Chapter 11

Palm Beach and Broward Counties

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In

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Chapter 11
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Description of the region

Palm Beach and Broward counties (Figures 11.1 and 11.2) are Florida's second and third most populous counties, respectively, behind Miami-Dade County. The estimated 2021 population between the two counties exceeded 3.4 million (U.S. Census 2021). While dense urban development borders the limestone Atlantic Coastal Ridge and the sandy beaches along the coast, the western portions of the counties are dominated by the Everglades and the Francis S. Taylor Wildlife Management Area, which are water conservation areas. Palm Beach County also includes the Arthur R. Marshall Loxahatchee National Wildlife Refuge and a portion of the Everglades Agricultural Area. This region receives the highest amount of rainfall in Florida, averaging more than 1.5 m (4.9 ft) per year (USFWS 1999a, FDEP 2012).

The Biscayne Aquifer, which extends from Monroe County to southern Palm Beach County, supplies water to the Florida Keys and to Broward and Miami-Dade counties (Fish and Stewart 1991, USFWS 1999a). The aquifer is more than 61 m (200 ft) thick near the coast, thinning progressively toward the center of the state (Fish and Stewart 1991, FDEP 2020a). Saltwater intrusion into groundwater, particularly during periods of little rainfall, is increasingly problematic due to urban and agricultural demand for freshwater, drastically altered surface flow, and sea-level rise (SFWMD 2013, FDEP 2020a).

Before humans developed it, much of the coastal region was dominated by sawgrass (*Cladium jamaicense*) and other freshwater plants (USFWS 1999b, CERP 2005, FDEP 2020a). The construction of the Intracoastal Waterway in 1912 and the dredging of inlets in 1935 and 1945 through the barrier islands to expand the waterway, altered hydrology and led to a brackish nearshore environment, killing freshwater species (Steinberg 1977, FDEP 2020a). The hydrology of the region was significantly altered when the U.S. Army Corps of Engineers constructed drainage canals connecting Lake Okeechobee to the Atlantic Ocean as part of the Central and Southern Florida Project in the 1950s and 1960s. Mosquito ditches and impoundments also altered local hydrology and topography, although in many regions these ditches have been filled and the natural hydrology partly restored (FDEP 2012).

Palm Beach and Broward counties have lost most of their coastal wetlands to extensive urban development. Approximately 87% of mangroves and a nearly all salt marshes were removed and replaced by residential and commercial housing, seawalls, and Australian pine (*Casuarina* spp.) between 1940 and 1975. A mere 111 ha (273 ac) of scattered mangrove forest was all that remained until 1985 (Harris et al. 1983, Dames and Moore 1990). More than 61% of the estuarine shorelines spanning from the Loxahatchee River to the lower portion of Miami–Dade County have been altered using hard armoring approaches (e.g., seawalls and bulkheads) (Mitsova et al. 2016). Within each county, Broward County had the greatest percentage (84%) of hard-armored shorelines, followed by Palm Beach County (63%) and Miami–Dade County (59%) (Mitsova et al. 2016). In Palm Beach County, humans have been intensely altering the Lake Worth Lagoon for more than a century. Now 70% of the shoreline is armored with seawalls, which increases erosion, harms water quality, can magnify storm damage and flooding, and provides poor habitat for wildlife (Figure 11.3, LWLI 2021). The Palm Beach County Department of Environmental Resources Management

