



CONSERVATION, SUSTAINABILITY AND RESILIENCY

LIVE



DATA, INVENTORY, AND ANALYSIS

WORK



PLAY



GROW





TABLE OF CONTENTS

Introduction _____	CSR-1
Inventory _____	CSR-2
Protect and Improve the Quality of the City's Air Resources _____	CSR-6
Smoke-free Environment _____	CSR-7
Greenhouse Gas Emissions _____	CSR-7
Reduction of Fossil Fuel Dependence _____	CSR-8
Conservation, Existing Use, and Protection of Water Resources _____	CSR-10
Conservation, Existing Use, and Protection of Mineral and Soil Resources _____	CSR-16
Protection of Endangered, Threatened, and Species of Special Concern _____	CSR-17
Conservation, Existing Use, and Protection of Natural Areas _____	CSR-19
Preservation of Publicly Held Natural Areas _____	CSR-19
Preservation of Privately-owned Natural Areas _____	CSR-22
Exotic Plants _____	CSR-22
Coastal Habitat _____	CSR-23
Historic Natural Resources _____	CSR-19
Sustainable Use and Management of Resources _____	CSR-24
Energy Efficiency _____	CSR-24
Diverse Energy Mix _____	CSR-26
Composting _____	CSR-29
Urban Agriculture and Community Gardens _____	CSR-29
Green Implementation Advancement Board _____	CSR-30
Sustainable Product Use _____	CSR-30
Sustainable Procurement _____	CSR-31
Greening City Events _____	CSR-31
Green Blue Economy _____	CSR-31
Increasing Citywide Resilience to Sea Level Rise, Flooding, Storms _____	CSR-32
Conservation, Sustainability, and Resiliency Public Outreach _____	CSR-40
Recommendations _____	CSR-41
Definitions _____	CSR-47



TABLES

Table CSR 1 – Hydrology_____	CSR-2
Table CSR 2 - Geology _____	CSR-3
Table CSR 3 - Natural Environments _____	CSR-4
Table CSR 4 – Species of Special Concern _____	CSR-5
Table CSR 5 - Delray Beach Verified Impaired Waterbodies_____	CSR-14
Table CSR 6 - Delray Beach Turtle Nesting Data (2015, 2016, 2017) _____	CSR-18
Table CSR 7 - Federal Emergency Management Agency Flood Zone Descriptions _____	CSR-35

REFERENCED MAPS

Location of Natural Ecosystems and Conservation Areas_____	AD-19
Coastal Areas Subject to Flooding_____	AD-15
Potential Coastal Inundation from Sea Level Rise_____	AD-18
Wellfield Protection Areas_____	AD-20



CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

INTRODUCTION

Section 163.3177(6)(d), Florida Statutes, requires local governments to include a Conservation Element providing for the conservation, use, and protection of natural resources within its Comprehensive Plan. The City of Delray Beach (herein referred to as "Delray Beach" or "City") has elected to create an enhanced conservation element that also addresses sustainability and resiliency strategies for a comprehensive approach to managing the natural and built environment.

Conservation, sustainability, and resiliency are discrete but overlapping disciplines. Conservation acknowledges that some resources are finite, and should be preserved. Sustainability typically addresses the interdependence of environmental, social, and economic systems through management of resources to maintain their availability for future generations. Sustainable development is typically defined as development which meets the needs of the present without compromising the ability to meet the needs of future generations. Sustainable actions are those that conserve, maintain, support, and enhance the environmental, economic, and social systems. Resilience refers to the capacity of systems to recover quickly after adverse situations such as disruptions or disasters. Resiliency strengthens systems to prepare for shocks, absorb impact, and recover from, and adapt to both persistent threats or single events.

Urban resiliency has become an important goal for many local governments with the onset of climate change impacts such as rising temperatures, extreme weather events like drought or storms, sea level rise, and large volume precipitation events. Proactive adaptation planning calls for an innovative approach which plans for ecological conditions which might not be "normal" as characterized by past trends, but looks to the future and characterizes changing conditions which may currently be underway or anticipated by the science community. Sustainable policies such as curbing greenhouse gas emissions, or reducing energy and water consumption are important actions which can contribute to larger long-term resiliency and sustainability efforts to avoid the worst impacts of climate change.

Delray Beach is committed to addressing global climate change at a local level. Development of modern society and our reliance on fossil fuels, has caused the release of excess gases (Sulfur dioxide, Methane, Nitrogen oxide, Carbon dioxide), creating a layer of gas in earth's atmosphere which allows light to pass but traps heat, preventing its escape. Models predict earth's temperature will increase over the next 100 years anywhere from a 2-10-degree Fahrenheit temperature.

For Delray Beach climate change has the capacity to cause the following impacts:

- 🌈 Increased annual rainfall with higher volume rain events,
- 🌈 Warmer weather with increased heat waves,
- 🌈 Damage to ecological and natural systems,
- 🌈 Increased algae blooming,
- 🌈 Increased coastal erosion,
- 🌈 Greater flood risks,
- 🌈 Extreme weather events which may cause drought or coastal storm surge, and
- 🌈 Sea level rise which will threaten coastal infrastructure, water supplies, ecosystems, and potentially cause the inundation of stormwater systems.

Local governmental units have large conservation, resiliency, and sustainability potential because they provide citizens with goods, resources, and basic services such as drinking water, public, transportation, and waste management. Plus, local governments are largely vulnerable to resource challenges and climate change impacts. Local governance drives the consumption of materials and energy, regional economic growth, the local production of waste, and the emission of greenhouse gases. Local decision-makers have the ability to impact the level of resource use in the community and to manage economic growth in such a way that will ensure long-term viability.

An important philosophy of the City is to enhance the "triple bottom line". This concept combines social equity, economic, and environmental factors. The phrase, "people, planet, and profit" is often used to describe the triple bottom line and the goal of sustainability, which serve as a basis for the expansion of this Element. The social component provides benefit to many



CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

constituencies across socio-economic dimensions. The economic component incorporates concepts of gain for all sectors of the community and, finally, the environmental component that reduces the ecological footprint of the City by, among other things, carefully managing its consumption of energy and reducing manufacturing waste as well as rendering waste less toxic before disposing of it in a safe and legal manner. This includes improvements to overall environment of the City for the entire community.

The Conservation, Sustainability, and Resiliency Element of the Delray Beach Comprehensive Plan employs a coordinated public policy and planning approach to maintain the protection and conservation of natural resources, to promote the acceptance of sustainable practices, and to proactively prepare for future disturbances by increasing community resiliency.

INVENTORY

The following section identifies the natural resources found within the Delray Beach Planning Area and is prepared to facilitate review with the requirements of Section 163.3177(6)(d), Florida Statutes.

Florida Statutes provide, "[t]he following natural resources, where present within the local government's boundaries, shall be identified and analyzed and existing recreational or conservation uses, known pollution problems, including hazardous wastes, and the potential for conservation, recreation, use, or protection shall also be identified: [r]ivers, bays, lakes, wetlands including estuarine marshes, groundwaters, and springs, including information on quality of the resource available; [f]loodplains; [k]nown sources of commercially valuable minerals; [a]reas known to have experienced soil erosion problems; [a]reas that are the location of recreationally and commercially important fish or shellfish, wildlife, marine habitats, and vegetative communities, including forests, indicating known dominant species present and species listed by federal, state, or local government agencies as endangered, threatened, or species of special concern." Section 163.3177(6)(d), Florida Statutes.

Table CSR - 1 Hydrology
Surface Waters
The Intracoastal Waterway
Lake Ida (80 acres)
SFWMD Canal C-15
Lake Worth Drainage District lateral canals and equalizers
Private water bodies used primarily as water retention areas
The Atlantic Ocean
Groundwater
Surficial aquifer system, an unconfined unit, it is the primary source of the City potable water supply through municipal wells.
Intermediate Confining Unit (Hawthorn Formation)
Floridan aquifer system, a confined unit, it is currently used to supplement the Surficial Aquifer system for potable water supply and is a potential long-term water supply resource with reverse osmosis treatment.
Wetland Areas
There are no publicly-held wetlands in the Delray Beach Planning Area.



Table CSR – 2 Geology
Soil Erosion
Construction Areas: after vegetation is cleared prior to construction parcels are highly subject to wind erosion.
Canal Areas: canal banks can erode, resulting in sediment build-up in the canals. This can be caused by runoff from adjacent streets or high-speed boat traffic.
Beach and Intracoastal Area: the Delray Municipal Beach experiences erosion from the ocean's winds, waves, and storms, and is mitigated by the Palm Beach County Shoreline Protection Plan. The soil behind seawalls can erode due to poor compaction or fluctuating water table and sea level heights. This type of erosion can be mitigated by backfilling and seawall repairs.
Areas containing Sandy Soils: areas containing sandy soils in conjunction with slope and intense water runoff are erosion prone.
Source: PBS&J Report, 1989 Delray Beach Conservation Element
Commercially Valuable Minerals
No commercially valuable minerals are being mined or extracted in the Delray Beach Planning Area. Some concentrations of coquina, dolomite and sand exist below the surface but are located in developed areas.
Source: Florida Mining Atlas
Hazardous Waste Sites
No hazardous waste sites are located in the Delray Beach Planning Area. The City has one waste transfer site located at 1901 SW 4 th Avenue that is leased to the Solid Waste Authority (SWA).



Table CSR – 3 Natural Environment
Native Ecosystems
Delray Oaks (24.48 acres, Low Oak Hammock)
Leon Weekes Environmental Preserve (12.37 acres, Florida Scrub)
Orchard View Park (5.94 acres)
Atlantic Dunes Park (4.64 acres, Beach Strand Community)
Hurricane Pines (0.14 acres, Florida Scrub)
Environmentally Sensitive Sites
Donnelley Tract (1.64 acres, Mangroves)
FIND Parcel MSA 645 (7.41 acres, Mangroves)
FIND Parcel MSA 650, known as Mangrove Park, (4.05 acres, Mangroves)
Hammock Reserve Preserve Area (4.86 acres, Oak Hammock)
Marine Habitat
Atlantic Ocean
Intracoastal Waterway
Continental Southwest Florida Reef Tract
Inter-tidal Habitat
Surf zone and Subtidal Habitat



CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

Table CSR - 4	
Species of Special Concern	
Plants	
Curtiss Milkweed	
Wild Cotton	
Dancing Lady Orchid	
Hand Fern	
Tropical Curly-grass	
Mammals	
West Indian Manatee	Threatened
Florida Mouse	
Sherman's Fox Squirrel	
Amphibians / Reptiles	
Loggerhead Turtle	Endangered & Threatened
Greenback Turtle	Endangered & Threatened
Leatherback Turtle	Endangered
Eastern Indigo Snake	Threatened
Florida Gopher Frog	
Gopher Tortoise	Threatened
Florida Scrub Lizard	
Birds	
Least Tern	Endangered
Scrub Jay	Threatened
Cedar Waxwing	
Burrowing Owl	
Limpkin	
Grasshopper Sparrow	Endangered
American Kestrel	
Sandhill Crane	
Short-tailed Hawk	
Black- whiskered Vireo	
Invertebrates	
Stoney Coral Species (such as <i>Acropora</i>)	Threatened
Florida Tree Snail	
Scarab Beetle	
Source: PBS&J Report, 1989 Delray Beach Conservation Element; United States Fish and Wildlife Service, <i>Environmental Conservation Online System</i> , (Last visited Sept. 9, 2018).	



CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

PROTECT AND IMPROVE THE QUALITY OF THE CITY'S AIR RESOURCES

Clean air is a highly important natural resource which must be protected. Air pollution is known to be linked to decreased lung function, asthma, chronic bronchitis, irregular heartbeat, heart attack, and early death for those suffering from heart or lung disease. Arden Pope III, *Environmental Health Perspectives*, 2000. Certain populations are more susceptible to health risks from air pollution, such as young children and infants, the elderly, and individuals with chronic conditions. Paul Mohai et al., *Environmental Justice*, 2009.

The National Clean Air Act, requires the United States EPA to set National Ambient Air Quality Standards for pollutants considered harmful to public health and the environment.

The Florida DEP maintains a comprehensive ambient air monitoring network involving over 220 monitors positioned across the state. In 2016, a monitor for particulate matter was relocated from the AG Holley site in Lantana to a site off of Congress Avenue proximate to Atlantic Avenue (AQS Site #12-099-2005). Florida DEP, 2016-2017 *Annual Air Monitoring Network Plan*.

In late 1993, the Florida DEP (DEP) submitted a request to the United States Environmental Protection Agency (EPA) to re-designate the Southeast Florida Area (Dade, Broward, and Palm Beach County) from non-attainment to a maintenance area for ozone (effective 1995). The region has been in maintenance status, and continued compliance with air quality standards is anticipated. It has been achieved to date through new control methods including less evaporative gasoline, vapor controls for retail gasoline fueling, and replacement of older vehicles with less polluting ones. In addition, gasoline dispensing facilities within the City have been outfitted with vapor recovery systems, and all underground corrosive (steel) storage tanks have been replaced.

The Palm Beach County Department of Health maintains an Air Quality Index online and is responsible for programs supporting the permitting and licensing of air pollution sources; conducting

inspections and enforcing air pollution regulations; encouraging effective growth management programs including transportation planning; promotion of pollution prevention and conservation; technical assistance to residents reporting indoor air pollution; control of open burning; asbestos abatement and building demolition; and monitoring molds and moistures in the atmosphere. The air quality within Delray Beach and Palm Beach County as a whole continues to comply with all National Ambient Air Quality Standards.

The National Oceanic and Atmospheric Administration through the National Weather



Service has partnered with the United States EPA and provides daily air quality forecasts as part of a national Air Quality Forecasting Capability.

Palm Beach County has generally good air quality throughout the year. The City of Delray Beach is encouraged to continue to participate with regional and state efforts to maintain current air quality levels in conformance with the National Air Quality Standards.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

SMOKE-FREE ENVIRONMENT

In order to protect air quality in the Delray Beach Planning Area the City has adopted a smoke-free policy on the Delray Municipal Beach, a tobacco ban for City employees, and an ordinance limiting e-cigarette or vape use to outdoor areas only. The City will continue to maintain these practices.



GREENHOUSE GAS EMISSIONS

Reducing greenhouse gas emissions within the Delray Beach Planning Area will improve air quality, contribute to broader efforts to combat climate change, and translate into energy cost savings in the community. As the City graduates to relying on cleaner energy technologies to support its existing and future capital investments community stakeholders and residents will also transition to more sustainable practices. If the growing global energy demand continues to be met mostly with fossil fuels, it is expected that earth's average temperatures and levels of atmospheric carbon dioxide will continue to increase. Delray Beach prioritizes the transition to cleaner energy technology in order to protect local air quality.

Delray Beach pledged to participate in the Sierra Club Cool Cities Program in 2006, and is committed to reducing greenhouse gas at a local level by conducting a greenhouse gas emission inventory, creating a reduction plan, monitoring progress, and implementing a greenhouse gas reduction plan.

Quick Fact:

In 2015, Florida was the fourth largest carbon dioxide emission emitting State in the United States. Source: United States Energy Information Administration, *Rankings: Total Carbon Dioxide Emissions, 2015*.

Delray Beach also committed to adopt, honor, and uphold the United Nations / Framework

Convention on Climate Change (2015), Adoption of the Paris Agreement, 21st Conference of the Parties, Paris: United Nations (or Paris Agreement) goals through the Mayors National Climate Action Agenda and the United States Conference of Mayors. Climate Mayors, *Members*, CLIMATE MAYORS, (last visited Sept. 10, 2018); The United States Conference of Mayors, *Meet the Mayors* (last visited Sept. 10, 2018). The Paris Agreement encourages government entities to inventory, track, and curb greenhouse gas emissions. These climate initiatives represent collective action towards intensifying efforts not to exceed temperature increases of more than 1.5 degrees Celsius and to create a 21st century clean energy economy, both of which are key initiatives in the Paris Agreement.

