percent slopes	Very poorly drained	None/frequent	20 to 40 inches to lithic bedrock	About 0 inches	Negligible	Yes	No rating	High	Very Limited	Not prime farmland	0 to 10 inches: muck; 10 to 16 inches: fine sand; 16 to 33 inches: fine sandy loam; 33 to 43 inches: bedrock
	Matlacha, limestone substratum-Urban land complex	Somewhat poorly drained	None	40 to 60 inches to lithic bedrock	About 24 to 36 inches	Low	No	Low	High	Very Limited	Not prime farmland	0 to 23 inches: gravelly fine sand; 23 to 48 inches: fine sand; 48 to 52 inches: unweathered bedrock
	Margate fine sand, occasionally ponded, 0 to 1 percent slopes	Poorly drained	None	20 to 40 inches to lithic bedrock	0 to 18 inches	Negligible	Yes	Low	High	Very Limited	Not prime farmland	0 to 8 inches: fine sand; 8 to 16 inches: fine sand; 16 to 28 inches: fine sand; 28 to 32 inches: very gravelly fine sand; 32 to 42 inches: bedrock
S-13 Pump Station and Gated Spillway	Urban land, 0 to 2 percent slopes	No rating	No rating	No rating	No rating	No rating	No rating	No rating	No rating	No rating	Not prime farmland	No rating
	Lauderhill muck, frequently ponded, 0 to 1 percent slopes	Very poorly drained	None/frequent	16 to 36 inches to lithic bedrock	0 inches	Negligible	Yes	No rating	Low	Very Limited	Not prime farmland	0 to 31 inches: muck; 31 to 41 inches: bedrock

Source: NRCS 2024

B.1.15 Hazardous, Toxic, and Radioactive Waste

This section reviews conditions regarding the presence of hazardous and toxic chemicals and materials at the WCS under consideration for improvement. Work on these structures may require the removal of materials and sediments that contain harmful and regulated substances, resulting in hazardous, toxic, and radioactive wastes (HTRW). In accordance with Resource Conservation and Recovery Act, Toxic Substances Control Act, and FAC 62-730, administered by the FDEP, wastes of these types must be handled appropriately once characterized.

The canals of the Study Area have been subjected to various pollutants for more than 70 years from both point and non-point sources. Many chemical constituents do not degrade over that time and may persist in canal sediments. Each WCS is physically positioned on a small area of land. Footprints for the operational facilities are small while the administrative boundary of the canal and land associated with each facility varies in size from less than 5 acres to more than 50 acres.

To determine contamination from pollutants within the canals and at each WCS, sampling and testing was conducted in Phase I and II Environmental Site Assessments (ESA). The full report of the Phase I and II ESAs sampling methodologies and analyses are included in **Appendix L, Hazardous, Toxic and Radioactive Waste**. The Phase I ESA identifies conditions which materially affect the subject facility's function and operational status as well as past, current, and potential compliance issues. The Phase II ESA provides analytical results of sediment and soil sampling, identifying any constituents which exceed specific limits for surface water and groundwater standards and which may pose a risk to workers during the proposed action. Industrial/Commercial and Residential Exposure limits (IDE and RDE) from Soil Cleanup Target Levels (SCTL) and the Threshold and Probable Effective Concentrations (TEC and PEC) from the Sediment Quality Assessment Guidelines (SQAG) and were referenced during the review of analytical data to determine the impact of activities proposed. The surface water leachability criteria was also used as a factor to understand potential for contaminant release.

Assessing the affected environment included conducting Phase I ESAs at eight of the nine WCS in the Study Area and Phase II ESAs at eight of the nine sites for soil and sediment sampling to characterize the level of hazardous contamination of each site. Phase I ESAs included identification of potential findings in the vicinity of the WCS and associated facilities and Tier 1 vapor encroachment screening. In the Phase II ESAs, soil samples were collected from the banks of the waterways, both upstream and downstream of each facility, near the top of bank. A total of 38 soil borings were completed, which were composited where appropriate, resulting in 19 samples analyzed. Sediment samples were collected from both the upstream and downstream sections of the waterway near each WCS. There were a total of 10 sediment samples collected. The results of the Phase I and II ESA are further detailed below by watershed basin.

G-56 Gated Spillway / Hillsboro Canal Basin. This basin is influenced by a variety of land uses but is overall highly developed. Some farmland is directly located along the G-08 (Hillsboro) Canal. It is reasonable to expect a low risk of contamination based on development characteristics and land use. The G-56 Gated Spillway facility consists of 17.3 acres of land and canal within the G-08 (Hillsboro) Canal. The operational facility is a reinforced concrete structure spanning the width of the canal. The control building is a small single-story concrete building on the south bank of the canal. It also contains a backup generator powered by propane, which is stored in an underground storage tank (UST) on the site.

No potential findings or recognized conditions were identified in the Phase I ESA. Soil and sediment sampling conducted at this site indicated the presence of Arsenic and Chromium in the soil only. Arsenic was found in the soil above the RDE SCTL of 2.1 mg/kg at 2.4 mg/kg. Chromium was found in the soil above the Solid Waste Leachability Criteria of 4.2 mg/kg at 4.8 mg/kg. There is an adjacent golf course on the south bank which has existed and operated since the early 1970s. The playing surfaces of the golf course are located on the bank of the canal for a 0.75-mile segment directly west of the facility. Another drainage originating and flowing through the golf course and adjacent residential area ties in and contributes to the G-08 (Hillsboro) Canal upstream of the G-56 Gated Spillway.

G-57 Gated Spillway / Pompano Canal Basin. The Pompano Canal Basin is very small in comparison to other basins in the Study Area and is characterized by urban and transportation-related development. A small basin that is fully urbanized contributing to a small waterway could be a risk for contaminants. The G-57 Gated Spillway facility consists of 4.5 acres of land and canal, in two sections, within the G-16 (Pompano) Canal. The operational facility, located in the east section, is a reinforced concrete structure spanning the width of the canal. Two single-story concrete control buildings are located on the northeast bank of the canal near the spillway. A backup generator powered by propane, which is stored in a UST is also present on the site.

The west section of this facility includes a stretch of the G-16 (Pompano) Canal that was converted to a culverted system, backfilled, and paved over or developed in the late 1980s or early 1990s. The far east section of the facility remains open water canal.

There is one site upstream of the spillway but adjacent to the west section of the facility which has recent known contamination in groundwater samples. In soil and sediment samples collected, the only contaminant detected was Chromium. The level was found above surface water leachability criteria of 4.2 mg/kg at 6.8 mg/kg for sediment and 6 mg/kg for soil but well below RDE (SCTL) of 210 mg/kg.

S-37B Gated Spillway / C-14 West Basin. The C-14 West Basin is the largest in the Study Area and is comprised mostly of residential and commercial development. The S-37B Gated Spillway consists of 10.3 acres of land and water within the C-14 (Cypress Creek) Canal. The operational facility is a reinforced concrete structure spanning the width of the canal. The control building is a small single-story concrete building on the east bank of the canal. It also contains a backup generator powered by propane, which is stored in a UST on the site.

No known issues were identified in the Phase I ESA nor were any potential issues identified in vicinity of the facility. Barium was present in sediment samples, exceeding the TEC SQAG for Barium of 20 mg/kg at 21 mg/kg. Chromium was present in both sediment and soil samples, exceeding the surface water leachability criteria of 4.2 mg/kg with a range of 4.6 to 5.4 mg/kg, but not above SCTL. Golf courses have been in operation along both sides of this stretch of Cypress Creek Canal since the early 1970s.

S-37A Gated Spillway / C-14 East Basin. This small basin is mostly urbanized with some open space elements. The S-37A Gated Spillway facility consists of 7.9 acres of land and water within the C-14 (Cypress Creek) Canal. The operational facility is a reinforced concrete structure spanning the width of the canal. The control building is a small single-story concrete building on the south bank of the canal. It also contains a backup generator powered by propane, which is stored in a UST on the site.

No known issues were identified in the Phase I ESA nor were any potential issues identified in the vicinity of the facility. Sediment sampling results indicated the presence of Arsenic, Barium, Chromium, Selenium, and 4,4-DDE all below the SCTL. Chromium in sediment was above surface water leachability criteria of 4.2 mg/kg at 4.6 mg/kg. Selenium in sediment was above surface water leachability criteria of 0.5 mg/kg at 1.3 mg/kg. Arsenic was also found in sediment samples above the TEC SQAG of 9.8 mg.kg and the RDE SCTL of 2.1 mg/g at 10 mg/kg. Additionally, a pesticide, 4,4-DDE was found in sediment above the TEC SQAG of 3.2 micrograms/kg at 4.49 micrograms/kg. Soil sampling results indicated the presence of Chromium below the SCTL but above surface water leachability criteria of 4.2 mg/kg with a range of 4.3 to 8.9 mg/kg. Silver in the soil was found below SCTL but above the surface water leachability criteria of 0.01 mg/kg at 0.088 mg/kg.

S-36 Gated Spillway / C-13 West Basin. This very large basin is highly urbanized. The S-36 Gated Spillway facility consists of 7.9 acres of land and water within the C-13 (Middle River) Canal. The operational facility is a reinforced concrete structure spanning the width of the canal. The control building is a small single-story concrete building on the north bank of the canal, very close to the road. It also contains a backup generator powered by propane, which is stored in a UST on the site.

No known issues were identified in the Phase I ESA nor were any potential issues identified in vicinity of the facility. Sediment sampling results indicated Arsenic and Chromium while soil sampling results indicated only Chromium,. In both samples, Chromium was above the surface water leachability criteria of 4.2 mg/kg at range of 4.7 to 6.2 mg/kg in sediment and 4.6 to 5.4 mg/kg in soil, but below all SCTL. The Arsenic indicated in the sediment was above the RDE SCTL of 2.1 mg/kg at 3.8 mg/kg.

S-33 Gated Spillway / C-12 West Basin. The small C-12 West Basin is influenced heavily by urban and transportation related development. The S-33 Gated Spillway consists of 6.7 acres of land and water within the C-12 (Plantation) Canal. The operational facility is a reinforced concrete structure spanning the width of the canal. The control building is a small single-story concrete building on the south bank of the canal. It also contains a backup generator powered by propane, which is stored in a UST on the site.

A compliance issue was identified at the S-33 Gated Spillway regarding a closed and abandoned UST that is missing tank closure documents. Sediment samples collected at the site included Arsenic above RDE SCTL of 2.1 mg/kg at 2.3 mg/kg, but below SQAG. Chromium was indicated above surface water leachability criteria of 4.2 mg/kg at 6.5 mg/kg for sediment and 6.5 to 8.5 mg/kg for soil, but below SCTL.. Silver was found in the soil above surface water leachability criteria of 0.01 mg/kg at 0.51 mg/kg, but below SCTL of 410 mg/kg.

G-54 Gated Spillway / North New River Canal West Basin. This basin is influenced mostly by dense residential development and transportation corridors. Without testing specific sites, there is a low risk for the basin to have contamination of hazardous constituents. The G-54 Gated Spillway facility consists of 58.3 acres of land and canal within the G-15 (North New River) Canal. The operational facility is a reinforced concrete structure spanning the width of the canal. The control building is a small single-story concrete building on the south bank of the canal. It also contains a backup generator powered by propane, which is stored in a UST on the site. A public park, Sewall Lock Park, is located on the south bank, where picnic tables and parking are available.

The Phase I ESA did not identify any potential findings or recognized conditions. There are no existing compliance issues with this site or with neighboring sites by which this site would be affected. Chromium was found in both sediment and soil samples above surface water leachability criteria of 4.2 mg/kg at 5.8 mg/kg for sediment and 4.7 to 5.1 mg/kg for soil, but below SCTL of 210 mg/kg. Selenium was indicated in soil samples above surface water leachability criteria of 0.5 mg/kg at 0.77 mg/kg. Arsenic was found is the soil above the RDE SCTL of 2.1 mg/kg at 2.3 mg/kg.

S-13AW Gated Culvert / C-11 West Basin and S-13 Pump Station and Gated Spillway / C-11 East Basin. The C-11 (South New River) Canal basin is very large and is the southernmost basin in the Study Area, including a wide variety of land uses and development types. The S-13 Pump Station and Gated Spillway facility consists of 12 acres of land and water in the canal. The operational facility is a pump station and spillway which includes three diesel powered pumps and an in-stream trash rake located on a peninsula in the canal. The S-13 Pump Station and Gated Spillway also includes aboveground storage tanks for storing diesel fuel, a control building, and a generator building.

No known issues were identified in the Phase I ESA nor were any potential issues identified in vicinity of the facility. Both soil and sediment sampling results indicated presence of Arsenic. In sediment, this was analyzed at 11 mg/kg, above the TEC SQAG of 9.8 mg/kg and RDE SCTL of 2.1 mg/kg. In soil, the arsenic was analyzed 2.4 mg/kg, above RDE SCTL of 2.1 mg/kg.. Chromium was also present in the soil results above the surface water leachability criteria of 4.2 mg/kg at 6.3 to 7.4 mg/kg, but below SCTL.

B.1.16 Land Use and Real Estate

Region of Influence, Definition, and Methodology. This section details the regional and localized land use characteristics, beginning with an overview of land use patterns across Broward County and Palm Beach County. Following this, the analysis narrows its focus to the Study Area, which encompasses eastern, developed regions of Broward County and southern Palm Beach County[4] and the WCS infrastructure. Finally, it provides a detailed examination of the immediate surroundings of the nine primary WCS within the Study Area. This approach provides a tiered perspective on land use and real estate, moving from county-level considerations to the specific land use contexts surrounding each WCS.

Land use describes the human use of land. It represents current use and plans and programs that guide the future use and development of an area. Categories of land use include agricultural, commercial, industrial, military, mixed-use, natural, recreational, and residential. In addition to discussing existing land uses immediately surrounding each WCS, this section also addresses adopted land use designations, ownership, and management of the surrounding areas. Owners and managers of land in the ROI include federal, state, and local governments as well as private organizations and individuals.

Affected Environment. Land uses in the Study Area vicinity are identified through a review of existing federal, state, county, and community-level land use plans. There are no comprehensive federal regulations that address all land use categories. Communities limit allowable land uses in certain areas by implementing general plans and zoning codes. Land use planning ensures compatible land uses and predictable future development.

[4] Only a portion of each of Broward and Palm Beach counties are included in the Study Area. Approximately 28 percent of Broward County and approximately 3 percent of Palm Beach County (by area) are within the Study Area.

Figure B.1-1 shows the location and boundaries of the Study Area as well as the individual WCS.

B.1.16.1 Broward County

Broward County is the second-most populous county in Florida, following Miami-Dade County, and is one of three counties comprising the Miami metropolitan area. The county encompasses a total land area of 1,322 square miles. Historically, Broward County's development has followed a suburban model, characterized by auto-oriented, low-density, and functionally segregated land uses, resulting in sprawling development patterns. Today, however, Broward County's urbanized "developable" area, consisting of approximately 431 square miles in the eastern portion of the County, can be characterized as essentially built-out (Broward County 2024c). The western two-thirds of the county consists primarily of undeveloped conservation lands, including the Everglades and the Francis S. Taylor Wildlife Management Area.

The county's land use framework is structured to integrate high-density urban and residential zones near commercial hubs, while lower-density suburban neighborhoods are situated at greater distances from major economic centers. Key transportation corridors, including Interstate 95 and the Florida Turnpike, serve as critical infrastructure, facilitating regional connectivity, economic activity, and industrial development.

Broward County's strategic planning initiative, BrowardNext, prioritizes the preservation of green spaces, effective water management, and resilience against sea level rise through comprehensive coastal zone management and flood mitigation strategies (Broward County 2024c). The initiative seeks to balance sustainable development with community-centered urban planning by governing the allocation of land to meet housing, commercial, and industrial needs while safeguarding environmental resources. BrowardNext fosters adaptive land use management that supports growth and enhances community resilience, with key priorities focused on transportation infrastructure improvements and climate adaptation strategies.

B.1.16.2 Palm Beach County

Approximately 3 percent of Palm Beach County is included in the Study Area. In its entirety, Palm Beach County, which is contiguous to Broward County to the north, spans approximately 2,378 square miles, making it the largest county in the state by land area. It has a population of over 1.5 million residents, the third-most populous county in Florida (Behind Miami-Dade and Broward counties). The county features a diverse landscape, including coastal areas along the Atlantic Ocean, the southeastern quadrant of Lake Okeechobee, extensive wetlands fed by the lake, and numerous other lakes and canals, which are critical for water management and flood control. The land area within Palm Beach County, contiguous to and extending from Lake Okeechobee, comprises substantial agricultural holdings. As reported in the 2022 Census of Agriculture County Profile, the county contains 1,368 farms, encompassing a total of 460,575 acres, which constitutes approximately 37 percent of the county's total land area (USDA 2022). Palm Beach County's proximity to both Miami and the Treasure Coast enhances its regional significance, with major infrastructure such as Palm Beach International Airport and the Port of Palm Beach contributing to its economic and transportation networks.

Land use in the eastern, developed portions of Palm Beach County is an extension of neighboring Broward County. Land use planning in both counties prioritizes water management and flood control, given their shared proximity to the coast and extensive canal systems. Palm Beach County's land use plan, as outlined in the Palm Beach County Comprehensive Plan, supports a mix of residential, commercial, and industrial development, while promoting conservation of critical environmental resources and ensuring adequate infrastructure to support growth in both urban and rural zones. This complementary land use strategy strengthens the regional framework, facilitating coordinated development between the counties (Palm Beach County 2024b).

B.1.16.3 Section 203 Study Area

The Section 203 Study Area encompasses approximately 420 square miles in eastern Broward County and southern Palm Beach County (**Figure B.1-1**). As detailed in **Table B.1-3**, the Study Area consists of nine upstream watershed basins, with a network of seven primary canals managed by nine WCS. Additionally, the area includes six non-managed watersheds located downstream of each WCS. The focus of the Section 203 Study is the 302 square mile Action Area of managed upstream watersheds with nine WCS owned and operated by the SFWMD.