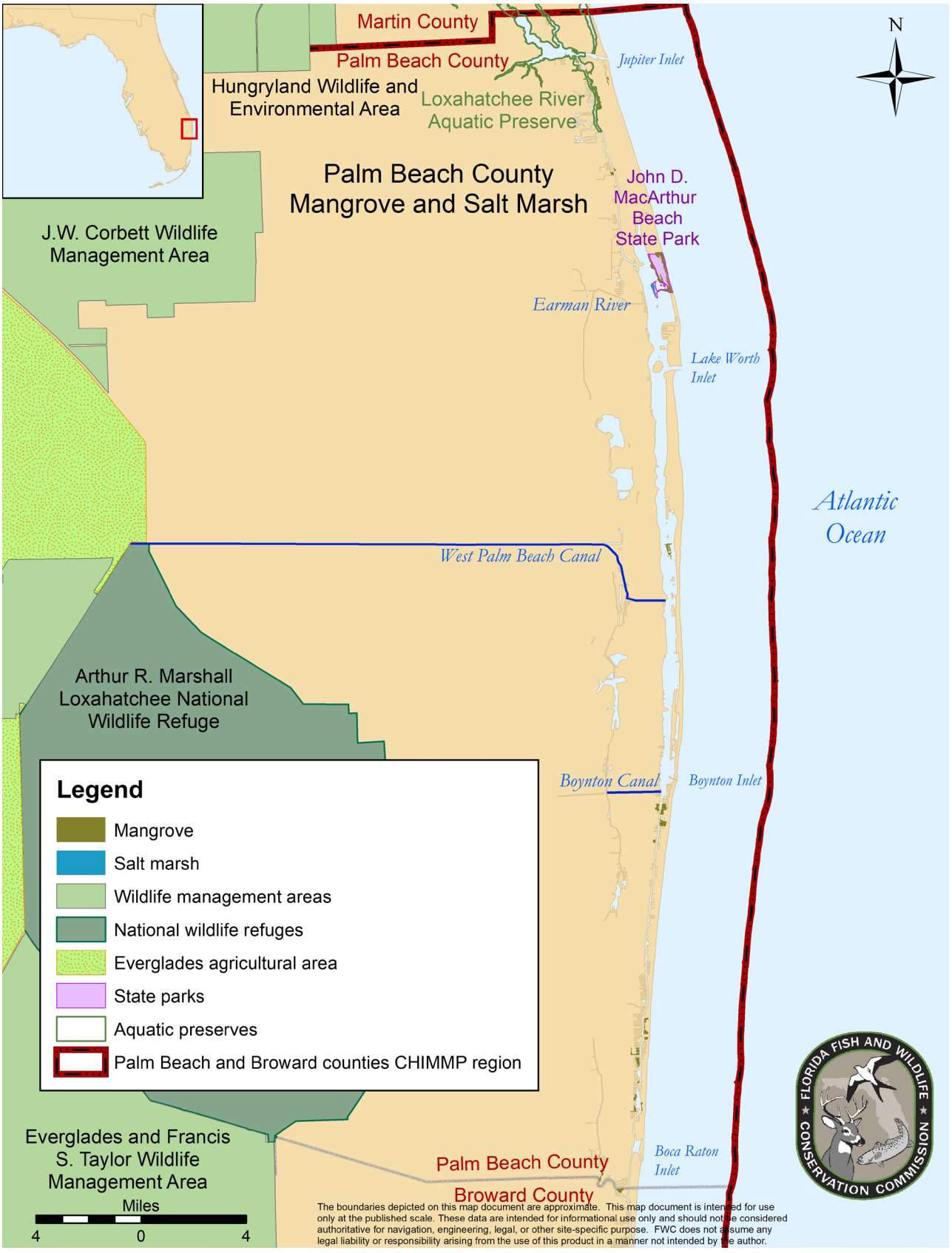

Figure 11.1. Salt marsh and mangrove extent in Palm Beach County. Data source: SFWMD 2017–2019 land use/land cover data, based on FLUCCS classifications (FDOT 1999, SFWMD 2022).

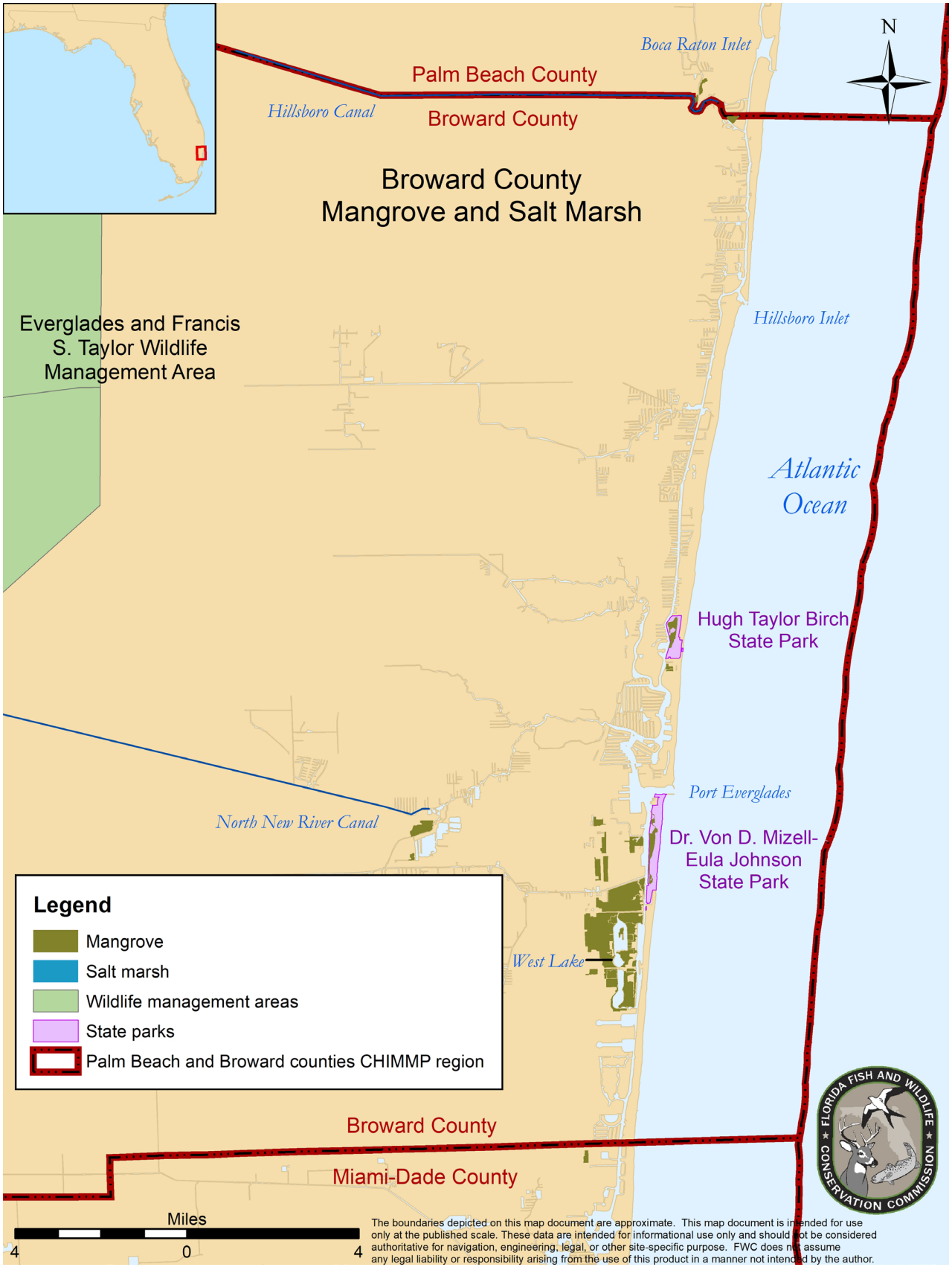

Figure 11.2. Salt marsh and mangrove extent in Broward County. Data source: SFWMD 2017–2019 land use/land cover data, based on FLUCCS classifications (FDOT 1999, SFWMD 2022).

