

AGENDA

Planning and Zoning Board



Comprehensive Plan Citizen Board Workshop
City of St. Augustine, Florida

Tuesday, May 21, 2019
9:00 am - 12:00 pm

Alcazar Room
City Hall

-
1. **Roll Call**
 2. **General Public Comments for Items Not on the Agenda**
 3. **Introduction and Discussion Related to Mobility Planning and Transportation Issues**
 - Presentation by Jonathan Paul, Consultant with NUE URBAN CONCEPTS on creating an integrated Mobility Plan.
 4. **Discussion and Public Comment Related to the Draft Conservation and Coastal Management Element of the Comprehensive Plan including Draft Goals, Objectives and Policies**
 - Introduction to the Conservation and Coastal Management Element
 - Key Issues and Assumptions
 - Introduction of Goals, Objectives and Policies
 5. **Discussion and Public Comment Related to the Draft Recreation and Open Space Element of the Comprehensive Plan including Draft Goals, Objectives and Policies**
 - Introduction to the Recreation and Open Space Element
 - Key Issues and Assumptions
 - Introduction of Goals, Objectives and Policies

6. Adjournment

Notices: In accordance with Florida Statute 286.0105: "If any person decides to appeal any decision made by the Planning and Zoning Board with respect to any matter considered at this scheduled meeting or hearing, the person will need a record of the proceedings, and for such purpose the person may need to ensure that a verbatim record of the proceedings is made, which record includes the testimony and evidence upon which the appeal is to be based."

In accordance with the Americans with Disabilities Act, persons needing a special accommodation to participate in this proceeding should contact the individual or agency sending notice not later than seven days prior to the proceeding at the address given on the notice. Telephone: (904) 825-1007; 1-800-955-8771 (TDD) or 1-800-955-8770 (V), via Florida Relay Service.

CITY OF ST. AUGUSTINE

MEMORANDUM

TO: Planning and Zoning Board

DATE: May 21, 2019

RE: **Item 3**
Introduction and Discussion Related to Mobility Planning and Transportation Issues

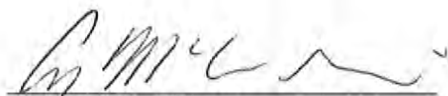
The City of St. Augustine is required to create a Mobility Plan. A Mobility Plan is one of the required updates for our Comprehensive Plan 2040 by Florida Statutes.

In 2011 the City was given the option to eliminate the traditional “concurrency” system of keeping track of traffic and development roadway impacts. The concurrency system was typically oriented towards widening roads or building new roads to accommodate more traffic. The elimination of concurrency made sense for the City because of the severe limitations on “improving” (i.e., widening) the roadways both because of the built environment and the natural environment adjacent to our major thoroughfares (US Highway 1, King Street, San Marco Avenue for example).

This is part of balancing priorities and overall goals. Because preservation, and maintaining the scale and character of St. Augustine are also important goals it is not realistic for St. Augustine to tear down buildings in order to widen roads. The State FDOT is also starting to recognize that there needs to be other mobility options for areas that have a more urban context.

This item for the Workshop is intended to introduce the PZB and the public, to Jonathan Paul with NUE Urban Concepts, LLC, the City’s mobility consultant, and to begin the conversation related to Mobility Planning for St. Augustine. This is the first of four (4) Workshops related to transportation and mobility and the Comprehensive Plan 2040 update. Mobility Planning has the ability to look at transportation and mobility as part of establishing a broad perspective on the direction of moving people, commerce, and quality of life into the future.

If you have any questions or require additional information please contact myself or David Birchim at our office by calling (904) 825-1065 or by email at either askinner@citystaug.com or dbirchim@citystaug.com.



Amy McClure Skinner
Deputy Director

NUE URBAN CONCEPTS



Creatively Integrating Mobility & Land Use

www.nueurbanconcepts.com

City of St. Augustine Draft Mobility Plan

May 21st, 2019

Presented by:
Jonathan B. Paul, AICP, MA²

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Jonathan B. Paul, AICP

- Principal, NUE Urban Concepts, LLC
- Over 20 years of land use, transportation & impact fee experience.
- Served as Concurrency & Impact Fee Manager for Alachua County & Interim Transportation Planning Director for Sarasota County.
- Created the 1st Mobility Plan and Mobility Fee in Florida
- Lead Planner for the Celebration Pointe Transit Oriented Development
- Completed Mobility Plans & Fees: Alachua, Sarasota & Osceola Counties
Cities of Altamonte Springs, Maitland & Venice
- Mobility Plans & Fees Underway: Cities of Miami Beach, West Palm Beach, Palm Beach Gardens, Tallahassee, DeBary, Bradenton, Delray Beach, Walton County & Leon County

NUE URBAN CONCEPTS



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Insightful Perspective

“We decided to **build around the car**, so traffic is what we got. We also made **driving the easy choice**, providing ample parking and building fast-moving streets. This is the same choice every town in the Sunbelt made, and many of them are now experiencing the same problems we are.”

Adie Tomer - Brookings
Sarasota Magazine



Congestion Problem or Prosperity?

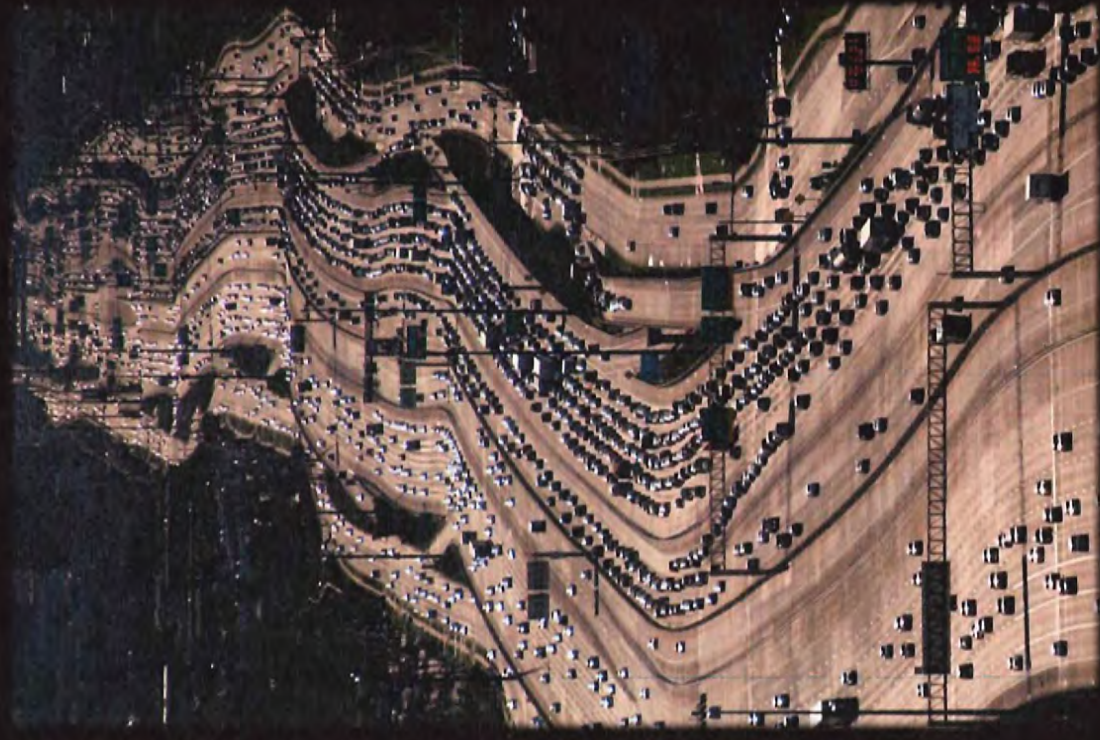
“Peak-hour congestion is the **balancing mechanism** that makes it possible for Americans to pursue goals they value, such as working while others do, living in low-density settlements, and **having many choices of places to live and work.**”

Anthony Downs
Stuck in Traffic

SR 54 & US 41 Pasco County, Florida

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Can a community build its way out of Congestion?

Katy Freeway – Houston TX

26 Lanes Wide

12 main lanes

8 feeder lanes

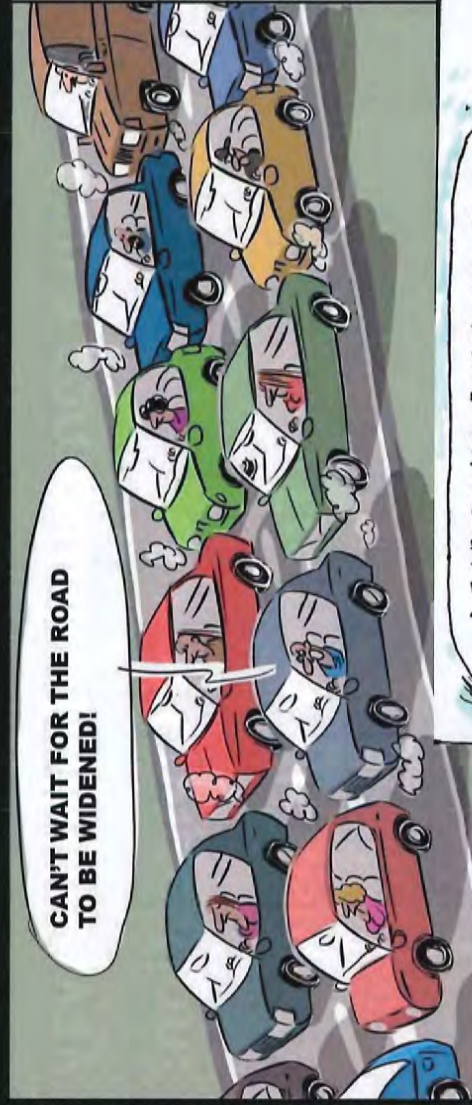
6 managed lanes

Result:

Slower Travel Speed

Greater Delay

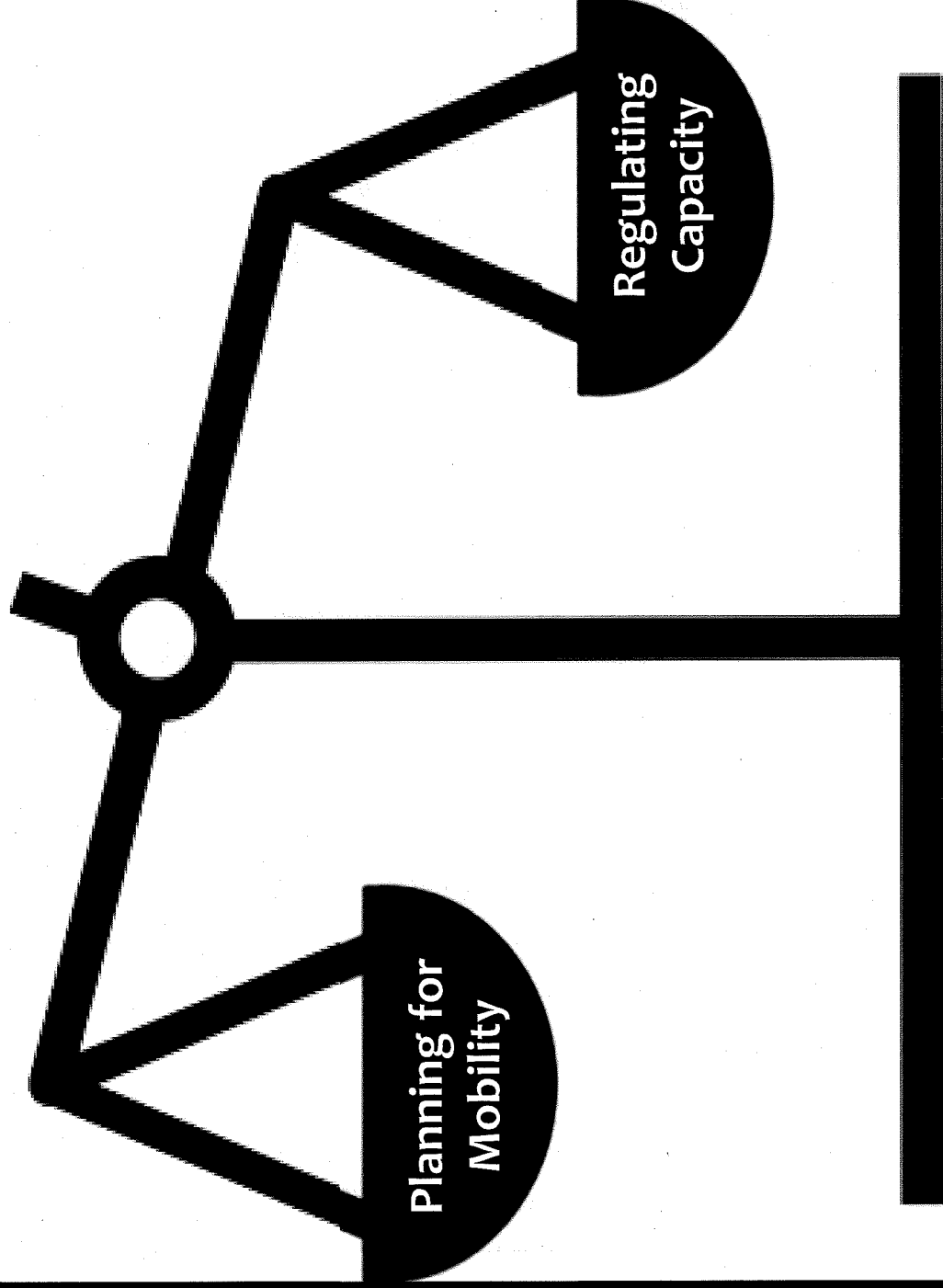
Increase in Crashes



Induced Demand

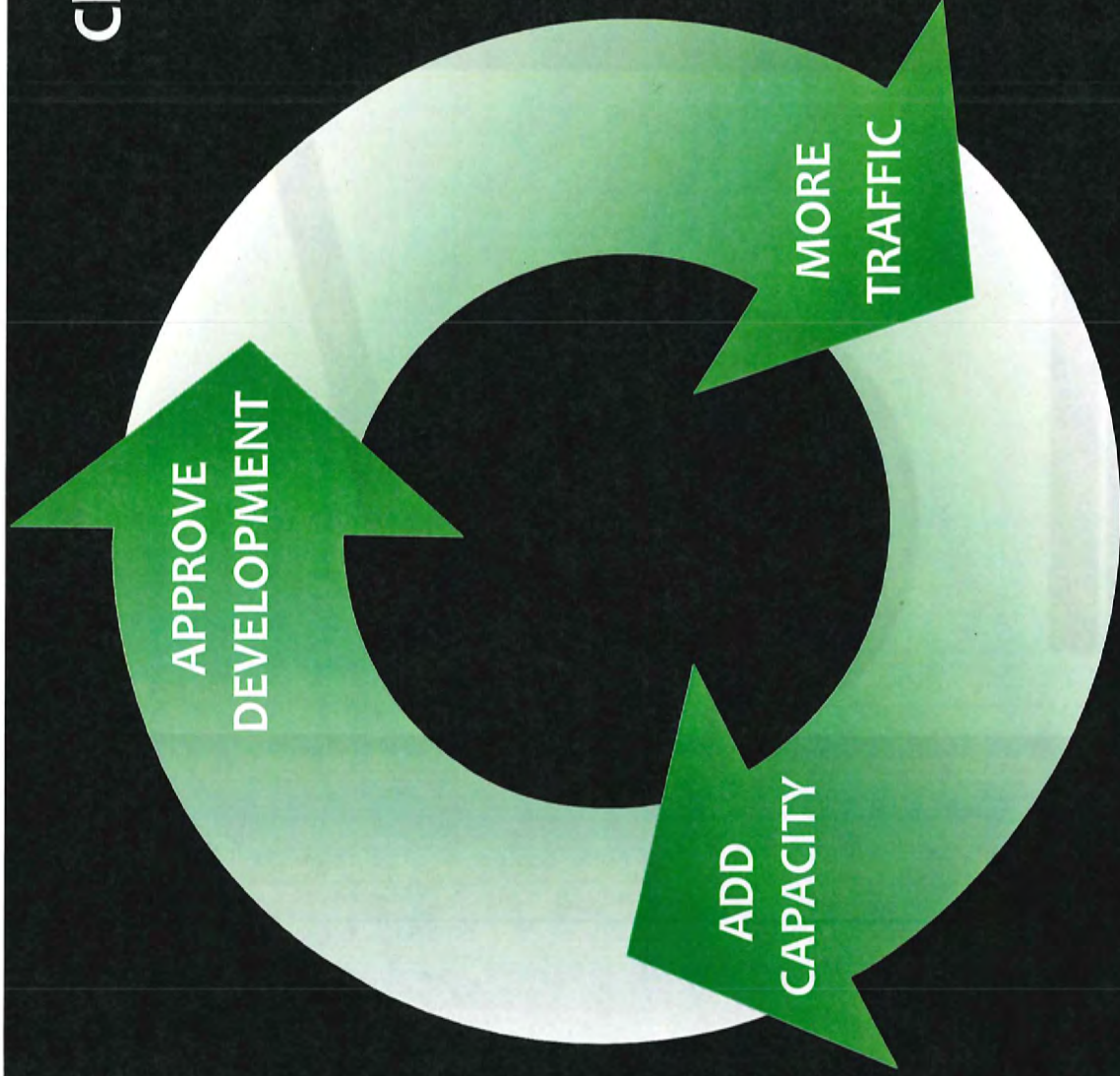
“on urban commuter expressways, peak-hour traffic congestion rises to meet maximum capacity” – Downs Stuck in Traffic





Transportation
Concurrency

Chasing Road Capacity



Ever Evolving Transportation Concurrency

- 2005: Proportionate Share
Multimodal Transportation District
- 2007: Urban Service Area
Proportionate Fair-Share
- 2009: Dense Urban Land Area
Mobility Fee
Proportionate Fair Share Tightened
- 2011: Concurrency Optional
Eliminate Dept. Community Affairs
Impact Fee Credit
- 2013: Alternative Concurrency System
Proportionate Share Restricted
Deficient Road Exclusion



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What happens when a community no longer plans to widen roads?



VS



What about prioritizing **SAFETY** over **SPEED**?



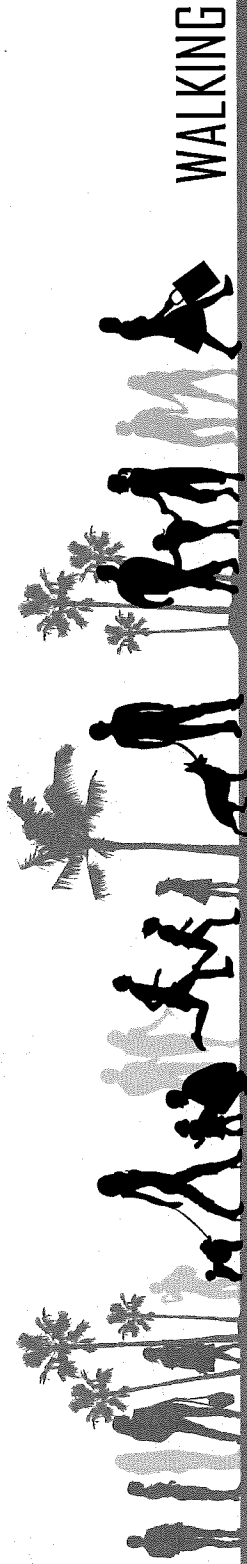


& Plan for Mobility

Move towards



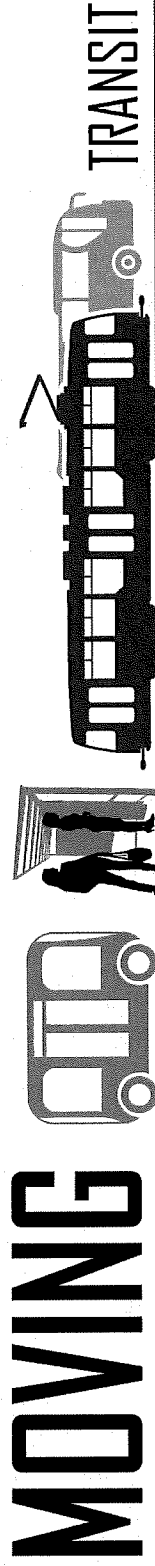
21st Century Transport



WALKING



BICYCLING



TRANSIT

PEOPLE

MICRO MOBILITY &
LOW SPEED VEHICLE



PROVIDING CHOICES

SHARING



MOTOR VEHICLE



NUE URBAN CONCEPTS
Land Use - Transportation - Parking - Impact & Mobility Fees - Traffic - Funding

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MOBILITY DEFINITIONS

MOBILITY

Ability to move PEOPLE from place (**origin**) to place (**destination**) by multiple modes (**walk, bike, transit, vehicle**) of travel in a timely (**speed**) manner

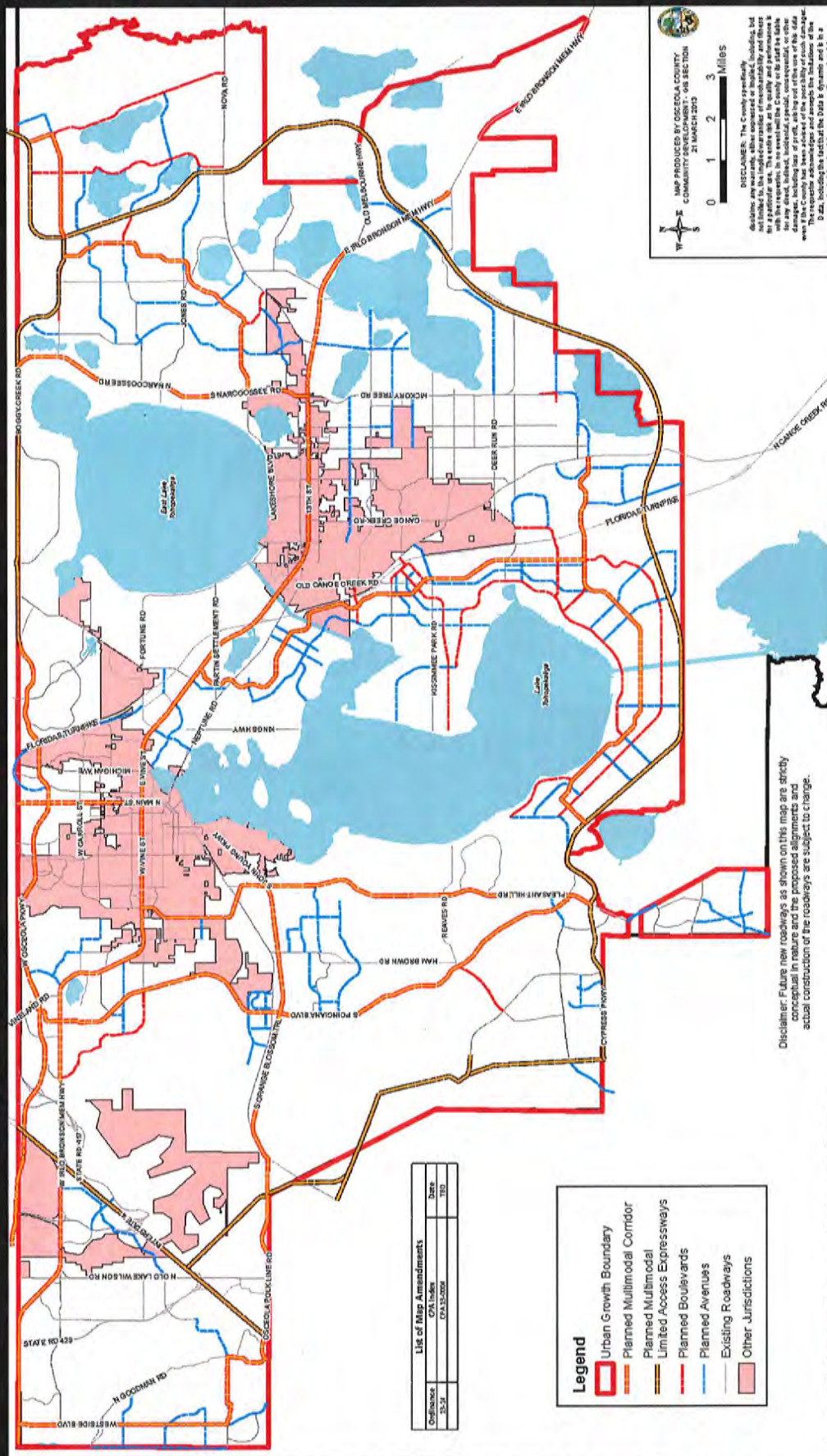
ACCESSIBILITY

Ease at which PEOPLE reach, enter and use modes (**walk, bike, transit, vehicle**) of travel and the ease at which they reach and enter their destination

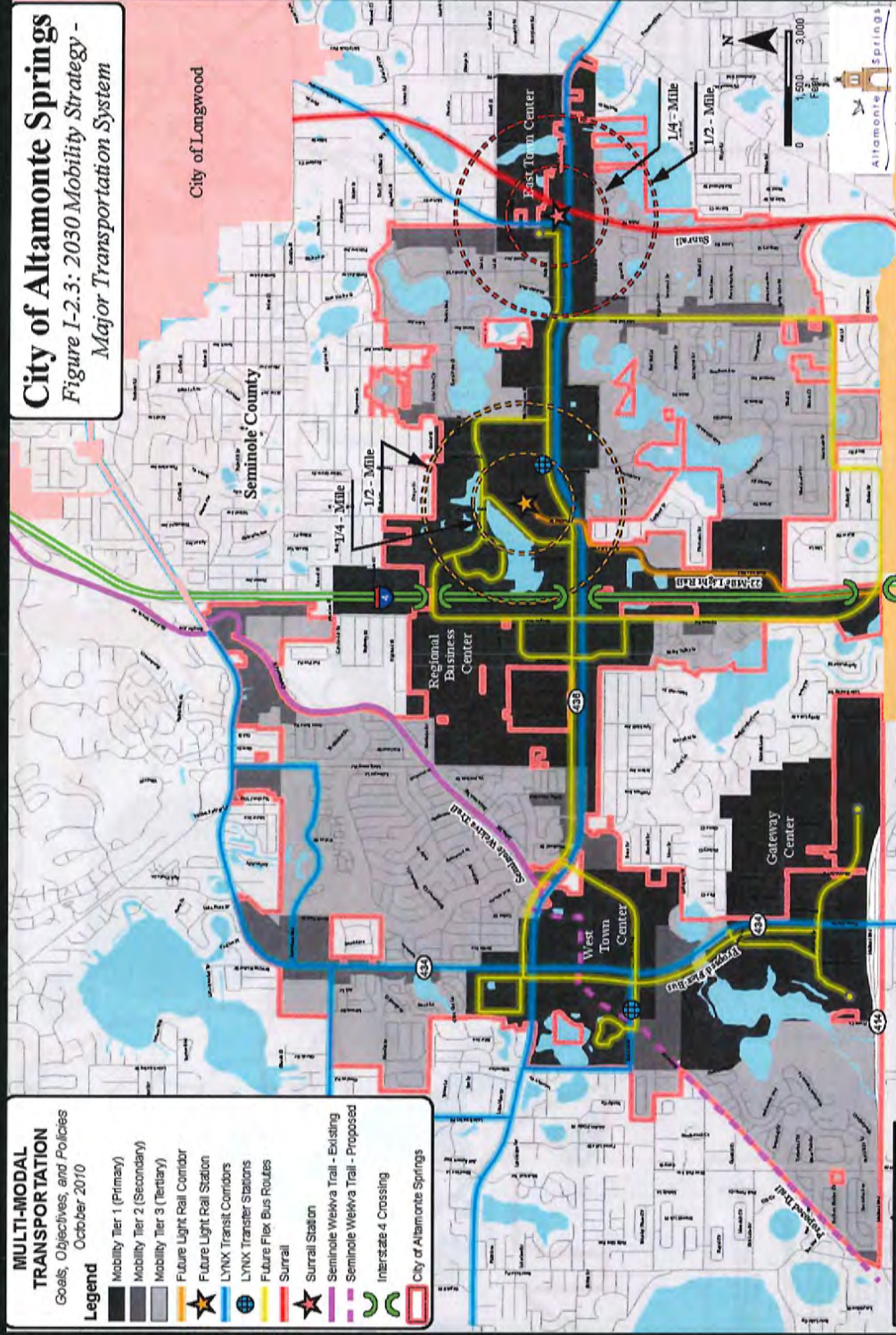
CONNECTIVITY

Number of route options PEOPLE have to move from place to place and the directness (**distance**) of those route options to reach their destination. A gridded network of streets provides a high level of connectivity, whereas cul-de-sacs & freeways do not

Mobility Plan – Osceola County



Mobility Plan - Altamonte Springs



Mobility Plan Corridors - North Mobility Fee District

Mobility Plan Sarasota County



Map published using ArcGIS 10.1 by Sarosha on Thursday, August 13, 2015

This map is provided for informational purposes only. The County does not warrant, guarantee, or represent the accuracy of the information contained herein. This map should not be used as a guide for navigation.

District lines are for illustration purposes only. The Mobility Fee District Map defines District boundaries.

Sarasota County
August 13, 2015



Springhills developers are suing county

The developers of Springhills filed suit late Thursday afternoon against Alachua County, alleging that meetings were held in violation of Florida's open meeting laws and that the county tried to get the developers to pay for more road improvements...

Published June 22, 2007

<http://www.gainesville.com/article/20070622/LOCAL/706220336/0/search>

County rejects Springhills changes

CINDY SWIRKO

Sun staff writer

Published: Friday, May 4, 2007 at 6:04 a.m.

Proposed changes to the Springhills development were unanimously denied by the Alachua County Commission Thursday night, capping for the time-being several years of negotiations and debate that have in recent weeks become especially contentious.

The commission held another marathon

meeting in which last-minute offers were presented and squabbling broke out between commissioners and Springhills attorney Patrice Boyes.



Thursday's meeting was a continuation of a Tuesday public hearing attended by about 1,200 residents at which presentations were given by the county's Growth Management Department and the Springhills developer, the Pennsylvania Real Estate Investment Trust.

Genesis for 1st Mobility Plan

Vote Yes 4 FLORIDA HOMETOWN DEMOCRACY

Our Homes, Our Community, Our Vote

Residents unite against increased traffic



BY CINDY SWIRKO
Sun staff writer

Published: Monday, January 22, 2007 at 6:01 a.m.

Last Modified: Sunday, January 21, 2007 at 11:25 p.m.

The traffic tipping point may have been reached in Alachua County with two recently formed groups vowing to exert political or legal muscle to curb developments that will add more cars to several area roads.

Newberry Village debate a preview of constitutional amendment battle
A proposal to let voters decide if regulatory changes should be made to allow a mixed-use development on Newberry Road will be considered by the Alachua County Commission Tuesday.

Published May 21, 2007

<http://www.gainesville.com/article/20070521/LOCAL/705210316/>

Public vote proposed on Newberry Village
An opponent of the proposed Newberry Village mix of homes and shops submitted a formal settlement offer Monday in which he agreed to drop his legal action if the county lets voters decide if the project should be approved.

Published February 20, 2007

<http://www.gainesville.com/article/20070220/LOCAL/702200324/>

Residents unite against increased traffic
The traffic tipping point may have been reached in Alachua County with two recently formed groups vowing to exert political or legal muscle to curb developments that will add more cars to several area roads.

Published May 21, 2007

<http://www.gainesville.com/article/20070521/LOCAL/705210316/>

Regulating area retail a tough balancing act
As Tracy Peterson and Lurel Penjujan of Gainesville strolled through the Old Mill a week before Christmas, they had a wish — for more stores in Gainesville.

Published December 20, 2006

<http://www.gainesville.com/article/20061220/LOCAL/612200311/>

Two proposed developments spurred the formation of the citizen groups: Newberry Village prompted Save Newberry Road, while Springhills led to the Coalition for Responsible Growth.

Resident Brad Stith is co-president of Save Newberry Road and has filed legal action against a comprehensive plan amendment and other regulatory action taken by the County Commission that would enable Newberry Village to move forward. Bill Wrighton is also co-president.

Florida's 1st Mobility Plan & Fee - Alachua County

Mobility

ALACHUA COUNTY'S PLAN TO EFFECTIVELY LINK LAND USE AND TRANSPORTATION

Overview
Alachua County is preparing amendments to its Comprehensive Plan which propose to reduce vehicle miles travelled and greenhouse gas emissions per capita by providing for enhanced transportation mobility options in conjunction with land use changes that bring services closer to residents and provide for development densities and characteristics that are transit appropriate.

Key features of this plan include:

- 1) An alternative concurrency management system that will enable new development to satisfy its transportation concurrency obligations through the payment of a multimodal transportation fee.
- 2) Provisions and incentives for Transit Oriented Developments and Traditional Neighborhood Developments that will facilitate a reduction in vehicle miles travelled per capita.
- 3) A financially feasible multimodal infrastructure plan to accommodate future growth and transportation demands within the Urban Cluster Boundary in an fiscally efficient and ecologically responsible way.

EXISTING & FUTURE BICYCLE & PEDESTRIAN NETWORK

LAND USE: THE COMMUNITY OUR CHILDREN WILL INHERIT

Urban Cluster
Alachua County identified an Urban Cluster Boundary in its Comprehensive Plan. Urban densities are only provided for inside the urban cluster boundary and outside municipal boundaries.

Traditional Neighborhood Development (TND)
The Mobility Plan encourages development that is walkable and bikeable, a mix of commercial, residential, office and civic uses.

Transit Oriented Development (TOD)
The Mobility Plan encourages a higher density focal point for transit. They also will be able to serve residents in outlying areas, parking, getting a cup of coffee, back to your vehicle, picking up groceries into village centers, and finding home for dinner.

POTENTIAL TRANSIT ORIENTED DEVELOPMENT

TRANSPORTATION: GETTING FROM HERE TO THERE

Express Transit Service
The Mobility Plan encourages Express Transit Service from the edges of the Urban Cluster to Uplands and Downtown Gainesville. Proposed express transit routes serving commuting trips from East Gainesville, Southwest Gainesville, downtown Gainesville, and the University of Florida.

Rapid Transit Service
The Mobility Plan proposes a rapid transit system referred to as "Rapid Transit". The primary feature of this system is buses running in dedicated lanes in the Urban Cluster. The system will be developed in conjunction with TODs and as density increases within the Urban Cluster.

Interconnected Roadway Network
The Mobility Plan proposes to continue the development of the roadway network and to address the bottlenecks crossing Interstate-75.

Bicycle and Pedestrian Connectivity
The Mobility Plan proposes a connected bicycle and pedestrian network with new on-street bicycle lanes, sidewalks, and trails. These features will connect existing and future residential development to TODs, TNDs and Activity Centers.

EXPRESS TRANSIT CORRIDORS

RAPID TRANSIT CORRIDORS

TRANSPORTATION MOBILITY AREAS

SUSTAINABILITY: THE HOW AND WHY OF MOBILITY CHOICES

Mixed Use
The Mobility Plan provides for commercial, office, civic and institutional uses within walking and biking distance to residents by providing incentives for mixed-use development.

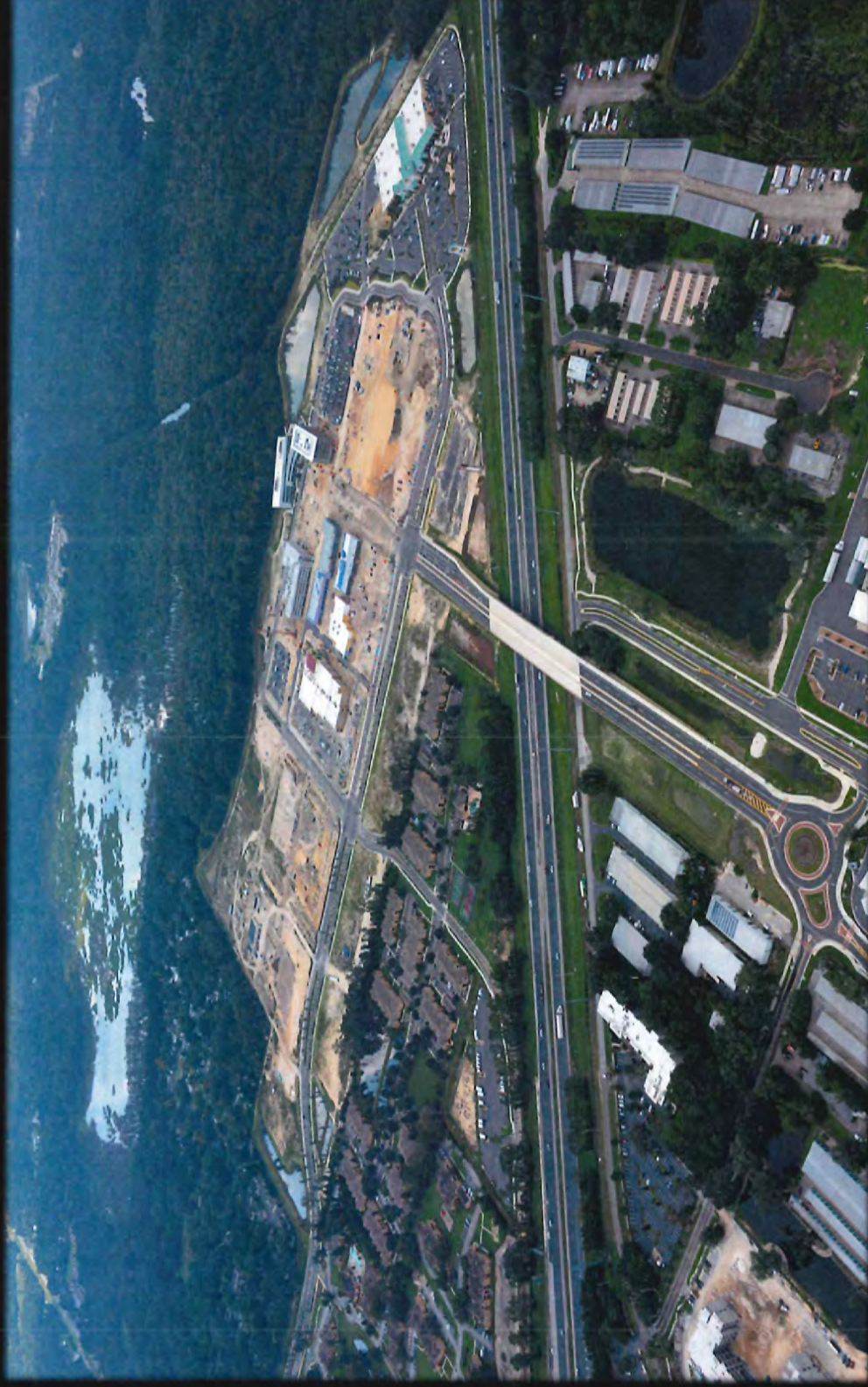
Energy Efficiency
The Mobility Plan is consistent with the County's recommendations regarding land use and transportation. The plan focuses on alternative modes of transportation and compact development to reduce energy consumption and dependence on foreign-sourced fossil fuels.

Greenhouse Gases
Per capita greenhouse gas emissions of any motorized transportation mode. Bicycle and pedestrian modes are virtually greenhouse gas free.

Reduced Fiscal Impacts
The Mobility Plan provides a fiscally responsible approach to transportation. The County is able to reduce future infrastructure construction and maintenance costs. The Plan focuses on the existing Urban Cluster and encourages development within the County's Urban Cluster Boundary to reduce the need for future infrastructure.

MOBILITY CHOICES

Celebration Pointe Transit Oriented Development



Dedicated Transit Lane - New Overpass & Complete Streets





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SHARED MOBILITY

LOW SPEED VEHICLE (LSV)

Hoverboards



Segways



Micromobility

e-scooter



e-skateboard



UniCycle



OneWheel



The Next Generation of Bicycles



Copenhagen Wheel

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E-Bike

Bike Sharing



Car Sharing



e-scooter share



Car pool



Shared Mobility

Ride Hailing



Golf Carts & Low Speed Vehicles



Commuter & High Speed Rail



Water Taxi & Ferry



Gondolas (Aerial Trams)



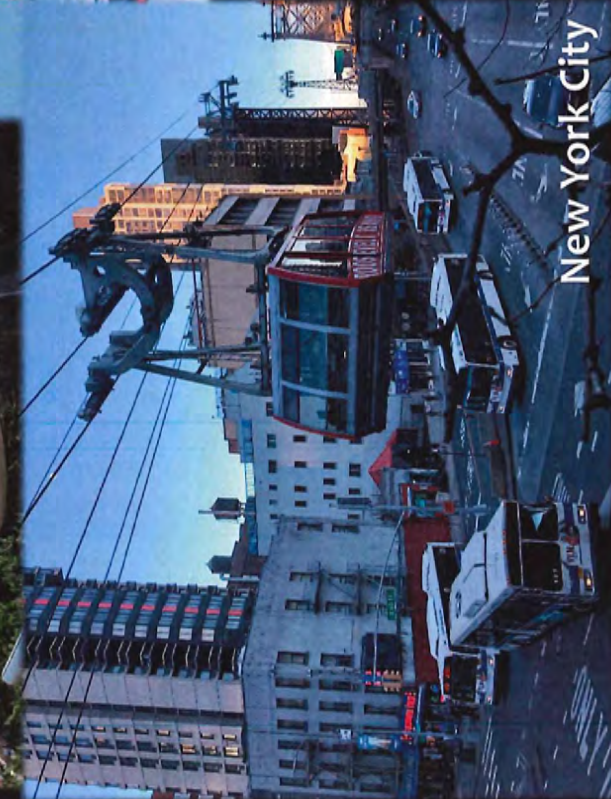
Portland



La Paz (Bolivia)



London



New York City

Autonomous Vehicles & Autonomus Transit



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21st Century Mobility



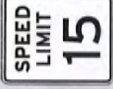
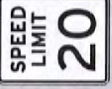
The draft St. Augustine Mobility Plan is focused on making it safer and more convenient for people to walk and bicycle and to use innovative approaches to create a park once environment within the multimodal district and reduce the impact of non-resident traffic on residential streets.

CONCEPTUAL

Vision Zero (Concept Speed Limits)

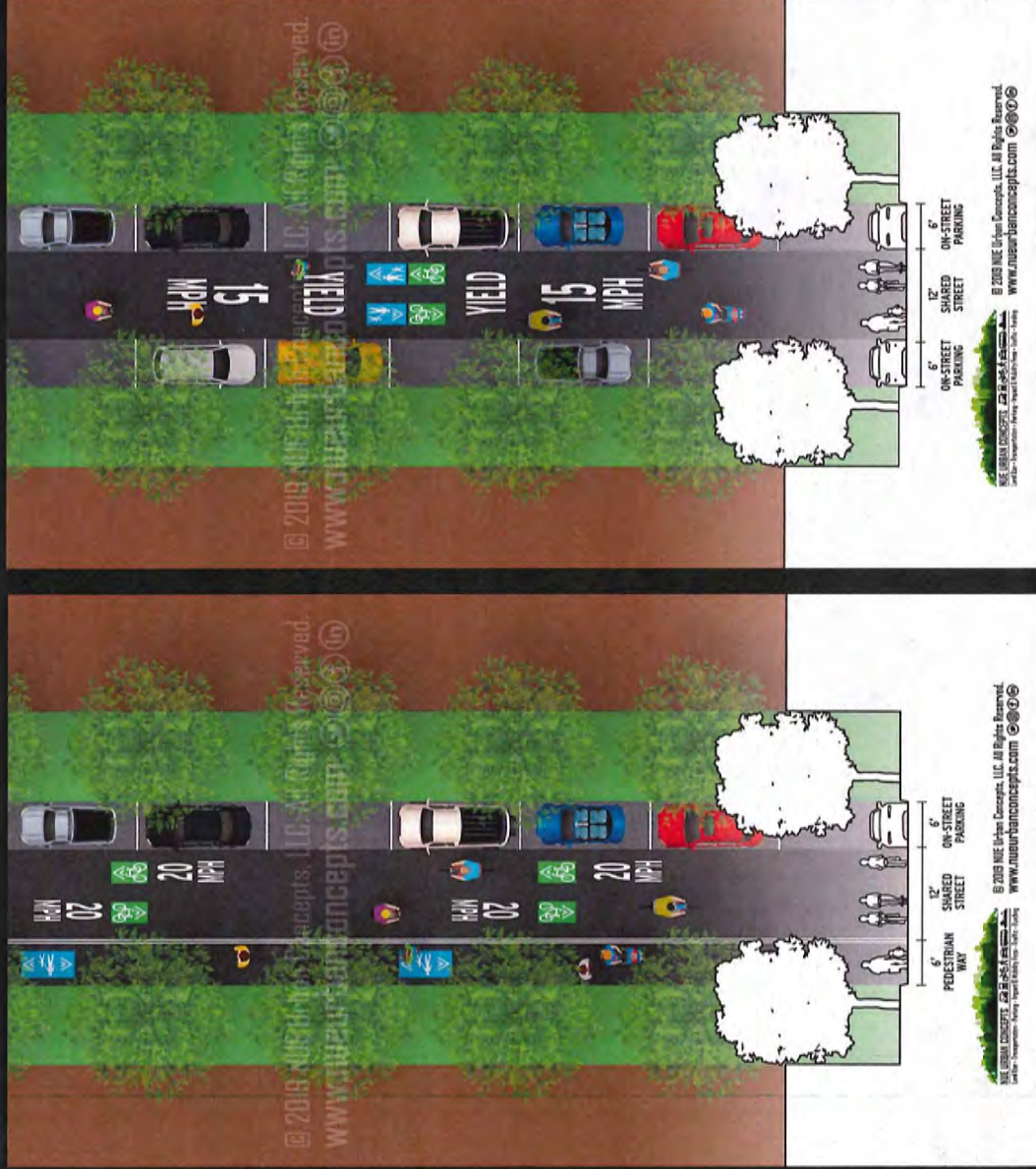
VISION ZERO SPEED LIMITS

CITY OF ST. AUGUSTINE

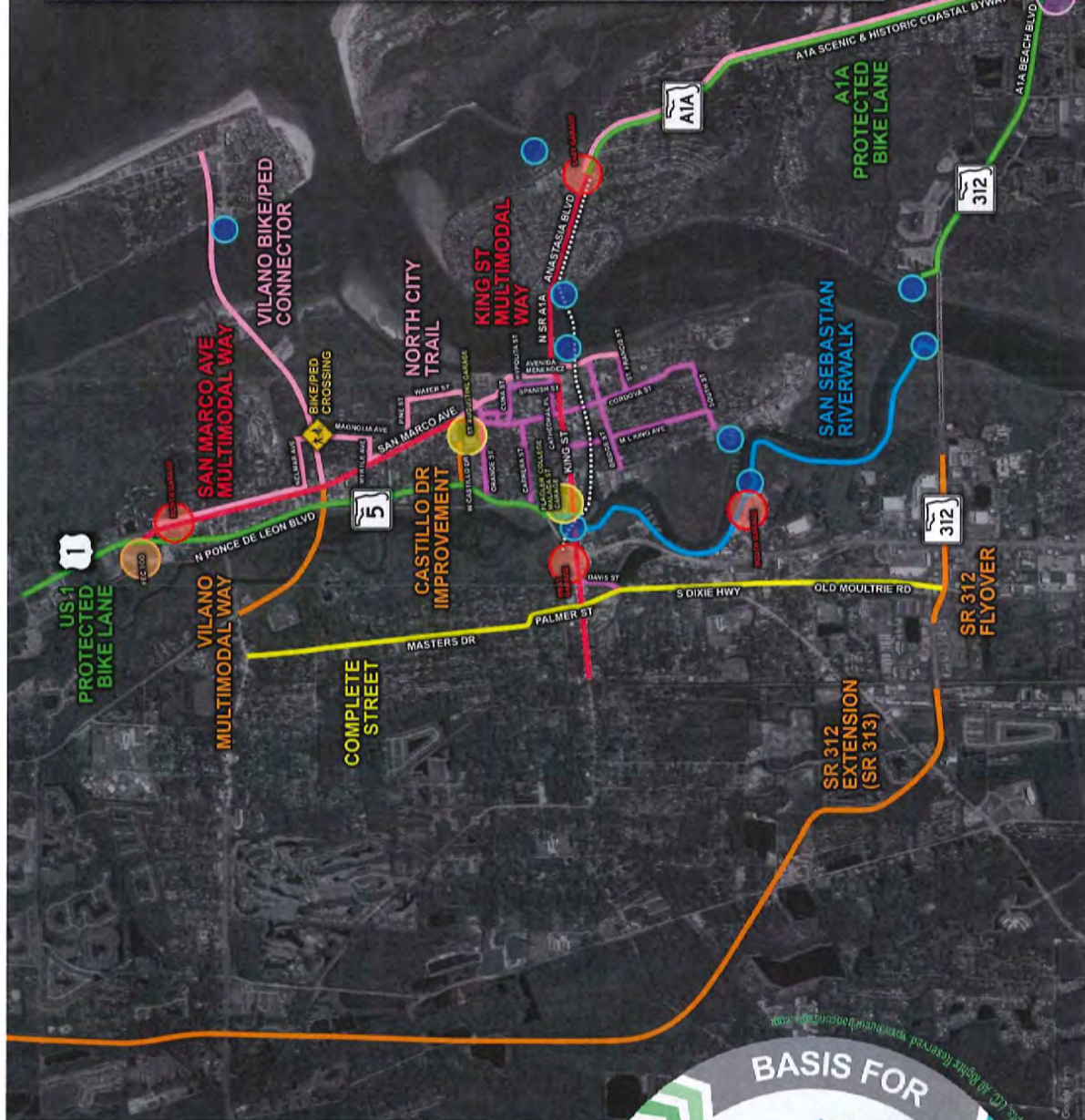
Europe (kph)	U.S. (mph)	Applicable Locations	Europe (kph)	U.S. (mph)	Applicable Locations
		Main Streets City Centres Square/Plaza/Promenade(s)			Residential Streets Main Streets
	  	Woonerf (pl. woonerven) Living/Shared Streets Alleyways Residential Streets			Residential Streets Main Streets Collectors
					Major Collectors Minor Arterials
					Principal Arterials

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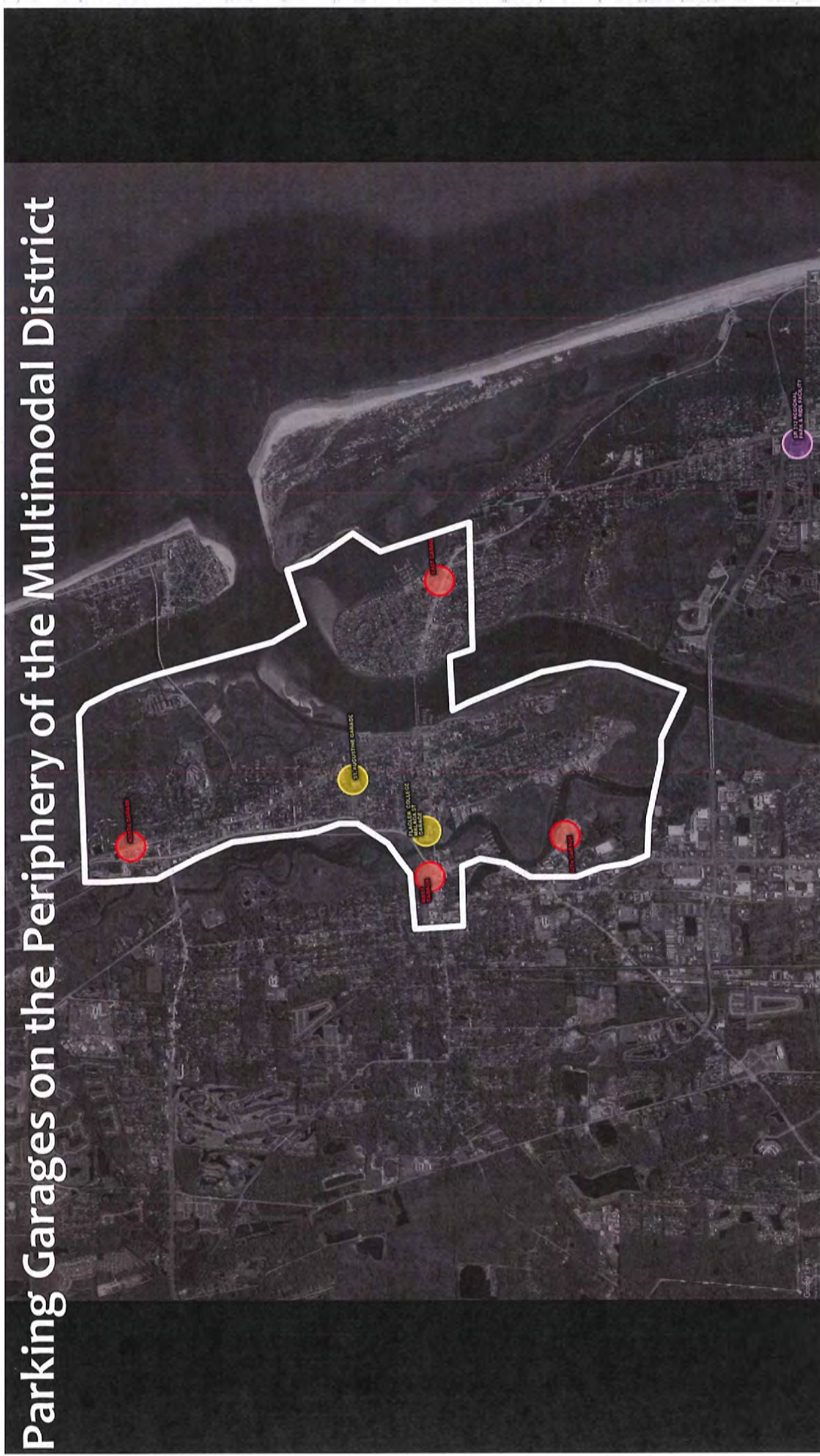
Vision Zero & Residential Streets