The boundaries of the Study Area are defined by the respective watersheds and contiguous urban zones within Reach A (SFWMD 2024e). Hydrologic, hydraulic, and hydrodynamic modeling for the area has identified critical vulnerabilities in infrastructure within the C&SF Project system in Broward County. The region is characterized by a relatively flat landscape, situated slightly above sea level, with highly dense urban areas that rely on the C&SF Project features for flood control and water management.

The C&SF Project flood control system, which was designed and constructed over 60 years ago, is approaching the end of its expected design life. Originally designed to accommodate a population of 2 million, the system now serves a population exceeding 6 million, placing significant strain on its infrastructure. Flooding events result in substantial property damage, impacting residences, businesses, and critical infrastructure, while also posing health and life safety risks, exacerbating saltwater intrusion, and threatening vital economic activities. The system's spillways, ROW areas, Water Management District levees, and the canals within these levees are integral components of the C&SF Project infrastructure. These elements require ongoing assessment and potential improvements to address evolving flood risks and infrastructure demands in the region.

Section B.1.8 Vegetation, presents a detailed analysis of land cover within the Study Area, informed by spatial data sourced from the FWC and classified according to the FLCCS. The resulting data were consolidated and are presented in Table B.1-12, which categorizes and quantifies the predominant land uses observed. The table delineates eight primary land use categories, listed in descending order of spatial extent: urban, transportation, engineered waters, natural waters, rural/agricultural, natural lands, infrastructure, and engineered lands. These categories provide a general representation of land use patterns within the Study Area and support the environmental analysis herein.

Developed and human-modified land uses predominate, with the urban, transportation, and infrastructure categories comprising approximately 81 percent of the Study Area (**Table B.1-12**). Natural lands and waters, defined as areas remaining largely undisturbed or unaltered, account for approximately six percent. The remaining 13 percent consists of engineered or modified lands and

waters, such as canals, detention areas, or other human-altered features. This distribution reflects a Study Area that is largely characterized by intensive development and infrastructure, with limited remaining natural cover types.

Table B.1-12. Land Uses with the Study Area.

Land Use Category	Acreage	Percentage
Urban	157,141	58.5%
Transportation	57,544	21.4%
Engineered Water (e.g., canal, ponds, retention channels)	24,774	9.2%
Natural waters (e.g., wetlands, lakes, estuary)	9,768	3.6%
Rural/Agricultural	9,692	3.6%
Natural lands (e.g., forests, scrub, vegetation)	6,398	2.4%
Infrastructure (e.g. utilities, communications)	2,619	1.0%
Engineered lands (e.g., extractive industries, clear cuts)	848	0.3%
TOTAL:	**268,784**	**100%**

Land uses surrounding the nine WCS that are the focus of the Section 203 Study are further described below.

G-56 Gated Spillway (location: 26.327972°N, 80.131583°W) **/ Hillsboro Canal Basin.** The G-56 Gated Spillway is the northernmost WCS analyzed in this Study. Positioned along the G-08 (Hillsboro) Canal, it serves the Hillsboro Canal Basin. The Hillsboro Canal acts as a natural boundary between Broward and Palm Beach counties for much of its course. The G-56 Gated Spillway straddles this county line with nearby land uses reflecting a range of residential densities: higher-density housing developments are more prevalent to the immediate north in Palm Beach County, while lower-density single-family homes are found to the south near the Deer Creek Golf Club in Broward County.

G-57 Gated Spillway (location: 26.230850°N, 80.121525°W) **/ Pompano Canal Basin.** The G-57 Gated Spillway is situated along the G-16 (Pompano) Canal and serves the Pompano Canal Basin. Land uses immediately abutting the G-16 (Pompano) Canal at the G-57 Gated Spillway are primarily low- to medium-density residential developments. Nearby land uses are varied and include higher density residential developments, commercial developments, public uses, and places of worship. The City of Pompano Beach's government offices and cultural center are located approximately 500 feet to the west of this WCS.

S-37B Gated Spillway (location: 26.223689°N, 80.170163°W) **/ C-14 West Basin.** The S-37B Gated Spillway is situated along the C-14 (Cypress Creek) Canal and serves the C-14 West Basin. The land uses immediately surrounding the S-37B Gated Spillway are predominantly residential and recreational, including various housing developments and golf courses that are part of the Palm Aire Country Club. This area encompasses a range of residential densities, from single-family homes to multi-family residential buildings.

S-37A Gated Spillway (location: 26.206246°N, 80.131641°W) **/ C-14 East Basin.** The S-37A Gated Spillway is situated along the C-14 (Cypress Creek) Canal and serves the C-14 East Basin. The land uses immediately surrounding the S-37A Gated Spillway are incredibly varied. The Pine Crest School occupies a large swath of land to the south with single family homes along the canal to the west of the WCS. To the immediate west is SR 811, Dixie Highway, and Interstate 95. Between these major transportation

arteries are the Cyprus Creek Mobile Home Park, an office park, a hotel, other low density commercial establishments, and additional residential developments.

S-36 Gated Spillway (location: 26.173183°N, 80.179122°W) **/ C-13 West Basin.** The S-36 Gated Spillway is situated along the C-13 (Middle River) Canal and serves the C-13 West Basin. It is situated directly between Emerald Lake and Blue Heron Lake. The immediate surroundings are primarily medium-density residential areas, including developments along NW 39th Street and the Lakeview Club Condominium community, which borders the C-13 (Middle River) Canal adjacent to the spillway. Additionally, Lauderdale Lakes Middle School and Boyd H. Anderson High School are located approximately 1,500 feet and 2,000 feet northwest of the WCS, respectively.

S-33 Gated Spillway (location: 26.135942°N, 80.194494°W) **/ C-12 West Basin.** The S-33 Gated Spillway is situated along the C-12 (Plantation) Canal and serves the C-12 West Basin. The land uses surrounding the S-33 Gated Spillway include extensive single-family residential developments located to the south of the C-12 (Plantation) Canal, with commercial establishments situated to the north across Sunrise Boulevard. Approximately 1,000 feet north of the WCS, beyond the commercial development, is the Paris Saint-Germain Academy Pro Residency Florida, a youth soccer training facility.

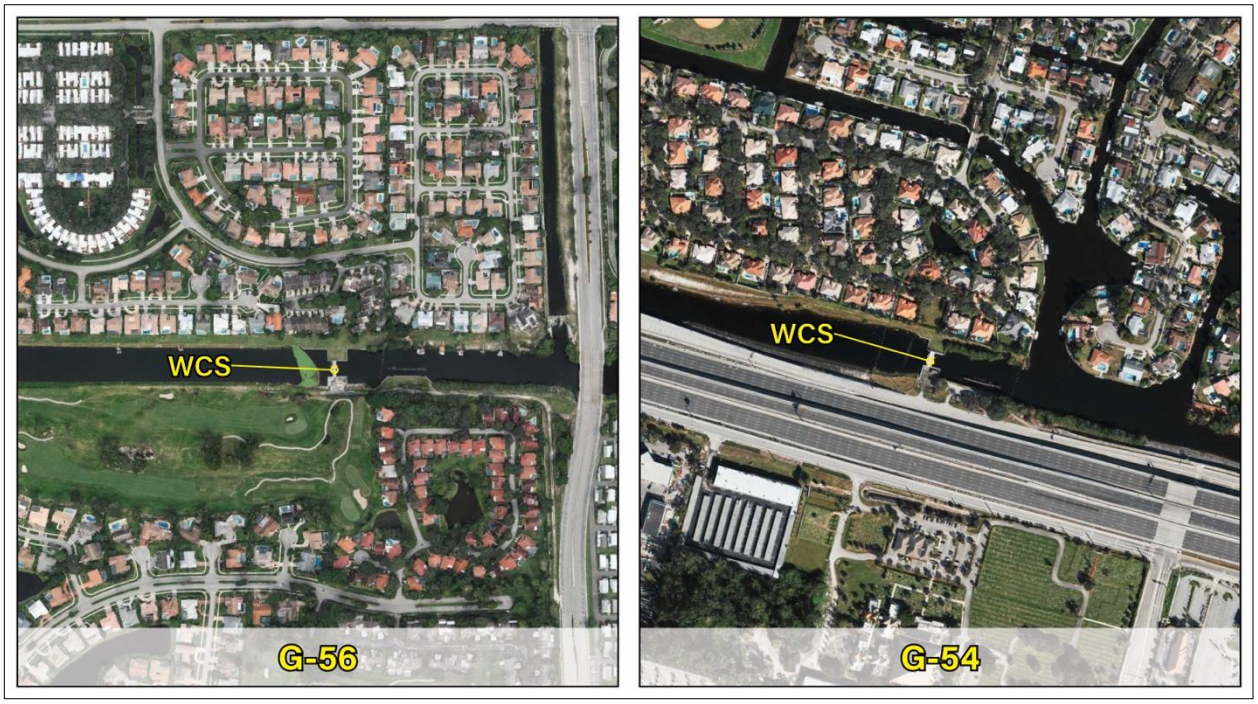
G-54 Gated Spillway (location: 26.095082°N, 80.229682°W) **/ North New River Canal West Basin.** The G-54 Gated Spillway is situated along the G-15 (North New River) Canal and serves the North New River Canal West Basin. The G-54 Gated Spillway is located along I-595, Port Everglades Expressway, a major transportation artery. North of the WCS are extensive single-family developments as well as the Seminole Middle School, located approximately 2,200 feet to the north of the WCS. South of the G-54 Gated Spillway and across Interstate 595 are transportation yards, storage facilities, and other commercial and light industrial uses.

S-13AW Gated Culvert (location: 26.064633°N, 80.281512°W) **/ C-11 West Basin.** The S13-AW WCS is a double-box, concrete culvert situated along the C-11 (South New River) Canal and serving the C-11 West Basin. Land uses in the immediate vicinity are predominately single-family residential developments. Aside from the residential developments, there is a medium-density commercial development across Griffin Road (SR-818) to the south and the 243-acre “Tree Tops Park” owned and managed by Broward County approximately 500 feet east. There is also a place of worship, the Kingdom Hall of Jehovah’s Witnesses, in the intervening land between the WCS and Tree Tops Park.

S-13 Pump Station and Gated Spillway (location: 26.066360°N, 80.208858°W) **/ C-11 East Basin.** The S-13 WCS is a gated spillway and pump station situated along the C-11 (South New River) Canal and serving the C-11 East Basin. Surrounding land uses are diverse, including the Fort Lauderdale Florida Power and Light power plant, a 1,200-megawatt natural gas-fired facility immediately northeast of the S-13 Pump Station and Gated Spillway. The area also includes various commercial and light industrial developments, as well as several residential communities located to both the north and south of the canal. State Road 7 lies immediately to the east of the WCS, while Florida Turnpike is situated approximately 2,000 feet to the west. Additionally, Fort Lauderdale-Hollywood International Airport, located around 2.5 miles north-northeast of the WCS, has an outsized influence on regional land use patterns due to its proximity and associated infrastructure needs.

Figure B.1-20 presents a satellite image illustrating typical development patterns in the vicinity of the WCS. This figure highlights the surrounding land uses near the G-56 Gated Spillway and G-54 Gated Spillway, which were selected as representative examples due to their diverse adjacent land uses. Collectively, these areas encompass a range of development types found within the Study Area, including varying densities of residential neighborhoods, commercial developments, Interstate 595, a cemetery, and parkland (i.e., the Deer Creek Golf Club).

A summary of land uses within a 1,000-foot radius of each WCS is provided in **Table B.1-13**.



Note: Images are from Google Maps 2025

Figure B.1-20. Representative Satellite Photo of Two Water Control Structures: G-56 and G-54 Gated Spillways.

Table B.1-13. Summary of Land Uses within 1,000-foot Radius of Each Water Control Structure.

Water Control Structure	Residential – Single Family	Residential – multi-family	Commercial – Low Density	Commercial – Medium/High Density	Industrial - Light	Industrial – Medium/Heavy	School	Place of Worship/Cemetery	Park
G-56 Gated Spillway	●	●							● a/
G-57 Gated Spillway	●	●	●	●			●	●	●
S-37B Gated Spillway	●	●							● b/

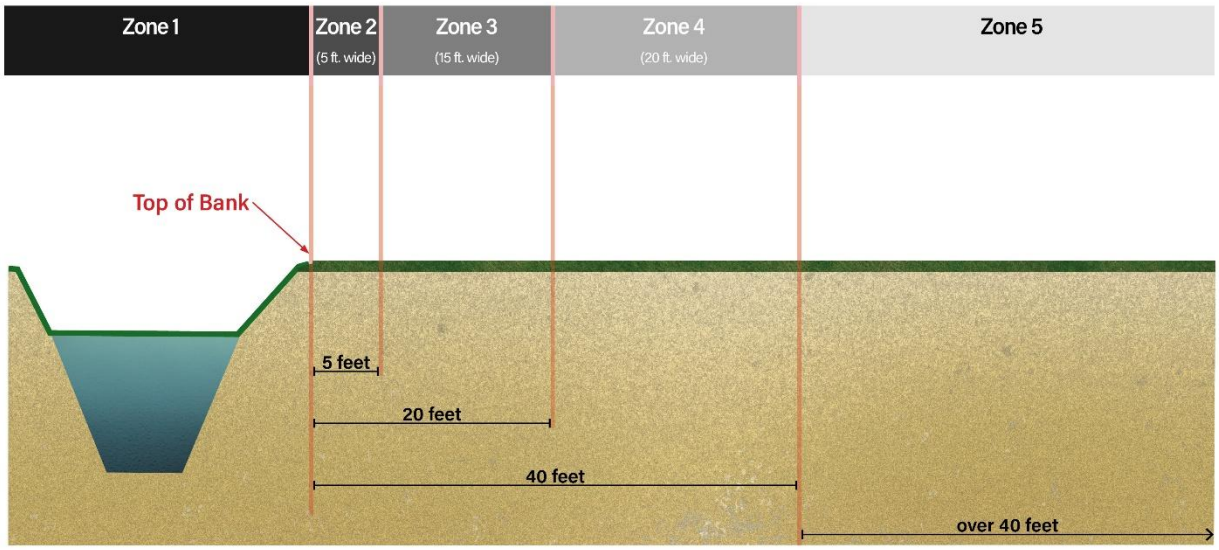
Water Control Structure	Residential – Single Family	Residential – multi-family	Commercial – Low Density	Commercial – Medium/High Density	Industrial - Light	Industrial – Medium/Heavy	School	Place of Worship/Cemetery	Park
S-37A Gated Spillway	●	●	●	●	●		●		●
S-36 Gated Spillway	●	●							
S-33 Gated Spillway	●		●		●		●		
G-54 Gated Spillway	●		●					●	●
S-13AW Gated Culvert	●		●						●
S-13 Pump Station and Gated Spillway	●	●	●		●	● c/			●

a/ Deer Creek Golf Club
b/ Palm Aire Country Club
c/ Wheelabrator South Broward Waste to Energy Plant, a 66-megawatt biopower project

B.1.16.4 Rights of Way

A ROW refers to a strip of land designated for transportation, utilities, or infrastructure purposes, providing legal access for specific uses, such as roadways, utility lines, or canal maintenance areas. In the context of the SFWMD, ROWs are lands owned or controlled by the SFWMD (e.g., easement or reservation) to facilitate the construction, operation, and maintenance of flood control works, including canals, levees, WCS, and associated access roads. ROWs serve essential functions: they ensure unobstructed access for maintenance, emergency operations, and inspections; allow the placement of infrastructure where not in conflict with SFWMD needs, such as utilities; and maintain open pathways for flood control and water management. The SFWMD requires ROW permits for any encroachment or use within the ROW, aligning these uses with SFWMD objectives to ensure ROW activities do not interfere with flood protection, water quality, or environmental preservation.

SFWMD classifies ROW lands along its canals into five operational zones, each with specific guidelines to balance land use, maintenance needs, and environmental protection (**Figure B.1-21**). Zone 1 encompasses the canal itself, extending from one bank to the opposite, and is strictly reserved for flood control and unobstructed water flow. Zone 2 is a narrow 5-foot strip adjacent to the top of the bank, primarily used for inspection and limited maintenance. Zone 3 spans from 5 to 20 feet from the top of the bank and allows certain maintenance activities while preserving vegetation for environmental purposes. Zone 4, located from 20 to 40 feet landward, provides space for maintenance equipment and emergency response vehicle access. Finally, Zone 5 covers areas more than 40 feet from the bank, often used for utilities or other activities that do not interfere with canal operations or flood control. These zones allow SFWMD to maintain operational flexibility while accommodating certain land uses that align with maintenance and environmental criteria.



Source: SFWMD 2024e

Figure B.1-21. Right of Way Zones.

Housing developments, commercial buildings, or permanent structures are prohibited within the SFWMD's ROWs to maintain SFWMD's operational integrity. The ROW guidelines restrict permanent above-ground installations within a clear 40-foot strip adjacent to canals and WCS to prevent interference with flood control, maintenance access, and other essential functions. Temporary or small structures like sheds may be allowed in designated zones (e.g., Zone 5) but must meet strict criteria, including being removable without machinery and not impacting SFWMD maintenance activities.

For any existing or previously authorized structures within the ROW, such permits are limited and revocable if they impede SFWMD's operations. These rules ensure that residential and commercial developments near the ROW do not compromise flood protection and maintenance requirements critical to the C&SF Project flood control system.

B.1.17 Visual Resources

Region of Influence, Definition, and Methodology. The visual ROI includes the full extent of the Study Area, with a particular emphasis placed on the individual WCS facilities and operations and views of the WCS from public viewpoints. Special consideration is given to actions within visually sensitive locations and viewpoints from visually sensitive locations.