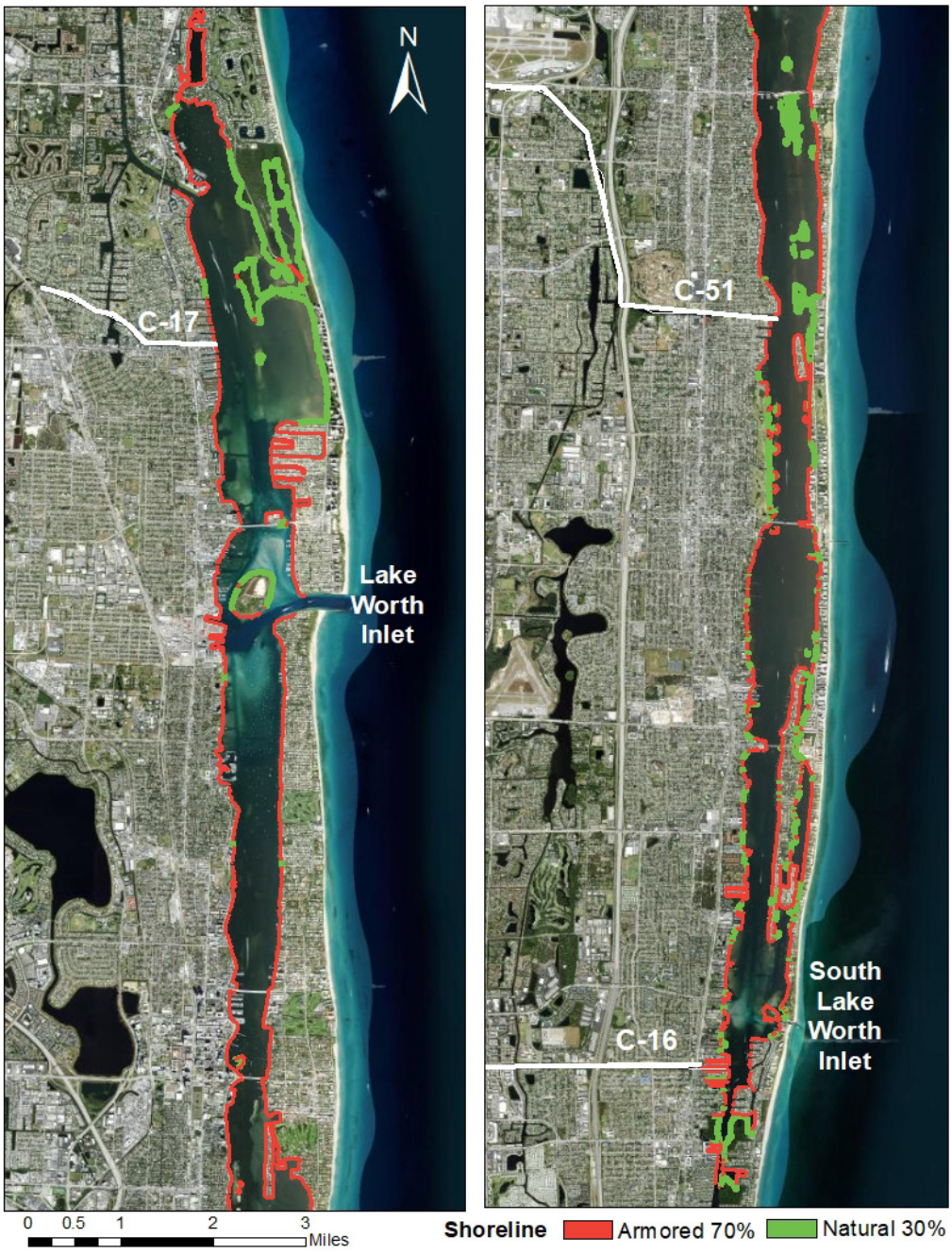

Figure 11.3. Lake Worth Lagoon shoreline characterization. Red represents armored shorelines (70%) and green shows where natural shorelines remain (30%). Data source: LWLI 2021.

(PBCDERM) and Lake Worth Lagoon Initiative partners have been improving habitat resiliency by creating coastal wetlands through island building and enhancing armored stretches with living shorelines (Figures 11.4 and 11.5). Living shorelines shield critical coastal infrastructure by buffering the impact of storms and floods while providing habitat for fish and wildlife. Other restoration projects implemented in the area include: 1) the creation of restoration islands from dredge spoil (Figure 11.4), 2) subaqueous capping of dredge holes, wherein contaminated dredged material is covered by suitable isolating material to reduce the release of contaminants into the water column, and 3) improving hydrology for mangroves and salt marsh (e.g., through installation of culverts).

South Florida Water Management District (SFWMD) mapping shows an increase in mangrove extent in recent decades (Figure 11.6, Table 11.1). Salt marsh de-

Figure 11.4. Volunteers planting 3-gallon red mangrove (*Rhizophora mangle*) as part of the living shoreline at Monceaux Park, Palm Beach County, in April 2023 (top); salt marsh cordgrass (*Spartina alterniflora*) patches planted alongside red mangrove saplings at a restoration island in Tarpon Cove created from dredge spoil December 2022 (bottom). Photo credit: MANG.

clined after 1999 but has remained at a low but stable 8 ha (21 ac) from 2008 to 2019 (Figure 11.6, Table 11.1). Urban development of coastal systems causes extensive declines in salt marsh extent through loss of habitat and nutrient enrichment, although coastal wetland responses to eutrophication are widely variable (Deegan et al. 2012, Kirwan and Megonigal 2013). Additionally, when mangrove growth is not restricted by cold temperatures, mangroves can shade and eventually replace salt marsh vegetation (Stevens et al. 2006, Saintilan et al. 2014).

Loxahatchee River

The Loxahatchee River crosses through Martin and Palm Beach counties before it reaches the Atlantic Ocean at Jupiter Inlet (the downstream portion of the river is visible in Figure 11.1). The Loxahatchee River–Lake Worth Creek Aquatic Preserve includes the Loxahatchee River which is made up of three forks (North, Northwest, and Southwest). The Northwest Fork is composed of subtropical cypress swamp, mesic and hydric hammocks, and mixed hardwood forest. Historically, the Northwest Fork of Loxahatchee River received flow from the Loxahatchee and Hungryland sloughs, but in the 20th century the watershed and river underwent substantial changes (Wan et al. 2015). Those changes included, in 1947, the permanent opening of Jupiter Inlet through dredging and the stabilization with constructed jetties (Work and Dean 1990, SFWMD 2006, Wan et al. 2015). The Loxahatchee River watershed has been permanently altered by the stabilization of the Jupiter Inlet, which heightens the effects of increased tidal amplitude and saltwater intrusion. The construction and operation of drainage canal systems and water management (e.g., diversions, pumping, impoundment) has also altered the natural pattern of freshwater flow and inundation of the floodplain. Groundwater levels in the Loxahatchee River watershed declined more than 0.6 m (2 ft) from 1950 to 1990 (Orem et al. 2007). The increased soil salinity and tidal inundation are important concerns for the survival