Draft 2040 Mobility Plan



Parking Garages on the Periphery of the Multimodal District



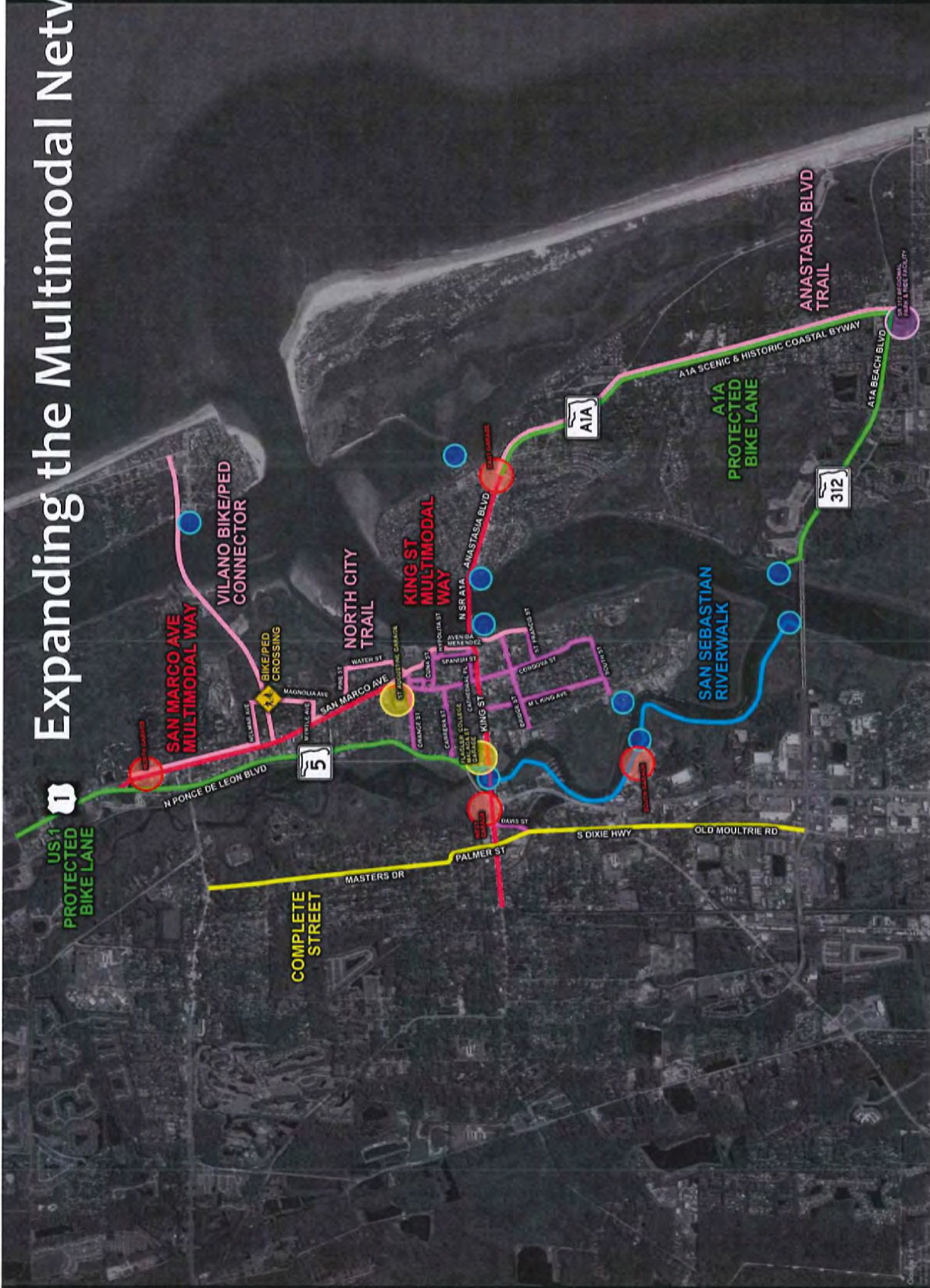
Connecting Parking Structures through Multimodal Streets



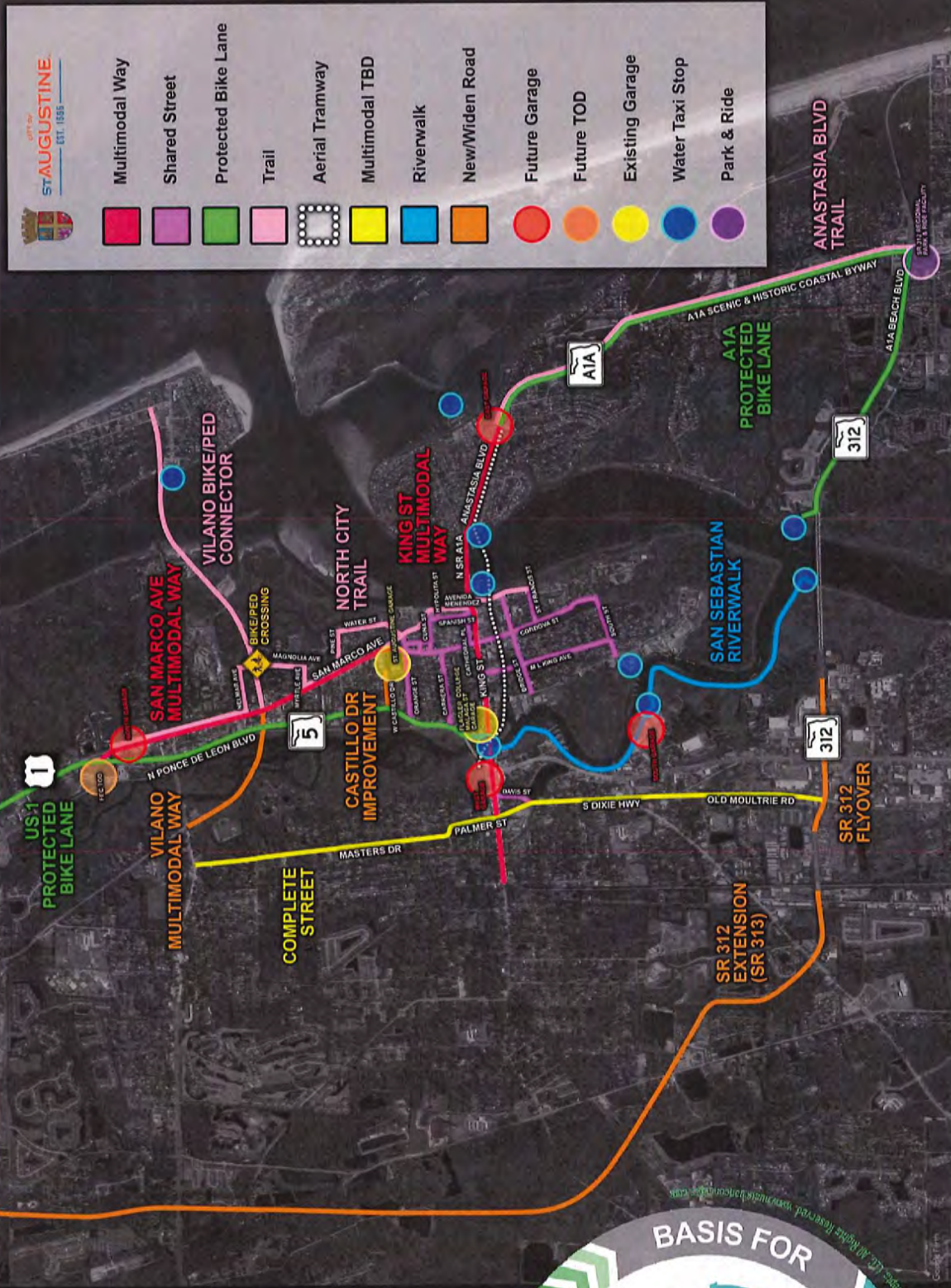
Further Connectivity – Water Taxi, Riverwalk & Trails



Expanding the Multimodal Network



Draft 2040 Mobility Plan



Jonathan B. Paul, AICP

NUE URBAN CONCEPTS



Land Use - Transportation - Parking - Impact & Mobility Fees - Traffic - Funding

www.nueurbanconcepts.com nueurbanconcepts@gmail.com

CITY OF ST. AUGUSTINE

MEMORANDUM

TO: Planning and Zoning Board

DATE: May 21, 2019

RE: **Item 4**
Discussion and Public Comment Related to the Draft Conservation and Coastal Management Element of the Comprehensive Plan including Draft Goals, Objectives and Policies

The Conservation and Coastal Management Element of the Comprehensive Plan is a required element. The element is the chapter of the Comprehensive Plan that establishes the overall plan and framework to identify natural resources, associated conservation issues, protecting coastal zone areas, the local ecology, preparing for natural disasters, and adapting to sea level rise and flooding for the City. It is the element that outlines all of the important issues impacting the environment, and recognizes the potential impact of development on environmentally sensitive areas.

Attached is a **Draft** updated Data and Analysis for the Conservation and Coastal Management Element, the St. Johns River Water Management District (SJRWMD) Water Supply Plan Addendum, maps illustrating recharge areas, sections of the Florida Fish and Wildlife Conservation Commission (FWC) 10-year Conservation Plan, detailed descriptions of several listed species, Sea level rise Adaptation information, and draft Goals, Objectives and Policies related to the required Perils of Flood update.

This is a lot of information. The purpose in providing this information is to provide the PZB and the public an opportunity to review the information, and discuss priorities as staff works with other City departments to move forward with a proposed course of action. The comments, and the direction provided by the PZB will help to set the direction for future conversations.

The Evaluation and Appraisal process in 2018 identified several issues outlined below related to the Conservation and Coastal Management Element. The update is an attempt to address these issues, as well as, update the element through 2040.

- Incorporate “perils of flood” language as required
- Research armoring issues related to conservation zone development
- Research alternative practices, such as, impervious surface ratios
- Research tree canopy implications related to filling
- Address extreme events and infrastructure impacts
- Relate conservation issues to the future land use plan

As noted in the Evaluation Summary there are crossover issues with other Elements and the land development code. Staff is still evaluating the implications of armoring, establishing impervious surface ratios in the Future Land Use Plan, implications of filling, and infrastructure impacts.

Several surrounding jurisdictions are currently working on the sea level rise and perils of flood issue. These include Cocoa Beach, Satellite Beach, and the City of Titusville. Staff is currently evaluating options that these jurisdictions are discussing along with help from the Coastal Planning Specialist from the University of Florida.

These are important issues as we continue to understand, and grapple with the City's experience and recovery from Hurricanes Matthew and Irma.

If you have any questions or require additional information please contact myself or David Birchim at our office by calling (904) 825-1065 or by email at either askinner@citystaug.com or dbirchim@citystaug.com.



Amy McClure Skinner
Deputy Director
Planning and Building Department

Conservation and Coastal Management Element

Introduction to the Conservation Element

As potential development pressures increase, the need for protection and management of the City's natural, and historic resources will increase. The identification of the types of resources, their location, and their significance to the residents of the City is necessary to outline goals, objectives, and policies intended to guide future growth, create protection incentives, and establish conservation guidelines for the use of natural resources in the area.

This environmental planning process is a continuously evolving one that responds not only to new discoveries about the importance of upland and aquatic habitats, but also to the changing needs and priorities of the citizens who share those areas.

The role of the Conservation Element is to maintain or improve the quality of the City's environmental and natural resources and its citizens' quality of life in the face of potential population and development growth. The Conservation Element must work in harmony with the Future Land Use, Coastal Management, Transportation and Mobility, Recreation and Open Space, and the other elements of the Comprehensive Plan in ensuring environmental protection while fostering responsible economic growth. The updated Conservation Element provides an inventory and analysis of the City's natural resources, and establishes policies that provide long-term protection and management of these resources, including the required Water Supply Plan.

Key Issues and Assumptions

The updated Data and Analysis follows the statutory requirements.

Water resources require attention if the intention is to maintain quality of life. The ecosystems within the city are all connected.

Conservation of resources needs to be taken seriously, including drinking water.

These issues are also related to mobility and transportation issues, infrastructure, community resiliency and sustainability.

Introduction to the Coastal Management Element

Since 2011 the perspective on the environment and the impacts of human development have both expanded and changed.

As potential development pressures increase, the need for protection and management of the City's natural, and historic resources will increase. The identification of the types of resources, their location, and their significance to the residents of the City is necessary to outline goals, objectives, and policies intended to guide future growth, create protection incentives, and establish conservation guidelines for the use of natural resources in the area.

A community's natural resources are among its greatest assets. They warrant protection and enhancement not only for their ecological importance, but also for protecting against natural disasters, and rising waters in low lying coastal zones.

Key Issues and Assumptions

Coastal management includes species preservation, ecological planning and updating the land development code. The code may need to be updated related to conservation overlay zones, tree preservation, and replanting to maintain a tree canopy in all stages.

The implications of sea level rise, and the perils of flood are real, and need to be addressed sustain our community.

Conservation and Coastal Management Element

Draft

Data & Analysis

Prepared by:

**Planning and Building Department
City of St. Augustine
75 King Street
St. Augustine, Florida 32084**

May 21, 2019

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Conservation and Coastal Management Conservation Element

163.3177(6)(d)

Introduction

The City of St. Augustine's population has stayed relatively stable over the years. This is a range between approximately 11,500 people to 14,000. However, this cannot be said for St. Johns County. The County surrounding the City has experienced rapid and intense growth. According to Census populations the highest rates of growth in the County occurred between 1970 and 2010. This is an average of 58% growth for each 10 year period. After 2010 the projected population for St. Johns County is expected to grow at approximately 12% through 2040.

By comparison the City of St. Augustine is projected to grow an average of 7% between 2010 and 2040. Most of this population is expected to be from infill and redevelopment in existing developed areas within the city. Otherwise, there are also several new subdivisions beginning to build out north of the core area and southeast of the core area along the SR 312 corridor.

As potential development pressures increase, the need for protection and management of the City's natural, and historic resources will increase. The identification of the types of resources, their location, and their significance to the residents of the City is necessary to outline goals, objectives, and policies intended to guide future growth, create protection incentives, and establish conservation guidelines for the use of natural resources in the area.

This environmental planning process is a continuously evolving one that responds not only to new discoveries about the importance of upland and aquatic habitats, but also to the changing needs and priorities of the citizens who share those areas.

Purpose

The role of the Conservation Element is to maintain or improve the quality of the City's environmental and natural resources and its citizens' quality of life in the face of potential population and development growth. The Conservation Element must work in harmony with the Future Land Use, Coastal Management, Transportation and Mobility, Recreation and Open Space, and the other elements of the Comprehensive Plan in ensuring environmental protection while fostering responsible economic growth. The updated Conservation Element provides an inventory and analysis of the City's natural resources, and establishes policies that provide long-term protection and management of these resources, including the required Water Supply Plan.

A community's natural resources are among its greatest assets. They warrant protection and enhancement not only for their ecological importance, but also for the aesthetic and recreational values they provide.

Only recently have we learned that these resources are not boundless. The growing popularity of coastal areas as places to live, work, and vacation has strained the environmental integrity of these fragile lands. As growth continues to focus on these highly desirable areas, proper planning to insure their survival becomes crucial.

Background

When the Spanish landed on these shores over 450 years ago they were met by native people. The natural, ocean, riverine, and canopy forested resources had attracted and provided for human populations for thousands of years. Since then the impacts are almost beyond measure.

The Conservation Element, as a required element of the Comprehensive Plan, addresses long range planning for the conservation and protection of the City of St. Augustine's natural resources. The general location, extent, and status of the City's resources are identified, including:

- Water resources (surface waters, wetlands, floodplains, and natural groundwater recharge areas);
- Air resources;
- Land resources (soils and geological resources); and
- Ecosystems (vegetative communities, wildlife and wildlife habitats).

This Element also identifies potential impacts of tourism, and recreation demands on these resources. These include the volume of tourists, development pressures, and mobility issues on vulnerable natural and historic resources. Implementation of the City's conservation policies may include a broad array of strategies that could relate to education and outreach, public participation, regulations, incentives, acquisition, intergovernmental coordination, and other appropriate mechanisms.

Visioning

The City initiated a visioning process that began in 2014 where volunteers worked together to garner input and provide feedback to develop a vision plan. The *Vision 2014 & Beyond* document was adopted in June 2015 including a set of governing principles that encourage a livable and vital community. Maintaining a healthy, resilient and sustainable environment was recognized by the vision document.

Inventory and Analysis of Natural Resources

The City of St. Augustine's natural resources are presented in four (4) major topic areas: water, air, land, and ecosystems. Several maps from the Future Land Use Map Series are included along with figures, as well as inventory lists of features, plants, and animals found in the City. The Florida Department of Environmental Protection (FDEP) data on resource quality has also been included when available.

Water Resources

Water resources are a critical component of St. Augustine's natural resource base. The City's ecology, economy, and its residents' quality of life are all connected to its water resources. St. Augustine's water resources include areas of tidal wetlands and floodplains, and rivers associated with them. Economic support from water includes ocean access, rivers, and tidal wetlands providing boating, swimming, fishing, and other forms of recreation. Groundwater from the Surficial and Floridan Aquifers supplies the City's drinking water.

Florida's water resources are subject to a variety of regulations and programs from federal, state, regional, and local agencies. St. Augustine will continue to work with these organizations, as appropriate, to ensure continued protection, restoration, and/or improvement of the City's water resources. Table 1 is a summary of water management agencies and programs in Florida.

Table 1: Agencies Responsible for Water Management in Florida

FEDERAL
Department of Commerce National Oceanic and Atmospheric Administration • Weather forecasting and climate change • Coastal ecosystems • Fisheries
Environmental Protection Agency • Implementation of programs under the Clean Water Act and the Safe Drinking Water Act, Superfund, and the Resource Conservation and Recovery Act
Department of the Interior U.S. Geological Survey • Assess quantity and quality of the nation's water resources • Biological Resources Division • Endangered species, migratory birds, certain marine mammals, and freshwater and anadromous fish
U.S. Army Corps of Engineers • River and harbor navigation • Flood control • Hydroelectric power • Environmental restoration • Wetland permitting
Department of Agriculture Natural Resources Conservation Service • Programs to reduce erosion and to conserve and protect water • National Resources Inventory

• Wetlands Reserve Program
Federal Emergency Management Agency • Flood zone mapping • National Flood Insurance Program • Disaster relief
STATE
Executive Office of the Governor • Coordination of interagency review of development projects and grant applications • Review of water management district budgets • Appointment of water management district Governing Board members
Department of Environmental Protection • Water Resources Implementation Rule • Florida Water Plan • Pollution control permitting and monitoring • Ecosystem management and restoration • Water quality standards • Solid and hazardous waste management • Aquatic weed control • Administration of SWIM and Preservation 2000 funds • Mine reclamation management • Marine resources
Department of Economic Opportunity • Areas of Critical State Concern • Developments of Regional Impact review • Coastal management • Emergency management coordination and disaster relief
Florida Fish and Wildlife Conservation Commission • Research and manage habitats to maintain the long-term well-being of fish and wildlife • Assess development impacts on habitats
Department of Health • Protect public health, related to solid waste disposal, septic tanks, and drinking water
Public Service Commission • Private water and sewage utility rate structures and approval
Department of Agriculture and Consumer Services • Development of agricultural and silvicultural BMPs for protection of water resources • Regulation of pesticide and fertilizer use
REGIONAL
Water Management Districts (SJRWMD) • District water management plans • Regional water supply plans • Water resources development • Water supply assistance to local governments • Flood protection and emergency response • Stormwater management • Natural system protection and restoration • Consumptive use permitting • Water well construction • Environmental Resource Permitting (ERP) Program • SWIM plans • Land acquisition for conservation and recreation

• Water shortage orders
Regional Planning Councils (NEFRC) • Developments of Regional Impact review • Growth management coordination • Surface water quality planning and studies • Development of regional policy plans that provide guidelines for local comprehensive plans • Hurricane evacuation planning and mapping
Water Supply Authorities • Water distribution • Development of regional sources
LOCAL
City and County Governments • Water supply development • Local environmental controls and monitoring • Building codes, zoning, and land use • Drinking water and wastewater services • Growth management and comprehensive planning • Land acquisition and management • Emergency preparedness • Public utility protection (water, sewer, solid waste) • Stormwater management • Water conservation programs • Emergency water restrictions
Special Districts • Operation, maintenance of local surface water management systems (chapter 298 districts, others)

Sources: Water Resources Atlas of Florida, 1998; SJRWMD Lower St. Johns River SWIM Plan Update, August 2008, City of St. Augustine, Planning and Building Department, 2019.

Surface Waters

Inventory and Analysis

The City of St. Augustine is located in the Northern Coastal Basin, which includes the Matanzas River, Tolomato River, San Sebastian River, Salt Run, St. Augustine Inlet and their associated tributaries. The Guana River converges with the Tolomato River, the Matanzas River, and Salt Run from the south before flowing into the Atlantic Ocean at the St. Augustine Inlet. Tidal effects are observed throughout these waterways, converging between the two northern inlets to a tidal minimum just north of the Palm Valley Bridge.

Additionally, “major freshwater drainage to the Matanzas River estuary comes from the San Sebastian River, Moultrie Creek, and Moses Creek, as well as inflow from overland urban runoff, and Pellicer Creek contributes with flows east to the Matanzas River lagoon. Both the St. Augustine Inlet in the north and the Matanzas Inlet, located 14 miles south, tidally influence the estuary. The Matanzas Inlet is a natural tidal inlet that, with the exception of the State Road A1A bridge over the inlet, has been unaltered and is not actively maintained for navigation (Northern Coastal Basin Surface Water Improvement and Management Plan).”

St. Augustine's surface waters include rivers, creeks, and lakes. There are six (6) named creeks adjacent and contributing to the riverine environment within the City of St. Augustine. There are two (2) perennial lakes, Oyster Creek Lake, and Maria Sanchez Lake also located within the City. The general location and extent of surface water resources are derived from the 2005 1:24,000 detailed rivers and detailed waterbodies data created by the United States Geologic Survey (USGS) in cooperation with the Environmental Protection Agency (EPA). Figure X and Map X (which is also included as part of the Future Land Use Map Series as Map X) shows the approximate location of these features.

The rivers, creeks and lakes in the City total approximately 1,536 acres or 2.4 square miles. These water features help to define the quality of life and character of the city. Table 2 lists all the named rivers and creeks in the City of St. Augustine.

Table 2: Named Rivers and Creeks in the City of St. Augustine

Name	Flows
Matanzas River	From the St. Augustine Inlet into Flagler County
San Sebastian River	From Red House Branch Creek, and creek north of City limits to the Matanzas River
Tolomato River	From St. Johns River at Mayport to the Matanzas River at the St. Augustine Inlet
Red House Branch Creek	From West of Woodlawn Road to the San Sebastian River
Oyster Creek	From West King Street to the San Sebastian River
Robinson Creek	Tolomato River Marshlands
Hospital Creek	Matanzas River east of Abbott Tract
Salt Run	South of the St. Augustine Inlet to St. Augustine Beach
Quarry Creek	Matanzas River marsh near South Davis Shores

Sources: Planning and Building Department, 2019

Water Quality

"The Tolomato River north of St. Augustine has good but degrading water quality, and urban runoff and other sources of sediment load impact the Tolomato/Matanzas River. The system as a whole has high average total suspended solids and somewhat elevated turbidity. Overall development in the planning unit and the corresponding increase in human-related activities may be the causes of increased fecal coliform bacteria levels and other water quality parameters in the receiving waters (Northern Coastal Basin Surface Water Improvement and Management Plan)."

Water quality is periodically assessed by the Florida Department of Environmental Protection (FDEP). FDEP undertakes water quality assessments of water bodies in response to Section 305

(b) of the Federal Clean Water Act. The latest available DEP water quality assessment information appears in the 2008 Florida Water Quality Assessment 305 (b) Technical Appendix.

Surface water bodies are classified by FDEP based upon the intended uses of these bodies. The waters surrounding St. Augustine are classified as Class II and Class III waters by the FDEP. Class II waters are suitable for shellfish harvesting and Class III waters are suitable for recreation and fish and wildlife maintenance and propagation.

Class II waters are located in Salt Run. This is the only area in which shellfish harvesting can still occur in the City. The southern bed has been designated as conditionally restricted which means that “periodically, relay and controlled purification activity is temporarily suspended based on pollution events, such as rain or increased river flow (Aquaculture Shellfish Harvesting Program, Division of Aquaculture).”

The northern bed in Salt Run has been designated as conditionally approved. The Aquaculture Shellfish Harvesting Program defines this as “periodically closed to shellfish harvesting based on pollution events, such as rainfall or increased river flow.” All other areas located in St. Augustine are prohibited.

Surface water quality is monitored by the Florida Department of Environmental Protection (FDEP). There are several factors that determine the FDEP evaluation of water quality in a given basin. The surface water quality criteria set forth in Chapter 62-302, Florida Administrative Code, and the Impaired Surface Waters Rule (IWR), Chapter 62-303, Florida Administrative Code, differentiate waterbodies by chloride concentrations, designated uses, and waterbody type (lake, stream, or estuary). Many water quality criteria for marine waters are different from those for fresh water.

Existing Uses

The predominant existing uses relate to recreational uses in the adjacent water bodies including boating, swimming, observing nature, fishing and tourism. The tourism industry includes all of the above, and charter fishing. Commercial fishing includes shellfish harvesting, and the remaining commercial fleet.

Known Pollution

Point source pollution from domestic and industrial wastewater facilities are regulated through the National Pollutant Discharge Elimination System (NPDES) program. The Clean Water Act requires permits to be obtained by wastewater discharges that establish pollution limits, monitoring and reporting requirements. Florida was delegated the power of running this program from the EPA in 1995. The Florida Department of Environmental Protection does not list any discharge facilities operating in St. Augustine without a permit.

The City of St. Augustine wastewater treatment plant (WWTP #1) provides sanitary sewer services to all the property owners located within the city limits (10.7 square miles) and along the U.S. 1 corridor in areas immediately North and South of the city limits.

Non-Point Source Pollution:

The most common source of non-point source pollution for the City of St. Augustine is from stormwater/overland runoff. The 1995 Stormwater Master Plan discusses urban pollutant loadings and reductions.

“Measurements of the quality of runoff in the City of St. Augustine are not available. However, annual urban runoff pollutant loading estimates were developed for the City from statewide averages of urban runoff pollutant concentrations. Multiplying the statewide pollutant concentrations times the estimated annual urban runoff volume yielded estimates of gross annual stormwater pollutant loads. Gross loads are total pollutant loads generated by the urban areas before stormwater treatment and management to remove pollutants.

The analysis revealed that the highest gross stormwater pollutant loads discharge to the San Sebastian River (54%), followed by the Matanzas River (42%). Salt Run receives about 4% of the total annual load. This distribution is based on analysis of the total suspended solids (TSS) loadings.

The City’s ongoing street sweeping program reduces gross loads by about 3%. Removals are highest in the downtown commercial/historic district where streets are swept three times per week. In this area, street sweeping reduces annual TSS loads by 28%.

In addition, treatment provided by Oyster Creek Lake and Maria Sanchez Lake significantly reduces gross loadings to the San Sebastian and Matanzas River, respectfully. These two lakes remove from 92% to 97% of the TSS load entering the lakes. The lakes remove 14% of the annual TSS load generated by the entire urban area.

In the future, urban runoff pollutant loadings from the St. Augustine urban area are likely to decrease as land within the City is redeveloped. The SJRWMD and the City of St. Augustine require redeveloped areas to provide onsite stormwater management facilities (1995 Stormwater Master Plan).”

Potential for Conservation, Use, or Protection

The City’s surface waters are recognized as a major resource that needs constant care and protecting. In addition to existing protections afforded by FDEP and the SJRWMD, the City has designated surface waters as one of its conservation targets, and important relationships, to not only conserve, but respect in an effort to protect the City’s sustainability.

Wetlands

Inventory and Analysis

Wetlands include all marshes and swamps, whether they are permanent, intermittent, or perennial. State statutes define wetlands in Section 373.019(25) as follows:

Those areas that are inundated or saturated by surface water or groundwater at a frequency and a duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils.

There are extensive wetland features stretching across the City generally associated with the riverine environments. The general location and extent of the wetlands is derived from the St. Johns County Geographic Information System (GIS) for reference as the 2014 Land Cover Map showing the approximate location of these features. The Land Cover information is derived from the St. Johns River Water Management District (SJRWMD) dataset.

The City's Existing Land Use Categories as described in the Future Land Use Element indicates that approximately 1,657 acres are described as Rivers/Lakes/Submerged lands or 20.2% of the City's total land area. The Existing Land Use Categories also indicate approximately 2,230 acres of Open Land land use category or an additional 27.3% of the City's total land area, which may include upland area, as well as, some submerged land/jurisdictional wetlands.

This confusion of potentially jurisdictional wetlands designated Open Land on the future land use map will be clarified as part of this 2040 update. The City intends to establish a second Open Land (Conservation) land use category, separate from an uplands and presumably developable Open Land category for areas specifically waterward of the most restrictive jurisdictional line, or delineated by some legal instrument as undevelopable in perpetuity.

Existing Uses

Saltwater marsh is the dominant wetland habitat in St. Augustine. This community is considered a non-forested wetland and includes tidal flats and brackish areas dominated by cordgrass and needlebrush. Saltwater marsh is located throughout the City, and forms natural barriers around the City's major waterways.

Saltwater marshes, like all wetlands, serve a variety of useful functions. They provide a buffer between higher lands and the open water, and are important fish nurseries. They also serve as filters that cleanse the water of many pollutants and are important for flood control.

Known Pollution

There are no documented instances of pollution associated with the City's wetlands.

Potential for Conservation, Use, or Protection

St. Augustine's wetlands are currently regulated and protected by one or all of the following agencies: the United States Army Corps of Engineers (USACOE), FDEP, and the SJRWMD. The City is beginning to understand the important relationship with its wetland areas beyond recognizing the important role the wetlands play as habitat areas. These areas also play an

important role toward the City's resiliency and sustainability as we look towards sea level rise, and buffering the city from its affects.

Groundwater

Inventory and Analysis

Both the Floridan and the Surficial Aquifers provide potable water for the City of St. Augustine. The City currently draws on both aquifers for potable water through the use of wells. The City's Annual Water Quality Report for 2009 identifies five wells, one that withdraws from the Surficial Aquifer and four that withdraw from the Floridan Aquifer.

Based on the sampling results in the report, there are several contaminants present in the City's potable water source. Contaminants identified are microbiological, radiological, inorganic, synthetic organic, disinfectants, and lead and copper. Although the above contaminants are present, none exceed levels that would render the water as unsafe. Likely sources of contamination are related to sources found in the natural environment, discharge from industrial manufacturing/uses, corrosion of plumbing, and products used to disinfect water.

The St. Johns River Water Management District (SJRWMD) is currently studying future water supply sources. Several options are being considered such as fresh groundwater, seawater, surface water and brackish groundwater due to salt intrusion. In addition to the identification of new water sources, preservation techniques are also being considered to protect current water resources. Techniques that could protect water resources are conservation and reuse, interconnection of the water supply system, artificial recharge, mitigation of adverse impacts of ground water withdrawal and aquifer storage recharge.

Another issue the City of St. Augustine must consider for the future is the designation of a Priority Water Resource Caution Area (PWRCA) by the St. Johns River Water Management District. The City has been recently included in the caution area identified St. Augustine in a Potential Priority Water Resource Caution Area. With the designation of a PWRCA come specific constraints such as statutory requirements "to identify alternative water supply sources and strategies in a water supply work plan. Local governments will be able to choose among alternative water supply options that will be listed in the District Water Supply Plan (DWSP) 2010 or they may submit additional projects for consideration. The DWSP will include more projects than are necessary to meet water needs so local governments have options (SJRWMD)."

The groundwater system is the principal source of water for domestic, commercial, and industrial uses in the City. There are two aquifer systems present in St. Augustine: the Floridan Aquifer System and the Surficial Aquifer System. The Floridan Aquifer underlies the entire state of Florida and supplies water to many utilities, municipalities, and permitted wells. The Surficial Aquifer in Florida includes any otherwise undefined aquifers that are present at land surface and is mainly used for domestic, commercial, or small municipal supplies. The City of St. Augustine operates five (5) wells and draws potable water from the Floridan Aquifer and a confined region of the Surficial Aquifer. There are also 91 permitted wells drawing from the Floridan Aquifer

and an additional 17 proposed wells. The majority of these wells are private consumptive use permits (CUPs) for agricultural uses.

Aquifers

The Floridan Aquifer is one of the highest producing aquifers in the world. It is found throughout Florida and extends into the southern portions of Alabama, Georgia, and South Carolina. This aquifer system is comprised of a sequence of limestone and dolomite, which thickens from about 250 feet in Georgia to about 3,000 feet in south Florida. The Floridan Aquifer system has been divided into an upper and lower aquifer separated by a unit of lower permeability. The upper Floridan Aquifer is the principal source of water supply in most of north and central Florida. Groundwater flow is generally from highs near the center of the state towards the coast.

The Surficial Aquifer is generally unconfined and is made up of mostly unconsolidated sand, shelly sand, and shell. The aquifer thickness is typically less than 50 feet. Groundwater in the Surficial Aquifer generally flows from areas of higher elevation towards the coast or streams where it can discharge as baseflow. Water enters the aquifer from rainfall and exits as baseflow to streams, discharge to the coast, evapotranspiration, and downward recharge to deeper aquifers. Figure X and Map X (which is also included as part of the Future Land Use Map Series as Map X) shows the approximate Aquifer Recharge areas in the City of Bunnell.

The following section will be completed with the update to the Infrastructure Element.

Existing Uses

Potable Water

Known Pollution

Potential for Conservation, Use, or Protection

Priority Water Resource Caution Areas

The SJRWMD identified priority water resource caution areas (PWRCA) based on a comparison of water resource constraints to the results of assessments of hydrologic impacts due to projected 2030 demands. Priority water resource caution areas are areas where existing and reasonably anticipated sources of water and conservation efforts may not be adequate (1) to supply water for all existing legal uses and reasonably anticipated future needs and (2) to sustain the water resources and related natural systems. The SJRWMD identified PWRCA based on the water resource constraints and the results of water use, groundwater, and surface water assessments. Bunnell, as well as all of Flagler County, is located in the PWRCA (Figure 7, and Map 2, which

is also included as part of the Future Land Use Map Series as Map 10). As part of the PWRCA, Bunnell has adopted a Water Supply Plan and is participating in regional water supply planning.

Water Quality and Quantity

The groundwater system supplies the potable water for all residents connected to the City's utility system. St. Augustine's potable water supply is discussed in detail in the Water Conservation section of this document and the approved Water Supply Plan, included as Appendix A of the Infrastructure Element. The City is considering updating its master stormwater management plan to address drainage.

Flood Prone Areas/Floodplains

St. Augustine's location along the Atlantic Ocean and the Matanzas and San Sebastian Rivers periodically subject the City to partial coastal flooding which is mostly tide related. Additionally, the City has special flood hazard areas which may become inundated during 100-year flood events. The Flood Insurance Rate Maps (FIRM) are periodically updated by the Federal Emergency Management Agency (FEMA). The most recent map was made using FEMA's updated Digital Flood Insurance Rate Map from December of 2007.

Floodplains are areas inundated by a 100-year flood event or identified by the National Flood Insurance Program of the Federal Emergency Management Agency as an "A" zone or a "V" (Velocity) zone on the City's Flood Hazard Areas Maps. Additionally, the map includes areas anticipated to be affected by a 500-Year flood event, as well as areas outside of the 100 year floodplain (denoted by X). The 100-Year floodplain makes up a majority of the lands located in the City of St. Augustine. Locations near the western fringe of the city limits and southwest of Anastasia State Recreation Area have areas outside of the 100-Year floodplain and zones that may only be affected by a 500-Year flood event.

City Code provides regulations for development within special flood zones regulated by the flood ordinance. When located in a special flood zone, all finished floors of commercial and residential buildings must be constructed at or above established base flood elevations. Buildings constructed below the required base flood elevation are required to be flood-proofed in accordance with acceptable construction standards which have been approved by FEMA.

Development shall conform to all requirements of FEMA relating to flood control and prevention. Prior to a Certificate of Occupancy being issued for the structure, the City shall continue to require an Elevation Certificate signed by a licensed engineer or surveyor certifying that the lowest floor of the structure has been constructed at or above the established base flood elevation, and per city code.

The national agency responsible for measuring sea level changes is the National Ocean Survey, a part of the National Geodetic Survey, within the National Oceanic and Atmospheric Administration. As reported in *Mean Sea Level Trends for Stations in Florida*,

(<http://tidesandcurrents.noaa.gov/>) the trend of relative sea level change in our region is on the order of 2.4 mm per year. The risks associated with a substantial rise should not be disregarded as infrastructure and private construction in the City of St. Augustine would most likely be affected.

Vegetative Cover:

St. Augustine has extensive marshlands and a few natural upland areas relatively intact even though it is our nation's oldest city. The natural communities remaining can be divided into two major categories: uplands and wetlands:

Uplands:

Upland areas are comprised of 5 primary habitats: herbaceous upland nonforested, shrub and brushland, pine flatwoods, upland hardwood forests and upland mixed coniferous/hardwoods. Data obtained by measuring the surface area occupied by upland communities indicate that approximately XXX acres remain within city limits.

Table 1: Upland Vegetative Cover in St. Augustine

<i>Upland Vegetative Cover</i>	<i>Acres</i>
Herbaceous Upland Non-forested	147.2
Shrub and Brushland	180.7
Pine Flatwoods	52.4
Upland Hardwood Forests	307.2
Upland Mixed Coniferous/Hardwood	274.7
Total	962.2

Sources: Land Use/Land Cover 2004, St. Johns River Water Management District

Herbaceous uplands are located in small patches throughout the City, with primary locations south of Anastasia State Recreation Area and in the northern portion of the city, adjacent to U.S. 1. Shrub and brushland areas are located in the southern portions of the City, with the largest portions adjacent to S.R. 312.

Pine flatwood habitat is only located along and to the west of the San Sebastian River. Flatwoods typically thrive on poorly drained, flat land and are dominated by slash or longleaf pine. These areas are characterized by thick underbrush of saw palmetto and gallberry.

Upland hardwood forests make up the largest upland habitat within St. Augustine. Approximately 32% of upland habitat is upland hardwood, most of which is one large contiguous area. The primary location of this habitat is south of Anastasia State Recreation Area. The hardwood forest is composed mainly of hardwood species such as oak.

Upland mixed coniferous/hardwood habitat is scattered throughout the City, with the largest concentration in the north, and southern portions to the east of the Matanzas River. The coniferous forest is dominated by trees, primarily pines, which remain green throughout the year.

Inventory and Analysis

There are floodplains stretching across the City, mostly associated with surface waters and/or wetlands. Although normally dry, these areas can become inundated with water during hurricane and severe storm conditions. The general location and extent of floodplains is derived from the 1996 Federal Emergency Management Agency (FEMA) GIS data. Figure X and Map X (which is also included as part of the Future Land Use Map Series as Map X) shows the approximate location of the City's floodplain features.

Floodplains include all lands located inside the special flood hazard area (SFHA) as designated by the FEMA and the National Flood Insurance Program (NFIP). The SFHA is the area where the NFIP's floodplain management regulations must be enforced and where the mandatory purchase of flood insurance applies. FEMA works closely with State and local officials to identify flood hazard areas and flood risks. The floodplain management requirements within the SFHA are designed to prevent new development from increasing the flood threat and to protect new and existing buildings from anticipated flood events.

In order for new development in the SFHA to qualify for insurance through the NFIP, St. Augustine must require permits for all development in the SFHA and ensure that construction materials and methods used will minimize future flood damage. Permit files must contain documentation to substantiate how buildings were actually constructed. In return, the Federal Government will make flood insurance available for almost every building and its contents within the community. The City must ensure that the adopted floodplain management ordinance and enforcement procedures meet the government's program requirements. St. Augustine must also continue to update its floodplain regulations as additional data is provided by FEMA or when Federal or State standards are revised.

Existing Uses

There are 72 acres of floodplains located on portions of land proposed for an urban land use. The City's future land use and conservation policies will provide guidelines for development in the presence of floodplains in accordance with NFIP and FEMA regulations.

Known Pollution

There are no documented instances of pollution associated with the City's floodplains.

Potential for Conservation, Use, or Protection

The regulation of floodplains is directly linked to the function and management of surface waters, wetlands, and stormwater treatment facilities. In addition to existing local policies, the City's floodplains are regulated by the following agencies: FEMA, FDEP (62-40, F.A.C.), and SJRWMD (40C-4, F.A.C.). St. Augustine, in conjunction with these regulatory agencies, will develop a comprehensive system of coordinated planning, management, and preservation to protect and, where feasible, enhance floodplain functions and associated natural systems in floodplains. This system shall include implementation of policies and programs to preserve and maintain valuable natural systems in floodplains, protect the natural water storage and water conveyance capabilities of floodplains, and, where feasible, enhance or restore natural flow regimes of rivers and watercourses that have been altered for water control purposes.

It will be a goal of the City to minimize incompatible activities in floodplains. The City will build on existing regulations and create policies that:

- Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards,
- Restrict or prohibit uses which result in damaging increases in erosion or flood heights or velocities;
- Require that uses vulnerable to floods, including facilities which serve those uses, be protected against flood damage at the time of construction;
- Control the alteration of natural floodplains, stream channels, and natural protective barriers which are involved in accommodating floodwaters;
- Control filling, grading, dredging and other development activities that may increase erosion or flood damage; and
- Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or that may increase flood hazards to other lands.

Floodplains can be a valuable resource for vegetation, wildlife, and groundwater recharge.

Air Resources

Air Quality

The concept of energy efficiency and greenhouse gas reduction is a new concept to the City and Region as whole. With little data pertinent to the City, this is a process that requires the City to embark on coordination efforts with landowners, developers and other agencies to begin establishing the data and analyses. Recognizing these issues is the starting point for the City.

As the City addresses new developments, there is close coordination with the Planning and Building Department, developers, landowners and other agencies to maximize the number of new construction projects which practice energy efficient techniques.

Effective greenhouse gas emissions reduction measures aren't City specific and they are not best implemented by a project by project approach. The City is part of the North Florida TPO and a portion of the City is included in the Northeast Regional Planning Model (NERPM). The NERPM provides only regional carbon emission data and does not include the emissions for the entire City. The City will continue to encourage efficient land use patterns from a transportation perspective, including encouraging infill redevelopment, additional density in proximity to jobs, mixed use developments and alternative modes of transportation where feasible. The results of such measures are expected to be both qualitative and quantitative during the short term planning horizon.

The City will acquire best available data from the NERPM. The North Florida TPO along with FDOT has begun research in incorporating the Environmental Protection Agency's (EPA) Motor Vehicle Emissions Simulator (MOVES) into the NERPM for future use. The addition of this module into the TPO model will allow project specific and county-wide data for emissions to be produced and monitored. Once the Motor Vehicle Emissions Simulator is complete, the City will need to update air quality data and analysis in the Comprehensive Plan.

Inventory and Analysis

St. Augustine has a limited amount of air pollution originating in or being transported into the City. According to the FDEP's Air Resources Management System (ARMS) there are several facilities with permitted emissions sources located in or near to the city limits. Table X identifies those facilities and indicates their ownership and current status.

Table X: Permitted Air Resource Management Systems (ARMS) Facilities

Facility Name	Owner	Status
St. Augustine Marine Center	WJ Development Corporation	Active
Luhrs Corporation	Luhrs Corporation	Inactive
St. Augustine site-Main Complex	Northrup Grumman Systems Co.	Active
Flagler Hospital, Inc.	Flagler Hospital, Inc	Inactive
VJ Usina Contracting, Inc.	VJ Usina Contracting, Inc.	Inactive
Craig Memorial Park-Human Cremation	Craig Funeral Home, Inc.	Active
St. Augustine site-North Complex	Northrup Grumman Systems Co.	Active
St. Johns Family Funeral Home & Cremation	Kotrady-Hudgins Funeral Service	Active
Florida School for the Deaf and the Blind	Florida School for the Deaf and the Blind	Inactive
St. Augustine Plant	EZFlow, LP	Inactive

Sources: FDEP, ARMS Table, May 2019

Overall, air quality is considered good in St. Augustine; however there are no air quality monitoring sites located in the City or in St. Johns County. According to the FDEP the nearest monitoring sites are at the Mayo Clinic in Jacksonville Beach, Mandarin, and at the Palatka Barge Port.

Known Pollution

The EPA identifies transportation emissions as a leading cause of air pollution responsible for over 93% of carbon monoxide (CO) emissions, 52% of all nitrogen (NO_x) emissions, and 90% of all hydrocarbon emissions (HC). The Florida Department of Environmental Protection (FDEP) 2018 reporting, on the website, emission pollution rates were found to be decreasing.

Potential for Conservation, Use, or Protection

Vehicles are the largest contributor to air pollution in St. Augustine. By continuing to follow state guidance regarding transportation planning and air quality monitoring, vehicle emissions should decrease over time. The proposed future land use plan and transportation and mobility will contribute to continued good air quality by reducing the need for vehicle travel and promoting infill and redevelopment, walkability and alternative modes of transportation.

Commercial Resources

Minerals

No commercially valuable minerals are presently mined in St. Augustine, although limestone and coquina quarries were once active on Anastasia Island, and a sand mine formerly operated in the north city. The quarries on Anastasia Island were excavated by early Spanish settlers for building materials for many of the original structures in the City (including the Castillo de San Marcos) and are designated historic sites.

Land Resources

Soils

Topography:

Most of St. Augustine's population is located to the west of the Matanzas River. A smaller section of the city extends to a barrier island known as Anastasia Island, where Anastasia State Recreation Area is located. All of this area is considered part of the physiographic region known as the Atlantic Coastal Lagoons. The Atlantic Coastal Lagoons consist of the Matanzas River, San Sebastian River, Guana River and Tolomato River. This region consists of open water and flat grassy marshes that are subject to daily flooding by normal high tides. Most of the soils are mineral soils that are high in clay and silt content, while some are organic in nature. The vegetation of this region is mostly halophytic grasses and some mangrove trees.

According to U.S. Geological Survey maps, elevations throughout the city range from mean sea level (MSL) at some locations along the shoreline of the San Sebastian and Matanzas Rivers, as well as coastal areas south of Anastasia State Recreation Area. Some sections near the western

boundary, as well as locations south and west of Anastasia State Recreation Area reach an elevation of 25 feet above MSL.

The topography of the City is determined by the surface geology, which is composed mainly of two ancient marine terraces formed during the Paleocene period as the ocean receded. These terraces are now called the Pamlico and Silver Bluff.

The Pamlico Terrace is characterized by elevations between ten and twenty-five feet above MSL, and can be found near Anastasia Island. The Silver Bluff Terrace, with elevations of zero to ten feet above MSL, is more prevalent and is found in the remainder of the city.

Both terraces form a relatively flat plain that slopes gently eastward, at a rate of four to five feet per mile, toward the Atlantic Ocean.

A third marine terrace, the Talbot Terrace, with elevations of twenty-five to forty feet above MSL, may be found in a very small area in the southwest portion of the City.

Soils:

The Soil Conservation Service *Soil Survey of St. Johns County* identifies four (4) soil associations within the city limits of St. Augustine. They are the Fripp-Satellite-Paola Association, the Astatula-Tavares Association, the Myakka-Immokalee-St. Johns Association and Pellicer-Tisonia Association.

The Fripp-Satellite-Paola Association is found in sand ridge and coastal dune areas. This soil association comprises all of the eastern section of Anastasia Island. Soil types that accompany this soil association are Pampona, Satellite, Fripp and Moultrie. These soils are sandy throughout and are excessively to somewhat poorly drained. Land areas containing these soils vary in topography from nearly level to moderately steep.

Astatula-Tavares soils can also be found in sand ridges and coastal dunes. However, these soils are typically found further inland. In St. Augustine, these soils are found in the northwest section of the City. They are sandy soils classified as excessively to moderately well drained, typical of nearly level to gently sloping lands.

The Myakka-Immokalee-St. Johns Association are typical soils of flatwood communities. These soils run in a strip down the middle of Anastasia Island and also comprise most of the central city and southern areas. Portions of the City containing these soils are nearly level and poorly drained, sand soils that have dark subsoil stained by organic matter comprise this association. Soils types that accompany this association are St. Augustine and Myakka.

The Pellicer-Tisonia Association is typically located in coastal wetlands and inland areas. For the City of St. Augustine, these soils are found in the tidal marshes of the Matanzas and San Sebastian Rivers. Pellicer-Tisonia soils are in nearly level areas which are poorly drained and subject to frequent tidal flooding. Some of the soils in this association are loamy; others are

organic and underlain by clay materials. The soil type in the association is predominantly Pellicer.

Inventory

The Natural Resources Conservation Service (NRCS), a division of the U.S. Department of Agriculture (USDA), is responsible for issuing soil surveys. The survey identifies soil types throughout the entire county. Map X (which is also included as part of the Future Land Use Map Series as Map X) shows the location and general extent of the four (4) soil series present in St. Augustine. The soil survey is one factor that can be used to evaluate the suitability of specific land uses in a given area. The information provided by the soil survey is not site specific and does not eliminate the need for onsite investigation or testing by professional soil scientists. Table X provides a summary of St. Augustine's soils with respect to drainage, and development limitations.

Table X: NRCS Soil Summary

Map Unit Name	Drainage Class	Typical Location	City Area	Development Rating
Astatula-Taveres	Excessively to moderately well drained, nearly level gently sloping	Inland Sand ridges, coastal dunes	Northwest section of the City	Not limited
Myakka Fine Sand	Poorly Drained, nearly level	Flatwood communities	Middle of Anastasia Island, central city, and southern areas	Very Limited
Immokalee Fine Sand-St. Johns Association	Poorly Drained, nearly level	Flatwood communities	Middle of Anastasia Island, central city, and southern areas	Very Limited
Fripp-Satellite-Paola Association	Sandy throughout, excessively to somewhat poorly drained	Sand ridge, coastal dunes	Eastern section of Anastasia Island	Not Limited
Pellicer-Tisonia Association	Very Poorly Drained, frequent tidal flooding, can be loamy, organic and underlain by clay materials	Coastal wetlands, and inland areas, tidal marshes	Coastal wetlands, tidal marshes of the Matanzas and San Sebastian Rivers	Very Limited

Source: City of St. Augustine 2011 Conservation and Coastal Management Element, summarized by the Planning and Building Department, 2019

Analysis

In St. Augustine, the majority of soils are somewhat limited for most types of building and site development.

Existing Uses

The City of St. Augustine is an urban area. Most of the developable area of the city has been developed or disturbed. However, there are environmentally sensitive areas along the riverine environments that warrant protection and review.

Known Erosion Issues

There are no known instances of significant erosion related to the City's soil.

Historic and Cultural

This section will be updated as part of the Historic Preservation Element.

Ecosystems

The concept of ecosystems is used to describe the various species of plants, animals, and microorganisms that surround us everyday. However, ecosystems are more than just the number and diversity of species. The concept also includes the genetic variation within a given species of plant or animal. At a higher level, it includes the natural communities, and landscapes of which species are a part. The concept of biodiversity within ecosystems includes both the variety of these things and the variability found within and among them. Biodiversity also encompasses the processes that allow life on Earth to continue adapting and evolving.

Critical Habitat

Protecting the full range of biological diversity requires a sound understanding of St. Augustine's ecological systems including where they are found and how they are faring. The term "ecological community" refers to an integrated association of plants and animals adapted to and dependent upon a particular environment. In general terms, the natural systems of the City may be divided into three (3) categories: estuary saltmarsh, wetland, and coastal hammock forest (coastal scrub is also found in Anastasia State Park). Each of these categories consists of, and provides habitat for, a wide variety of plants and animals. The natural upland and wetland systems that occur in St. Augustine are described below.