Visual resources are natural and human-made features that give a particular "landscape" (visible features of an area of land) or "viewshed" (view on an area from a vantage point) its character and aesthetic quality. The scenic quality or character of an area consists of the landscape features and social environment from which they are viewed. The landscape features that define an area of high visual quality may be natural, such as mountain views, or human-made, such as city skyline. To assess the quality of visual resources, this section describes the overall visual character and distinct visual features on or in the viewshed of the Study Area.

Affected Environment. To rate the scenic quality of the Study Area and the areas surrounding the WCS, the Bureau of Land Management's Visual Resource Management (VRM) Classification System was used. Although this classification system is designed for undeveloped and open land managed by the Bureau of Land Management, the system is valid in the analysis of VRM and planning activities. Selecting the VRM system as the basis for this analysis is an established means for determining visual values based on a set of objectives. **Table B.1-14** outlines the objectives of the four VRM classes.

Table B.1-14. Bureau of Land Management Visual Resource Management Class Objectives.

Class	Objective	Change Allowed (relative level)	Relationship of Activities to the Casual Observer
I	Preserves the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity.	Very Low	Activities should not be visible and **must not attract attention**.
II	Retains the existing character of the landscape. Management activities may be seen but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.	Low	Activities may be visible but **should not attract attention**.
III	Partially retains the existing character of the landscape. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.	Moderate	Activities may attract attention but **should not dominate the view**.
IV	Provides for management activities which require major modification of the existing character of the landscape. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.	High	Activities may attract attention, may dominate the view but are still mitigated.

Source: BLM 1986

The degree to which development affects the aesthetic quality of a landscape depends on the contrast created between the project elements and the existing landscape. This analysis uses the Bureau of Land Management's degree of contrast criteria to assess the level of contrast between the proposed or existing element and the landscape in which it sits (**Table B.1-15**). The four levels of contrast (i.e., none, weak, moderate, and strong) correspond to the VRM class objectives, I, II, III, and IV, respectively. For example, a "moderate" contrast rating is generally acceptable in a Class III area but may also meet the VRM objectives for a Class IV area when there are accumulating elements.

Table B.1-15. Bureau of Land Management Degree of Contrast Criteria.

Degree of Contrast	Criteria
None	The element contrast is not visible or perceived.
Weak	The element contrast can be seen but does not attract attention.
Moderate	The element contrast begins to attract attention and begins to dominate the characteristic landscape.
Strong	The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

Source: BLM 1986

A sensitivity level analysis is an important component of the VRM. Sensitivity levels are a measure of public concern, and lands are assigned high, medium, or low sensitivity levels. A sensitivity analysis is

conducted by evaluating the following factors: types of users, amount of use, public interest, adjacent land use, special areas, distance zones (foreground to midground, background, and seldom seen), and other dynamics.

Section 203 Study Area. The Study Area encompasses the heavily developed eastern portions of Broward County and a small portion of southern Palm Beach County as shown in **Figure B.1-1**. The Study Area extends from the WCAs in the western portions of each county. Large undeveloped parcels are rare within the Study Area, with most found in the western margins of the Study Area adjacent to the WCAs, as illustrated in **Figure B.1-22**, the National Land Cover Database (NLCD) inventory.

Land cover plays a role in visual resources. USGS maintains the NLCD, which inventories the existing character of a landscape, level of development, and degree of contrast.[5,6] **Figure B.1-22**, based on data from the NLCD, illustrates the land cover composition of the Study Area. The Study Area is dominated by extensive development, with a heavy presence of low-, medium-, and high-intensity developed land, represented in varying shades of red. This level of development contributes significantly to the region's visual resources by creating a highly urbanized landscape with limited natural or undeveloped areas.

The NLCD data categorizes land cover types to reflect the landscape's existing character, allowing an assessment of the visual contrast in the region. While open water bodies and scattered patches of green spaces, such as forests and wetlands, are visible, these areas are relatively small and isolated. The high concentration of developed land within the Study Area suggests a dense urban environment, which impacts the visual quality and scenic resources by reducing natural land cover and increasing visual uniformity associated with urban infrastructure. This heavy development footprint results in a landscape with high levels of contrast from the built environment, shaping the visual experience of the Study Area.

The extensive development, supporting infrastructure, and pronounced built contrast in the Study Area result in a VRM Class IV rating—the highest classification—indicating the dominance of the built environment, which visually supersedes the natural landscape across the Study Area. While limited views of natural landscapes exist at the periphery, such as the beaches and Atlantic Ocean to the east and the Everglades to the west, these do not mitigate the overwhelming visual impact of urban development. The degree of landscape modification within the Study Area is so significant that natural features are virtually absent, making the built environment the prevailing visual element and creating a high visual contrast aligned with urban characteristics.

[5] The NLCD data is current as of 2021.

[6] Land Cover is also addressed in Section B.1.8, Vegetation, with specific reference to Table B.1-5. Discrepancies between the data presented in Section B.1.8 and B.1.17 is attributed to the granularity of the dataset. The NLCD dataset is produced at a 30-meter spatial resolution, meaning each pixel represents a 30m x 30m area (900 square meters or ~0.22 acres per pixel). This level of detail provides a broad classification of land cover types across the United States with a moderate spatial scale suitable for regional and landscape-level analysis.

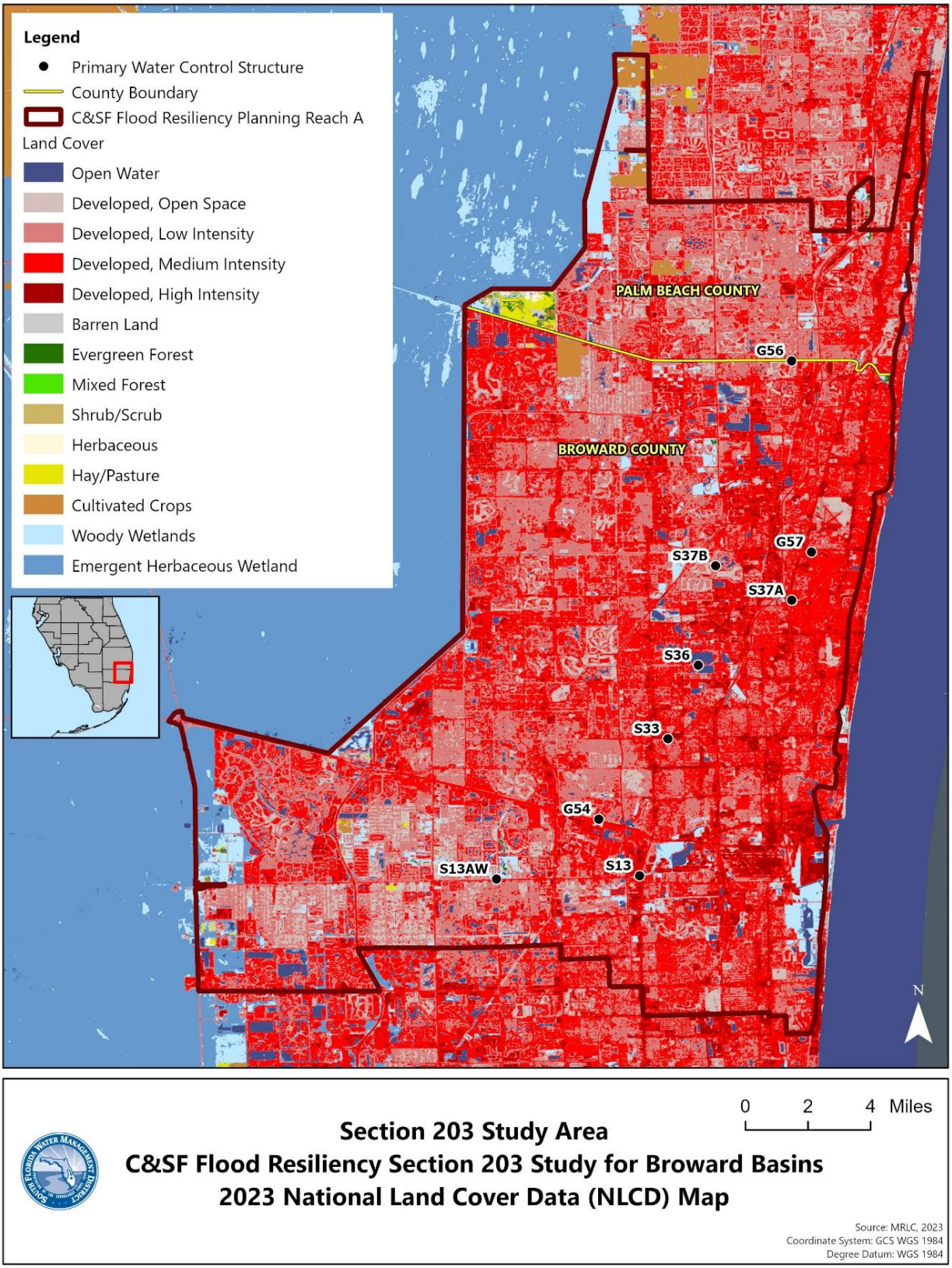


Figure B.1-22. National Land Cover Database (NLCD) Inventory of the Study Area.

Water Control Structures. A WCS is an engineered structure designed to manage water flow within canals, regulating water levels and mitigating flood risks. These structures are functional and utilitarian by design, often featuring large concrete components, metal fencing, railings, and signage, which add a distinctly industrial visual element to the landscape. The canals extending from the WCS, while visually blending into the environment, display uniform, straight lines and consistent dimensions that reveal their human-made origins, distinguishing them from naturally occurring waterways that typically have more organic, irregular shapes.

Figure B.1-23 depicts three distinct WCS highlighting the range of location-specific and capacity-driven design considerations inherent to regional water management infrastructure. The WCS share a common, utilitarian design language; however, each structure is uniquely engineered to regulate water flow within its respective basin. The S-37A Gated Spillway is a larger, gated structure with a conspicuous above-grade profile, whereas the S-36 Gated Spillway is a smaller, low-head structure with minimal visible infrastructure. The G-56 Gated Spillway represents an intermediate design, balancing structural scale and hydraulic capacity between the two.

Each WCS shares a consistent context within the Study Area's developed landscape, contributing similarly to the region's visual character. The WCS are situated in highly developed settings, characterized by dense infrastructure and proximity to major transportation routes, in alignment with the broader visual environment of the Study Area. Due to the uniformity in their immediate surroundings and the similar visual characteristics of each WCS, the visual analysis for these structures was aggregated to avoid redundancy.

The WCS are prominent features within the Study Area that command attention. Seven of the WCS consist of gated spillways with compact infrastructure and one of the WCS is a culvert that is visually like the other seven spillways. The remaining WCS, S-13 Pump Station and Gated Spillway, is a gated spillway with an additional pump station, presenting a significantly larger footprint with taller, more imposing features. Each WCS, regardless of size, disrupts the natural landscape and is visually dominant within its setting, meriting a VRM Class IV rating. This rating reflects the high level of visual contrast introduced by these conspicuous structures, which offer minimal integration with their natural surroundings.

Figure B.1-23. Representative Photo of Three Water Control Structures: G-56, S-37A, and S-36 Gated Spillways.

B.1.18 Transportation and Traffic

Region of Influence, Definition, and Methodology. The ROI for the traffic and transportation analysis includes the full extent of the Study Area, with a special emphasis placed upon the individual WCS facilities and surrounding traffic and transportation patterns. In the context of the Study Area, "transportation" refers to the infrastructure systems utilized for the movement of goods and people within the area, including road networks, mass transit, rail lines, airports, and waterways. "Traffic" pertains to the flow of vehicles and other modes of transportation on the network, as well as the related operational conditions. This includes the Annual Average Daily Traffic (AADT) data for local roads and highways, which serves as an indicator of traffic volumes, congestion, and patterns of use by commuters and travelers. AADT data is used in this analysis to assess the operational conditions of roads in proximity to the nine WCS.

B.1.18.1 Affected Environment.

Section 203 Study Area. The Study Area encompasses the densely developed eastern portions of Broward County and a small portion of southern Palm Beach County, two of the three most populous counties in Florida. This area is characterized by substantial urbanization, with extensive supporting traffic and transportation infrastructure. Given the population density and economic significance of the region[7], the Study Area houses a comprehensive transportation network, including road infrastructure, mass transit, rail, a major airport, commercial shipping channels and port, and the ICW. The following sections provide an analysis of these modules, establishing baseline conditions for the Study Area's transportation infrastructure.

Road Network. The road network within the Study Area is extensive, comprising 5,128 miles of public roads in Broward County alone, with residents and visitors traveling over 43 million miles each day on these routes (Broward MPO 2024). Major highways, such as Interstate 95, the Florida Turnpike, and State Road 7 traverse the area, facilitating north-south travel and connecting to local roadways that provide access to residential and commercial areas. Given the high population density, traffic congestion is a prevalent issue, especially during peak hours. This road network also supports emergency vehicle response routes and evacuation pathways, which are crucial in this region prone to tropical storms and hurricanes.

Mass Transit. Mass transit in the Study Area includes a comprehensive local bus service operated by Broward County Transit, which covers a 410 square mile area. Broward County Transit services accommodate approximately 130,000 passenger trips daily, or nearly 40 million annually (Broward MPO 2024). Express Bus services, developed in collaboration with the Florida Department of Transportation (FDOT), connect Broward County with Miami, carrying nearly 2,000 passengers daily on six routes, including the popular 595 Express (Broward MPO 2024).

Rail Network. The rail network within the Study Area is a critical component of both passenger and freight transportation, enhancing connectivity across Broward and Palm Beach counties. The Study Area is served by two primary rail corridors: the Florida East Coast (FEC) Railway, primarily handling freight,

[7] Broward County had an annual Gross Domestic Product (GDP) of $147 billion in 2022. This made it the second-largest GDP in Florida and the 25th largest in the United States (source: https://fred.stlouisfed.org/series/GDPALL12011). See Section B.1.20 for additional discussion of socioeconomic resources in the Study Area.

and the South Florida Rail Corridor, which supports both passenger and freight operations (Broward MPO 2024). Tri-Rail, operated by the South Florida Regional Transportation Authority, provides commuter rail service along the South Florida Rail Corridor, connecting Miami, Fort Lauderdale, and West Palm Beach. This service accommodates more than 4.4 million annual passengers (Broward MPO 2024). Brightline, a privately operated intercity rail service along the FEC corridor, serves major South Florida cities and offers seamless access to local transit options. Amtrak's Silver Service and Palmetto routes also utilize the South Florida Rail Corridor.

Freight rail operations play a substantial role in the Study Area's economic infrastructure. The FEC Railway operates a major freight corridor parallel to the coast, linking Port Everglades with domestic and international markets. The FEC, in partnership with Port Everglades, constructed the Intermodal Container Transfer Facility in 2014, streamlining freight transfers between ships, trains, and trucks, thereby reducing truck traffic on local roadways and enhancing the port's competitiveness. CSX Transportation also provides freight service on the South Florida Rail Corridor, facilitating cargo movement through connections to the Fort Lauderdale-Hollywood International Airport and Port Everglades, Broward's primary cargo hubs. This integrated freight network supports efficient goods distribution while minimizing environmental impacts and congestion on regional roads.

Air. Fort Lauderdale-Hollywood International Airport is a major transportation hub within the Study Area, serving as a large-hub airport with significant daily passenger volume. In 2018, Fort Lauderdale-Hollywood International Airport recorded over 17.6 million enplanements, with an average of 80,000 passengers traveling daily through its facilities (Broward MPO 2024). The airport hosts over 30 airlines and operates more than 700 flights daily. Fort Lauderdale-Hollywood International Airport plays a substantial economic role in the region, generating an estimated $2.4 billion annually and supporting approximately 37,000 jobs (Broward MPO 2024).

Waterways. Water transportation is an established and historic mode of transit in the Study Area, which includes: (1) the ICW, accommodating smaller boat traffic; (2) miles of inland canals; and (3) Port Everglades, a major commercial shipping port (Broward MPO 2024). In 2023, Port Everglades handled over 1 million Twenty-Foot Equivalent Units (TEU), ranking as the top perishables port in Florida and the 15th busiest container port in the United States (Port Everglades 2024). The ICW, a navigable channel maintained by the USACE, runs through this area and supports a wide range of recreational and commercial boating activities along Florida's eastern coast. Water transportation services in the Study Area also include the Riverwalk Water Trolley, operated by the Downtown Fort Lauderdale Transportation Management Association, which provides free public access along the New River. Additionally, the Water Taxi, a privately owned, year-round shuttle service, offers further water transportation options (Broward MPO 2024).

Water Control Structures. The WCS in the Study Area are critical infrastructure elements serving the canals within the designated area. While the canals provide recreational opportunities, such as fishing and boating, they were not conceived or ever intended for transportation purposes. None of the nine WCS in the Study Area are designed to accommodate boat traffic, as they lack locks or bypass routes. Consequently, the WCS effectively isolate each side of the canals they traverse, preventing access between the two canal segments.

Table B.1-16 lists the AADT counts for the last five years with the average for the three closest transportation routes with data for each of the nine WCS. AADT counts are the total volume of traffic on a highway segment for one year, divided by the number of days in the year.

Table B.1-16. Water Control Structures and Traffic Counts.