A greenhouse gas inventory is a tool which can be utilized by Delray Beach to identify its emission contribution, set reduction targets, and to develop strategies to reduce city and community-wide emissions, while tracking the progress of such strategies. A typical greenhouse gas inventory pursued by a city would include an analysis of emission sources from both city-wide operations (emissions related to facilities, vehicles, and infrastructure owned by Delray Beach) and community-wide aspects.

A community-wide inventory identifies the emissions originating from activities such as transportation and mobile sources; commercial electricity and natural gas consumption; residential electricity and natural gas consumption; water and wastewater treatment, nitrification, denitrification, and the electricity consumed from potable water and wastewater treatment; solid waste energy consumption, and fugitive emissions from natural gas distribution. A city operations inventory accounts for the same activities but from city owned and operated sources. A city operations greenhouse gas inventory is considered a subset of the community-wide inventory.

City and community-wide inventories are necessary to effectively plan to reduce emissions overtime. Delray Beach would benefit from a greenhouse gas emission forecast to understand how factors such as energy use, water use, and



CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

transportation might affect emissions under a business as usual scenario. A business as usual scenario assumes no policy or technological changes are put in place to affect the initial greenhouse baseline inventory analysis. By comparing the business as usual forecast with a greenhouse gas inventory baseline, Delray Beach can evaluate targeted investments to reduce emissions.

To effectively support broader efforts to reduce emissions, local governments across the nation are adopting greenhouse gas reduction targets. Greenhouse gas reduction targets can be identified for City operations or community-wide activities.

REDUCTION OF FOSSIL FUEL DEPENDENCE

Improving atmospheric conditions in Delray Beach can also be accomplished through support of a diversified transportation system, promotion of compact urban design, and use of cleaner vehicles. The existing transportation network can be enhanced to further support bicycle and pedestrian traffic, public transit, and automobiles. Sustainable design includes multimodal connectivity between neighborhoods and

economic centers to facilitate different modes of travel.

Increasing the use of alternatively fueled vehicles is another way to protect air quality. By promoting the use of alternative transportation modes such as buses, the Downtown Roundabout Trolley, carpools, and bikes, the Delray Beach will conserve resources, reduce traffic, and increase social equity.

Delray Beach operates a free fixed-route trolley service, the Downtown Roundabout Trolley, providing public transportation throughout downtown Delray Beach, connecting the Tri-Rail station to the beach via Congress Avenue and Atlantic Avenue. The City is in the process of considering adding a point-to-point service within the downtown to augment the fixed-route system. The Downtown Roundabout Trolley is an excellent means of alternative transportation and its possible expansion or augmentation connecting to other modes would increase community sustainability and resiliency.

Delray Beach Rail Transit

Delray Beach is currently serviced by two passenger rail services: Amtrak Passenger Rail and Tri-Rail commuter rail services. Both rail services use the CSX railroad line, which is located west of I-95. Tri-Rail provides commuter transportation for Palm Beach County, Broward, and Dade County residents. The Delray Beach Tri-Rail Station is located behind the South County Government Complex south of West Atlantic Ave, off of Congress Avenue. The Station has bicycle lockers, bicycle racks, parking, and has connection stops for the Palm Tran and the Downtown Roundabout Trolley.

Tri-Rail is in the process of preparing to provide additional passenger rail service on the Florida East Coast (FEC) railway, which runs through the downtowns of the coastal communities in the region. In preparation of the new Tri-Rail Coastal Link commuter rail service, the City recently adopted the Delray Beach Tri-Rail Coastal Link Transit-oriented Development Master Plan. The plan was a multi-agency effort led by the Treasure Coast Regional Planning Council in conjunction with the South Florida Regional Transportation





CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

Authority and the Palm Beach County Transportation Agency, funded by the Federal Transit Authority and the Delray Beach Community Redevelopment Agency.

The plan identifies the location of the future station and provides recommendations for the ½-mile area surrounding the station, including transit-oriented development techniques, and bike-pedestrian infrastructure improvements. A Tri-Rail Station in the center of downtown Delray Beach will ultimately enhance livability, expand multi-modal transportation opportunities, create enormous economic growth opportunity for local businesses, and provide regional connectivity for commuters and visitors alike. South Florida Regional Transportation Authority, *Tri-Rail Coastal Link Station Area Opportunities*, 2013, *Tri-Rail Coastal Link Transit-Oriented Development Master Plan*, 2018.

To reduce vehicle traffic within Delray Beach and protect air resources the City will continue to support rail transportation connectivity within the region.

Bicycle and Pedestrian Opportunities

Increased bicycle and pedestrian traffic within the Delray Beach Planning Area can be further enhanced by strategies promoted by the Bicycle Friendly Community Program and the Pedestrian Friendly Community Program. The Walk Friendly Community Program is a nationally recognized tool for improving walking conditions and promoting pedestrian safety. The Bicycle Friendly Community Program was established by the League of American Bicyclists which provides a roadmap for improving bicycle conditions within individual communities and participating jurisdictions receive a detailed report and community rating.

Multi-Modal Strategies

The Palm Beach Transportation Planning Agency completed a 2017 US-1 Multimodal Corridor Study to examine improved pedestrian and bicycle safety, and to promote the Palm Beach County Palm Tran Bus Service. The study has been converted into a corridor project which includes (short-term and long range) recommendations to improve the segment of US-1 that runs through the

Delray Beach Planning Area, with new bicycle and pedestrian features. The improvements will include the addition of new bicycle lanes, converting existing bicycle lanes into buffered bicycle lanes, road resurfacing, the addition of green space and street trees with stormwater management features, and upgraded pedestrian intersection crossings. Palm Beach Transportation Planning Agency, *US-1 Multimodal Corridor Study*, 2018.

A number of multi-modal improvements are planned by the Palm Beach Transportation Planning Agency for the Delray Beach Planning Area contained in the *List of Priority Project FY 2020-2024*.

Promoting sustainable transportation modes in Delray Beach will attract new residents while meeting the needs and desires of current residents who appreciate convenient public transportation, a bicycle friendly atmosphere, and strategies to enhance transit while conserving fuel and energy.

Fuel Efficient Vehicles

Policies and programs can be employed to promote fuel-efficient vehicle use within Delray Beach and transition the City fleet to cleaner technologies. Increasing the efficiency of the City fleet not only will improve air quality and reduce greenhouse gas emissions, but the City will realize fuel-related cost savings overtime. To depart from gasoline powered vehicle, use within Delray Beach, the City could undertake an electric changing station needs assessment, City-fleet right sized vehicle study, and pursue electric vehicle infrastructure training.

Quick Fact:

Electric vehicles require substantially lower fuel cost per mile than gasoline vehicles.

The annual greenhouse gas emissions emitted by a gasoline vehicle is approximately 11,435 pounds of CO₂ equivalent; whereas, an all-electric vehicle only emits 4,664 pounds of CO₂ equivalent.

Source: United States Department of Energy, *Florida Transportation Data for Alternative Fuels and Vehicles*, (last updated Mar. 14, 2018).



CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

Currently, the City provides three free public electric vehicle charging stations located within the Banker's Row parking lot. In addition to public infrastructure, new private development must comply with charging station requirements. Within the Central Business District (CBD), all new parking must provide 3% as alternative fuel spaces, which accommodate both electric vehicles charging stations and an outlet for recharging golf carts.



CONSERVATION, EXISTING USE, AND PROTECTION OF WATER RESOURCES

Groundwater

Groundwater is water beneath Earth's surface, captured in soil or rock pores and fractures. Underground soils and rock formations that are saturated are known as aquifers. Aquifers are considered either confined or unconfined. Unconfined aquifers are bounded by permeable rock and recharged by soil and rock layers above from precipitation. Confined aquifers are bounded by impermeable or semi-permeable formations, where recharge from precipitation occurs from rock or formation fractures.

Florida's geology is predominantly Karst in nature consisting of carbonate rich formations that are characterized by underground streams, fissures, sinkholes, and other related connections, allowing aquifer recharge through rainfall. Because of this Karst topography, surface and groundwater in southeast Florida are closely interrelated as part of the hydrologic system—effective management of both is crucial to maintaining a safe, quality water supply.

The Surficial aquifer system, an unconfined unit, is the primary source of the City's potable water supply through municipal wells. The City's aquifer storage and recovery well taps into the Florida aquifer system, a confined unit, and can be used to store water during low water demand times to supplement the surficial aquifer system for potable water supply during high demand and is a potential long-term water supply resource which would require more expensive treatment such as reverse osmosis.

Wellfield Protection

Palm Beach County maintains a Wellfield Protection Program and has established zones of protection around wellfields which pump drinking water from the surficial aquifer. The zones are codified in the Palm Beach County Unified Land Development Code, Article 14, Chapter B, and are protected by the Palm Beach County Wellfield Protection Ordinance which regulates the existing and new nonresidential use, handling, storage, and production of hazardous and toxic materials within the zones of influence of the wellfields.

Water Supply

Delray Beach withdraws from 30 active Surficial aquifer system wells in four wellfields (Eastern, Morikami, Golf Course and 20-Series) and 1 Floridan Aquifer system. The City holds a water use permit (WUP) from the SFWMD, Water Use Permit No. 50-00177-W (issued Dec. 20, 2010; expires Dec. 20, 2030). The City's water use permit was first issued in 1975, having since been modified three times, and renewed six times by the SFWMD, Water Use Permit No. 50-00177-W. The location of wellfields is portrayed on Map AD-20 (Wellfield Protection Areas).

Table CSR – 5		
Delray Beach Water Usage		
<u>Annual Allocation</u>	<u>Monthly Allocation</u>	<u>Daily Allocation</u>
6,972 million gallons	654 million gallons	19.19 million gallons per day

As governed by the permit, annual groundwater allocation shall not exceed 6,972 million gallons annually, or 19.10 million gallons per day (MGD). Currently, more than 1,000 domestic wells within the Delray Beach Planning Area are mostly used for irrigation. There are no major groundwater recharge areas in the Planning Area, however, the eastern portion of Palm Beach County has been identified as a prime aquifer recharge area by the U.S. Geological Survey and the Palm Beach



CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

County Comprehensive Plan. SFWMD, *Water Use Permit No. 50-00177-W*.

The Florida DEP and the Department of Health both have responsibility for monitoring the quality of public drinking water. The Well Surveillance Program was created by the State of Florida in 1984, to ensure potentially contaminated wells are located and tested. The Palm Beach County Health Department personnel are responsible for field sampling and surveys. The City of Delray Beach does not have any ground water quality problems. However, there are several potential sources of contamination within the radius of influence of the City's wellfields. These sites are either closed, undergoing remediation, or have ongoing investigations. The point source problem identified in 1988, in the Series 20 Wellfield (Aero-Dri site), has been mitigated through the use of air scrubbers at the water treatment plant. Water quality has improved to the extent that air scrubbers are no longer in use.

To reduce the possibility of soil and groundwater contamination, the Florida Department of Environment Protection mandated the replacement of all single-wall non-corrosive underground storage tanks and piping with double-wall systems (effective Dec. 31, 2009).

The Delray Beach water supply is tested regularly for contaminants on the list of the United States EPA primary and secondary drinking water standards. The potential movement of contaminants from known pollution sources as a result of withdrawal of the permitted allocation is considered minimal. SFWMD, *Water Use Permit No. 50-00177-W*.

Water Conservation, Saltwater Intrusion, and Projected Need for Water Resources

The Florida aquifer system contains water with higher chlorides throughout southern Florida than are experienced in many other parts of the state. Saline intrusion has been a concern for Delray Beach's eastern wellfields due to the proximity to the Intracoastal Waterway and the Atlantic Ocean. To effectively move withdrawals further west, the City of Delray Beach constructed six western 20-Series wellfields. To avoid saltwater intrusion, withdrawals from eastern wellfield wells

are restricted and operated on a daily rotation. Only the 20-Series (western location) wellfields are consistently in use.

Delray Beach utilizes one water treatment plant (WTP) with a potable water distributed system to provide water for users. The City's related capacity for the WTP is 26 million gallons per day and uses lime softening for treating water from the Surficial aquifer system according to the Lower East Coast Regional Water Supply Plan (2018). The City has six emergency interconnects with neighboring municipal water systems (Boynton Beach, Palm Beach County Utilities and City of Boca). To prevent any changes in location, timing, and volume of withdrawals from the Lower East Coast Everglades Waterbodies with increased water demand, the City has replaced permitted Surficial aquifer system irrigation withdrawal systems with reclaimed water within the Delray Beach service area. The entire demand of the City will be met by withdrawals from the Surficial aquifer system.

The City projects optimizing use of the Florida aquifer system which can be accomplished without exceeding maximum concentration levels of chloride. The City will continue to: operate the eastern wellfields according to permit restrictions (effective Apr. 11, 1991), monitor wells within the Planning Area, and maintain chloride concentration data.

Between 2003 and 2016, the City installed a phase I of a reclaimed water system with a re-pump station adequate to serve the barrier island, infrastructure in the south-east service area, and approximately 20 miles of transmission and distribution lines, with a system capacity of 3.0 MGD and flow of 2.29 MGD.

The SFWMD provides cost-share funding for alternative water supply projects. From FY2013 through FY2018, the SFWMD provided more than \$11 million in funding for 31 projects Districtwide. The City received funds for three projects:

1. Reclaimed Water System – Area 12A Phase I (2013) 0.11 mgd
2. Reclaimed Water System - Area 12A Phase II (2014) 0.08 mgd



CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

3. Reclaimed Water System Expansion – Area 12C (2017-2018) 0.16 mgd

City reclaimed water customers average about 2.5 million gallons per day (MGD) of irrigation use with an anticipated expansion of the system to about 3.8 MGD by 2025 to meet the Leah Schad Ocean Outfall Legislation requirements. The 2003 reclaimed water master plan identified 15 reclaimed water service areas and recommended developing and expanding the system based on proximity to the SCRWTP and the highest irrigation use. There are currently 570 metered connections to the reclaimed water system, primarily on the barrier island, with the biggest users consisting of the golf courses and homeowner associations. The City is in the process of expanding the system by adding at least an additional 50 customers. As the major reclaimed water trunk lines are installed, the City connects customers whenever physically possible along a corridor route. When the reclaimed system is complete, it is estimated that it will offset as much as 4.7 MGD of potable water, reducing irrigation withdrawals from the Surficial aquifer, shaving peak demands often caused by irrigation, and deferring capital costs required to develop expensive alternative water supplies for potable water use. The City's reclaimed water system, along with other conservation measures, has helped stabilize the average water use to approximately 16.5 MGD, despite growth.

The City has also converted its aquifer storage and recovery well in the upper Floridan aquifer to a public water supply well to supplement withdrawals from the Surficial aquifer during periods of repairs and maintenance. Withdrawals from the Floridan aquifer system are limited to 1.5 MGD in order to keep the chloride level in the blended water to within the water quality requirements.

Significant improvements to water use operations in Delray Beach have been achieved:

- Landscape Regulations are codified in the Delray Beach Land Development Regulations, Section 4.6.16. The Section provides the conservation of potable and non-potable water; the implementation of Florida-friendly landscaping principles; proper tree selection

adjacent to or within utilities to mitigate damages which may be caused by trees; encouraging the creation or preservation of open space; maintaining permeable land areas essential to surface water management and aquifer recharge; encouraging the preservation of existing plant communities; encouraging the planting of site specific, native and drought tolerant plant materials; establishing guidelines for the installation and maintenance of landscape materials and irrigation systems; reducing air, noise, heat, and chemical pollution through the biological filtering capacities of trees; reducing the temperature of the microclimate through the process of evapotranspiration; and promoting energy conservation through the creation of shade. The standards are to be considered minimum standards which may be increased as applicable.