Estuary Saltmarsh/Wetland Communities

The marine and estuarine vegetated wetlands dominate the eastern portion and eastern facing areas along the rivers adjacent to St. Augustine. The intertidal zone or supratidal zone is dominated by herbaceous or woody halophytic vascular plants. The salinity is greater than 0.5ppt.

The Salt Marsh is considered estuarine wetland on muck/sand/or limestone substrate; inundated with saltwater by daily tides; statewide; occasional or rare fire; treeless, dense herb layer with few shrubs; saltmarsh cordgrass, needle rush, saltgrass, saltwort, perennial glasswort, seaside oxeye. A salt flat of salt marsh with much exposed bare soil on slightly higher areas within marsh; high salinity and dry conditions; sparse and stunted cover of succulents and/or shoregrass can also be associated with this area.

Coastal Hammock Forest

In the coastal uplands area the mesic or xeric communities are restricted to barrier islands and near shore; woody or herbaceous vegetation; other communities may also occur in coastal environments. The maritime Hammock is described as stabilized coastal dune with sand substrate; xeric-mesic; statewide but rare in the Panhandle and keys; rare or no fire; marine influence; evergreen closed canopy; live oak, cabbage palm, red bay, red cedar in temperate maritime hammock; gumbo limbo, seagrape, and white or Spanish stopper in tropical maritime hammock.

Listed Species

The Florida Natural Areas Inventory (FNAI) biodiversity matrix lists many documented occurrences of rare plant and animal species in St. Johns County. Table X shows the individual species and their state and federal ranking information.

Table X: Listed Species Occurrence in St. Johns County

Plants and Lichens			EXPLANATION				
Scientific Name			Common Name	Global Rank	State Rank	Federal Status	State Status
<i>Asclepias viridula</i>			southern milkweed	G2	S2		T
<i>Baptisia calycosa</i> var. <i>calycosa</i>			Canby's wild indigo	G3T1	S1		E
<i>Calydorea coelestina</i>			Bartram's ixia	G2G3	S2S3		E
<i>Carex chapmannii</i>			Chapman's sedge	G3	S3		T
<i>Chamaesyce cumulicola</i>			sand-dune spurge	G2	S2		E
<i>Coreopsis integrifolia</i>			ciliate-leaf tickseed	G1G2	S1		E
<i>Ctenium floridanum</i>			Florida toothache grass	G2	S2		E
<i>Glandularia maritima</i>			coastal vervain	G3	S3		E
<i>Helianthus carnosus</i>			lake-side sunflower	G1G2	S1S2		E
<i>Litsea aestivalis</i>			pondspice	G3?	S2		E

<i>Lythrum curtissii</i>		Curtiss' loosestrife	G1	S1		E
<i>Matelea floridana</i>		Florida spiny-pod	G2	S2		E
<i>Monotropis reynoldsiae</i>		pygmy pipes	G1	S1		E
<i>Nemastylis floridana</i>		celestial lily	G2	S2		E
<i>Nolina atopocarpa</i>		Florida beargrass	G3	S3		T
<i>Pavonia spinifex</i>		yellow hibiscus	G4G5	S2		N
<i>Pecluma plumula</i>		plume polypody	G5	S2		E
<i>Pteroglossaspis ecristata</i>		giant orchid	G2G3	S2		T
<i>Pycnanthemum floridanum</i>		Florida mountain-mint	G3	S3		T
<i>Rhynchospora punctata</i>		dotted beaksedge	G1?	SH		N
<i>Rhynchospora thornei</i>		Thorne's beaksedge	G3	S1S2		N
<i>Rudbeckia nitida</i>		St. John's blackeyed susan	G3	S2		E
<i>Ruellia noctiflora</i>		nightflowering wild petunia	G3?	S2		E
<i>Verbesina heterophylla</i>		variable-leaf crownbeard	G2	S2		E

Clams and Mussels		EXPLANATION			
Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status
<i>Panopea bitruncata</i>	Atlantic Geoduck	G3G4	S2S3		N

Snails and Allies		EXPLANATION			
Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status
<i>Amnicola rhombostoma</i>	Squaremouth Amnicola Snail	GH	SH		N
<i>Floridobia fraterna</i>	Creek Siltsnail	G2	S2		N

Mayflies		EXPLANATION			
Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status
<i>Stenacron floridense</i>	A Mayfly	G3G4	S3S4		N

Dragonflies and Damselflies		EXPLANATION			
Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status
<i>Gomphaeschna antilope</i>	Taper-tailed Darner	G4	S4		N
<i>Neurocordulia obsoleta</i>	Umber Shadowfly	G5	S2		N

Beetles		EXPLANATION				
Scientific Name		Common Name	Global Rank	State Rank	Federal Status	State Status
<i>Aphodius aegrotus</i>		Small Pocket Gopher Aphodius Beetle	G3G4	S3?		N
<i>Aphodius dyspistus</i>		Surprising Pocket Gopher Aphodius Beetle	G3G4	S3?		N
<i>Aphodius laevigatus</i>		Large Pocket Gopher Aphodius Beetle	G3G4	S3?		N
<i>Bolbocerosoma hamatum</i>		Bicolored Burrowing Scarab Beetle	G3G4	S3		N
<i>Chelyoxenus xerobatis</i>		Gopher Tortoise Hister Beetle	G2G3	S2		N
<i>Cicindela hirticollis</i>		Hairy-necked Tiger Beetle	G5	S1		N
<i>Hypotrachia spissipes</i>		Florida Hypotrachia Scarab Beetle	G3G4	S3S4		N
<i>Peltotrupes profundus</i>		Florida Deepdigger Scarab Beetle	G3	S3		N
<i>Ptomaphagus schwarzi</i>		Schwarz' Pocket Gopher Ptomaphagus Beetle	G3	S3		N

Butterflies and Moths				EXPLANATION			
Scientific Name		Common Name		Global Rank	State Rank	Federal Status	State Status
<i>Euphyes dion</i>		Dion Skipper		G4	S2S3		N
<i>Nymphalis antiopa</i>		Mourning Cloak		G5	S2		N

Ants, Bees, and Wasps				EXPLANATION			
Scientific Name		Common Name		Global Rank	State Rank	Federal Status	State Status
<i>Bombus fraternus</i>	 	Southern Plains Bumble Bee		G2G4	S1S2		N

Fishes		EXPLANATION					
Scientific Name		Common Name		Global Rank	State Rank	Federal Status	State Status
<i>Acipenser brevirostrum</i>		Shortnose Sturgeon		G3	S1	E	FE
<i>Acipenser oxyrinchus oxyrinchus</i>		Atlantic Sturgeon		G3T3	S1	E	FE
<i>Ameiurus brunneus</i>		Snail Bullhead		G4	S4?		N
<i>Microphis brachyurus</i>		Opossum Pipefish		G4G5	S2	SC	N

Amphibians		EXPLANATION				
Scientific Name		Common Name	Global Rank	State Rank	Federal Status	State Status

<i>Notophthalmus perstriatus</i>		Striped Newt	Rank G2G3	Rank S2	Status 	Status N
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Reptiles		EXPLANATION				
Scientific Name		Common Name	Global Rank	State Rank	Federal Status	State Status
<i>Alligator mississippiensis</i>		American Alligator	G5	S4	SAT	FT(S/A)
<i>Caretta caretta</i>		Loggerhead Sea Turtle	G3	S3	T	FT
<i>Chelonia mydas</i>		Green Sea Turtle	G3	S2S3	T	FT
<i>Clemmys guttata</i>		Spotted Turtle	G5	S2S3		N
<i>Crotalus adamanteus</i>		Eastern Diamondback Rattlesnake	G4	S3		N
<i>Dermochelys coriacea</i>		Leatherback Sea Turtle	G2	S2	E	FE
<i>Drymarchon couperi</i>		Eastern Indigo Snake	G3	S3	T	FT
<i>Gopherus polyphemus</i>		Gopher Tortoise	G3	S3	C	ST
<i>Lampropeltis getula</i>		Common Kingsnake	G5	S2S3		N
<i>Pituophis melanoleucus</i>		Pine Snake	G4	S3		ST

Birds		EXPLANATION				
Scientific Name		Common Name	Global Rank	State Rank	Federal Status	State Status
<i>Charadrius melodus</i>		Piping Plover	G3	S2	T	FT
<i>Egretta caerulea</i>		Little Blue Heron	G5	S4		ST
<i>Egretta thula</i>		Snowy Egret	G5	S3		N
<i>Egretta tricolor</i>		Tricolored Heron	G5	S4		ST
<i>Elanoides forficatus</i>		Swallow-tailed Kite	G5	S2		N
<i>Eudocimus albus</i>		White Ibis	G5	S4		N
<i>Haematopus palliatus</i>		American Oystercatcher	G5	S2		ST
<i>Haliaeetus leucocephalus</i>		Bald Eagle	G5	S3		N
<i>Hydroprogne caspia</i>		Caspian Tern	G5	S2		N
<i>Mycteria americana</i>		Wood Stork	G4	S2	T	FT
<i>Pandion haliaetus</i>		Osprey	G5	S3S4		N
<i>Platalea ajaja</i>		Roseate Spoonbill	G5	S2		ST
<i>Rynchops niger</i>		Black Skimmer	G5	S3		ST
<i>Sterna antillarum</i>		Least Tern	G4	S3	N	ST
<i>Thalasseus maximus</i>		Royal Tern	G5	S3		N
<i>Thalasseus sandvicensis</i>		Sandwich Tern	G5	S2		N

Mammals			EXPLANATION				
Scientific Name			Common Name	Global Rank	State Rank	Federal Status	State Status
<i>Eubalaena glacialis</i>			North Atlantic Right Whale	G1	S1	E	FE
<i>Neovison vison lutensis</i>			Atlantic Salt Marsh Mink	G5T3	S3		N
<i>Peromyscus polionotus phasma</i>			Anastasia Island Beach Mouse	G5T1	S1	E	FE
<i>Podomys floridanus</i>			Florida Mouse	G3	S3		N
<i>Trichechus manatus</i>			West Indian Manatee	G2	S2	T	FT
<i>Ursus americanus floridanus</i>			Florida Black Bear	G5T4	S4		N

Other Elements			EXPLANATION			
Scientific Name	Common Name		Global Rank	State Rank	Federal Status	State Status
Bird Rookery			G5	SNR		N

Source: FNAI Biodiversity Matrix, www.fnai.org

The list in the above Table is a comprehensive list from the FNAI for St. Johns County not all of these species will occur within the city limits of St. Augustine, but several species are likely to occur in St. Augustine. The abundance of observed and potential species within the city limits indicates a need for listed species policies in the Conservation and Coastal Management Element that specifically address the presence of listed species within the City.

Water Conservation, Use, and Protection

Infrastructure

The U.S. Environmental Protection Agency (USEPA) establishes three levels of water conservation guidelines (Table X). Each level includes several categories for conservation strategies and each category has several specific measures. The City utilizes a variety of strategies in its utility infrastructure and water conservation practices. The City implements required conservation strategies as outlined in the City's adopted Water Supply Plan and required by the City's CUP.

Table X: USEPA Water Conservation Measures

Level	Description
1	▪ Universal metering ▪ Water accounting and loss control ▪ Costing and pricing ▪ Information and education
2	▪ Water-use audits ▪ Retrofits ▪ Pressure management ▪ Landscape efficiency
3	▪ Replacements and promotions ▪ Reuse and recycling ▪ Water-use regulations ▪ Integrated resource management

Source: USEPA Water Conservation Guidelines, 1998.

Table X: Water Supply Conservation

Level	Measure	Description	Status
1	Universal Metering	Install flowmeters at each well	Active
1	Water Accounting and Loss Control	Monitor unmetered uses such as sewer flushing, fire fighting	Planned
1	Universal Metering	Eliminate master meters	Planned
1	Costing and Pricing	Continue to charge a base rate for water use	Active
1	Costing and Pricing	Implement an inclined rate structure	Planned
1	Information and Education	Include educational information in water bills	Active
1	Universal Metering	Monitoring of all production wells and discharges	Planned
1	Water Accounting and Loss Control	Routine water audits	Active
2	Landscape Efficiency	Promote landscape efficiency	Active
3	Reuse and Recycling	Promote reuse	Planned
3	Water Use Regulations	Use lower quality water first	Active
3	Water Use Regulations	Encourage others to use lower quality water first	Active
3	Integrated Resource Management	Quarterly monitoring for saltwater intrusion, etc.	Active
3	Integrated Resource Management	Monitor wetlands associated with the potable water supply	Active
3	Water Use Regulations	Enforce state low-flow requirements for new construction	Active

3	Water Use Regulations	Enforce regional irrigation restrictions	Active
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Source: USEPA Water Conservation Guidelines, 1998; City of St. Augustine Water Supply Plan, 20XX.

The controlled and limited amount of water consumed minimizes the drawdown in the potentiometric surface of the underlying Floridan Aquifer. The confined nature of the Floridan Aquifer produces artesian conditions, but no ill effects have been noted to date. St. Augustine desires to grow in a compact and orderly fashion and provide centralized water services as necessary. The City will continue to sensibly plan for expanded needs of the existing water plant to provide adequate utilities.

Current and Projected Water Needs

This section will be updated with the Infrastructure Element.

Background

Current Demand

Water Quality

Regional Water Supply Policies

The City of St. Augustine participates in the regional water supply planning process led by the SJRWMD. In 2005, the SJRWMD adopted its first water supply plan. The current version specifically calls for increased efficiency in water use and strict regulation to ensure that Florida's water supply will adequately serve the population through 2030. St. Augustine will continue to participate in regional water supply planning and partnering with the SJRWMD and other agencies to ensure the quality and quantity of water available to future Florida residents. Several of the City's water conservation measures are directly related to the SJRWMD Water Supply Plan.

In addition to regulation, the SJRWMD is developing models for landscape ordinances and public awareness campaigns that can be adopted by its constituent jurisdictions. St. Augustine already has policies in place to encourage water wise and Florida friendly landscaping. When the City's Land Development Regulations are revised, the model landscape ordinance may be incorporated to provide a more robust and comprehensive approach to water conservation through landscaping.

Another regional issue of particular concern to St. Augustine is the designation of St. Johns County as a PWRCA. These are areas where existing and reasonably anticipated sources of water and water conservation efforts may not be adequate to supply water for all existing legal uses and anticipated future needs and/or to sustain the water resources and related natural systems. The City has identified alternative water source options and is participating in regional water source discussions. The SJRWMD will continue to address the issue of Florida's water supply from both the conservation and alternative source perspectives. The City will coordinate

with the SJRWMD, St. Johns County, and other regional partners and will adopt updated water conservation policies and programs as appropriate.

Conservation Strategies

Rivers and adjacent marshlands and open space help shape the form of the City through the use of scenic vistas, and the protection of environmentally sensitive areas for aesthetic, public safety, ecological and economic purposes. Historic preservation and Recreation and Open Space complement urban development by meeting the community's need for active and passive recreation, as well as protecting natural valuable resources, and reinforcing a preservation mindset for the built and natural environment.

The largest section of recreation and open space can be attributed to Anastasia State Recreation Area. The Recreation Area consists of 1,533 acres, of which approximately 547 acres are within the city limits. The park provides 139 camp sites, 3 designated picnic facilities, 3 playground areas, a nature trail, bicycle paths and over four miles of beaches. Popular activities include fishing, swimming, surfing and hiking. Outstanding natural features include a wide beach and sand dune area, a lagoon bordered by tidal marshes and a hardwood forest of oak trees.

Boating and fishing are the major recreational uses of St. Augustine waterways. Thus, facilities that cater to those interests, such as boat ramps and marinas, will remain an important component of the City's recreational options.

Natural Resources

The citizens of St. Augustine have included protection of natural resources as part of their vision for the future. Awareness of environmental issues affecting the City are even more important, specifically through previous comprehensive planning and visioning processes. As a result, there is a greater understanding of the delicate balance between economic development and environmental stewardship and the ecological impacts of land uses. Policies and regulations that appropriately preserve or conserve valuable natural resources, while allowing for orderly economic growth should continue to be implemented. In addition, complementing these strategies with a strong commitment to maintaining working partnerships with citizens, agencies and organizations, will add important new dimensions to an increasingly comprehensive approach to environmental conservation in St. Augustine. The City's perspective on resiliency and sustainability help to raise awareness for environmental protection and impacts of development on environmentally sensitive areas.

Information and Technology

Effective conservation requires that we know what resources exist, where they are found, and in what condition. The identity and geographical distribution of water resources, natural communities and species, important open spaces, become among the most important information needed for preservation efforts to succeed. Historically, St. Augustine has not had the resources

to perform detailed surveys of the City's natural resources. However, in recent years St. Augustine has started to accumulate this information. In addition, St. Augustine is utilizing Geographic Information System (GIS) technology when practicable. The goals, objectives, and policies call for continued data acquisition and mapping of important environmental resources in the City. This information will help citizens, planners, and state and local government officials understand the impacts of growth management decisions on natural resources.

Education and Outreach

Education and outreach is the most important natural resource protection strategy. Local officials cannot make informed decisions about land uses in natural resource areas if they do not understand the relationship between land uses within resource areas and environmental quality. Education can nurture appreciation of St. Augustine's natural resources and bring about cooperation and voluntary actions to protect the environment. Therefore, it is a goal to inform citizens and local leaders about the values, function, and protection needs of natural resources.

As part of the commitment to environmental stewardship, the City must provide St. Augustine's landowners the tools to protect natural resources while still maintaining their economic viability. This includes disseminating and providing technical assistance on the implementation of best management practices (BMP) for topics such as natural landscape, landscape fertilization, impacts on adjacent marsh areas, and stormwater management. BMP, when properly implemented, may provide effective protection without the need to implement new regulations.

Intergovernmental Coordination

To ensure that the City's resources are protected and managed appropriately, it is imperative that the appropriate state, regional and local land planning agencies, environmental agencies and service providers coordinate and provide accurate information and recommendations to decision makers so that full consideration is given to environmental issues when making land use decisions.

Incentives and Land Acquisition

Land acquisition is currently recognized as one of the best ways to protect natural resources from land use practices that reduce environmental quality. In order to be effective, acquisition must be accompanied by proper management that preserves and, where necessary, restores the natural functions and conditions of the land.

Energy

In 2008, the Florida House of Representatives passed H.B. 697, which added green components to building code standards. H.B. 697 revised provisions authorizing the use of solar collectors & other energy devices, requirements for the future land use element of the local comprehensive plan to include energy-efficient land use patterns and greenhouse gas reduction strategies,

revised eligibility requirements for rebates under Solar Energy System Incentives Program, and expanded required codes to be included in Florida Building Code updates.

Additionally, H.B. 697 set forth that the future land use element of a local comprehensive plan shall include energy-efficient land use patterns and greenhouse gas reduction strategies. The Energy Conservation map depicts three forms of energy conservation/greenhouse gas reduction strategies: *carbon sequestration, public transportation, including alternative modes of transportation and bicycle/pedestrian pathways.*

Vegetation, soils and wetlands are widely recognized as terrestrial carbon sinks. Carbon sinks facilitate either the net removal of carbon net emissions from the atmosphere or the prevention of carbon net emissions from the terrestrial ecosystem into the atmosphere. As a result, all wetlands are identified as carbon sequestration areas, and should help to alleviate concentrations of greenhouse gas emissions.

Public transportation, alternative modes of transportation and bicycle/pedestrian routes fall under alternative transportation methods. By using an alternative method of transportation, residents can reduce carbon emissions. Reductions in carbon emissions are realized through reduced traffic congestion and energy consumption.

Other programs that help to reduce energy consumption and protect limited resources are the Florida Residential Retrofit program, the Florida Water Star program, the U.S. Environmental Protection Agency's Energy Star program, and the St. Johns River Water Management District's Waterwise Landscaping program.

The Florida Residential Retrofit program is currently being undertaken by the State. This program focuses on the retrofitting of older homes to become more energy efficient to reduce energy use. The program will offer incentives for homeowners that have an energy audit and make sufficient improvements to capture at least a 20% improvement in their home energy efficiency.

Like many other cities and counties in Florida, St. Augustine understands the need to consider energy conservation as it plans for the future. During the visioning process, citizens expressed a desire to maintain flexibility in the Future Land Use and Conservation policies, specifically with regard to the location of alternative energy facilities. There are many additional options for energy conservation including site selection criteria, performance standards, infrastructure design, open space requirements, and building codes. St. Augustine will evaluate these options as the Land Development Code is revised and implement the strategies that best represent its vision.

As discussed in the Future Land Use Element. The City's strategies related to the reduction of energy use and green house gas production relate to addressing the historic downtown, new development and preserving the wetland areas. Through downtown rehabilitation and revitalization strategies the City will encourage retrofitting older buildings with updated and more energy efficient options, reusing these older buildings and providing opportunities for

“infill” development to encourage compact development. The City will also encourage the reuse and redevelopment of outlying commercial areas to promote connectivity and compact development. Additionally, the City will consider addressing required parking for old and new development. This can be accomplished as the City revises its land development code after the revised Comprehensive Plan is adopted, and may include increased and Florida friendly landscaping requirements.

New construction and development will be required to meet where feasible, any new energy efficient construction techniques, or green building techniques, and the City will promote “renewable ready” buildings and sites. Mixed-use and cluster developments will help to control land use issues by increasing densities, proximity, and diversity of land uses. The City’s future land use map series also illustrates the potential open spaces by the extent of Open Land (conservation), floodplains and wetlands and surface waters within the City. The City has not quantified its production of green house gases or level of existing green house gases. Given the City’s wetland areas, and current population, the City assumes its level of green house gases is relatively low; however the City will participate in appropriate baseline, or general data gathering efforts to establish measurable objectives. This will help to determine the best approaches to maintain or reduce development impacts.

Land Use:

This section will be updated with the Future Land Use Element.

Existing Land Use:

Existing Shoreline Uses:

All of the existing shoreline uses are located in the Coastal High Hazard Area. Existing land use within the Coastal High Hazard Area (CHHA) of St. Augustine is predominantly vegetative cover. The built environment is primarily composed of land uses designated as commercial or residential.

The majority of commercial land uses located on existing shoreline is located along the San Sebastian and Matanzas Rivers. Parcels line Ponce de Leon Boulevard, San Marco Avenue and Anastasia Boulevard.

Existing residential land use on shorelines are scattered throughout the City. The largest contiguous portion is adjacent to the commercial districts on Anastasia Boulevard, east of the Matanzas River. Other residential areas are on the west side of the San Sebastian River and north of King Street.

Port Authority:

The City of St. Augustine is within the boundaries of the St. Augustine Port, Waterway and Beach District, governed by the St. Augustine Port, Waterway and Beach Commission. The

Commission has the authority to acquire property, construct facilities, maintain waterways, charge fees, borrow money, issue bonds, levy taxes and promote the Port.

St. Augustine separates the northern and southern portions of the Guana Tolomato Matanzas National Estuarine Research Reserve. Vessels using the Intracoastal Waterway are in direct contact with over 60,000 acres of publicly opened uplands, tidal wetlands, as well as lagoons' and offshore seas.

Until the early 1990s, major issues revolved around the maintenance of the St. Augustine Inlet. A Master Plan was completed in 1993 and was subsequently revised and updated in 2004. The plan identified a number of other areas in which the District should be involved such as becoming a funding source for a number of important projects, among them: the removal of derelict boats, boat ramp feasibility studies, offshore artificial reefs, navigational guides to St. Augustine Waterways, installation and maintaining channel markers in Salt Run, harbor patrol in cooperation with the City of St Augustine Police Department, development of a comprehensive Inlet Management Plan, boat mooring issues, and identifying problems and rebuilding the Matanzas Bay seawall.

Demand for Future Shoreline Uses:

The demand for future shoreline uses will be limited because a vast majority of space that can accommodate future growth is limited to undeveloped upland areas, many of which do not have direct access to the water. The City has two undeveloped upland areas that are expected to build up according to the Future Land Use Map.

Upland areas adjacent to SR 312, to the east of the Matanzas River are expected to become a commercial corridor with residential uses radiating out from this corridor. Other shoreline areas that are subject to future development are upland areas along the San Sebastian River. Although most upland areas have already been developed, sections north of King Street provide an opportunity for increased residential and commercial development. Existing wetlands will remain intact throughout the City.

Swimming Beaches:

According to the Florida Land Use and Cover Classification System from 2004, the City of St. Augustine has approximately 1.6 miles of swimming beaches within city limits. All of the available swimming beaches are located in annexed lands from Anastasia State Recreation Area along the Atlantic Ocean.

Although the City has 1.6 miles of swimming beaches, residents have the ability to access several additional miles in the Bird Island Sector of Anastasia State Recreation Area, which runs north to the St. Augustine Inlet. Other swimming beaches that residents can access are located in the Vilano Beach area. Swimming beaches start at the St. Augustine Inlet and run north along S.R. A1A through St. Johns County.

The City of St. Augustine does not have any plans for the future development or acquisition of additional swimming beaches.

Harbor:

The City has developed a Harbor Management Plan, released in December of 2009, which aims at providing residents and visitors with shore side amenities to accommodate the needs of as many responsible, considerate boaters as possible while protecting environmental resources, navigational access and the property of others. The Harbor Management Plan specifies rules and regulations, current facilities, communication procedures, and guidelines to protect the environment. Additionally, the City has a municipal marina fund that is discussed in further detail in the Capital Improvements Element.

The City currently manages and operates three mooring fields (Menendez, San Marcos and Salt Run) with a total of 165 moorings sites. Mooring Fields have been sited in the deepest parts of the Harbor. At this time, the Harbor Management Plan does not discuss anticipated future needs. This section will need to be updated by the City of St. Augustine as the Harbor Management Plan is revised in the future.

Marinas:

Just south of the Historic Bridge of Lions in the City's historic district, is the St. Augustine Municipal Marina. The Marina currently has 96 slips for vessels up to 200 feet, and provides several amenities that are outlined in the St. Augustine Harbor Management Plan. There are also 110 moorings available with tender service daily.

The Harbor Management Plan states that the City of St. Augustine Marina shall provide the following amenities to the Vessels using the City of St. Augustine Marina as part of the User License Agreement: sewage pump-out, limited launch service (for long term renters), dinghy docks, water, trash disposal, showers and bathrooms. The Marina also offers the following services at their published rates: fuel, laundry, oil and a ship's store.

The St. Augustine Municipal Marina participates in the Florida Department of Environmental Protection's Florida Clean Marina Program. "The Florida *Clean Marina* Program is a voluntary designation program with a proactive approach to environmental stewardship. Participants receive assistance in implementing Best Management Practices through on-site and distance technical assistance, mentoring by other Clean Marinas and continuing education. To become designated as a Clean Marina, facilities must implement a set of environmental Best Management Practices (BMP) designed to protect Florida's waterways. These BMP's address critical environmental issues such as sensitive habitat, waste management, storm water control, spill prevention and emergency preparedness. Designated facilities and those facilities seeking designation receive ongoing technical support from the Florida Clean Marina Program and the Clean Boating Partnership (FDEP, Clean Marina Program)."

In 2013 the marina expansion through the use of a breakwater or wave attenuator north of the marina was completed. This allows for the addition of several boat slips. An additional concern is that the City's relatively shallow and narrow waterways and its extensive network of salt marshes severely limit its capacity for new marinas.

Boat Ramps:

The City of St. Augustine has two public saltwater boat ramps; one sited at Vilano Boat Basin just west of the St. Augustine Inlet and one sited at Lighthouse Park on the west side of Salt Run.

The Vilano Boat Basin is located west of the Bridge on S.R. A1A. This boat ramp location allows for direct access to the confluence of the Matanzas and Tolomato Rivers, as well as to the Atlantic Ocean through the St. Augustine Inlet to the east. Amenities at the Vilano Boat Basin are 3 boat ramps, 2 docks with accompanying floating docks, parking, a restroom and concessions building, and a picnic pavilion.

The Lighthouse Park Boat Ramp is located at Old Beach Road and Lew Boulevard, on the west side of Salt Run. This boat ramp provides direct access to shellfish beds in the southern extent of Salt Run and to the confluence of the Matanzas/Tolomato River and St. Augustine Inlet to the north. Amenities at Lighthouse Boat Ramp are 2 boat ramps, 9 tables, 3 grills, a dock and parking.

In addition to the boat ramps located in St. Augustine, local residents have the opportunity to access county and private boat ramps along the Intercoastal waterways adjacent to the City. There are several public and private boat ramps located along the Tolomato River to the north and Matanzas River to the south.

Commercial Fisheries Facilities:

City officials adopted Ordinance 84-45 prohibiting additional seafood processing plants in the City, therefore no future sites are warranted for such facilities.

Boat building and boat repair businesses have had a rich and varied history in the City. Historically most of the boat building has been for fishing vessels. Since the abundance of fisheries resources is cyclical, local facilities have prospered and declined accordingly. Commercial fisheries facilities are currently in a moderate to low period of activity, but are an established industry. No major new commercial fishing facilities are anticipated, the recreational boat builders have also closed. The former Luhrs plant on the west side of the San Sebastian River is now developing as a mixed use project, including a range of uses.

Pollution Sources:

Pollution is an undesirable by-product of mankind's use of the environment. Activities such as heavy manufacturing, waste disposal, and automobile usage are generally thought of as major

polluters. Many other uses create both point and non-point sources of pollution as well. There are several agencies at all levels of government that regulate and oversee activities for the specific reason of mitigating the harmful effects of pollution.

Conclusion

The City's updated data and analysis will help conservation efforts related to the entire spectrum of land use and environmental needs within the City.

Coastal Management Element

163.3177(6)(g)

Introduction

Since 2011 the perspective on the environment and the impacts of human development have both expanded and changed.

As potential development pressures increase, the need for protection and management of the City's natural, and historic resources will increase. The identification of the types of resources, their location, and their significance to the residents of the City is necessary to outline goals, objectives, and policies intended to guide future growth, create protection incentives, and establish conservation guidelines for the use of natural resources in the area.

This environmental planning process is a continuously evolving one that responds not only to new discoveries about the importance of upland and aquatic habitats, but also to the changing needs and priorities of the citizens who share those areas.

Purpose

The role of the Coastal Management Element is to set forth principles, guidelines, standards and strategies to maintain, protect or improve coastal resources, wildlife, ecology, and adapt to new environmental realities in the face of potential population and development growth. The Coastal Management Element must work in harmony with the Future Land Use, Conservation, Transportation and Mobility, Recreation and Open Space, and the other elements of the Comprehensive Plan in ensuring environmental protection, limiting public expenditures in hazardous areas, and protecting against natural disasters, rising seas and the perils of flood. The updated Coastal Management Element provides an analysis of the City's coastal resources, and establishes policies that provide long-term protection and management of these resources, including the required perils of flood, and adaptation planning for sea level rise.

A community's natural resources are among its greatest assets. They warrant protection and enhancement not only for their ecological importance, but also for protecting against natural disasters, and rising waters in low lying coastal zones.

Background

The Coastal Management Element, is a required element of the Comprehensive Plan for the City because the city is in a low-lying coastal zone area. It addresses long range planning for the protection of St. Augustine's built and natural environments. The general quality, species, coastal zone resources and development protection of the City's resources are identified.

Quality of Coastal Zone Environment

St. Augustine includes high quality coastal areas. Anastasia State Recreation Area has many amenities that encourage interaction with the environment and the history of the area. One of the City's greatest assets are the scenic views of the rivers, the adjacent marsh areas, and the inlet.

Species Preservation

The Florida Fish and Wildlife Conservation Commission (FWC) created a 10 year management plan in 2016. This Plan, *Florida's Imperiled Species Management Plan 2016-2026*, as amended December, 2018, establishes a comprehensive, integrated approach for the conservation of state-listed species. It is a Plan that focuses more broadly on systems to protect more holistically the range of species listed.

Wildlife:

A variety of wildlife species including those associated with wetlands (saltwater marshes), uplands, estuaries and rivers can be expected to occur in habitats throughout the City. Mature undisturbed upland forests provide important habitat to forest birds. Coastal upland forests are particularly important to both spring and fall migration, as well as wetland habitats. Major undisturbed wildlife areas exist primarily within the Anastasia State Recreation Area and the few large tracts of undeveloped land in the north. However, the vast saltwater marshes surrounding the City also harbor significant wildlife populations, especially waterfowl and wading birds.

Endangered and Threatened Species:

St. Augustine harbors several species considered endangered or threatened by the U.S. Fish and Wildlife Service and the Florida Fish and Wildlife Conservation Commission. The reasons for the decline of these species vary, but generally all may be attributed to some degree of human interference or exploitation. The listed species in St. Augustine include: the Anastasia Beach Mouse, Gopher tortoise, Indigo snake, American Oyster Catcher, Least Tern, Little Blue Heron, Reddish egret, Roseate Spoonbill, Tricolored Heron, Florida Pine snake, Manatee, Right whale, Sea turtles, and Bald eagle.

In the case of the gopher tortoise, development of sandy uplands that typically contain their burrows has drastically reduced its ability to survive. The listing process for consideration of the gopher tortoise was initiated in May 2002 when Florida Fish and Wildlife Conservation Commission (FWC) staff introduced a petition to reclassify the gopher tortoise from a "species of special concern" to a "threatened" species. A 5-member biological review panel found that the species meets criteria (population size reduction) for classification as a threatened species. In June 2006, the Commission determined that listing the gopher tortoise as a candidate for threatened designation was warranted. The FWC's Gopher Tortoise Management Plan was approved in September 2007. The overall goal of the management plan is to restore and maintain

secure, viable populations of gopher tortoises throughout the species' current range in Florida (St. Johns County EAR)."

The Anastasia Island beach mouse is found along the coastal beaches in grass and sea oat habitat. Although a viable population has not been found within the city limits, there are two viable populations located near its eastern boundary, which are found on Anastasia Island, in the south at the Ft. Matanzas National Monument area and in the north at Anastasia State Recreation Area. Although there has not been a documented population in the city limits, the potential for the mouse still exists along the coastal dunes south of Anastasia State Recreation Area.

The manatee is not a permanent resident of the coastal waters of St. Augustine, but frequently passes through the area on its way north or south. State and Federal employees have reported seeing manatees entering or exiting the Intercoastal Waterway through the St. Augustine Inlet.

There are three (3) species of marine turtles that visit the beaches of St. Augustine for nesting purposes. The most common nesting turtle is the Atlantic Loggerhead, and less common are the Atlantic green and Leatherback turtle. The Florida Fish and Wildlife Conservation Commission "assesses nesting abundance and reproductive output by coordinating a network of state, federal and volunteer permit holders who monitor sea turtle reproduction on Florida's beaches. FWC establishes scientifically sound monitoring designs, provides training, resolves data collection problems, assesses data collection error rates, analyzes data trends, and serves as a clearinghouse for information on marine turtle populations and habitats (Endangered and Threatened Species Management and Conservation Plan FY 2008-2009 Progress Report)."

The Northern Atlantic Right Whale is the most endangered sea mammal that uses the coastal waters adjacent to the City of St. Augustine. The only known calving grounds are the water off the coast of northeast Florida between December and March. The biggest threat to the whale is human induced in the form of vessel strikes and entanglement in fishing gear.

Unique Species:

A unique species present in St. Augustine is the little-known Sweadner's Hairstreak Butterfly. The Sweadner's Hairstreak, also known as the St. Augustine Hairstreak, has been the subject of research by the University of Florida biologist Dr. Ted Emmel since the 1970's. The butterfly host tree is the southern red cedar (*juniperus silicicola*), which is often confused with the eastern red cedar (*juniperus virginiana*). Contrary to other reports, there are no naturally occurring eastern red cedar forests in the St. Augustine area.

The Sweadner's Hairstreak is considered very rare and local. The only known remaining populations occur in Jacksonville and St. Augustine. The butterfly feeds on the southern red cedar in the larvae stage, while the adults feed on nectar from flowers around the cedar. Research has shown that a mature cedar tree and surrounding vegetation will support three to four individual adults. It is unlikely that a single, isolated tree will be inhabited or utilized by this species, according to Dr. Emmel's research. The only known population in St. Augustine occurs

near Lighthouse Park. Dr. Emmel has estimated that the remaining butterfly population at approximately 1,000.

In 1986, City officials adopted Ordinance 86-61 to protect the butterfly habitat. The ordinance requires the planting of two southern red cedars for each southern red cedar cut down or destroyed.

Wildlife and Marine Areas of Special Concern:

Wetlands, primarily salt marshes and tidal flats, exist throughout the City and constitute the City's most important natural resource. Wetlands have several benefits but the two most common are habitat for aquatic and terrestrial species, and flood prevention. Wetlands serve as important incubators for young aquatic life and as a substantial food source for migratory and wading birds.

The Anastasia Island area has the City's most diverse habitat. The area contains salt marshes of the Matanzas River system, as well as other special resources. This includes the City's only sea turtle nesting beach, the southern red cedar habitat of the St. Augustine Hairstreak butterfly, and approved shellfish harvesting area within Salt Run.

The presence of manatees in St. Augustine waters provides several challenges, particularly dealing with conflicts between boating activities and migratory paths of these protected species. Today, they are protected by the Florida Manatee Sanctuary Act (379.2431(2), F.S.) and are federally protected by both the Marine Mammal Protection Act and the Endangered Species Act.

In an effort to protect the species while still meeting the demands of the boating community, the Florida Fish and Wildlife Conservation Commission (FFWCC) has developed the Florida Manatee Program. Counties are encouraged to develop and implement Manatee Protection Plans. St. Johns County has a plan that was approved in September 2005. The City of St. Augustine is encouraged to work with St. Johns County in maintaining a Manatee Protection Plan that is approved by FFWCC.

The City has addressed manatee protection within their coastal waters through the Harbor Management Plan of 2009. Guidelines in the Plan require that all vessels shall observe the idle speed/no wake zone in and around the City of St. Augustine. Additionally, St. Augustine renters and guests shall acquaint themselves with the publications and warnings available from the Harbormaster regarding safe operation in waters frequented by manatees and to abide by all laws, ordinances, rules, and regulations governing the operation of watercraft in the presence of manatees.

Ecological Planning Principles

Coastal and Shore Protection Areas:

The City of St. Augustine does not have extensive shore protection structures such as revetments, groins, breakwaters, bulkheads, or seawalls. Major portions of the City are protected by natural barriers such as tidal marshlands, which can better absorb the impacts of standard tidal fluctuations and minor flooding events.

The St. Augustine Inlet has two jetties that protect its waters. The U.S. Army Corps of Engineers constructed the north jetty in 1941 and the south jetty in 1957. The north jetty is 1,500 feet long and constructed of timber piles, wakefield piling and rock. This north jetty is meant to act like a sand-trap groin. The south jetty is 3,044 feet long and is constructed entirely of rock. The south jetty is meant to deter shoaling within the inlet.

Beach and Dune Conditions:

The City of St. Augustine has approximately 1.6 miles of Atlantic Ocean beach frontage located to the south of Anastasia State Recreation Area. This area suffers from short-term erosion. FDEP's 2003 report on critical beach erosion classified four areas within the District as critical or noncritical erosion areas. "According to FDEP, for erosion problems to be critical there must exist a threat to or loss of one of four specific interests – upland development, recreation, wildlife habitat, or important cultural resources (St. Augustine Port, Waterways and Beach 2005 Master Plan). " The City of St. Augustine does not reside in one of these areas.

The north and south jetties protecting the St. Augustine Inlet are the major shore protection structures that shield St. Augustine.

Conservation Overlay Zones:

Generally, the City's environmental communities can be divided into three (3) areas: beaches, shores and dunes seaward of the State's Coastal Construction Control Line; transition zones (e.g., riverine to upland, edges of tidal creeks to upland); and upland areas with significant tree canopies. To address the special environmental needs or challenges within each of these generalized communities, the City has created three (3) "Conservation Overlay Zones."

Conservation Overlay Zones were originally established in the Comprehensive Plan for the City of St. Augustine to protect environmentally sensitive areas from development that could have a detrimental effect on the environment. The protection afforded by these zones is broad, extending from the conservation of water bodies and natural drainage features to the preservation of habitat for species that are endangered, threatened or of special concern.

The Conservation Overlay Zones have been established based on local environmental values, habitat sensitivity, intensity of development desired and federal, state and local laws. Constraints placed on the zones vary according to the types of effects that may result from development, free services that will be lost and loss of other natural values such as unique or endangered species habitat. The location of each zone is shown on Map X.

Conservation Overlay Zone 1:

It includes all beaches, shores and dunes seaward of the State's Coastal Construction Control Line, wetlands, brackish water and some habitat areas for species recognized as endangered, threatened, of special concern, or unique by federal state and local agencies. This zone includes the estuarine/riverine environments created by the San Sebastian and Matanzas Rivers and their tributaries.

Habitats in Zone 1 include tidal marshes; littoral zones along the rivers and tidal creeks; mud flats and sandbars; beaches and dunes; aquatic nursery areas; reefs; shellfish areas and other benthic habitat; tidal creeks; sea turtle nesting areas; and manatee use areas.

Environmental factors in Zone 1 include usually or periodically wet; protected by state, federal or local laws; wildlife nursery areas; fisheries resource areas; natural surge and storm buffer areas; significant recreational values; panoramas and vistas; brackish water, saltwater or salt spray adapted; and protected species.

Conservation Overlay Zone 2:

Zone 2 is the transition zone or buffer area between Zone 1 and Zone 3. The primary purpose of Zone 2 is to protect the functional integrity of Zone 1 and to protect Zone 3 from flooding due to extreme high water conditions.

Representative habitats in Zone 2 are transition zones from riverine to upland edges or tidal creeks to upland; transitions from marsh to upland transition; and transitions from beaches and dunes to uplands.

Environmental factors in Zone 2 include wet under extreme conditions; mixed high marsh to uplands species; mixed riverine to uplands species; and mixed beaches.

Conservation Overlay Zone 3:

Conservation Overlay Zone 3 is comprised of uplands and urban areas containing significant tree canopy and/or special flood hazard areas.

Limiting Development in CHHA

This section will be updated with the perils of flood section.

Natural Disasters

Add conversation related to recent storm experience.

Disaster Planning:

Disaster Planning encompasses both natural and man-made disasters. To address these concerns Florida Statute 252 orders the development and management of a County Comprehensive Emergency Management Plan (CEMP), which is required to be updated every two years.

“One of the primary responsibilities of the St. Johns County Department of Emergency Management is to develop a local emergency management plan. This plan addresses, as much as possible, all emergency response functions of local governmental departments and agencies, public officials, and other public and private organizations, during emergencies or disasters. The Department of Emergency Management in cooperation and coordination with local municipalities has achieved that objective by developing the St. Johns County Comprehensive Emergency Management Plan. This plan is designed to ensure that jurisdictions in St. Johns County can effectively prepare for, respond to and recover from emergencies and disasters. This plan was developed with input from all local government departments and agencies that play a pivotal and functional role in emergencies or disasters (St. Johns County Comprehensive Emergency Management Plan 2008).”

Hurricane Vulnerability Zones:

In 2006, the Florida Legislature approved House Bill 1359 (HB 1359). The bill defines the coastal high-hazard area as the area below the elevation of the category 1 storm surge line as established by a Sea, Lake, and Overland Surges from Hurricanes (SLOSH) computerized storm surge model.

In 1998, the Northeast Florida Regional Council (NEFRC) prepared the 1998 Hurricane Evacuation Study for Northeast Florida in cooperation with the Florida Department of Community Affairs (FDCA), the National Hurricane Center, and the local municipalities in the northeast Florida region.

Significant portions of the City of St. Augustine are located in the Coastal High Hazard Area (CHHA). Areas that are particularly vulnerable to a Category 1 storm surge are located along the San Sebastian and Matanzas Rivers, as well as coastal areas south of Anastasia State Recreation Area. Although there is substantial tidal marshes and wetlands that protect much of the City from standard flooding, land identified in the CHHA will be inundated by water from a Category 1 storm surge.

All areas outside of the designated CHHA in the City of St. Augustine are still vulnerable to storm surges produced by hurricanes larger than a Category 1. Because of the potential loss of life and property that accompany such storm surges, residents are advised to pay attention to storm advisories, watches and warnings. Additionally, all residents should vacate the area when directed by emergency personnel.

Number of People Who Require Evacuation:

Evacuation is described as a process to withdraw from a place in an organized way especially for protection. Evacuation zones are based on the Northeast Florida Hurricane Atlas Series 1998 produced by the Northeast Florida Regional Council (NEFRC).

Most evacuations will be local in scope and an emergency response incident commander will initiate actions following a decision. In such cases, the actions will be coordinated and administered by emergency response officials using local resources in accordance with operational procedures.

Every resident in the City of St. Augustine is at risk from storm surge. All residents that live in the CHHA will be required to evacuate prior to a Category 1 storm landfall or when directed by designated emergency personnel. The remainder of residents outside of the CHHA will need to evacuate prior to a Category 2 storm landfall or when directed by designated emergency personnel.

Current and future population projections are provided in the table below.

Table X: Permanent Population Estimates and Projections

Year	City of St. Augustine Population	St. Johns County Population
2000	11,592	123,135
2010	12,975	190,039
Projected 2015	13,590	213,566
Projected 2018	14,021	238,742
Projected 2020	14,042	255,300
Projected 2025	14,790	295,800
Projected 2030	16,480	329,600
Projected 2035	17,980	359,600
Projected 2040	19,330	386,600

Source: Shimberg Center for Housing Studies; Bureau of Business and Economic Research, Projections including and after 2025 are based on a steady rate of 5% of the projected St. Johns County population

Number of People Who Require Evacuation Shelter:

Vulnerable populations that may require shelter during an evacuation are those people located in group homes and Flagler Hospital. The hospital and group homes already have special evacuation plans in place.

There are a total of 133 beds available in St. Augustine group homes and 350 beds available at Flagler Hospital. Therefore, the maximum amount of people who may require evacuation shelter space is 488 people.

Table X: Group Homes in the City of St. Augustine

Name of Facility	Address	Number of Beds
Buckingham Smith Assisted Living Facility	169 Martin Luther King Avenue	36
Loving Care Living Facility	76 Bruen Street	8
Pavilion At Bayview	161 B Marine Street	69
Grafton House	168 Marine Street	20

Source: Florida Agency for Health Care Administration

Individuals in private homes and who need special assistance are asked to voluntarily register with the County and plans will be made to assist them. Special Needs Registration is coordinated and consolidated through the St. Johns County Department of Emergency Management. Special Needs Registration Forms are received from the St. Johns County Council on Aging, the St. Johns County Health Department, various Health Care and Home Health Agencies and other sources available.

The St. Johns County Special Needs Registration Program was created to preidentify and preplan for the needs of persons requiring assistance through registration and prior triage based on information provided by the client and the home health agency. All Special Needs Client information is on file with the Department of Emergency Management.

Upon receiving Registration Forms, each applicant is carefully triaged, taking various health issues into consideration, to insure proper placement and categorized into one of three groups.

- Low: Citizens requiring transportation to Public Shelters
- Medium: Citizens with special medical needs who are capable of transporting themselves to the Special Needs Shelter
- High: Citizens with special medical needs that need transportation to the Special Needs Shelter.

Each Citizen is then input into the St. Johns County Evacuation Assistance Database, which allows for easy reference of our Special Needs Registrants. Each client's registration form is also labeled / input with their Fire and Evacuation Zone to insure accuracy when specified areas are called to evacuate. After registration is complete, each client is notified by mail of their registration, shelter placement and a list of supplies necessary when evacuating to a shelter.

Hurricane Shelter Space Available:

Shelter space available in St. Johns County is identified in the County Comprehensive Emergency Management Plan (CEMP). Shelter space available to St. Augustine residents, as well as residents of St. Johns County is highlighted in the table below.

St. Johns County has a total of 6,200 primary shelter spaces; 1,000 pet shelter spaces, 5,204 secondary shelter spaces, and 500 special needs shelter spaces. This brings the total potential shelter spaces available in St. Johns County to 12,904.

Table X: Available Shelter Space in St. Johns County

Shelter Name	Shelter Address	City	Shelter Capacity	Shelter Retrofit Complete	Shelter Elevation	Shelter Category	Preferred Shelter
Primary Shelters							
Bartram Trail High	2050 Roberts Road	Jacksonville	500	Yes		5	Yes
Cunningham Creek Elem	1205 Roberts Road	St. Augustine	800	Yes	33.4	5	Yes
Creekside High School	100 Knights Lane	St. Johns	500	Yes			Yes
Durbin Creek Elem	4100 Race Track Road	St. Augustine	500	Yes		5	Yes
Fruit Cove Middle	3180 Race Track Road	St. Augustine	500	Yes		5	Yes
Hickory Creek Elem	235 Hickory Creek Trail	Jacksonville	500	Yes		5	Yes
Mill Creek Elementary	3750 International Golf Pkwy	St. Augustine	800	Yes	28	5	Yes
Osceola Elementary	1605 Osceola Elementary Rd	St. Augustine	800	Yes	40	3	Yes
Otis Mason Elementary	2300 SR 207	St. Augustine	800	Yes	41	3	Yes
Pedro Menendez High	600 SR 206 West	St. Augustine	500	Yes		4	Yes
Pet Shelters							
South Woods Elem	4750 SR 206 West	Elkton	500	Yes		5	Yes
Timberlin Creek Elem	555 Pine Tree Lane	St. Augustine	500	Yes		5	Yes
Secondary Shelters							
Allen Nease High	10550 Ray Road	St. Augustine	800	No	25	T/S	No
Gamble Rogers Middle	6250 US 1 South	St. Augustine	800	Yes		2	Yes
Hartley Elementary	260 Cacique Drive	St. Augustine	335	No	30	T/S	No
Julington Creek Elem	2316 Race Track Road	St. Augustine	600	Yes	10	T/S	No
Murray Middle	150 N Holmes Blvd	St. Augustine	189	Yes	35	3	No
Sebastian Middle	2955 Lewis Speedway	St. Augustine	800	Yes	9	T/S	No
St. Augustine High	3205 Varella Avenue	St. Augustine	800	Yes	28	2	No
Switzerland Middle	777 Greenbriar Road	Switzerland	800	Yes	30	5	No

Webster Elementary	420 N Orange Street	St. Augustine	80	Yes	25	3	No
Special Needs Shelters							
Hastings Community Center	6195 S Main Street	Hastings	200	Yes		3	Yes
Pacetti Bay Middle School	245 Meadowlark Lane	St. Augustine	300	Yes	19	5	Yes

Source: St. Johns County Comprehensive Emergency Management Plan 2008

Evacuation Routes:

Evacuation routes, as defined by the Statewide Regional Evacuation Study Program (SRESP), includes roadways designated by county emergency management officials, in coordination with FDOT and NEFRC as official regional evacuation routes: roadways and roadway segments identified by the SRESP as routes used to interconnect and City designated evacuations routes: or routes used to interconnect evacuation routes between study regions. This includes major highways that are part of the regional and statewide network including primary (interstates and turnpikes), secondary (major arterials), and certain local roadways (Minor arterials) which provide significant evacuation transportation capacity to move vulnerable populations to “points of safety”.

The NEFRC updated the Hurricane Evacuation Study in December 2010. The County will then incorporate the results and proactively plan accordingly. As can be seen, the entirety of the County east of the Intracoastal Waterway is currently in a defined Category 1 or 2 evacuation area. In the event of an evacuation, a significant portion of the coastal area will be ordered to evacuate. The ensuing effect on the County roadway network can be expected; several roadways will experience a high level of traffic congestion in the event of a Category 1 hurricane evacuation. In the event of a Category 4 or 5 hurricane, the entire area of the County east of I-95 would be in an evacuation area. As will be expected, the number of roadways experiencing congestion in the event of such an evacuation also increases.

Evacuation Times:

The Statewide Regional Evacuation Study of 2010 used two distinct sets of analysis; one set of analysis for growth management purposes and one set of analysis for emergency management purposes.

Base Scenarios: these scenarios assume 100% of the vulnerable population evacuates and includes impacts from counties outside of the Regional Planning Council area. Base scenarios were designed for growth management purposes, in order to ensure that all residents that choose to evacuate during an event are able to do so.

Operational Scenario: Operational scenarios were designed to provide important information to emergency management personnel to plan for different storm events. These scenarios are different from region to region and vary for each evacuation level.