Water Control Structure			Annual Average Daily Traffic					
	County	Road/Site	2019	2020	2021	2022	2023	Average
G-56 Gated Spillway	Palm Beach	Powerline Rd (930016)	38,000	37,000	34,500	36,000	36,500	36,400
		SW 18th St (938552)	24,500	23,500	23,500	24,500	25,500	24,300
	Broward	Military Tr (869347)	27,000	21,000	20,900	20,800	27,000	23,340
G-57 Gated Spillway	Broward	Atlantic Blvd (860071)	43,000	41,000	42,500	41,500	40,500	41,700
		Dixie Hwy (860025)	27,000	26,000	25,500	23,500	24,000	25,200
		NE 18th Ave (867424)	22,500	15,700	15,700	15,500	19,900	17,860
S-37B Gated Spillway	Broward	Florida's Tpke (971916)	123,300	105,700	105,300	124,200	129,500	117,600
		Atlantic Blvd (867493)	51,500	48,500	49,500	52,500	54,500	51,300
		SW 36th Ave (869590)	7,900	5,400	5,400	5,400	7,900	6,400
S-37A Gated Spillway	Broward	Dixie Hwy (860501)	23,500	20,200	25,400	20,500	21,000	21,120
		Cypress Creek Rd (860301)	42,500	40,500	35,500	39,000	39,000	39,300
		NE 18th Ave (869277)	22,000	21,000	20,000	19,800	19,100	20,380
S-36 Gated Spillway	Broward	Oakland Park Blvd (860479)	60,000	56,000	57,500	52,500	58,000	56,800
		NW 31st Ave (867441)	31,000	24,500	24,500	24,500	34,000	27,700
		NW 39th St (867087)	6,800	3,500	3,500	3,500	7,300	4,920
S-33 Gated Spillway	Broward	Sunrise Blvd (860487)	52,500	59,500	53,500	50,500	57,000	54,600
		SR-7/US-441 (860103)	53,000	50,500	50,000	49,000	48,500	50,200
		MLK Jr Ave (860430)	28,500	23,000	24,000	27,500	26,500	25,900
G-54 Gated Spillway	Broward	I-595 (860380)	159,413	123,536	145,812	148,903	151,408	145,814
		Davie Rd (865313)	46,500	20,600	20,500	20,500	43,000	30,220
		SR-84 (860630)	17,500	16,500	16,000	19,000	11,500	16,100
S-13AW Gated Culvert	Broward	SR-818 (860115)	37,500	35,500	25,500	38,500	31,500	33,700
		Nob Hill Rd (869241)	22,500	18,200	18,000	17,800	21,500	19,600
		SW 95th Ave (867277)	6,200	3,700	3,700	3,700	5,400	4,540
S-13 Pump Station and Gated Spillway	Broward	Florida's Tpke (971904)	147,000	130,100	133,600	150,200	158,200	143,820
		SR-7/US-441 (860089)	52,500	53,500	49,500	48,500	50,500	50,900
		Orange Dr (867036)	14,700	8,000	7,900	7,900	9,400	9,580

Source: FDOT 2024

B.1.19 Infrastructure and Utilities

This section describes flood control infrastructure within the Study Area. Many of these structures were constructed by the USACE as part of the C&SF Project from 1950 through the 1970s (SFWMD 2021a). There are a total of 27 WCS in the Study Area (**Table B.1-17**). The nine primary WCS that are the focus of this Section 203 Study and their associated primary canals are listed in **Table B.1-18**. In addition to the C&SF Project structures, Broward County contains 23 Drainage Districts, 29 Sewer Service Areas, and 30 Water Service Areas to manage potable water, wastewater, and stormwater within the Study Area, all of which are affected by flooding risks.

Table B.1-17. Water Control Structures in the Section 203 Study Area.

Water Control Structure[a/]	Location (Latitude, Longitude)	Section 203 Study Structure
CS NO 1 Spillway[b/]	26.483401°N, 80.212158°W	No

Water Control Structure[a/]	Location (Latitude, Longitude)	Section 203 Study Structure
G-94A Gated Culvert	26.435024°N, 80.229933°W	No
CS NO 3 Weir	26.434912°N, 80.215763°W	No
S-40 Gated Spillway	26.421560°N, 80.072445°W	No
S-39 Gated Spillway	26.355739°N, 80.297653°W	No
S-39A Gated Culvert	26.355409°N, 80.297395°W	No
LWDD 17W Spillway[c/]	26.328366°N, 80.170654°W	No
LWDD 17W Pump	26.328365°N, 80.170733°W	No
G-56 Gated Spillway	26.327972°N, 80.131583°W	Yes
S-38B Gated Culvert	26.287706°N, 80.297819°W	No
G-57 Gated Spillway	26.230850°N, 80.121525°W	Yes
S-38A Gated Culvert	26.229939°N, 80.298139°W	No
S-38 Gated Culvert	26.229461°N, 80.298517°W	No
S-38C Gated Culvert	26.228659°N, 80.298161°W	No
S-37B Gated Spillway	26.223689°N, 80.170163°W	Yes
G-65 Gated Culvert	26.230905°N, 80.159510°W	No
S-37A Gated Spillway	26.206246°N, 80.131641°W	Yes
S-36 Gated Spillway	26.173183°N, 80.179122°W	Yes
S-125 Gated Culvert	26.164253°N, 80.297985°W	No
S-34E Gated Culvert	26.149784°N, 80.442377°W	No
S-33 Gated Spillway	26.135942°N, 80.194494°W	Yes
S-124 Gated Culvert	26.129263°N, 80.365700°W	No
G-54 Gated Spillway	26.095082°N, 80.229682°W	Yes
S-13AW Gated Culvert	26.064633°N, 80.281512°W	Yes
S-13 Pump Station and Gated Spillway	26.066360°N, 80.208858°W	Yes
S-381 Gated Weir	26.061598°N, 80.419523°W	No
G-87 Gated Culvert	26.029438°N, 80.312959°W	No

a/ Most structures designed and built by the USACE are preceded by the letter "S," such as S-37, while most structures designed and built by the SFWMD are preceded by the letter "G," such as G-56.

b/ CS = Control Structure

c/ LWDD = Lake Worth Drainage District

Table B.1-18. Water Control Structures and Associated Primary Canals that are part of the Section 203 Study.

Water Control Structure[a/]	Primary Canal
G-56 Gated Spillway	G-08 (Hillsboro) Canal
G-57 Gated Spillway	G-16 (Pompano) Canal
S-37B Gated Spillway	C-14 (Cypress Creek) Canal
S-37A Gated Spillway	C-14 (Cypress Creek) Canal
S-36 Gated Spillway	C-13 (Middle River) Canal
S-33 Gated Spillway	C-12 (Plantation) Canal
G-54 Gated Spillway	G-15 (North New River) Canal
S-13AW Gated Culvert	C-11 (South New River) Canal
S-13 Pump Station and Gated Spillway	C-11 (South New River) Canal

In general, the WCS are situated on primary canals that flow from west to east (**Figure B.1-1**). The gated spillway structures are used to control the headwater elevation along the canals on which they are located. During dry periods, the structure's spillway gate can be lowered, reducing, or eliminating flow through the structure to raise headwater elevation for water conservation purposes. During a flood event, or for regulatory releases, the gate can be raised, passing water flow through the structure to maintain a lower-than-normal head water elevation. In addition to maintaining upstream freshwater control as described above, automatic operational features are used to close the gate and prevent

upstream migration of salt water during high tide events, whenever the differential between the head and tail water pool elevations reaches a certain number (default differential value is 0.1 foot) (SFWMD 2021a).

B.1.19.1 Gated Spillway Structures and Primary Canals

This section summarizes the major features and operations of each gated spillway structure as described below, proceeding from the northernmost to southernmost structure. **Table B.1-19** summarizes additional specific information concerning design specifications, discharge capacity, physical facilities, and primary canal dimensions. **Section B.1.16 Land Use and Real Estate** describes the land use around each WCS.

G-56 Gated Spillway and G-08 (Hillsboro) Canal

The G-56 WCS is a three-bay, reinforced concrete, gated spillway located on the G-08 (Hillsboro) Canal. The structure consists of three 12.2-foot-high by 20.0-foot-wide gates with sill elevations of -5.1 feet NAVD88. The discharge from this structure is controlled by hydraulically driven cable operated vertical lift gates. The gates can either be remotely operated from the SFWMD Operation Control Center or controlled on-site. The structure was completed in 1991 to replace the old Deerfield Lock Structure. The structure is currently maintained by the Fort Lauderdale Field Station. This structure is operated to maintain optimum upstream stages in the G-08 (Hillsboro) Canal. It passes basin flows or regulatory releases from WCA-1 while limiting the upstream stage and channel velocity (SFWMD 2022a).

G-57 Gated Spillway and C-16 (Pompano) Canal

The G-57 WCS is a two-bay, reinforced concrete gated spillway, located on C-16 (Pompano) Canal. The structure consists of two 6.5-foot-high by 14.7-foot-wide gates. The discharge from this structure is controlled by an electric driven cable drum operated vertical lift gate. The gates can either be remotely operated from the SFWMD Operation Control Center or controlled on-site. The structure was completed in 1987, and it is currently maintained by the Fort Lauderdale Field Station. This structure maintains optimum upstream stages in the C-16 (Pompano) Canal. It passes the design flood without exceeding the upstream flood design stage and channel velocities to non-damaging levels, and it prevents saltwater intrusion during periods of high tides (SFWMD 2022b).

Table B.1-19. Description of Water Control Structures and Associated Primary Canals.

Water Control Structure	G-56 Gated Spillway	G-57 Gated Spillway	S-37B Gated Spillway	S-37A Gated Spillway	S-36 Gated Spillway	S-33 Gated Spillway	G-54 Gated Spillway	S-13AW Gated Culvert	S-13 Gated Pump Station and Gated Spillway
Design Specifications									
Year Built	1991	1987	1959	1959	1954	1954	1992	2007	1954, Pump station refurbished in 2017
Design Discharge (cubic feet per second)	3,760	375	3,390	3,890	1,090	920	1,600	500	1,080 (540 via 3 pumps and 540 via 1 gate)
Optimum Headwater Elevation (ft NAVD88)	5.9	2.9	5.4	2.4	2.9	1.9	2.4	1.4 to 2.0	0.0
Design Discharge Flow Type	Uncontrolled submerged	Controlled submerged	Uncontrolled submerged	Controlled submerged	Uncontrolled submerged	Uncontrolled submerged	Uncontrolled submerged	Submerged	Uncontrolled submerged (for gate) and pumped
Generator Room/Building Finished Floor Elevation (ft NAVD88)	12.9	8.3	9.9	7.4	13.1	11.9	8.9	7.7	7.0
Water Level which will Bypass Structure (ft NAVD88)	12.4	7.4	9.9	6.4	9.9	8.4	6.4	6.6	6.4
Number of Spillway/Culvert Gates	3	2	2	2	1	1	3	2	1
Gate Type	Vertical slide	Vertical lift	Vertical lift	Vertical lift	Vertical lift	Vertical lift	Vertical slide	Vertical-lift sluice	Vertical lift
Gate Lift Mechanism Type	Hydraulic cable lift hoist	Cable drum	Electric driven cable drum	Hydraulic cable lift hoist	Direct drive electric motor gear, connected to cables	Cable drum	Hydraulic cable lift hoist	Stem-driven	Cable lift
Manatee Protection Pressure Sensors[a/]	No	No	No	No	No	Yes	No	No	No[b/]
Gate Lift Normal Power Source	Commercial electricity	Commercial electricity	Commercial electricity	Commercial electricity	Commercial electricity	Commercial electricity	Commercial electricity	Commercial electricity	Commercial electricity

Water Control Structure	G-56 Gated Spillway	G-57 Gated Spillway	S-37B Gated Spillway	S-37A Gated Spillway	S-36 Gated Spillway	S-33 Gated Spillway	G-54 Gated Spillway	S-13AW Gated Culvert	S-13 Gated Pump Station and Gated Spillway
Gate Lift Backup Power Source	LPG engine-driven generator	LPG engine-driven generator	LPG engine-driven generator	LPG engine-driven generator	LPG engine-driven generator	LPG engine-driven generator	LPG engine-driven generator	LPG engine-driven generator	2 diesel engine-driven generators (1 primary, 1 backup)
Canal Description									
Primary Canal	G-08 (Hillsboro) Canal	G-16 (Pompano) Canal	C-14 (Cypress Creek) Canal	C-14 Cypress Creek) Canal	C-13 (Middle River) Canal	C-12 (Plantation) Canal	G-15 (North New River) Canal	C-11 (South New River) Canal	C-11 (South New River) Canal
Bottom Width (upstream, downstream) (ft)	80.0	20.0	20.0, 30.0	45.0, 80.0	20.0	10.0	100, 72.5	40.0	40.0
Bottom Elevation (upstream, downstream) (ft NAVD88)	-12.6, -18.6	-8.6	-16.1, -16.6	-16.6	-9.6, -10.6	-4.6, -6.6	-7.6, -9.6	-5.6	-10.6

a/ Where manatee protection pressure sensors do not exist, WCS can be operated in such a manner as to exclude manatees (e.g., 2.5-foot minimum gate openings).
b/ Although the S-13 Pump Station and Gated Spillway gate does not include manatee protection sensors, it does include a metal grating within its spillway discharge bay that functions as a physical barrier to prevent manatees from contacting the S-13 spillway gate.
Note: LPG = liquified petroleum gas
Source: As-built drawings of structures and SFWMD 2022a-h

S-37B Gated Spillway and C-14 (Cypress Creek) Canal

The S-37B WCS is a two-bay, reinforced concrete gated spillway, located on C-14 (Cypress Creek) Canal. The structure consists of two 6.58-foot-high by 25.75-foot-wide gates with sill elevations of -1.6 feet NAVD88. The discharge from this structure is controlled by an electric driven cable drum operated vertical lift gate. The gates can either be remotely operated from the SFWMD Operation Control Center or controlled on-site. The structure was completed in 1959, and a 1-foot plate was added on top of the gates around 1990. The gate operators were modified from stem to cable drum in 2004. The structure is currently maintained by the Fort Lauderdale Field Station. This structure maintains optimum upstream stages in C-14 (Cypress Creek) Canal. It was designed to pass 40 percent of the Standard Project Flood (SPF) from the western agricultural portion of the drainage basin and 60 percent SPF of eastern urban area without exceeding the upstream flood design stage, restrict downstream flood stages and channel velocities to non-damaging levels, and prevent saltwater intrusion (SFWMD 2022c).

S-37A Gated Spillway and C-14 (Cypress Creek) Canal

The S-37A WCS is a two-bay, reinforced concrete gated spillway, located on C-14 (Cypress Creek) Canal. The structure consists of two 12.8-foot-high by 25.8-foot-wide gates with sill elevations of -9.3 feet NAVD88. The discharge from this structure is controlled by an electric driven cable drum operated vertical lift gate (gates' operator base and platform were overhauled in 2004). The gates can either be remotely operated from the SFWMD Operation Control Center or controlled on-site. The structure was completed in 1959, and it is currently maintained by the Fort Lauderdale Field Station. This structure maintains optimum upstream stages in the C-14 (Cypress Creek) Canal. It was designed to pass 40 percent of the SPF from the western agricultural portion of the drainage basin and 60 percent SPF of eastern urban area without exceeding the upstream flood design stage, restrict downstream flood stages and channel velocities to non-damaging levels, and prevent saltwater intrusion during periods of high tides (SFWMD 2022d).

S-36 Gated Spillway and C-13 (Middle River) Canal

The S-36 WCS is a one-bay, reinforced concrete gated spillway, located on the C-13 (Middle River) Canal. The structure consists of one 14.0-foot-high by 25.0-foot-wide gate with a sill elevation of -8.6 feet NAVD88. The discharge from this structure is controlled by an electric driven cable drum operated vertical lift gate. The gate can either be remotely operated from the SFWMD Operation Control Center or controlled on-site. The structure was completed in 1954, and it is currently maintained by the Fort Lauderdale Field Station. This structure maintains optimum upstream stages in the C-13 (Middle River) Canal. It was designed to pass 50 percent of the SPF without exceeding upstream flood design stage, restrict downstream flood stages and discharge velocities to non-damaging levels, and prevent saltwater intrusion during periods of high tides (SFWMD 2022e).

S-33 Gated Spillway and C-12 (Plantation) Canal

The S-33 WCS is a one-bay, reinforced concrete gated spillway, located on C-12 (Plantation) Canal. The structure consists of one 9.0-foot-high by 22.0-foot-wide gate with a sill elevation of -3.6 feet NAVD88. The discharge from this structure is controlled by an electric driven cable drum operated vertical lift gate. The gate can either be remotely operated from the SFWMD Operation Control Center or

controlled on-site. The structure was completed in 1954, and it is currently maintained by the Fort Lauderdale Field Station. This structure maintains optimum upstream stages in the C-12 (Plantation) Canal. It was designed to pass 50 percent of the SPF without exceeding the upstream flood design stage, restrict downstream flood stages and channel velocities to non-damaging levels, and prevent saltwater intrusion during periods of high tides (SFWMD 2022f).

G-54 Gated Spillway and G-15 (North New River) Canal

The G-54 WCS is a reinforced concrete gated spillway, located on the G-15 (North New River) Canal. The structure consists of three 9.5-foot-high by 16-foot-wide gates with a sill elevation of -5.6 feet NAVD88. The discharge from this structure is controlled by hydraulically driven cable operated vertical lift gates. The gates can either be remotely operated from the SFWMD Operation Control Center or controlled on-site. Construction of the G-54 WCS was completed in 1992 to replace the old Sewell Lock Structure. Normal operational range is from 1.9 to 2.9 feet NAVD88. This structure maintains optimum water control stages in the G-15 (North New River) Canal and controls upstream migration of saline water. The G-54 Gated Spillway passes watershed flows or regulatory releases from WCA-2 while limiting the upstream stage and channel velocity (SFWMD 2022g).