- Chapter 59, of the Delray Beach City Code of Ordinances requires the use reclaimed water for irrigation of residential and nonresidential lawns, golf courses, cemeteries, parks, landscaped areas, edible crops (as set forth in Chapter 62-610, Florida Administrative Code), highway medians, dust control, on construction sites, mixing of concrete, and cleaning of roads and sidewalks is mandatory within the City where the connection is available.
- The City Code adopts the mandatory year-round water restrictions from 40E-24 in the Florida Administrative Code. In times of crisis both the City and SFWMD may impose restrictions on the outdoor use of water (irrigation, car washing, etc.) pursuant to F.A.C. Chapter 40E-21.
- The City has adopted the Florida Building Code which requires ultra-low volume plumbing fixtures.
- Leak detection program: in 2018, the City finished migrating from an automatic meter reading system to an advanced automatic metering infrastructure metering system for over 22,000 meters. The advanced metering infrastructure can identify areas of water loss, abnormally high-water use, and reduces the duration of leaks.
- The City uses a water conserving or inverted rate structure, where water rates increase with



CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

increasing use, which encourages conservation and reduction of use.

- In 2018, the Utilities Department initiated an enhanced water conservation program with components such as public information outreach at City events, and a water conservation outreach effort to 5th grade students in City public schools.

While such efforts have been sufficient in the past, greater demands upon the area's water resources dictate that additional water conservation measures, particularly those directed toward reduction in normal consumption, irrigation use, Florida friendly landscaping, and leak detection and repairs, should be continued by the City.

Previously, it was predicted that the demand for water use in agriculture would decrease over a ten-year period, based on the anticipation that the few remaining agricultural uses would be abandoned in favor of residential development. The Saltwater Brewery, a craft microbrewery with tasting room that opened in 2013, is one example of a local food production business that impacts water use. Local agricultural or food production activities should be monitored for their impact on water use, and sustainable practices used where feasible, in order to effectively manage demand.

The overall demand for water by commercial and industrial uses is calculated as a part of the per capita demand upon which water needs are projected. No special needs have previously been identified for industrial water through the intensification of industrial uses. The impact of new businesses on water use should be monitored in planning.

The City expects a demand of 6,752 million gallons (18.5 MGD) annually by 2030, based on an estimated population of 82,556. There are eight additional Surficial aquifer system wells proposed in the current SFWMD WUP, and because some of the existing wells have diminished capacity and water demand is starting to rise, the City plans to evaluate wellfield limits, replacing some wells, and developing alternative water resources. Per capital use rate is expected to be reduced largely due to the expansion of reclaimed water use, new leak detection technology, and potable water use

for irrigation. SFWMD, Water Use Permit No. 50-00177-W.

Surface Water Quality

The Florida DEP and the Department of Health both monitor water quality. The Florida DEP has included Lake Ida, the E-3 and E-4 Canals, and the Intracoastal Waterway in the list of impaired waterbodies within Palm Beach County. Waterbodies on this list have been verified as impaired for a particular pollutant. Waterbodies verified as impaired are described as follows:

The "verified list" is the list of Florida's waterbodies that fail to attain any of its designated uses and/or meet the minimum criteria for surface waters established in the Surface Water Quality Standards (62-302, F.A.C.) and the Impaired Waters Rule (IWR, 62-303, F.A.C.). The entire state of Florida is divided into five basin groups in which each waterbody is re-assessed on a rotating basis every five years. If a waterbody is assessed as impaired, a TMDL (Total Maximum Daily Load) must be developed to determine the maximum amount of a pollutant that a waterbody can receive and remain healthy. Once a TMDL has been completed, the waterbody is removed from the verified list regardless of whether or not the waterbody meets standards.

The Total Maximum Daily Load is the maximum amount of a given pollutant that a water body, such as a canal, river or an estuary, can absorb and still maintain its designated uses. Designated uses include; drinking, fishing, recreation, and shellfish harvesting. The purpose of a Total Maximum Daily Load, is to limit pollutant loading to water bodies that are not meeting their intended uses and therefore determined to be impaired by Rule, based on water quality monitoring. Pollutant loading reductions are placed on known pollutant sources such as drainage systems and other permitted discharges. Impaired waterbodies in the Delray Beach Planning Area are listed below in Table CSR-6.

Within the Delray Beach Planning Area, is Lake Ida the southernmost of five interconnected lakes called the Chain-of-Lakes. The Chain-of-Lakes is an integral part of the drainage system for central and southern Palm Beach County. While these



CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

waterbodies are lakes, the hydrology is atypical of a lake/watershed regime, due to the interconnection with the Central and Southern Flood Control Project, and the Lake Worth Drainage District.

As part of a Chain-of-Lakes restoration project Palm Beach County has removed existing muck sediments, graded the shoreline, excavated channels to create wetland habitat, and added wetland plants and trees. Continued natural restoration activities will improve the water quality of Lake Ida.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

Table CSR-6

Delray Beach Verified Impaired Waterbodies

Water Segment Name	Waterbody ID	Parameter	Comments
Intracoastal (Palm Beach County)	3226F3	Copper	This waterbody is impaired for this parameter based on planning period data and is being added to the 303(d) List. This WBID was created from the retired WBID 3226F that was on the Verified List for this parameter.
E-4 Canal	3262	Nutrients (Chlorophyll-a)	This waterbody is impaired because the annual average Chl-a value exceeded the listing threshold of 20.0 µg/L in 2002 and 2008. Based on TN/TP ratio median of 8.63, TN was identified as the limiting nutrient. New listing from cycle 2.
Lake Ida	3262A	Biology	This waterbody is impaired for this parameter based on failing bioassessments and nutrients have been determined to be the causative pollutant. This parameter is being added to the 303(d) List.
Lake Ida	3262A	Nutrients (Chlorophyll-a)	This waterbody is impaired for this parameter. The annual geometric means exceeded the nutrient criteria more than once in a threeyear period. This parameter is being added to the 303(d) List.
Lake Ida	3262A	Nutrients (Total Phosphorus)	This waterbody is impaired for this parameter. This parameter was assessed against the minimum nutrient criterion because corrected chlorophyll-a annual geometric means exceeded the applicable chlorophyll-a threshold. The annual geometric means exceeded the nutrient threshold more than once in a three-year period. This parameter will be added to the 303(d) list.
E-3 Canal	3262D	Nutrients (Chlorophyll-a)	This waterbody is impaired because the annual average Chl-a value exceeded the listing threshold of 20.0 µg/L in 2002, 2007, and 2008. Based on TN/TP ratio median of 10.55, TN was identified as the limiting nutrient.

Source: Florida DEP, *Comprehensive Verified Impaired Waterbodies List*, 2018.

Palm Beach County monitors and manages the Chain-of-Lakes, and periodically produces reports detailing the condition of the Chain-of-Lakes, including Lake Ida. The County also maintains the Chain-of-Lakes Water Quality Monitoring Program to protect, restore and enhance the natural resource values the lakes.

Historical and recent water quality data reveals concentrations of total nitrogen, total phosphorus, and chlorophyll-a in Lake Ida are highly variable. Delray Beach should continue Lake Ida restoration efforts and create policies to reduce overgrowth of algae biomass which can cause excessive algae and diminish the ecological functions of Lake Ida. From north to south in the Chain of Lakes, there has been an increase in pH values—8.01-8.11. High pH



CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

can be an indicator of pollution or other environmental conditions. Palm Beach County, *Palm Beach County Chain-of-Lakes Water Quality Evaluation and Analysis*, 2015.

The Florida Healthy Beaches Program of the Florida Department of Health monitors water quality at Florida's beaches. Since 2000, the Beach Water Sampling Program has conducted periodic beach water sampling of the 30 coastal counties in Florida, with weekly water sampling since 2002. In 2016, Florida Healthy Beaches Program of the Florida Department of Health adopted new water quality criteria for the Program from the U.S. EPA 2012 Recreational Water Quality Criteria.

Chapter 2008-232, Laws of Florida, created the Leah Schad Memorial Ocean Outfall Program, which prohibits the construction of new domestic wastewater ocean outfalls and the expansion of existing outfalls. The law requires domestic wastewater discharge through ocean outfalls to meet advanced wastewater treatment and management requirements and establish a timeline for the elimination of existing discharges except as backup (by 2025). Six ocean outfalls are located along the Florida's Southeast coastline, one of which is located on the border of Boynton Beach and Delray Beach.

The South Central Regional Wastewater Treatment Facility, co-owned by the utilities of Boynton Beach and Delray Beach and operated pursuant to Interlocal Agreement, no longer regularly discharges through an ocean outfall; thus, the Atlantic Ocean and beach area do not show any indications of pollution. The South Central Regional Wastewater Treatment and Disposal Board holds the permit for the outfall located within the Delray Beach Planning Area. The irrigation quality reclaimed water plan is 10 MGD, with the entire rated capacity of the plant at 24 MGD. It is currently be expanded to a capacity of 30 MGD. The facility disposes of its treated wastewater through deep injection wells or through irrigation reuse. The City and the South Central Regional Wastewater Treatment and Disposal Board initiated a wastewater effluent reuse program for irrigation in 2003, to reduce effluent disposal to the Boynton/Delray Beach ocean outfall and as a demand management and potable water

conservation measure, which helps defer more costly alternative water supply and treatment options.

The Boynton/Delray Beach ocean outfall is currently only used to handle peak flows during significant wet weather events, during mechanical integrity testing of its deep wells, to exercise ocean outfall pump stations, or as an emergency disposal method. Florida DEP, Division of Water Resource Management, *Implementation of Chapter 2008-232, Laws of Florida Domestic Wastewater Ocean Outfalls*, 2015. According to the Lower East Coast Water Supply Plan (2018), the 2025 reuse target for the South Central Regional Wastewater Treatment Facility is 13.30 million gallons per day.

An additional deep injection well is being designed and planned for drilling, testing and permitting within the next five years. While only small amounts of treated wastewater are disposed through the outfall and plans for to phase out all ocean discharges are ongoing, the City of Delray Beach should continue to work with the South Central Regional Wastewater Treatment and Disposal Board to ensure management plans account for increase volume participation events, sea level rise, and emergency situations which could involve power outages.

Surface Waters

Waterways in the Delray Beach Planning Area are used for swimming, boating, fishing and other recreation activities. The Intracoastal Waterway has three commercial marinas (Delray Harbor Club, Delray Beach Yacht Club, and Marina





CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

Delray) and one municipally operated marina. Three City parks, two of which provide boat launching facilities, are located along the Intracoastal Waterway. Other public access points along the Waterway are via street ends. The Delray Beach Marina maintains approximately 22 slips. Extensive boat traffic originates from marinas and waterfront properties within Delray Beach, and locations outside the City.

Lake Ida is extensively used for boating. On the west side of the lake is a regional park, and a neighborhood park is located on the east side, both are operated by Palm Beach County. North of Lake Ida Park, partially within the City of Boynton Beach, Delray Beach has acquired a small parcel that is currently not programmed. Restoration of the parcel will improve lake water quality. The Palm Beach County department of Environmental Resource Management, *State of the Lakes*, report recommends monitoring the water quality, conducting aquatic management surveys, and enhancing shorelines through removal of upland and aquatic exotic vegetation, as well as establishing native wetland and aquatic plant populations (1997).

There is no commercial usage of the South Florida Water Management Canal (C-15) nor of the several Lake Worth Drainage District laterals and equalizer canals. The only recreational use of the canals is for small craft.

There is no commercial use of the private water bodies within the Delray Beach Planning Area, nor is there significant recreational use since they are used primarily as water retention areas and use is restricted by SFWMD and the Lake Worth Drainage District regulations.

No commercial use is located along the shoreline of the Atlantic Ocean within the City, except for the concessions renting cabanas and recreational equipment, and the permitted parking of Sailboats. The one and one-half miles of municipal beach are a major recreational center.

Recreational and commercial boat traffic on the Intracoastal Waterway and Lake Ida may see an increase, due to the proposed "Intracoastal Waterway Plan for Palm Beach County" and the

Blueway Trail project of the Treasure Coast Regional Planning Council and Palm Beach Transportation Planning Agency. The goal of the Intracoastal Waterway Plan, is to preserve working waterfronts and build the regional economy and quality of place through improved linkages to enhanced environmental and cultural assets. Recommendations impacting Delray Beach in this context include support of the development of a marina village in Delray Beach, support for ecotourism, and a possible County-wide water taxi service and high-speed ferry service. Two water taxi stops are proposed in or adjacent to Delray Beach.

The Blueway Trail project is one future use recommendation of the Intracoastal Waterway Plan, designed to foster eco-tourism. The Trail will provide two-way connectivity between the Chain of Lakes, Lake Worth Lagoon, Intracoastal Waterway and the Atlantic Ocean. The project will have a boat-lift and portage system. It will also include a pier at the boatlift, and refurbishment of existing natural habitats and upgrades to existing fishing piers. The boatlift will be located at Spillway Park on a canal dividing Lake Worth and West Palm Beach, and is designed to accommodate boats shorter than 23.5 feet, no more than 5.5 feet above the water line. The preliminary feasibility analysis and engineering plans were completed in 2017, but project permitting is expected to take 2 years.

CONSERVATION, EXISTING USE, AND PROTECTION OF MINERAL AND SOIL RESOURCES

Commercially valuable minerals are not mined or extracted in the Delray Beach Planning Area and there is not any active or inactive mineral mining sites. There are concentrations of coquina, dolomite, and sand below the surface throughout the City.

Soil erosion is not a concern, except beach erosion, which is mitigated by the Palm Beach County's Shoreline Protection Plan Program discussed later in this document. Detailed information can also be found in the COASTAL MANAGEMENT ELEMENT.

The non-coastal related erosion problems identified (within the 1989 Delray Beach



CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

Conservation Element) are governed by Ordinance No. 53-87. The Ordinance sets out soil erosion control methods, standards, and procedures required to be used in the Delray Beach Planning Area. The ordinance provides specific management strategies for soil erosion in connection with land development, land clearing, grading, filling and excavation, the construction of buildings and utilities, paving activities, drainage facilities demolition, and any other land disturbing process.

In 2013, Delray Beach was recognized as “Best Restored Beach” by the American Shore and Beach Preservation Association. The City was also designated as a Blue Wave Beach by the Clean Beaches Coalition, for the City's demonstrated commitment to maintaining a clean, healthy, and environmentally well-managed beach.



PROTECTION OF ENDANGERED, THREATENED, AND SPECIES OF SPECIAL CONCERN

Preservation of species and diversity is an important goal. Species of special concern include the Florida Manatee that continues to be subject to danger from boat traffic. Palm Beach County administers a State-approved Manatee Protection Plan which includes manatee data, strategies, and management actions aimed at protecting manatees. Florida is home to a subspecies of the West Indian Manatee, a federally listed endangered species and is afforded protection by the Florida Manatee Sanctuary Act of 1978. Manatees in the Delray

Beach Planning Area are more abundant in the winter season in comparison to the summer season.

Boat speed restrictions have been established for the Intracoastal Waterway throughout the City. The manatee is seen in the Intracoastal Waterway and the C-15 Canal. Palm Beach County ranks 10th for all manatee deaths between 1974 and 2003, and 6th for all documented watercraft-related fatalities. The Intracoastal Waterway between Delray Beach and Boca Raton (along with the Lake Worth Lagoon and Jupiter Sound) has the highest number of watercraft-related manatee deaths in the County.



Several species of sea turtles' nest on the municipal beach. The turtles are protected by the Delray Beach Sea Turtle Monitoring and Conservation Program, as well as, lighting restrictions codified in the Delray Beach Land Development Code. Section 4.6.8, involves restrictions on artificial lighting. In intensely developed coastal areas artificial lighting can deter sea turtle nesting and disorient hatchlings. The City is working to darken point source light and ambient light, turtle-friendly lighting required in a 600' zone. The Sea Turtle Monitoring and Conservation Program involves nest monitoring and protection, with data collection on nesting and hatching success.