Clearance times were developed to include the time required for evacuees to secure their homes and prepare to leave, the time they spent by vehicle traveling along the evacuation route network, and the additional time spent on the road caused by traffic and road congestion. The four clearance times that were calculated as part of the evacuation transportation analysis include the following:

- *Clearance Time to Shelter:* The time necessary to safely evacuate vulnerable residents and visitor's to a "point of safety" within the county based on a specific hazard, behavioral assumptions and evacuation scenarios. Calculated from the point in time when the evacuation order is given to the point in time when the last vehicle reaches a point of safety within the county. Key points to remember for clearance time to shelter include:
 - All in-county trips reach their destination within the county
 - This definition does not include any out of county trips
- *In-County Clearance Time:* The time required from the point an evacuation order is given until the last evacuee can either leave the evacuation zone or arrive at safe shelter within the county. This does not include evacuees leaving the county of their own free will. Key points to remember for incountry clearance time include:
 - All in-county trips reach their destination within the county
 - All out of county trips exit the evacuation zone, but still may be located in the county.
 - This definition does not include out-of-county pass-through trips from adjacent counties, unless they evacuate through the evacuation zone.
- *Out of County Clearance Time:* The time necessary to safely evacuate vulnerable residents and visitors to a "point of safety" within the county based on a specific hazard, behavioral assumptions and evacuation scenario. Calculated from the point an evacuation order is given to the point when the last vehicle assigned an external destination exits the county. Key points to remember for out of county clearance time include:
 - The roadway network within the county is clear
 - All out of county trips exit the county, including out of county pass-through trips from adjacent counties
 - All in-county trips reach their destination
- *Regional Clearance Time:* The time necessary to safely evacuate vulnerable residents and visitors to a "point of safety" within the northeast Florida region based on specific hazard, behavioral assumptions and evacuation scenario. Calculated from the last vehicle assigned an external destination exits the region. Key points to remember for regional clearance time include:
 - The roadway network within the region is clear
 - All out of county trips exit the region, including out of county pass-through trips for adjacent counties
 - All in-county trips reach their destination

- Regional clearance time is equal to the largest out of county clearance time for a given scenario for any of the counties within the northeast Florida region

Post Disaster Redevelopment:

Existing and Proposed Land Use in CHHA:

Existing land use within the Coastal High Hazard Area (CHHA) of St. Augustine is predominantly vegetative cover. Wetlands and conserved open space buffer much of the developed land from intrusion of St. Augustine's many water bodies. The built environment is primarily composed of land uses designated as commercial, institutional or residential.

Major commercial land uses are located along Anastasia Boulevard, San Marco Avenue, and U.S. 1 in the western portion of the City. The largest institutional land uses are located in the central part of the City, with smaller parcels north of the Vilano Causeway. Residential developments are located throughout the CHHA. The largest contiguous residential land use is located adjacent to the commercial land uses on Anastasia Boulevard, with smaller residential neighborhoods being developed in upland areas to the south. There are several other St. Augustine neighborhoods in the CHHA located near the historic district of downtown and along the Tolomato/Matanzas, San Sebastian riverfronts.

Future land use in the CHHA remains relatively the same as existing land use. Anticipated development will take place in the remaining undeveloped upland areas. The largest portion of upland area that is anticipated to be developed is located near SR 312, east of the Matanzas River. A commercial corridor will line SR 312 and have residential developments that are adjacent to the commercial corridor.

Another area ripe for development are the subdivisions north of the city along the US 1 corridor and Lewis Speedway.

Structures with Repeated Storm Damage:

The City of St. Augustine does not currently have any structures that have suffered repetitive loss due to storm surge or weather related damage.

Ports

There is a Port and Waterway Authority. The city has an important proximity to the inlet, and the intercoastal waterway, but it is not an active port in the sense for shipping and commerce. Access to the ocean and the city marina is important for tourism, and some commercial fishing related to the City's remaining working waterfront.

Preserve Historic and Archaeological Resources

This item will be updated with the Historic Preservation Element.

Historic Preservation:

A small city by virtually any standard, St. Augustine nevertheless enjoys a national and even international reputation as the oldest continuously occupied community in the United States. As a result, cultural resources such as buildings, sites, and districts and structures constitute a valuable part of the community.

Although many of these cultural resources are scattered throughout the City, the Future Land Use Map depicts one specific area designated for Historic Preservation. The Historic Preservation district is located in the central part of the City between the San Sebastian and Matanzas Rivers. Sections of the district run north and south of King Street with ample shoreline access to the east along the Matanzas River.

The Historic Preservation district is intended to provide primarily residential uses that will encourage the preservation and restoration of historic structures. This district is also intended to provide a mix of residential uses and compatible nonresidential uses that will maintain the historic ambiance and pedestrian scale of the district.

Much of the land depicted as Historic Preservation on the Future Land Use Map is currently residential, recreational, commercial or institutional. These existing land uses coincide with the anticipated land uses of the Historic Preservation district. Therefore, development impacts within the district should remain relatively low in the future

Resilience and Sea level Rise

This item will be updated in conjunction with the Conservation, Future Land Use, Infrastructure, and Intergovernmental Coordination Elements.

Conclusion

TECHNICAL PUBLICATION SJ2006-2A

**ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
2005 DISTRICT WATER SUPPLY PLAN**

**ADDENDUM
OCTOBER 10, 2006**



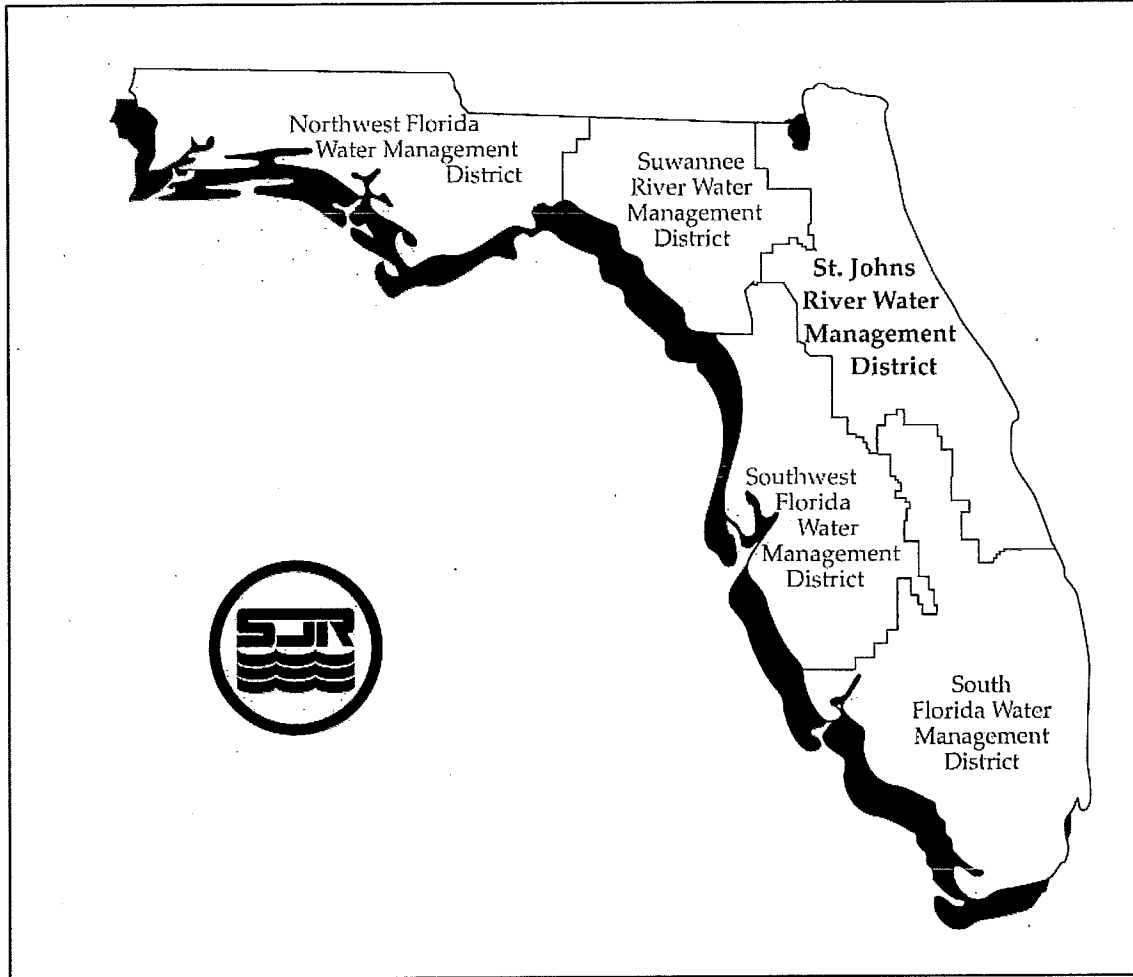
Technical Publication SJ2006-2A

St. Johns River Water Management District
2005 District Water Supply Plan

Addendum
October 10, 2006

St. Johns River Water Management District
Palatka, Florida

2006



The St. Johns River Water Management District (SJRWMD) was created by the Florida Legislature in 1972 to be one of five water management districts in Florida. It includes all or part of 18 counties in northeast Florida. The mission of SJRWMD is to ensure the sustainable use and protection of water resources for the benefit of the people of the District and the state of Florida. SJRWMD accomplishes its mission through regulation; applied research; assistance to federal, state, and local governments; operation and maintenance of water control works; and land acquisition and management.

This document is published to disseminate information collected by SJRWMD in pursuit of its mission. Copies of this document can be obtained from:

Library
St. Johns River Water Management District
4049 Reid Street • P.O. Box 1429
Palatka, FL 32178-1429

Phone: (386) 329-4132

2005 DISTRICT WATER SUPPLY PLAN

ADDENDUM OCTOBER 10, 2006

The St. Johns River Water Management District (SJRWMD) approved its *District Water Supply Plan 2005* (DWSP 2005) on February 7, 2006. DWSP 2005 has been published by SJRWMD as Technical Publication SJ2006-2. Subsequent to publication, SJRWMD identified several errors within the document, in Tables 13, 14, and 15; and Figures 5 and 6. The SJRWMD Governing Board approved an addendum on October 10, 2006, to correct these errors. This Addendum to DWSP 2005 is important because the revised information contained within tables is directly (1) linked to the water supply entity notification process, which is required pursuant to Section 373.0361, *Florida Statutes*; (2) required for SJRWMD's Water Protection and Sustainability Program; and (3) essential in SJRWMD's efforts to develop technical assistance documents for local governments to use in updating their comprehensive plans to address water supply issues, including the identification of alternative and traditional water supply projects necessary for meeting the water supply needs within their jurisdictions. The following are enumerated addenda to DWSP 2005.

Table 13. Quantities and estimated costs of alternative water supply development projects. As presented in this addendum, Table 13 changes the names of water supply development project categories, to better explain the types of use associated with projects in each category. In addition, the project numbers in the surface water category have been rearranged to make them consistent with numbers appearing elsewhere in DWSP 2005. Table 13, as it is included in this addendum, supersedes the table included in DWSP 2005, which was approved on February 7, 2006.

Table 14. SJRWMD—Public water supply entities and associated alternative water supply development projects. As presented in this addendum, Table 14 includes the addition and deletion of several water supply entities; includes the addition and deletion of projects associated with water supply entities; corrects the names of some water supply entities; corrects the location of water supply entities; and corrects minor style errors. Table 14, as it is included in this addendum, supersedes the table included in DWSP 2005, which was approved on February 7, 2006.

Table 15. Status of water supply development projects. As presented in this addendum, Table 15 includes the addition of one water supply development project that is identified in other locations in *DWSP 2005*; corrects the single-entity or multijurisdictional status of projects; corrects project sponsors; corrects funding sources; and corrects minor style errors. Table 15, as it is included in this addendum, supersedes the table included in *DWSP 2005*, which was approved on February 7, 2006.

Figure 5. Multijurisdictional water supply development projects 2005. As presented in this addendum, Figure 5 adds the location of project number 39. Figure 5, as it is included in this addendum, supersedes the figure included in *DWSP 2005*, which was approved on February 7, 2006.

Figure 6. Single entity water supply development projects 2005. As presented in this addendum, Figure 6 changes the location of project number 16 from Orange County to Seminole County and deletes project number 39, which is added to Figure 5. Figure 6, as it is included in this addendum, supersedes the figure included in *DWSP 2005*, which was approved on February 7, 2006.

Table 13. Quantities and estimated costs of alternative water supply development projects

DWSP Project Number	Project Name	Estimated Cost				
		Capacity Average Daily Flow (mgd)	Construction (in millions)	Total Capital (in millions)	Operation and Maintenance (in millions per yr)	Unit Production (cost per 1,000 gal)
Brackish Groundwater Source for Potable Use						
1	Dunes Community Development District Brackish Groundwater Project	1.00	\$9.50	\$10.40	\$0.183	\$2.65
2	East Putnam Regional Water System Project	0.63	\$10.91	\$11.22	\$0.400	\$5.39
3	Meibourne Reverse Osmosis (RO) Plant Expansion	2.50	\$4.80	\$5.80	\$2.827	\$3.54
4	Ormond Beach Water Treatment Plant Expansion Project	2.00	\$10.90	\$12.02	\$0.427	\$0.69
5	St. Augustine Water Supply Project	5.00	\$12.80	\$14.70	\$1.980	\$1.69
6	St. Johns County Water Supply Project	6.66	\$20.00	\$22.00	\$2.000	\$1.51
Brackish Groundwater Subtotals		17.79	\$68.91	\$76.14	\$7.82	
Surface Water Source for Potable Use						
7	Lower Ocklawaha River in Putnam County Project	20.00	\$201.00	\$266.00	\$5.790	\$3.16
8	St. Johns River Near SR 50 Project	10.00	\$76.00	\$95.00	\$4.350	\$3.01
9	St. Johns River Near Lake Monroe Project	50.00	\$387.56	\$505.68	\$21.003	\$3.04
10	St. Johns River Near DeLand Project	20.00	\$182.58	\$239.52	\$8.578	\$3.40
11	St. Johns River Near Lake George Project	33.00	\$313.00	\$402.00	\$13.670	\$3.39
12	St. Johns River/Taylor Creek Reservoir Water Supply Project	40.00	\$174.00	\$215.00	\$11.830	\$1.87
Surface Water Subtotals		173.00	\$1,334.14	\$1,723.20	\$65.22	
Seawater Source for Potable Use						
13	Indian River Lagoon at FP&L Cape Canaveral Power Plant Project	15.00	\$111.00	\$140.00	\$7.510	\$3.43
14	Indian River Lagoon at Reliant Energy Power Plant Project	15.00	\$113.00	\$141.00	\$8.100	\$3.57

2005 District Water Supply Plan – Addendum

Table 13—continued

DWSP Project Number	Project Name	Capacity Average Daily Flow (mgd)	Estimated Cost			
			Construction (in millions)	Total Capital (in millions)	Operation and Maintenance (in millions per yr)	Unit Production (cost per 1,000 gal)
15	Intracoastal Waterway at New Smyrna Beach Project	15.00	\$134.00	\$168.00	\$8.840	\$4.05
	Seawater Subtotals	45.00	\$358.00	\$449.00	\$24.45	
Reclaimed Water Source						
16	Alafaya Reclaimed Water Storage and High Service Pumps Project	0.41	\$2.02	\$2.44	\$0.033	\$1.25
17	Altamonte Springs and Apopka Project RENEW APRICOT	6.63	\$11.19	\$13.52	\$0.195	\$0.46
18	Apopka and Winter Garden Reuse Partnership Project	3.00	\$4.31	\$5.21	\$0.071	\$0.38
19	Bellevue and Spruce Creek Golf Course Reclaimed Water System Expansion Project	1.00	\$1.64	\$2.37	\$0.032	\$0.55
20	Beverly Beach Integrated Reclaimed Water and Stormwater Reuse Project, Phase II	0.50	\$2.25	\$2.64	\$0.049	\$1.28
21	Clermont Reclaimed and Stormwater System Expansion Project	5.10	\$18.77	\$22.68	\$0.923	\$1.28
22	Cocoa/Rockledge Reclaimed Water Line Connection Project	0.25	\$1.07	\$1.29	\$0.021	\$1.14
23	Daytona Beach Reclaimed Water System Project	26.00	\$20.33	\$25.41	\$1.826	\$0.36
24	DeLand Reclaimed Water and Surface Water Augmentation Project	1.70	\$4.83	\$5.55	\$0.328	\$1.15
25	Eastern Orange and Seminole Counties Regional Reuse Project	20.00	\$28.94	\$28.94	\$0.364	\$0.32
26	Edgewater Reclaimed Water System Interconnect to Southeast Volusia County Project	1.00	\$5.22	\$6.30	\$0.146	\$1.49

Table 13—continued

DWSP Project Number	Project Name	Capacity Average Daily Flow (mgd)	Estimated Cost			Unit Production (cost per 1,000 gal)
			Construction (in millions)	Total Capital (in millions)	Operation and Maintenance (in millions per yr)	
27	Eustis Reclaimed Water System Expansion and Augmentation Project	1.10	\$1.87	\$2.26	\$0.096	\$0.60
28	Flagler County Bulow Reclaimed Water System Project	1.70	\$1.77	\$2.14	\$0.185	\$0.53
29	Holly Hill Reuse System to Ormond Beach	0.60	\$0.40	\$0.49	\$0.048	\$0.36
30	Lady Lake Phase II Reclaimed Water System	0.50	\$2.00	\$2.20	\$0.229	\$2.06
31	Lake Utility Services (Utilities Inc. of Florida)—Lake Groves WWTF Reclaimed Water System Expansion Project	1.00	\$3.60	\$4.35	\$0.219	\$1.43
32	Leesburg Reclaimed Water Reuse Project	7.05	\$23.02	\$27.82	\$0.334	\$0.88
33	Melbourne Reclaimed Water System Expansion Project	1.50	\$4.03	\$4.87	\$0.373	\$1.50
34	Minneola Reclaimed Water Reuse Project	1.00	\$7.78	\$11.46	\$0.140	\$1.01
35	Mount Dora Country Club Golf Course Reclaimed Water Project	0.26	\$0.33	\$0.40	\$0.021	\$0.49
36	North Seminole Regional Reclaimed Water and Surface Water Optimization System Expansion and Optimization Project	7.76	\$8.78	\$10.30	\$0.505	\$0.43
37	Ocoee Reuse System Expansion Project	0.35	\$2.33	\$2.69	\$0.001	\$1.33
38	Orange County Northwest Reclaimed Water Project	3.00	\$10.00	\$10.25	\$0.300	\$0.87
39	Orange County Southeastern Reclaimed Water System Expansion	12.50	\$13.21	\$13.21	\$0.351	\$0.27
40	Orlando Utilities Commission Project RENEW	9.20	\$51.93	\$62.75	\$1.612	\$1.66
41	Ormond Beach North Peninsula Reclaimed Water Storage Project	0.49	\$2.46	\$2.97	\$0.142	\$1.94
42	Ormond Beach South Peninsula Reuse Improvement Project	2.13	\$8.20	\$9.91	\$0.194	\$1.06
43	Palm Coast Reclaimed Water System Expansion Project	8.23	\$13.91	\$16.61	\$1.232	\$0.77
44	Port Orange Airport Road Reclaimed Water Transmission Main Project	1.00	\$1.60	\$1.93	\$0.080	\$0.56
45	Port Orange Pioneer Trail Storage and Pumping Facility Project	2.00	\$2.34	\$2.83	\$0.183	\$0.50

2005 District Water Supply Plan – Addendum

Table 13—continued

DWSP Project Number	Project Name	Capacity Average Daily Flow (mgd)	Estimated Cost			Unit Production (cost per 1,000 gal)
			Construction (in millions)	Total Capital (in millions)	Operation and Maintenance (in millions per yr)	
46	Port Orange Reclaimed Water Reservoir and Recharge Basin Project	2.70	\$8.78	\$10.06	\$0.107	\$0.82
47	Rockledge Reclaimed Water Storage Project	0.16	\$1.68	\$2.03	\$0.013	\$2.36
48	Rockledge Reclaimed Water System Expansion—ASR Project	0.55	\$2.01	\$2.43	\$0.045	\$1.25
49	South Daytona Reclaimed Water System Expansion Project	0.14	\$0.72	\$0.87	\$0.011	\$1.32
50	Tavares Reclaimed Water Treatment System Expansion Project	0.60	\$4.71	\$5.69	\$0.048	\$1.86
51	Volusia County Southwest Reclaimed Water System Project	0.20	\$1.18	\$1.43	\$0.016	\$1.46
52	West Melbourne Above Ground Reclaimed Water Storage Tank	2.48	\$2.51	\$2.76	\$0.100	\$0.31
53	Winter Garden Reclaimed Water Pumping and Transmission Project	4.00	\$14.40	\$17.40	\$0.496	\$1.09
	Reuse Subtotals	139.79	\$296.12	\$348.46	\$11.07	
	Reuse Augmentation Source					
54	Lake Apopka Reuse Augmentation Project	1.00	\$7.27	\$8.79	\$0.114	\$1.99
55	Seminole County Yankee Lake Reclaimed Water System Augmentation Project	10.00	\$25.08	\$31.36	\$3.156	\$1.43
56	University of Central Florida (UCF) Reclaimed Water and Stormwater Integration Project	0.41	\$0.88	\$1.06	\$0.052	\$0.80
57	Winter Park Windsong Stormwater Reuse Demonstration Project	0.10	\$0.43	\$0.52	\$0.030	\$1.72
58	Winter Springs—Lake Jessup Reclaimed Water Augmentation Project	2.25	\$6.70	\$6.70	\$0.150	\$0.75
	Reuse Augmentation Subtotals	13.76	\$45.36	\$56.61	\$3.50	

Table 13—continued

DWSP Project Number	Project Name	Capacity Average Daily Flow (mgd)	Estimated Cost			Unit Production (cost per 1,000 gal)
			Construction (in millions)	Total Capital (in millions)	Operation and Maintenance (in millions per yr)	
Other						
59	Cherry Lake Tree Farm Lake Withdrawal for Agricultural Irrigation Project	0.77	\$0.68	\$0.82	\$0.062	\$0.42
60	Holloway Farms Agricultural Irrigation Rainwater Collection System Project	0.08	\$1.29	\$1.55	\$0.002	\$3.66
Other Subtotals		0.85	\$1.97	\$2.36	\$0.06	
Alternative Water Supply Development Projects Total		388.19	\$2,099.50	\$2,647.59	\$112.12	

mgd = million gallons per day

Notes: Alternative water supply projects are defined, to the extent possible, on the basis of complete water production, treatment, storage, and transmission systems. Complete projects may include several hydraulically connected major projects elements under single ownership.

Cost estimates are presented for various levels of project development, ranging from order of magnitude conceptual planning level to final design. Actual project costs will vary from these estimates, which are presented herein only to provide an overview of potential alternative water supply project costs.

Construction cost estimates may include construction contingencies as appropriate.

Total capital costs include estimated construction cost plus allowance for nonconstruction capital items, which may include land, land acquisition, planning, permitting, design, and services during construction, as applicable to a given project.

Cost totals for project categories have been rounded. Dollars are in millions for construction, total capital, and operation and maintenance.

2005 District Water Supply Plan – Addendum

Table 14. SJRWMD—Public water supply entities and associated alternative water supply development projects

Water Supply Entities	Apopka and Winter Garden Reuse Partnership Project	Cocoa / Rockledge Reclaimed Water Reuse System	Seminole Orange and Eastern Orange and Regional Reclaimed Water Reuse System	Indian River Lagoon at F&L Cape Canaveral Power Plant	Indian River Lagoon at Reliant Energy Power Plant	Intracoastal Waterway at New Smyrna Beach	Lower Ocklawaha River in Putnam County	North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Project	Allamonte Springs and Apopka Project RENEW APRICOT	Orange County Southeast Reclaimed Water System Expansion Project	St. Johns River Near Lake Monroe	St. Johns River Near Deland	St. Johns River Near Lake George	St. Johns River / Taylor Creek Reservoir	*Single Water Supply Entity Project Number
Altamonte Springs, City of (Seminole)															
Apopka, City of (Orange)	•								•			•			54
Aqua Utilities Florida Inc. (Lake)															
Aqua Utilities Florida Inc. (Seminole)															
Bellevue, City of (Marion)															19
Casselberry, City of (Seminole)															
Chateau Land Development Co. (Orange)															
Chateau Land Development—Orange Lake MHP (Lake)															
Cherry Lake Tree Farm (Lake)															59
Clermont, City of (Lake)															
Cocoa, City of (Brevard)				•										•	21
East-Central Florida Services (Brevard, Orange, Osceola)		•												•	
Eatonville, Town of (Orange)															
Eustis, City of (Lake)															
Fruitland Park, City of (Lake)															27
Groveland, City of (Lake)															
Harbor Hills Utilities LP (Lake)															
Hawthorne at Leesburg (Lake)															
Holloway Farms (Lake)															
Howey-in-the-Hills, Town of (Lake)															60
Lady Lake, Town of (Lake)															
Lake Griffin Isles (Lake)															30
Lake Mary, City of (Seminole)															
Leesburg, City of (Lake)															
Longwood, City of (Seminole)															
Maitland, City of (Orange)															32
Marion County (Marion)															
Mascotte, City of (Lake)															
Melbourne, City of (Brevard)															
Mid Florida Lakes MHP (Lake)															3, 33
Minneola, City of (Lake)															
Montverde, Town of (Lake)															34
Mount Dora, City of (Lake)															
Mount Dora Country Club (Lake)															35

2005 District Water Supply Plan – Addendum

Table 14—continued

Water Supply Entities	Apoka and Winter Garden Reuse Partnership Project	Cocoa / Rockledge Reclaimed Water Reuse System	Eastern Orange and Seminole Counties Regional Reclaimed Water Reuse System	Indian River Lagoon at F&L Cape Canaveral Power Plant	Indian River Lagoon at Reliant Energy Power Plant	Intracoastal Waterway at New Smyrna Beach	Lower Ocklawaha River in Putnam County	North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Project	Altamonte Springs and Apoka Project RENEW APRICOT	Orange County Southeast Reclaimed Water System Expansion Project	St. Johns River Near SR 50	St. Johns River Near Lake Monroe	St. Johns River Near Deland	St. Johns River Near Lake George	St. Johns River / Taylor Creek Reservoir	*Single Water Supply Entity Project Number
Oakland, Town of (Orange)																
Oak Springs MHP (Lake)																
Occoee, City of (Orange)																
Orange County (Orange)																
Orlando, City of (Orange)																
Orlando Utilities Commission (Orange)																
Oviedo, City of (Seminole)																
Palm Valley MHP (Seminole)																
Pembroke Utilities Inc. (Lake)																
Rock Springs MHP (Orange)																
Rockledge, City of (Brevard)																
Sanford, City of (Seminole)																
Seminole County (Seminole)																
Shadow Hills MHP (Orange)																
Southlake Utilities (Lake)																
Sunshine Utilities (Marion)																
Sunlake Estates (Lake)																
Tavares, City of (Lake)																
Titusville, City of (Brevard)																
Toho Water Authority (Osceola)																
Umatilla, City of (Lake)																
University of Central Florida (Orange)																
Utilities Inc. of Florida (Lake)																
Utilities Inc. of Florida (Orange)																
Utilities Inc. of Florida (Seminole)																
Villages of Lake-Sumter (Lake)																
Water Oak Estates (Lake)																
Wedgewood Homeowners Association (Lake)																
West Melbourne, City of (Brevard)																
Winter Garden, City of (Orange)																
Winter Park, City of (Orange)																
Winter Springs, City of (Seminole)																
Zellwood Station Utilities (Orange)																
Zellwood Water Association (Orange)																

2005 District Water Supply Plan--Addendum

Table 14--continued

Water Supply Entities	Apoka and Winter Garden Reuse Partnership Project	Cocoa / Rockledge Reclaimed Water Reuse System	Eastern Orange and Seminole Counties Regional Reclaimed Water Reuse System	Indian River Lagoon at F&L Cape Canaveral Power Plant	Indian River Lagoon at Reliant Energy Power Plant	Intracoastal Waterway at New Smyrna Beach	Lower Ocklawaha River in Putnam County	North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Project	Allamonte Springs and Apoka Project RENEW APRI/COT	Orange County Southeast Reclaimed Water System Expansion Project	St. Johns River Near SR 50	St. Johns River Near Lake Monroe	St. Johns River Near Deland	St. Johns River Near Lake George	St. Johns River / Taylor Creek Reservoir	*Single Water Supply Number
Bunnell, City of							Flagler Area									
Dunes Community Development District																
Flagler Beach, City of																1
Flagler County																
Ormond Beach, City of																20, 28
Palm Coast, City of																
Daytona Beach, City of							Volusia Area									43
DeLand, City of																23
Deltona, City of																24
Edgewater, City of																26
Holly Hill, City of																29
Lake Beresford Water Association																
Lake Helen, City of																
Orange City, City of																4, 41, 42
Ormond Beach, City of																
Pierson, Town of																
Port Orange, City of																
South Daytona Beach, City of																44, 45, 46
Utilities Commission of New Smyrna Beach																49
Volusia County																
Water Authority of Volusia (WAV)																51
Areas that would be identified as PWRCAs if proposed alternative water supply development projects were not implemented																
East Putnam Water System (Putnam)																2
St. Augustine, City of (St. Johns)																5
St. Johns County (St. Johns)																16

Notes: Inclusion of a project on this table is not assurance that the project will receive funding through the Water Protection and Sustainability Program (WPSP). Any water supply development option could be used by any water supply entity. However, the development of some options are less reasonable than others because of factors such as distance and cost. The water supply development project options identified in this table, in association with specific water supply entities, are those that SJRWMD considers most reasonable.

*Single water supply entity project numbers are identified beginning on page 116 of the DWSP 2005.

Table 15. Status of water supply development projects

Projects	Multi-Jurisdictional Entity	Selected for Implementation	Project Sponsor(s)	Proposed Quantity	Funding Source	Project Planning	Engineering Design	Permitting	Construction
Dunes Community Development District	no	yes	Dunes Community Development District	1.00 mgd	Brackish Groundwater Source for Potable Use	Complete	In progress	Complete	2005–2007
Brackish Groundwater Project	no	yes	Palm Beach County	0.93 mgd	Dunes Community Development District, WPSP funds requested	Complete	In progress	In progress	2005–2007
East Palm Beach Regional Water System Project	no	yes	City of Melbourne	2.50 mgd	U.S. Department of Agriculture Rural Development Fund, Florida Department of Environmental Protection grant, WPSP funds requested	Complete	2008	2008–2009	2009–2010
Melbourne RO Plant Expansion	no	yes	City of Ormond Beach	2.00 mgd	City of Ormond Beach, WPSP funds requested	2005	2005–2006	2006	2006–2007
Ormond Beach Treatment Plant Expansion Project	no	yes	City of St. Augustine	6.00 mgd	City of St. Augustine, WPSP funds requested	Complete	In progress	In progress	2006–2007
St. Augustine Water Supply Project	no	yes	St. Johns County	8.00 mgd	St. Johns County, WPSP funds requested	Complete	In progress	In progress	2005–2006
St. Johns County	no	yes	St. Johns County	8.00 mgd	St. Johns County, WPSP funds requested	Complete	In progress	In progress	2005–2006
Lower Ocklawaha River in Palm Beach County Project	*to be determined	no	to be identified	20.00 mgd	Surface Water Source for Potable Use	Not scheduled	Not scheduled	Not scheduled	Not scheduled
St. Johns River Near SR 50 Project	*to be determined	no	to be identified	up to 10.00 mgd	to be identified	Not scheduled	Not scheduled	Not scheduled	Not scheduled
St. Johns River Near Lake Monroe Project	no	yes	City of Sanford	2 mgd (up to 50.00 mgd total available)	City of Sanford, WPSP funds requested	In progress	2006	2006	2007/2008
St. Johns River Near DeLand Project	*to be determined	no	to be identified	up to 20.00 mgd	to be identified	Not scheduled	Not scheduled	Not scheduled	Not scheduled
St. Johns River Near Lake George Project	*to be determined	no	to be identified	up to 33.00 mgd	to be identified	Not scheduled	Not scheduled	Not scheduled	Not scheduled
St. Johns River/Taylor Creek Reservoir Water Supply Project	yes	yes	City of Cocoa, City of Titusville, East Central Florida Services, Inc., Orange County, Orlando Utilities Commission, South Florida Water Management District, St. Johns River Water Management District, Toho Water Authority	up to 40.00 mgd	Project sponsors, State and Tribal Assistance Grant (STAG), WPSP funds requested	2005–2008	2008–2009	2008–2009	2010–2012
Indian River Lagoon at FP&L Cape Canaveral Power Plant Project	*to be determined	no	to be identified	up to 30.00 mgd	Seawater Source for Potable Use	Not scheduled	Not scheduled	Not scheduled	Not scheduled
Indian River Lagoon at Reliant Energy Power Plant Project	*to be determined	no	to be identified	up to 30.00 mgd	to be identified	Not scheduled	Not scheduled	Not scheduled	Not scheduled
Intracoastal Waterway at New Smyrna Beach Project	*to be determined	no	to be identified	15.00 mgd	to be identified	Not scheduled	Not scheduled	Not scheduled	Not scheduled
Alafaya Utilities Reclaimed Water Storage and High Service Pumps	no	yes	Utilities Inc. of Florida (Seminole)	0.41 mgd	Reclaimed Water Source	Complete	Complete	2006	2006
Altamonte Springs and Apopka Project RENEW APPLICOT	yes	yes	Altamonte Springs, Apopka	6.63 mgd	Utilities Inc. of Florida (Seminole), WPSP funds requested	Complete	2006	2006	2007
Apopka and Winter Garden (or Northwest Orange County) Regional Reuse Partnership Project	yes	yes	Apopka, Winter Garden	3.00 mgd	Project sponsors, WPSP funds requested	Complete	Not scheduled	Not scheduled	Not scheduled

2005 District Water Supply Plan – Addendum

Table 15—Continued

Projects	Multi-jurisdictional Entity	Selected for Implementation	Project Sponsor(s)	Proposed Quantity	Funding Source	Project Planning	Engineering Design	Permitting	Construction
Bellevue and Spruce Creek Golf Course Reclaimed Water System Expansion	no	yes	City of Bellevue	1.00 mgd	City of Bellevue, WPSP funds requested	Complete	2005-2006	2006	2006-2007
Beverly Beach Integrated Reclaimed Water and Stormwater Reuse Project, Phase II	no	yes	Flagler County	0.50 mgd	Flagler County, Rural Development, WPSP funds requested, others to be identified	Complete	2006	2006	2006-2007
Clermont Reclaimed and Stormwater System Expansion	no	yes	City of Clermont	5.10 mgd	City of Clermont, WPSP funds requested	2004-2006	2005-2007	2006-2007	2007-2008
Cocoa/Rockledge Reclaimed Water Line Connection	yes	yes	City of Cocoa, City of Rockledge	0.25 mgd	City of Cocoa, City of Rockledge, WPSP funds requested	2006	2006	2006	2007
Daytona Beach Reclaimed Water System	no	yes	City of Daytona Beach	26.00 mgd	City of Daytona Beach, WPSP funds requested	Complete	2005-2006	2006-2007	2007-2008
Deland Reclaimed Water and Surface Water Augmentation Project	no	yes	City of Deland	1.70 mgd	City of Deland, Florida Forever Trust Fund, WPSP funds requested	Complete	Complete	2004-2006	2004-2009
Eastern Orange and Seminole Counties Regional Reuse Project	yes	yes	City of Orlando, Orange County, Orlando Utilities Commission, Seminole County, City of Oviedo, University of Central Florida	20.00 mgd	Project partners, STAG, WPSP funds requested	Complete	Complete	2007	2004-2007
Edgewater Reclaimed Water system Interconnect to SE Volusia County	no	yes	City of Edgewater	1.00 mgd	City of Edgewater, WPSP funds requested	Complete	2006	2006-2007	2007
Eustis Reclaimed Water System Expansion and Augmentation	no	yes	City of Eustis	1.10 mgd	City of Eustis, WPSP funds requested	Complete	2006-2006	2007-2009	2009-2012
Flagler County Bulow Reuse Water System	no	yes	Flagler County	1.70 mgd	Flagler County, WPSP funds requested	Complete	2006-2007	2007	2007-2008
Holly Hill Reuse System to Ormond Beach	no	yes	City of Holly Hill	0.60 mgd	City of Holly Hill, WPSP funds requested	Complete	2006-2007	2007	2008
Lady Lake Phase II Reclaimed Water System	no	yes	Town of Lady Lake	0.50 mgd	Town of Lady Lake, WPSP funds requested	Complete	2006	2007-2008	2008-2009
Lake Utility Services Inc. (Utilities Inc. of Florida) Lake Groves WWTF Reclaimed Water Expansion	no	yes	Utilities Inc. of Florida	1.00 mgd	Utilities Inc. of Florida, WPSP funds requested	Complete	2005-2006	2006	2006-2007
Leesburg Reclaimed Water Reuse Project	no	yes	City of Leesburg	7.10 mgd	City of Leesburg, WPSP funds requested	Complete	Complete	2006	2006-2007
Melbourne Reclaimed Water System Expansion	no	yes	City of Melbourne	1.50 mgd	City of Melbourne, WPSP funds requested	Complete	2005-2006	2006	2006-2007
Minneola Reclaimed Water Reuse Project	no	yes	City of Minneola	1.50-2.50 mgd	City of Minneola, WPSP funds requested	Complete	Complete	Complete	2005-2006
Mount Dora Country Club Golf Course Reclaimed Water Project	no	yes	Mount Dora Country Club	0.26 mgd	Mount Dora Country Club, WPSP funds requested	Complete	Complete	Not scheduled	Not scheduled
North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Project	yes	yes	City of Sanford, City of Lake Mary, Seminole County	7.80 mgd	Project partners, Florida Forever Trust Fund, WPSP funds requested	Complete	In progress	In progress	2005-2009

Table 15—Continued

Projects	Multi-jurisdictional Entity	Selected for Implementation	Project Sponsor(s)	Proposed Quantity	Funding Source	Project Planning	Engineering Design	Permitting	Construction
Ocoee Reuse System Expansion	no	yes	City of Ocoee	0.35 mgd	City of Ocoee, WPSP funds requested	Complete	2005–2006	2006	2006
Orange County Northwest Reclaimed Water Augmentation	no	yes	Orange County	3.00 mgd	Orange County, WPSP funds requested	Complete	2006	2006–2007	2006–2010
Orange County Southeast Reclaimed Water System Expansion	yes	yes	Orange County, Orlando Utilities Commission, City of Orlando	12.50 mgd	Orange County, WPSP funds requested	Complete	2005–2006	2006–2008	2006–2010
Orlando Utilities Commission Project RENEW	no	yes	Orlando Utilities Commission	9.20 mgd	Orlando Utilities Commission, WPSP funds requested	2005–2007	2008–2009	2009–2010	2009–2011
Ormond Beach North Peninsula Reclaimed Water Storage Project	no	yes	City of Ormond Beach	0.49 mgd	City of Ormond Beach, Florida Forever Trust Fund, WPSP funds requested	Complete	In progress	In progress	2005–2006
Ormond Beach South Peninsula Reuse Improvements	no	yes	City of Ormond Beach	2.13 mgd	City of Ormond Beach, WPSP funds requested	Complete	2006–2007	2006–2009	2007–2010
Palm Coast New Reclaimed Water System Expansion	no	yes	City of Palm Coast	8.23 mgd	City of Palm Coast, WPSP funds requested	Complete	2005–2007	2006–2009	2006–2009
Port Orange Airport Road Reclaimed Water Transmission Main	no	yes	City of Port Orange	1.00 mgd	City of Port Orange, WPSP funds requested	Complete	Complete	2006	2006
Port Orange Pioneer Trail Storage and Pumping Facility	no	yes	City of Port Orange	2.00 mgd	City of Port Orange, WPSP funds requested	Complete	2006	2008	2006
Port Orange Reclaimed Water Reservoir and Recharge Basin	no	yes	City of Port Orange	2.70 mgd	City of Port Orange, Florida Forever Trust Fund, WPSP funds requested	Complete	Complete	Complete	2004–2006
Rockledge Reclaimed Water Storage	no	yes	City of Rockledge	0.16 mgd	City of Rockledge, WPSP funds requested	Complete	Not scheduled	Not scheduled	Not scheduled
Rockledge Reclaimed Water System Expansion—ASR	no	yes	City of Rockledge	0.55 mgd	City of Rockledge, WPSP funds requested	Complete	Complete	2005–2006	2006
South Daytona Reclaimed Water System Expansion	no	yes	City of South Daytona	0.14 mgd	City of South Daytona, WPSP funds requested	Complete	2005–2006	2006–2007	2006–2007
Tavares Reclaimed Water Treatment System Expansion	no	yes	City of Tavares	0.6 mgd	City of Tavares, WPSP funds requested	2006	2007	2007	2008
Volusia County SW Reclaimed Water System	no	yes	Volusia County	0.20 mgd	Volusia County, WPSP funds requested	Complete	2006	2006	2007
West Melbourne Above Ground Reclaimed Water Storage Tank	no	yes	City of West Melbourne	2.43 mgd	City of West Melbourne, STAG funds, WPSP funds requested	Complete	2006	2006	2006–2007
Winter Garden Reclaimed Water Pumping and Transmission	no	yes	City of Winter Garden	4.00 mgd	City of Winter Garden, WPSP funds requested	Complete	2005–2006	2006	2006–2008

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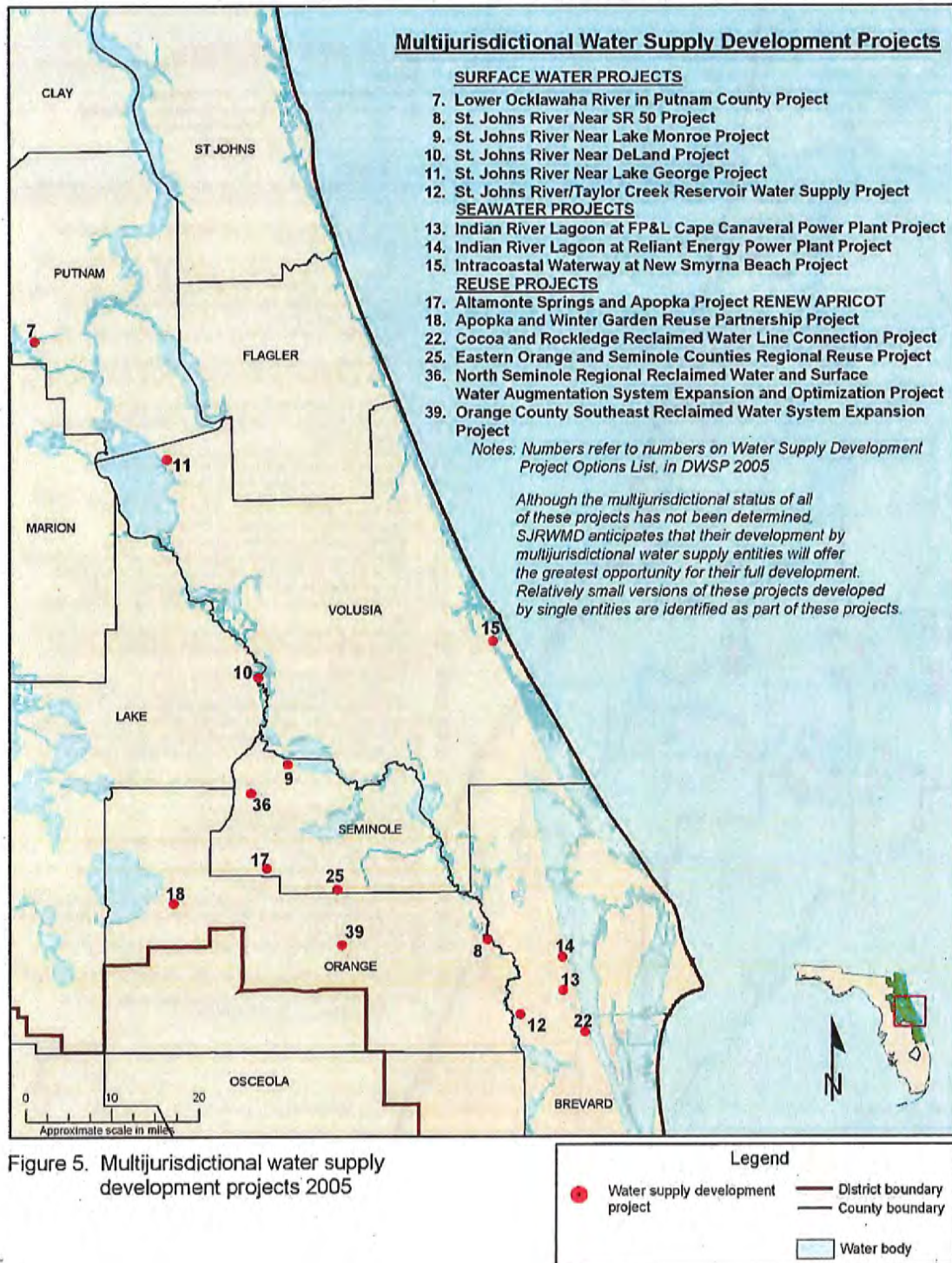
Table 15—Continued

Projects	Multi-Jurisdictional Entity	Selected for Implementation	Project Sponsor(s)	Proposed Quantity	Funding Source	Project Planning	Engineering Design	Permitting	Construction
Reuse Augmentation Source									
Lake Apopka Reuse Augmentation Project	no	yes	City of Apopka	1.00 mgd	City of Apopka, WPSP funds requested	In progress	In progress	2006	2007–2008
Seminole County Yankee Lake Reclaimed Water System Augmentation	no	yes	Seminole County	10.00 mgd	Seminole County, WPSP funds requested	Complete	2006	2006	2006–2007
University of Central Florida (UCF) Reclaimed Water and Stormwater Integration	no	yes	University of Central Florida	0.41 mgd	University of Central Florida, SJRWMD stormwater cost-share funds, WPSP funds requested	Complete	2006	2006	2006
Winter Park Windsong Stormwater Reuse Demo	no	yes	City of Winter Park	0.10 mgd	City of Winter Park, SJRWMD stormwater cost-share funds	Complete	2006	2006	2006
Winter Springs—Lake Jesup Reclaimed Water Augmentation	no	yes	City of Winter Springs	2.25 mgd	City of Winter Springs, WPSP funds requested	2006	2006	2006–2007	2008–2010
Other									
Cherry Lake Tree Farm Lake Withdrawal for Agricultural Use	no	yes	Cherry Lake Tree Farm	0.77 mgd	Cherry Lake Tree Farm, WPSP funds requested	Complete	2006	2006	2007
Holloway Farms Agricultural Rainwater Collection System	no	yes	Holloway Farms	0.08 mgd	Holloway Farms, WPSP funds requested	Not scheduled	Not scheduled	Not scheduled	Not scheduled

mgd = million gallons per day

Note:

*Although the multijurisdictional status of these projects has been not been determined, SJRWMD anticipates that their development by multijurisdictional water supply entities will likely offer the greatest opportunity for their full development. Relatively small versions of these projects, which are to be developed by single entities, are identified as part of these projects.



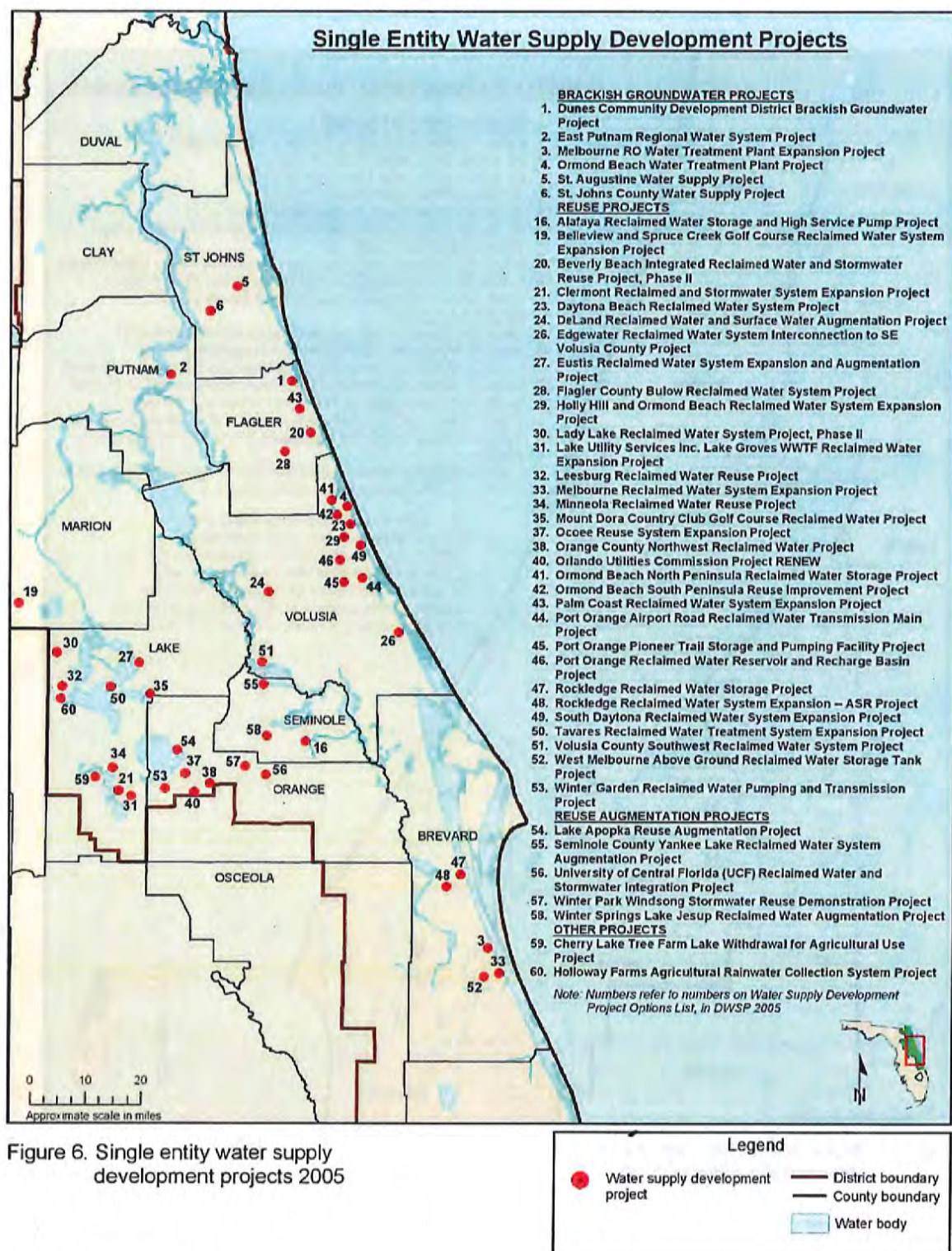


Figure 6. Single entity water supply development projects 2005

DISTRICT WATER SUPPLY PLAN

2005

FOURTH ADDENDUM

MAY 12, 2009

The St. Johns River Water Management District (SJRWMD) approved its *District Water Supply Plan 2005 (DWSP 2005)* on February 7, 2006. *DWSP 2005* has been published by SJRWMD as Technical Publication SJ2006-2. The SJRWMD Governing Board approved an addendum (first addendum) to *DWSP 2005* on October 10, 2006. A second addendum to *DWSP 2005* was approved on December 11, 2007, and a third addendum to *DWSP 2005* was approved on May 13, 2008. Except as described below, this fourth addendum to *DWSP 2005* incorporates by reference *DWSP 2005*. It has been prepared for the purposes of adding an expanded description of the role of water conservation and the use of reclaimed water in meeting projected water demands, removing four water supply development projects, identifying 16 completed water supply development projects, and refining descriptions of water supply development projects. As a result and as set forth below, the fourth addendum supersedes the water supply development project options described in Technical Publication SJ2006-2 and in the first, second, and third addenda. The revised information contained within this fourth addendum is: (1) required for SJRWMD's Water Protection and Sustainability Program; and (2) essential in SJRWMD's efforts to develop technical assistance documents for local governments to use in updating their comprehensive plans to address water supply issues, including the identification of alternative and traditional water supply projects necessary for meeting the water supply needs within their jurisdictions. This fourth addendum to *DWSP 2005* supersedes all previous addenda. Following are enumerated changes to *DWSP 2005* associated with this fourth addendum.

Amendment to Executive Summary: Replacement of the list of *DWSP 2005* components on page v of the Executive Summary with the following list:

- A water conservation component
- A minimum flows and levels component
- A water supply development component
- A water resource development component

Amendment to Introduction chapter: Replacement of the list of *DWSP 2005* components on page 1 of the Introduction chapter with the following list:

- A water conservation component
- A minimum flows and levels component
- A water supply development component

- A water resource development component

Addition of new chapter titled Water Conservation Component: Add the following new chapter titled Water Conservation Component to *DWSP 2005* immediately following the chapter titled Resource Analysis.

Water conservation is generally defined as the process of efficient and effective use of water. Water conservation is typically practiced for the purpose of sustaining, or at least extending, existing water supplies. SJRWMD strives to maximize water conservation within its jurisdiction, to the extent economically, environmentally, and technically feasible, through its regulatory, water supply planning, and public outreach programs.

SJRWMD prepared its initial water supply assessment in 1998 and district water supply plan in 2000, with updates in 2003 and 2005, respectively. As the water supply planning process has become more mature, citizens of SJRWMD have become increasingly aware of the likely potential for harm to water resources if traditional groundwater sources are exclusively relied upon to meet future demands and of the need to explore alternative water sources to avoid this harm. Based on investigations and discussions related to developing alternative water supply sources, there has also been a realization that alternative water supply projects will be significantly more costly than projects that rely on traditional groundwater sources and pose additional concerns about harm to water resources. This reality has focused heightened attention on water conservation.