S-13AW Gated Culvert and C-11 (South New River) Canal

The S-13AW WCS is a double-box, concrete culvert with discharge controlled by two sluice vertical lift gates. The S-13AW Gated Culvert is located on the C-11 (South New River) Canal about 4.5 miles upstream from the S-13 WCS. The structure can either be remotely operated from the SFWMD Operation Control Center or controlled on-site. The S-13AW WCS was built by SFWMD in 2007 to replace the S-13A WCS. This was due to a change in flood control operation initiated in July 2003, when the S-13A WCS began more frequently releasing excess water from the C-11 West Basin to be discharged to tide through the S-13 WCS. This structure functions together with the S-13 WCS to discharge excess water to tide from the C-11 West Basin to reduce pumping by the S-9/S-9A WCS into WCA-3A. During the dry season, the S-13AW Gated Culvert will allow water supply releases to the areas east of the structure. The design flow is also increased from 120 cubic feet per second (cfs) to 500 cfs.

S-13 Pump Station and Gated Spillway and C-11 (South New River) Canal

This structure is a pumping station with a gated spillway that can control flows that bypass the pumps. The structure is in the C-11 (South New River) Canal and is a reinforced concrete structure with concrete block superstructure. The pumping station is equipped with three Fairbanks Morse 60-inch Figure 6310W vertical propeller pumps each having a rated capacity of 180 cfs at a 4-foot static head. Each pumping unit is driven through a Bradfoot Gear Works two-stage right-angle reducer by a Detroit Diesel V-71 285 horsepower in-line diesel engine. At the south side of the station, there is a 16-foot-wide by 11-foot-high vertical lift gate that is raised or lowered by means of Baldor 3 Phase stem hoists. Operation of the gate hoist is normally controlled automatically but may be controlled manually during emergencies or for servicing. Other equipment includes a Wright 5-ton manually operated overhead bridge crane for general maintenance and a dual water stage recorder. The purpose of the structure is to release flood runoff from, prevent over drainage of, and saltwater intrusion into the agricultural area served by the C-11 (South New River) Canal west of the WCS. The purpose of the pumping units in the WCS is to pump surplus water through C-11 from the agricultural area west of the structure at the rate

of 3/4 inch per day from the tributary drainage area, to keep water level in the canal west of the structure at optimum elevation of 2.2 feet above mean sea level, as practicable (SFWMD 2022h).

B.1.19.2 Structure Inspection Program

The WCS are inspected on a regular basis by SFWMD, at least once every 5 years, per the operation, maintenance, repair, replacement, and rehabilitation requirements established by USACE. SFWMD also makes additional improvements when feasible. The most recent inspections were conducted in 2021, with exception to the S-13 Pump Station and Gated Spillway, in which structure components (gates, crane, and pump station engines), were inspected from 2022 to 2024. The inspections review civil, structural, mechanical, and underwater components of the WCS. The WCS vary in size and number of gates, but in general have a similar layout. All the structures have a control building, which houses a backup generator and the electronics for manual gate operation; gate operation can also be controlled remotely. The backup generator is powered by liquefied petroleum gas, except for the S-13 Pump Station and Gated Spillway which uses diesel-powered generators. The inspections review the integrity of the structure: wingwalls and tiebacks, pier walls, retaining walls, cathodic protection system, gate lift system, dewatering structure, electrical system, and general site conditions. The most recent inspections identify some deficiencies and provide recommendations for repair. In general, the inspections indicate that the structures are operational but have passed or are passing their life expectancy (SFWMD 2020, 2021c-i, 2022i). The drainage system was not originally designed to accommodate the combined effects of increased runoff due to urbanization, sea level rise averaging 6 to 8 inches, and heightened storm surge and high tides resulting from more frequent and intense storms, as well as extreme rainfall events. As the system relies on gravity, its efficiency, capacity, and ability to provide flood protection have been reduced due to more frequent inundation.

B.1.20 Socioeconomics

B.1.20.1 Overview

The socioeconomic resources of the communities in which the Section 203 Study will take place are in eastern Broward County and a small portion of southern Palm Beach County. Since only a portion of each of Broward and Palm Beach counties are included in the Study Area, some county-level data presented in this section may over- or under-represent certain socioeconomic parameters. Data by census tract, when available, are also provided.

The Study Area includes 397 total census tracts: 338 census tracts in Broward County and 59 census tracts in Palm Beach County. The Study Area does not include the very large census tract (census tract 9800) west of the Study Area that includes the Everglades Agricultural Area, WCAs, and Miccosukee Tribe of Indians of Florida reservation land. It also does not include the southeastern census tracts in Broward County, in the communities of Hallandale Beach, Miramar, or Pembroke Pines. Socioeconomic data are provided by state, county, and where applicable, city or municipality and census tract.

Definitions

Census tracts are subdivisions of a county, averaging approximately 4,000 people. Tracts are designed to be relatively homogenous in terms of population characteristics, economic status, and living conditions at the time they are established.

Chained dollars gross domestic product is the result of multiplying the current-dollar value of an aggregator component for its corresponding chain-type quantity index and then dividing by 100 to calculate growth rates (BEA 2018).

Industry as used in this report is defined by the North American Industry Classification System (NAICS), which is the standard used by federal statistical agencies to classify business establishments for their scope of work (BLS 2023).

B.1.20.2 Technical Approach/Methods

Data on demographics, population, labor force and employment, gross domestic product, income, housing, social vulnerability from natural hazards, and risk index ratings were gathered from multiple sources to characterize socioeconomic resources. Data sources include the following:

- U.S. Census Bureau's (USCB) American Community Survey (ACS; USCB 2013a,b, 2018, 2019, 2022a-c, 2023a-o, 2024a,b): The ACS includes social, economic, demographic, and housing data collected annually (ACS) by the U.S. Census Bureau.
- Federal Emergency Management Agency (FEMA) National Risk Index for Natural Hazards: The National Risk Index for Natural Hazards (NRI) is an interactive tool that shows which communities are most at risk to natural hazards (FEMA 2022a,b). Data include expected annual losses to individual natural hazards, social vulnerability, and community resilience.
- U.S. Bureau of Economic Analysis (BEA 2024a-f) economic data including gross domestic product by NAICS code.
- Florida Department of Commerce, Bureau of Workforce Statistics and Economic Research (BWSER 2024a,b) for workforce statistics for Broward and Palm Beach counties.
- University of Florida, Bureau of Economic and Business Research (BEBR 2023, 2024) for population estimates by county.

Data from the FEMA NRI were reviewed at the county and census tract level. Data from the USCB ACS, BEA, Florida Department of Commerce BWSER, and University of Florida Bureau of Economic and Business Research (BEBR) were reviewed at the state and county levels as those sources do not provide data at the census tract level. Where available and applicable, data was reviewed at the city or municipality level to fully document socioeconomic resources.

Population Characteristics

Demographics

U.S. Census Bureau's ACS data indicate that an average of 12.7 percent of the Broward County population is below the national poverty level (USCB 2024b), with black or African American people representing the highest percentage of people below the poverty level (17.4 percent). In Palm Beach

County, an average of 10.7 percent of the population is below the national poverty level, with the highest percentage of people below the poverty level (20.4 percent) identified as non-white (USCB 2024b).

Population and Median Age

According to the U.S. Census Bureau, there has been a general population migration to the south with Florida being the epicenter of this growth. Four of the five metropolitan statistical areas (MSAs) with the fastest growing populations in the nation are in Florida (USCB 2024c). This includes the Miami-Fort Lauderdale-West Palm Beach MSA that added 43,387 residents between 2022 and 2023 and covers the Study Area. **Figure B.1-24** shows the percent change in population by MSA in Florida between 2022 and 2023.

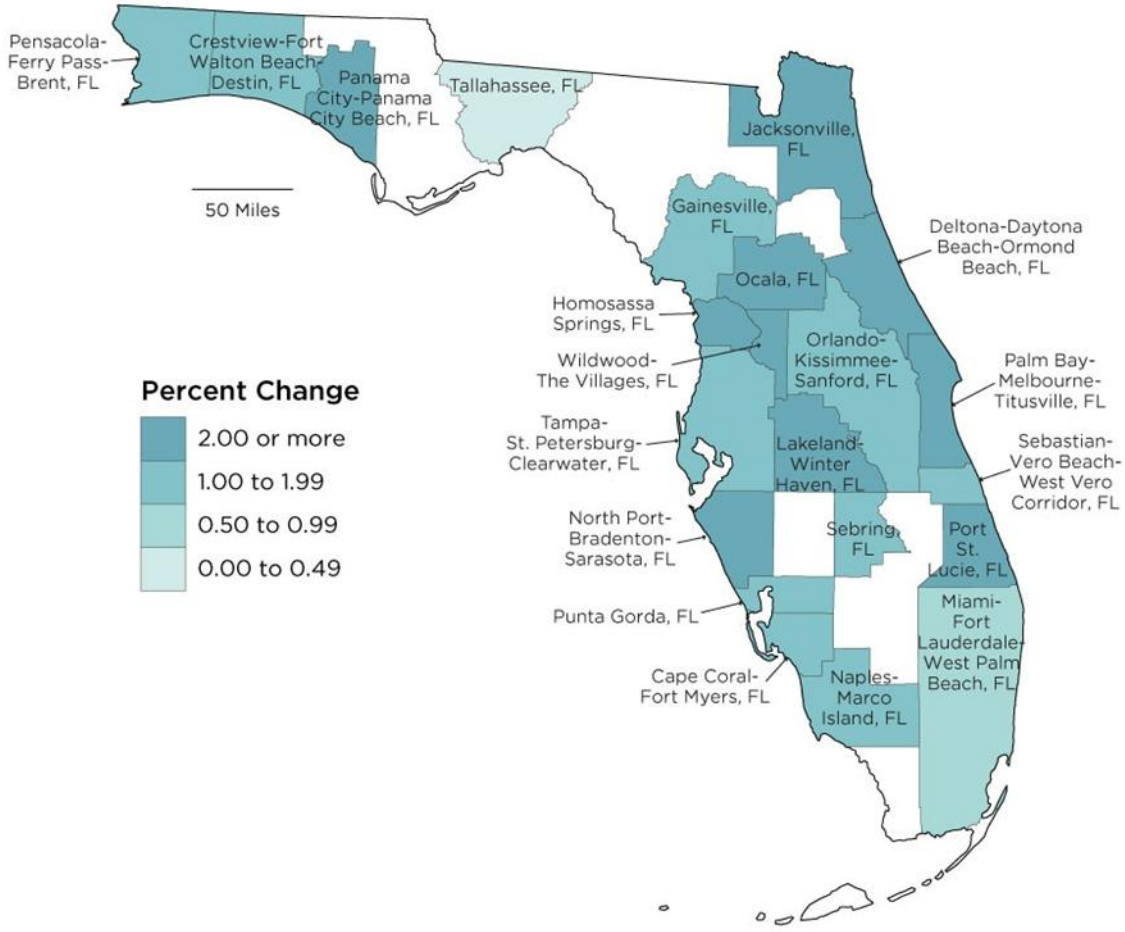


Figure B.1-24. Percent Change in Metropolitan Statistical Area Population: July 1, 2022, to July 1, 2023.

Table B.1-20 summarizes the population from 2013 (USCB 2013a) to 2023 (USCB 2023a) of the counties that fall within the Study Area, along with an overview of the state of Florida for contextualization of the presented data. According to the Census Bureau, Broward County and Palm Beach County are respectively the second and third most populated counties in Florida. Of the two counties, Broward is smaller geographically. Both counties demonstrated overall population growth, which supported the

observable population growth of the state of Florida. Despite Broward County having a larger population, in the examined 10-year period, it had less population growth than Palm Beach County. The median age of Palm Beach County was also higher than both Broward County and the state average, but not to any significant, notable degree.

Table B.1-20. Population in 2013 and 2023, Population Change, and Median Age.

Population	State of Florida	Broward County	Palm Beach County
Population 2013	19,552,860	1,838,844	1,372,171
Population 2023	22,610,726	1,962,531	1,533,801
Population Change 2013-2023	13%	6%	10%
Median Age	42.8	41.5	45.6

Source: USCB 2013a, USCB 2023a

The Broward County portion of the Study Area contains four of the 25 most populace cities in Florida, according to 2023 U.S. Census data (USCB 2023m) estimates: Fort Lauderdale (184,255 people; median age 43.6), Hollywood (153,859 people; median age 42.3), Coral Springs (134,906 people; median age 38.3), and Pompano Beach (113,619 people; median age 44.6). The same data also indicates that the two largest cities in the Palm Beach County portion of the Study Area are Boca Raton (99,974 people; median age 46.3) and Delray Beach (67,536 people; median age 51.9).

BEBR projects growth for all Florida counties, including Broward and Palm Beach counties, through 2050 (BEBR 2024). In addition, BEBR produced population projection estimates through 2075 for all counties that fall entirely or partially within the boundaries of the SFWMD (BEBR 2023). In Broward County, BEBR projects that the population will increase 12.2 percent between 2023 and 2050 (BEBR 2024), with a total population of 2.4 million people in 2075 based on medium series projections (BEBR 2023). The Hispanic population is expected to increase 44.6 percent and non-Hispanic black population 28.5 percent between 2023 and 2050, while the non-Hispanic white population is projected to decrease 35.3 percent. Population growth in Palm Beach County will outpace Broward County by increasing an estimated 17.5 percent between 2023 and 2050 (BEBR 2024). The total population in Palm Beach County is projected to be 1.9 million people in 2075 based on medium series projections (BEBR 2023). Like Broward County, minority group populations are expected to increase in Palm Beach County, specifically with the Hispanic population increasing 42.3 percent and non-Hispanic black population 29.8 percent while the non-Hispanic white population will increase slightly by 0.9 percent between 2023 and 2050 (BEBR 2024).

Table B.1-21 demonstrates total expected population growth from 2024 to 2029 within Broward County census tracts. In the 5-year period from 2024 to 2029 the Broward County population is anticipated to grow by 41,420 individuals. The census tract with the highest population is expected to grow by 850 individuals in a 5-year period. The census tract with the lowest population is expected to grow by two individuals in a five-year period (USCB 2024b).

Table B.1-21. Population Change in Broward County from 2024 to 2029.

Year	Population — All Census Tracts	Highest Population Census Tract	Lowest Population Census Tract
2024	2,097,008	26,612	634
2029	2,138,428	27,462	636
Change 2024 to 2029	41,420	850	2

Note: Data are for all Broward County census tracts (minus those census tracts where data were not available); only a portion of Broward County is within the Study Area.
Source: USCB 2024b

Employment and Economic Conditions

Labor Force and Employment

Table B.1-22 demonstrates the labor force and employment rates (USCB 2023j,k) of the total population 16 years of age and over in the selected counties, the state of Florida, and the United States.

Broward County demonstrated a higher rate of labor force participation than the United States and Florida averages, while Palm Beach demonstrated roughly the same as the state average, falling just short. All four demonstrated similar unemployment rates. Broward County showed a notably higher labor force participation rate while simultaneously displaying a higher unemployment rate than the state. Of the examined areas, Palm Beach had the lowest labor force participation rate, and a higher unemployment rate compared to Broward County and Florida, but on par with the unemployment rate of the nation.

Table B.1-22. Labor Force and Employment.

Labor Force and Employment	United States	State of Florida	Broward County	Palm Beach County
Total Population 16 Years and Over	271,122,729	18,768,460	1,605,669	1,284,051
Population 16 Years and Over in Labor Force	173,038,795	11,267,928	1,069,433	768,650
Labor Force Participation Rate	63.8%	60.0%	66.60%	59.90%
Unemployment Rate	4.30%	4.1%	4.20%	4.30%

Source: USCB 2023j,k

According to the U.S. Census Bureau's ACS (USCB 2023j,k), of the cities in the Broward County Study Area, in 2023, Fort Lauderdale had a labor force participation rate of 65.5 percent and an unemployment rate of 3.3 percent, Hollywood city had labor force participation rate of 62.6 percent and an unemployment rate of 3.9 percent, Coral Springs had a labor force participation rate of 71.9 percent and an unemployment rate of 2.2 percent, and Pompano Beach had a labor force participation rate of 62.6 percent and an unemployment rate of 1.8 percent. The same data also shows that of the cities in the Palm Beach County portion of the Study Area, Boca Raton had a labor force participation rate of 57.8 percent and an unemployment rate of 2.4 percent, and Delray Beach had a labor force participation rate of 60.6 percent and an unemployment rate of 3.6 percent.

The population aged 16 years and over in the labor force can be broken into 13 industry sectors defined by the NAICS and utilized by the ACS. Table B.1-23 is a breakdown of the employed civilian population aged 16 years and over and the percentage of that total population that make up each industry sector in the United States, Florida, Broward County, and Palm Beach County.

Table B.1-23. Percentage of Workforce (16 years and over) by Industry Sector.

Industry Sector	United States	State of Florida	Broward County	Palm Beach County
Agriculture, forestry, fishing and hunting, and mining	1.6%	0.9%	0.2%	0.9%
Construction	6.9%	8.1%	6.7%	8.6%
Manufacturing	9.9%	5.4%	4.9%	4.3%
Wholesale trade	2.0%	2.2%	2.9%	2.1%
Retail trade	10.6%	11.6%	11.4%	11.6%
Transportation and warehousing, and utilities	6.0%	6.5%	7.5%	5.7%
Information	1.9%	1.5%	1.6%	1.3%
Finance and insurance, and real estate and rental and leasing	6.6%	8.4%	8.6%	9.1%
Professional, scientific, and management, and administrative and waste management services	12.8%	14.4%	15.5%	15.6%
Educational services, and health care and social assistance	23.5%	20.7%	20.1%	20.8%
Arts, entertainment, and recreation, and accommodation and food services	8.8%	11.1%	11.8%	10.1%
Other services, except public administration	4.8%	5.2%	5.1%	6.3%
Public administration	4.6%	4.0%	3.6%	3.5%

Source: USCB 2023j,k

The highest percentages all fell under the "Educational services, and health care and social assistance" category, accounting for above 20 percent of employment at the U.S. and state level, as well as in each of the two counties. The lowest percentages all fell under "Agricultural, forestry, fishing and hunting, and mining," although the U.S. percentage of 1.6 was higher than both the Florida and Palm Beach County percentage of 0.9, and much higher than the Broward County percentage of 0.2. From there, each region (United States, Florida, and counties) begins to show further distinction in their percentages of industry sector. "Professional, scientific, and management, and administrative waste management services" was another unanimously important industry sector with the second highest percentages in both counties, and with both Broward County and Palm Beach County rising above the state and U.S. averages. "Retail trade" had a higher percentage for all regions, but "Arts, entertainment, and recreation" was third highest in Broward County (11.8 percent), slightly above its fourth highest "Retail Trade" percentage of 11.4 percent. Meanwhile, "Arts, entertainment, and recreation" was lower in Palm Beach County and fourth highest at 10.1 percent while "Retail Trade" was the third highest percentage and matched the state percentage of 11.6 percent.