CONSERVATION, SUSTAINABILITY, AND RESILIENCY ELEMENT

The 2017 Delray Beach Turtle Nesting Data resulted from a survey over the course of two hundred and forty-two days on beaches located in Delray Beach (2.8 miles). The overall total of turtle nests increased from 2016 reports. Nesting disturbances prior to hatching can be attributed to a wide range of impacts, including foxes, erosion, accretion, inundation, and storm-related events. Recent research from Florida Atlantic University has found that sampled nests over the past few years contained 100% female turtles, raising concern that warmer temperatures are resulting in all female offspring, potentially impacting future reproduction rates. The 2015, 2016, and 2017 turtle count is provided in Table CSR-6.

To increase public awareness of turtle and manatee protection, the City could seek opportunities for new informational signage and materials for residents and visitors.

The threatened or endangered wildlife species recently observed within the City include the least tern (bird), scrub jay (bird), cedar waxwing (bird), burrowing owl (bird), limpkin (bird), and eastern indigo snake (reptile). The City of Delray Beach has established a bird sanctuary within the corporate limits of the Planning Area, and therefore the take (capture or killing) of any wild bird is unlawful. Delray Beach Code of Ordinances, Sec. 91.04.

Table CRS- 6 Delray Beach Turtle Nesting Data				
<u>2017 Turtle Nesting Data</u>				
	<i>C. caretta</i> Loggerhead	<i>C.mydas</i> Green Turtle	<i>D. coriacea</i> Leatherback	Total Species
Total # of Nests	252	46	6	304
Total # of False Crawls	900	120	2	
Date of First Nest	04/23/17	05/30/17	04/13/17	
Date of Last Nest	08/19/17	08/25/17	05/11/17	
<u>2016 Turtle Nesting Data</u>				
	<i>C. caretta</i> Loggerhead	<i>C.mydas</i> Green Turtle	<i>D. coriacea</i> Leatherback	Total Species
Total # of Nests	249	6	9	264
Total # of False Crawls	854	19	3	
Date of First Nest	4/29/16	6/20/16	3/25/16	
Date of Last Nest	8/16/16	9/12/16	6/21/16	
<u>2015 Turtle Nesting Data</u>				
	<i>C. caretta</i> Loggerhead	<i>C.mydas</i> Green Turtle	<i>D. coriacea</i> Leatherback	Total Species
Total # of Nests	198	26	11	235
Total # of False Crawls	722	76	1	
Date of First Nest	Data not Available.	Data not Available.	Data not Available.	
Date of Last Nest	Data not Available.	Data not Available.	Data not Available.	



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

CONSERVATION, EXISTING USE, AND PROTECTION OF NATURAL AREAS

Delray Beach recognizes the need to protect and restore the natural communities within the Planning Area. Natural communities are groupings of plants and habitats that occur together in recurring patterns based on available resources such as soils, water, nutrients, and climate. Environmental changes associated with global warming will put pressure on the natural communities in Delray Beach. The preservation and maintenance of natural areas is important to their continued existence.

Various sections of the Delray Beach Land Development Code require the preservation of local natural features, all future and current development is required to comply with applicable codes and ordinances regarding the protection, preservation, or conservation of natural resources.

Delray Beach has committed to the policies promoted by Tree City USA since 1999. Delray Beach has retained this designation by meeting four core standards for urban forestry management: maintaining a tree board or department, having a community tree ordinance, spending at least \$2 per capita on urban forestry, and celebrating Arbor Day. Trees are an extremely important resource for the City, as trees are known to reduce energy costs, stormwater run-off, and boost property values.

There are no City managed wetlands in the Delray Beach Planning Area. Privately held wetland areas within the Delray Beach Planning Area are conserved, protected, and managed according to Army Corps of Engineers and Florida DEP rules.

PRESERVATION OF PUBLICALLY HELD NATURAL AREAS

Within the Delray Beach Planning Area there is a diverse park system which involves native vegetative communities, various water access points, and environmentally sensitive sites which must be protected and conserved.

The Municipal Beach area in Delray Beach is approximately three miles long. The City owns the 1-mile Municipal Beach, Palm Beach County owns

and the City leases, the south 100 feet of the 500-foot-long Atlantic Dunes Park. The approximately remaining two miles of beach within the Planning Area are adjacent to private lands. The City is responsible for platting the Coastal Construction Control Line to fix the mean high-water line. The sandy beach east of the Coastal Construction line is vested in the State. Section 161.191, Florida Statutes.



Delray Beach's coastal dune is almost entirely man-made, the dune has been installed and enhanced during several projects dating back to 1973. The coastal dunes provide habitat for over two hundred plant and animal species. A total of fifty native species have been added to date, which includes several listed as endangered or threatened by the State of Florida or the U.S. Fish and Wildlife service. Natural coastal sand dunes are known to be dominated by saw palmettos, with a mix of herbaceous and shrubs species.





CONSERVATION, SUSTAINABILITY, AND RESILIENCY

There is no commercial usage along the Municipal Beach, except for concessions renting cabanas and recreational equipment, and the beachside storage of sailboats for permitted vessels. The Delray Beach Parks and Recreation Department monitors beach boat storage.

The City of Delray Beach contracted with Coastal Management and Consulting in 2015, to inspect and survey the Delray Beach dune system. Coastal Management and Consulting identified exotic plant contamination in the dune system, generated maps depicting invasive species, and produced a report for with various best management principles for managing the dune system in Delray Beach.

The Delray Beach Management of Coastal Dune Plan suggests the following recommendations:

- 🌈 Pioneer Zone Support: plant sea oats and dune panic grass in barren areas greater than 100 square feet.
- 🌈 Dune Shrub Pruning: coordinate with Florida DEP to develop and carry out a plan for remedial reduction of the sea grape footprint, develop protocol for lateral control during regular pruning events, and review pruning methods and train staff.
- 🌈 Scrub/Strand Zone Renovation: proceed with permitted dune section renovations as funding becomes available.
- 🌈 Sailboat Storage: the City could review and update the Sailboat Storage Area Rules and Regulations to address specifics for securing in the designated area, and the City should continue to monitor the Sailboat Storage Area to maintain dune protection.

Barron, Coastal Management and Consulting, *Analysis and Recommendations for Management of the Coastal Dune at Delray Beach, Florida*, 2015.

There are interpretive nature trails in Atlantic Dunes Park, and at the Delray Oaks and Leon Weekes preserves. The City could enhance recreation opportunities by providing for a contiguous trail system throughout the Delray Beach Planning Area where possible.

Atlantic Dunes park is a public beach access point in Delray Beach located one block north of Linton

Boulevard and beach side of A1A. The park is an elevated wooded area with a large pavilion, boardwalk, and 300-foot nature trail through the dunes. There are two parking lots with metered parking for visitors, public restrooms, and a life guard tower. The park has accessible handicap parking near the beach access point and two Surf Chairs are available for the physically challenged to enjoy the beach (located at the lifeguard tower). The Pavilion at Atlantic Dunes has been reconstructed after a fire in 2016 burnt down the original 1977 structure.

Delray Beach has managed Atlantic Dunes Park since the 1970's; the park is owned by Palm Beach County. Atlantic Dunes park represents a native coastal ecosystem with a full transverse section of Beach/Dune, Coastal Strand, and Maritime Hammock Communities. The Park is home to many native plant and animal species. More than a dozen of the native species which used to exist there have been lost, the decline in species diversity is likely due to overshadowing of exotic plants. Barron, Coastal Management and Consulting, *Analysis and Recommendations for Management of the Coastal Dune at Delray Beach, Florida*, 2015.

Delray Oaks is a 24.48 acre preserve within the Planning Area, owned by Palm Beach County. This site is managed as a countywide system of natural area and features an observation platform, as well as, paved and sandy trails. The area is protected to maintain the diversity of biological communities and species in the Delray Beach Planning Area. The Delray Oaks property represents examples of native ecosystems such as: prairie, xeric hammock ecosystems, and mesic flat woods. The tree canopy is made up of live oaks and sabal palms. Large tracts of oak hammock are unusual in Palm Beach County due to urban development and because oak hammock communities only develop in areas where fires have not occurred for at least thirty years.

Orchard View Park is a 5.94-acre neighborhood park located west of Old Germantown Road. The park was purchased by Delray Beach from the Blood Family in 2000. Prior to purchase, the land was formally known as Blood's Hammock Groves. The park has pavilions, barbecue grills, playground



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

area, restrooms, and a walking trail. The park is filled with berry trees and is often frequented by runners, bird watchers, and nature photographers.

The Leon Weekes Preserve is located between Linton Boulevard and Lindell Boulevard, west of Old Dixie Highway. The Preserve is named after Leon M. Weekes, who served as Delray Beach Mayor from 1978-1982. The property was purchased by the City of Delray Beach in 1988, to preserve the site's 12.37 acres of high-quality scrub and scrubby flatwood communities which includes species such as gopher tortoise, Curtiss' milkweed, common wild pine, and scrub palmetto. Florida Scrub is one of the oldest habitats in Florida, this vegetative community is specialized to live in periodically burned areas with high, well-drained, nutrient poor soils. The preserve features nature trails, a playground, gazebo, and parking area.

Water-related uses of natural areas within the Delray Beach Planning Area include docking facilities and marinas. There are three City parks that provide water-related amenities: Veterans Park (fishing and short-term dockage), Knowles Park (boat ramp facilities), and Mangrove Park (boat ramp facilities).

Veterans Park is north of Atlantic Avenue, west of the Intracoastal Waterway. The park features a playground facility, gazebo, restrooms, a recreation center, and a public dock area for Atlantic Avenue visitors on the Intracoastal Waterway.

Knowles Park is located at 1001 South Federal Highway, the park features parking, restrooms, and a boat ramp providing public access to the Intracoastal Waterway. The natural shoreline includes mangrove trees, sea grapes, and other vegetation which protects the park from storm damage and erosion.



The "environmentally sensitive area" designation is used for natural areas where significant flora or fauna communities have been identified and need special protection because of its landscape, wildlife, or ecological value. The Delray Beach Land Development Code has specific restrictions for development involving environmentally sensitive areas in Section 3.2.4.

Publicly-owned environmentally sensitive areas have been identified on the Land Use Map by an "Open Space" or "Conservation" symbol. Conservation areas include: the Donnelly Tract, and Florida Inland Navigational District (FIND) Parcels 645 and Parcel 650 (Mangrove Park)

Mangrove Park (south of Knowles Park) is a 4.05-acre environmentally sensitive site, also known as Florida Inland Navigational District (FIND) Parcel 650. This area was originally a spoil area for Intracoastal Waterway dredging. The City negotiated a long-term lease on the site to take over management developing Mangrove Park on the site. The park offers a boat ramp leading to the inter coastal, public parking, and restrooms.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

The Florida Inland Navigational District, is the local sponsor of the State and Federal navigation project for the Atlantic Intracoastal Waterway, ensuring lands are available for dredged materials removed from the waterway. Generally, FIND properties are utilized only as dredged material management sites and are not available for use by the general public, but several FIND sites have been leased to a county or municipality for passive recreational activities.

Florida Inland Navigational District (FIND) Parcel 645 is a 7.41-acre mangrove site located on the east side of the Intracoastal just south of George Bush Blvd. The City will continue to negotiate with the Florida Inland Navigational District for utilization and potential ownership of Parcel 645 and Mangrove Park.

The Donnelly Tract is a small (1.64 acre) mangrove tract located on the west side of the Intracoastal Waterway approximately one-quarter mile north of George Bush Boulevard. The site is owned, preserved, and maintained by the City.

The Donnelly Tract and FIND parcel 645, are both environmentally sensitive areas, which feature densely vegetated mangrove wetlands. There are no current plans for developing these parcels. To preserve the diverse biological species in these areas the City should pursue a biological assessment and habitat analysis for both parcels.

In 2015, the City of Delray Beach acquired 5-acres of undeveloped land west of Lake Ida (outside of the Delray Beach Planning Area), referred to as the Lake Ida Open Space Parcel. The City of Delray Beach has partnered with Delray Beach-based nonprofit Institute for Regional Conservation to restore the parcel's shoreline. Restoration of this area will improve overall water quality of Lake Ida and it will also offer protection for Lake Ida from stormwater run-off and pollution. There is currently no public access point to this parcel, or plans for development.

PRESERVATION OF PRIVATELY-OWNED NATURAL AREAS

Privately-owned natural areas are limited. The Hurricane Pines site was developed as part the private Heritage Club development one mile south



of Downtown Delray, off of Southeast 10th Street. Three portions of the site (0.4 acres), have been preserved as part of the open space designation for the private housing development.

The oak hammock in the Hammock Reserve development has been preserved through conditions of a development order and has been set aside as a preservation area through zoning (Open Space) and platting. The Reserve includes 3 acres of broad-leafed trees, known as a hardwood hammocks ecosystem.

EXOTIC PLANTS

Preserving the natural landscape of Delray Beach is important to protect native species and water quality. Palm Beach County spends over two million dollars a year removing exotic plants from natural areas within the County and regulates vegetation through the Palm Beach County Unified Land Development Code to limit unnecessary native vegetation removal, to promote the use of native vegetation in landscape plans, and to eradicate invasive nonnative vegetation. The main focus of the Prohibited Invasive Non-native Vegetation Removal Ordinance is to support the removal of the County's nine prohibited plant species on properties within 500-feet of publicly owned natural areas. Palm Beach County Department of Environmental Resources, *Best Management Practices for Protection of Native Vegetation*, 2009.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

As part of a Chain-of-Lakes restoration project, Palm Beach County, Florida Fish and Wildlife Commission, and Florida DEP have removed exotic vegetation like Brazilian Pepper, Java Plum, and Pongam Trees from the shoreline of Lake Ida.

Federal and state laws were passed in the 1970's, to prevent the further spread or importation of weeds that pose an economic threat to agriculture and navigation. The United States Department of Agriculture and the Florida Department of Agriculture and Consumer Services maintain individual Noxious Weed Lists that identify plants known to interfere with Florida's native ecosystems.



COASTAL HABITAT

As discussed in the Coastal Management Element, the City has numerous coastal resources. One of which is an offshore coral reef that is part of the Continental Southeast Florida Reef Tract. The natural offshore coral reef is located in approximately $\frac{3}{4}$ of a mile from the beach in about 60 feet of water. The Delray reef is home to octocorals and sponges, a complex microalgae community, stony corals (including the federally listed coral species of *Acropora*, and other listed coral species), and schooling fish. Coastal habitats must be monitored and protected in order to preserve the animal and plant species found in the Delray Beach Planning Area.

HISTORIC NATURAL RESERVATIONS

Delray Beach has a rich architectural heritage with structures dating back to the late 19th Century. The

City has five historic districts and twenty-six individually listed properties.

Two locally designated Historic Districts are



inherently vulnerable to climate change impacts due to their coastal location, and risk of flooding. The Nassau Street Historic District is the only historic site located on the barrier island, and the Marina Historic District borders the eastside of the Intracoastal Waterway. These historic resources should be monitored to ensure their unique character is preserved. To mitigate climate change impacts to historic sites, infrastructure improvements in historic areas should be prioritized.

The historic character of Delray Beach attracts visitors supporting the heritage tourism cluster of local economy. To focus on reuse of existing buildings, the City could administer programs to assist existing buildings and historic properties with improved sustainability by promoting efficient design choices and recycling of old materials. Many building materials and practices which will never be duplicated again. Historic structures can be rehabilitated and retrofitted with sustainable building techniques. Sustainable historic stewardship will contribute to a rich sense of place and spread local history.