SJRWMD has estimated that 200 million gallons per day (mgd) of alternative water supplies or a reduction in demand through water conservation and increased use of reclaimed water (see subsection titled Replacement of Potable Water Supply Use) would have to be implemented to meet the projected water demands identified in *Water Supply Assessment 2003 (WSA 2003)* without resultant unacceptable impacts to water resources and related natural systems. If this 200-mgd deficit were to be met solely by conservation of potable quality water by public water supply utilities and their customers in priority water resource caution areas (PWRCA's), the average gross per capita water use of these utilities would have to decrease from 172 gallons per capita per day to 105 gallons per capita per day, a reduction of 39%. Even if such a decrease in gross per capita water use occurred, it would not necessarily ensure that projected demands would be met without unacceptable impacts to water resources and related natural systems. This is because reductions in groundwater withdrawals would not result in a consistent magnitude of reduced impacts throughout PWRCA's due to the hydrogeologic variability throughout identified PWRCA's.

SJRWMD has a long history of emphasizing water conservation through its regulatory program. SJRWMD's regulatory requirements related to water conservation are applied to each consumptive use permit issued by SJRWMD and are designed to ensure that all feasible water conservation measures will be implemented before an allocation of water from additional potable water supplies is authorized.

Water Conservation Potential

There are several water conservation options that public supply utilities can use to reduce their future water supply demands. Analysis indicates a reasonable possibility that a substantial portion of the projected increase in SJRWMD water use between 2005 and 2025 could be met through improved water use efficiency, provided aggressive programs are implemented and funded by water supply utilities and local governments to promote and enforce the necessary practices consistent with SJRWMD's authority under Chapter 373, *Florida Statutes* (F.S.). A high potential exists for improved efficiency but the actual degree that will be attained cannot be specifically known until it is accomplished. Success of this approach is highly dependent upon aggressive implementation. Furthermore, the aggregate cost for extensive retrofits, better irrigation systems, and other practices needed to reach the projected potential water savings would be measured in hundreds of millions of dollars, just as the development of alternative water supplies would be, and many of those costs would be incurred without certainty of the amount of water that would be made available.

Estimated water savings and initial capital costs per gallon of water savings for five groups of conservation practices are shown in Table 4 of *DWSP 2005*. The 20-year (2005 through 2025) total cost of outreach and education practices are integrated into the total costs for other water conservation practices. Costs are calculated only for new water savings and are incremental to the cost of existing programs and practices. Descriptions and critiques of available conservation practices and a list of those considered to be cost-effective and potentially applicable in SJRWMD appear in Appendix E of *DWSP 2005*. Explanations of the methodologies used to derive estimated water savings and costs for individual conservation practices are provided in Appendix F of *DWSP 2005*. Additional tables providing the results of calculations of water savings and costs for individual conservation practices are found in Appendix G of *DWSP 2005*.

The capital costs for individual conservation practices range up to \$14.17 per gallon per day of water-saving capacity. These costs are comparable to the costs of constructing water supply production capacity for alternative water supply projects identified in *DWSP 2005*. Ongoing operation and maintenance costs comparable to the unit production cost of water supply facilities also would be incurred. The ongoing costs for some practices, such as retrofitted low-flow toilets, may be no more than the cost of maintaining existing older toilets, but the cost of other practices, such as ordinance enforcement, may be substantial.

Several factors limit the precision of these estimates: (1) The actual market penetration that will be obtained is unknown. It is not possible to determine in advance how many people in the target groups will adopt any specific conservation practice, particularly voluntary practices. A population penetration rate of 50% over the 20-year planning period through 2025 is used throughout for voluntary conservation practices to provide an example of possible water savings from the listed conservation practices at a given level of implementation. (2) The aggregate impact of more than one practice addressing savings from the same type of water use is

Table 4. Water savings (millions of gallons per day) and costs (millions of dollars) by county by conservation practice group.

County	Existing Indoor Use		Existing Outdoor Use		New Construction Indoor		New Construction Outdoor		General		Total Water Saved	Total Cost
	Saving	Cost	Saving	Cost	Saving	Cost	Saving	Cost	Saving	Cost		
Alachua	4.42	18.69	0.93	7.18	0.43	4.55	3.29	37.64	1.38	0.00	10.46	68.06
Baker	0.44	1.14	0.15	0.82	0.00	0.03	0.59	2.35	0.22	0.00	1.41	4.34
Bradford	0.03	0.08	0.00	0.04	0.00	0.00	0.00	0.06	0.00	0.00	0.03	0.19
Brevard	13.00	51.22	2.63	20.43	0.77	8.07	9.49	83.35	4.04	0.00	29.92	163.06
Clay	3.35	16.47	0.89	6.70	0.21	1.92	3.71	42.54	1.45	0.00	9.60	67.62
Duval	22.17	114.19	5.36	26.52	1.31	12.92	18.63	101.16	7.82	0.00	55.29	254.79
Flagler	1.01	6.11	0.41	4.00	0.11	1.19	3.16	33.18	1.11	0.00	5.80	44.47
Indian River	3.02	17.91	0.76	5.90	0.35	3.83	2.98	33.56	1.21	0.00	8.31	61.20
Lake	4.86	25.58	3.30	12.66	0.33	3.44	10.31	94.86	3.83	0.00	22.63	136.54
Marion	4.34	22.66	0.93	10.56	0.13	1.37	3.71	39.58	1.48	0.00	10.58	74.17
Nassau	1.37	7.45	1.04	3.22	0.10	0.95	3.37	14.49	1.20	0.00	7.08	26.11
Okeechobee	0.02	0.08	0.00	0.03	0.00	0.00	0.00	0.05	0.00	0.00	0.02	0.16
Orange	17.13	89.89	4.73	29.14	1.99	18.81	17.48	122.70	6.73	0.00	48.05	260.54
Osceola	0.04	0.20	0.00	0.10	0.01	0.08	0.00	0.93	0.00	0.00	0.05	1.31
Putnam	1.84	8.83	0.47	2.77	0.01	0.08	1.48	3.94	0.62	0.00	4.43	15.63
St. Johns	2.83	17.09	0.93	7.96	0.39	3.95	5.89	45.11	2.11	0.00	12.15	74.11
Seminole	9.81	53.21	3.10	15.44	0.92	8.73	11.70	76.53	4.66	0.00	30.19	153.91
Volusia	12.28	67.01	2.89	17.35	0.60	6.43	11.33	69.56	4.64	0.00	31.74	160.35
Education	*	12.75	*	3.56	*	0.96	*	11.65	*	5.31	*	38.10
SJRWMD TOTAL	101.96	530.55	28.50	174.39	7.66	77.28	107.11	813.23	42.50	5.31	287.73	1604.64
Cap. cost per gal	5.20		6.12		10.09		7.59		0.13		5.58	

*No water savings is attributed directly to outreach and education, to avoid double-counting with the direct savings of other practices that are promoted by education. However, outreach and education contribute to the adoption of various water-saving practices that probably would not be adopted without outreach and education.

uncertain. Attempts have been made to avoid double or multiple counting of the same water saved by two or more practices. The assumptions used in this process are described in Appendix G of DWSP 2005. (3) It is not always possible to determine with reasonable certainty which cost resulted in what specific water savings.

SJRWMD expects that many of these factors contributing to uncertainty will be addressed through the ongoing Conserve Florida water conservation program, a cooperative effort between Florida Department of Environmental Protection (FDEP), the water management districts, American Water Works Association (AWWA), and various public supply utilities. The emphasis of the program is to develop a clearinghouse and detailed database documenting individual utility service area characteristics, water conservation practices, and water use data documenting the beneficial impacts of water conservation practices and to develop and maintain a software tool to assimilate this information for the development of goal-based public supply water conservation plans. The information will then be used by water management districts and water supply utilities to maximize water conservation benefits based on utility and customer characteristics. SJRWMD proposes to continue supporting this effort.

Specific Water Conservation Measures Required for Consumptive Use Permits

Chapter 40C-2, *Florida Administrative Code (F.A.C.)*, applies to all consumptive use permit (CUP) applications, including for large-volume water users such as public water supply utilities. Water users who are required to apply for a consumptive use permit from SJRWMD include those whose average annual daily withdrawal exceeds 100,000 gallons, whose capacity to withdraw water exceeds a million gallons per day, or those with a well of 6 inches in diameter or greater.

Chapter 40C-2.301(4)(e), *F.A.C.*, requires water conservation as a part of all CUP applications and states that "... all available water conservation measures must be implemented unless the applicant demonstrates that implementation is not economically, environmentally or technologically feasible ..." (Subsection 40C-2.301(4)(e) Conditions for Issuance of Permits).

Public supply utilities in SJRWMD are required to have water conservation plans to ensure that all available water conservation measures are implemented (unless infeasible). Section 12.2.5 of the *Consumptive Use Permit Handbook* specifies water conservation practices for public supply CUPs that, if implemented, are deemed to meet the water conservation requirements of 40C-2.301(4)(e), *F.A.C.* These practices are summarized below.

- Perform a system-wide audit of the amount of water used in the applicant's production and treatment facilities, transmission lines, and distribution system.
- Perform a meter survey, and correct the water audit to account for meter error if the initial, unaccounted-for water is 10% or greater based on the results of the initial water audit.

- Perform a leak detection evaluation and then either implement a leak detection program immediately or develop an alternative plan of corrective action (and submit a new water audit), if the initial water audit shows greater than 10% unaccounted-for water use.
- Implement a meter replacement program if the meter survey indicates that a group or type of meters is less than 95% accurate.
- Implement a customer and employee water conservation education program containing specific listed elements.
- Submit and implement a water conservation-promoting rate structure or amend an existing conservation rate structure to improve its effectiveness in promoting water conservation, unless the cost is not justified because it will have little or no effect on reducing water use.
- Submit a management plan designed to minimize the need for augmentation if the permit includes a backup water source to meet peak demands for reclaimed water.
- Additional water conservation measures may be required when an audit and/or other available information indicates there is a need to reduce a project's water use to a level consistent with that of other similar projects or that additional significant water savings can be achieved and are feasible.

Other types of water users, including agriculture and industry, have a similar list of specific water conservation requirements. In the case of agriculture, emphasis is placed on upgrading irrigation systems to improve efficiencies, commodity-specific improvements that result in water savings, the capture and use of storm water for irrigation, and the use of reclaimed water from nearby utility providers. For industrial users, emphasis is on water-saving process improvements, recycling of water, use of lowest-acceptable water quality sources, and providing reclaimed water or storm water for use.

Watering Restrictions for Landscape Irrigation

SJRWMD has the most stringent, districtwide, year-round watering restrictions of any water management district in Florida (Rule 40C-2.042, *F.A.C.*, General Permit by Rule), which are designed to ensure the efficient use of water for landscape irrigation. The mandatory restrictions specify the time when watering may occur, the amount of water that may be applied, and the days when watering may occur for residential and nonresidential locations. These days depend on whether the address ends in an odd or even number, and on the time of year. This rule also authorizes local governments to enforce these restrictions within their respective jurisdictions by adopting them by an ordinance that is fully consistent with the rule. The rule amendment prescribes which days of the week landscape irrigation may be allowed by a local government ordinance.

Summary of the watering restrictions:

- Irrigation is prohibited between 10 a.m. and 4 p.m.
- During daylight saving time (second Sunday in March until the first Sunday in November) irrigation is limited to no more than two days per week on scheduled days.
 - Residential irrigation at odd-numbered addresses or no addresses is allowed on Wednesday and Saturday.
 - Residential irrigation at even-numbered addresses is allowed on Thursday and Sunday.
 - Nonresidential irrigation is allowed on Tuesday and Friday.
- During Eastern Standard Time (first Sunday in November until the second Sunday in March) irrigation is limited to no more than one day per week on scheduled days.
 - Residential irrigation at odd-numbered addresses or no addresses is allowed on Saturday.
 - Residential irrigation at even-numbered addresses is allowed on Sunday.
 - Nonresidential irrigation is allowed on Tuesday.
- Irrigation is limited to no more than $\frac{3}{4}$ inch of water per zone per irrigation day.
- Irrigation is limited to no more than one hour per irrigation zone per irrigation day.
- Irrigation is limited to only that amount necessary to meet landscape needs.
- When reclaimed water is available for irrigation use, the use of private irrigation wells is not authorized by Rule 40C-2.042, *F.A.C.*
- Irrigation limitations apply to water withdrawn from ground or surface water, from a private well or pump, or from a public or private utility.
- Irrigation limitations apply to all landscape irrigation not currently regulated by a consumptive use permit. Typically, this includes residential, commercial, and industrial establishments.
- Persons irrigating with an automatic lawn irrigation system installed after May 1, 1991, must install, maintain, and operate a rain sensor device or switch that overrides the system when adequate rainfall has occurred.
- Limited exceptions apply for certain highly efficient microirrigation systems, hand watering with an automatic shutoff device, irrigation of newly planted landscape daily for the initial 30 days and then every second day for the next 30 days (for a total of one 60-day period), and use of reclaimed water or storm water.

Non-Regulatory Water Conservation Initiatives

In addition to its regulatory program, SJRWMD has also initiated a number of other projects and initiatives to improve water conservation and expand the efficient use of reclaimed water.

Conserve Florida Water Conservation Information Clearinghouse

SJRWMD is a participant in the development of a comprehensive, statewide water conservation program for public water supply. This effort includes FDEP, the five water management districts, the Florida Rural Water Association, Florida Section AWWA, Florida Water Environment Association, and the Florida Public Service Commission. Major parts of this effort are the development of a clearinghouse for water conservation information and software to assist in the development of goal-based water conservation plans for public supply utilities. SJRWMD proposes to continue support of this effort in the hope that it will provide information valuable to determining the cost and effectiveness of various water conservation approaches. This project is included in the Hydrologic Data Collection and Analysis Project, which is described in the Water Resource Development Component of this document.

Landscape Water Conservation Ordinance Guidelines

SJRWMD has developed a document (SJRWMD 2005b) to provide guidance and example language for the creation of local landscape water conservation ordinances that meet the requirements specified in Section 373.185, F.S. (SJRWMD 2007). Local governments are required by Sections 125.568 and 166.048, F.S., to consider adopting ordinances that will reduce the amount of water used to irrigate landscape. SJRWMD will update and revise its document that provides guidance and example language to take into account its recently amended water conservation rule and other new information and developments concerning water conservation practices and technology.

SJRWMD has also contributed technical expertise to the statewide effort, required by Section 373.228, F.S., to develop landscape irrigation and Xeriscape design standards for new construction. These standards incorporate scientifically based model guidelines for urban, commercial, and residential landscape irrigation, including drip irrigation, for plants, trees, sod, and other landscaping. Section 373.228, F.S., requires local governments to use these standards and guidelines when developing landscape irrigation and Xeriscape ordinances. SJRWMD now promotes these statewide standards and will incorporate them in its revised document that provides guidance and example language.

Water Conservation Public Awareness Campaign

SJRWMD partners with local governments and water supply utilities to conduct an annual multimedia campaign, which has included television, radio, newspaper, the Internet, direct mail and billboards, a Web site, and printed materials. The budget for the campaign in fiscal year 2008–2009 was \$2.431 million, which includes partners' and SJRWMD funding. This campaign has successfully increased public awareness of water conservation.

SJRWMD Strategic Water Conservation Initiative

The Strategic Water Conservation Initiative's goal is to improve water conservation efforts by reviewing key elements of SJRWMD's current water conservation-related programs and modifying them as needed to optimize their effectiveness. Major current conservation efforts include the following:

- Consumptive use permitting, which requires conservation plans and reporting from permittees
- Water demand forecasting
- Calculating the costs of conservation strategies
- Local government technical assistance
- Florida Water StarSM certification program for efficient construction
- Public education and communication programs
- Coordination with other water management districts, principally in the process of rulemaking

This review will allow SJRWMD to avoid duplication of effort and to take advantage of opportunities to collaborate and coordinate efforts. The other overarching goal is to develop new actions, including a water conservation cost-share program to achieve a significant reduction in water use for landscape irrigation, indoor use, and agricultural irrigation.

SJRWMD will utilize outside experts from the University of Florida's Water Institute to peer-review SJRWMD's major water conservation goals and initiatives.

Environmental Resource Permit (ERP) and Consumptive Use Permit (CUP) Linkage

SJRWMD is planning to initiate rulemaking in the near future to more closely link the ERP and CUP permitting processes for certain projects with landscape requiring irrigation. Key concepts of this ERP/CUP linkage include the following:

- Requiring maximum feasible reuse of storm water for landscape irrigation
- Setting landscape design standards for maximum residential per capita irrigation use (regardless of water source)
- Requiring covenants and restrictions for developments to include efficient landscaping/irrigation system design requirements
- Prohibiting covenants and restrictions for developments from containing language that prevents use of landscape/irrigation system design standards adopted by SJRWMD

Amendment to the Reclaimed Water section by the addition of a new subsection titled Replacement of Potable Public Water Supply Use: Amend the Reclaimed Water section by appending a new subsection after the Projected Quantities of Reclaimed Water subsection on page 71 of *DWSP 2005* with the following paragraph:

Replacement of Potable Public Water Supply Use: As described elsewhere in this addendum, SJRWMD has estimated that 200 mgd of alternative water supplies or a reduction in demand through water conservation and increased use of reclaimed water would have to be implemented to meet the projected water demands identified in WSA 2003 without resultant unacceptable impacts to water resources and related natural systems. It is estimated that treated wastewater that is currently not reused plus additional wastewater flows within the PWRCAs by 2025 would total 240 mgd of additional reclaimed water available for use. However, due to seasonal variability in availability and demand, it is not possible to utilize all of this water during wet times and still meet demand during dry times without augmentation from other sources. Based on the experience of utilities in the central Florida region, it has typically been feasible to reuse 50 to 60% of a wastewater treatment facility's annual flow without resorting to augmentation (FWEA, personal communication, 2009). Assuming it is feasible to reuse a minimum of 50 to 60% of available treated wastewater without augmentation, 120 to 144 mgd could be counted on to be available for replacement of potable water use. However, given the need to maximize the use of this supply in the future, the goal should be to increase the portion of reclaimed water that is used during the 20-year planning horizon. Under an optimal condition, such as apparently demonstrated by the city of Altamonte Springs, the most thoroughly built-out reuse system in SJRWMD, it appears to be reasonable to reuse as much as 85% of a wastewater treatment facility's annual flow without resorting to augmentation. Thus, it may be possible to achieve as much as 200 mgd of reclaimed water (85% of projected flows) if water is used efficiently during peak demand periods, and large quantities of storage are constructed to go along with dual distribution systems. This level of required storage likely represents a very substantial cost. Further, reclaimed water, historically, has not been used efficiently, probably due to very low or fixed cost rates. However, experience with the city of Ocoee has shown that reclaimed water can replace potable water at a 1-to-1 ratio if rates for reclaimed water are close to that of potable water (Burton and Associates 2008).

Use of an additional 204 mgd of reclaimed water would not necessarily ensure that projected demands would be met without unacceptable impacts to water resources and related natural systems. This is because reductions in groundwater withdrawals and placement of reclaimed water at land surface for lawn and landscape irrigation purposes would not result in a consistent magnitude of reduced impacts throughout PWRCAs due to the hydrogeologic variability throughout identified PWRCAs.

Amendment to the subsection titled Potential Uses of Reclaimed Water: Amend the title of subsection Potential Uses of Reclaimed Water on page 71 of *DWSP 2005* to Other Potential Uses of Reclaimed Water.

Removal of water supply development projects from *DWSP 2005* as amended: The following water supply development projects are removed for the reasons described:

- DWSP Project Number 9: St. Johns River Near Lake Monroe Project — This project has been removed because other water supply projects that would utilize withdrawals of water from the St. Johns River Near Lake Monroe have been identified by water supply entities.
- DWSP Project Number 11: St. Johns River Near Lake George Project — This project has been removed because none of the water supply entities identified as potential users of water from this project have expressed an interest in the project and all are identified in association with other potential water supply development projects that, if developed, would be adequate to meet their projected demands through 2025.
- DWSP Project Number 15: Intracoastal Waterway at New Smyrna Beach Project — This project has been removed because the water supply entity that owns the property where the facility would be located has indicated that it does not plan to pursue this project.
- DWSP Project Number 57: Winter Park Windsong Stormwater Reuse Demonstration Project — This project has been removed because the project's sponsor has indicated that they do not plan to pursue this project.

Water supply development projects: Replaces the list of water supply development projects, beginning on page vi of the Executive Summary and on page 116 in *DWSP 2005*, to include all of the projects included on List 1 included in this fourth addendum to *DWSP 2005*.

Identification of projects using reclaimed water: Replaces the list of projects using reclaimed water, as identified on pages 76 and 77 of *DWSP 2005*, to include all of the projects included on List 2 in this fourth addendum to *DWSP 2005*.

Amendment to Recommendations chapter: The following amendments are made.

- Delete the Other Water Supply Projects section, which had its contents revised and expanded within the new chapter titled Water Conservation Component.
- Add “Water conservation and reuse” as a new first bullet to the categories of implementation strategies.
- Add the following Water Conservation and Reuse recommendation before the Minimum Flows and Levels recommendation:
 - Water Conservation and Reuse
 - Proposed Action
 - Implement the projects as described in the Water Conservation and Reuse chapter of this fourth addendum.
 - Initiate rulemaking to create linkage between certain environmental resource permit and consumptive use permit applications
 - Enforce water restrictions for landscape irrigation

- Evaluate the amount of reclaimed water use as a percentage of wastewater flows and measures to ensure efficient use of reclaimed water when considering cooperative funding grants for alternative water supply development or other cooperative funding grant programs of SJRWMD
- Evaluate measures in place to encourage or improve conservation as measured by a reduction in gross per capita water use and residential per capita water use when considering cooperative funding grants for alternative water supply development or other cooperative funding grant programs of SJRWMD.
- Encourage local governments to adopt and enforce ordinances consistent with SJRWMD's water restrictions for landscape irrigation and evaluate the status of such ordinances and enforcement efforts when considering cooperative funding grants for alternative water supply development or other cooperative funding grant programs of SJRWMD.

Amendment to subsection titled Proposed Action in section titled Water Supply Development Projects in Recommendations chapter: Replace the paragraph immediately preceding the last bullet in the subsection, on page 165, with the following paragraph:

Thus, SJRWMD's priority in funding support should be for projects that will provide significant quantities of new, naturally occurring sources of water to users within PWRCAs or areas that would otherwise be designated as PWRCAs; provided water supply entities that would be served by such projects have maximized water conservation and the use of reclaimed water to replace potable demands to the extent environmentally, economically, and technically feasible.

Figure 5. Multijurisdictional water supply development projects 2005. As presented in this addendum, Figure 5 shows the project location of multijurisdictional projects. Figure 5 in this addendum supersedes Figure 5 appearing in *DWSP 2005* and the first, second, and third addenda to *DWSP 2005*.

Figure 6. Single-entity water supply development projects 2005. As presented in this addendum, Figure 6 shows the location of single-entity projects. Figure 6 in this addendum supersedes Figure 6 appearing in *DWSP 2005* and the first, second, and third addenda to *DWSP 2005*.

Table 13. Quantities and estimated costs of alternative water supply development projects. As presented in this addendum to *DWSP 2005*, Table 13 reflects the removal of four projects. Table 13 in this addendum supersedes Table 13 appearing in *DWSP 2005* and the first, second, and third addenda to *DWSP 2005*.

Table 14. SJRWMD — Public water supply entities and associated alternative water supply development projects. As presented in this addendum, Table 14 reflects the removal from *DWSP 2005* as amended of four projects (Project Numbers 9, 11, 15 and 57), the removal

of two water supply entities in Orange County (Shadow Hills Mobile Home Park and Zellwood Station Utilities), corrections to the names of three water supply entities, and changes in the projects that should be considered by some water supply entities. Table 14 supersedes Table 14 appearing in *DWSP 2005* and the first, second, and third addenda to *DWSP 2005*.

Table 15. Status of water supply development projects. As presented in this addendum, Table 15 includes the updated status of 16 projects and the removal of four projects (Project Numbers 9, 11, 15 and 57) from *DWSP 2005* as amended. Table 15 supersedes Table 15 appearing in *DWSP 2005* and the first, second, and third addenda to *DWSP 2005*.

Reference: Replaces the reference list beginning on page 175 of *DWSP 2005* to include recent references associated with projects in the plan and the fourth addendum. This reference list supersedes the reference list contained in *DWSP 2005*.

Appendix M: This appendix contains historical water use by county and by water use category for 1995 to 2007.

Appendix N: This appendix contains detailed project descriptions for water supply development projects. This new appendix contains project descriptions for each water supply development project included in this fourth addendum.

All of the water supply development project options in *DWSP 2005* as amended by this fourth addendum would develop alternative water supplies as defined by Section 373.019, F.S., and all of the options would use water from nontraditional water supply sources. Since SJRWMD began to collect and report water use data in 1978, the majority of water use has been supplied by groundwater sources. Since 1995, the base year for assessing the impacts of groundwater withdrawals in SJRWMD's water supply assessment and planning process, groundwater has accounted for about 79% of the total reported water use in SJRWMD (Appendix M). Also, since 1995, fresh groundwater has generally been the first source of choice for increased water supplies by water supply entities in SJRWMD, because it has generally been readily available near the location of use and is relatively inexpensive to treat — about \$1 per 1,000 gallons as compared to about \$3 to \$4 per 1,000 gallons for identified surface water sources (Wycoff, personal communication 2009) and \$5.71 to \$7.08 per 1,000 gallons for desalination (Salsano, personal communication 2009). Public supply utilities account for about 90% of proposed increased water use in SJRWMD from 1995–2025 (SJRWMD 2006). Proposals, primarily by public water supply utilities, to develop increased quantities of fresh groundwater have been the basis of SJRWMD's identification of priority water resource caution areas since the first statutorily required districtwide water supply assessment was prepared in 1994 (Vergara 1994). Fresh surface water is currently being used as a source of public water supply by only two public supply utilities in SJRWMD: the city of Melbourne and the city of Cocoa. Surface water sources were developed by these utilities only after fresh groundwater sources in reasonable proximity to the locations of use were no longer sustainable. Fresh surface water sources that have been identified as potential sources of future water supply are typically located relatively long

distances from the likely locations of use. Although the cost of treating water from these fresh surface water sources may be similar to the cost of treating fresh groundwater and is considerably less than the cost of treating brackish water, the capital investment necessary to construct the relatively long transmission facilities to transport the water to the locations of use has, historically, been a disincentive to the development of these sources. Therefore, for water supply planning purposes, SJRWMD has recognized and continues in this fourth addendum to recognize fresh groundwater as the only traditional water supply source in its jurisdiction. Likewise, in this addendum, SJRWMD continues to consider and designate all water supply sources other than fresh groundwater to be nontraditional water supply sources. Water supply sources other than fresh groundwater account for such a small portion of total water demand within SJRWMD that it considers their development to be nontraditional.

List 1: Projects included in *DWSP 2005*, as amended by fourth addendum

DWSP Project Number	Project Name
Brackish Groundwater Source for Potable Use	
1	Dunes Community Development District Brackish Groundwater Project*
2	East Putnam Regional Water System Project*
3	Melbourne Reverse Osmosis (RO) Plant Expansion Project*
4	Ormond Beach Water Treatment Plant Expansion Project*
5	St. Augustine Water Supply Project*
6	St. Johns County Water Supply Project*
Surface Water Source for Potable Use	
7	Lower Ocklawaha River in Putnam County Project
8	St. Johns River Near SR 50 Project
10	St. Johns River Near DeLand Project
12	St. Johns River/Taylor Creek Reservoir Water Supply Project
61	Lower Ocklawaha River in Marion County Project
62	Sanford ASR Well for Surface Potable Water Storage Project*
63	Sanford Surface WTP on Lake Monroe Project*
64	St. Johns River Near SR 46 Project
65	St. Johns River Near Yankee Lake Project
Seawater Source for Potable Use	
13	Indian River Lagoon at FPL Cape Canaveral Power Plant Project
14	Indian River Lagoon at Reliant Energy Power Plant Project
66	Coquina Coast Seawater Desalination Project
Reclaimed Water Source	
16	Alafaya (Utilities Inc. of Florida) Reclaimed Water Storage and High-Service Pumps Project*
17	Altamonte Springs and Apopka Project APRICOT
18	Apopka and Winter Garden Reuse Partnership Project
19	Bellevue and Spruce Creek Golf Course Reclaimed Water System Expansion Project*
20	Beverly Beach Integrated Reclaimed Water and Stormwater Reuse Project, Phase II*
21	Clermont Reclaimed and Stormwater System Expansion Project*
22	Cocoa and Rockledge Reclaimed Water Line Connection Project
23	Daytona Beach Reclaimed Water System Project*

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List 1.—Continued

DWSP Project Number	Project Name
25	Eastern Orange and Seminole Counties Regional Reuse Project
26	Edgewater Reclaimed Water System Interconnect to Southeast Volusia County Project*
27	Eustis Reclaimed Water System Expansion and Augmentation Project*
28	Flagler County Bulow Reclaimed Water System Project*
29	Holly Hill-Ormond Beach Reclaimed Water System Expansion Project*
30	Lady Lake Phase II Reclaimed Water System*
31	Lake Utility Services (Utilities Inc. of Florida) Lake Groves WWTF Reclaimed Water System Expansion Project*
32	Leesburg Reclaimed Water Reuse Project*
33	Melbourne Reclaimed Water System Expansion Project*
34	Minneola Reclaimed Water Reuse Project*
35	Mount Dora Country Club Golf Course Reclaimed Water Project*
37	Ocoee Reuse System Expansion Project*
38	Orange County Northwest Reclaimed Water Project*
39	Orange County Southeastern Reclaimed Water System Expansion
40	Orlando Utilities Commission Project RENEW
41	Ormond Beach North Peninsula Reclaimed Water Storage Project*
42	Ormond Beach South Peninsula Reuse Improvement Project*
43	Palm Coast Reclaimed Water System Expansion Project*
44	Port Orange Airport Road Reclaimed Water Transmission Main Project*
45	Port Orange Pioneer Trail Storage and Pumping Facility Project*
46	Port Orange Reclaimed Water Reservoir and Recharge Basin Project*
47	Rockledge Reclaimed Water Storage Project*
48	Rockledge Reclaimed Water System Expansion – ASR Project*
49	South Daytona Reclaimed Water System Expansion Project*
50	Tavares Reclaimed Water Treatment System Expansion Project*
51	Volusia County Southwest Reclaimed Water System Project*
52	West Melbourne Above Ground Reclaimed Water Storage Tank*
53	Winter Garden Reclaimed Water Pumping and Transmission Project*
56	University of Central Florida (UCF) Reclaimed Water and Stormwater Integration Project*
67	Heathrow Boulevard Reclaimed Water Transmission Main Project
68	Markham Woods Road Reclaimed Water Transmission Main Project*

List 1.—Continued

DWSP Project Number	Project Name
69	Orange Boulevard Reclaimed Water Transmission Main Project
70	Oviedo Reclaimed Water Project*
71	Seminole County Residential Reclaimed Water Retrofit Project—Phase 1
72	Seminole County/Sanlando Utilities Interconnect With Altamonte Springs Project
73	Spruce Creek Golf and Country Club Reclaimed Water Project*
74	Timacuan Reclaimed Water Main Upgrade Project
75	West Melbourne – Reuse Distribution System Improvements Project*
76	Western Ormond Beach Reclaimed Water Distribution Project*
78	Sanford and Volusia Interconnect Reclaimed/Augmentation Project
81	City of Flagler Beach Reclaimed Water Treatment System Project*
84	City of Ocoee Northwest Reuse Re-Pump Station and Interconnection Mains Project*
Reclaimed Augmentation Source	
24	DeLand Reclaimed Water and Surface Water Augmentation Project*
36	North Seminole Regional Reclaimed Water and Surface Water Augmentation System Expansion and Optimization Project
54	Lake Apopka Reuse Augmentation Project*
55	Seminole County Yankee Lake Reclaimed Water System Augmentation Project*
58	Winter Springs–Lake Jesup Reclaimed Water Augmentation Project*
77	Nova Canal Reclaimed Augmentation Project
79	St. Johns River Near SR 46 – Non-Potable With Storage Project
80	Umatilla Reclaimed Development and Surface Water Reclaimed Supply Project*
82	Securing Minneola's Alternative Resources for Tomorrow (SMART) Project*
83	Silver Springs Citrus Industrial Waste for Reuse Blending and Augmentation Project*
Other	
59	Cherry Lake Tree Farm Lake Withdrawal for Agricultural Irrigation Project*
60	Holloway Farms Agricultural Irrigation Rainwater Collection System Project*

Note: Blue shading indicates a completed project.

*Indicates projects that will service one water supply entity only.

Table M-1. Freshwater source withdrawals by water use category in the St. Johns River Water Management District, 1995–2007
 Freshwater withdrawals by category in the St. Johns River Water Management District, 1995–2007
 (All values in million gallons per day)

Year	Public Supply		Domestic Self-Supply		Commercial-Industrial-Institutional		Agricultural		Recreational		Power Generation		Total Freshwater Withdrawn	
	Ground	Surface	Ground	Surface	Ground	Surface	Ground	Surface	Ground	Surface	Ground	Surface	Ground	Surface
1995	449.52	12.15	93.20	0.00	95.74	35.88	304.53	189.89	15.40	7.51	7.66	84.80	966.05	330.23
1996	474.81	11.07	85.61	0.00	108.17	17.99	311.52	189.13	28.20	12.23	19.07	17.71	1,027.38	248.13
1997	474.15	11.85	82.27	0.00	100.50	18.20	228.55	129.79	27.15	11.51	7.70	20.25	920.32	191.80
1998	517.39	12.15	90.33	0.00	97.26	34.49	415.04	197.07	32.77	13.69	7.89	19.27	1,160.68	276.87
1999	530.55	12.11	90.38	0.00	93.85	33.86	227.02	116.14	22.66	9.76	8.00	17.78	972.46	189.65
2000	558.47	14.08	51.10	0.00	90.62	31.80	387.85	213.74	72.66	31.94	10.86	18.91	1,171.56	310.47
2001	538.93	14.08	53.08	0.00	77.26	27.24	235.97	150.99	28.80	20.75	8.83	23.56	942.87	236.82
2002	519.68	15.57	68.62	0.00	69.92	26.78	246.82	130.98	18.56	21.27	8.96	27.04	932.56	221.64
2003	536.58	26.84	70.57	0.00	81.90	62.97	253.63	171.99	29.07	27.86	2.64	22.68	974.39	312.34
2004	571.46	25.08	72.91	0.00	78.85	71.23	275.99	207.33	28.13	35.09	3.15	28.31	1,030.51	367.04
2005	565.83	15.87	70.74	0.00	80.15	30.38	252.74	127.67	16.09	28.25	1.66	0.78	987.21	202.95
2006	632.95	20.44	72.91	0.00	92.15	31.12	459.73	210.83	24.45	37.92	2.27	1.19	1,284.46	301.50
2007	590.43	21.04	72.46	0.00	81.71	23.30	346.93	68.03	21.01	33.21	7.69	0.00	1,120.24	145.58

The estimation procedure for domestic self-supplied withdrawals changed for 2000 because a different per capita was used to calculate withdrawals as compared to previous years.

Agricultural includes water withdrawn for crop irrigation, livestock, and fish farming purposes.

Recreational includes water used for all turf grass (golf, commercial, industrial, and public) irrigation.

Data sources: 1995–2007, St. Johns River Water Management District

Excludes Polk County for all years

Table M-2.—Continued

Commercial/Industrial/Institutional Groundwater													Commercial/Industrial/Institutional Surface water													Commercial/Industrial/Institutional Freshwater													
1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	
ALACHUA	1.91	1.91	1.54	1.64	1.71	2.04	1.92	0.95	0.60	0.54	0.67	0.35														1.91	1.91	1.54	1.66	1.71	2.04	1.92	0.95	0.60	0.60	0.54	0.67	0.35	
BAKER	0.19	0.19	0.19	0.21	0.20	0.17	0.17	0.15	0.60	0.44	0.35	0.45														0.19	0.19	0.19	0.21	0.20	0.17	0.17	0.15	0.60	0.44	0.35	0.45	0.63	
BRAEFORD	0.00	0.00	0.00	0.00	0.00	0.01	0.01	1.21	1.17	0.88	0.62	0.59														0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	1.21	1.17	0.88	0.62	0.59	
BREYARD	1.80	1.75	1.67	3.46	2.66	1.04	1.28	0.97	3.74	3.08	3.67	4.98	4.45													1.80	1.75	1.67	3.46	2.66	1.04	1.28	0.97	3.74	3.08	3.67	4.98	4.54	5.85
CLAY	4.46	5.02	4.37	2.74	2.68	6.87	4.02	3.82	2.77	3.27	2.73	1.14	0.74													4.46	5.02	4.37	2.74	2.68	6.87	4.02	3.82	2.77	3.27	2.73	1.14	0.74	
DAVAL	24.75	24.15	25.63	22.02	16.37	12.51	13.73	13.05	18.53	16.82	15.49	21.46	18.35													24.75	24.15	25.63	22.02	16.37	12.51	13.73	13.05	21.60	20.79	18.26	22.10	19.49	
FLAHER	0.18	0.07	0.07	0.06	0.05	0.20	0.15	0.16	0.43	0.01	0.10	0.00														0.18	0.07	0.07	0.06	0.05	0.27	0.22	0.23	0.14	0.43	0.01	0.10	0.00	
FLAHER	0.15	0.14	0.11	0.15	0.13	0.12	0.14	0.14	1.75	2.06	0.00	0.00	0.17													0.15	0.14	0.11	0.15	0.13	0.12	0.15	0.14	1.75	2.27	0.00	0.00	0.17	
INDIAN RIVER	10.23	8.51	8.61	8.63	10.38	10.44	8.61	10.43	9.89	8.91	9.54	8.77	7.19													10.23	8.51	8.61	8.63	10.38	10.44	8.61	10.43	9.89	37.53	9.54	11.43	9.37	
LAKE	1.86	1.76	1.75	1.05	1.36	1.56	1.52	1.40	2.82	3.04	2.68	4.09	4.48													1.86	1.76	1.75	1.05	1.36	1.56	1.52	1.40	2.82	2.83	4.22	4.62		
MARION	34.49	35.73	35.23	35.03	30.56	32.46	31.43	30.70	29.98	29.73	36.17	34.98	32.43													34.49	35.73	35.23	35.03	30.56	32.46	31.43	30.70	29.98	29.78	36.30	34.96	32.43	
NEAUSSAU	0.03	0.03	0.03	0.03	0.06	0.08	0.05	0.00	0.05	0.07	0.00	0.00	0.00													0.03	0.03	0.03	0.06	0.08	0.03	0.05	0.00	0.07	0.00	0.00	0.00		
ORANGE	3.61	3.15	2.74	1.72	2.63	3.04	2.57	2.99	2.71	3.09	3.06	2.97	3.20													3.61	3.15	2.74	1.72	2.83	3.04	2.57	2.99	5.26	5.91	4.09	3.67	3.95	
ORANGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00													0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
OSCEOLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00													0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
PUTNAM	11.19	20.36	17.94	19.55	24.16	19.14	11.10	4.95	4.09	3.69	3.49	10.01	7.13													45.93	37.62	35.01	53.53	57.51	50.26	38.00	31.24	29.41	26.72	26.58	34.52	24.57	
SEBASTIAN	0.06	0.05	0.08	0.08	0.06	0.01	0.01	0.02	0.79	0.38	0.63	0.88	1.08													0.06	0.05	0.06	0.06	0.06	0.01	0.01	0.02	1.42	0.94	0.93	0.68	1.08	
SEMPIONE	0.14	0.15	0.16	0.15	0.09	0.08	0.07	0.09	0.51	0.61	0.39	0.00	0.12													0.14	0.15	0.16	0.15	0.08	0.07	0.06	0.54	0.61	0.39	0.00	0.12		
SEMPIONE	0.14	0.15	0.16	0.15	0.09	0.08	0.07	0.09	0.51	0.61	0.39	0.00	0.12													0.14	0.15	0.16	0.15	0.08	0.07	0.06	0.54	0.61	0.39	0.00	0.12		
VOLUSIA	0.69	5.20	4.40	0.56	0.58	0.46	0.45	0.44	0.72	1.55	0.72	0.83	0.89													0.69	5.20	4.40	0.56	0.58	0.46	0.45	0.44	0.73	1.55	0.72	1.08	1.14	
TOTAL	65.74	406.17	400.87	97.05	80.85	80.62	59.92	59.92	81.00	72.58	80.15	61.45	64.45	45.88	17.00	18.20	34.40	33.65	31.80	37.24	36.78	29.97	71.23	30.38	31.42	25.38	33.62	126.16	118.70	127.71	122.47	95.70	150.08	110.53	123.27	105.01			

Thermoelectric Power Generation

Groundwater	Surface water														Total Freshwater													
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007		
ALACHUA	0.40	0.19	0.17	0.24	0.32	0.15	0.17	0.30	0.21	0.42	0.17	0.18	0.36	0.40	0.19	0.17	0.24	0.32	0.15	0.17	0.30	0.21	0.42	0.17	0.18	0.36		
BAKER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
BRAZLORD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
BREWARD	0.31	0.33	0.34	0.49	0.41	0.39	0.35	0.28	0.31	0.31	0.14	0.12	0.13	0.31	0.33	0.34	0.49	0.41	0.39	0.35	0.28	0.31	0.31	0.14	0.12	0.13		
CLAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
DUVAL	5.47	4.54	5.44	5.28	5.54	8.33	6.23	6.33	5.55	6.61	5.50	1.25	5.74	5.47	4.54	5.44	5.28	5.54	8.33	6.23	6.33	5.55	6.61	5.50	1.25	5.74		
FLAGLER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
INDIAN RIVER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
LAKE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
MARION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
NASSAU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
NORFOLK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
ORANGE	0.41	0.72	0.71	0.76	0.94	0.76	0.74	0.73	0.82	0.85	0.45	0.50	0.46	0.41	0.72	0.71	0.76	0.94	0.76	0.74	0.73	0.82	0.85	0.45	0.50	0.46		
OSCEOLA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
PALM BEACH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
PULPIT	0.70	0.55	0.61	0.61	0.58	0.69	0.82	0.73	0.26	0.64	0.02	0.01	0.70	14.50	15.91	17.19	16.33	14.39	13.90	17.69	15.39	14.14	17.37	18.76	1.19	0.00		
ST. JOHNS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
SEMINOLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
VOLUNIA	0.37	0.27	0.43	0.51	0.51	0.54	0.52	0.58	0.49	0.32	0.36	0.21	0.30	70.30	1.80	3.06	2.94	3.39	5.01	5.69	11.65	8.54	10.94	0.00	0.00	0.00		
Totals	7.66	13.07	7.70	7.89	8.00	10.65	8.63	8.93	2.64	3.15	1.66	2.27	7.69	92.46	36.78	27.95	27.16	25.78	29.77	32.39	35.00	25.32	31.46	2.44	3.46	7.69		

District Water Supply Plan 2005—Fourth Addendum

Table M-2.—Continued

Domestic Self-Supply															Domestic Self-Supply															Domestic Self-Supply																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
Groundwater															Surface water															Total Freshwater																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
County	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	County	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Total	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
ALACHUA	3.29	1.29	1.50	1.23	1.24	0.65	0.54	0.66	0.67	0.68	2.02	2.04	1.03	ALACHUA	22.15	22.70	22.71	25.21	25.40	25.63	26.52	26.10	27.04	27.85	25.01	25.21	27.51	93.20	85.81	82.27	90.33	90.38	51.10	53.08	68.62	70.57	72.91	70.74	72.91	72.46	93.20	85.81	82.27	90.33	90.38	51.10	53.08	68.62	70.57	72.91	70.74	72.91	72.46																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
BAKER	2.50	2.44	2.47	2.36	2.52	1.78	1.76	2.81	2.66	2.93	3.37	3.51	3.45	BAKER	0.68	0.75	0.76	0.77	0.62	0.68	0.83	0.80	0.82	0.82	0.86	0.87	0.92	0.68	0.75	0.76	0.77	0.62	0.68	0.83	0.80	0.82	0.82	0.86	0.87	0.92	0.68	0.75	0.76	0.77	0.62	0.68	0.83	0.80	0.82	0.86	0.87	0.92																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
BRADFORD	0.16	0.12	0.12	0.00	0.09	0.16	0.10	0.12	0.12	0.13	0.89	0.90	0.11	BRADFORD	0.04	0.04	0.04	0.00	0.04	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.55	0.04	0.04	0.04	0.04	0.04	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.12	0.35	0.45	0.45	0.00	0.05	0.11	0.1

Table M-2.—Continued

County	Groundwater												Total Water Use												Total Freshwater														
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
ALACHUA	31.51	31.83	30.29	35.55	33.76	36.91	33.37	31.87	35.02	37.77	31.51	38.55	36.20	0.11	0.16	0.15	0.17	0.11	0.28	0.03	0.11	0.21	0.25	0.20	0.22	0.17	31.62	31.89	30.44	35.72	33.69	37.19	33.40	31.96	35.23	38.02	31.71	38.77	36.37
BAKER	4.38	5.54	5.39	4.85	4.63	5.64	4.62	5.32	6.74	5.68	6.09	7.05	5.65	0.63	0.94	0.80	0.51	0.37	1.73	1.08	0.90	2.69	0.99	0.92	1.37	0.00	5.02	6.48	6.19	5.36	5.20	7.37	5.70	6.22	11.43	6.87	7.01	8.43	5.88
BRADFORD	0.35	0.37	0.41	0.37	0.38	0.43	0.24	0.26	2.59	3.15	2.63	2.48	1.54	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.02	0.04	0.02	0.03	0.01	0.35	0.37	0.41	0.37	0.38	0.45	0.25	0.27	3.01	3.19	2.65	2.51	1.56	
BREVARD	137.26	142.84	59.02	218.80	100.05	168.14	97.23	122.85	112.48	117.59	95.94	128.95	109.83	22.50	23.19	19.08	25.17	19.31	39.20	21.52	33.29	40.54	36.56	22.62	31.62	31.72	159.76	173.03	118.10	246.97	119.35	208.34	118.75	156.14	153.02	156.55	118.16	158.58	141.55
CLAY	21.28	21.52	20.15	21.92	23.17	33.57	26.95	27.50	28.14	31.39	22.71	23.11	27.78	0.24	0.31	0.31	0.35	0.45	0.52	0.73	0.47	0.28	2.04	0.39	0.69	0.45	21.52	21.83	20.45	22.27	23.62	34.09	27.69	27.97	28.42	33.43	23.10	28.80	28.23
DAL	144.58	151.06	151.35	150.94	151.94	154.33	141.10	144.14	146.48	158.38	165.11	175.43	174.83	0.48	0.73	0.73	0.82	0.66	1.65	2.68	3.52	8.13	7.27	6.39	4.76	4.16	145.05	151.79	152.08	151.76	152.60	155.96	143.76	147.89	152.61	155.65	171.50	180.19	178.89
FLAGLER	13.30	13.24	13.21	15.83	18.26	24.65	18.57	16.23	15.79	17.73	15.51	27.62	34.46	0.85	1.42	1.44	1.83	1.23	3.60	0.36	0.33	0.14	0.94	3.75	1.29	1.50	14.15	14.66	14.65	17.46	19.51	28.15	18.93	16.56	15.93	18.87	19.28	20.11	35.98
INDIAN RIVER	76.58	71.09	53.24	76.32	59.60	67.36	65.90	57.27	79.27	68.78	71.59	105.30	97.16	136.29	123.86	87.00	122.01	86.69	481.08	121.06	97.04	120.04	162.72	111.88	180.12	81.19	212.87	200.85	140.24	138.33	156.59	245.44	197.86	154.31	199.31	259.50	193.58	205.42	118.39
LAKE	74.13	76.55	77.38	101.50	76.19	95.61	84.15	80.65	77.92	82.62	75.70	97.35	102.50	7.56	8.25	7.69	11.47	6.01	9.63	6.53	6.91	38.74	41.29	10.32	11.15	13.25	81.69	86.80	55.07	113.37	84.16	98.24	80.66	97.77	116.66	123.81	85.02	114.51	115.75
MADISON	36.78	39.63	38.88	41.13	40.79	45.92	36.21	34.08	39.48	37.97	35.40	57.41	48.02	0.75	1.02	1.14	1.38	0.86	1.54	2.99	1.78	1.91	4.65	1.19	1.88	1.49	37.53	40.65	40.02	42.51	41.65	43.66	36.79	35.66	41.39	42.62	35.59	59.28	48.51
NAUSSAU	44.54	46.79	46.82	47.99	45.24	48.53	43.26	45.79	47.86	47.14	52.01	53.54	50.46	0.11	0.19	0.21	0.21	0.16	0.48	0.78	0.88	2.59	0.89	1.84	1.40	1.25	44.65	46.98	47.03	48.20	45.40	47.01	44.04	47.67	50.25	47.53	53.65	54.74	51.72
OKEECHOBEE	11.89	10.29	6.81	11.58	7.91	13.28	11.79	7.80	4.82	6.60	16.95	27.53	21.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.98	10.29	6.81	11.58	7.91	15.28	11.79	7.80	4.82	6.60	16.95	27.53	21.52
ORANGE	123.58	139.49	136.20	155.30	145.01	157.28	146.99	135.37	140.95	142.41	144.82	176.05	164.55	24.23	23.70	20.41	33.90	2.05	5.32	2.85	2.54	5.53	6.44	4.57	5.04	3.62	153.81	168.19	155.61	168.80	150.07	162.60	149.54	137.51	146.49	143.85	148.19	181.10	168.77
OSCEOLA	5.88	5.70	4.79	8.40	2.80	29.48	20.86	12.50	20.57	22.75	51.14	95.29	26.54	9.20	8.25	7.46	14.77	2.55	19.05	15.03	2.93	32.13	32.13	0.74	1.76	0.00	15.08	13.95	12.25	23.17	5.75	48.54	35.91	21.78	50.48	54.88	51.88	97.07	26.54
PUTNAM	38.11	49.88	41.61	47.63	49.06	40.35	29.76	24.72	24.49	23.44	23.44	36.22	32.44	50.32	34.29	35.36	51.08	48.92	47.69	45.80	44.80	43.34	28.28	27.57	18.42	86.43	84.17	76.97	98.71	97.98	89.27	77.45	70.52	69.29	66.78	51.72	63.79	50.86	
ST. JOHNS	45.73	44.16	42.89	51.33	51.75	52.55	34.70	39.62	25.08	28.46	32.34	55.41	57.20	0.64	0.93	0.84	1.04	0.77	3.16	2.08	1.97	3.24	4.35	3.21	4.40	3.61	46.37	45.03	43.73	52.97	52.52	55.71	36.78	41.59	28.32	32.81	35.53	59.81	60.61
SEMIWOLE	68.91	68.53	71.78	79.43	71.52	88.47	67.12	65.32	77.58	65.82	68.28	77.58	76.11	0.88	1.10	1.35	1.33	0.87	1.76	1.36	0.75	1.14	0.97	0.94	1.17	1.08	59.79	67.53	73.13	80.76	72.39	90.25	63.46	66.08	78.72	86.79	68.22	78.75	79.18
VOLUNSA	81.16	101.87	80.10	90.41	84.90	97.16	79.04	60.05	86.72	84.33	76.04	94.95	91.05	75.44	7.19	7.83	8.23	8.23	12.10	10.25	16.05	14.63	20.37	5.58	12.01	3.43	156.69	103.66	87.73	95.64	93.13	103.26	89.29	95.11	101.95	104.70	82.22	103.58	94.48
Totals	956.05	1,027.38	920.32	1,150.88	872.48	1,171.59	942.87	832.59	974.39	1,030.51	987.21	1,294.48	1,120.24	330.23	248.13	191.60	276.67	189.65	310.47	236.62	221.54	312.34	367.04	292.95	301.50	145.66	1,275.51	1,111.92	1,437.35	1,162.11	1,492.03	1,179.49	1,544.20	1,286.73	1,397.55	1,193.16	1,368.96	1,263.80	

Table A-1 (2-NRWSP): Population Estimates for 2010 and Population Projections for 2015-2035, by County, in the St. Johns River Water Management District and Suwannee River Water Management District.