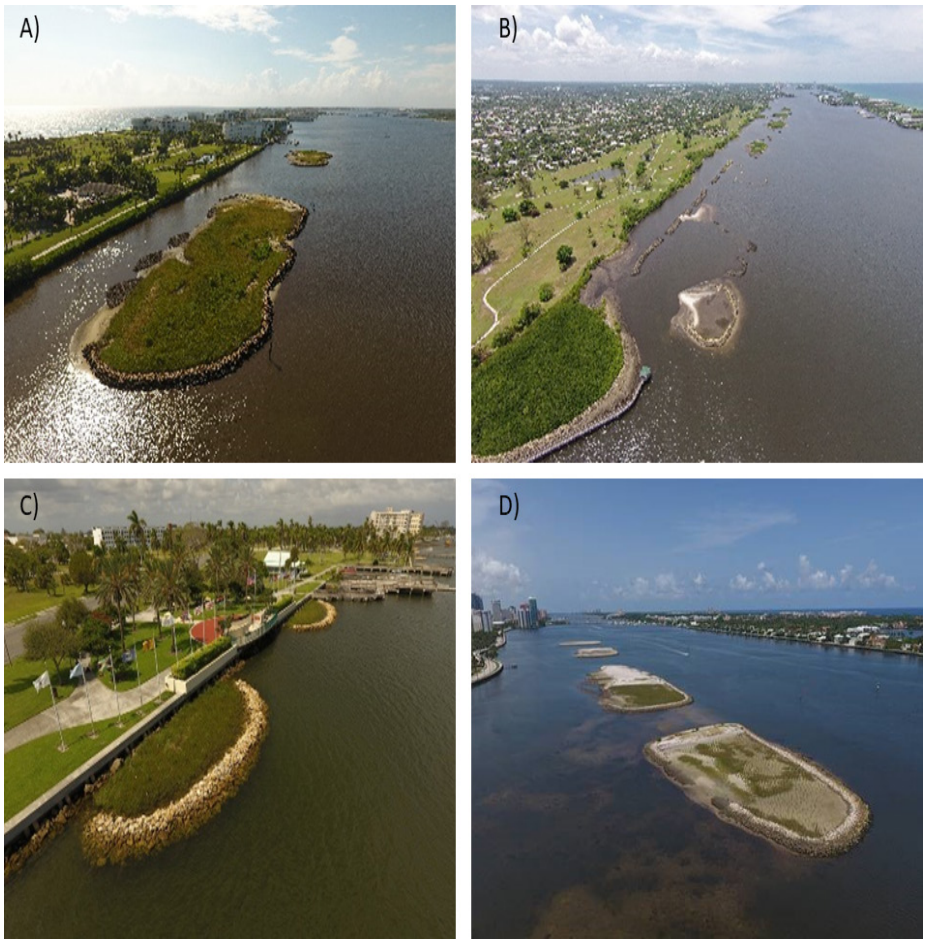

Figure 11.5. Habitat restoration projects built by Palm Beach County in the Lake Worth Lagoon. A) Grassy Flats (completed in 2015); B) Snook Islands (phase 2, 2015; natural area II modifications 2018); C) Currie Park (completed in 2017); and D) Tarpon Cove (phase 1, 2019; phase 2, 2023). Additional restoration projects constructed during 2014–2022 include Bryant Park Islands (2014), Bryant Park Living Shorelines (phase 1, 2015; phase 2, 2017), Jewel Cove (2016), Osprey Park (2017), Lyman Kayak Park and Living Shoreline (2018), and Lake Worth Lagoon Mangrove Pods (2020); locations shown in Figure 11.8. Photo credit: Palm Beach County Department of Environmental Protection.

of the remaining floodplain plant communities. Hydrological changes led to a mass mortality of the freshwater vegetation, primarily bald cypress (*Taxodium distichum*), and increased establishment and growth rates of mangroves (Hedgepeth and Roberts 2009, Wan et al. 2015, Figure 11.7). A minimum-flow-and-levels rule, defined as the "limit at which further withdrawals would be significantly harmful to water resources or ecology of the area," and a restoration plan were developed to establish incremental freshwater flows to protect and restore the ecosystem (SFWMD 2006). As part of the Comprehensive Everglades Restoration Plan (CERP), restoration initiatives aim to release freshwater into the river and floodplain through water-control structures to be built throughout the watershed (Sullivan et al. 2020). But with the floodplain located between the terrestrial freshwater environment and the coastal zone, restoration options must carefully take into consideration the impacts of future land-use changes and sea-level rise. Increased salinity and inundation under future sea levels will impact the function and resilience of freshwater communities, and mangrove forests will likely continue to encroach into what had been freshwater portions of the floodplain (Sullivan et al. 2020, Woodroffe et al. 2016).

In 1985, the Loxahatchee River was designated as Florida's first National Wild and Scenic River (SFWMD 2006) and is one of only two federally designated Wild and Scenic Rivers in Florida. This swamp contains bald cypress trees that are at least 300 years old and is one of the last remaining bald cypress swamps in Southeast Florida. The Loxahatchee River is also Southeast Florida's last remaining free-flowing river system (SFWMD 2006). Additionally, the tidal floodplains and estuary with their seagrasses, mangroves, and oyster beds are valuable ecological resources in the Loxahatchee River watershed. Mangroves are found fringing the natural shorelines of the Loxahatchee River estuary, occasionally expanding landward as a full mangrove forest (SFWMD 2006). Red mangrove (*Rhizophora mangle*) and white mangrove (*Laguncularia racemosa*) are dominant, while black mangrove (*Avicennia germinans*) is found along the Intracoastal Waterway.