The Florida Department of Commerce, Bureau of Workforce Statistics and Economic Research (BWSER) provides workforce projections through 2032. For both Broward (BWSER 2024a) and Palm Beach (BWSER 2024b) counties, when all industries are totaled BWSER projects positive job growth. In Broward County, job totals are expected to increase 5.1 percent between 2024 and 2032 (BWSER 2024a). Employment is expected to increase across almost all industries with the greatest increases occurring in the information (17.5 percent) and professional and business services (10.8 percent) sectors. The county is projected to see decreases in the construction (0.4 percent) and government (0.6 percent) sectors. Occupations with the biggest expected increases include data scientists (43.3 percent), nurse practitioners (39.6 percent), information security analysts (32.7 percent), software developers (29.0 percent), and software quality assurance analysts and testers (25.2 percent). In Palm Beach County, the

number of jobs is expected to increase 7.1 percent from 762,323 in 2024 to 816,358 in 2032 (BWSER 2024b). Industries projected to see the highest growth in Palm Beach County are the professional and business services industry (13.2 percent). The only industries expected to decrease are agriculture, forestry, fishing, and hunting (12.7 percent decrease) and mining (9.5 percent decrease). Job types with the biggest projected increases in hiring include nurse practitioners (40.8 percent), data scientists (30.0 percent), information security analysts (28.7 percent), veterinary technologists and technicians (26.7 percent), and veterinary assistants and laboratory animal caretakers (26.2 percent).

Top Employers

The top employers in Broward County, based on number of employees, are ranked by the Greater Fort Lauderdale Alliance (2024a). The largest private sector employers are First Service Residential (4,869 employees), HEICO (4,532 employees), Nova Southeastern University (4,089 employees), American Express (3,500 employees), and Spirit Airlines (2,734 employees). The largest public sector employers in Broward County are Broward County Public Schools (27,781 employees) and Broward County Government (12,928 employees), followed by Memorial Health Care System (16,167) and Broward Health (8,769). The remaining public sector employees for which County-level data is available employ less than 3,000 full-time staff each. Based on 2022 revenue (Greater Fort Lauderdale Alliance 2024b), the largest Broward County employers are AutoNation ($26.99 billion), Chewy ($10.1 billion), and Spirit Airlines ($5.07 billion). Greater Fort Lauderdale Alliance also reports that the fastest growing companies in southern Florida (as measured by gross revenue increase in two years) include MyFBA Prep in Sunrise (711.4 percent increase), Stretch Zone in Fort Lauderdale (355.93 percent increase), Entech Network Solutions in Coral Springs (339.29 percent increase), NationsBenefits Holding, LLC in Plantation (331.61 percent increase), and CareStaff Partners in Plantation (331.61 percent increase).

The Business Development Board in Palm Beach County tracks the top (by number of employees) goods-producing and service-providing businesses in the county. Based on 2024 data (Greater Fort Lauderdale Alliance 2024b), the top goods-producing employers are Florida Crystals Corporation and Pratt & Whitney, an RTX Company, both with approximately 2,000 employees. U.S. Sugar (1,300 employees) and Lockheed Martin and Sikorsky (1,052 employees) rank third and fourth, respectively, demonstrating that the top four goods-producing companies in this county are from the agriculture and aerospace sectors. The county has also been dubbed “Wall Street South” due to its location quotient of financial institutions that are concentrated in the county as well as wage location quotient for having between twice (investment banking) and seven times (open-ended investment funds) as many financial jobs in the county than the national average. The top service-providing employers in Palm Beach County include the Palm Beach County School District (22,218 employees), Florida Atlantic University (6,335 employees), and Palm Beach County Board of County Commissioners (5,873 employees). This follows similar trends from Broward County where public sector employees exceed those of private corporations.

Gross Domestic Product and Contribution by Industry Sector

Table B.1-24 shows the gross domestic product (GDP) of the area in millions of chained dollars over a 10-year period and the percentage change from the preceding period. Broward County (BEA 2024b) consistently displayed a higher GDP than Palm Beach County (BEA 2024d) over the course of the decade.

Both counties demonstrated growth at similar levels, increasing roughly 30 million dollars between their 2012 GDP and their 2022 GDP.

Table B.1-24. Real Gross Domestic Product (In Millions of Chained Dollars) and Percentage Change from Preceding Period.

Year	Florida	Percentage Change	Broward County	Percentage Change	Palm Beach County	Percentage Change
2012	$857,861,342	1.0%	$90,161,425	0.3%	$67,636,630	1.3%
2013	$880,183,486	2.6%	$91,488,536	1.5%	$70,171,271	3.7%
2014	$905,648,485	2.9%	$94,364,607	3.1%	$72,150,280	2.8%
2015	$945,929,031	4.4%	$98,710,123	4.6%	$76,561,321	6.1%
2016	$978,989,749	3.5%	$101,145,721	2.5%	$79,105,008	3.3%
2017	$1,014,866,863	3.7%	$104,770,308	3.5%	$82,713,425	4.6%
2018	$1,050,433,812	3.5%	$107,817,123	3.0%	$85,555,960	3.4%
2019	$1,079,271,045	3.3%	$111,228,607	3.2%	$87,095,128	1.8%
2020	$1,068,377,540	-1.4%	$109,429,320	-1.6%	$87,415,511	0.4%
2021	$1,164,778,182	9.4%	$119,327,415	9.0%	$96,812,350	10.7%
2022	$1,218,430,197	5.9%	$124,843,480	4.6%	$100,113,799	3.4%

Source: BEA 2024a,b,c,d,e,f

As per **Table B.1-25**, contributions to GDP in Broward County (BEA 2024e) increased 4.1 percent between 2022 and 2023. The greatest increases were in private industries, which increased 3.89 percent from the previous year's level, and primarily in services-producing industries which accounted for 3.85 percent of the increase whereas private goods-producing industries accounted for the remaining 0.04 percent increase. Specific industries showing growth included finance, insurance, real estate, rental, and leasing at 0.78 percent, and professional and business services at 0.75 percent. Declines in industry sectors were generally minimal with the largest decline impacting "other services."[8]

Table B.1-25. Broward County: Contributions to Percent Change in Real GDP by Industry Sector between 2022 and 2023.

Industry Sector	Contributions to Percent Change
All industry total (percent change)	4.1
Private industries	3.89
Agriculture, forestry, fishing, and hunting	0.02
Mining, quarrying, and oil and gas extraction	0.00
Utilities	0.26
Construction	-0.02
Manufacturing	0.04
Durable goods manufacturing	*0.06*
Nondurable goods manufacturing	*-0.02*
Wholesale trade	0.12

[8] Definition from U.S. Bureau of Economic Analysis: "The Other services (except government and government enterprises) NAICS sector comprises establishments engaged in providing services not specifically provided for elsewhere in the classification system. Establishments in this sector are primarily engaged in activities, such as equipment and machinery repairing, promoting or administering religious activities, grant-making, advocacy, and providing dry-cleaning and laundry services, personal care services, death care services, pet care services, photofinishing services, temporary parking services, and dating services. Private households that engage in employing workers on or about the premises in activities primarily concerned with the operation of the household are included in this sector. For a complete list of regional statistics, see Regional Definitions."

Industry Sector	Contributions to Percent Change
Retail trade	0.94
Transportation and warehousing	0.14
Information	0.47
Finance, insurance, real estate, rental, and leasing	0.78
Finance and insurance	*-0.06*
Real estate and rental and leasing	*0.84*
Professional and business services	0.75
Professional, scientific, and technical services	*0.46*
Management of companies and enterprises	*0.18*
Administrative and support and waste management and remediation services	*0.11*
Educational services, health care, and social assistance	0.37 a/
Educational services	*0.10*
Health care and social assistance	*0.26*
Arts, entertainment, recreation, accommodation, and food services	0.15
Arts, entertainment, and recreation	*0.03*
Accommodation and food services	*0.12*
Other services (except government and government enterprises)	-0.11
Government and government enterprises	0.25
Natural resources and mining	0.02
Trade	1.06
Transportation and utilities	0.39
Manufacturing and information	0.51
Private goods-producing industries b/	0.04
Private services-providing industries c/	3.85

Source: BEA 2024e

a/ CAGDP11 Contributions to percent change in real GDP 1, Broward County) lists the overall Contributions to Percent Change for the category, "Educational Services, health care, and social assistance," as 0.37 even though this is slightly greater than the sum of the two sub-categories listed underneath it.

b/ The private goods-producing industries consist of agriculture, forestry, fishing, and hunting; mining, quarrying, and oil and gas extraction; construction; and manufacturing.

c/ The private services-producing industries consist of utilities; wholesale trade; retail trade; transportation and warehousing, excluding Postal Service; information; finance and insurance; real estate, rental, and leasing; professional, scientific, and technical services; management of companies; administrative and support and waste management and remediation services; educational services; health care and social assistance; arts, entertainment, and recreation; accommodation and food services; and other services (except government and government enterprises). Metropolitan Areas are defined (geographically delineated) by the Office of Management and Budget (OMB) bulletin no. 20-01 issued March 6, 2020. Last updated: December 4, 2024-- new statistics for 2023; revised statistics for 2019-2022.

Contributions to Percent Change GDP in Palm Beach County (BEA 2024f) was slightly higher than Broward County. **Table B.1-26** shows that GDP in Palm Beach County increased 4.8 percent between 2022 and 2023 with much of that growth attributed to private industries and private services-providing industries. Like Broward County, declines by industry sector were generally low with the greatest declines occurring in "other services."

Table B.1-26. Palm Beach County: Contributions to Percent Change in Real GDP by Industry Sector Between 2022 and 2023.

Industry Sector	Contributions to Percent Change
All industry total (percent change)	4.8
Private industries	4.69
Agriculture, forestry, fishing, and hunting	0.23
Mining, quarrying, and oil and gas extraction	-0.01
Utilities	0.17
Construction	-0.04
Manufacturing	0.11

Industry Sector	Contributions to Percent Change
Durable goods manufacturing	*0.10*
Nondurable goods manufacturing	*0.01*
Wholesale trade	0.30
Retail trade	0.77
Transportation and warehousing	0.11
Information	0.24
Finance, insurance, real estate, rental, and leasing	0.76
Finance and insurance	*-0.2*
Real estate and rental and leasing	*0.79*
Professional and business services	1.22
Professional, scientific, and technical services	*0.47*
Management of companies and enterprises	*0.86*
Administrative and support and waste management and remediation services	*-0.12*
Educational services, health care, and social assistance	0.75
Educational services	*0.03*
Health care and social assistance	*0.72*
Arts, entertainment, recreation, accommodation, and food services	0.25
Arts, entertainment, and recreation	*0.12*
Accommodation and food services	*0.13*
Other services (except government and government enterprises)	-0.17
Government and government enterprises	0.12
Natural resources and mining	0.22
Trade	1.07
Transportation and utilities	0.28
Manufacturing and information	0.35
Private goods-producing industries	0.29
Private services-providing industries	4.40

Source: BEA 2024f

Income

Table B.1-27 demonstrates the estimated 2013, 2018, and 2023 per capita income (USCB 2013b, 2018, 2023e) and the mean income in the past 12 months for all households (USCB 2023c) in the state of Florida, Broward County, and Palm Beach County.

Table B.1-27. 2023 Per Capita Income.

Income	State of Florida	Broward County	Palm Beach County
Per Capita Income 2013	$25,834	$27,804	$32,690
Per Capita Income 2018	$31,359	$32,368	$38,805
Per Capita Income 2023	$41,902	$42,000	$52,754
Mean Income Past 12 Months All Households	$103,634	$105,969	$130,324

Source: USCB 2013b, 2018, 2023c,e

In the past 10 years, Palm Beach County has had the consistently highest per capita income. In 2013, Palm Beach County had a 14 percent higher per capita income than Broward County and a 20 percent higher per capita income than the state of Florida. In 2018, those percentages changed to 16 percent higher income than Broward County and 19 percent higher than the State of Florida.

In 2013, Broward County had a 7 percent higher per capita income than the state of Florida; and in 2018 that number dropped to 3 percent higher. In 2023, Broward County showed a marginally higher, less than 1 percent, per capita income compared with the state of Florida. Palm Beach County showed a

higher per capita income than the others, 20 percent higher than the state of Florida and Broward County. This is reflected in the higher mean income of Palm Beach households.

This indicates comparatively slightly slower per capita income growth in Broward County, as from 2013 to 2023 its per capita income only increased by $14,000 while the state of Florida increased by $16,000 and Palm Beach County increased by $20,000.

Table B.1-28 shows that of the major cities within the Study Area (Boca Raton, Coral Springs, Delray Beach, Fort Lauderdale, Hollywood, and Pompano Beach), Hollywood City in Broward County had the lowest per capita Income in 2023 (USCB 2023d). The highest per capita income was from Boca Raton in Palm Beach County. The two cities in the Study Area in Palm Beach County had either nearly as high per capita income or much higher per capita income than the four cities in Broward County.

Table B.1-28. Per Capita Income of Major Cities in the Study Area in 2023.

City	Per Capita Income
Hollywood, Broward County	$34,490
Pompano Beach, Broward County	$38,585
Coral Springs, Broward County	$40,363
Delray Beach, Palm Beach County	$56,993
Fort Lauderdale, Broward County	$58,071
Boca Raton, Palm Beach County	$75,475

Source: USCB 2023d

Table B.1-29 provides the per capita income of Broward County census tracts for 2024 and as estimated for 2029. In 2024, the maximum per capita income value across all Broward County census tracts was $118,673 higher than the minimum value. In 2029, that difference is predicted to widen to $138,733. The difference between the maximum value and the average value was $89,612 in 2024 and is anticipated to widen to $104,776 by 2029. These values indicate non-proportional per capita income growth rates and a widening income margin between areas (USCB 2024b).

Table B.1-29. Per Capita Income of Broward County Census Tracts in 2024 and 2029.

Average Per Capita Income Ranking	Per Capita Income 2024	Per Capita Income 2029 (estimated)	Change in Per Capita Income 2024 to 2029
Minimum	$14,355	$17,696	$3,341
Maximum	$133,028	$156,429	$23,401
Difference between minimum and maximum	*$118,673*	*$138,733*	*$20,060*
Average of census tracts	$43,416	$51,653	$8,237
Difference between average and maximum	*$89,612*	*$104,776*	*$15,164*

Note: Data are for all Broward County census tracts (minus those census tracts where data were not available); only a portion of Broward County is within the Study Area.

Source: USCB 2024b

Housing

As shown in **Table B.1-30**, in 2023, Broward County had more total housing units than Palm Beach County (USCB 2023l). Palm Beach had roughly 100,000 less housing units but more vacant housing units overall. More units were owner-occupied as opposed to rented, and the median value of a house in

Palm Beach County was higher than both the state and Broward County averages. Although the median home value in Palm Beach was 10 percent more than in Broward, the median gross rent in Palm Beach was only 1 percent more.

Table B.1-30. 2023 Housing Units.

Housing	State of Florida	Broward County	Palm Beach County
Total Housing Units	10,451,823	868,151	725,849
Vacant Housing Units	1,485,421	109,298	120,717
Owner-occupied	68.1%	63.9%	71.8%
Renter-occupied	31.9%	36.1%	28.2%
Median Home Value	$381,000	$439,100	$491,500
Median Gross Rent	$1,719	$1,961	$1,982
Homeowner Vacancy Rate	1.20%	0.70%	1.90%
Rental Vacancy Rate	7.60%	6.50%	9.40%
Total Housing Vacancy Rate	14.20%	12.60%	16.60%

Source: USCB 2023l

Broward County census tracts were examined for their home value. **Table B.1-31** shows the minimum, maximum, and average value of homes in Broward County census tracts. Each census tract was averaged for their home value, and then the averages of all census tracts were examined against each other to obtain the lowest and highest home values. These values were then further averaged to a single value reflective of the entire county. The lowest average home value, $42,021, was in census tract 12011050309, located at the junction of Florida Turnpike South and North State Road 7 in Tamarac City. The highest average home value, $1,611,370, was in census tract 12011042000 in east Fort Lauderdale. The average of all census tracts was a home value of $512,389.

Table B.1-31. Home Values in Broward County Census Tracts.

Average Home Value Ranking	Census Tract	Home Value
Minimum	12011050309	$42,021
Maximum	12011042000	$1,611,370
Average	All	$512,389

Note: Data are for all Broward County census tracts (minus those census tracts where data were not available); only a portion of Broward County is within the Study Area.
Source: USCB 2024b

Much of Florida's tax revenue is generated through property tax. **Table B.1-32** demonstrates the property taxes levied in Broward County's four major cities by property type. In all four cities, residential homes and non-homestead types levied the highest percentage of taxes by a notable margin. Of the cities examined, Fort Lauderdale levied the highest amount of taxes while Coral Springs levied the least.

Table B.1-32. Property Taxes in 2024 to 2025 by Major Cities in Broward County.