SUSTAINABLE USE AND MANAGEMENT OF RESOURCES

Delray Beach is continuously engaged in maintaining and upgrading existing assets, infrastructure, and the building stock owned and operated by the City. While the urban structure of



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

Delray Beach cannot easily be modified, 'grey' infrastructure can be efficiently managed and retrofitted to improve performance. Grey infrastructure refers to roads, railways, buildings, street lighting, and utilities managed by the City. Sustainable strategies should guide future Delray Beach capital expenditures, acquisitions, and improvements in order to avoid misuse of resources.

As Delray Beach strives to become more sustainable the City can promote programs that help the entire community work towards increased resource efficiency and renewable energy use. By reducing resource consumption and achieving resource efficiency Delray Beach will realize cost savings and offer a better quality of life for its residents.

The concept of sustainable use of resources can be factored into City decision making. "Sustainable use" refers to the use of Delray Beach resources in a cognizant manner that improves the socio-economic wellbeing of people and does not waste unnecessary value or lead to long-term decline of the environment. "Resource" refers to raw materials such as fuels, minerals, metals, energy (oil, natural gas, coal, biomass), but also refers to food, services, water, wind, biomass, funding, knowledge, and our ecosystems, etc. Resources are consumed in many ways. Whether in the form of gasoline burning in our cars or the electricity and water used in our homes, our daily resource consumption contributes to harmful environmental impacts and the depletion of vital resources on which our lifestyles depend. Delray Beach recognizes the scarcity of natural resources poses a threat to the continued prosperity of the community and well-being of its citizens, thus conservation of resources ultimately contributes to community resiliency.

The City can develop productive and efficient ways to manage resources by monitoring production and consumption while also using an integrated resource management planning approach. Financial costs should not be the only consideration when evaluating the profitability of a potential capital improvement project or policy, social and environmental benefits must also be recognized. This is known as the "triple bottom line"

of a project. Many of the policies within the Conservation, Sustainability, and Resiliency Element of the Comprehensive Plan have the ability to provide more than just economic benefit; for example, recommissioning City owned buildings with energy efficient fixtures has the capacity to enhance the indoor comfortability of buildings for staff, while also protecting air quality by decreasing greenhouse gas emissions.

ENERGY EFFICIENCY

Local governments have immense opportunity to seek solutions to current power challenges and to promote technological changes within the community. Evaluation of current energy use is the first step towards understanding potential opportunities to conserve resources, increase resiliency, and to reduce Delray Beach's contribution to global climate change. A large portion of energy consumed within the Delray Beach Planning Area can be contributed to the built environment. Existing buildings and lighting infrastructure represent two sources of energy use that can be improved by technological and policy development.

Delray Beach should pursue a baseline resource assessment to measure City performance in categories such as energy, fuel, water, and waste, by characterizing Delray Beach's electricity use, natural gas consumption, water use, fleet energy use, and energy consumed by waste management. A resource baseline assessment can be used as a starting point to identify areas where resources can be conserved and also to understand originating sources of greenhouse gases and flag opportunities to reduce consumption.

Delray Beach would benefit from tracking and reporting on utilities data (electric, water, other commodity billings). Existing City owned buildings and street lighting fixtures could be retrofitted to increase energy efficiency which in turn would result in cost saving, a reduction in greenhouse gas emissions, and lessen wasteful practices. Delray Beach should also study the potential costs and savings associated with the installation of solar photovoltaic systems on compatible City owned buildings and the need for additional electric vehicle infrastructure.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

Delray Beach can begin investigating and analyzing the performance of buildings owned or operated by the City in order to optimize performance and correct deficiencies. The City can undertake routine energy and water audits to understand usage and retro-fit potential for existing infrastructure systems and City owned facilities. The data generated by an audit can be used to determine the return on investment associated with a Citywide retrofitting program. The data can be managed in a consolidated database to monitor City progress overtime. By managing the data in a transparent manner, the City can create accountability by promoting its actions to the local community and can promote its actions to the local community.

Building recommissioning is a cost-effective sustainability strategy that improves energy and water performance, resolves maintenance problems, and improves indoor environmental comfort. Best management practices promote recommissioning important facilities on a five-year cycle to maintain a high level of performance and to capture new performance opportunities. The City could undertake a building performance study including energy and water efficiency; HVAC upgrades and needs; automated thermostats; indoor lighting controls; interior lighting, and solar energy potential.

Delray Beach is already engaged in recommissioning existing systems and use of sustainable design techniques in new projects to become more sustainable and to save resources. Steps have been taken to install low-use lighting and more efficient cooling systems in City buildings, as well as light-emitting diode (LED) street light replacements on West Atlantic and use of high efficiency lights for the sports fields at Pompey Park. In conjunction with Waste Management, Delray Beach has also installed solar trash compactors at City owned sites. Delray Beach will continue this momentum by utilizing the goals, objectives, and policies defined in this Element.

SUSTAINABLE BUILDING STANDARDS

"Sustainable building" is the practice of creating structures and using processes that are environmentally responsible and resource-efficient

throughout a building's life-cycle, from siting to design, construction, operation, maintenance, renovation and deconstruction.

Sustainable building practices conserve energy, materials, water, and natural land areas, and can also accomplish preservation of existing structures, and the diversion of old construction materials from land disposal sites through reuse and recycling. Additionally, Florida Statutes state City-owned buildings "shall be constructed to comply with a national green building code or a sustainable building rating system." Section 255.2527, Florida Statutes.

Multiple nationally recognized guides, codes, and certification programs are available that can be used to fulfill the Florida legislature's requirement, and to encourage sustainable building in Delray Beach. The United States Green Building Council created the most widely used green building certification program in the world, the current program is commonly referred to as Leadership in Energy and Environmental Design ("LEED"). LEED certification provides a framework for creating highly efficient and cost-saving green buildings.

The International Green Construction Code is a sustainable building code created by the International Code Council that provides model language for municipalities to adopt within their Land Development Regulations to accomplish baseline sustainable building requirements. The Living Building Challenge Petal Certification is a program developed by the International Future Institute, providing building strategies to achieve net-zero or net-positive energy buildings, structures free of chemicals, and with overall lower net-energy footprint.

The Florida Green Building Coalition is a non-profit Florida corporation dedicated to improving the built environment which offers membership to individuals, companies, and local governments. The Coalition certifies buildings (bronze, silver, and gold), according to a proprietary grading system, which considers Florida's climate and geography. The Florida Green Building Coalition is a resource for green building strategies, Delray Beach decided to pursue Green Local Government designation in 2007 and became a certified



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

“silver” local government in 2016. The Florida Green Building Coalition Green Local Government Standard acknowledges cities and counties for outstanding environmental stewardship.

Delray Beach currently has established green building standards for proposed new construction projects in the Central Business District Zone that requires buildings 50,000 square feet or more within that Zone to be certified as Silver by the United States Green Building Council Leadership in Energy and Environmental Design standards or equivalent. Amd. Ord. 28-15 12/02/15.

To incentivize compliance, developers are required to post a performance bond to ensure construction projects within the Central Business District Zone achieve the identified green building standard. Once the project obtains the required level of certification the City refunds the value of the posted performance bond. If the developer achieves a lower certification level than required, or achieves partial certification, only a partial bond refund is offered proportional to the achieved criteria.

Delray Beach should evaluate the success of current green building practices and the Central Business District Zone performance bond. Delray Beach can then establish more rigorous standards for new City facilities and commercial development projects beyond the Central Business District Zone. The City should extend its sustainable building practices to all City facilities either through requiring participation in a prominent national rating system, or by designing their own menu of requirements, by borrowing techniques from various sustainable building codes. Adopting a green certification requirement for city-owned buildings and facilities is a nationally accepted practice.

Currently, all new development within the Central Business District is required to use reflective roofing or rooftop plantings. The reflective / green roofing is a design strategy that can improve cooling and heating energy use in buildings and benefit the urban climate. The reflective / green roof regulation should be included in new, city-wide sustainable design standards. A further discussion of reflective roofs is included in the Resiliency

portion of this document addressing the Heat Island Effect.

DIVERSIFIED ENERGY MIX

Delray Beach can promote opportunities to shift City away from fuels that generate greenhouse gases to cleaner, alternative, and renewable energy sources. By facilitating the use of renewable energy, Delray Beach can establish community and environmental leadership while furthering the goals of National and International coalitions promoting the reduction of greenhouse gas emissions (Climate Mayors Pledge and Sierra Clubs “Ready for 100” Campaign). Non-renewable sources of energy contribute to the degradation of land, water, and air, while releasing greenhouse gases into the atmosphere. There are many forms of renewable energy sources. Solar, wind, hydroelectric, biomass, geothermal power, hydrogen, are all recognized sources of renewable energy. Alternative fuels are transportation fuels other than gasoline and diesel, including but not limited to liquified natural gas, biodiesel, compressed natural gas, electricity, ethanol, hydrogen, and propane. Alternative fuels are cleaner can reduce harmful emissions and pollutants, specifically carbon dioxide (CO₂), which is a primary contributor to climate change.

Renewable energy strategies can increase community resiliency by providing alternative sources of electricity during fuel supply disruptions. Delray Beach has started to promote the transition towards renewable energy alternatives. The City became a Bronze SolSmart designee in 2017, for encouraging solar energy growth and removing obstacles to solar development in the community, making it easier for homes and businesses to go solar. SolSmart is a program by the Solar Foundation and the International City/County Management Association funded by the U.S. Department of Energy SunShot Initiative.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

Currently, other initiatives are developing across the state that provide support for communities wanting to increase solar generation at the neighborhood level. Cooperatives take advantage of a group of property owner's bulk-purchasing power to get discounted pricing and a quality installation. Volunteer participants choose an installer on behalf of the entire group through an open and competitive bidding process. The selected installer provides co-op participants a personalized proposal for their consideration. The City should ensure that land development regulations do not inadvertently prevent the development of solar cooperatives.

Quick Facts:

- 🌍 In Florida, natural gas, a nonrenewable fossil fuel, continues to be the dominate fuel source for electricity generation.
- 🌍 In 2017, natural gas represented 71.6% of Florida's total utility-scale electric generation.
- 🌍 In contrast, Florida's renewable energy facilities currently provide approximately only 3.8% of Florida's overall electric generation.
- 🌍 Florida's three top renewable energy sources are solid biomass, solar energy, and municipal solid waste (largest source first).

Source: Florida Public Service Commission, *Review of the 2017 Ten-Year Site Plans of Florida's Electric Utilities*.

The City of Delray Beach currently has three free public parking electric charging stations and plans to install two more. Charging is free to the public, but there is a two-hour charging limit. Electric vehicle drivers frequently choose Delray Beach for charging due to the ample entertainment and dining options. The City now requires new private development within the Central Business District to provide 3% alternative fuel spaces.



In 2018, eight new life guard towers were installed on the Delray Municipal Beach, equipped with solar panels used to power fans or for charging purposes. The solar panels provide a more comfortable work environment for the Ocean rescue staff.

Delray Beach could pursue a renewable energy and alternative energy feasibility study to understand City opportunities to transition away from fossil fuels. A feasibility study will determine the viability and cost/benefit of such transition for systems rather than a piecemeal approach. For example, solar system feasibility studies are routinely used for proposed solar projects and include a site analysis, environmental issues, financial modeling, interconnection costs analysis, permitting requirement analysis, etc. Renewable and alternative projects are often costly expenditures, and a feasibility study is the first step in transitioning the City away from fossil fuel dependence.

Promoting the use of renewable energy and alternative energy within the Delray Beach Planning area will help the community maintain a viable quality of life, assist in ensuring the reliable transmission of power, conserve environmental resources, and possibly provide a backup power supply and protect water quality.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

Finally, the City of Delray Beach offers Property Assessed Clean Energy (PACE) financing to residential and commercial property owners as a source of funds to retrofit properties for energy efficiency, renewable energy and wind resistance projects. The property owner voluntarily enters into the program and works with their selected contractor, but then pays the financing back as a non-ad valorem assessment on their property tax bill.

Quick Facts:

On September 10, 2017, Hurricane Irma knocked out power to 64% of all electricity customers in the Florida, nine days later (on September 19, 2017) about 1% or 100,000 customers remained without power.

According to the United States Energy Information Administration, Hurricane Irma caused substantially more outages than Hurricane Wilma in 2005 which impacted only 36% of Florida customers. Hurricane Irma cut power to nearly two-thirds of Florida's electricity customers.

Source: United States Energy Information Administration, *Today in Energy*, Sept. 20 2017.

SUSTAINABLE WASTE MANAGEMENT

The Palm Beach County Solid Waste Authority manages a countywide recycling program. Section 403.706(2)(a), Florida Statutes, requires each county to achieve the following recycling rate of solid waste: 70% by December 1, 2018, and 75% by December 31, 2020.

The Palm Beach County Solid Waste Authority collects recyclable materials in blue and yellow bins. The following items are recycled in blue bins: aluminum cans, drink boxes, glass bottles and jars, milk and juice cartons, plastic bottles and containers, and steel cans. The following items are collected in the yellow bins: paper bags, unwanted mail, newspaper, cardboard, old paper, tissue/beverage boxes, magazines, catalogs, and telephone books. There are also multiple community drop-off locations for paper, cardboard, and oil/grease within the City.

For construction and demolition materials the Palm Beach County Solid Waste Authority has an approved list of "Roll-Off Haulers," in order to ensure construction materials are disposed of legally. These haulers are required to dispose of the materials in permitted landfills or recycling facilities.

Hazardous materials placed in the waste stream can present multiple dangers. The Palm Beach County Solid Waste Authority provides for the proper disposal of chemical produces and hazardous substances at the Home Chemical and Recycling Center, at 1901 SW 4th Avenue (east) or 13400 South State Road 7 (west). County residents can also bring old outdated electronics to any of the Palm Beach County Solid Waste Authority locations. Old paints and coatings can be disposed of at Palm Beach County Authority transfer stations.

The City of Delray Beach has plans for ten textile recycling bins within the Planning Areas. Textile recycling is the process by which old clothing and other textiles are recovered for reuse or material recovery. Benefits of textile recycling include: a decrease in the amount of materials ending up in landfills, reduced consumption of energy and water, and pollution avoidance. It is important to note, natural fibers can take hundreds of years to decompose (which may also involve the release of greenhouse gases), and synthetic fiber textiles will never decompose.

Delray Beach could promote increased recycling in City managed areas, such as on Atlantic Ave, on the municipal beach, and in Pineapple Grove by providing additional recycle receptacles and educational signage.

Recycling and proper waste disposal requires a robust, multi lingual public engagement program. Delray Beach should continue to work with the Palm Beach County Solid Waste Authority and the designated waste hauler to: increase recycling rates and to promote the proper disposal of other materials, enhance community waste disposal outreach and education, collect data on waste disposal throughout the City, and maintain a centralized waste disposal database.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

Tracking waste disposal data can help the City identify new opportunities to improve sustainable waste disposal and work with its selected waste hauler. Currently, the City receives monthly data reports from the waste hauler, the data includes tonnage for garbage, recycling, vegetation, and bulk. While this allows the City to track trends, data collection could be improved by collection tonnage data by route. Such data could be utilized to identify and target low performing areas of the City.

COMPOSTING

Compost is decomposed organic material that provides essential nutrients for plant growth. Composting programs exist throughout the Nation at the neighborhood, City, and regional levels, in urban, suburban, and rural areas.

Composting locally provides benefits such as: breeding a sustainable community culture, local job creation, improved soil composition, reduction of soil erosion, decreased need for garbage hauling, and diversion of materials from landfills, which in-turn extends the life of regional landfills.