Lake Worth Lagoon

Lake Worth Lagoon (LWL) is a narrow lagoon that extends 35 km (22 mi) along Palm Beach County (Figure 11.1, detailed extent in Figure 11.8). Lake Worth was a

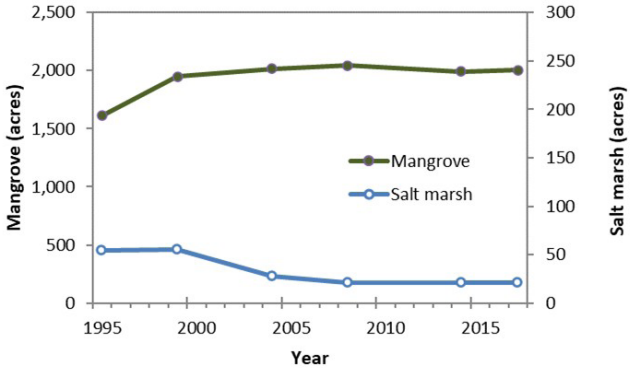

Figure 11.6. Acreages of mangrove swamp and salt marsh in Palm Beach and Broward counties. Data source: SFWMD 2022.

Table 11.1. Historical acreages of mangrove swamp (FLUCCS 6120) and salt marsh (FLUCCS 6420) in Palm Beach and Broward counties (Figure 11.6). Data source: SFWMD 2022.

Year	Mangrove (ha)	Mangrove (ac)	Salt marsh (ha)	Salt marsh (ac)
1995	652	1,612	22	55
1999	788	1,947	23	56
2004–2005	815	2,015	11	28
2008–2009	826	2,042	8	21
2014–2016	807	1,993	8	21
2017–2019	811	2,004	8	21

freshwater lake that received sheet flows of surface water from the Everglades, but the construction of artificial inlets in the early 1900s caused the water to become brackish (USFWS 1999b, CERP 2005). More than 81% of the lagoon's shoreline is now lined by urban development (PBCDERM 2008), but mangroves still occupy some of the lagoon's northern shoreline and islands, along with a few patchy regions around its southern end (Figure 11.8, USFWS 1999b). Lake Worth Lagoon receives considerable freshwater input from the Earman River, West Palm Beach Canal, and Boynton Canal (C-17, C-51, and C-16 canals, respectively; SFWMD 2013). This freshwater input decreases salinity in LWL and increases sedimentation. SFWMD regulates freshwater discharges in attempts to limit high-volume outflows and maintain estuarine salinities above 15 (SFWMD 2013).

The North Palm Beach County portion of the Comprehensive Everglades Restoration Plan (CERP), now called the CERP Loxahatchee River Watershed Restoration Project, seeks to capture, store, and treat excess freshwater discharge to LWL and to use that water to enhance Loxahatchee Slough and Grassy Waters Preserve. The project aims to support riverine floodplain vegetation and the re-establishment of submerged aquatic veg-

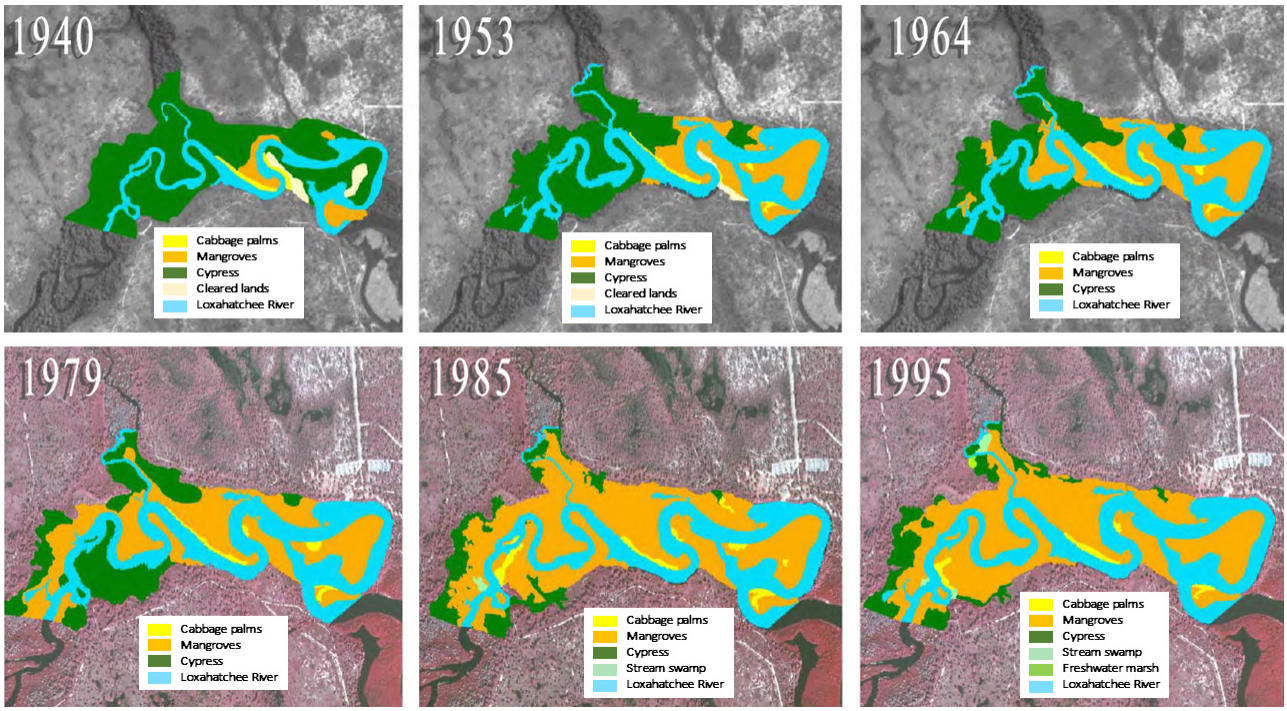

Figure 11.7. Time series of floodplain vegetation changes along the Northwest Fork of the Loxahatchee River. The 1940, 1953 and 1964 maps use a 1940 aerial photograph as the background. The 1979, 1985 and 1995 maps use a 1995 digital orthophoto quadrangle color-infrared aerial photograph as the background. Figure source: Hedgepeth and Roberts 2009.