Table A-7 (E-NRWSP). Population Estimates for 2010 and Population Projections for 2015-2035, by County, in the St. Johns River Water Management District and Suwannee River Water Management District.																																																																																																																																																																																																																																			
County	District	2010				2015				2020				2025				2030				2035				Domestic and Small Public Supply Systems Population	Public Supply Systems Population	Domestic and Small Public Supply Systems Population	Public Supply Systems Population	Domestic and Small Public Supply Systems Population	Public Supply Systems Population																																																																																																																																																																																																				
		County Population	District Population	Public Supply Population	Domestic and Small Public Supply Systems Population	County Population	District Population	Public Supply Population	Domestic and Small Public Supply Systems Population	County Population	District Population	Public Supply Population	Domestic and Small Public Supply Systems Population	County Population	District Population	Public Supply Population	Domestic and Small Public Supply Systems Population	County Population	District Population	Public Supply Population	Domestic and Small Public Supply Systems Population	County Population	District Population	Public Supply Population	Domestic and Small Public Supply Systems Population							County Population	District Population	Public Supply Population	Domestic and Small Public Supply Systems Population																																																																																																																																																																																																
Alachua	SURWMD	N/A	203,953	183,326	10,627	N/A	208,789	197,691	11,098	N/A	219,014	207,653	11,461	N/A	228,862	216,686	11,994	N/A	237,732	225,238	12,494	N/A	246,638	233,654	12,984	N/A	255,542	243,058	13,484	21%																																																																																																																																																																																																					
	SRWMD	N/A	43,363	21,922	21,441	N/A	44,411	22,001	22,410	N/A	46,566	23,078	23,508	N/A	48,638	24,059	24,542	N/A	50,666	25,052	25,561	N/A	52,462	25,991	26,471	N/A	54,262	26,930	27,332	21%																																																																																																																																																																																																					
	Total	247,336	247,336	204,818	32,516	253,200	253,200	219,692	33,398	265,600	265,600	230,651	34,966	277,300	277,300	240,764	36,536	288,300	288,300	250,290	299,100	299,100	288,300	288,300	299,100	299,100	300,000	300,000	300,000	21%																																																																																																																																																																																																					
	Alachua	SRWMD	N/A	26,513	6,334	20,079	N/A	26,762	6,631	20,131	N/A	28,550	7,208	21,442	N/A	30,507	7,788	22,719	N/A	32,257	8,343	23,914	N/A	33,930	8,874	25,056	N/A	35,682	9,267	26,415	28%																																																																																																																																																																																																				
Baker	SURWMD	N/A	602	0	602	N/A	608	0	608	N/A	650	0	650	N/A	693	0	693	N/A	733	0	733	N/A	770	0	770	N/A	810	0	810	28%																																																																																																																																																																																																					
	SRWMD	N/A	602	0	602	N/A	608	0	608	N/A	650	0	650	N/A	693	0	693	N/A	733	0	733	N/A	770	0	770	N/A	810	0	810	28%																																																																																																																																																																																																					
	Total	27,115	27,115	6,334	20,681	27,400	27,400	6,631	20,739	27,300	27,300	7,208	22,092	31,200	31,200	7,788	23,412	33,000	33,000	8,343	24,647	34,700	34,700	8,874	25,826	35,492	35,492	35,492	28%																																																																																																																																																																																																						
	Bradford	SRWMD	N/A	5,781	905	4,876	N/A	5,955	876	5,079	N/A	5,757	901	4,856	N/A	5,919	876	4,953	N/A	6,051	949	5,112	N/A	6,182	949	5,215	N/A	6,313	970	5,343	7%																																																																																																																																																																																																				
Bradford	SURWMD	N/A	22,739	6,719	16,020	N/A	22,005	5,978	16,027	N/A	22,440	6,253	16,491	N/A	22,881	6,525	16,956	N/A	23,322	6,800	17,426	N/A	23,763	7,072	17,928	N/A	24,204	7,347	18,369	7%																																																																																																																																																																																																					
	SRWMD	N/A	28,520	7,084	21,436	N/A	27,600	6,854	20,748	23,400	24,400	7,253	21,497	24,200	25,200	7,651	22,849	25,500	26,500	7,950	23,450	26,100	27,100	8,250	23,800	26,450	27,450	27,450	27,450	7%																																																																																																																																																																																																					
	Total	28,520	28,520	7,084	21,436	27,600	27,600	6,854	20,748	23,400	24,400	7,253	21,497	24,200	25,200	7,651	22,849	25,500	26,500	7,950	23,450	26,100	27,100	8,250	23,800	26,450	27,450	27,450	27,450	7%																																																																																																																																																																																																					
	Clay	SRWMD	190,865	190,865	122,132	68,733	201,800	201,800	130,484	71,316	224,600	224,600	146,193	78,407	247,000	247,000	160,889	86,111	268,400	268,400	174,993	93,407	288,300	288,300	188,202	100,098	51%																																																																																																																																																																																																								
Columbia	SURWMD	884,283	884,283	730,470	153,813	889,300	889,300	769,693	135,617	945,900	945,900	805,848	140,052	989,500	989,500	845,759	143,841	1,030,400	1,030,400	893,420	1,067,900	1,067,900	1,067,900	918,516	145,384	24%																																																																																																																																																																																																									
	SRWMD	16,939	16,939	9,632	7,307	16,900	16,900	9,599	7,301	17,800	17,800	9,959	15,801	18,600	18,600	10,500	16,601	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19%																																																																																																																																																																																																					
	Total	900,222	900,222	740,102	161,120	906,200	906,200	779,493	150,118	967,200	967,200	815,807	155,853	1,007,400	1,007,400	865,759	160,442	1,049,800	1,049,800	903,320	1,087,300	1,087,300	1,087,300	1,087,300	1,087,300	1,087,300	1,087,300	1,087,300	1,087,300	1,087,300	24%																																																																																																																																																																																																				
	Flagler	SRWMD	95,688	95,688	52,864	42,824	96,300	96,300	52,864	42,824	96,900	96,900	52,864	42,824	97,500	97,500	52,864	42,824	98,100	98,100	52,864	42,824	98,700	98,700	52,864	42,824	99,300	99,300	52,864	42,824	99,900	99,900	52,864	42,824	19%																																																																																																																																																																																																
Gulf Breeze	SURWMD	16,939	16,939	9,632	7,307	16,900	16,900	9,599	7,301	17,800	17,800	9,959	15,801	18,600	18,600	10,500	16,601	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19%																																																																																																																																																																																																				
	SRWMD	16,939	16,939	9,632	7,307	16,900	16,900	9,599	7,301	17,800	17,800	9,959	15,801	18,600	18,600	10,500	16,601	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19,400	19%																																																																																																																																																																																																				
	Total	33,878	33,878	19,264	14,614	33,800	33,800	19,198	14,602	34,600	34,600	19,558	31,602	38,200	38,200	20,500	33,202	38,800	38,800	38,800	38,800	38,800	38,800	38,800	38,800	38,800	38,800	38,800	38,800	38,800	38,800	38,800	19%																																																																																																																																																																																																		
	Nassau	SRWMD	73,314	73,314	43,070	30,244	73,800	73,800	43,070	30,244	74,300	74,300	43,070	30,244	74,800	74,800	43,070	30,244	75,300	75,300	43,070	30,244	75,800	75,800	43,070	30,244	76,300	76,300	43,070	30,244	76,800	76,800	43,070	30,244	19%																																																																																																																																																																																																
Palm Bay	SURWMD	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190,039	103,039	87,000	190,039	190

Notes:

1.) Rounding errors account for nominal discrepancies.

2.) 2015 to 2035 county population projections were obtained from BEER Population Projections: Volume 48, Bulletin 171, Published April 2015.

3.) Population projections shown here are permanent population projections only and do not include any factors such as seasonal residents, tourist population or net commuter population.

4.) Public water supply utility service areas often include residences that derive their water supply from privately owned (domestic self-supply) wells. Typically, these domestic self-supply water users existed prior to their locations becoming part of public water supply service areas. For public water supply service areas, the Districts do not have sufficient information to separate the populations served by public supply systems from those served by domestic self-supply wells. Therefore, public water supply populations estimated by the Districts often include some domestic self-supply population. In certain counties the domestic self-supply population is projected to decrease.

Table A-1a (1-Region 1). Population Calculation for St. Johns River Water Management District Split Counties.

County	Census Estimates		BEBR Medium Population Projections						SJRWMD Population as a % of County Population	Population Served	Population Projections				
	2010		2010	2015	2020	2025	2030	2035			2010	2015	2020	2025	2030
Alachua	247,336	253,200	265,600	277,300	288,300	299,100	82.46%	203,953	208,789	219,014	228,682	237,732	246,638		
Baker	27,115	27,400	29,300	31,200	33,000	34,700	97.78%	26,513	26,792	28,650	30,507	32,267	33,930		
Bradford	28,520	27,600	28,400	29,200	29,900	30,500	20.27%	5,781	5,595	5,757	5,919	6,061	6,182		
Clay	190,865	201,800	224,600	247,000	268,400	288,300	100.00%	190,865	201,800	224,600	247,000	268,400	288,300		
Duval	864,263	899,300	945,900	989,600	1,030,400	1,067,900	100.00%	864,263	899,300	945,900	989,600	1,030,400	1,067,900		
Flagler	95,696	101,900	122,100	141,700	160,000	177,200	100.00%	95,696	101,900	122,100	141,700	160,000	177,200		
Nassau	73,314	76,800	84,400	91,900	99,100	105,700	100.00%	73,314	76,800	84,400	91,900	99,100	105,700		
Putnam	74,364	72,600	73,100	73,500	73,800	74,200	100.00%	74,364	72,600	73,100	73,500	73,800	74,200		
St. Johns	190,039	214,800	253,400	290,900	325,000	356,500	100.00%	190,039	214,800	253,400	290,900	325,000	356,500		
Region 1 Total	1,791,512	1,875,400	2,026,800	2,172,300	2,307,900	2,434,100	N/A	1,724,788	1,808,376	1,956,921	2,099,688	2,232,760	2,356,550		

Notes:

- 1.) BEER Source: Volume 48, Bulletin 171, Published April 2015.
- 2.) SJRWMD population for Alachua County includes GRU portion of SRWMD.
- 3.) Rounding errors account for nominal discrepancies.

Table A-1b (1-Region 1). Population Estimates for 2010, by County, in the St. Johns River Water Management District.

County	2010 Public Supply Population	2010 Small Public Supply System Population	2010 DSS Parcels	2010 BEBR PPH	2010 Domestic Self-supply Population	2010 Total County Population	2010 BEBR Population Estimate	Deviation	Correct 2010 DSS (Adjustment) to bring to BEBR	2010 Total County Population	Deviation
Alachua	193,326	0	5,397	2.32	12,521	205,847	203,953	-1,894	10,627	203,953	0
Baker	8,434	0	5,613	2.82	15,829	22,263	26,513	4,250	20,079	26,513	0
Bradford	905	0	572	2.53	1,447	2,352	5,781	3,429	4,876	5,781	0
Clay	122,132	1,690	17,646	2.76	48,703	172,525	190,865	18,340	67,043	190,865	0
Duval	730,470	0	13,297	2.47	32,844	763,314	864,263	100,949	133,793	864,263	0
Flagler	92,832	369	9,522	2.42	23,043	116,244	95,696	-20,548	2,485	95,696	0
Nassau	43,070	114	10,573	2.53	26,750	69,934	73,314	3,380	30,130	73,314	0
Putnam	17,643	3,024	26,482	2.48	65,675	86,342	74,364	-11,978	53,697	74,364	0
St. Johns	160,542	1,299	10,289	2.49	25,620	187,461	190,039	2,578	28,198	190,039	0

Notes:

- 1.) Rounding errors account for nominal discrepancies.
- 2.) 2010 county persons per household were obtained from BEBR Number of Households and Average Household Size in Florida Volume 44, Bulletin 159, Published April 2011.
- 3.) 2010 county population was obtained from BEBR Florida Estimates of Population, April 2011.
- 4.) 2010 DSS parcels obtained from SJRWMD DSS parcel calculation model.

Table A-3 (1-Region 1). Total Water Use for 2010 and 5-in-10 Year Water Demand Projections for 2015-2035, and 1-in-10 Year Water Demand Projections for 2035 by County in the St. Johns River Water Management District.

County	Water Use						Demand Projections (5-in-10)												Percent Change 2010-2035	Demand Projections (1-in-10)		
	2010			2015			2020			2025			2030			2035						
	Ground	Surface	Total	Ground	Surface	Total	Ground	Surface	Total	Ground	Surface	Total	Ground	Surface	Total	Ground	Surface	Total				
Alachua	27.63	0.68	28.31	29.17	0.69	29.86	30.86	0.71	31.57	32.18	0.73	32.91	33.74	0.75	34.49	35.40	0.77	36.17	28%	38.42	1.61	40.03
Baker	5.44	0.24	5.68	4.29	0.12	4.41	4.59	0.13	4.72	4.86	0.13	4.99	5.15	0.14	5.29	5.42	0.15	5.57	-2%	5.67	0.16	5.82
Bradford	0.30	0.00	0.30	0.49	0.00	0.49	0.69	0.00	0.69	0.70	0.00	0.70	0.71	0.00	0.71	0.72	0.00	0.72	140%	0.77	0.00	0.77
Clay	21.37	2.93	24.30	22.46	3.18	25.64	25.12	3.46	28.58	27.66	3.69	31.35	29.99	3.89	33.88	32.37	4.15	36.52	50%	35.27	8.10	43.37
Duval	162.23	18.08	180.31	161.88	15.86	177.74	170.31	12.30	182.61	177.87	12.64	190.51	185.10	13.13	198.23	191.76	13.58	205.34	14%	219.70	15.27	234.97
Flagler	20.98	1.27	22.25	24.46	1.63	26.09	25.12	1.89	26.81	26.07	1.78	27.85	26.90	1.86	28.76	27.51	1.93	29.44	32%	28.71	2.34	32.05
Nassau	48.49	1.45	49.94	46.02	1.63	47.65	47.18	1.67	48.85	48.16	1.67	49.83	49.42	1.78	51.20	50.55	1.88	52.43	5%	51.98	2.24	54.22
Putnam	31.92	22.41	54.33	25.95	21.89	47.84	24.25	21.78	46.03	23.00	21.69	44.69	21.82	21.59	43.41	20.47	21.48	41.95	-23%	23.12	21.81	44.93
St. Johns	47.96	6.09	54.05	54.93	6.78	61.71	58.45	7.54	65.99	63.06	8.34	71.40	68.04	9.10	77.14	72.07	9.78	81.85	51%	79.11	11.48	90.59
Region 1 Total	366.32	53.15	419.47	369.65	51.78	421.53	386.57	49.28	435.85	403.56	50.67	454.23	420.87	52.24	473.11	436.27	53.72	489.99	17%	465.75	63.00	528.75

Notes:

- 1.) All water use is shown in million gallons per day.
- 2.) Rounding errors account for nominal discrepancies.

Table A-5a (1-Region 1). Continued. 2010-2014 Water Use, Population Served and Five-Year Gross Per Capita Averages for Public Supply Permitted Equal to or Greater than 0.10 mgd. in the St. Johns River Water Management District.																
Cup Number	Owner	Utility	Alternate Name / Comments	County	Water Use					Population				2010-2014 Average Gross GPCD	Notes	
					2010	2011	2012	2013	2014	2010	2011	2012	2013			2014
59	City of Flagler Beach	City of Flagler Beach	Include Beverly Beach Area	Flagler	0.698	0.688	0.646	0.657	0.819	4,484	4,504	4,482	4,510	4,630	155	
				Flagler	8.041	7.922	7.514	7.404	6.578	76,531	79,759	79,905	79,905	79,905	95	
1960	Plantation Bay Utility Company	Plantation Bay Utility Company		Flagler	0.230	0.245	0.214	0.138	0.175	2,996	3,086	3,000	3,000	3,000	68	
1982	City of Bunnell	City of Bunnell		Flagler	0.314	0.282	0.221	0.250	0.353	2,676	2,700	2,685	2,682	2,648	108	
2002	Manufactured Home Communities	Manufactured Home Communities	Bulow Village Campground	Flagler	0.142	0.073	0.081	0.053	0.055	1,384	1,394	1,384	1,384	1,284	59	Includes Golf Course. Per capita
51136	Dunes Community Development District	Dunes Community Development District		Flagler	0.700	0.734	0.709	0.657	0.673	5,051	5,051	4,100	4,100	4,017	156	of 97 for just PS.
	Flagler Total				10.125	9.944	9.385	9.169	8.653	93,382	96,494	95,586	95,271	95,484	99	
122	City of Fernandina Beach	City of Fernandina Beach		Nassau	3.418	3.464	3.295	3.080	3.051	18,603	18,603	18,603	18,661	18,661	175	
922	Town of Callahan	Town of Callahan		Nassau	0.167	0.170	0.182	0.160	0.152	1,609	1,609	1,609	1,609	1,609	103	
948	Town of Hilliard	Town of Hilliard		Nassau	0.298	0.276	0.259	0.249	0.221	2,763	2,763	2,763	2,763	3,000	93	
	Nassau County Board of County Commissioners			Nassau	1.398	1.426	1.346	1.316	1.267	8,736	8,788	8,788	8,788	8,946	153	
50087	Nassau County Board of County Commissioners		Amelia Island	Nassau	2.420	2.296	2.192	2.011	2.165	11,359	14,292	14,424	14,697	14,697	160	
88271	JEA		Nassau Regional (Old 942)	Nassau	7.701	7.632	7.274	6.816	6.886	43,070	46,055	46,187	46,518	46,913	159	
	Nassau Total															
1624	8150 Town of Interlachen	Town of Interlachen		Pulnam	0.103	0.088	0.081	0.059	0.069	926	930	1,054	930	930	84	
1627	City of Crescent City	City of Crescent City		Pulnam	0.343	0.177	0.180	0.171	0.176	1,577	1,524	1,522	1,800	1,800	127	
7861	Melrose Water Association	Melrose Water Association		Pulnam	0.118	0.110	0.104	0.099	0.100	469	505	505	545	585	204	
7981	River Park Utility Mgt. Assoc.	River Park Utilities Management Assoc.		Pulnam	0.042	0.029	0.060	0.040	0.047	736	736	736	1,000	1,000	52	
8114	City of Palatka	City of Palatka		Pulnam	1.673	1.466	1.525	1.268	1.327	10,558	10,522	10,203	11,900	11,900	132	
8168	Town of Welaka	Town of Welaka		Pulnam	0.085	0.077	0.094	0.063	0.094	1,100	1,100	1,100	1,780	1,780	63	
	East Pulnam County Water System. East Palatka & San Mateo			Pulnam	0.368	0.405	0.412	0.410	0.416	2,277	2,287	2,287	2,393	2,393	173	
92168	Pulnam County BOCC			Pulnam	2.732	2.352	2.458	2.730	2.229	17,643	17,604	17,407	20,348	20,388	121	
	North Beach Utilities			St. Johns	0.368	0.405	0.412	0.410	0.416	3,653	3,295	3,295	3,295	3,295	119	
157	North Beach Utilities			St. Johns	0.129	0.067	0.062	0.059	0.061	878	896	911	848	848	86	
324	Wildwood Water Company			St. Johns												
	Was previously Intercoastal Utilities CUP 1213 Duval, St. Johns			St. Johns	4.746	4.853	4.435	4.080	3.671	23,688	23,973	23,531	23,531	23,531	181	
1142	St. Johns County Utilities			St. Johns	6.700	6.651	6.706	6.390	6.827	64,082	67,697	71,289	71,289	62,677	99	
1198	St. Johns County Utilities			St. Johns	0.088	0.081	0.081	0.080	0.081	531	639	639	593	593	137	
1392	Town of Hastings			St. Johns	3.227	3.086	3.094	2.902	2.946	27,833	26,233	26,233	26,207	26,207	112	
60239	City of St. Augustine Utilities			St. Johns	15,258	15,155	14,790	13,922	14,001	120,645	122,733	125,896	127,763	129,973	118	
	St. Johns Total			St. Johns Total	188,764	184,934	178,300	168,775	172,229	1,357,913	1,370,912	1,380,965	1,394,417	1,372,460	131	

Notes:

- 1.) All water use is shown in million gallons per day.
- 2.) Rounding errors account for nominal discrepancies.
- 3.) 2010-2014 water use obtained from SURWMD Estimated Water Use Survey, SURWMD metered EN60 data, DEP MOR data and USGS data.
- 4.) 2010-2014 population obtained from Technical Staff Reports. BEER estimates of population, DEP MOR and Base Facility Report Data, parcel data and permittee surveys.

Table A-2a (1-Region 1). Domestic Self-Supply Population and Water Use for 2010 and Population Projections for 2015-2035, 5-to-10 Year Water Demand Projections for 2015-2035 and 1-to-10 Year Water Demand Projections for 2025 by County, in the St. Johns River Water Management District.

County	Population						Population Projections						Percent Change 2010-2015	Demand Projections (2015-2035)						Percent Change 2010-2015	Demand Projections (14-10)						
	2010			2015			2020			2025				2030			2035				2010-2014 Avg Growth			2015-2035			
	2010	2015	2020	2025	2030	2035	2010	2015	2020	2025	2030	2035		2010	2015	2020	2025	2030	2035		GW	SW	Total	GW	SW	Total	
Alachua	10,827	10,660	11,481	11,994	12,494	12,884	22%	0.73	0.00	0.73	0.73	0.00	0.73	0.63	0.00	0.63	0.66	0.00	0.66	0.00	0.90	0.23%	69	0.95	0.00	0.95	
Baker	20,079	20,161	21,442	22,719	23,924	25,056	25%	2.97	0.00	2.97	2.90	0.00	2.44	2.59	0.00	2.59	2.73	0.00	2.73	2.86	0.00	2.86	-4%	114	3.03	0.00	3.03
Brevard	4,976	4,719	4,856	4,993	5,112	5,215	7%	0.09	0.00	0.09	0.40	0.00	0.40	0.42	0.00	0.43	0.44	0.00	0.44	0.00	0.44	385%	94	0.47	0.00	0.47	
Citrus	67,043	69,589	70,621	71,507	72,441	73,315	46%	4.11	0.00	4.11	5.64	0.00	6.21	6.83	0.00	6.83	7.41	0.00	7.41	7.95	0.00	7.95	93%	81	8.43	0.00	8.43
Duval	133,793	135,617	140,052	143,841	148,950	153,384	12%	12.08	0.00	12.08	12.61	0.00	13.02	13.38	0.00	13.38	13.67	0.00	13.67	13.89	0.00	13.89	15%	193	14.72	0.00	14.72
Flagler	2,485	2,769	2,959	3,159	3,359	3,559	350%	0.15	0.00	0.15	0.17	0.00	0.18	0.41	0.00	0.41	0.53	0.00	0.53	0.65	0.00	0.65	61	0.69	0.00	0.69	
Franklin	3,457	3,457	3,457	3,457	3,457	3,457	0%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Greene	23,892	24,412	24,932	25,452	25,972	26,492	2%	2.61	0.00	2.61	3.72	0.00	3.72	3.77	0.00	3.78	3.80	0.00	3.80	3.80	0.00	3.80	16%	71	4.03	0.00	4.03
St. Johns	28,168	31,512	37,101	42,677	48,253	53,829	115%	2.80	0.00	2.80	2.96	0.00	3.42	3.42	0.00	3.42	3.52	0.00	3.52	3.60	0.00	3.60	100%	92	5.93	0.00	5.93
Region 1 Total	350,938	359,267	384,386	409,509	435,700	463,448	32%	34.29	0.00	34.29	33.03	0.00	35.42	37.82	0.00	37.82	40.37	0.00	40.37	42.89	0.00	42.89	N/A	45.47	0.00	45.47	

Notes:

- 1.) All water use is shown in million gallons per day.
- 2.) Rounding errors account for nominal discrepancies.
- 3.) Projected county population source for years 2016-2035 is BEBR Medium Projections from Volume 48, Bulletin 171, Published April 2015. Domestic Self-Supply Population is BEBR Medium County population minus large public supply population and small public supply population.
- 4.) Population projections shown here are permanent population projections only and do not include any factors such as seasonal residents, tourist population or non-commuter population.
- 5.) Per capita used to calculate demand projections is an average from 2010-2014 and is calculated as (Total County-wide Residential Water Use / Total Estimated Population). This per capita is commonly referred to as a residential per capita, as it only includes the indoor and outdoor residential uses.
- 6.) 1-to-10 year demand projections are based on the 2010 per capita and the 2010 population.
- 7.) All demands are expanded to come from groundwater, thus surface water is not included.
- 8.) 2010 estimates of domestic self-supply water use obtained from SIRWMD Annual Water Use Surveys and USGS data. Duval County was adjusted from published values to account for domestic self-supply population within JEA public supply service area.

Table A-5b (1-Region 1). 2010-2014 Residential Per Capita Averages for All Public Supply Permittees in the St. Johns River Water Management District.

[illegible]

1.) All water use is shown in million gallons per day.

2.) Rounding errors account for nominal discrepancies.

3.) 2010-2014 water use obtained from SJRWMD Estimated Water Use Survey and USGS data.

4.) 2010-2014 population obtained from Technical Staff Reports, BEER estimates of population, DEP MCR and Base Facility Report Data, parcel data and permittee surveys.

5.) 2010-2014 % household sources obtained from Technical Staff Reports.

6.) Any missing years data or erroneous was obtained from Technical Staff Reports.

Table A-6d (1--Region1). 2010-2014 Water Use, Population Served and Five-Year Gross Per Capita Averages for Public Supply Permitted Smaller than 0.10 mgd in the St. Johns River Water Management District.

Cup Number	Owner	Utility	Alternate Name / Comments	County	Water Use 2010	Water Use 2011	Water Use 2012	Water Use 2013	Water Use 2014	Population 2010	Population 2011	Population 2012	Population 2013	Population 2014	2010-2014 Avg GPCD	Notes
497	Pennay Retirement Community Inc	Pennay Retirement Community Inc	Pennay Retirement Community	Clay	0.050	0.051	0.052	0.044	0.043	202	202	202	202	202	238	
509	Pennay Farms Water Utility Enterprise	Pennay Farms Water Utility Enterprise	Town of Pennay Farms	Clay	0.042	0.041	0.037	0.032	0.031	488	488	488	488	488	75	
527	Green Cove Springs LP	Green Cove Springs LP	St. Johns Landing	Clay	0.122	0.129	0.132	0.107	0.082	1,000	1,000	1,000	1,087	1,084	1,000	111
					0.214	0.221	0.221	0.183	0.156	1,890	1,890	1,777	1,781	1,897	115	
1979	Holiday Travel Park Co-op Inc	Holiday Travel Park Co-op Inc	Holiday Travel Park	Flagler	0.012	0.011	0.005	0.010	0.010	369	369	369	369	369	26	
					0.012	0.011	0.005	0.010	0.010	369	369	369	369	369	26	
925	Bobby Dollison	Bobby Dollison	American Beach	Nassau	0.001	0.001	0.013	0.013	0.013	114	114	114	114	114	72	
					0.001	0.001	0.013	0.013	0.013	114	114	114	114	114	72	
7982	Aqua Utilities of Florida, Inc.	Aqua Utilities of Florida, Inc.	River Grove	Putnam	0.015	0.016	0.015	0.015	0.015	219	219	219	219	219	67	
7986	Aqua Utilities of Florida, Inc.	Aqua Utilities of Florida, Inc.	Park Manor- Interlachen Lake Estates	Putnam	0.031	0.029	0.031	0.036	0.030	620	622	622	622	622	60	
8071	Hilltop Farms Inc	Kirkwood Estates		Putnam	0.002	0.009	0.037	0.037	0.039	47	47	47	47	47	45	
8072	Lake Como Water Assoc	Lake Como Water Assoc	Village of Lake Como	Putnam	0.037	0.028	0.046	0.028	0.052	373	374	374	374	374	102	
8124	Hiawatha Management Inc	Hiawatha Management Inc	Hiawatha Management	Putnam	0.010	0.010	0.010	0.010	0.010	145	145	145	145	145	69	
8127	Aqua Utilities of Florida, Inc.	Aqua Utilities of Florida, Inc.	Palm Port	Putnam	0.012	0.011	0.010	0.010	0.010	218	218	218	218	218	47	
90227	St. Johns Harbor Water Association	St. Johns Harbor Water Association	CUP # 90227 was in house, but never issued - "No permit required."	Putnam	0.027	0.026	0.022	0.019	0.018	358	360	360	360	360	62	
			Wooden MSP (PWSID 2541280), Beechers Point (2540070) do not have any record of CUPs. Two other PWSABs have expired CUPs # 84974 (Silver Lake Oaks - PWSID 2544258) and 82918 (Saratega - PWSID 2541008, 2541242).	Putnam												
			CUPs 7984 (Hermits Cove - PWSID 2540482) and 7988 (St. Johns Highlands / Hermits Cove - PWSID 2540482) expired in 1992 and were not renewed - "No permit required." St. Johns River Club Utilities PWSID 2544266 does not have any record of a CUP.	Putnam	0.019	0.021	0.020	0.017	0.016	205	205	205	205	205	81	
			CUP 8129 was closed in 2003, no permit required.	Putnam	0.032	0.027	0.023	0.022	0.023	474	475	467	467	467	54	
				Putnam												
				Putnam	0.029	0.035	0.040	0.039	0.040	215	215	215	215	215	170	
	Mr. W. Herrington	River Villas Inc		Putnam	0.006	0.005	0.003	0.005	0.005	150	150	164	164	150	31	
				Putnam	0.240	0.217	0.257	0.237	0.228	3,024	3,031	3,036	3,129	3,020	77	
1190	Pinkham Pasati	Pinkham Pasati	Pasati's Marina & Campground	St. Johns	0.019	0.009	0.008	0.008	0.008	345	345	345	312	312	30	
1381	Comanche Cove Yacht Harbor	Comanche Cove Yacht Harbor		St. Johns	0.038	0.031	0.025	0.023	0.023	378	386	411	411	378	71	
1386	Homeowners Utilities	Homeowners Utilities	Purposes Point	St. Johns	0.069	0.047	0.043	0.036	0.036	232	237	237	237	237	195	
1423	St. Johns County Board of County Commis	Fruit Cove Utilities	Fruit Cove Oaks. Was previously owned by Fruit Cove Properties Joint Venture.	St. Johns	0.031	0.041	0.045	0.043	0.042	344	351	461	461	369	102	
				St. Johns	0.157	0.128	0.121	0.109	0.109	1,299	1,375	1,497	1,421	1,296	91	
				Region 1 Total	0.524	0.578	0.617	0.552	0.516	6,496	6,579	6,793	6,825	6,507	87	

Notes:

- 1.) All water use is shown in million gallons per day.
- 2.) Rounding errors account for nominal discrepancies.
- 3.) 2010-2014 water use obtained from SJRWMD Estimated Water Use Survey, SJRWMD metered EN50 data, DEP MOR data and USGS data.
- 4.) 2010-2014 population obtained from Technical Staff Reports, BEBR estimates of population, DEP MOR and Base Facility Report Data, parcel data and permittee surveys.

County		Demand Projections (5-in-10)												Demand Projections (1-in-10)																			
		2010				2015				2020				2025				2030				2035											
		Ground		Surface		Total		Ground		Surface		Total		Ground		Surface		Ground		Surface		Ground		Surface		Ground		Surface		Ground		Surface	
		Water Use	Permit	Water Use	Permit	Water Use	Permit	Water Use	Permit	Water Use	Permit	Water Use	Permit	Water Use	Permit	Water Use	Permit	Water Use	Permit	Water Use	Permit	Water Use	Permit	Water Use	Permit	Water Use	Permit	Water Use	Permit	Water Use	Permit		
Alachua	0.63	0.24	1.17	0.47	0.12	0.59	0.52	0.13	0.65	0.58	0.14	0.70	0.59	0.15	0.74	0.57	0.16	0.73	0.57	0.16	0.73	0.57	0.16	0.73	0.57	0.16	0.73	0.57	0.16	0.73			
Baker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Bradford	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Clay	0.02	0.27	0.49	1.03	0.45	1.48	1.32	0.59	1.96	1.54	0.67	2.21	1.59	0.73	2.32	1.99	0.86	2.85	2.07	0.91	2.98	3.14	1.04	4.18	3.24	1.12	4.36	4.52	1.24	4.76			
Columbia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Flagler	0.30	0.50	0.86	1.97	0.45	2.42	1.97	0.45	2.42	1.97	0.45	2.42	1.97	0.45	2.42	1.97	0.45	2.42	1.97	0.45	2.42	1.97	0.45	2.42	1.97	0.45	2.42	1.97	0.45	2.42			
Franklin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Nassau	0.44	0.17	0.61	0.75	0.29	1.04	0.35	0.21	0.56	0.31	0.21	0.56	0.29	0.21	0.56	0.29	0.21	0.56	0.29	0.21	0.56	0.29	0.21	0.56	0.29	0.21	0.56	0.29	0.21	0.56			
Putnam	48.98	1.74	20.70	14.41	1.32	15.73	12.61	1.16	13.77	11.30	1.04	12.34	10.09	0.93	11.02	8.67	0.80	9.47	7.28	0.69	8.97	6.80	0.57	7.37	5.19	0.45	6.64	4.73	0.33	5.97			
St. Johns	23.82	1.01	24.83	27.29	1.17	28.56	25.02	1.11	27.13	24.85	1.11	26.97	24.50	1.15	25.65	23.21	1.17	24.44	21.98	1.19	23.17	20.72	1.21	22.51	20.06	1.23	21.80	19.35	1.25	20.60			
Region 1	56.83	6.14	62.77	60.23	5.26	65.52	55.78	4.94	60.62	52.79	4.42	57.21	51.69	4.09	55.77	48.85	3.72	53.59	46.03	3.35	52.75	45.97	3.00	51.97	44.79	2.65	51.44	44.28	2.29	50.85			
Total	56.83	6.14	62.77	60.23	5.26	65.52	55.78	4.94	60.62	52.79	4.42	57.21	51.69	4.09	55.77	48.85	3.72	53.59	46.03	3.35	52.75	45.97	3.00	51.97	44.79	2.65	51.44	44.28	2.29	50.85			

1) Water use is shown in million gallons per day.
2) Rounding error account for nominal discrepancies.
3) 2010 estimated irrigated acres and water use derived from FSAD AG layer, deliverable dated 09/22/14 from The Balmoral Group as Florida Department of Agriculture and Consumer Services representative. 2010 values will not match published Annual Water Use Survey nor USGS data. 2010 estimates of water use for SJRWMD were updated from FSAD 1 values to reflect reported water use from permittees; water use for areas known to irrigate that did not have a permit was estimated via APFMS.
4) 2015-2035 average projections and 2015-2035 average and 1-in-10 water demand projections derived from FSAD 1 AG layer, deliverable dated 07/16/15 from The Balmoral Group as Florida Department of Agriculture and Consumer Services representative.
5) SJRWMD 2010 groundwater / surface water split was estimated using the percent split of total permitted allocations for each county.
6) 2015-2035 groundwater / surface water split estimated using 2010 ratios.
7) 2015-2035 groundwater / surface water split estimated using 2010 ratios.

Table A-8 (1-Region 1). Landscape/Recreational/Aesthetic Self-Supply Water Use and Acreage for 2010 and 5-in-10 Year Demand Projections for 2015-2035, 1-in-10 Year Demand Projections for 2035 by County, in the St. Johns River Water Management District.

County	Water Use												Demand Projections (5-in-10)												Demand Projections (1-in-10)											
	2010				2015				2020				2025				2030				2035				2040				2045				2050			
	Ground	Surface	Total		Ground	Surface	Total		Ground	Surface	Total		Ground	Surface	Total		Ground	Surface	Total		Ground	Surface	Total		Ground	Surface	Total		Ground	Surface	Total		Ground	Surface	Total	
	0.46	0.67	1.13		0.46	0.66	1.12		0.49	0.71	1.20		0.50	0.73	1.23		0.51	0.75	1.26		0.51	0.75	1.26		0.51	0.75	1.26		0.51	0.75	1.26		0.51	0.75	1.26	
Alachua	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	
Baker	0.10	0.00	0.10		0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	
Bradford	0.63	2.66	3.29		0.63	2.73	3.36		0.63	2.89	3.52		0.63	2.96	3.59		0.63	3.03	3.66		0.63	3.10	3.73		0.63	3.17	3.80		0.63	3.24	3.87		0.63	3.31	3.94	
Cay	0.50	3.42	3.92		0.51	3.56	4.07		0.51	3.70	4.21		0.51	3.84	4.35		0.51	3.98	4.49		0.51	4.12	4.63		0.51	4.26	4.77		0.51	4.40	4.91		0.51	4.54	5.05	
Duval	0.58	1.26	1.84		0.58	1.33	1.91		0.58	1.40	1.98		0.58	1.47	2.05		0.58	1.54	2.12		0.58	1.61	2.19		0.58	1.68	2.26		0.58	1.75	2.33		0.58	1.82	2.40	
Flagler	0.34	0.07	0.41		0.34	0.07	0.41		0.34	0.07	0.41		0.34	0.07	0.41		0.34	0.07	0.41		0.34	0.07	0.41		0.34	0.07	0.41		0.34	0.07	0.41		0.34	0.07	0.41	
Franklin	0.34	0.07	0.41		0.34	0.07	0.41		0.34	0.07	0.41		0.34	0.07	0.41		0.34	0.07	0.41		0.34	0.07	0.41		0.34	0.07	0.41		0.34	0.07	0.41		0.34	0.07	0.41	
St. Johns	1.16	4.35	5.51		1.16	4.35	5.51		1.16	4.35	5.51		1.16	4.35	5.51		1.16	4.35	5.51		1.16	4.35	5.51		1.16	4.35	5.51		1.16	4.35	5.51		1.16	4.35	5.51	
Region 1 Total	7.53	13.12	20.65		7.53	13.09	20.62		7.53	13.06	20.59		7.53	13.03	20.56		7.53	12.99	20.53		7.53	12.96	20.50		7.53	12.93	20.47		7.53	12.90	20.44		7.53	12.87	20.41	

Notes:

- 1.) All water use is shown in million gallons per day.
- 2.) Rounding errors account for nominal discrepancies.
- 3.) 2010 water use and irrigated acreage obtained from SJRWMD Estimated Water Use Survey, golf course land coverage, EN-50 and USGS data.
- 4.) 2015-2035 projected surface water demand was interpolated based on 2010 percentages.
- 5.) 2015-2035 acreage projections estimated using 2010 acreage to 2010 water use ratio.
- 6.) 2035 1-in-10 rainfall year demands estimated using % above average from highest water year from 2006-2014.

Table A-8a (1-Region 1), 2000-2014 Water Use, Total County Population and Five-Year Grows Per Capita Averages for Land Use/Recreational/Residential Self-Supply and Land Use/Recreational/Residential Self-Supply and Land Use/Recreational/Residential Self-Supply, in the St. Johns River Water Management District.

County	Total County Water Use										2010-2014 Average		County Population Within District										2010-2014 Average		County Population Projections Within District										Increase in County Population Within District										Change in Recreational Self-Supply Water Demand																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	2000	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427	2428	2429	2430	2431	2432	2433	2434	2435	2436	2437	2438	2439	2440	2441	2442	2443	2444	2445	2446	2447	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467	2468	2469	2470	2471	2472	2473	2474	2475	2476	2477	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497	2498	2499	2500	2501	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	2543	2544	2545	2546	2547	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557	2558	2559	2560	2561	2562	2563	2564	2565	2566	2567	2568	2569	2570	2571	2572	2573	2574	2575	2576	2577	2578	2579	2580	2581	2582	2583	2584	2585	2586	2587	2588	2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617	2618	2619	2620	2621	2622	2623	2624	2625	2626	2627	2628	2629	2630	2631	2632	2633	2634	2635	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	2648	2649	2650	2651	2652	2653	2654	2655	2656	2657	2658	2659	2660	2661	2662	2663	2664	2665	2666	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	2679	2680	2681	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707	2708	2709	2710	2711	2712	2713	2714	2715	2716	2717	2718	2719	2720	2721	2722	2723	2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737	2738	2739	2740	2741	2742	2743	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767	2768	2769	2770	2771	2772	2773	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847	2848	2849	2850	2851	2852	2853	2854	2855	2856	2857	2858	2859	2860	2861	2862	2863	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887	2888	2889	2890	2891	2892	2893	2894	2895	2896	2897	2898	2899	2900	2901	2902	2903	2904	2905	2906	2907	2908	2909	2910	2911	2912	2913	2914	2915	2916	2917	2918	2919	2920	2921	2922	2923	2924	2925	2926	2927	2928	2929	2930	2931	2932	2933	2934	2935	2936	2937	2938	2939	2940	2941	2942	2943	2944	2945	2946	2947	2948	2949	2950	2951	2952	2953	2954	2955	2956	2957	2958	2959	2960	2961	2962	2963	2964	2965	2966	2967	2968	2969	2970	2971	2972	2973	2974	2975	2976	2977	2978	2979	2980	2981	2982	2983	2984	2985	2986	2987	2988	2989	2990	2991	2992	2993	2994	2995	2996	2997	2998	2999

Table A-9 (1-Region 1), Commercial/Industrial/Institutional and Mining/Dewatering Self-supply Water Use for 2010, 5-in-10 Year Demand Projections for 2015-2035, by County, in the St. Johns River Water Management District.

County	Water Use			Demand Projections (5-In-10)												Percent Change 2010-2035			
	2010			2015			2020			2025			2030				2035		
	Ground	Surface	Total	Ground	Surface	Total	Ground	Surface	Total	Ground	Surface	Total	Ground	Surface	Total		Ground	Surface	Total
Alachua	0.57	0.00	0.57	0.58	0.00	0.58	0.61	0.00	0.61	0.64	0.00	0.64	0.67	0.00	0.67	0.70	0.00	0.70	23%
Baker	0.54	0.00	0.54	0.54	0.00	0.54	0.57	0.00	0.57	0.60	0.00	0.60	0.63	0.00	0.63	0.66	0.00	0.66	22%
Bradford	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	N/A
Clay	0.70	0.00	0.70	0.72	0.00	0.72	0.77	0.00	0.77	0.81	0.00	0.81	0.85	0.00	0.85	0.89	0.00	0.89	27%
Duval	29.91	0.00	29.91	30.75	0.00	30.75	31.87	0.00	31.87	32.92	0.00	32.92	33.90	0.00	33.90	34.80	0.00	34.80	16%
Flagler	1.84	0.00	1.84	1.97	0.00	1.97	2.39	0.00	2.39	2.80	0.00	2.80	3.18	0.00	3.18	3.54	0.00	3.54	N/A
Nassau	31.79	0.00	31.79	31.80	0.00	31.80	31.82	0.00	31.82	31.84	0.00	31.84	31.86	0.00	31.86	31.88	0.00	31.88	0%
Putnam	4.68	20.25	24.93	4.67	20.20	24.87	4.67	20.22	24.89	4.67	20.23	24.90	4.68	20.24	24.91	4.68	20.24	24.92	0%
St. Johns	0.31	0.73	1.04	0.32	0.77	1.09	0.35	0.82	1.17	0.37	0.88	1.25	0.39	0.93	1.32	0.41	0.97	1.38	33%
Region 1 Total	70.34	20.98	91.32	71.35	20.97	92.32	73.05	21.04	94.09	74.65	21.11	95.76	76.16	21.16	97.32	77.56	21.21	98.77	8%

Notes:

- 1.) All water use is shown in million gallons per day.
- 2.) Rounding errors account for nominal discrepancies.
- 3.) 2010 water use obtained from SJRWMD Estimated Water Use Surveys, EN-50 and USGS data.
- 4.) 2015-2035 projected surface water demand was interpolated based on 2010 Percentages.

Table A-5a (1-Region 1), 2006-2014 Water Use, Total County Population and Five-Year Gross Per Capita Averages for Commercial/Industrial and Mining/Dewatering Self-Supply Water Demand Increases, in the St. Johns River Water Management District.

County	Total County Water Use										County Population Within District										County Population Projections Within District										Increase in County Population Within District										Change in Commercial / Industrial / Institutional & Mining / Dewatering Self-Supply Water Demand																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
	2006-2014 Year CM, Total County Population and Average Per Capita Water Use										2010-2014 Average GPCD										2010-2014 Average GPCD										2010-2014 Average GPCD										2010-2014 Average GPCD										2010-2014 Average GPCD																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2015-2019	2020-2022	2023-2025	2026-2029	2030-2035	2015-2019	2020-2022	2023-2025	2026-2029	2030-2035	2015-2019	2020-2022	2023-2025	2026-2029	2030-2035																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
Alameda	0.89	0.74	0.42	0.57	0.57	0.79	0.38	0.37	195,916	199,110	201,250	202,913	203,853	203,854	203,487	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	204,502	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Table A-11 (1-Region 1). Public Supply and Domestic Self-Supply and Small Public Supply 2010 Water Use and 2015-2035 Demand Projections, by County, in the St. Johns River Water Management District.

County	2010 Water Use			2015 Demand Projections (5-in-10)			2020 Demand Projections (5-in-10)			2025 Demand Projections (5-in-10)			2030 Demand Projections (5-in-10)			Percent Change 2010-2035			2035 Demand Projections (5-in-10)				
	Public Supply	Domestic Self-Supply and Small Public Supply	Total	Public Supply	Domestic Self-Supply and Small Public Supply	Total	Public Supply	Domestic Self-Supply and Small Public Supply	Total	Public Supply	Domestic Self-Supply and Small Public Supply	Total	Public Supply	Domestic Self-Supply and Small Public Supply	Total	Public Supply	Domestic Self-Supply and Small Public Supply	Total	Public Supply	Domestic Self-Supply and Small Public Supply	Total		
Alachua	23.00	0.73	23.73	23.34	0.75	24.09	24.47	0.79	25.26	25.55	0.83	26.38	26.55	0.86	27.41	27.55	0.90	28.45	28.74	0.95	29.20	29.50	30.15
Baker	1.00	2.97	3.97	0.98	2.90	3.88	1.06	2.84	3.90	1.15	2.58	3.74	1.23	2.73	3.96	1.31	2.86	4.17	3.14	4.76	5.90	7.04	
Bradford	0.11	0.09	0.20	0.09	0.40	0.49	0.10	0.41	0.51	0.10	0.42	0.52	0.10	0.43	0.53	0.10	0.44	0.54	0.11	0.47	0.58	0.69	
Clay	15.10	4.32	19.42	14.22	5.84	20.06	15.94	6.41	22.35	17.55	7.04	24.59	18.08	7.62	26.70	20.54	8.17	28.71	36.71	8.99	21.78	8.66	
Duval	109.22	12.06	121.28	108.86	12.61	121.47	115.06	13.02	128.08	120.90	13.36	134.28	126.44	13.67	140.11	131.59	13.89	145.47	139.47	15.50	130.47	14.72	
Flagler	10.12	0.16	10.28	9.71	0.18	9.89	11.51	0.29	11.80	13.25	0.42	13.67	14.85	0.54	15.39	16.33	0.66	16.99	17.30	0.70	17.30	0.70	
Nassau	7.71	6.87	14.58	7.17	4.55	11.72	7.77	5.12	12.89	8.35	5.68	14.03	8.92	6.21	15.13	9.28	6.82	16.10	20.70	10.40	9.83	7.23	
Pulaski	2.73	4.76	7.49	2.22	3.95	6.17	2.24	3.88	6.22	2.25	4.00	6.25	2.25	4.01	6.26	2.27	4.03	6.30	-1.70	-1.50	2.39	4.27	
St. Johns	19.91	2.98	22.87	22.30	3.03	25.33	27.05	3.54	30.59	31.09	4.05	35.14	33.99	4.89	38.88	36.63	5.72	42.35	84.70	85.00	38.83	6.07	
Region 1 Total	188.30	34.92	223.22	189.49	33.61	223.10	205.20	38.00	241.20	220.19	38.41	258.60	233.41	40.36	274.37	245.59	43.49	289.08	30.70	25.00	260.30	46.10	

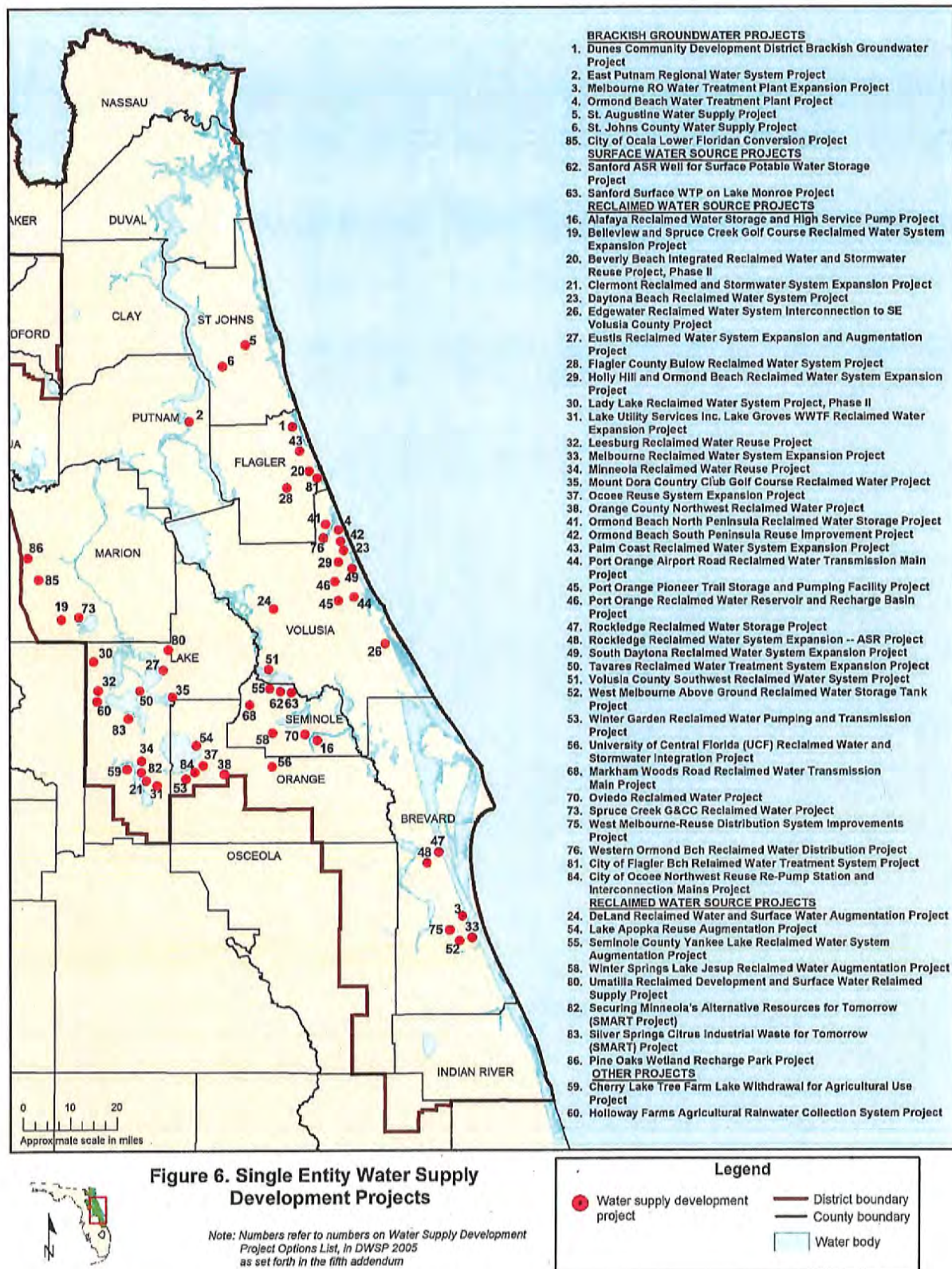
Notes:

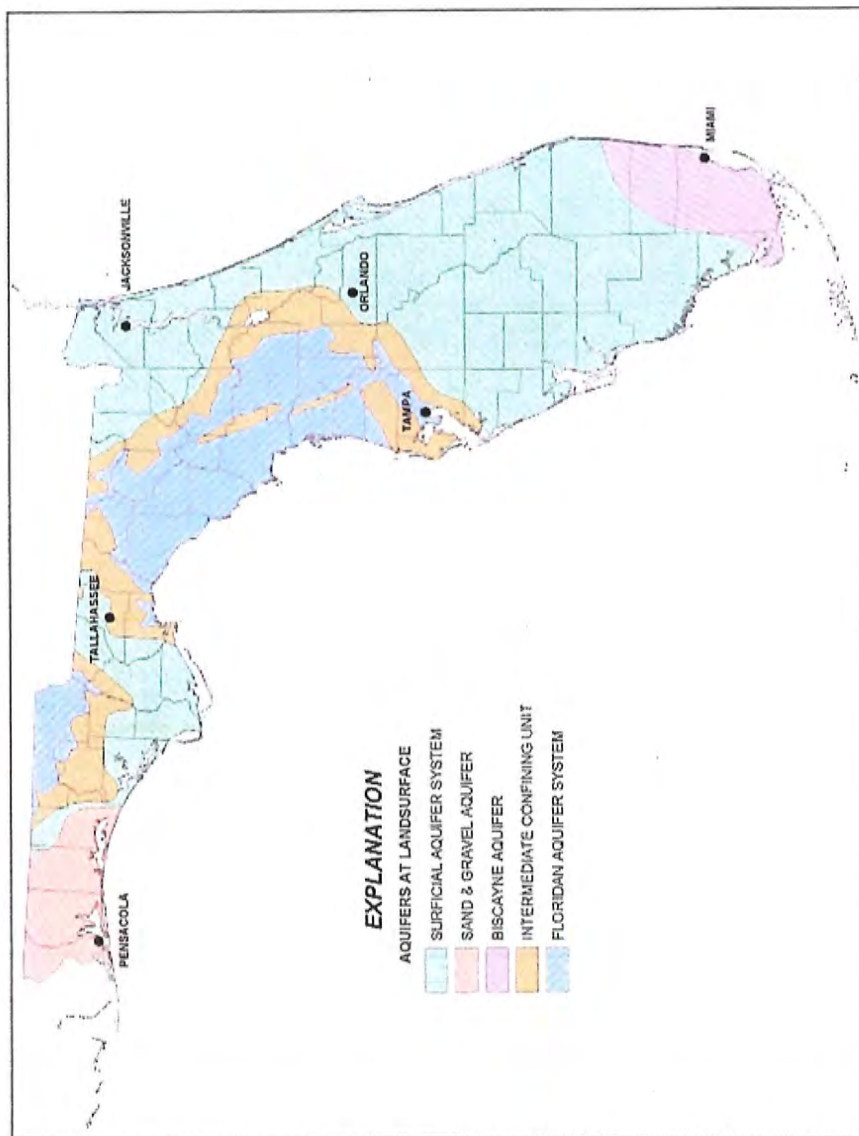
- 1) All water use is shown in million gallons per day.
- 2) Rounding errors account for nominal discrepancies.
- 3) Public water supply utility service areas often include residences that derive their water supply from privately owned (domestic self-supply) wells. Typically, these domestic self-supply water uses are excluded prior to their locations becoming part of public water supply service areas. For public water supply service areas, the Districts do not have sufficient information to separate the population served by public supply systems from those served by domestic self-supply wells. Therefore, public water supply population estimated by the Districts often include some domestic self-supply population.