Composting programs are categorized by source materials, such as the composting of yard trash (landscaping or land clearing debris), vegetative waste (source-separated material from non-residential sources such as fruits, vegetables & grains, including decomposable packaging), pre-consumer vegetative waste (that has not come in contact with end use or animal products / byproducts), and animal byproducts (source separated waste such as meat, fat, dairy or eggs from non-residential sources).

A Solid Waste Management Facility Permit is required by the Florida DEP to construct or operate a solid waste management facility producing compost. However, permits are not required for "disposal by persons of solid waste resulting from their own activities on their own property, if such waste is ordinary household waste from their residential property or is rocks, soils, trees, tree remains, and other vegetative matter that normally result from land development operation." Furthermore, a compost operation that produces less than 50 cubic yards of compost per year when the compost is produced and used on the

property where the compost operation is located also does not require a permit. Section 403.707(2)(g), Florida Statutes.

Delray Beach can promote household composting practices and community garden composting less than 50 cubic yards, plus on-site composting of trash or yard debris associated with farming or agricultural activities. In the future, Delray Beach could explore opportunities to work with Mounts Botanical Garden of Palm Beach County, as well as, waste management agencies and haulers, to create community composting opportunities for the City.

URBAN AGRICULTURE AND COMMUNITY GARDENS

Urban agriculture is the practice of cultivating, processing, and distributing food within a local community. Urban or Suburban agriculture is an opportunity to reduce urban poverty and food insecurity, while enhancing the urban environment. The cost of supplying and distributing goods from rural areas to urban ones is rising. Similarly, "urban farming" is growing or producing food in a city or heavily populated town or municipality. Growing food within Delray Beach can help residents save money, provide access to fresh produce, and create jobs.

Backyard farming is when ordinary homeowners turn a portion of their backyard into a micro farm. Backyard farming can help families save money on food costs and enhance the natural environment of neighborhoods.

Delray Beach Ordinance Number 07-17 provides for urban agriculture such as commercial rooftop gardens, productive green walls, indoor farm facilities, urban farms, and other innovative food production in the urban area. Failure to maintain an outdoor Urban Agriculture site shall be a violation of City's Code of Ordinances. Urban farms are permitted to sell produce, flowers, and plants on site from 7:00 AM to 9:00 PM. A site plan is required for all Urban Agriculture.

Delray Beach is home to the wildly popular GreenMarket, where local businesses can sell their products. There is the Winter GreenMarket which opens on October 28th and is open every Saturday through May (at Old School Square Park on NE 2nd



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

Avenue). The Summer GreenMarket runs from June 2nd through July 28th, and returns every Saturday (at the Tennis Center, 201 West Atlantic Avenue). The Winter GreenMarket was established in 1996, by the Delray Beach Community Redevelopment Agency. The GreenMarket hosts more than 65 premier food vendors featuring farm-to-fork produce, juice, eggs, milk, butter, cheese, jams, baked goods, vegan and organic products, fresh cut flowers, and other unique gourmet items.

Another approach to increasing access to fresh fruits and vegetables is to encourage local production at community gardens. A “community garden” is defined as a garden space within an urbanized area that cultivated and cared for by the community. Delray Beach adopted a Community Garden Policy by Resolution 40-17 in 2017, to benefit the public health, the environment, the economy, and the quality of life in neighborhoods. The Community Garden program is intended to support the local production of fruits, vegetables, and herbs. The City neither sponsors nor organizes the community gardens in the Delray Beach Planning Area. Instead, local residents are encouraged to come together to establish their own garden by complying with the rules, regulations, laws, and ordinances of Delray Beach’s program.

Community gardens are not intended to be used for commercial operation, however if organizers of a community garden wish to grow and sell produce at the community garden they can seek a permit for an Urban Farm. Community gardens are encouraged to donate surplus food to organizations that help feed less privileged members of the community. Community garden organizers are also permitted to sell the produce at the Delray Beach GreenMarket and use monies to support the garden’s operating costs or to recover expenses associated with the gardening activities of its members.

Community gardens and urban agriculture present immense opportunity for enriching natural areas and cultivating a sense of community for residents. For example, in Delray Beach’s Catherine Strong Park, over 300 trees have been planted to create a young orchard of leafy fruit trees. Community Greening, a Delray Beach

nonprofit, brought together volunteers on Arbor Day in 2017, to plant mango, sugar apple, avocado, and guava trees. The orchard is intended to provide free fruits for community members and is an innovated example of utilizing public-private partnership for the benefit of the community. Catherine Strong Park is located at the southwest corner of Southwest 125 Terrace and Southwest Sixth Street. Community Greening is also engaged in similar projects throughout the City and County, revitalizing greenspaces and bringing the community together to learn about the long-term resiliency and sustainability benefits of green spaces.

GREEN IMPLEMENTATION ADVANCEMENT BOARD

Delray Beach should continue to support the activities of the Green Implementation Advancement Board. The Green Task Force was created by the City Commission 2009 and was tasked with reviewing City operations and policies and recommending strategies and projects for making Delray Beach a more sustainable community.

The Green Task Force produced *the Delray Beach Green Task Force Report* in 2009, and then became the Green Implementation Advancement Board in 2011. Projects include the installation of 138 solar trash compactors, the donation and installation of 6 electric voltaic charging stations, development of the annual Earth Day Celebration, and the expansion of water reuse infrastructure. The Delray Beach Green Implementation Advancement Board actively produces policy and project suggestions to advance environmental conservation and reduce the production of harmful greenhouse gases within the City. Most recently the Green Implementation Advancement Board created the “Skip the Straw Initiative,” a textile recycling program, and are working with local developers to update the Delray Beach green building requirements. Meetings are held in the Swinton Operation Complex, on the third Thursday of each month at 9:00 AM.

SUSTAINABLE PRODUCT USE

Delray Beach recognizes the need to encourage local businesses to use sustainable products and to incite change in today’s throwaway culture.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

Single-use plastic products are defined as items intended to be used only once before they are thrown away or recycled. Plastics are harmful to the environment and often end up polluting surface waters like the Atlantic Ocean, Lake Ida, and the canal system within the Delray Beach Planning Area.

Examples of single-use plastic products include:

- Plastic forks and knives,
- Plastic shopping bags,
- Plastic coffee cup lids,
- Plastic water bottles,
- Styrofoam and plastic take out containers, and
- Plastic straws.

In 2018, Delray Beach established the “Skip the Straw Initiative.” The City started by engaging local businesses in the campaign and sharing information about the harmful impacts of single-use products. Public outreach is necessary in order to garner the support of the community. Participating establishments can promote the initiative by putting a “Skip the Straw” decal in their window and by educating customers on the sustainable benefits of ending plastic straw usage. The City of Delray Beach is planning on introducing an ordinance addressing single-use plastic products to first reduce and then eliminate the use of plastic straws by the businesses and restaurants in Downtown Delray Beach.

Quick Fact:

About 150 million tons of plastic is floating in the world's oceans. World Economic Forum, *The New Plastics Economy 2016*.

SUSTAINABLE PROCUREMENT

Delray Beach acknowledges the interrelated nature of economic, environmental, and social impacts of sustainability within City procurement and purchasing. The City seeks to create a sustainable procurement program that incentivizes the use of local, organic, environmentally friendly, re-useable, chemical free products, and vendors.

Sustainable procurement requirements are criteria that are compatible with the protection of the environment and society as guidelines for City purchasing. Sustainable procurement programs can provide cost savings, reduce waste, enhance the City's image, improve resource efficiency and drives markets for new products and services.

Delray Beach will develop a sustainable procurement plan that prioritizes energy-efficiency, renewable energy, and recycled, healthy, or environmentally preferable products. The City could promote bulk buying and reducing the variety of products purchased which can result in a net savings for the City.

Sustainable procurement also offers the dual benefit of increasing City employees' awareness of the City's sustainability goals objectives and policies. Delray Beach government might also consider the benefits of expanding City storage potential, so that left-over durable goods can be saved rather than new procurement.

GREENING CITY EVENTS

A “green” event is one that provides ample opportunities for recycling, discourages the use and sale of bottled water and other single-use plastic products, utilizes local foods/services, and even allows for public composting opportunities. Delray Beach can encourage “green” community events by developing a green event policy document with criteria to guide the planning of City sponsored events and providing incentives for privately held green events.

GREEN BLUE ECONOMY

The local Delray Beach economy and business atmosphere would benefit from the development of a sustainable business program that promotes public health, environmental conservation, and community resiliency. The program could serve as a resource for business stakeholders of all sizes, and provide assistance with implementation of resilient, environmentally friendly, energy efficient, and greenhouse gas reduction strategies. Increasing the sustainability and resiliency of Delray Beach can only be achieved through local action.

A “green” economy is commonly associated with economic growth due to sustainable



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

practices/technologies and reduction of environmental risks. A “blue” economy specifically relates the unique range of economic sectors and activities found in coastal communities and related policies that ensure the sustainable use of oceanic resources. Typical blue economies are related to tourism, maritime, other water related activities, and coastal protection. A blue economy promotes economic growth, environmental conservation, resilient business practices, and social inclusion. Implementation of the Conservation, Sustainability, and Resiliency Element will support the growth of a local green blue economy in Delray Beach.

The City can collaborate with organizations including, but not limited to, the Delray Beach Community Redevelopment Agency, Delray Beach Downtown Redevelopment Authority, and the Greater Delray Beach Chamber of Commerce to create a blue green business program. Creation of a blue green business program will support economic growth, resiliency, sustainability, and create employment opportunities in Delray Beach's emerging green blue economy. By fostering partnerships with the business community, Delray Beach will create an increased demand in skilled labor needed for energy efficiency retrofits, solar installation, new use for recycled materials, growing and processing of local food, and designing /maintaining the public infrastructure. Reduction of greenhouse gases and energy conservation can produce direct cost savings for local business owners. The City will engage local business stakeholders in sustainability and resiliency education, programs, and best practice strategies while promoting economic growth.

INCREASING CITYWIDE RESILIENCE TO SEA LEVEL RISE, FLOODING, STORMS AND OTHER DISRUPTIVE EVENTS

The conservation and sustainability strategies discussed in this document are integrally tied to the resiliency of Delray Beach. The incorporation of

resiliency and sustainability strategies into local government planning is vital for protecting Delray Beach's infrastructure, planning for future capital improvement projects, and preparing Delray Beach for climate change impacts.

Southeast Florida's climate naturally experiences variability in weather patterns that historically have included periods of extended droughts and water shortages; high volume rain events and associated flood threats; and, storm events such as hurricanes that bring severe wind and storm surge risks. Gainesville Climate Institute, *Florida's Climate: Changes, Variations, & Impacts*.

Delray Beach has a tropical climate with rainfall throughout the year, the average annual temperature is 74 degrees Fahrenheit. The City experiences a short dry season and receives on average 4.9 feet of rain annually. June is known as the wettest month, and December as the driest. In the coming decades, temperatures across the southeast region of the United States are expected to increase along with the number of hot days (95 degrees or hotter) during the year. Higher temperatures have the capacity to increase the intensity of hurricanes in the Atlantic and the amount of rainfall in precipitation events. Hot weather contributes to the formation of harmful air pollutants and allergens, increased algae blooms, and disease-causing agents in inland and coastal waterways. National Climate Assessment, *United States National Climate Assessment*.

The coastal location of Delray Beach, combined with a high-water table, and the variability of the Intracoastal Waterway, makes the City vulnerable to flooding, rising sea levels, and coastal erosion. While hurricanes, tropical storms, and heavy rains are part of Delray Beach's seasonal weather patterns, Palm Beach County has also experienced weather extremes in recent years. Strategic decision making is necessary to prevent and recover from severe inland flooding, annual King tides, extreme high tides – all which strain the flood control system, impact private property and public infrastructure, and disrupt essential pristine ecosystems. As the City plans for new capital improvement projects and economic development within the Delray Beach Planning

Quick Fact:

For every 1\$ spent on hazard mitigation and resilience saves an average of 6\$ in future disaster costs. Source: National Institute of Building Sciences, *Natural Hazard Mitigation Saves: 2017 Interim Report*.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

Area, the variability of ecological conditions should be factored into design.

It is important to note that not only coastal areas will receive climate change impacts, but that inland areas will also be faced with the challenge of managing higher-volume and frequency rain events that will stress drainage and other infrastructure. Interior portions of the City may become vulnerable with the diminished drainage capacity of the regional system. As a result, swales may have to be widened or deepened, stormwater pipes may need upgrading, and the wastewater systems may need additional capacity to handle increased water table heights.

Delray Beach has annually experienced flooding in low lying areas near the Intracoastal Waterway during seasonal high tides or during the raining season. "Nuisance flooding" refers to low levels of stormwater inundation that can cause standing water throughout a community which may disrupt routine daily activities. Canals which drain into the Intracoastal Waterway utilize gravity, thus when sea levels are experiencing a seasonal high the water control gate on the seaward side of the system is unable to effectively drain. Flooding can also result from the rising water table in the region. During rain events, the rain saturates the ground as the water table rises, as a result, retention areas within Delray Beach will have less capacity to hold runoff.

Areas impacted by King Tides and the rainy season include:

-  Marina Way,
-  Veteran's Park, low lying areas on either side of the Intracoastal, and
-  Marina Historic District.

Source: Delray Beach Rising Waters Task Force and ESA Associates, *Elevating the Discussion of Rising Waters*, 2017.

As storm events strengthen, and the average temperatures in the Atlantic Ocean become warmer, the magnitude of storm surge is predicted to increase. Storm surge will largely impact the barrier island areas of the City and will likely cause mainland systems to become inundated.

Saltwater intrusion of the Biscayne aquifer is closely monitored throughout the region. As sea levels rise and freshwater is pulled from the aquifer, the head of pressure that keeps the saltwater at bay may become compromised. It is important for Delray Beach to continue to balance the demand and supply of drinking water for the community. As mentioned previously, to avoid saltwater intrusion the City of Delray Beach constructed six western wellfields and withdrawals from eastern wellfield wells are restricted and operated on a daily rotation. Palm Beach County's 2015 Capital Improvement Plan suggests \$210 million should be spent by 2020 on the southern portion of the County focusing on water and wastewater infrastructure.

Delray Beach will have the opportunity to build back better in ways which mitigate and adapt to climate change impacts. When new developments and redevelopment projects are proposed within the Planning Area, the City can utilize best practice mitigation strategies to reduce flood risks and increase resiliency.

Delray Beach shall continue to work with the SFWMD, the Southeast Regional Climate Change Compact, the Southeast Palm Beach County Micro-Regional Group, and the Lake Worth Drainage District to address these future hydrological challenges. A few key strategies include: reduce and avoid development in flood prone areas, strengthen building requirements for new buildings and infrastructure, increasing the base-flood elevation of structures, reduction of impervious surfaces, and informational multi-lingual outreach to educate residents.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

ADAPTING TO SEA LEVEL RISE WITH THE SOUTHEAST REGIONAL CLIMATE CHANGE COMPACT

In 2010, Southeast Florida Regional Climate Compact (the "Compact") was formed by Broward, Miami-Dade, Monroe, and Palm Beach Counties to establish unified climate change mitigation and adaptation strategies across the four counties. In support of the Southeast Florida Regional Climate Compact and the Regional Climate Action Plan, Delray Beach signed onto the Mayor's Climate Action Pledge in January 2014.