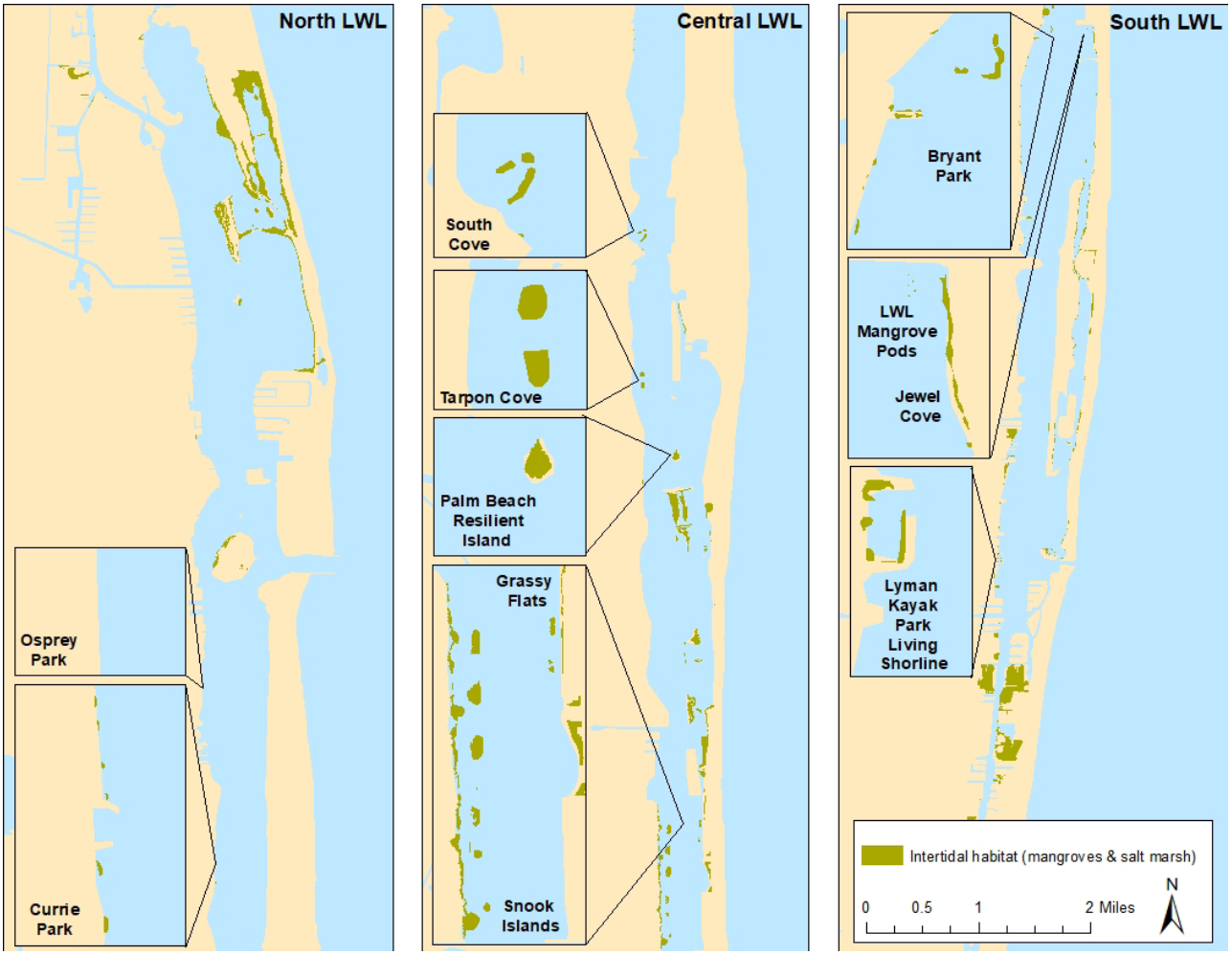

Figure 11.8. Emergent saltwater vegetation, including that at coastal wetland restoration sites, Lake Worth Lagoon (LWL), 2022. Prepared by Palm Beach County Department of Environmental Protection.

etation by improving hydroperiods in the region (CERP 2019). Other CERP projects in this region included the construction of sediment traps along the West Palm Beach Canal and the addition of sand near Ibis Isle in LWL to provide the elevation necessary for planting mangrove and salt marsh vegetation (SFWMD 2013). In the floodplain along the Loxahatchee River and in Lake Worth Lagoon, the construction of inlets and the resulting increase in tidal influence has caused expansion of mangroves into a region previously occupied by freshwater vegetation. Management practices vary depending on whether the overall objective is to protect existing coastal wetlands (LWLI 2021) or remaining freshwater vegetation (SFWMD 2006).

Broward County West Lake Park

Mangroves are present in a few parks and barrier islands along the coast of Broward County, such as Dr. Von D. Mizell-Eula Johnson State Park (formally John U. Lloyd Beach State Park) and Hugh Taylor Birch State Park (Figure 11.2). West Lake Park contains the largest remaining mangrove habitat in Broward County (USFWS 1999b). In the 1920s, the area surrounding the park was dredged and filled to prepare for development (MacAdam et al. 1998). The land was never developed, however, and was purchased for conservation in 1980. From 1985 to 1996, a restoration effort removed Australian pine and revised land elevation to encourage natural recruitment of mangroves (MacAdam et al. 1998). A 633-ha (1,564 ac) coastal wetland and mangrove preserve was the result, including two salt marshes dominated by seaside tansy (*Borrichia arborescens*) and sea oxeye daisy (*B. frutescens*) (FDEP 2020b, USFWS 1999b).

Threats to coastal wetlands

- **Coastal development:** Palm Beach and Broward counties have lost most of their coastal wetlands to urban development, predominantly due to coastal construc-

Table 11.2. Mangrove and salt marsh acreage in the Lake Worth Lagoon (LWL) and Intracoastal Waterway (ICW) of Palm Beach County (PBC). Data source: PBC 2008. No salt marsh data available in 1985 and 2001.