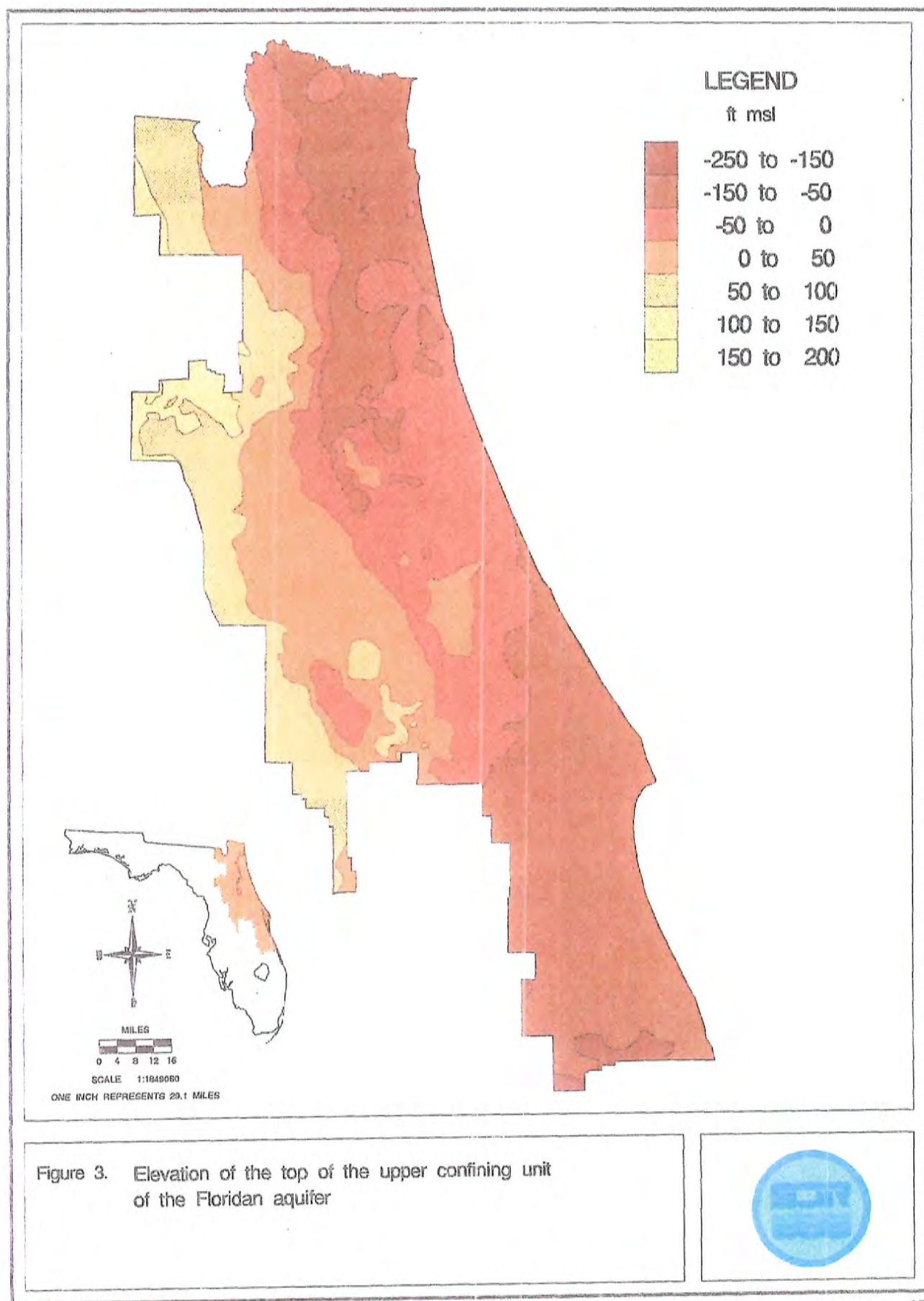
Table A-11 (6-NRWSP), Public Supply and Domestic Self-Supply and Small Public Supply 2010 Water Use and 2015-2035 Demand Projections, by County, in the St. Johns River Water Management District and Suwannee River Water Management District.

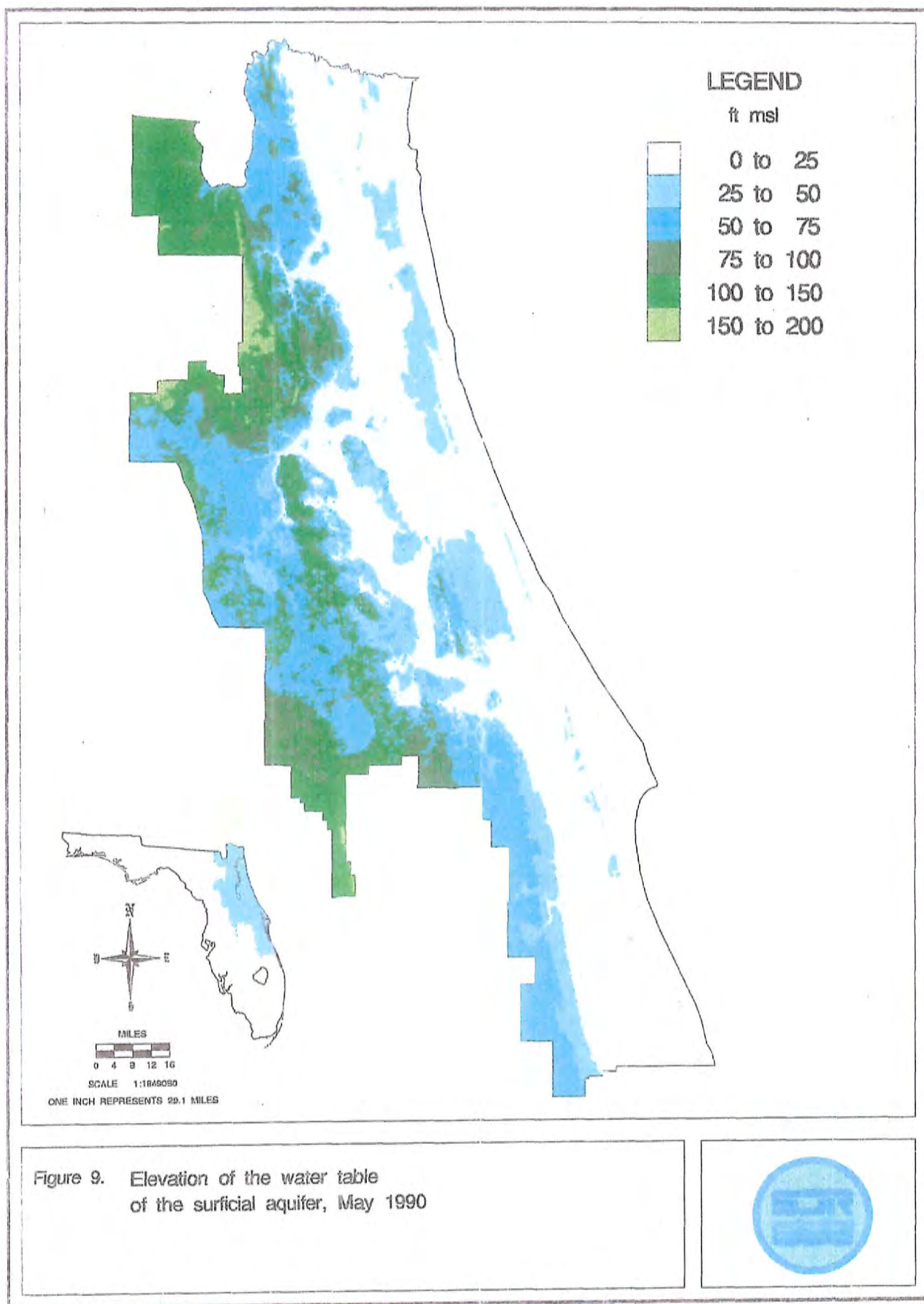
County	District	2010 Water Use			2015 Demand Projections (6-in-10)			2020 Demand Projections (6-in-10)			2025 Demand Projections (6-in-10)			2030 Demand Projections (6-in-10)			2035 Demand Projections (6-in-10)			Percent Change 2010-2035			2035 Demand Projections (1-in-10)		
		Public Supply	Domestic Self-Supply and Small Public Supply	Total	Public Supply	Domestic Self-Supply and Small Public Supply	Total	Public Supply	Domestic Self-Supply and Small Public Supply	Total	Public Supply	Domestic Self-Supply and Small Public Supply	Total	Public Supply	Domestic Self-Supply and Small Public Supply	Total	Public Supply	Domestic Self-Supply and Small Public Supply	Total	Public Supply	Domestic Self-Supply and Small Public Supply	Total	Public Supply	Domestic Self-Supply and Small Public Supply	Total
Alachua	SRWMD	23.00	0.73	23.73	23.34	0.75	24.09	24.47	0.79	25.26	25.55	0.83	26.38	26.55	0.86	27.41	27.41	0.90	28.45	28.45	0.95	29.20	29.20	0.95	30.15
Alachua	SRWMD	2.46	2.80	5.26	2.31	1.54	3.85	2.43	2.43	4.86	2.53	1.59	4.12	2.62	1.76	4.38	2.73	1.82	4.55	2.82	1.95	4.77	2.90	1.95	4.83
Alachua	Total	25.46	3.53	28.99	25.65	2.29	27.94	26.90	2.41	29.31	28.08	2.62	31.76	29.17	2.62	31.79	30.28	2.72	33.00	31.27	3.00	32.10	2.88	3.00	34.98
Baker	SRWMD	1.00	2.97	3.97	0.98	2.30	3.28	1.08	2.44	3.50	1.15	2.59	3.74	1.23	2.73	3.96	1.31	2.86	4.17	1.39	3.03	4.27	1.39	3.03	4.42
Baker	SRWMD	0.00	0.04	0.04	0.00	0.07	0.07	0.00	0.07	0.07	0.00	0.08	0.08	0.00	0.09	0.09	0.00	0.09	0.09	0.00	0.10	0.10	0.00	0.10	0.10
Baker	Total	1.00	3.01	4.01	0.98	2.37	3.35	1.08	2.51	3.57	1.15	2.67	3.82	1.23	2.81	4.04	1.31	2.95	4.26	1.39	3.13	4.37	1.39	3.13	4.52
Bradford	SRWMD	0.11	0.09	0.20	0.09	0.40	0.49	0.10	0.41	0.51	0.10	0.42	0.52	0.10	0.43	0.53	0.10	0.44	0.54	0.11	0.47	0.56	0.11	0.47	0.56
Bradford	SRWMD	1.00	1.70	2.70	0.92	1.36	2.30	0.94	1.43	2.37	0.97	1.47	2.44	0.99	1.50	2.49	1.02	1.53	2.55	1.05	1.58	2.63	1.05	1.58	2.68
Bradford	Total	1.11	1.79	2.90	1.01	1.76	2.79	1.04	1.84	2.88	1.07	1.89	2.96	1.09	1.99	3.02	1.12	1.97	3.09	1.16	1.73	3.29	1.16	1.73	3.44
Clay	SRWMD	15.10	4.32	19.42	14.22	5.64	20.06	15.94	6.41	22.35	17.55	7.04	24.59	19.08	7.62	26.70	20.54	8.17	28.71	23.71	8.66	30.44	21.78	8.66	30.44
Columbia	SRWMD	3.48	3.72	7.20	3.49	4.48	7.97	3.67	4.72	8.39	3.65	4.95	8.60	4.01	5.16	9.17	4.14	5.32	9.46	4.31	5.64	9.95	4.31	5.64	10.03
Duval	SRWMD	109.22	12.05	121.27	108.85	12.61	121.47	115.05	13.02	128.08	120.90	13.38	134.28	126.44	13.67	140.11	131.58	13.89	145.47	136.47	14.17	154.19	136.47	14.17	154.19
Flagler	SRWMD	10.12	0.16	10.28	9.71	0.18	9.89	11.51	0.25	11.80	13.25	0.42	13.67	14.85	0.54	15.39	16.33	0.66	16.99	17.30	0.70	18.00	17.30	0.70	18.00
Gleichen	SRWMD	0.23	1.28	1.52	0.23	1.42	1.65	0.23	1.50	1.73	0.23	1.58	1.81	0.23	1.65	1.88	0.23	1.72	1.95	0.23	2.00	2.23	0.23	2.00	2.23
Hamilton	SRWMD	0.86	0.74	1.60	0.89	0.95	1.84	0.91	0.95	1.86	0.94	1.01	1.95	0.96	1.04	2.00	0.97	1.06	2.03	0.97	1.06	2.03	0.97	1.06	2.03
Nassau	SRWMD	7.71	6.87	14.58	7.17	4.55	11.72	7.77	5.12	12.89	8.35	5.88	14.03	8.92	6.21	15.13	9.28	6.82	16.10	10.00	7.23	17.06	10.00	7.23	17.06
Palm Bay	SRWMD	2.73	4.76	7.49	2.22	3.95	6.17	2.24	3.98	6.22	2.25	4.00	6.25	2.25	4.01	6.26	2.27	4.03	6.30	2.27	4.03	6.30	2.27	4.03	6.30
St. Johns	SRWMD	19.81	2.96	22.87	22.80	3.03	25.93	27.05	3.54	30.59	31.09	4.05	35.14	33.99	4.89	38.88	36.53	5.72	42.35	39.83	6.07	44.90	39.83	6.07	44.90
Suwannee	SRWMD	1.09	2.74	3.83	1.30	3.43	4.73	1.38	3.63	5.01	1.44	3.62	5.28	1.50	4.00	5.50	1.57	4.16	5.73	1.65	5.73	6.38	1.65	5.73	6.38
Union	SRWMD	0.37	1.16	1.53	0.33	1.33	1.66	0.33	1.38	1.71	0.33	1.42	1.75	0.33	1.47	1.80	0.33	1.52	1.85	0.33	1.52	1.85	0.33	1.52	1.85
SRWMD Region 1 Total		188.90	34.92	223.82	189.49	33.64	223.10	205.20	36.00	241.20	220.19	38.41	258.60	233.41	40.96	274.37	245.59	43.49	289.08	260.30	46.10	306.40	260.30	46.10	306.40
SRWMD NRWSP Total		9.49	14.19	23.68	9.47	14.80	24.07	9.89	15.33	25.22	10.28	16.02	26.31	10.64	16.66	27.30	10.99	17.22	28.21	11.05	17.22	28.21	11.05	17.22	28.21
NRWSP Total		198.39	49.11	247.50	198.96	48.44	247.17	215.09	51.33	266.42	230.48	54.43	284.91	244.05	57.62	301.67	256.58	60.71	317.29	271.35	67.15	334.61	271.35	67.15	334.61

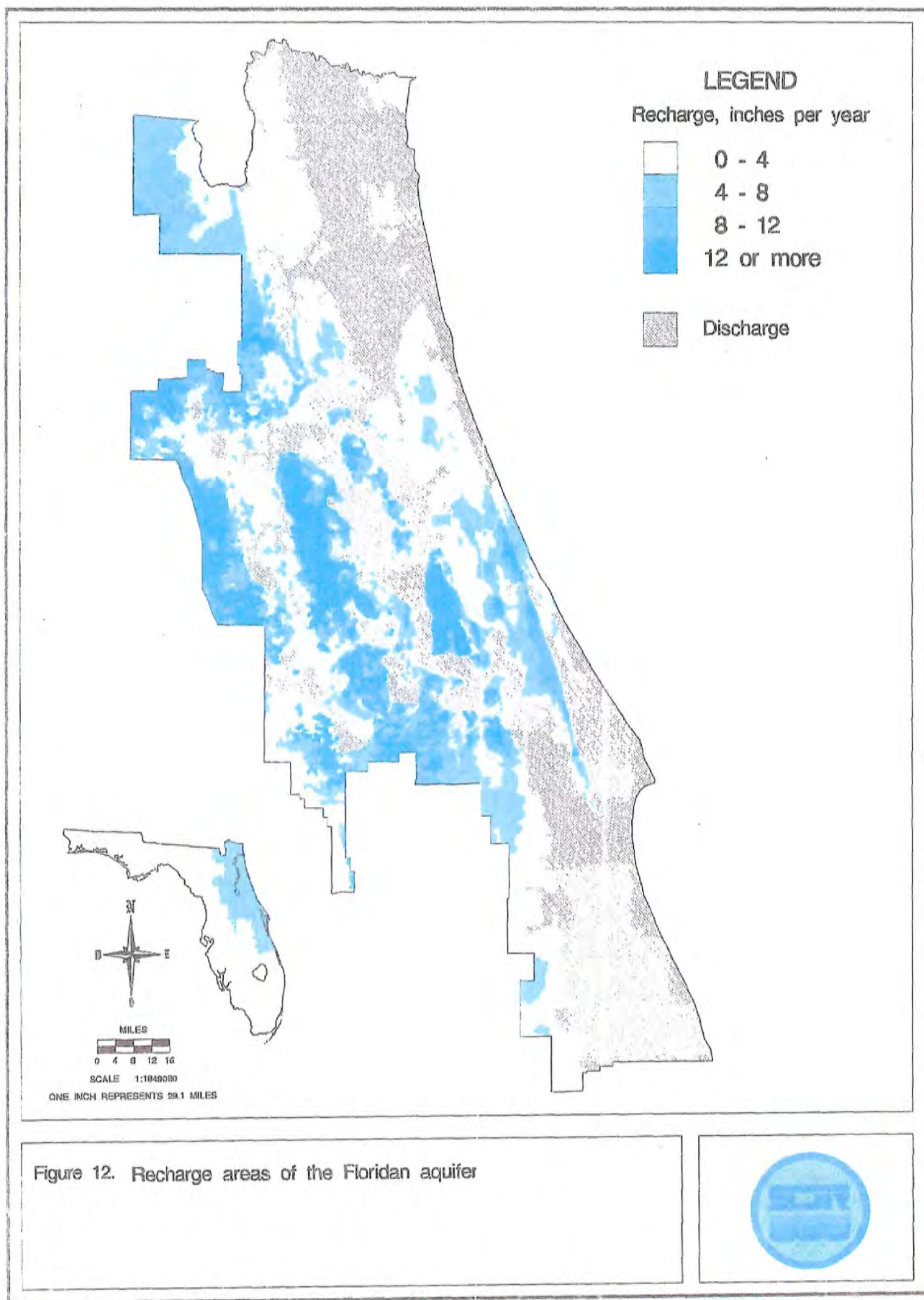
Notes:
1. All water use is shown in million gallons per day.
2. Rounding errors account for nominal discrepancies.
3. Public water supply utility service areas often include residences that derive their water supply from privately owned (domestic self-supply) wells. Typically, these domestic self-supply water uses existed prior to their locations becoming part of public water supply service areas, or public water supply service areas, the Districts do not have sufficient information to separate the population served by public supply systems from those served by domestic self-supply wells. Therefore, public water supply population estimated by the Districts often include some domestic self-supply population.

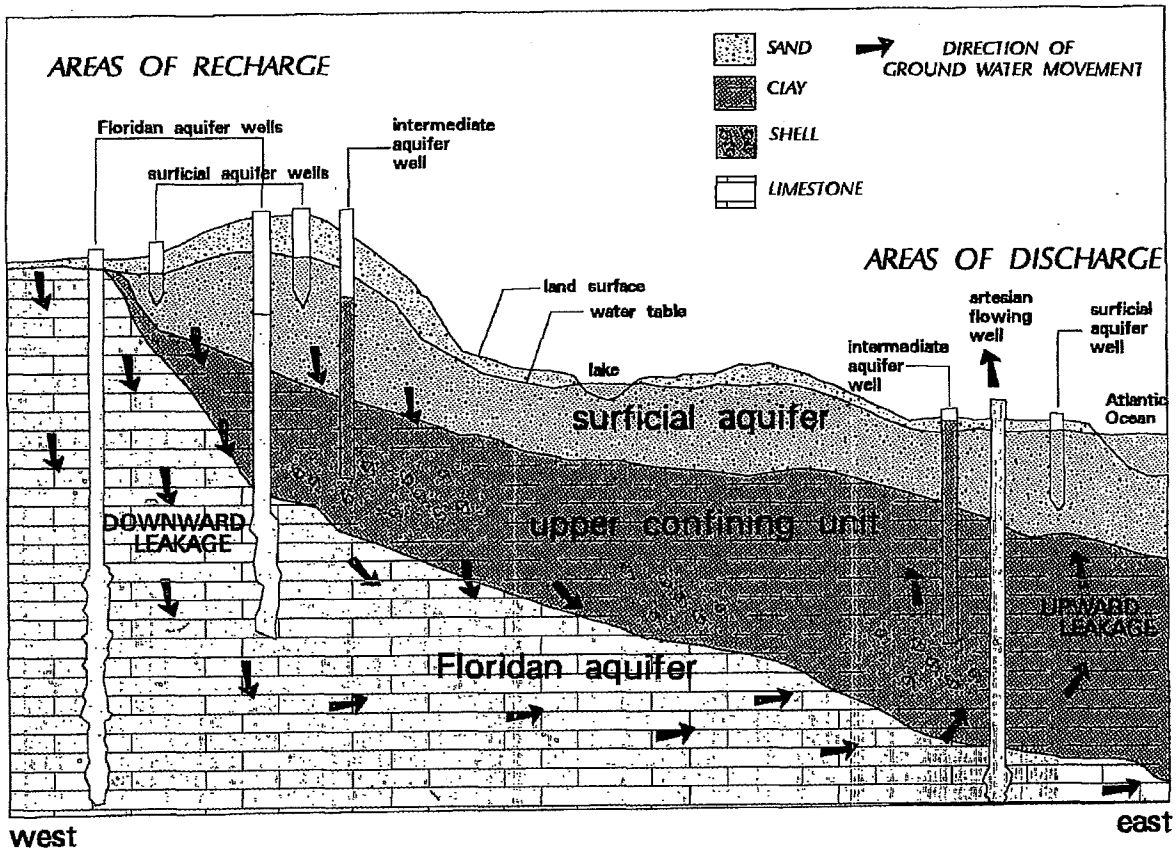






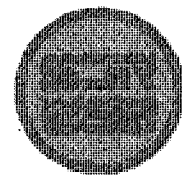






not to scale

Figure 1. Generalized hydrogeologic cross section,
St. Johns River Water Management District

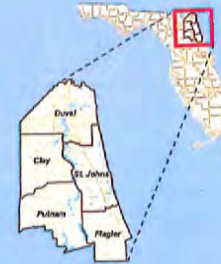


Public Utility Water Supply Wells



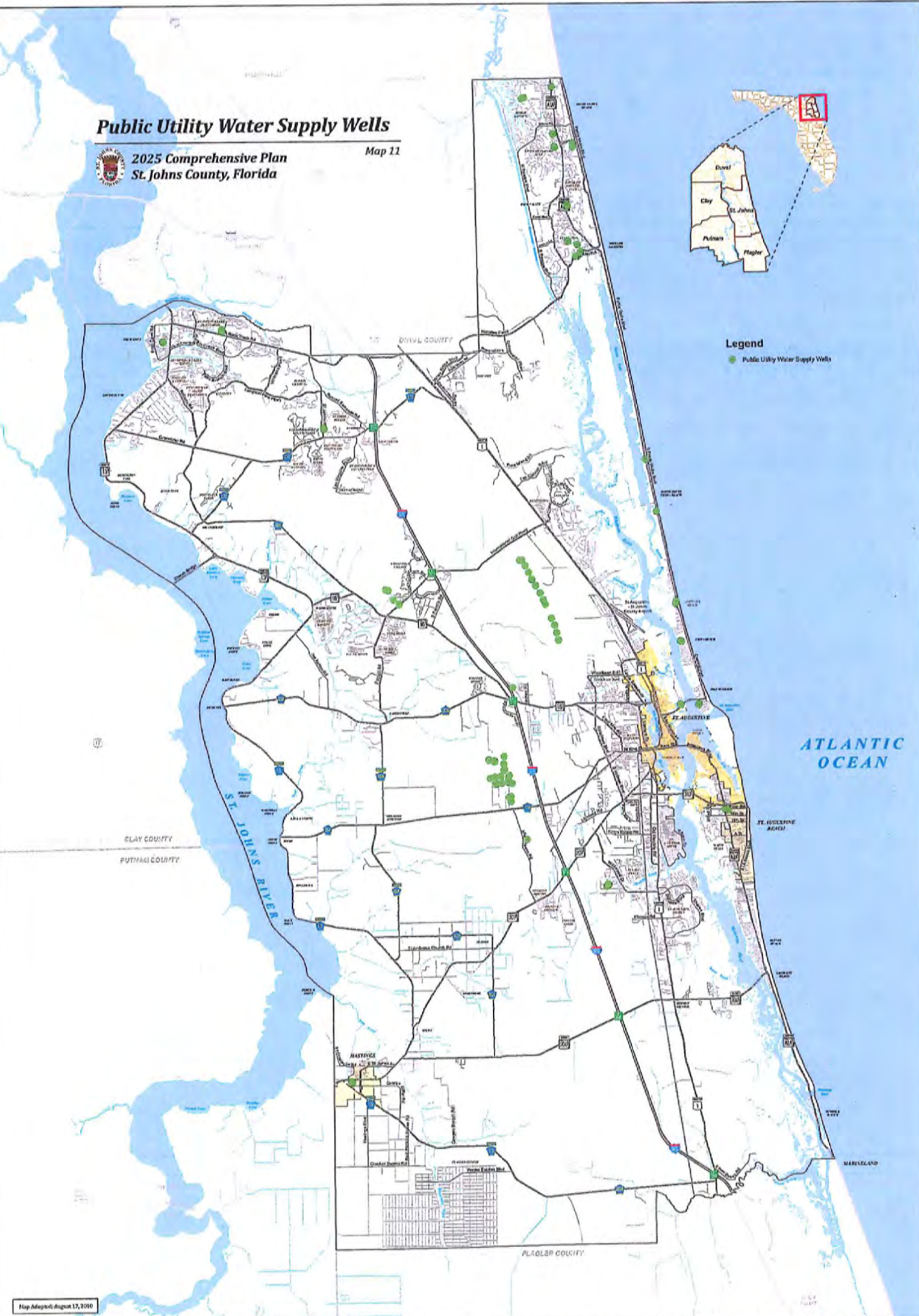
2025 Comprehensive Plan
St. Johns County, Florida

Map 11



Legend

Public Utility Water Supply Wells



Map Adopted: August 17, 2010

Public Utility Water Supply Wells:

Public Utility Water Supply Wells represent public utility wells permitted by the St. Johns River Water Management District. This data is used by Growth Management as a water resource planning strategy to protect the areas around well fields. These strategies are designed to protect the water quality of an aquifer or aquifers in the vicinity of wells which provide ground water to public water supply systems.

Comprehensive Plan:

The purpose of the Comprehensive Plan is to effectively manage growth and development by designating areas of anticipated future development which satisfy demand where feasible, in a cost-efficient and environmentally acceptable manner.

Public Utility Water Supply Well Notes

Data Source:
Public Utility Water Supply Well information is derived from data obtained by the St. Johns River Water Management District. Consequently the Permit/Pump/Well dataset.



0 1 2 3 4 5
Miles

St. Johns County
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DISCLAIMER:
This map is for reference only. Data provided are derived from multiple sources with varying levels of accuracy. The St. Johns County GIS Division disclaims all responsibility for the accuracy or completeness of the data shown hereon.



Florida's Imperiled Species

Management Plan

2016-2026



MyFWC.com

Florida's Imperiled Species Management Plan

*A comprehensive, integrated approach
for the conservation of state-listed species*

November, 2016

Amendments incorporated December, 2018



Florida Fish and Wildlife Conservation Commission

Financial support for this plan's development was provided by the Florida Fish and Wildlife Conservation Commission and the U.S. Fish and Wildlife Service's State and Tribal Wildlife Grants Program

Introduction

The first of its kind for state-listed species, Florida's Imperiled Species Management Plan (ISMP) is a 10-year plan created to address the conservation needs of multiple species through a comprehensive approach. The approach is two-fold: use integrated strategies to benefit multiple species and simultaneously address individual species' needs. This comprehensive approach is a strategic course to imperiled species conservation and management, and it increases the opportunity to use available resources to benefit a greater number of species and effectively improve conditions for Florida's wildlife statewide. The strategies presented are intended to minimize threats and reverse negative impacts, and to address the complexity of improving habitat conditions for multiple species.

Goal and objectives

Development of Florida's Imperiled Species Management Plan was a cross-agency effort, with significant input from partners and stakeholders. The result is a blueprint for statewide management of imperiled species, the purpose of which is to improve management and conservation by reducing the risk of extinction, maintaining biodiversity, and improving public and partner support for conservation efforts. Conveying identified threats and known species' needs, as well as promoting opportunities for the public and partners to improve conditions for wildlife, are critical components of this plan. Through implementation of the ISMP, Florida Fish and Wildlife Conservation Commission (FWC) intends to improve the conservation status of Florida's imperiled wildlife through strategic management, research, and outreach. Progress will be measured and evaluated and appropriate course corrections made, with the knowledge that adjustments for emerging information and issues will be necessary.

The [goal and objectives](#) of this plan largely focus on two key areas: filling data gaps to improve conservation and management, and maximizing conservation through directed communication, outreach, and management. Considerable gaps in knowledge exist for many imperiled species (some have been listed in Florida for more than 30 years and only limited research and monitoring have been conducted for certain species). To effectively improve the status of these species, our understanding of species-specific attributes and requirements must improve. Directed communication, outreach, and management—for FWC staff, our partners, and the public—are important for increasing support and achieving the results necessary for imperiled species conservation. Targeting outreach to specific audiences will improve its effectiveness (Haubold 2012), and FWC will continue to expand efforts to do this (e.g., providing Guidelines and best management practices to landowners and land managers). This plan emphasizes FWC's commitment to work cooperatively with private landowners, as well as managers of public conservation lands, to improve conservation for species included in this plan.

This plan is the result of a progressive approach to wildlife conservation in Florida. Through public engagement and close partnerships with stakeholders, other government agencies, and nongovernmental organizations, a streamlined, comprehensive, and prioritized process has been carefully designed to facilitate successful conservation of Florida's wildlife. Through implementation, coordination and collaboration with the many partners that support ISMP's development, will continue to be a critical component of successfully achieving the plan's goal.

Priorities for the ISMP are reflected in six objectives, which together support achievement of the ISMP goal.

Florida's Imperiled Species Management Plan goal

With broad public and partner support, conserve or improve the status of imperiled species to effectively reduce the risk of extinction.

Objective 1

By 2017, conduct necessary research and reevaluate the five species designated as Species of Special Concern.

Objective 2

By 2020, complete 15 percent of data gap actions identified in Species Action Plans and by 2025, 30 percent.

Objective 3

By 2025, implement a monitoring plan for all species included in Florida's Imperiled Species Management Plan with an existing survey protocol.

Objective 4

By 2016, complete a regional assessment for the FWC Northwest region and by 2020 for each of the other FWC regions.

Objective 5

By 2017, focus at least 10 percent of agency resources on supporting implementation of Florida's Imperiled Species Management Plan and Species Action Plans.

Objective 6

By 2018, develop a system to account for protections and conservation gains for species included in Florida's Imperiled Species Management Plan throughout the range of FWC engagement with partners and stakeholders.

Species included in this plan

Imperiled species are those that Florida is in danger of losing—that is, species that face threats to long-term survival. The species included in this plan are those listed on [Florida's Endangered and Threatened Species List](#) as state-designated Threatened or Species of Special Concern (SSC)—in other words, state-listed species—and those species that were found to no longer warrant listing and were removed from Florida's Endangered and Threatened Species List.

Florida's Imperiled Species Management Plan is designed to address the needs of 57 species (see [Table 1](#)):

- 37 state-designated Threatened species,
- Five Species of Special Concern, and
- 15 delisted species (i.e., species removed from Florida's Endangered and Threatened Species List).

Species removed from Florida's Endangered and Threatened Species List in 2016 are included in this plan, and conservation actions are identified for each to prevent them from again becoming listed, as required by Chapter 68A-27, Florida Administrative Code (F.A.C.). The Species of Special Concern listing status is expected to be phased out by the end of 2017, once updated Biological Status Reviews (BSRs) for the five Species of Special Concern are completed. Following the updated BSRs for SSCs, a recommendation will be made to either re-

move the species from the list or retain it as Threatened. This will allow for a single state-listing status (Threatened), in accordance with the intent of the 2010 rule changes in Chapter 68A-27, F.A.C.

In 2010, changes to the rules relating to Endangered and Threatened Species initiated BSRs for all state-listed species, and required management plan development for those without a draft or final management plan. As seen in Figure 1, species included in the ISMP do not include those that appear on Florida's Endangered and Threatened Species List as federally Endangered or federally Threatened.

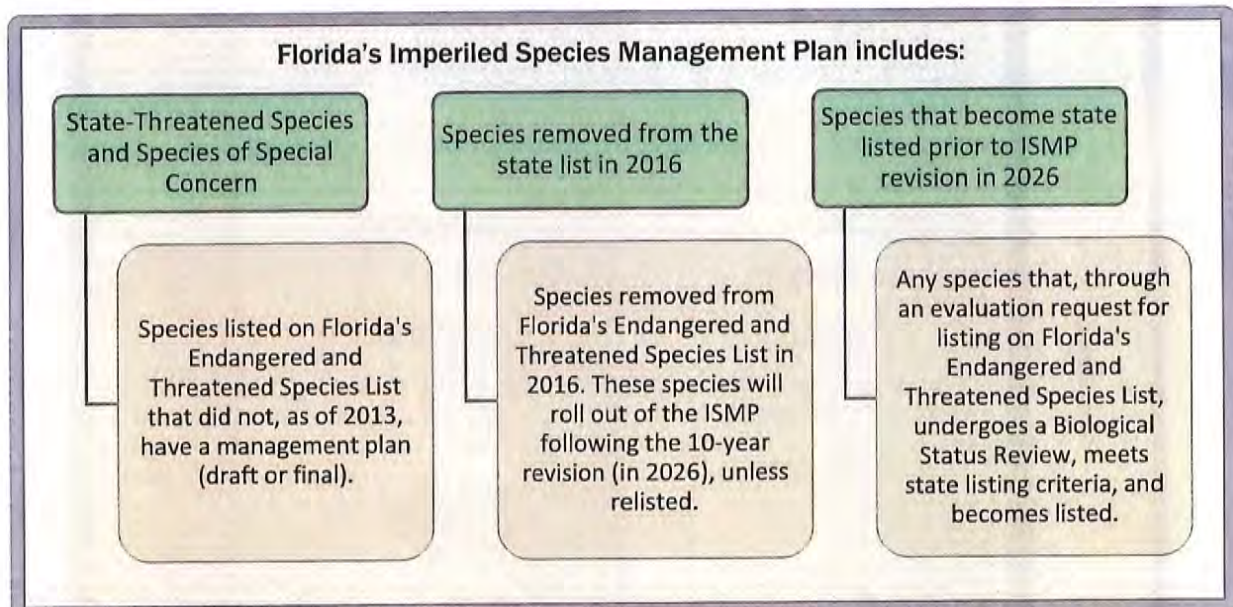


Figure 1. Species included in Florida's Imperiled Species Management Plan (ISMP) for 2016-2026.

Any species listed in the future will be incorporated into Florida's Imperiled Species Management Plan. Species may be considered for addition to, or removal from, Florida's Endangered and Threatened Species List through submission of a species evaluation request or by emergency listing request as described in Rule 68A-27.0012, F.A.C. For a species evaluation request to be complete, the species must undergo a biological vulnerability screening (an evaluation process using specific criteria to determine a species' biological score), followed by a BSR. Emergency listing determinations made effective on a temporary basis by Executive Order must be approved or terminated by the Commission. If it is determined that the species meets criteria to be added to or removed from Florida's Endangered and Threatened Species List, a Species Action Plan (SAP) will be developed (or revised, if one already exists) within one year. Upon approval by the Commission, the species will be added to or removed from the list in accordance with Rule 68A-27.0012, F.A.C., and the ISMP will be amended accordingly.

Table 1. Species included in Florida's Imperiled Species Management Plan, as of the 2018 amendment.

Species are color coded by taxa:	Mammals	Birds	Reptiles	Amphibians	Fish	Invertebrates	Total
Threatened (T)	4	16	8	2	6	2	38
Delisted since 2016 (DL)	4	5	6	2	3	1	21

59 species (as of 2018)

2018 Status	Taxa	Common Name	Scientific Name	Status Change
Threatened		Big Cypress fox squirrel	<i>Sciurus niger avicennia</i>	Remaining T
		Everglades mink	<i>Neovison vison evergladensis</i>	Remaining T
		Sanibel Island rice rat	<i>Oryzomys palustris sanibeli</i>	SSC → T
		Sherman's short-tailed shrew	<i>Blarina shermani</i>	SSC → T
		American oystercatcher	<i>Haematopus palliatus</i>	SSC → T
		Black skimmer	<i>Rynchops niger</i>	SSC → T
		Florida burrowing owl	<i>Athene cunicularia floridana</i>	SSC → T
		Florida sandhill crane	<i>Antigone canadensis pratensis</i>	Remaining T
		Least tern	<i>Sterna antillarum</i>	Remaining T
		Little blue heron	<i>Egretta caerulea</i>	SSC → T
		Marian's marsh wren	<i>Cistothorus palustris marianae</i>	SSC → T
		Reddish egret	<i>Egretta rufescens</i>	SSC → T
		Roseate spoonbill	<i>Platalea ajaja</i>	SSC → T
		Scott's seaside sparrow	<i>Ammodramus maritimus peninsulae</i>	SSC → T
		Snowy plover	<i>Charadrius nivosus</i>	Remaining T
		Southeastern American kestrel	<i>Falco sparverius paulus</i>	Remaining T
		Tricolored heron	<i>Egretta tricolor</i>	SSC → T
		Wakulla seaside sparrow	<i>Ammodramus maritimus juncicola</i>	SSC → T
		White-crowned pigeon	<i>Patagioenas leucocephala</i>	Remaining T
		Worthington's marsh wren	<i>Cistothorus palustris griseus</i>	SSC → T
		Suwannee alligator snapping turtle	<i>Macrochelys suwanniensis</i>	SSC → T
		Barbour's map turtle	<i>Graptemys barbouri</i>	SSC → T
		Florida brown snake (Lower Keys)	<i>Storeria victa</i>	Remaining T
		Florida Keys mole skink	<i>Plestiodon egregius egregius</i>	SSC → T
		Florida pine snake	<i>Pituophis melanoleucus mugitus</i>	SSC → T
		Key ringneck snake	<i>Diadophis punctatus acricus</i>	Remaining T
		Rim rock crowned snake	<i>Tantilla oolitica</i>	Remaining T
		Short-tailed snake	<i>Lampropeltis extenuata</i>	Remaining T
		Florida bog frog	<i>Lithobates okaloosae</i>	SSC → T
		Georgia blind salamander	<i>Eurycea wallacei</i>	SSC → T
		Blackmouth shiner	<i>Notropis melanostomus</i>	Remaining T
		Bluenose shiner	<i>Pteronotropis welaka</i>	SSC → T
		Crystal darter	<i>Crystallaria asprella</i>	Remaining T
		Key silverside	<i>Menidia conchorum</i>	Remaining T
		Saltmarsh topminnow	<i>Fundulus jenkinsi</i>	SSC → T
		Southern tessellated darter	<i>Etheostoma olmstedti maculatiopsis</i>	SSC → T
		Black Creek crayfish	<i>Procambarus pictus</i>	SSC → T
		Santa Fe cave crayfish	<i>Procambarus erythrops</i>	SSC → T
Delisted		Eastern chipmunk	<i>Tamias striatus</i>	SSC → DL
		Florida mouse	<i>Peromyscus floridanus</i>	SSC → DL
		Homosassa shrew	<i>Sorex longirostris eionis</i>	SSC → DL
		Southern fox squirrel	<i>Sciurus niger niger</i>	SSC → DL
		Brown pelican	<i>Pelecanus occidentalis</i>	SSC → DL
		Limpkin	<i>Aramus guarana</i>	SSC → DL
		Osprey (Monroe County)	<i>Pandion haliaetus</i>	SSC → DL
		Snowy egret	<i>Egretta thula</i>	SSC → DL
		White ibis	<i>Eudocimus albus</i>	SSC → DL
		Alligator snapping turtle	<i>Macrochelys temminckii</i>	SSC → DL
		Apalachicola alligator snapping turtle	<i>Macrochelys apalachicola</i>	SSC → DL
		Peninsula ribbon snake (Lower Keys)	<i>Thamnophis sauritus sackenii</i>	T → DL
		Red rat snake (Lower Keys)	<i>Pantherophis guttatus</i>	SSC → DL
		Striped mud turtle (Lower Keys)	<i>Kinosternon baurii</i>	T → DL
		Suwannee cooter	<i>Pseudemys concinna suwanniensis</i>	SSC → DL
		Gopher frog	<i>Lithobates capito</i>	SSC → DL
		Pine Barrens treefrog	<i>Hyla andersonii</i>	SSC → DL
		Harlequin darter	<i>Etheostoma histrio</i>	SSC → DL
		Lake Eustis pupfish	<i>Cyprinodon variegatus hubbsi</i>	SSC → DL
		Mangrove rivulus	<i>Kryptolebias marmoratus</i>	SSC → DL
		Florida tree snail	<i>Liguus fasciatus</i>	SSC → DL

Imperiled species management system

Background

From 1972 to 1999, Florida's process for adding or removing species from Florida's Endangered and Threatened Species List did not include fixed criteria or a standardized species evaluation process. In 1999, with the assistance of stakeholders, FWC adopted a listing process that includes quantitative criteria based on the International Union for Conservation of Nature (IUCN). In 2003, FWC responded to stakeholder concerns about the management of imperiled species by broadening group representation to find a solution. Following enhancements to the listing process, FWC continued to work with a broader pool of partners and stakeholders to further refine the evaluation and management of imperiled species, and to address public concerns.

Current system

In 2010, FWC officially adopted the imperiled species management system through changes to Chapter 68A-27, F.A.C. The listing process, a critical part of imperiled species management (Haubold 2012), is only one of many components of Florida's approach to imperiled species management; this is an important distinction and was key to achieving stakeholder support. The system includes measurable criteria used to determine a species' eligibility for listing on Florida's Endangered and Threatened Species List, requires Biological Status Reviews for species being considered for addition to or removal from the list, and specifies management plan development for all species being added to or removed from the list (see sidebar).

Conservation actions necessary to address threats to a particular species or suite of species, including protective provisions such as permitting standards or possession limits, are components of a management plan. Species not already listed and believed to be at high risk of extinction may be evaluated during the allocated annual time frame, or immediately if an emergency listing request is submitted, with the intent to minimize threats and impacts and to improve the status of imperiled species and reduce the potential need for future federal listing.

Desired future condition

Thinking beyond just the listing process to consider the dynamics of an effective, comprehensive management system led FWC, in partnership with stakeholders, to define the desired future condition of the imperiled species management system as,

A Florida where no native species goes extinct due to human action or inaction; species declines are halted or reversed; species conservation is coordinated among partners; biodiversity is maintained; adequate funding is available for species conservation; and the importance of species conservation is fully supported by the public.

Realizing the desired future condition for the imperiled species management system relies heavily on the effective development and implementation of the ISMP. This will not be achieved by FWC or other state or federal agencies alone; success depends on partnerships with stakeholders and the citizens of Florida. With many

Components of FWC's imperiled species management system

- Measurable listing criteria
- Biological Status Reviews
- Management plan development (through Species Action Plans and Florida's Imperiled Species Management Plan)

endemic species and a mosaic of unique natural communities, wildlife management in Florida has been influenced by numerous stakeholders, agencies, programs, and plans. Other agency and partner planning efforts and the resulting resources continue to influence conservation planning. They have provided a foundation and established a standard to which the ISMP was developed, and they will continue to be integral to Florida's wildlife management.

Nine major factors (see sidebar) are identified as key to an effective imperiled species management system (Haubold 2012), none of which should be considered independently. For example, without resources or public support, conservation activities could not occur. If a species' status is not accurately determined through the listing process, which typically requires good science, the species might not receive the directed conservation it needs. Conversely, if listed when not at risk, it might take resources away from other species needing directed management (Haubold 2012).

Nine factors of an effective imperiled species management system (Haubold 2012)

- Resources
- Partnerships
- Communication and outreach
- Policy, regulation, enforcement
- Science and technology
- Designation of at-risk species
- Conservation activities
- Species and habitat
- Public support

Plan development

Development of Florida's Imperiled Species Management Plan began in 2010, following Commission approval of changes to the Threatened and Endangered Species Rule, and has involved hundreds of agency staff members, partners, and stakeholders. The resulting plan is a comprehensive approach to wildlife management. The public, partners, and stakeholders have been actively engaged in developing an integrated and comprehensive plan. Development of the ISMP has included Biological Status Reviews; development of Species Action Plans; and evaluation of shared needs, emerging issues, and available protective measures; followed finally by the development of integrated conservation strategies (ICSs) (Figure 2). The strategies and actions presented in this plan are designed to benefit multiple species. They are not, however, intended to replace species-specific needs identified in Species Action Plans, species management plans, or Species Conservation Measures and Permitting Guidelines; rather, these documents serve as components of the ISMP's holistic approach.

The balance of using integrated strategies and simultaneously addressing the needs of individual species is a strategic course to achieving the ISMP conservation goal: With broad public and partner support, conserve or improve the status of imperiled species to effectively reduce of the risk of extinction.

Biological Status Reviews

Immediately following adoption of the 2010 changes to Chapter 68A-27, F.A.C., Biological Review Groups (BRGs) appointed by FWC evaluated those species already on Florida's Endangered and Threatened Species List. The groups conducted Biological Status Reviews for all species on the list that had not received a review in the past decade—61 in total. In accordance with the newly adopted evaluation criteria (under Rule 68A-27.0012(2)(b), F.A.C.), the BRGs looked at population size and trends, distribution and range, threats to the species, population viability models, and aspects of the life history that may influence the rangewide and Florida-specific status, according to the Guidelines for Using the IUCN Red List Categories and Criteria (IUCN 2001) and Guidelines for Application of IUCN Red List Criteria at Regional Levels (IUCN 2003). The BRGs also considered information submitted by the public and the best available scientific and commercial biological data for

the species to determine if its status met listing criteria. Over 200 external experts and staff were involved in development and peer review of the approved BSRs.

Following the Biological Status Reviews, FWC staff ultimately recommended that 40 species be listed as Threatened on Florida's Endangered and Threatened Species List. Based on FWC listing criteria, evidence indicated that 16 species were not facing a high risk of extinction, and staff recommended removing them from the list. These species have published Species Action Plans and will continue to receive management and protection adequate to prevent them being relisted on Florida's Endangered and Threatened Species List. Staff recommended that five species, for which key information is unknown, remain Species of Special Concern, with the intent to pursue additional information sufficient to determine whether they meet listing criteria (see [Table 1](#) for specific listing status changes).

The FWC Commissioners agreed with the recommendations and directed staff to proceed with developing management plans for species that did not already have a draft or final management plan. Of the 61 state-listed species that had not undergone a Biological Status Review in a decade, one (the Florida black bear [*Ursus americanus floridanus*]) had a draft management plan, and three (Atlantic sturgeon [*Acipenser oxyrinchus oxyrinchus*], pillar coral [*Dendrogyra cylindrus*], and Florida bonneted bat [*Eumops floridanus*]) became federally listed and are not included in the ISMP. This leaves a total of 57 species included in the ISMP.

Species Action Plans

Species Action Plans outline the management actions necessary to minimize the impacts of known threats, improve habitat conditions, and streamline efforts to conserve and recover the species. The FWC staff, partners, and numerous stakeholders were involved in developing Species Action Plans to address the needs of the species evaluated during the BSRs. Following public review, Species Action Plans were published in November 2013 and finalized with Commission approval as components of the ISMP. Goals for the Species Action Plans were determined based on the recommended listing status and consideration of the listing criteria triggered for each species ([Table 2](#)). For Threatened species, goals were developed with intent to improve species status so it can be removed from listing and not again need to be listed. However, for those Threatened species with a limited range, goals were developed to improve the species status so it is secure within its historical range. For the few remaining Species of Special Concern, goals include gathering information necessary to determine the species status. For species being removed from the list (delisted), goals were developed with intent to maintain or improve the species status so the species will not need to be relisted in the future. In support of the selected conservation goal, each Species Action Plan includes specific management objectives and priori-tized conservation actions. Species-specific actions, categorized among habitat conservation and management, population management, research and monitoring, rule and permitting intent, law enforcement, incentives and influencing, education and outreach, and coordination with other entities, are included along with identified partners and organizations that are key to implementation. Conservation actions are primarily nonregulatory, and directly support the ISMP through their emphasis on filling knowledge gaps and maximizing conservation through directed communication, outreach, and management.

Table 2. Species conservation goals identified in the Species Action Plans.

Species Listing Status	Species Action Plan Conservation Goals
Threatened	Goals for Threatened species were created with the intent to improve the conservation status of the species to a point that the species can be removed from Florida's Endangered and Threatened Species List and will not again need to be listed. For Threatened species that have a very limited range, occur in fewer than 10 locations, and/or have a population totaling less than 1,000 mature individuals, goals were created with the intent to improve the conservation status of the species to the point that the species is secure within its historical range.
Species of Special Concern	Goals are designed to determine the conservation status for the species.
Delisted	Goals for species being removed from the list were created with the intent that the conservation status of the species is maintained or improved so that the species will not need to be relisted on Florida's Endangered and Threatened Species List.

Species Action Plans will be revised within seven years, and may be updated sooner, as progress toward objectives or additional information necessitates. Staff will develop a rolling schedule to avoid revising all SAPs within the same year. If any additional species are determined to meet state-listing criteria, a SAP will be prepared within one year of Commission approval of the recommended listing status.

Critical to the ISMP, SAPs assess current conditions and prioritize the actions and resources needed to improve species' conservation status. Implementation of the SAPs is ongoing, with many actions already in progress, and it is through the species-specific actions that integrated conservation strategies emerged. While SAPs provide the detailed steps necessary to improve the conservation status for individual species, the ISMP outlines the implementation strategies to ensure that benefits are maximized, resources are applied in the most effective manner, and wildlife populations are managed holistically.

Integrated conservation strategies

While SAPs identify threats and outline conservation needs for individual species or groups of species, ICSs take a more comprehensive approach by focusing on higher-level strategies and the integrated actions that benefit multiple species and their habitats. Integrated conservation strategies facilitate implementation of the SAPs while also considering emerging issues and potential conflicts, thereby focusing implementation on areas and issues that will yield the highest level of conservation for the greatest number of species. While the 14 ICSs describe integration of species needs; habitat needs; and staff time, effort, and resources, they are not intended to meet the complete needs of all species. Species-specific needs outside of the ICSs are not discounted and will be addressed simultaneously with ICS implementation.

Accomplishing the ICSs and their integrated actions requires communication and coordination across agency and partner boundaries, as well as with stakeholders. Effective progress depends on implementation at a regional and landscape scale, and consideration of the needs of other species not included in this plan. Complementary programs and coordination of applied resources will achieve the most conservation for the greatest number of species.