Taxes Levied by Property Type	Hollywood	Pompano	Coral Springs	Fort Lauderdale
Total Taxes Levied	$189,745,736	$110,730,734	$91,181,206	$243,153,073
Residential Homestead	27.1%	21.6%	45.1%	29.3%
Residential Non-Homestead	41.9%	40.8%	32.7%	42.3%
Residential Vacant Lots	0.5%	0.7%	0.1%	1.4%
Commercial	17.7%	12.1%	14.7%	20.0%

Taxes Levied by Property Type	Hollywood	Pompano	Coral Springs	Fort Lauderdale
Industrial	5.3%	19.5%	4.6%	4.4%
Institutional	0.8%	0.9%	0.3%	0.3%
Agricultural	0.0%	0.0%	0.0%	0.0%
Other	0.2%	0.2%	0.0%	0.1%
Tangible personal property	6.3%	4.0%	2.5%	2.1%
Centrally Assessed property	0.0%	0.1%	0.0%	0.1%

Source: Florida Department of Revenue 2024

Table B.1-33 breaks down the taxes levied by different tax authorities in Broward County. Aside from the broader category of Broward County Board of County Commissioners, the highest quantity of taxes levied was by Fire/Rescue, with the lowest amount of taxes levied by Water Management District 4A.

Table B.1-33. Broward County Taxes in 2024 to 2025 by Authority.

Taxing Authority	Taxes Levied
Broward County Board of County Commissioners	$1,672,018,434
Cocomar Water Control District	$953,271
Fire/Rescue	$3,559,030
Street Lighting	$296,265
Unincorporated County Municipal Service District	$3,173,381
Water Management District 2	$803,491
Water Management District 3	$578,277
Water Management District 4A	$12,229
Water Management District 4B	$41,992
Water Management District 4C	$387,481

Source: Florida Department of Revenue 2024

National Risk Index for Natural Hazards

Data from FEMA's NRI illustrate communities across each country that are most at risk for 18 natural hazards. A risk index score for each community (by census tract) is calculated using an equation that combines scores for expected annual loss due to natural hazards, social vulnerability, and community resilience.

Using the NRI in Broward County, 43 census tracts scored as very high risk and another 261 census tracts as relatively high risk, while 112 census tracts scored lower (i.e., less risk) (FEMA 2024). FEMA NRI data scored 33 census tracts in Palm Beach County as very high risk, with another 233 census tracts scored as relatively high risk; only 105 census tracts scored lower (i.e., less risk) (FEMA 2024). **Table B.1-34** summarizes environmental and socioeconomic considerations for Broward and Palm Beach counties.

Table B.1-34. NRI Environmental and Socioeconomic Indicators for Broward and Palm Beach Counties.

Metric	Broward County Ranking	Palm Beach County Ranking
Below national poverty level	12.7%	10.7%
FEMA NRI "very high risk" census tracts	43	33

Source: FEMA 2024, USCB 2024b

When examining just the census tracts in the Study Area, FEMA NRI data scored 37 census tracts in Broward County very high risk and 8 tracts in Palm Beach County as very high risk. **Figure B.1-25** shows

the risk index for census tracts in both counties in and near the Study Area. Importantly, the risk index for almost every census tract in the Study Area is rated as Relatively Moderate or above.

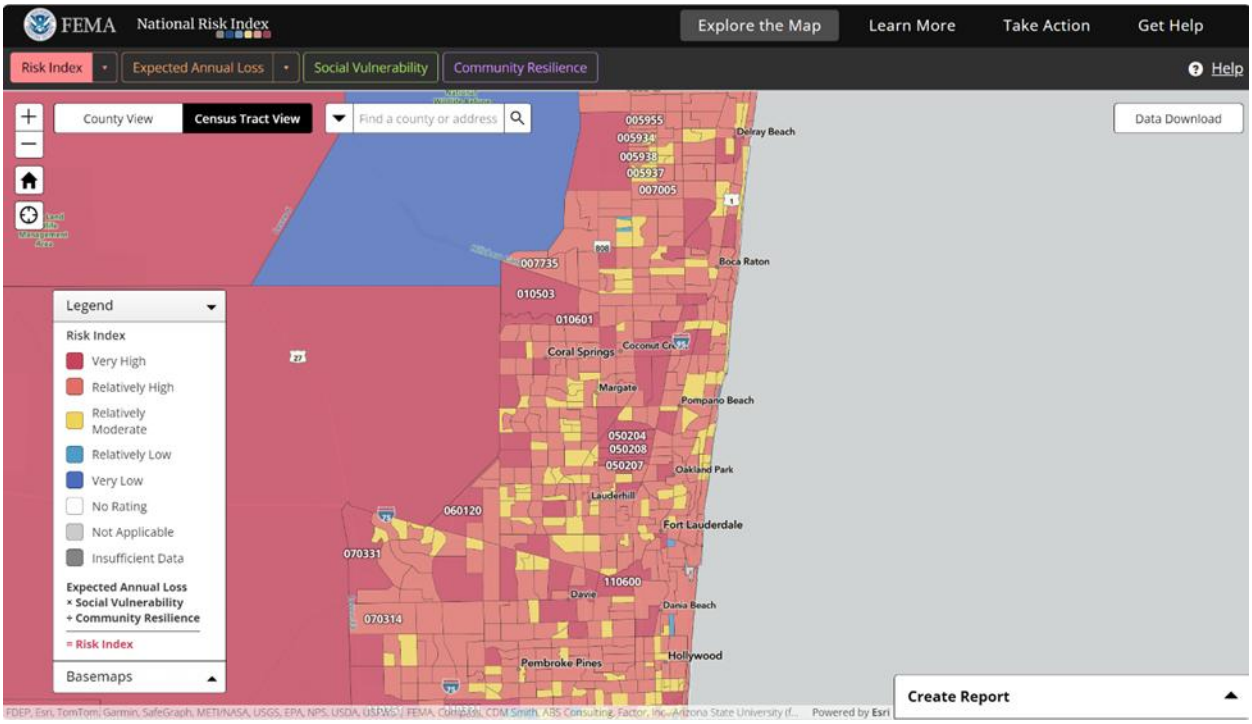


Figure B.1-25. FEMA NRI Risk Index Ratings for Census Tracts in Broward and Palm Beach Counties in and near the Study Area.

B.1.21 Cultural Resources

A cultural resources assessment survey was completed in February 2025 in the areas surrounding the eight WCS that are the focus of the Section 203 Study . In addition, a search of the Florida Master Site File (FMSF) revealed there are 7,944 recorded cultural resources present within the Study Area. These cultural resources include historic buildings, bridges, structures, cemeteries, and archaeological sites and range in origin from the Archaic period to the 20th century. One hundred and eighty-three of the recorded cultural resources are eligible for the National Register of Historic Places (NRHP), and an additional 20 resources are potentially NRHP-eligible. **Table B.1-35** includes a summary of the cultural resources recorded within the Study Area.

Table B.1-35. Cultural Resources Recorded within the Section 203 Study Area.

Cultural Resource Type	Number of Resources	Age	NRHP-eligible	NRHP-potentially eligible	NRHP-ineligible	NRHP-not evaluated
Archaeological site	107	Prehistoric	10	1	16	80
Archaeological site	35	Prehistoric and historic	3	1	2	29
Archaeological site	24	Historic	0	0	6	18

Cultural Resource Type	Number of Resources	Age	NRHP-eligible	NRHP-potentially eligible	NRHP-ineligible	NRHP-not evaluated
Archaeological site	7	Undetermined	0	0	0	7
Bridge	54	20th century	17	0	25	12
Cemetery	2	19th century	1	0	0	1
Cemetery	11	20th century	1	0	3	7
Resource group	1	Prehistoric and 20th century	1	0	0	0
Resource group	3	19th century	0	0	1	2
Resource group	11	19th to 20th century	5	0	4	2
Resource group	89	20th century	16	1	44	28
Resource group	29	20th century to present	3	0	15	11
Resource group	1	20th to 21st century	0	0	1	0
Resource group	3	19th and 20th century to present	1	0	1	1
Resource group	8	Undetermined	0	0	5	3
Structure	1	19th century	0	0	0	1
Structure	6819	20th century	119	14	1900	4786
Structure	739	Undetermined	6	3	64	666

As of September 2025, there have been 604 cultural resource surveys conducted within the Study Area. Of the nine WCS that are the focus of the Section 203 Study, eight have been fully surveyed for cultural and historical resources, through either field or desktop surveys. In addition, approximately 164 feet of the G-56 Gated Spillway has been surveyed along the eastern edge abutting South Military Trail. Based on the data provided through the FMSF and these surveys, the affected environment consists of 20 cultural resources that are in the direct vicinity of structural and nature-based measures being considered in the Section 203 Study. Error! Not a valid bookmark self-reference. provides additional information about these 20 cultural resources associated with each Section 203 Study feature.

Table B.1-36. Cultural Resources Associated with Section 203 Study Water Control Structures and Proposed Features.

Cultural Resource	Associated Water Control Structure or Feature	Archaeological Survey Date(s)	National Register of Historic Places Eligibility
G-08 (Hillsboro) Canal	G-56 Gated Spillway	1999, 2004, 2006, 2007, 2008, 2009, 2010, 2012, 2013, 2018, 2019, 2024	Eligible
Deerfield Lock	G-56 Gated Spillway	2025	Not evaluated
E-3 (N-5) Canal	G-56 Gated Spillway	2003	Ineligible
Military Trail	G-56 Gated Spillway	2008, 2015, 2016, 2016, 2017, 2019, 2019, 2021	Ineligible
Hillsboro Canal Bridge	G-56 Gated Spillway	1996, 2014	Not evaluated

Cultural Resource	Associated Water Control Structure or Feature	Archaeological Survey Date(s)	National Register of Historic Places Eligibility
Seaboard Air Line Railroad	G-56 Gated Spillway	2005, 2006, 2010, 2010, 2016, 2016, 2016, 2016, 2016, 2017, 2017, 2018, 2019, 2019, 2020	Eligible
Bridge #860184	G-56 Gated Spillway	2009	Ineligible
E-2 Canal	G-56 Gated Spillway	2003,2006, 2008, 2010, 2012, 2012, 2015, 2020, 2024	Not evaluated
C-14 (Cypress Creek) Canal	G-57 Gated Spillway, S-37B Gated Spillway and S-37A Gated Spillway	1999, 2006, 2012, 2012, 2015, 2016, 2017, 2022	Ineligible
Dixie Highway	G-57 Gated Spillway	2006, 2006, 2014, 2015, 2016, 2019, 2020, 2023, 2023, 2024	Eligible
FEC railroad tracks	G-57 Gated Spillway and S-37A Gated Spillway	2004, 2006, 2007, 2012, 2012, 2014, 2015, 2023	Eligible
FEC Bridge	S-37A Gated Spillway	2012,	Eligible
C-13 (Middle River) Canal	S-36 Gated Spillway	1999, 2016	Ineligible
C-12 (Plantation) Canal	S-33 Gated Spillway	2006	Ineligible
Lock No. 1	G-54 Gated Spillway	2006	Listed
G-15 (North New River) Canal	G-54 Gated Spillway	1999, 2005	Eligible
C-11 (South New River) Canal	S-13AW Gated Culvert and S-13 Pump Station and Gated Spillway	, 2004, 2006, 2007, 2011, 2012, 2014, 2017, 2018, 2021	Eligible
S-13 Pump Station and Gated Spillway	S-13 Pump Station and Gated Spillway	2025	Not evaluated
Site 8BD182	Markham Park Stormwater Storage Capacity	1993, 2004	Not evaluated
Site 8BD183	Markham Park Stormwater Storage Capacity	1993, 2004	Not evaluated

Source: FMFSweb 2025

The G-08 (Hillsboro) Canal (8PB10311) is a small portion of the larger, 51-mile Hillsboro Canal. The canal began construction in 1913 and was completed in 1917. The canal one of the six major drainages of the Everglades Drainage District project. The canal is currently managed by the South Florida Water Drainage District. The site has been visited for cultural resource surveys 12 times from 1999 and 2024. The Florida SHPO determined the canal to be NRHP-eligible in 200. The canal maintains engineering significance as an early example of a water management system and primary canal of the Everglades Drainage District. The G-08 Canal is also historically significance as a contributing factor in the development of South Florida (FMSFweb 2025). The G-08 Canal intersects with the proposed G-56 Gated Spillway construction area. While the G-56 Gated Spillway replaced the spillway component of the lock structure, the original 1920 Deerfield Lock (8BD10412) is still present the G-56 Gated Spillway. The concrete structure is an example of the early locks associated with the six major canals of the Evergreen Drainage District. The structure has been subject to a single, 2025 cultural resource survey. The surveyors determined that the lock is ineligible for the NRHP as an individual structure as it lacks integrity of design, use, and materials. They also argued that the lock was eligible as a contributing structure to a NRHP-eligible resource, the G-08 Canal. The Florida SHPO has not made an eligibility determination for this resource (FMSFweb 2025). Throughout this FS/EIS, this resource is analyzed as an individual structure.

The E-3 (N-5) Canal was initially dug around 1910 as part of the Lake Worth Drainage District. The canal has historically been used for drainage rather than navigable functions. A 2003 cultural resource survey included an analysis of the canal. The results of the survey indicated the E-3 Canal was ineligible for the NRHP as it has a common design, construction methods, and maintenance procedures. The Florida SHPO concurred with the results of the survey (FMSFweb 2025). The E-3 Canal intersects with the eastern-most boundary of the G-56 Gated Spillway construction area. The Military Trail (8PB13795) is a Seminole War-era trail between Forts Jupiter, Lauderdale, and Dallas. The trail was constructed by Tennessee Volunteers and Major William Lauderdale. The Military Trail was an important overland route used for military movements and later to connect settlements. The route has been the subject of eight cultural resource surveys from 2008 and 2021. In 2021, the Florida SHPO determined the Military Trail was ineligible for the NRHP because the original route has been altered and overlayed with modern roadways over time (FMSFweb 2025). The Military Trail is located above the proposed G-56 Gated Spillway dredging area. The Hillsboro Canal Bridge (8BD3042/8PB08214) is a steel swing span bridge that was built by the American Bridge Company and Virginia Bridge and Iron Company around 1926. The bridge was significantly altered when the G-08 Canal switched functions from navigation to drainage control. By 1996, the swing mechanism on the bridge was removed so that the structure remained fixed in place. The Hillsboro Canal Bridge was surveyed in 1996 and 2014. The Florida SHPO determined that the structure was not eligible for the NRHP as it lacked integrity and historical relevance because of the alterations (FMSFweb 2025). The Hillsboro Canal Bridge intersects with the proposed G-56 Gated Spillway dredging area. The portion of the Seaboard Air Line Railroad (8PB12917) that overhangs the proposed G-56 Gated Spillway dredging area was constructed in 1925 to connect Central and South Florida and was operational in 1926. The railway was the first to run across the entirety of Florida and was one of the largest railroads in 1920s Florida. There have been 16 cultural resource surveys from 2005 to 2020 that include an analysis of the railway. In 2021, the Florida SHPO determined the Seaboard Air Line Railroad was NRHP-eligible due to its importance in the development and transportation of the area (FMSFweb 2025).Bridge #860184 (8BD4647) is a reinforced concrete bridge that was initially constructed in 1956 and reconstructed in 1985. The bridge was the subject of a cultural resource survey in 2009. The Florida SHPO determined Bridge #860184 to be ineligible for the NRHP due to a lack of integrity (FMSFweb 2025). Bridge #860184 intersects with the proposed G-56 Gated Spillway dredging area.

The E-2 Canal (8PB7704) was constructed in 1956 in conjunction with Florida's Turnpike as part of the Lake Worth Drainage District. The mid-century canal was an expansion of the 1921 E-2W Canal. Nine cultural resource surveys between 2003 and 2024 have included analysis of the E-3 Canal. Despite these surveys, the Florida SHPO requires additional information on the resource for an eligibility determination (FMSFweb 2025). The E-2 Canal intersects with the proposed dredging area for the G-56 Gated Spillway. The portion C-14 (Cypress Creek) Canal (8BD3226) that intersects with the G-57, S-37B, and S-37A Gated Spillways was constructed around 1960. The canal was constructed as a branch of the circa 1912 portion of the canal. The 1960 portion of the canal has been subject of eight cultural resource surveys from 1999 to 2022. Based on the results of the surveys, the Florida SHPO determined the C-14 Canal is ineligible for the NRHP due to a lack of notable features and/or historical associations (FMSFweb 2025).

Construction of the 26-mile stretch of the Dixie Highway (8BD4227) in Broward County began in 1922. The original roadway consisted of two lanes that ran parallel to the FEC Railway. The highway was expanded to include four lands around 1961. The initial purpose of the Dixie Highway was to create a road system north to south that would promote development and tourism along the route. The portion of the Dixie Highway in Broward County has been subject to 10 cultural resource surveys from 2006 to 2024. In 2025, the Florida SHPO determined the resource was NRHP-eligible based on its importance to the development of the region (FMSFweb 2025). A portion of the Dixie Highway runs above the proposed G-57 Gated Spillway project area. The FEC (Florida East Coast) Railway Tracks (8BD4087) were built circa 1896 after the line had expanded south from Jacksonville and Daytona, Florida in the proceeding years. The railway was used to ship various goods that had been transported down the New River. There have been eight cultural resource surveys between 2004 and 2023 that included an analysis of the FEC Railway Tracks. In 2016, the Florida SHPO determined the resource was NRHP-eligible due to its significance in the development, community planning, and transportation within and throughout the region (FMSFweb 2025). The FEC Railway Tracks intersect with the G-57 and S-37A Gated Spillway project areas. The FEC (Florida East Coast) Bridge (8BD4860) is a 1960 concrete slab fixed railway bridge that was built to allow for the FEC Railway tracks to cross over the C-14 Canal. The 2012 survey of the structure argued that the bridge was eligible for the NRHP as a contributing component a potential FEC Railway Linear Historic District. In 2012, the Florida SHPO determined the bridge to be NRHP-eligible as an individual structure. The FEC Bridge intersects with the proposed project area of the S-37A Gated Spillway.