Year	North ICW	North LWL	Central LWL	South LWL	South ICW	Total PBC
			Mangrove (ha/ac)			
1985	93/231	48/119	21/52	31/76	62/152	255/631
2001	98/243	54/134	23/56	30/73	59/147	265/654
2007	108/266	62/153	23/58	30/73	66/162	288/711
			Salt marsh (ha/ac)			
2007	0.00/0.00	0.00/0.00	0.55/1.35	0.06/0.16	0.00/0.00	0.61/1.51

tion between 1940 and 1970 (Harris et al. 1983). Extant coastal wetlands are found primarily on protected public lands and so are less susceptible to the direct threat of development, though indirect impacts (discussed below) of a large human population remain.

- **Hydrologic alterations:** The region has already undergone a major shift from freshwater to estuarine wetlands due to the dredging of inlets and the rerouting of surface water. While extending the inland range of the tides did increase the extent of estuarine wetlands in the area, salinity is highly variable due to inconsistent freshwater inputs from inland sources. Construction of canals for efficiently draining water from the Everglades and Lake Okeechobee into coastal estuaries led to the concentration of runoff while other regions were starved of freshwater, both of which hinder optimal salinity for estuarine wetlands (FDEP 2012, LWLI 2021).
- **Climate change and sea-level rise:** Extensive urban development along the shoreline restricts the extent of buffer zones and hinders landward migration of mangroves and salt marsh habitats. Sea-level rise threatens coastal habitats in this region as mangroves fringing seawalls or other hardened shorelines will likely be lost due to inundation. This region is also vulnerable to inundation due to storm surge from hurricanes, which are exacerbated by higher sea levels (LWLI 2021, Skylar et al. 2021, Parkinson and Wdowinski 2022).
- **Water quality and pollution:** Runoff from the dense urban development in this region is detrimental to local water quality. Pollutants in freshwater runoff, including fertilizers (nitrogen and phosphorus), pesticides, hydrocarbons, and heavy metals, often flow directly into coastal wetlands and lagoons. As development increases, so does the amount of polluted urban runoff. During the rainy season, nonpoint-source pollution (i.e., urban runoff) from rainfall, combined with high water temperature, creates concentrated nutrient environments that promote algal blooms and increase biological oxygen demand, often resulting in hypoxic or anoxic events (Broward 2019). Within Broward County, the largest pollution threat to surface waters is storm-water runoff from roadways, parking lots, golf courses, and residential lawns. Comparatively, agricultural runoff from the Everglades Agricultural Area around Lake Okeechobee and in Palm Beach County are the largest pollution threats to wetlands in the water conservation areas (Broward 2019). In canals, important pollution sources are hazardous spills due to high boat traffic and shipping, illegal release of raw sewage, and marine debris from construction and repair of vessels (Broward 2019, FDEP 2012).
- **Invasive vegetation:** As in much of coastal Florida, invasive plants such as Brazilian pepper (*Schinus terebinthifolia*) and Australian pines compete with native vegetation for space and freshwater (FDEP 2012).
- **Erosion:** Much of the mangrove habitat lines the Intracoastal Waterway; bank erosion from wind waves and boat wakes threatens these mangroves (FDEP 2012).

Mapping and monitoring efforts

Water management district mapping

Since 1995 SFWMD has conducted land use and land cover (LULC) surveys using interpretation of aerial photography taken for each county. Salt marsh and mangrove extent is available for 1995, 1999, 2004–2005, 2008–2009, 2014–2016, and 2017–2019 (see Table 11.1). Land cover classifications for 2017–2019 were based on a SFWMD-modified FLUCCS classification system (FDOT 1999, SFWMD 2011). Minimum mapping units for classification were 2 ha (5 ac) for uplands and 0.2 ha (0.5 ac) for wetlands. The 2017–2019 maps were made by updating 2014–2016 vector data (SFWMD 2022).

Palm Beach County habitat mapping

In 2007, the Palm Beach County Habitat Mapping Project used aerial photography to identify the extent of seagrass, mangrove, salt marsh, and oyster habitat in LWL and the Intracoastal Waterway in the northern and southern portions the county (PBC 2008). Aerotriangulation, digital orthophotography, field work, photointerpretation, and trend analyses were used to map these coastal resources. Shoreline characteristics of LWL are shown in Figure 11.3. This effort updated older maps from 1985 and 2001–2003 (PBC 2004). There has not been an update since 2007, although an extensive seagrass mapping effort was completed in 2013 for LWL, Lake Boca, and Jupiter Sound (Orlando et al. 2016). A mangrove assessment was completed as part of the Lake Worth Lagoon Management Plan in 2012; it reported an 8% increase in mangrove extent from 1985 to 2012 (LWLI 2013). Increase in mangrove acreage in LWL from 2007 to 2013 was determined by mapping mangroves at PBCDERM restoration sites.

Loxahatchee River floodplain vegetation study

In 2003, SFWMD and the Florida Park Service established four new vegetative belt transects and studied six transects from earlier studies, for a total of 138 vegetative plots in the Loxahatchee River floodplain (Hedgepeth and Roberts 2009). These data were collected in preparation for establishing the minimum flow and level requirements for the Northwest Fork of the Loxahatchee River. Since then, the canopy has been examined every six years and shrub and groundcover every three years.