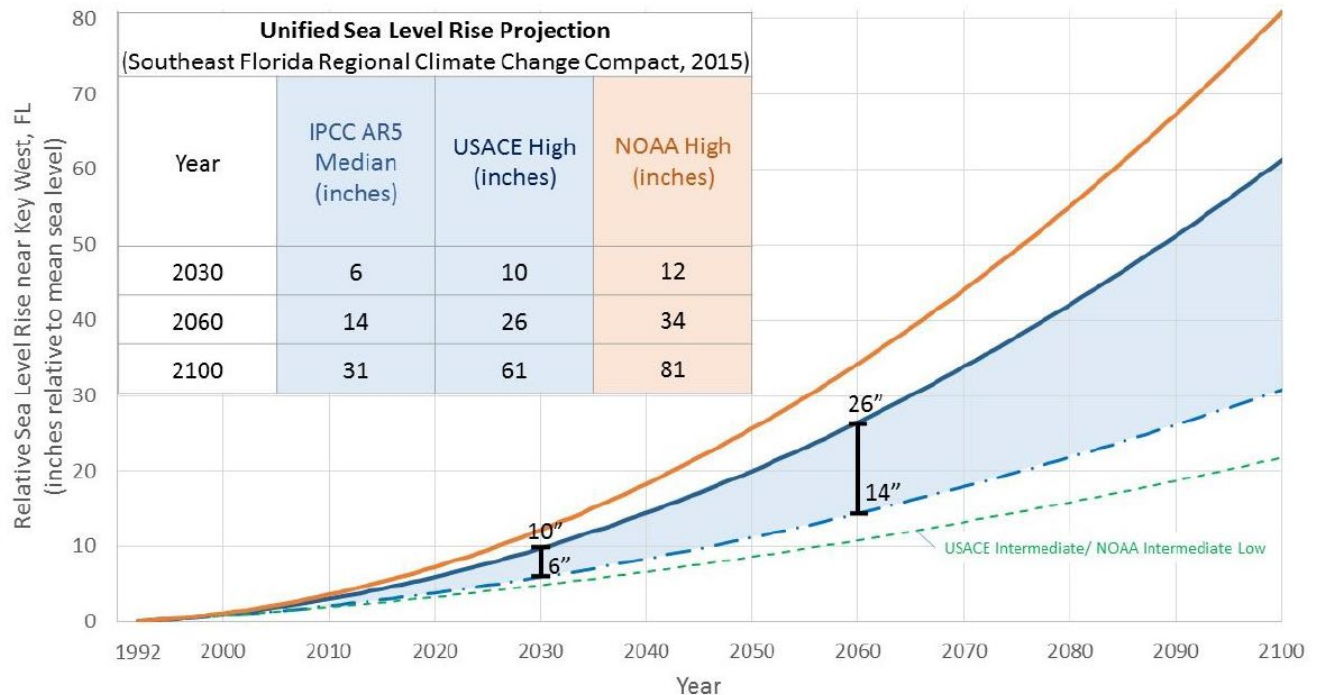
The Compact created the Regional Climate Action Plan in 2012, which outlines recommendations to advance climate adaption and mitigation techniques throughout Southeast Florida. The Regional Climate Action Plan ("RCAP") was updated in 2017, to RCAP version 2.0 and includes three new goal areas (regional economic resilience, social equity, and public health). RCAP provides a framework for local and regional implementation of resiliency strategies.

The Compact developed a baseline range of sea level rise projections as a basis for developing risk informed adaptation strategies. The Unified Sea Level Rise Projection was updated in 2015, and incorporates newly observed and published sea

level rise data into one coherent model for the region. The 2015 *Unified Sea Level Rise Projection* projects sea level rise of 6 to 10 inches by 2030, and 14 to 26 inches by 2060, and 31 to 61 inches by 2100.

Sea level rise projections for South Florida are based on historic tidal information from the following sources: (1) tidal gauge in Key West, and in dependent sea level rise models by the (2) United States Army Corps of Engineers, (3) the National Oceanic and Atmospheric Administration, (4) Intergovernmental Panel on the Climate Change, (5) the World Meteorological Organization.

Planning for sea level rise demands planning for variable conditions. The Compact has been and will continue to be instrumental in planning for future sea level rise projections and climate mitigation strategies in the region. The City of Delray Beach should continue to participate in the Compact as a city-member, by pursuing Delray Beach specific scientific data, projections, and strategies.





CONSERVATION, SUSTAINABILITY, AND RESILIENCY

SOUTHEAST PALM BEACH COUNTY MICRO-REGIONAL GROUP

The Southeast Palm Beach County Micro-Regional Group, also known as the “inlet-to-inlet collaborative” originated in 2017, and is focused on addressing environmental and sustainability issues from the inter-jurisdictional perspective of the municipalities that share the Intracoastal waterway from Boca Raton to Boynton Beach.

Delray Beach is a founding member and the Collaborative includes: Boca Raton, Highland Beach, and Boynton Beach. In the future this partnership will be used as a vehicle to implement the Southeast Regional Climate Change Compact's Regional Climate Action Plan 2.0 and develop micro-regional solutions related to climate change.

NATIONAL FLOOD INSURANCE PROGRAM AND FLOOD PRONE AREAS

Flood zones identified by the Federal Emergency Management Agency (FEMA) are identified on Map AD-15 (FEMA Flood Zones). The FEMA flood zone categories are described in the Table CSR-7.

Delray Beach has adopted and enforced floodplain management ordinances to reduce future flood damage. National Flood Insurance Program rates depend on flood maps created by the National Flood Insurance Program. These maps are periodically updated, new maps for Palm Beach County went into effect March 2017. This is the first map revision since the 1980s.

Most of the area east of the Intracoastal Waterway is Zone AE, and the areas between the Intracoastal Waterway and I-95 are predominately Zone X, with areas of Zone AE and X500. Specific flood zone boundaries are identified on FIRM Community Panel Number 12099C0979D, effective 10/05/2017. The City has a flood damage protection program which is certified by FEMA.

National Flood Insurance Program flood maps are based off of historic flooding data and do not incorporate expected changing ecological conditions such as sea level rise, increase water table heights, and participation variability. Therefore, the National Flood Insurance Program maps are not adequate for planning future

economic development or City capital improvement expenditures that may be necessitated by level rise impacts.

The Community Rating System is a voluntary program for National Flood Insurance Program

Table CSR-7 Federal Emergency Management Agency Flood Zone Descriptions	
Zone	Description
AE	Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base Flood Elevations (BFEs) are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
VE	Areas subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
X	Areas of 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance (base flood) sheet flow flooding with average depths of less than 1 foot, areas of base flood stream flooding with a contributing drainage area of less than 1 square mile or areas protected from the base flood by levees. No BFEs or depths are shown in this zone and insurance purchase is not required, and; Areas outside the 0.2-percent-annual-chance floodplain. No BFEs or depths are shown in this zone, and insurance purchase is not required.
X500	Same as Zone X, however this zone is between the 100 and 500-year flood zone.
Source: Federal Emergency Management Agency (FEMA)	



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

participating communities. Delray Beach has received a level 8 Community Rating Score. Federal Emergency Management Agency, *Community Rating System Communities and their Classes*, 2017.

The Community Rating System includes 10 classes, with Class 1 being the highest. For Community Rating System participating communities, flood insurance premium rates are discounted in increments of 5% [i.e., a Class 1 community would receive a 45% premium discount, while a Class 9 community would receive a 5% discount (Class 10 is for non-participating Cities which receive no discount)].

Delray Beach residents currently receive 10% premium discount for the City's participation in floodplain management Community Rating System activities. The City could further improve its score by pursuing climate, future conditions, and sea level rise activities within the Community Rating Manual. There are at least ten different areas within the Community Rating System where credits can be gained for efforts such as a City-wide vulnerability assessment, or accounting for sea level rise in stormwater master planning. Improving the rating through these activities would provide greater insurance discounts and an added incentive for residents to purchasing flood insurance.

Similar to the Southeast Regional Climate Change Compact's sea level rise projections, the Community Rating System has adopted the National Oceanic Atmospheric Administration Intermediate-High projection as its minimum sea level rise standard. National Flood Insurance Program, *Community Rating System, Coordinator's Manual*, FIA- 15/2017.

VULNERABILITY ASSESSMENT

Vulnerability assessments can be used to integrate the topography and critical assets of Delray Beach with sea level rise scenarios, increased water table heights, and storm surge projections. A vulnerability assessment is used to identify and assess critical City controlled infrastructure, systems, and identify the vulnerability of areas or segments of the community in order to properly

plan for the life of structures, improvements, and upgrades.

Climate change impacts will be felt throughout the Delray Beach Planning Area and not just along the coast or Intracoastal Waterway. Delray Beach would benefit from a City-wide vulnerability assessment that identifies City-owned buildings, water and wastewater treatment plants, pumping stations, stormwater systems, roads, railways, bridges, transportation infrastructure, power generating facilities and transmission lines, at-risk populations, hospitals, historic sites, and designated Palm Beach County Emergency Shelters.



It is imperative for the City to obtain and track data pertaining to the vulnerability of City assets, roads, and critical facilities, in order to better plan capital improvement projects and define supporting policies for highly vulnerable areas within the Delray Beach Planning Area.

The City's 2018 Stormwater Management Master Plan Update includes assumptions for sea level rise based on 30-year and 75-year projections identified in the City of Delray Beach Intracoastal Waterway Water Level & Infrastructure Vulnerability Study, conducted in 2018. The Stormwater Management Master Plan Update identifies stormwater management challenges due to impacts of sea level rise and localized flooding. These issues coupled with a rising groundwater table will impact primary and secondary drainage systems, ultimately reducing



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

the capacity of these systems which can result in flooding of street, buildings and natural systems.

The Stormwater Management Master Plan Update will provide current data on elevations of structures and their projected future impact which provides the City with additional tools for evaluating future projects. The goal of the Stormwater Management Master Plan Update is to create a plan to address water resource issues and problems, including but not limited to, drainage problems, street flooding, tidal flooding, inadequate infrastructure, stormwater quality and recharge as well as other stormwater related issues or problems. The Update also evaluates the adequacy and condition of the drainage facilities, determines the level of service for flood protection for the City's sub-watersheds and identifies solutions. The Update will address the current and future needs of the City based on growth and climatological changes that have and will continue to impact the City's stormwater management system.

SHORELINE PROTECTION, SEAWALL RESTORATION, AND LIVING SHORELINES

The beach and dune system are Delray Beach's first line of defense against storm surge and waves. The dune system provides a rich coastal environment full of natural resources. The beach is heavily used for recreational activities. Delray Beach has 2.8 miles of oceanfront shoreline, all of which are deemed critically eroded by the state. The beach is 100% accessible and 51% of the frontage is contained within two the Municipal Beach and Atlantic Dunes Park.

Coastal dunes stabilize the beach and provide important storm protection. The sandy dune provides habitat for over two hundred plant and animal species. The City recognizes the importance of exotic species removal, the protection of the beach dunes as resiliency features, and as a natural resource which must be preserved.

Quick Fact:

In 2018, the City added two feet to the seawall protecting Veteran's Park to provide flood protection.

The Florida DEP maintains the Coastal Construction Control Line, a regulatory program to protect Florida's beaches and dunes while ensuring reasonable enjoyment of private property. The program minimizes new man-made structures proposed beyond the Coastal Construction Control Line.

Erosion, coastal development, and the rising sea levels can impact the ability of waterfront infrastructure to rebound after storm impacts. The City's response to erosion should utilize a holistic strategy that will ensure a resilient coastline, shoreline reconstruction, and beach management.

The City should continue to work with the Palm Beach County Department of Environmental Resource Management to coordinate the protection and management of Lake Ida, the Municipal Beach, shared natural areas, and shorelines.



The City should also continue to coordinate with the Palm Beach County Department of Environmental Resource Management, as well as State and Federal agencies on beach nourishment projects and implementation of the Palm Beach County Shoreline Protection Plan. To date Delray Beach has participated in eight nourishment projects since the initial nourishment in 1973. Periodic nourishment is provided every five years, and occasional storm damage repair projects are used as a response to losses from the hurricane season. For detailed information See COASTAL MANAGEMENT ELEMENT.



The City of Delray Beach Intracoastal Waterway Water Level & Infrastructure Vulnerability Study, conducted in 2018, to assess existing seawalls and outfalls along the intracoastal waterway. The assessment included a survey of current conditions. Backflow devices have been installed on select outfalls and future updates have been identified and will be implemented by the Public Works Department.

The Intracoastal Waterway Level & Infrastructure Vulnerability Study inventories current conditions and develops recommendations to reduce the risks of high tide flooding for both public and private properties. Sea level projections from the Southeast Florida Regional Climate Compact served as the basis for the Study's identification of vulnerable areas. Target elevations are identified for future sea wall design standards. Case studies are summarized for implementation of seawall retrofitting programs.

Adaptation techniques promoted by the Southeast Regional Climate Change Compact include evaluating sea walls and other critical shoreline infrastructure present within the community and planning for updates using best available climate change data. The City may pursue updating its current sea wall criteria for existing or newly constructed seawalls, as well as, policy relating to living shorelines.

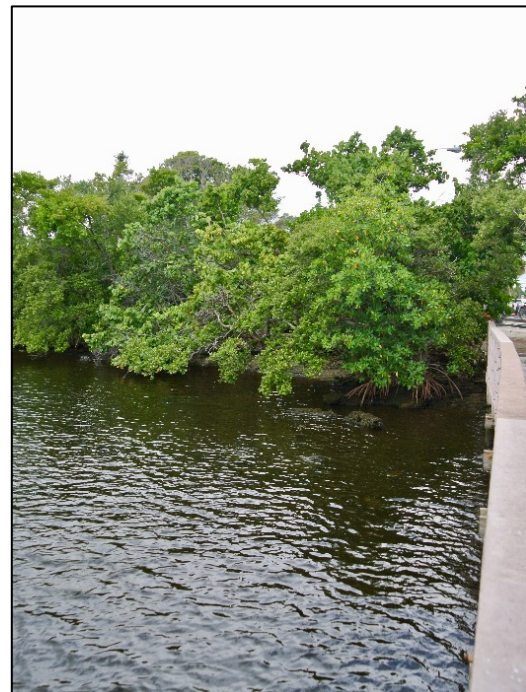
A "living shoreline" is a management practice that provides erosion control benefits; protects, restores, or enhances natural shoreline habitat; and maintains coastal processes through the strategic placement of plants, stone, sand, and other structural organic materials. National Oceanic and Atmospheric Administration, *A Guide to National Shoreline Data and Terms*, 2016. Living shoreline projects incorporate a variety of materials such as wetland plants, sand, wood, oyster shell, coir fiber logs, and native rocks. Living shorelines can be a great tool to armor the shoreline while stabilizing natural coastal habitats. Living shorelines cannot be used in every location and have proven to be most useful in natural areas where there is not already a "hard" sea wall in place. Living sea walls are considered restoration activities and not a technique for mitigation.

SECONDARY IMPACTS OF CLIMATE CHANGE

Climate change impacts causing flooding throughout Delray Beach also have the capacity to cause vector-borne diseases or increased blue-green algae blooms. Sitting water or shallow puddles that fail to drain are the ideal environment for mosquitos that can spread water-borne illnesses and viral diseases, like the Zika Virus.

Stormwater run-off from intense storms can carry fertilizers into drainage areas and canals. Warm weather mixed with the slow-moving character of the canals or lakes creates favorable conditions for algae growth. Algae-blooms can be harmful to the natural ecological systems, particularly within Delray Beach, and can impact human health through emitted toxins.

Green-blue algae blooms are expected to increase with climate change due to high volume precipitation events and warmer weather. The City could monitor and consider such impacts during policy development and adaptation planning.





CONSERVATION, SUSTAINABILITY, AND RESILIENCY



HEAT ISLAND EFFECT

The “heat island effect” refers to earth’s altered surface climate caused by commonly used building materials such as concrete and asphalt, which absorb the sun’s energy and releases heat. During the hot summer months, urbanized areas experience higher temperatures than rural communities because built structures and surfaces have replaced the natural vegetated landscape. The built environment takes time to cool down once the sun sets.

The United States EPA began studying the heat island effect in 1998, in the Urban Heat Island Pilot Project. The project concluded the hottest spots within a built environment are often large rooftops and the coolest areas were those covered with vegetation. There is significant potential to address the heat island affect with mitigation strategies focused on roofs, improving the City’s tree canopy coverage, and preserving existing greenspaces.