The C-13 (Middle River) Canal (8BD3225) was constructed from 1913 to 1927 as part of the Everglades Drainage District. The canal has been subject of two cultural resource surveys in 1999 and 2016. Following both surveys, the Florida SHPO determined that the canal was ineligible for the NRHP because it lacked notable engineering factures and it had also been modified. The C-13 Canal intersects with the S-36 Gated Spillway.

The C-12 (Plantation) Canal is a 1954 canal that was constructed as part of the Central and South Florida Project. A 2006 survey of the canal noted that while the resource was notable as part of a larger regional drainage system, the canal did not retain any significant engineering and/or historical attributes. In 2008, the Florida SHPO determined that the C-12 Canal was ineligible for the NRHP. (FMSFweb 2025). The C-12 Canal intersects with the proposed S-33 Gated Spillway project area. Lock No. 1 (8BD0058), or Sewell Lock, is an NRHP listed structure that is located within the G-54 Gated Spillway project area. The Furst-Clark Construction Company began building the poured concrete structure in 1911 and it was first operational in 1912. The lock was built to assist in maintaining the water levels and traffic on the North New River Canal. While only the western gate of Lock No. 1 is remaining component of the lock, the structure was added to the NRHP in 1978 due to its notable engineering features and its importance to the development of the area. In addition, Lock No. 1 has been subject to one 2006 survey (FMSFweb 2025). The G-15 (North New River) Canal (8BD3279) began construction in 1906 as part of the Everglades Drainage District. The canal has historically been used to support drainage and manage water levels in the Everglades. In addition, the lock system throughout the canal facilitated travel and commerce on the canal route. Cultural resource surveys conducted in 1999 and 2005 included analyses of the G-15 Canal. In 2001, the Florida SHPO determined the G-15 Canal to be NRHP-eligible because of its importance to the development of the region and its notable engineering features (FMSFweb 2025).

The G-15 Canal intersects with the G-54 Gated Spillway project area. The C-11 (South New River) Canal (8BD4153) was constructed between 1907 and 1915 as part of the Everglades Drainage District. The canal has historically been used to facilitate drainage throughout the region. Nine cultural resource surveys from 2004 to 2021 have included an analysis of the C-11 Canal. The results of those surveys demonstrated the canal's notable engineering attributes and importance to the development of South Florida. In 2022, the Florida SHPO determined the C-11 Canal to be NRHP-eligible (FMSFweb 205). The C-11 Canal intersects with the S-13AW Gated Spillway and S-13 Pump Station and Gated Spillway project areas. The S-13 Pump Station and Gated Spillway was constructed in 1955 and is part of the larger C-11 (South New River) Canal, which was constructed between 1907 and 1915 as part of the Everglades Drainage Project and, in its entirety, runs 15.7 miles from WCA-3A and along Griffin Road to the New River. The S-13 Pump Station and Gated Spillway was surveyed in 1991 by FDOT, in 1993 and 1995 by Broward County Office of Planning, and in 2004 by Vertex Engineering Service, Inc. Due to its integrity and connection to early water management in South Florida, the C-11 (South New River) Canal was determined eligible for inclusion on the NRHP. In addition, results from a 2025 survey indicate that the S-13 Pump Station and Gated Spillway is ineligible as an individual structure, but eligible as a contributing structure to the C-11 Canal.. Further review of the pump station in concert with the C-11 Canal suggest that the S-13 Pump Station and Gated Spillway is likely not a contributing factor to the original canal design as the pump station was constructed four decades after the canal. The Florida SHPO has not evaluated the structure for eligibility.

The S-13AW Gated Culvert was constructed in 2007 to replace the previous S-13A double-box concrete culvert. Like WCS S-13, the S-13AW Gated Culvert is part of the larger C-11 (South New River) Canal, which was built between 1907 and 1915 as part of the Everglades Drainage Project. In 2004, the C-11 (South New River) Canal was determined to be eligible for the NRHP due to its integrity and connection to early water management systems in South Florida. The entirety of the S-13AW Gated Culvert was included in a 1993 Phase II archaeological survey by the Broward County Office of Planning. Robert H. Miller & Associates conducted an additional archaeological survey adjacent to the eastern border of the WCS in 1989.

The proposed construction of the Markham Park Stormwater Storage Capacity Improvement Project is associated with two archaeological sites, 8BD182 and 8BD183. The entirety of Markham Park has been subject to cultural resource surveys in 1993 and 2004. Site 8BD182 is a multicomponent habitation, midden, and burial mound site that was occupied during the Glades Period. Site 8BD183 is a multicomponent camp, procurement, midden, and burial mound site that was occupied throughout the Archaic, Glades, and Seminole Periods. Both sites are known to include prehistoric human remains and have not been evaluated by the Florida SHPO.

B.2 Future Without Project Conditions

The environmental conditions within the Section 203 Study Area are expected to change over time, regardless of whether the proposed action is implemented. These changes may either compound, offset, or have no noticeable effect on environmental conditions in the Study Area. **Table B.2-1** presents the expected or likely future conditions of the environmental resources in 2085 based on reasoned estimates of future conditions.

Table B.2-1. Future Without Project Conditions.

Resource Area	Future Without Project Conditions
Air Quality	Air quality in the Study Area is expected to improve over time as cleaner energy generation and increased electric vehicle use reduce emissions. These trends should enhance long-term air quality without directly impacting SFWMD infrastructure management. However, more frequent and intense flooding from climate-related events could indirectly affect air quality by releasing terrestrial carbon, accumulating waste, and requiring emissions-intensive cleanup and repairs. In residential areas, reconstruction efforts may temporarily increase localized emissions. Without mitigation, these episodic impacts could partially offset long-term air quality improvements.
Greenhouse Gases	Greenhouse gas emissions would be expected to continue to be uncertain. Uncertainty in efforts to sequester carbon and/or reduce future emissions would be expected to influence the future climate conditions and would influence management of SFWMD infrastructure. Flooding may increase greenhouse gas (GHG) emissions through terrestrial carbon release, waste accumulation, debris handling, and the use of heavy equipment for cleanup and repairs. In residential areas, flood damage may require reconstruction, leading to temporary increases in localized GHG emissions from construction activity, material transport, and energy use. If not mitigated, these episodic effects could partially offset long-term reductions in emissions.
Climate	Climate conditions in the Study Area are expected to remain uncertain, particularly regarding the frequency and duration of extreme precipitation. Continued flooding may significantly impact both the physical and economic environment and directly affect how the South Florida Water Management District (SFWMD) manages its infrastructure. Future climate projections indicate rising sea levels and increased rainfall associated with more frequent and intense tropical weather events. These trends are expected to exacerbate flooding risks, especially in low-lying and coastal areas. Combined sea level rise and heavier precipitation may lead to prolonged inundation, reduced drainage capacity, and increased strain on stormwater and flood control infrastructure.
Noise	Noise in the Study Area would not be expected to change over time. The affected area would continue to be predominantly high density residential with noise from traffic and other urban infrastructure.
Hydrology	Major hydrology drivers in the region, including rainfall, evapotranspiration, groundwater levels, and sea levels, would be expected to change in the future. These changing climatic conditions will significantly impact stormwater runoff (intensity, duration, frequency), resulting in a reduction of the system efficiency and future flood protection level of service. Flooding events result in property damage to residences, businesses, and critical infrastructure, present health and life safety risks, and threaten economic activities that are of significance.
Groundwater	Rising sea levels will likely degrade groundwater quality, composition, and overall supply in the Study Area. As saltwater intrusion progresses, wells tapping the Biscayne Aquifer near the coast may need to be relocated or replaced with the brackish Floridan Aquifer, requiring new water treatment systems. Additionally, increased salinity in Biscayne Aquifer wells will raise treatment costs for potable water production. A study by the Water Utility Climate Alliance (2019) estimates that by 2060, 16% of Broward County's public supply wells will be at risk of saltwater intrusion. Several wellfields have already been decommissioned due to rising salinity levels.
Surface Water Quality	Surface water quality in the Study Area will likely degrade over time as sea levels rise and saltwater intrusion becomes a primary factor. Broward County, currently the second most populous in Florida, is projected to grow by 12% by 2050 (BEBR 2024). This population increase will contribute to conditions that negatively affect water quality. While Broward County has numerous ordinances to manage impervious surface, rising percentages of impervious surfaces can be expected to boost runoff, worsening water quality and heightening contamination risks. An increase in rainfall duration and intensity, along with a projected rise in sea level, leads to an increase in the inflow and infiltration of the wastewater system, resulting in overloads (FTL 2024). Exceedances of *E.coli* thresholds will likely increase due to anthropogenic and climatic changes.
Vegetation	The 5% cover by natural lands is significantly constrained by urban development. Future Without Project (FWOP) conditions are likely to cause remnant natural vegetation to convert into other types of vegetation cover, but in general no net loss is expected. Vegetative communities in the Study Area are vulnerable to sea level rise, flooding, land use change, and fragmentation. Remnant natural communities with the highest overall relative vulnerability score within the Study Area account for 0.3% of the Study Area and include Glades Marsh (Vulnerability Score 4=Very High),

Resource Area	Future Without Project Conditions
	Rockland Hammock (Vulnerability Score 3=High), and Scrub/Sand Pine Scrub (Vulnerability Score 3=High). These communities will likely be among the first to convert into less complex communities that are more vulnerable to invasive species. Additionally, existing vegetation in low-lying areas will be among the first to convert into mangrove and other salt-tolerant communities.
Wetlands	FWOP conditions are unlikely to result in net freshwater or estuarine wetlands losses. Hydric conditions that facilitate wetlands emergence will remain. However, the specifics of those hydric conditions (duration of inundation, salinity, etc.) are likely to change in response to storm events, sea level rise, and flooding, shifting the dominant wetlands vegetation and type. Wetlands communities in the Study Area are vulnerable and changes such as sea level rise and flooding represent significant risks. The Glades Marsh community has a very high relative vulnerability score (Vulnerability Score 4). This community can be expected to be less resilient to change and more rapidly convert into less complex communities.
Invasive Species	It is expected that increased summer and winter minimum temperatures, increased extreme tropical systems, sea level rise, and changing weather patterns (e.g., droughts, floods) will enhance invasive species colonization, from introduction through establishment and expansion. Both Broward and Palm Beach counties have ongoing programs to minimize the impacts of invasive plants and animals. FWOP conditions are unlikely to change the uncontrollable inputs of invasive species from the Everglades, homes, and unmanaged private lands. Therefore, the change in environmental conditions within the Study Area is expected to compound the negative effects from invasive species to a minor/moderate degree in the FWOP Conditions.
Essential Fish Habitat	In the future, it is predicted that the Study Area's high density urban landscape will remain largely intact, and the amount of EFH will be relatively unchanged. The quality of EFH is expected to degrade due to disruptions from flood control and lack of regulated freshwater flows between the present and 2085. Important EFH habitat constituents like mangroves would also be negatively impacted from storm surges, drought, and lack of space for inland migration. Predicted changes will degrade these habitats and may affect their viability as EFH.
Federally Threatened and Endangered Species	Federally threatened and endangered species are either known to exist or potentially exist within the Study Area. In the future, it is predicted that the Study Area's high density urban landscape will remain largely intact, limiting the amount of habitat available for these species. As sea level rises, the remaining habitats face encroachment from saltwater intrusion and erosion, shrinking the already scarce natural areas where these species can survive. Strong storms and hurricanes will become more frequent and intense, reshaping coastlines and threatening ecosystems. Low-lying areas and coastal habitats will face persistent flooding and erosion, potentially leading to the disappearance of many habitats that support threatened and endangered species.
Fish and Wildlife	Fish and wildlife are expected to be heavily impacted by the year 2085 due to shifting climate patterns in the highly urbanized Study Area. Saltwater intrusion and changes to salinity and temperature levels would change freshwater/saltwater fish species distributions and associated angler opportunities. Habitat loss for coastal-dependent species like wading birds and marine fish is expected as sea level rises and storm surges erode shorelines. Important habitat like mangroves would also be negatively impacted from storm surges, drought, and lack of space for inland migration. Species on watch lists for the potential to become endangered or threatened, such as endemic species and those that time breeding according to hydrological cycles, may be negatively impacted. Shifts in migration, ranges, and breeding time are expected (and are already being documented for some species) for birds, amphibians, reptiles, mammals, and insects.
Geology and Soils	Geologic conditions in the Study Area are not expected to change over time. The general topography, structural geology, and stratigraphy would remain the same. There are no active mines or oil/gas production within the Study Area. Seismic risk would remain low. Soil erosion would increase from increased frequency of extreme precipitation events and flooding.
Hazardous, Toxic, and Radioactive Waste	It is expected that the accumulation of contaminants in the Study Area sediments and soils would be exacerbated by 2085 and may have migrated or expanded beyond the current extent. This could result in higher maintenance and cleanup costs as the current structures age and require refurbishment or replacement, the water level rises and requirements regarding hazardous and toxic materials evolve over time.
Visual Resources	Visual resources in the Study Area may be significantly degraded because of rising sea levels, increased flooding, and saltwater intrusion. As water levels rise and more frequent extreme weather events occur, the natural landscapes, scenic views, and coastal features could be altered or

Resource Area	Future Without Project Conditions
	eroded, diminishing the area's aesthetic appeal. The built environment, including infrastructure and development, could become more costly to upkeep and ultimately fall into various states of disrepair, further detracting from the visual integrity of the built environment.
Land Use and Real Estate	Land use patterns in the Study Area may be significantly impacted by future land development, increased flooding, saltwater intrusion, and shifting water levels. As sea levels rise and extreme weather events become more frequent, the flood control system may no longer be able to effectively manage water volumes, resulting in more frequent and severe flooding of surrounding lands. This could lead to widespread infrastructure damage, including the deterioration of roads, utilities, and buildings due to increased flooding and saltwater intrusion. The built environment would face more frequent and severe damage, potentially resulting in higher repair and maintenance costs. Development in low-lying areas may become less feasible, leading to reduced density or abandonment of vulnerable parcels. Some lands could transition to open space or stormwater management areas to enhance flood storage capacity, while zoning and land use regulations may shift to favor flood-resilient design, stricter building codes, and expanded conservation zones. Additionally, the severance of essential services, such as water supply, drainage systems, and transportation routes, could further impede existing and planned developments.
Transportation and Traffic	The transportation network in the Study Area may experience significant strain in the future. Roads and transportation routes could become more prone to disruption from rising water levels, which would impede vehicle access and increase travel times. The existing road network may not be able to accommodate the growing demands of both local and commuter traffic, leading to congestion and diminished mobility. Additionally, essential transportation infrastructure, such as bridges and drainage systems, , including drainage associated with airports and the port, may be vulnerable to damage, further compromising the efficiency and reliability of the transportation network. As a result, traffic flow and accessibility could be severely impacted.
Infrastructure and Utilities	Sea level rise, saltwater intrusion, extreme rainfall, and drought will intensify and place increasing stress on the Study Area's WCS. These structures currently manage flooding, block saltwater from moving upstream, conserve freshwater, and regulate water levels both upstream and downstream. As sea levels and rainfall volumes rise, water levels in primary canals will exceed the WCS design capacity. When that occurs, the structures will no longer control flows effectively, and flood events will become more frequent and severe. The system's reduced performance will compromise water management across the region. Flooding events will further affect the potable water, wastewater, and stormwater utilities managed by Broward County. There is an expectation of increased infiltration and inflow events, which will disrupt treatment and distribution processes. Wellfields are likely to become more vulnerable to saltwater intrusion, potentially necessitating their relocation or abandonment in favor of new water supply sources. Additionally, the frequency of sanitary sewer overflows is expected to rise, along with greater challenges in stormwater management drainage.
Socioeconomics	As part of a national trend, populations in the Study Area are expected to continue to grow through 2075. This growth will drive demand for both the filling of vacant housing units and the construction of additional units. At the same time, sea level rise is likely to inundate more neighborhoods and homes, leading to property sales or abandonment and creating associated economic challenges. In Broward and Palm Beach counties, overall positive job growth (totaled across all industries) is expected through 2032. Despite net positive growth, Broward County projects a decrease in certain industry sectors by 2032, including construction and government. Palm Beach County projects a decrease in agriculture, forestry, fishing, hunting, and mining within the same time frame. These decreases are likely to be exasperated further in the future by natural hazards that make it difficult to produce product output due to potential lack of habitable construction areas and fishable water. The future trajectory of natural hazard risks is uncertain, but it is likely that these risks will worsen in the future, resulting in further socioeconomic impacts on Study Area communities. If left unaddressed, impacts from environmental stressors such as flooding and saltwater intrusion will exacerbate economic challenges.
Cultural Resources	There are 7,944 recorded cultural resources present within the Study Area and it is probable that additional resources will be identified in the future. Preservation studies have shown that there is an increasing threat of disturbance, damage, and/or destruction to cultural resources, especially in coastal areas, due to sea level rise, flooding, storm surges, and associated erosional activities. These environmental situations are likely to impact cultural resources through, at a minimum, ground disturbance, weathering over time, water damage, and structural damage.

Resource Area	Future Without Project Conditions
	These impacts have the potential of diminishing the integrity of these cultural resources. The future of natural hazard risks is uncertain, but it is likely that the risks will worsen in the future, resulting in further threat to cultural resources within the Study Area. If left unaddressed, impacts from the environmental stressors, including sea level rise and flooding, will increase the threat to cultural resources.

B.3 Environmental Consequences

THE ENVIRONMENTAL CONSEQUENCES SECTION OF THE REPORT WILL BE COMPLETED AT A LATER DATE.

B.4 Environmental Compliance

THE ENVIRONMENTAL COMPLIANCE SECTION OF THE REPORT WILL BE COMPLETED AT A LATER DATE.

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