The SFWMD study focused on the stability of floodplain plant communities (Hedgepeth and Roberts 2009). Due to inadequate hydroperiods, in the inland regions these floodplain plants were at risk of displacement by upland and transitional communities. In the tidal reaches, reduction in freshwater flow led to increased salinity, prompting the establishment of salt-tolerant species such as mangroves (Hedgepeth and Roberts 2009, Kaplan et al. 2010). The study concluded that bald cypress should be the primary species of concern for restoration and enhancement in this riverine swamp, while red maple (*Acer rubrum*) and water hickory (*Carya aquatica*) should be the primary species of concern for bottomland hardwood communities, and cabbage palm (*Sabal palmetto*) for hydric hammock communities (Hedgepeth and Roberts 2009). Wan et al. (2015) expanded on this using artificial neural network modeling and time series of aerial photographs to elucidate vegetation dynamics in relation to saltwater intrusion and watershed hydrology. Restoration of the Loxahatchee River focuses on reducing salinities to less than 2 in the upper tidal reaches and improving hydroperiods on the riverine floodplain, which should in turn improve habitat quality for freshwater seed production, germination, and eventually reforestation throughout the river system. Because mangroves may persist in freshwater environments, it is expected to take decades for an ecological succession from mangrove forest back to bald cypress wetland to occur (Wan et al. 2015). SFWMD monitors freshwater flow, water quality, vegetation, seagrasses, and various animals in the North Fork of the St. Lucie River and the Loxahatchee River Floodplain and Watershed (SFWMD 2006). The restoration plan for the Northwest Fork of the Loxahatchee River (SFWMD 2006) chronicles these problems and provides ecological target species, performance measures, and monitoring requirements needed to track the success of restoration and guide future adaptive management and operational practices. Continued vegetation, surface water, and soil monitoring of the floodplain will be necessary to ensure that the hydrologic conditions necessary for the long-term stability of these vegetative communities are maintained.

Restoration projects

To facilitate safe navigation in the Intracoastal Waterway, the Florida Inland Navigation District regularly dredges tens of thousands of cubic yards of material. When this dredge material is safe to use in the lagoon, Palm Beach County reuses dredge sediment for the benefit of coastal ecosystems. From 2014–2020, Palm Beach County augmented 17 ha (43 ac) of coastal habitat, 5.7 ha (14 ac) of this land was created using dredge materials at multiple project areas. Through the county's restoration efforts, 2.5 ha (6.1 ac) of mangrove and salt marsh, 12 ha (30 ac) of suitable seagrass habitat, and 3 ha (7.2 ac) of living shoreline mangrove planters and oyster reef was created (LWLI 2021) (Figures 11.4 and 11.5). These intertidal habitats provide long-term wildlife and water quality benefits as well as reduce ecological impacts from storms. Some of these restored shorelines consisted of intertidal mangrove islands, like those installed at Tarpon Cove (Phase 1 completed in October 2019 and Phase 2 completed in 2023). Successful nesting of imperiled and threatened shorebirds has been documented on multiple restored and created islands. Part of the county's restoration efforts included volunteer events with project stakeholders to plant mangroves and salt marsh cordgrass upon the completion of construction. For example, in 2019, Palm Beach County's Environmental Resources Management staff hosted volunteer

planting events at Snook Islands Natural Area where volunteers planted 850 mangroves. The Snook Islands Natural Area Habitat Enhancement Project has also created salt marsh, oyster reef, and seagrass recruitment areas (TNC 2014). Between 2020 and 2023, Palm Beach County staff, the Florida Fish and Wildlife Conservation Commission the Florida Department of Environmental Protection, the National Oceanic and Atmospheric Administration, the West Palm Beach Fishing Club, many local volunteers and stakeholders and MANG, a Florida-based ecosystem restoration brand that grows and propagates mangroves for coastal resilience projects, held over 18 volunteer planting events and planted an estimated 4,800 red mangrove saplings, 850 red mangrove seedlings, and 12,000 salt marsh cordgrass plugs on a newly created island at Tarpon Cove Natural Area creating 1.4 ha (3.5 ac) of mangrove and salt marsh habitat as part of a 18.6-ha (46 ac) restoration project (Figure 11.4; LWLI 2021). MANG continues planting red mangroves and salt marsh cordgrass at multiple restoration sites in Palm Beach County and across Florida as well as cleanup marine debris during site visits.

Recommendations for protection, management, and monitoring

- Restore connectivity between isolated habitats and develop a monitoring program for assessing impacts of sea-level rise on coastal ecosystems.
- Upland habitats adjacent to coastal wetlands should be protected from development to facilitate landward migration of mangroves and salt marshes to keep pace with sea sea-level (SFRCCCC 2012). Further recommended responses to climate change are outlined in the Southeast Florida Regional Climate Change report (SFRCCCC 2012).
- To minimize climate impacts on fisheries, improve water quality and habitats that support fisheries, such as seagrass and mangroves (SFRCAP 2022).
- Continue to install living shorelines such as mangroves or other native vegetation in place of bulkheads or other artificial shorelines.
- Several regions, including parts of Dr. Von D. Mizell-Eula Johnson State Park and Lantana Nature Preserve, were once ditched to curb mosquito population growth (FDEP 2012, LWLI 2021). Although many of the ditches were eventually filled, water stagnates in the remaining ditches, so continued filling and restoration are recommended (FDEP 2012, LWLI 2021).
- Mangroves in Hugh Taylor Birch State Park would benefit from increased circulation and tidal flushing; spoil regions have been recommended for restoration to mangrove forest (FDEP 2020a).
- Invasive vegetation continues to be a major threat to Florida wetlands. Efforts should be made to control the introduction of exotic species and to educate landowners about the value of planting native species. Restoration efforts should continue to remove invasive nonnative vegetation that encroaches on salt marshes and mangroves.
- Goals set forth in the Lake Worth Lagoon Management Plan (LWLI 2021) include reducing sediment load, nutrient input, and contaminant input into the lagoon. The action plan also aims specifically to restore, create, and protect mangrove habitats. This result will be achieved through the education of landowners, installation of living shorelines, and collaboration with local partners and governmental agencies to complete habitat restoration projects.
- Goals in the John D. MacArthur Beach State Park Management Plan include continuing exotic vegetation removal, restoration of the beach dune community, updating plant and animal inventories, and improved mapping, monitoring, and management of designated species (FDEP 2020c).

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General references and additional regional information

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Palm Beach County Environmental Resources Management: https://discover.pbcgov.org/erm

Southeast Florida Regional Compact—Climate Change: https://southeastfloridaclimatecompact.org/

South Florida Water Management District: https://www.sfwmd.gov/

Comprehensive Everglades Restoration Plan (CERP): https://www.evergladesrestoration.gov/comprehensive-everglades-restoration-plan

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