The heat island effect has negative consequences such as:

- 🌍 Increased energy consumption required for air-conditioned buildings
- 🌍 Increased air pollution
- 🌍 Negative health impacts for the public population. Those most susceptible to heat island include pregnant woman, young children, the elderly, people who work outdoors, and people with certain preexisting conditions.

- 🌍 Increased stress on City-wide natural ecosystems
- 🌍 Increased water consumption
- 🌍 Economic impact to local tourism

Communities across the nation are taking actions to reduce urban heat islands using five strategies: (1) increasing tree and vegetative cover, (2) installing green roofs, (3) installing reflective roofs, (4) using cool pavement, and (5) utilizing smart growth practices that constrain building footprint and parking spaces. United States EPA, *Heat Island Colling Strategies*.

“Green roofs” refer to roofs that have been covered with plants or host a garden. Green roofs can be expensive, but unlike reflective roofs, green roofs have the added benefit of managing stormwater runoff, which can prove useful in the rainy season in low lying areas.

Trees and plants cool the environment and are the most useful mitigation strategy for the heat island effect. The City of Delray Beach would benefit from a tree canopy analysis that would determine the number of trees within the community providing shade when viewed from above. The City can then adopt specific goals for tree canopy cover to help reduce the heat island effect and enhance the built environment.

Reflective roofs are a way to conserve energy. Specifically, a “reflective roof” or a “cool roof” is one that has been designed to reflect more sunlight and absorb less heat than a standard roof. Reflective roofs utilize some type of paint, sheet covering, or highly reflective tiles or shingles. Reflective roofs and green roofs can provide energy savings, improve indoor comfort, reduce local air temperatures, and reduce greenhouse gas emissions associated with energy consumption.

“Cool Pavement” refers to solar reflective pavements that stay cooler in the sun than traditional pavements. Like conventional dark roofs, dark pavements absorb 80-95% of sunlight, which directly warms the local air and radiates heat into the atmosphere. Cool pavement techniques are currently utilized in California, and



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

related benefits include energy savings, emission reductions, and increased comfort and health.

By conserving natural areas within the Delray Beach Planning Area and promoting cool or green roofs in building design, the City will protect human health, conserve energy, and preserve the natural environment. All new development within the Central Business District is required to use reflective roofing or rooftop plantings in order to lower the temperature of local atmosphere in the downtown area. Due to the built character of the City, strategies to reduce the heat island effect should be used in future capital improvement projects and integrated into existing development plans.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY PUBLIC OUTREACH

The conservation, sustainability, and resiliency, of Delray Beach depends on the widespread understanding of the critical relationship between resource use and environmental degradation. Public involvement is the foundation for a sustainable democracy. Delray Beach's greenhouse gas emission largely result from community activities; thus, it is imperative to encourage community buy-in to support Delray Beach's conservation, sustainability, and resiliency goals. Delray Beach can create opportunities for individuals and institutions to design, develop, and apply sustainability and resiliency practices into their lives and operations.

Information about conservation, sustainability, and resiliency can be made readily available in various formats to empower residents with knowledge regarding energy conservation, renewable energy opportunities, environmental conservation, and the steps Delray Beach's government has taken to green the local community.

Delray Beach sustainability and resiliency civic engagement will be inclusive of all members of the community, particularly neighborhoods and groups of individuals struggling with economic stability or vulnerable populations with less access to vital necessities. Public outreach strategies can include identification of socially vulnerable populations at risk from aging infrastructure or lack

of economic capacity and develop strategies that are individualized to fit the needs of those areas

In 2017, as part of the City's effort to educate residents about climate vulnerability and adaption, the Delray Beach Office of Sustainability organized the 2nd Annual King Tide presentation on green and gray shoreline strategies. Delray Beach Office of Sustainability can maintain and enhance these public outreach efforts. The City can engage in community-wide dialogue regarding flooding, sea level rise, weather-related events, and emergency management to support community-wide preparedness for climate change impacts.

In 1998, the Sandoway Discover Center opened in Delray Beach. The Sandoway Discovery Center is a coastal ecosystems and marine life center, that is open to the public. The Center presents educational exhibits and programs for locals, tourists, and visitors of all ages. The Center currently hosts field trips and offers educational outreach programs related to sea level rise, climate change, coral reefs, amphibians and birds, insects, plants and seeds, sea turtles, and reptiles. The Center represents early beach-front living, the lawn is thick with natural local beach dune vegetation.



The Sandoway House Nature Center is a historic home built in 1936, where one can experience Delray's rich history through a self-guided tour. Palm Beach County owns the property and leases it the City of Delray Beach, who in turn, subleases the property to the Friends of Sandoway Nature Center, inc. The City could coordinate with the



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

Friends of Sandoway House to create and coordinate public education programs.

As part of community outreach the City can develop a youth-component to engage young people in learning about conservation, sustainability, and resiliency, and to provide a forum for sharing their ideas about improving their environment.

The Office of Sustainability and the City's Education Coordinator have already begun reaching out to Atlantic High School, Carver Middle School, and several Elementary Schools to enrich their curriculum with sustainability concepts and provide learning opportunities for the students. These activities should continue. Delray Beach would benefit from developing long term strategic partnerships with institutions of higher learning such as Florida Atlantic University, Digital Media Arts College, Keiser University, Palm Beach Atlantic University, Nova Southeastern, Lynn University, and Palm Beach State College. Academic partnerships can yield the City a wealth of resources, students, administration, and professors can get involved with Delray Beach's sustainability and resiliency goals and assist with implementation.

SUSTAINABILITY AND CLIMATE ACTION PLAN

The purpose of creating a Delray Beach Sustainability and Climate Action Plan is to link the status quo of the City with economic health, sustainability strategies, resiliency techniques, and community support. By integrating efforts into a plan, improving the sustainability and resiliency of Delray Beach will become a transparent process allowing for dialogue between the City, community members, and business stakeholders.

Methods for promoting conservation, sustainability, and resiliency in the community should range from passive informational strategies, to active involvement with targeted community groups.

Delray Beach can foster stakeholder partnerships with the public and private sectors through informational programs, public outreach, and other initiatives. To advance sustainability goals, the City should develop a Sustainability and

Climate Action Plan that benchmarks current conditions, identifies opportunities, and measures successes.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

RECOMMENDATIONS

The Conservation, Resiliency and Sustainability Element goals, objectives, policies, performance measures, and strategies reflect the following needs and recommendations suggested by the community:

The City recognizes that collecting data related to air quality may be outside of the purview of City operations and regulatory authority, but there is an opportunity with monitoring and tracking the City's greenhouse gas emissions. Such inventorying of the City's fuel and energy use support multiple benefits such as reducing operating costs as well as reducing transportation-related greenhouse gas emissions.

Protection Air Resource Recommendations:

- Develop a greenhouse gas inventory to better link transportation and air quality improvements
- Implement City operations and assets in a manner that reduces greenhouse gas emissions, fuel use and saves the City in operating costs over time.
- Use greenhouse gas inventory to develop additional policies that reduce the City's largest sources of emissions at the City operations and community levels.

The City already has a proactive utility and programming aimed at improving water quality and water conservation for the benefit of the resource. Continuing to adapt those policies will meet growing populations' needs while protecting water quality.

The City's highest priorities should be on the development of new water supply sources, maintaining and increase water conservation, expanding the reclaimed water system, the use of landscaping, sound development principles, and elimination of septic systems.

Conserve and Protection Water Resources Recommendations:

- The City should improve data collection to identify and reduce water quality impacts to improve water resources for recreation, swimming and environmental benefits.
- The City will have to continue to monitor for water resource indicators that may start to reflect the impacts of climate change such as increase chlorides in wells.
- The City should continue aggressive water conservation efforts and development of new regional water supply resources.
- Continuing to partner on water quality, monitoring and water resource improvement should be a priority for the City for important water bodies such as Lake Ida.

Even though the City does not have extractive industries related to mineral or soils, erosion of beaches and shorelines may be an increasing problem in the future for the City. The City must continue to promote the conversion of older septic systems to centralized service.

Conserve and Protect Minerals and Soils Recommendations:

- Converting septic systems to centralized wastewater should continue to be a goal of the City's infrastructure programming.
- Utilizing strong principles of streetscaping and shoreline protection should be a priority to protecting mineral and soil resources.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

While the City is a predominantly built and will grow largely through redevelopment, opportunities still remain to protect existing habit and species. A continued emphasis on participation in data collection is needed to share information related to sea turtles (and nesting), natural areas that may be owned or maintained by the City or County and other important natural systems such as wetlands. Enforcement of existing policies to not allow such habitats to be impacted will be critical.

Protect Land for the Benefit of Habitat and Species Recommendations:

- 🌱 The City should promote and enforce policies that manage and eliminate exotic vegetation and species and focus on protecting and increasing native habitats and shorelines.
- 🌱 The City should continue to protect critically designated conservation, recreation and open space properties for the benefit of the habitat and species that rely upon them.
- 🌱 The City should develop funds to maintain specially designed properties to keep them in a natural state and avoid habitat transitions or exotic infestation.
- 🌱 The City should protect key wetlands habitat and continue to require wetlands preservation and enhancement for public and private lands.
- 🌱 Regional collaboration with the County or other municipalities shall continue to be a focus to protect extra-jurisdictional natural resources.

More and more local governments are recognizing the relationships between energy use as a mitigation strategy for addressing climate change. Generally, these policies should begin with the City leading by example in terms of increasing the energy efficiency and renewable energy opportunities within its own facilities and operations.

Promote Energy Efficiency and Diversify the Energy Mix Recommendations:

- 🌱 Energy efficiency and renewable energy shall be new priorities for the City in terms of facilitating more projects on City infrastructure, assets and buildings as well as private property installations.
- 🌱 The City should commit to building its own assets to the most energy efficient standards possible to save costs on future asset operations.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

A key component of sustainable waste management, urban agriculture and food and food waste programming is education and outreach to the community coupled with partnerships for the key influencers of waste management including the business community and the actual waste hauler. The City has already launched numerous sustainability initiatives related to recycling and materials management. Because the business community is a larger producer of waste, it will be important to work with them to increase beneficial reuse and recycling of all types of materials. The City should seek opportunities to enhance these opportunities through building stronger relationships with the business community, Chamber of Commerce and the City's contracted waste hauler.

The City has already been developing recommendations on sustainable practices for quite some time. The challenge has been that there is currently no cohesive planning document inventorying the sustainable practices the City already undertakes in terms of sustainability and climate that integrates across the City for implementation. The City should utilize the infrastructure it has already created through the Green Implementation Advancement Board and expand its effort into a framework for implementation. By assessing the effectiveness of current work to date, and adding an actual strategy that incorporates the principles of the triple bottom line, the planning process can be equitably implemented and focus on economic, social and environmental factors together

Support Sustainable City Operations and Practices that Increase the Triple Bottom Line Recommendations:

- 🌱 The City should create a baseline of existing sustainability practices and identify opportunities to improve those through development of a Sustainability and Climate Plan.
- 🌱 Outreach and education opportunities are critical for residents and business owners to see sustainability initiatives in practice to improve the cultural identification with green initiatives.
- 🌱 A priority shall be to increase facilitating sustainability strategies that will promote green businesses and the green economy.

Support Sustainable Waste Management, Urban Agriculture and Food Programs Recommendations:

- 🌱 Water management programs in partnership with the City's waste hauler and the County's Solid Waste Authority should focus on more innovation in recycling and repurposing materials.
- 🌱 Engagement of commercial businesses, particularly the restaurant industry, should be a priority to increase opportunities for composting and recycling.
- 🌱 Education and outreach to residents and business owners is an important goal to improve recycling, composting and increasing urban agriculture.
- 🌱 The City can and should facilitate opportunities for residents to participate in community gardens and individual urban agriculture.



CONSERVATION, SUSTAINABILITY, AND RESILIENCY

Community resiliency will continue to, and increasingly, impact the City in the future due to the impacts of climate change. The City has already begun to assess infrastructure impacts and proactively begun to incorporate sea level rise into assessments related to seawalls and stormwater. But the work must continue and become an ongoing philosophy in terms of basis for current and future planning and infrastructure decisions.

Increase Citywide Resiliency to Sea Level Rise and Weather-Related Events Equitably for all City Residents Recommendations:

- 🌍 Data collection is critical for the City's resiliency strategies and the City must invest in accurate data to make informed planning decisions about future flood risk.
- 🌍 The City must make climate adaptation and sea level planning a cornerstone of all planning efforts for infrastructure, habitat and development.
- 🌍 Harmonizing current efforts, such as seawall vulnerability and stormwater management planning, should serve as a foundation for creation of a City Sustainability and Climate Plan.
- 🌍 Green infrastructure projects should be increased to passively manage precipitation, flooding and water resource recovery.
- 🌍 Reducing vulnerability must be a key goal of capital planning projects.
- 🌍 The City should continue its partnerships and involvement in regional and micro-regional planning efforts to exchange information and learn about successful climate planning case studies for projects and programs.

The City must actively link and integrate infrastructure planning, emergency management and the future impacts of climate and sea level rise to become a more resilient community. The City already has strong emergency planning approaches for hurricane evacuation that will only be exacerbated by sea level rise and impacted infrastructure. Linking project development, such as through the Local Mitigation Strategy. It is through these efforts that the City must "harden" its infrastructure and assets and support residents' and business' efforts to do the same

Emergency Preparedness Recommendations:

- 🌍 Emergency planning shall be coordinated among departments citywide and in conjunction with County efforts.
- 🌍 The City must calibrate emergency management planning with future flood risk and capital improvements shall consider these impacts.
- 🌍 Education and outreach regarding individual preparedness and business continuity are critical to reducing recovery intervals and the City shall link such efforts with its floodplain management programming.



DEFINITIONS

"ADAPTATION ACTION AREA" OR "ADAPTATION AREA"

An optional comprehensive plan designation for areas that experience coastal flooding and are vulnerable to the related impacts of rising sea levels for the purpose of prioritizing funding for infrastructure needs and adaptation planning.

CLIMATE CHANGE

A broad range of global phenomena created predominantly by burning fossil fuels, which add heat-trapping gases to Earth's atmosphere (Source: NASA.gov).

CONSERVATION

Policy and practice that acknowledges that some resources are finite, and should be preserved.

GREENHOUSE GAS

Gases that trap heat in the atmosphere are called greenhouse gases, which include carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O), and fluorinated gases.

GROUNDWATER

Water in the soil, pores, or fractures in rocks beneath the surface of the ground.

MULTI-MODAL TRANSPORTATION

Transportation systems that accommodate all modes of transportation (bicycle, pedestrian, transit, and private automobiles).

RESILIENCY

Resilience refers to the capacity of systems to recover quickly after adverse situations such as disruptions or disasters, and the strengthening of systems to prepare for shocks, absorb impact, and recover from, and adapt to both persistent threats or single events.

SURFACE WATER

Water on the surface of land, such as rivers, lakes, or wetlands.

SUSTAINABILITY

Policy and practice that addresses the interdependence of environmental, social, and economic systems through management of

resources to maintain their availability for future generations.

SUSTAINABLE ACTIONS

Behavior that conserves, maintains, supports, and enhances the environmental, economic, and social systems.

SUSTAINABLE DEVELOPMENT

Development which meets the needs of the present without compromising the ability to meet the needs of future generations.

WETLANDS

Areas where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season. Water saturation (hydrology) largely determines how the soil develops and the types of plant and animal communities living in and on the soil. Wetlands may support both aquatic and terrestrial species. The prolonged presence of water creates conditions that favor the growth of specially adapted plants (hydrophytes) and promote the development of characteristic wetland (hydric) soils (Source: EPA.gov).