Law and policy

The Law and Policy chapter was carefully developed with intense consideration of the nonregulatory components of the plan. The 2010 rule changes to Chapter 68A-27, F.A.C., included revision of the *take* definition. *Take*, as defined in Rule 68A-27.001(4), F.A.C., extends protection to state-Threatened species with the addition of take resulting from harm (which may include significant habitat modification or degradation that results in actual injury or death by impairing essential behavioral patterns including breeding, feeding, or sheltering) and harassment (an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent that normal behavioral patterns are disrupted). For Species of Special Concern and delisted species, *take* in Rule 68A-1.004(79), F.A.C., applies to and protects these species, and their nests or eggs from pursuing, hunting, molesting, capturing, or killing, unless otherwise allowed in an alternate rule chapter (see *take* in Glossary).

Take, as defined in F.A.C. rules, is fundamental to the development and implementation of permitting guidance and future species protections. Species Conservation Measures and Permitting Guidelines (Guidelines) will include both nonregulatory and regulatory guidance, as appropriate, and will be an additional resource to the SAPs in providing species-specific conservation details. Depending on listing status, the Guidelines will be tailored to provide information relevant to the species, such as habitats that support essential behavioral patterns for each species, and related protections as they apply. Not all species will have the same level of detail in the Guidelines, even among those with a shared listing status. The Current Protections section will first identify rules for take of state-Threatened species or Species of Special Concern. Any additional protections for state-Threatened species or Species of Special Concern or protections for delisted species will also be summarized with reference to the applicable rule, statute, or federal regulation. Additional protections may include possession limits, feeding prohibitions, or federal requirements for migratory birds. Through collaboration among staff, partners, and stakeholders, Species Conservation Measures and Permitting Guidelines will be developed, and when completed will be presented to the Commission for approval. The Guidelines will be revised as warranted, following public review, and Commission approval.

Our level of knowledge and understanding of life history and ecology varies widely among the species. Because of the cryptic nature of some species, simply finding them presents a challenge; therefore, attempting to interpret when actions or activities may result in take for cryptic species is not always possible and could lead to inefficient and unreasonable results. This plan openly acknowledges that the management approaches, even among state-Threatened species, will adapt based on our level of knowledge and understanding of the essential behavioral patterns for each individual species.

Implementation

Partners and stakeholders have provided significant input into the development of Florida's Imperiled Species Management Plan. The ISMP—along with the associated Species Action Plans, laws, policies, and Species Conservation Measures and Permitting Guidelines—forms the road map to guide us toward improving conditions for Florida's imperiled species. While FWC will take the lead in coordinating and supporting the ISMP's implementation, the agency will still rely very heavily on other state and federal agencies, our key partners, and engaged stakeholders to provide the necessary input and resources for successful implementation. With so much unknown about many state-listed species, a significant focus for this plan's first 10 years is to fill knowledge gaps necessary to improve management and conservation for these species.

In addition to filling knowledge gaps, identifying more systematic, coordinated approaches to imperiled species management and conservation are priorities for achieving our goal. Each of the above objectives will be mon-

itored, and progress will be reported annually. Because the ISMP outlines implementation of integrated strategies simultaneous with completing actions that address individual species needs, annual progress reporting will also include a species update to document achievements on prioritized species actions in the SAPs.

A formal review of ISMP progress will occur five years after plan approval. This review will include an assessment of the six measurable objectives, summarize progress on SAPs and ICSs, and include input from key partners and stakeholders. Assessing progress midway through the plan's 10-year revision time-frame will allow for thoughtful evaluation on any changing priorities, consideration of emerging issues, sharing of lessons learned, and formal engagement with stakeholders.

The ISMP is a guiding part of an overall imperiled species management approach to support Florida's wildlife diversity. Achieving the goal of the ISMP will take many years, in part due to the magnitude of the challenges facing state-listed species, and in part due to the biology and conservation needs of some species. Because of the complexity of implementing the ISMP, this plan provides the direction and sideboards for implementation, while allowing for flexibility in how to proceed. Assessing the potential impacts of implementing or not implementing the ISMP informs FWC as to better fulfill its mission of managing fish and wildlife resources for their long-term well-being and the benefit of people.

The ISMP also includes an assessment of ecological, social, and economic impacts in the [Impacts Assessment](#) chapter, prepared with stakeholder input. The impacts assessment looks at potential costs and benefits of implementing, or not implementing, the plan. Proposed rule changes that may have economic impacts are individually addressed in [Table 17](#).

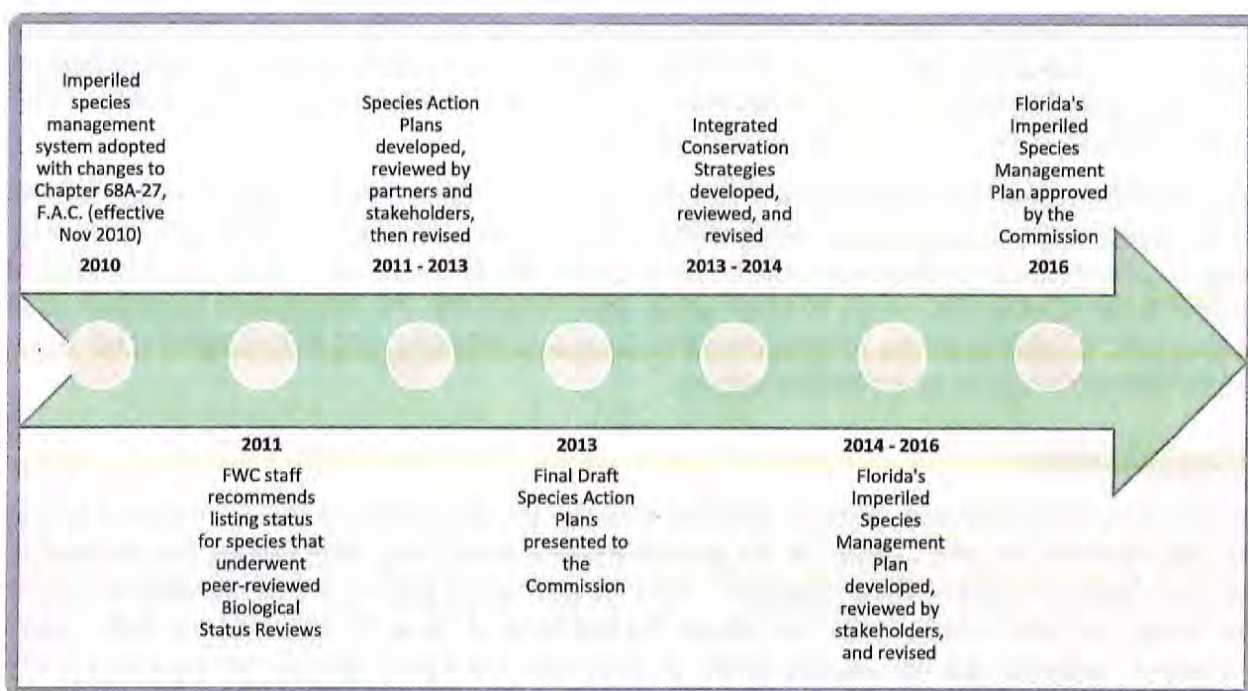


Figure 2. Imperiled Species Management Plan development timeline.

Contributions to imperiled species management

Florida, home to many endemic species and unique natural communities, is among the most biologically diverse states in the U.S. (NatureServe 2002). Wildlife management in Florida has been influenced by numerous

stakeholders, agencies, programs, and plans. In addition to their contributions to improving wildlife diversity in Florida, the programs and resources outlined below are among those that have most influenced development of the ISMP and will be instrumental in the ISMP's successful implementation.

FWC Agency Strategic Plan

The [Agency Strategic Plan](#) is a comprehensive road map to accomplishing FWC's mission of managing fish and wildlife resources for their long-term well-being and the benefit of people. The Agency Strategic Plan outlines strategic initiatives: areas where significant gains are needed in the short-term. Strategic initiatives identify programs and conservation challenges to which FWC is committed to making meaningful progress in the next five to 10 years. Completing the ISMP and beginning implementation of prioritized species actions and integrated conservation strategies is one of the six strategic initiatives in the 2014–2019 Agency Strategic Plan.

Florida's Wildlife Legacy Initiative

The federal [State and Tribal Wildlife Grants Program](#), created by the U.S. Congress in 2000, encourages efforts to protect and conserve wildlife before they become imperiled. Florida's State Wildlife Grants Program (SWG) is supported by the federal State and Tribal Wildlife Grants Program, which provides annually appropriated funding to every state and territory. As a requirement of participating in this program, Florida developed a State Wildlife Action Plan, which identifies listed and nonlisted species deemed to be at risk or declining. In the [State Wildlife Action Plan](#), these at-risk species are referred to as Species of Greatest Conservation Need (SGCN). The SWG is a matching grants program that provides financial support for projects that address conservation needs identified in Florida's State Wildlife Action Plan.

To meet the intent of the State and Tribal Wildlife Grants Program, and to further the goals of Florida's State Wildlife Action Plan, FWC created Florida's Wildlife Legacy Initiative (FWLI). A nonregulatory program, FWLI is designed to combine effective statewide planning with regional partnership development to implement conservation actions at the local level. Partners are essential in identifying and implementing priority FWLI goals that support Florida's State Wildlife Action Plan. The [FWLI goals](#) direct the use of SWG funding and other FWC resources.

Through FWLI, FWC has worked with more than 100 partners to secure \$33 million in funding and matching contributions to undertake approximately 200 projects that include habitat restoration, research, surveying and monitoring to fill species data gaps, and other conservation projects on both public and private lands (FWC 2012). Information gathered has helped guide management of Species of Greatest Conservation Need. Other supported activities include prescribed-fire teams, coral monitoring and recovery, springs working groups, water-quality improvement, and seagrass restoration and monitoring. Projects that address the actions and threats identified in Florida's State Wildlife Action Plan complement implementation of the ISMP. Together, both plans will address threats to Florida's imperiled and at-risk wildlife.

Promoting Wildlife Diversity

Maintaining wildlife diversity is the core focus of Florida's State Wildlife Action Plan. The Wildlife Conservation, Prioritization, and Recovery (WCPR) program within FWC assists FWC land managers in prioritizing species' needs. Section 259.105(2)(a)11, F.S., requires that other land-management agencies consult FWC about management activities related to imperiled species, and FWC then provides technical assistance and other support that non-FWC land managers need to improve wildlife conservation on Florida's public lands. Staff from FWC comments on a variety of development and land-conversion projects during the planning phase, and through

this process, species needs are considered, with options to minimize or prevent impacts and improve landscape-level planning for conservation and diversity. Other landscape-level programs that address wildlife diversity include the federal Landscape Conservation Cooperative and the FWC-led Cooperative Conservation Blueprint (CCB). These programs have influenced ISMP development by their requests for more-refined information regarding imperiled species. In order to provide species-specific habitat management recommendations or relay the higher-level needs for multiple imperiled species, the information had to be compiled and evaluated. The Species Action Plans, integrated conservation strategies, Species Conservation Measures and Permitting Guidelines—all components of Florida's Imperiled Species Management Plan—provide the refined information that FWC will use to offer consultation and technical assistance regarding imperiled species conservation and management in Florida. Through development and implementation of the ISMP, FWC has increased and, will continue to increase, as appropriate, the resources necessary to provide more consultation, technical assistance, and commenting related to state-listed species.

State-federal coordination

Once species are federally designated under the Endangered Species Act (ESA), the appropriate federal agency (National Oceanic and Atmospheric Administration Fisheries [NOAA Fisheries] or U.S. Fish and Wildlife Service [USFWS]) assumes the lead role for conservation of those species. The transition to federal listing under the ESA does not entirely end the role that state agencies may have in research or management for a particular species. The USFWS [Interagency Policy Regarding the Role of State Agencies in ESA Activities](#) summarizes the authority under which state and federal agencies work together to protect federally listed species. The FWC is highly engaged with USFWS and NOAA Fisheries in conservation and management activities for many federally listed species, including, for example, the Florida grasshopper sparrow (*Ammodramus savannarum floridanus*), Atlantic sturgeon, Gulf sturgeon (*Acipenser oxyrinchus desotoi*), multiple beach mice (*Peromyscus* spp.), and Eastern indigo snake (*Drymarchon couperi*).

The three species that became federally listed between the 2010 BSRs and the 2016 publication of the ISMP (Atlantic sturgeon, pillar coral, and Florida bonneted bat) are not included in the ISMP; however, the information in their Species Action Plans is highly valuable in developing federal recovery plans and identifies priority actions that FWC staff can support as the species transition from state to federal oversight. While federal agencies (NOAA Fisheries or USFWS) will ultimately assume the lead role for conservation of those three species, FWC will continue to work closely with our federal partners, as is done for other federally listed species. Many landscape- and habitat-level activities benefit both state-listed and federally listed species; thus, any recommendations for state-listed species or their habitats must also support the protection of federally listed species and their habitats.

The USFWS, NOAA Fisheries, and FWC are also working closely in response to the recent multidistrict litigation petition to list more than 300 species under the federal ESA. Many of these petitioned species are on Florida's Endangered and Threatened Species List, and development and implementation of the SAPs and the ISMP may help prevent the need for listing at the federal level. For some species, such as Barbour's map turtle, alligator snapping turtle, and Florida pine snake, federally funded projects are underway to fill data gaps necessary to fully implement Species Action Plans and provide input to status reviews at the federal level.

In addition to the federal agency coordination for petitioned species, FWC actively participates in recovery planning set forth in Section 4 of the federal ESA. Ongoing recovery team and/or recovery planning involvement by FWC staff includes the Miami blue butterfly (*Cyclargus thomasi bethunebakeri*), Florida scrub jay (*Aphelocoma coerulescens*), Florida manatee (*Trichechus manatus latirostris*), and Florida panther (*Puma concolor coryi*), among others.

Section 6 of the federal ESA outlines cooperative work with the states. Florida's Section 6 Agreement, revised in 2012, is an excellent example of furthering joint management efforts. In addition to standard Section 6 language that allows states to survey and monitor federally listed species and provides some funding for management of these species, the agreement between Florida and USFWS has the flexibility for Florida to issue permits for federally listed species, if conditions are agreed on by both the state and federal agencies. Florida's Section 6 Agreement is intended to highlight the truly cooperative nature between FWC and the three USFWS field offices located in Florida, an approach that began in 2003 with development of the Manatee Forums. The Manatee Forums began with a goal of increasing cooperation between FWC, USFWS, and stakeholder groups.

In addition to the Section 6 Agreement, Florida plays an active role in other federal conservation programs, including habitat conservation plans (HCPs) and safe harbor agreements, both of which assist nonfederal landowners who encounter federally listed species on their properties. Staff from FWC provides the technical assistance necessary for Florida landowners and municipalities to enroll in these programs. Over the last decade, FWC has assisted in the development of HCPs and land acquisitions, including easements, for the recovery of federally listed species. Candidate Conservation Agreements with Assurances (CCAAs) allow landowners with federal candidate species on their property to receive credit for beneficial management practices, with the assurance that if the candidate species is listed in the future, the landowner will not have additional regulatory burdens associated with their ongoing activities. The development of CCAAs also incorporates state-listed species where appropriate, and benefits these species, improving conservation for a suite of species.

Benefits of the comprehensive and integrative approach

While the ISMP is adaptive and will be revised to reflect changing priorities, new information, and progress toward conservation goals, the shift to a more comprehensive approach to imperiled fish and wildlife conservation in Florida has already yielded the positive outcomes shown below.

- Thorough and systematic compilation of available information on Florida's imperiled species allows FWC to be more efficient and effective in consultations with landowners and land managers, as well as in internal prioritization and implementation of research and management activities.
- The ability to provide supporting information to the USFWS and NOAA Fisheries for petitioned species has also improved. Not only are species threats and conservation needs identified, but additional research is being conducted for several petitioned species to gather much-needed additional data. Providing this information and demonstrating FWC's ability to bring conservation and necessary protections to these species may help to preclude the need for federal protection.
- Greatly improved collaboration among agency staff has allowed for thoughtful evaluation of necessary protections and how to best achieve them in a real world application. Because the species are quite different, the ISMP openly acknowledges as policy that they will not all be treated the same. Input is expected and needed from partners and stakeholders on those necessary protections and how best to achieve them.
- With the desire to be more proactive and work more closely with landowners, land managers, developers, and local governments in planning for land-use changes, developments, projects, and/or future land use, FWC has already increased resources to provide consultation, technical assistance, and commenting. As necessary, FWC will adjust resources to support any increase in permitting for state-listed species.
- Partners and stakeholders have been heavily engaged in planning and will be needed for successful implementation as well.

American Oystercatcher

Haematopus palliatus



Photograph by Jack Rogers.

The American oystercatcher makes its nest directly in sand, shell, or small gravel in coastal areas. This species creates a scrape in the substrate in which to lay its camouflaged eggs. As its name implies, the species feeds primarily on marine bivalves.

Status

Listed as state Threatened on Florida's Endangered and Threatened Species List.

Conservation Goal

Improve the conservation status of the American oystercatcher to a point that it can be removed from Florida's Endangered and Threatened Species List and will not again need to be listed.

Identified Threats

- Habitat loss and degradation, largely due to coastal development and incompatible recreational use.
- Disturbance during breeding, causing nest failure and resulting in loss of eggs and/or chicks.
- Changes to water quality that impact bivalves (e.g., pollution, turbidity, depth, and temperature).
- Predation is a significant threat magnified by human disturbance.

Conservation Approach

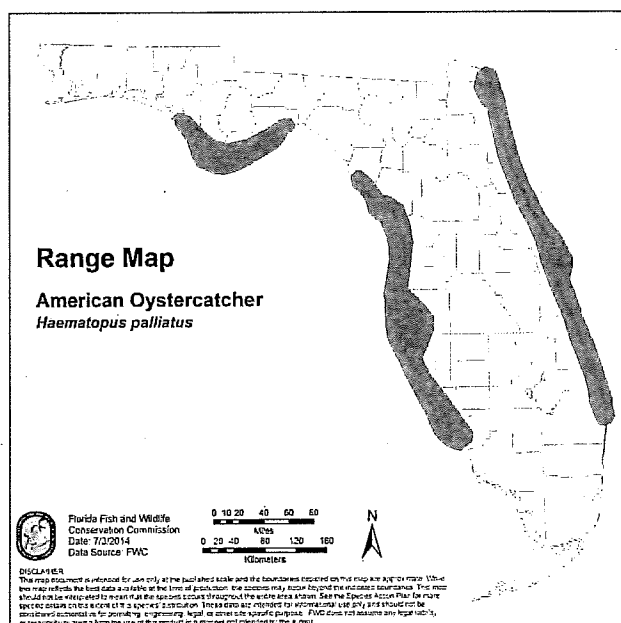
- Increase the population of the American oystercatcher by protecting breeding sites.
- Protect, restore, enhance, and create habitat sufficient to accommodate population growth.
- Continue monitoring through the Florida Shorebird Alliance, and refine methods as necessary.
- Fill information gaps, including determining productivity rates necessary to sustain population growth.
- Minimize loss of birds and nests at rooftop breeding sites.
- Educate those who recreate, reside, and work on beaches and in coastal areas about the species' conservation needs.
- Improve protections and implement a permitting structure to support management actions.

Current Protections

- No person shall take (including harm or harass), possess, or sell any Threatened species or parts of their nests or eggs, as outlined in Chapter 68A-27, F.A.C., Rules Relating to Endangered or Threatened Species.
- Under the federal Migratory Bird Treaty Act, it is unlawful to pursue, hunt, take, capture, kill, or sell migratory birds, including their feathers, eggs, and nests.

Resources

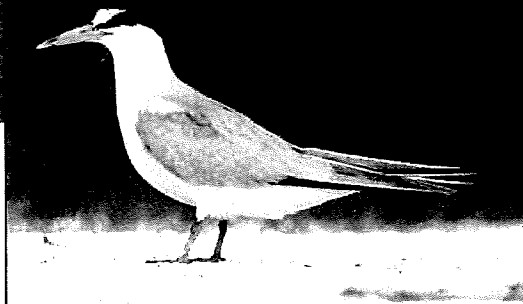
- Species Action Plan
- Biological Status Review Report



Least Tern

Sternula antillarum

The least tern is the smallest tern of North America, measuring about nine inches in length. Like other beach-nesting birds, nests in shallow scrapes in sand, shell, or gravel on the coast or near bodies of fresh water. Least terns also utilize flat, gravel rooftops for nesting.



Photograph by Jack Rogers.

Status

Listed as state Threatened on Florida's Endangered and Threatened Species List.

Conservation Goal

Improve the conservation status of the least tern to a point that it can be removed from Florida's Endangered and Threatened Species List and will not again need to be listed.

Identified Threats

- Habitat loss and degradation, largely due to coastal development and incompatible recreational use.
- Disturbance during breeding, causing nest failure and resulting in loss of eggs and/or chicks.
- Direct loss of eggs and chicks due to pedestrian and vehicular traffic on beaches.
- Mortality and injury associated with rooftop nesting colonies.
- Predation is a significant threat that is magnified by human disturbance.

Conservation Approach

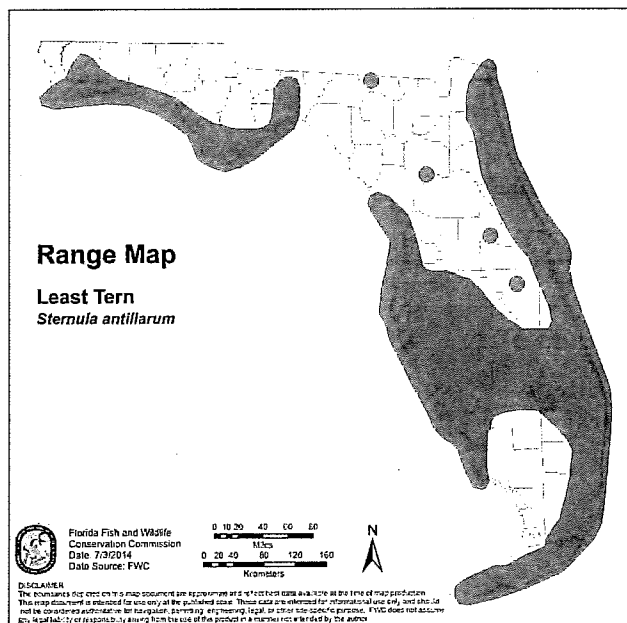
- Increase the population by protecting breeding sites through appropriate management.
- Protect, restore, enhance, and create habitat sufficient to accommodate population growth.
- Continue monitoring through the [Florida Shorebird Alliance](#), refining methods as necessary.
- Fill information gaps necessary to improve protections and management.
- Through targeted outreach, expand awareness about the species' conservation needs.
- Minimize loss of birds and nests at rooftop breeding sites.
- Improve protections and implement a permitting structure to support management actions.

Current Protections

- No person shall take (including harm or harass), possess, or sell any Threatened species or parts of their nests or eggs, as outlined in Chapter [68A-27](#), F.A.C., Rules Relating to Endangered or Threatened Species.
- Under the federal [Migratory Bird Treaty Act](#), it is unlawful to pursue, hunt, take, capture, kill, or sell migratory birds, including their feathers, eggs, and nests.

Resources

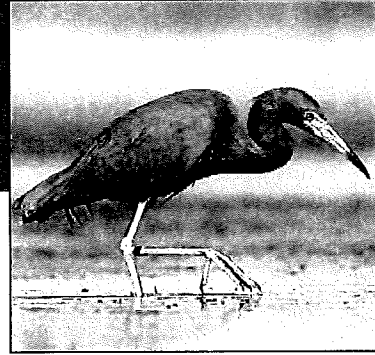
- [Species Action Plan](#)
- [Biological Status Review Report](#)



Little Blue Heron

Egretta caerulea

Little blue herons are stealthy hunters, preying on small fishes, aquatic crustaceans, amphibians, snakes, and insects. Though their diets are diverse, they do require shallow wetlands for foraging.



Photograph by Jack Rogers.

Status

Listed as state Threatened on Florida's Endangered and Threatened Species List.

Conservation Goal

Improve the conservation status of the little blue heron to a point that it can be removed from Florida's Endangered and Threatened Species List and will not again need to be listed.

Identified Threats

- Habitat degradation, including diversion of natural water-flow, altered levels of water fluctuation, lower water-tables, and nutrient enrichment in waters.
- Loss of suitable foraging and breeding areas due to human disturbance, especially during key phases of reproduction (e.g., continued disturbance near nesting colonies).
- Increased presence of predators that cause nest failure.
- Magnified vulnerability to pesticides, heavy metals, and other environmental contaminants.

Conservation Approach

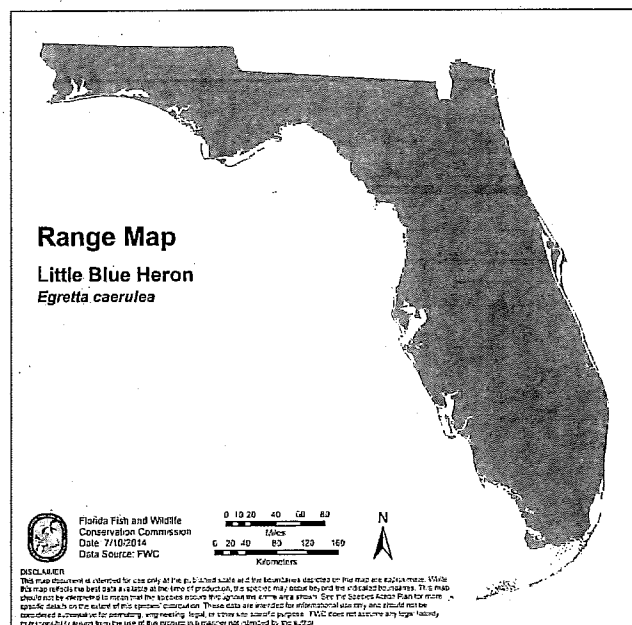
- Reverse the little blue heron's population decline by protecting breeding sites.
- Ensure that quality habitat is sufficiently available to support migratory populations and to sustain and grow Florida's resident population.
- Partner effectively to ensure that species needs are considered during large-scale wetland restoration (such as projects occurring in and planned for the Everglades).
- Provide adequate protection to important nesting colonies through enforcement and education.
- Identify and prioritize top nesting colonies in Florida to effectively target research and conservation efforts.

Current Protections

- No person shall take (including harm or harass), possess, or sell any Threatened species or parts of their nests or eggs, as outlined in Chapter 68A-27, F.A.C., Rules Relating to Endangered or Threatened Species.
- Under the federal Migratory Bird Treaty Act, it is unlawful to pursue, hunt, take, capture, kill, or sell migratory birds, including their feathers, eggs, and nests.

Resources

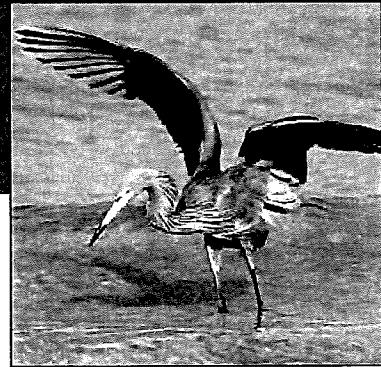
- Species Action Plan
- Biological Status Review Report



Reddish Egret

Egretta rufescens

The reddish egret nests exclusively on vegetated islands along the coast with nearby wetlands for foraging. Saltwater mud flats, sandbars, and coastal lagoons with water less than six inches deep are typical foraging grounds.



Photograph by Jack Rogers.

Status

Listed as state Threatened on Florida's Endangered and Threatened Species List.

Conservation Goal

Improve the conservation status of the reddish egret to a point that it can be removed from Florida's Endangered and Threatened Species List and will not again need to be listed.

Identified Threats

- A habitat specialist, this species is restricted to coastal wetlands, making it especially vulnerable to coastal habitat alteration from development, use, sea-level rise, and water management.
- Diversion of natural water flow, altered levels of water fluctuation, lower water-tables, and nutrient enrichment in waters when these conditions impact prey abundance and diversity.
- Human disturbance, especially during foraging and key phases of reproduction.
- Increased presence of predators that cause nest failure.
- Magnified vulnerability to pesticides, heavy metals, and other environmental contaminants.

Conservation Approach

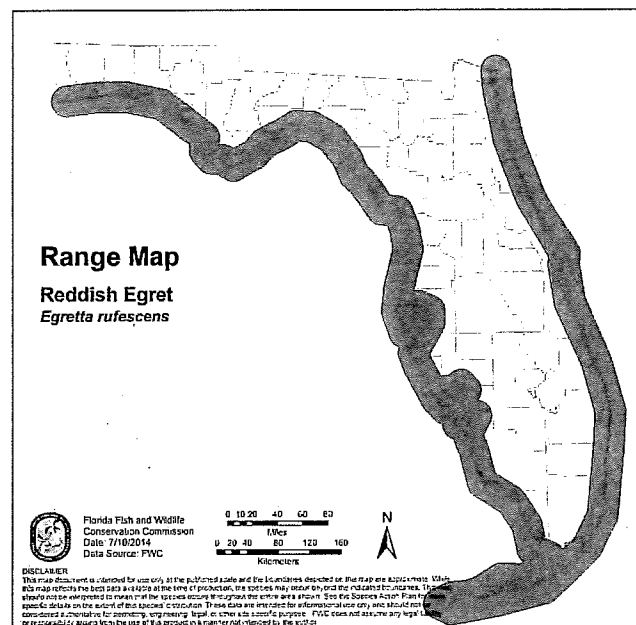
- Increase the population of reddish egrets by protecting breeding sites.
- Ensure quality habitat is sufficient to increase the number of locations in which the species occurs.
- Partner with appropriate organizations to ensure that species needs are considered during large-scale wetland restoration (such as projects occurring in and planned for the Everglades).
- Protect important nesting colonies through partnership with law enforcement and education.
- Identify and prioritize top nesting colonies within Florida to better target research and conservation efforts.

Current Protections

- No person shall take (including harm or harass), possess, or sell any Threatened species or parts of their nests or eggs, as outlined in Chapter 68A-27, F.A.C., Rules Relating to Endangered or Threatened Species.
- Under the federal Migratory Bird Treaty Act, it is unlawful to pursue, hunt, take, capture, kill, or sell migratory birds, including their feathers, eggs, and nests.

Resources

- Species Action Plan
- Biological Status Review Report



Roseate Spoonbill

Platalea ajaja



Photograph by FWC.

The roseate spoonbill uses its flat, spoon-shaped bill to probe shallow fresh or salt waters for small fish and other aquatic animals. Spoonbills nest primarily on coastal islands, though they occur inland outside of the breeding season.

Status

Listed as state Threatened on Florida's Endangered and Threatened Species List.

Conservation Goal

Improve the conservation status of the roseate spoonbill to a point that it can be removed from Florida's Endangered and Threatened Species List and will not again need to be listed.

Identified Threats

- Hydrologic alterations; this species relies on prey concentration resulting from gradual dry-down.
- Habitat degradation, including diversion of natural water-flow, altered levels of water fluctuation, lower water-tables, nutrient enrichment in waters, as well as changes associated with sea-level rise.
- Loss of suitable habitat due to human disturbance (e.g., continued disturbance of nesting colonies).
- Increased presence of predators that cause nest failure.
- Magnified vulnerability to pesticides, heavy metals, and other environmental contaminants.

Conservation Approach

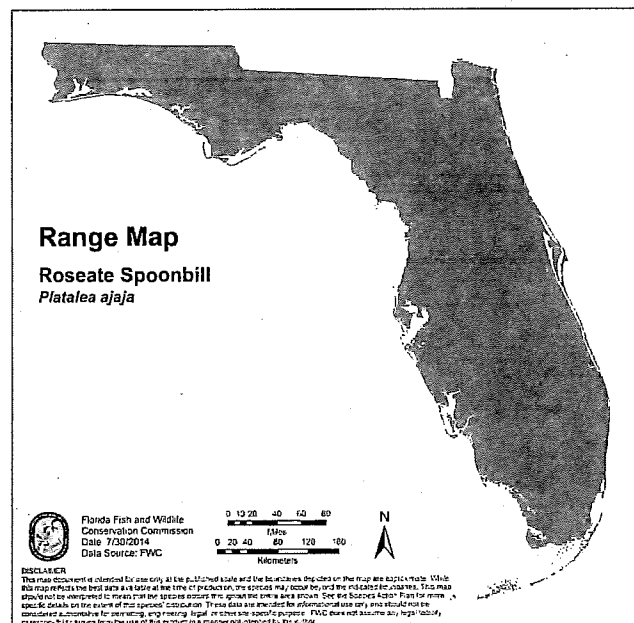
- Increase the population of roseate spoonbills by protecting breeding sites.
- Ensure that quality habitat is sufficiently available to support migratory populations and to increase the number of locations where the roseate spoonbill occurs.
- Partner effectively to ensure that species needs are considered during large-scale wetland restoration (such as projects occurring in and planned for the Everglades).
- Adequately protect nesting colonies through partnership with law enforcement and education.
- Identify and prioritize top nesting colonies in Florida to better target research and management.

Current Protections

- No person shall take (including harm or harass), possess, or sell any Threatened species or parts of their nests or eggs, as outlined in Chapter 68A-27, F.A.C., Rules Relating to Endangered or Threatened Species.
- Under the federal Migratory Bird Treaty Act, it is unlawful to pursue, hunt, take, capture, kill, or sell migratory birds, including their feathers, eggs, and nests.

Resources

- Species Action Plan
- Biological Status Review Report



Tricolored Heron

Egretta tricolor

The tricolored heron nearly always selects densely vegetated sites overhanging water for nesting, such as mangrove islands and willow thickets. Tricolored herons forage in a variety of wetlands including tidal marshes, swamps, and pond edges.

Status

Listed as state Threatened on Florida's Endangered and Threatened Species List.

Conservation Goal

Improve the conservation status of the tricolored heron to a point that it can be removed from Florida's Endangered and Threatened Species List and will not again need to be listed.

Identified Threats

- Habitat degradation, including diversion of natural water-flow, altered levels of water fluctuation, lower water-tables, and nutrient enrichment in waters.
- Loss of suitable foraging and breeding areas due to human disturbance, especially during key phases of reproduction (e.g., continued disturbance near nesting colonies).
- Increased presence of predators that cause nest failure.
- Magnified vulnerability to pesticides, heavy metals, and other environmental contaminants.

Conservation Approach

- Reverse the tricolored heron's population decline by protecting breeding sites.
- Ensure that quality habitat is sufficiently available to support migrants and grow Florida's population.
- Through partnerships, ensure species needs are considered during large-scale wetland restoration (e.g., projects in the Everglades).
- Protect important nesting colonies through partnership with law enforcement and education.
- Identify and prioritize the top nesting colonies within Florida to effectively target research and conservation efforts.

Current Protections

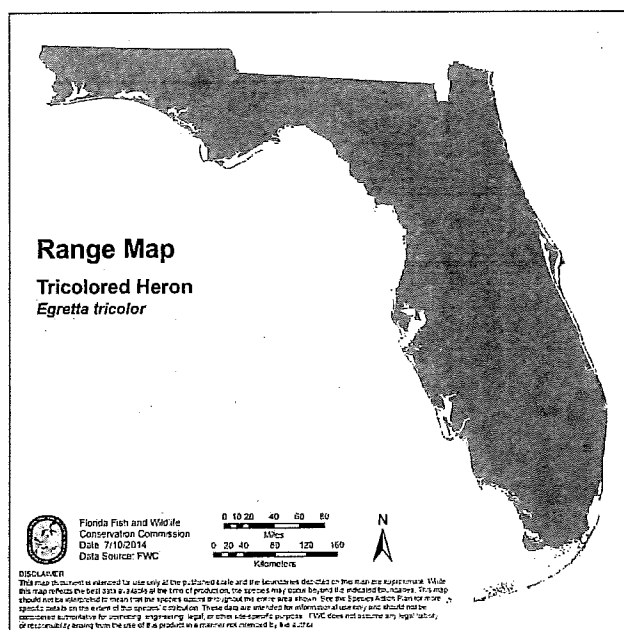
- No person shall take (including harm or harass), possess, or sell any Threatened species or parts of their nests or eggs, as outlined in Chapter 68A-27, F.A.C., Rules Relating to Endangered or Threatened Species.
- Under the federal Migratory Bird Treaty Act, it is unlawful to pursue, hunt, take, capture, kill, or sell migratory birds, including their feathers, eggs, and nests.

Resources

- Species Action Plan
- Biological Status Review Report



Photograph by Jack Rogers.



Florida Pine Snake

Pituophis melanoleucus mugitus



Photograph by Kevin Enge.

The Florida pine snake is a large (48-66 inches), nonvenomous snake with dark brown to reddish blotches on a gray to sandy-colored background. Its head and snout are adapted for burrowing, and this species spends most of its time underground. Its impressive defensive displays include hissing, raising its head and inflating its upper body, and shaking its tail.

Status

Listed as state Threatened on Florida's Endangered and Threatened Species List.

Conservation Goal

The conservation status of the Florida pine snake is improved to a point that the species can be removed from Florida's Endangered and Threatened Species List and will not again need to be listed.

Identified Threats

- Habitat loss, fragmentation, and degradation from the loss of dry uplands and fire suppression.
- Roads, which fragment habitat, may contribute to reduced genetic diversity and mortality.
- Due to its dependency on underground refuges, the decline of burrowing species such as the gopher tortoise (*Gopherus polyphemus*) and pocket gopher (*Geomys pinetus*) present a threat to habitat.
- Operations that result in stump removal, soil compaction, and root removal may be threats.
- Predation by domestic pets and other nonnative species, and intentional killing by humans.

Conservation Approach

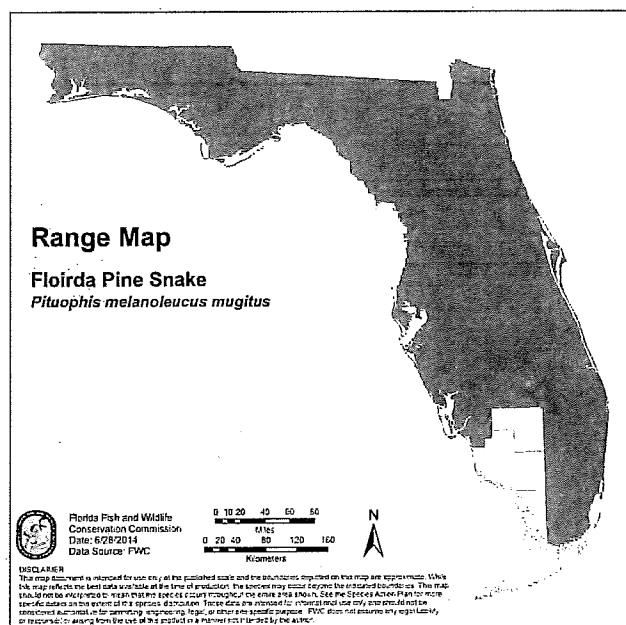
- Increase the amount of suitable habitat through restoration, appropriate fire management, conservation easements, and support (incentive based and other) and technical assistance to public and private land managers.
- Fill knowledge gaps in species life history, threats, and potential conservation strategies.
- Determine and monitor the status of Florida pine snake populations.
- Encourage public understanding of and support for conservation actions through education and outreach about the natural history, identification, and ecological importance of Florida pine snakes and other snakes.

Current Protections

- No person shall take (including harm or harass), possess, or sell any Threatened species or parts of their nests or eggs, as outlined in Chapter 68A-27, F.A.C., Rules Relating to Endangered or Threatened Species.

Resources

- [Species Action Plan](#)
- [Biological Status Review Report](#)



Integrated Conservation Strategies

While Species Action Plans identify threats and outline prioritized conservation needs for individual species or groups of species, integrated conservation strategies take a more complete and comprehensive approach and focus on higher-level strategies and integrated actions that benefit multiple species and their habitats. The ICSSs will facilitate implementation of key actions outlined in the SAPs while considering emerging issues and potential conflicts. This effort will help focus implementation on areas and issues that will yield the greatest level of conservation for the greatest number of species. The strategies present the current agency approach to increasing collaboration with key partners and stakeholders while minimizing duplication of efforts on issues that impact the species included in this plan. They also describe integration of species needs, habitat needs, staff time, effort, and resources.

Development of the ICSs began with an analysis of the SAPs. Staff, assembled from a variety of FWC sections and divisions, worked in teams on five topics: Research and Monitoring, Habitat Conservation and Management, Incentives and Influencing, Law and Policy, and Education and Outreach. Each team worked to identify high-level issues that influence multiple species. Teams then developed 14 strategies and 72 actions that address the needs of multiple species. Each ICS team identified the SAPs and applicable SAP action number relevant to the integrated conservation strategy and integrated action they developed (see [Table 6](#)). The strategies and actions are not in priority order, but represent an effort to discern the actions that will have the most benefit for the highest number of species. The priority of any given action and the Division or Section best suited to implement those actions is outlined in the [Implementation](#) section. In most cases, the integrated conservation strategies and integrated actions are applicable to more than just imperiled species, and could benefit many beyond the 57 currently included in Florida's Imperiled Species Management Plan. Not all SAP actions are covered under the integrated conservation strategies because some species face very specific threats and have individual needs that should be addressed.

By implementing the strategies that emerged from this process, the conservation efforts of staff, partners, and stakeholders can be more efficient and effective. These integrated strategies and actions, in combination with prioritized actions identified in the SAPs for individual species, will, over the next 10 years, guide implementation of Florida's Imperiled Species Management Plan.

Prioritization of the key strategies and actions, described in the Implementation section, will be balanced with individual species' needs and priorities. Staff will use these strategies and the associated SAP actions to prioritize regional and statewide efforts. Progress monitoring will be essential during implementation to ensure that approaches to conservation are adapted to account for emerging issues or unanticipated results. Implementing Florida's Imperiled Species Management Plan will require collaboration and coordination across the agency and with our partners and stakeholders.

The integrated conservation strategies are listed by category. Each strategy, and the actions that, when implemented, support progress toward meeting the ISMP goal, is explained in further detail in this chapter.

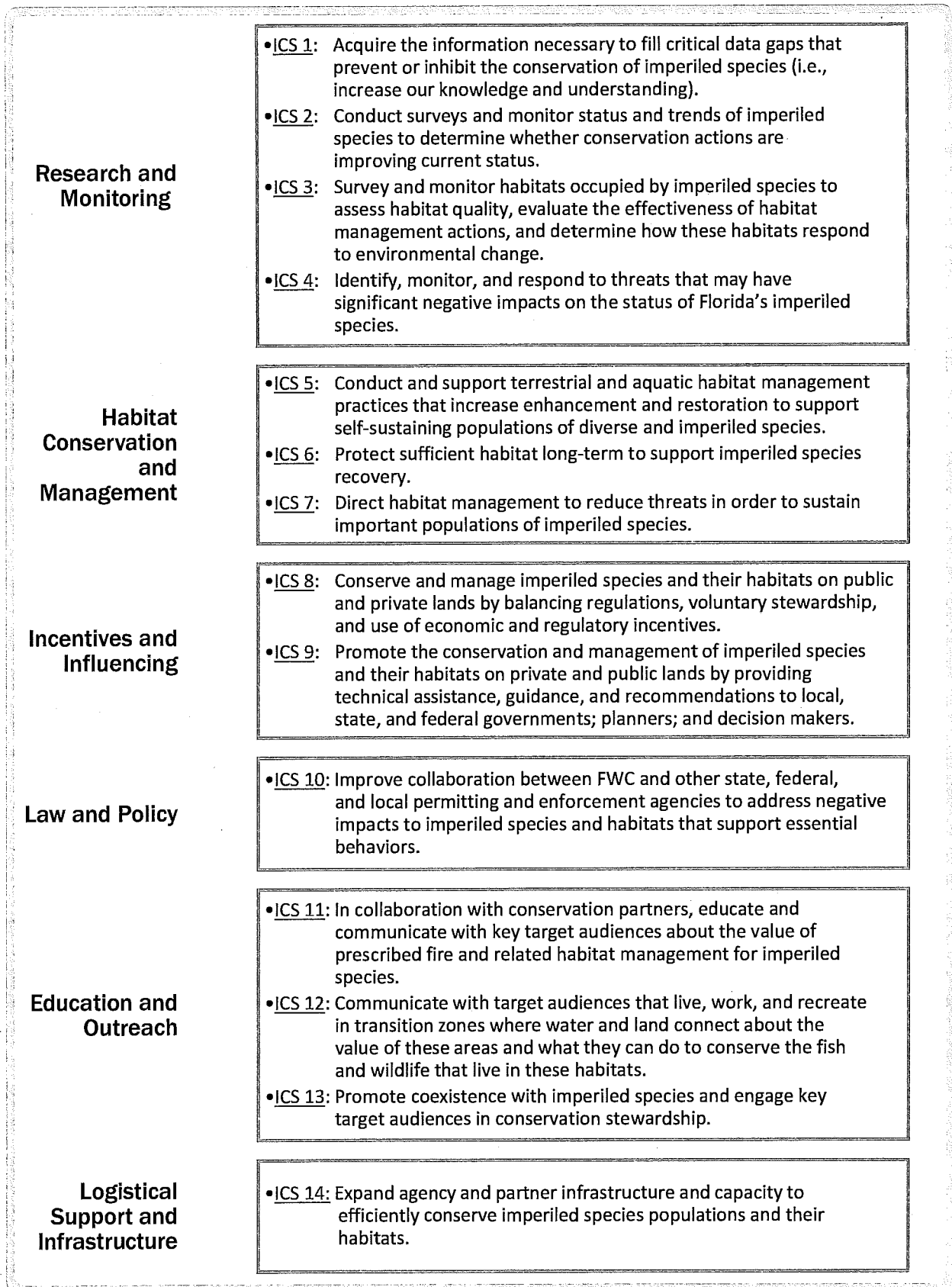


Figure 3. Integrated conservation strategies (ICSs). Organized into six categories, each strategy and its supporting actions will support progress towards achieving Florida's Imperiled Species Management Plan goal.

Implementation

Implementation of Florida's Imperiled Species Management Plan over the next 10 years, from 2016 to 2026, will be complex and multilayered. Some actions may require changes in FWC's policies or organization. Some require review of ongoing activities and refocusing of FWC's efforts to conserve imperiled species. All necessitate internal and external communication and collaboration. To successfully achieve the ISMP's goal and objectives, implementation requires active engagement with and participation by partners and stakeholders.

Florida's Imperiled Species Management Plan goal: With broad public and partner support, conserve or improve the status of imperiled species to effectively reduce the risk of extinction.					
Objective 1	Objective 2	Objective 3	Objective 4	Objective 5	Objective 6
•By 2017, conduct necessary research and reevaluate the five species designated as Species of Special Concern.	•By 2020, complete 15 percent of data gap actions identified in Species Action Plans and by 2025, 30 percent.	•By 2025, implement a monitoring plan for all species included in Florida's Imperiled Species Management Plan with an existing survey protocol.	•By 2016, complete a regional assessment for the FWC Northwest region and by 2020 for each of the other FWC regions.	•By 2017, focus at least 10 percent of agency resources on supporting implementation of Florida's Imperiled Species Management Plan and Species Action Plans.	•By 2018, develop a system to account for protections and conservation gains for species included in Florida's Imperiled Species Management Plan throughout the range of FWC engagement with partners and stakeholders.

Figure 4. Goal and objectives of Florida's Imperiled Species Management Plan.

Florida Fish and Wildlife Conservation Commission staff prepared the ISMP with significant support and input from partners and stakeholders, and it serves as a road map to guide us on our journey toward improving the status of Florida's imperiled species. To ensure that the desired future condition is reached, FWC is committed to leading the way. Staff across the agency was challenged and empowered to support the ISMP's implementation. Although each division and office of FWC is involved, the Division of Habitat and Species Conservation (HSC) will take primary responsibility for implementation and progress monitoring, relying heavily on the Fish and Wildlife Research Institute for research needed to fill data gaps and support management decisions.

While FWC will take the lead in developing products and supporting implementation of actions identified in the Species Action Plans and integrated conservation strategies, the agency will still rely heavily on other state and federal agencies, our key partners, and engaged stakeholders to provide the necessary input, support, and resources to successfully implement this plan.

Implementation approach

Reflected within this chapter are the priorities that FWC has identified for this 10-year-plan period, as well as the process and resources needed for implementation. The objectives outlined below are important first steps toward achieving FWC's overall goal, and are based on existing funding and staff resources. They are a focus for the agency, but are not expected to be the only work completed for Florida's imperiled species. Partners and stakeholders are anticipated to participate and provide additional achievements identified within Species Action Plans or integrated conservation strategies that may be outside the scope of these objectives.

Because of the complexity of implementing the ISMP, this plan provides direction and sideboards without detailing how the process is expected to, or will, proceed. The Law and Policy chapter explains the framework for protecting imperiled species, while the Species Action Plans and integrated conservation strategies identify conservation actions that will benefit single species or suites of species, or will aid in program implementation. Included within the Species Action Plans and the integrated conservation strategies are suggestions for how implementing a conservation action could proceed. Successful implementation works across law and policy, Species Action Plans, and integrated conservation strategies and leads us to achieving the outlined objectives, goal, and ultimately the desired future condition. Essential to this process is obtaining and integrating feedback and results so that adaptations and improvements can be made. Directed outreach by agency staff to solicit input and data both internally and externally will be ongoing and incorporated into annual progress reviews. Regularly seeking feedback and results will allow for faster adjustments that may be needed to adapt and improve implementation.

Realizing the goal of the ISMP will take many years, in part because of the magnitude of the challenges facing state-listed species, and in part due to the biology and conservation needs of some species. Progress towards this goal will be incremental, with strategic and practical use of staff resources and partner support focusing on prioritized objectives.

Measurable objectives

Conservation objectives set priorities and provide benchmarks to measure progress towards achieving the ISMP goal. Objectives will be met through implementing actions described in the Species Action Plans and the integrated conservation strategies. Priorities are identified to improve species knowledge, cooperation across the agency in implementation, and the ability to implement at regional and statewide scales. Priorities set at this point will be reviewed and revised as they are accomplished. The ISMP proposes the following objectives, which will be monitored throughout the 10-year implementation period.

Objective 1: By 2017, conduct necessary research and reevaluate the five species designated as Species of Special Concern.

During the Biological Status Reviews in 2010, five species (eastern chipmunk, harlequin darter, Homosassa shrew, osprey of Monroe County, and Sherman's fox squirrel) were identified as data deficient or peer reviewers expressed concern that the quality of the data was not adequate for assessment. Research conducted on the eastern chipmunk during development of the ISMP has provided enough data for an updated BSR, resulting in this species being delisted. For the remaining species, the decision was made to maintain them as Species of Special Concern until more data could be collected or the quality of available data is verified, with a commitment to reevaluate them at a future date. Species Action Plans were developed for these species, with the goal being to determine their conservation status. [Table 7](#) outlines priority actions necessary to determine the status for Species of Special Concern.

Additionally, data published in 2014 (Thomas et al. 2014) indicates that three species of alligator snapping turtles occur in Florida, not one species, as previously thought. Therefore, staff recommended maintaining the alligator snapping turtle as a Species of Special Concern until a Biological Review Group can be reconvened to evaluate this new information, prepare Biological Status Reviews, and recommend listing statuses for all three species. Because the alligator snapping turtle is not considered a data-deficient species, it is not included in Table 7.

Since 2010, FWC has initiated projects to collect data necessary for an updated Biological Status Review of the data-deficient Species of Special Concern.

1. Although the harlequin darter SAP identifies a target of 2020 to complete a status review, ongoing projects are already collecting data, and a review is anticipated prior to 2020.
2. The Homosassa shrew SAP also identifies 2020 as the targeted date for a status review, but projects are underway collecting data, and a completed review is anticipated prior to 2020.
3. For the osprey of Monroe County, data collection is almost complete, and an updated review is anticipated by the end of 2016.
4. The Sherman's fox squirrel SAP identifies a five-year period after plan completion for data collection. However, ongoing research is assessing the taxonomic validity of the subspecies, developing survey protocols, and undertaking improved habitat analyses to better delineate the extent of occurrence and area of occupancy.

role, and may provide avoidance and minimization measures or accept mitigation through another agency's permitting process (e.g., Environmental Resource Permits issued through DEP or the water management districts). Some land-use actions may trigger the need for FWC permitting, leading FWC to interact with a smaller group of stakeholders. The smallest subset of engagement with the public occurs when FWC law enforcement becomes involved in imperiled species issues; and this involvement is most often in the form of education over compliance. [Figure 5](#) shows the narrowing levels of public engagement, with the focus on broad conservation actions over a strong regulatory approach. Integrated actions follow the narrowing levels of engagement, with more actions focusing on larger landscape conservation and management than on permitting and enforcement. Achieving Objective 6 will require both implementing the integrated actions and accounting for the implementation through many of FWC's existing programs. The Integrated Conservation Strategies chapter further details implementation of these strategies.

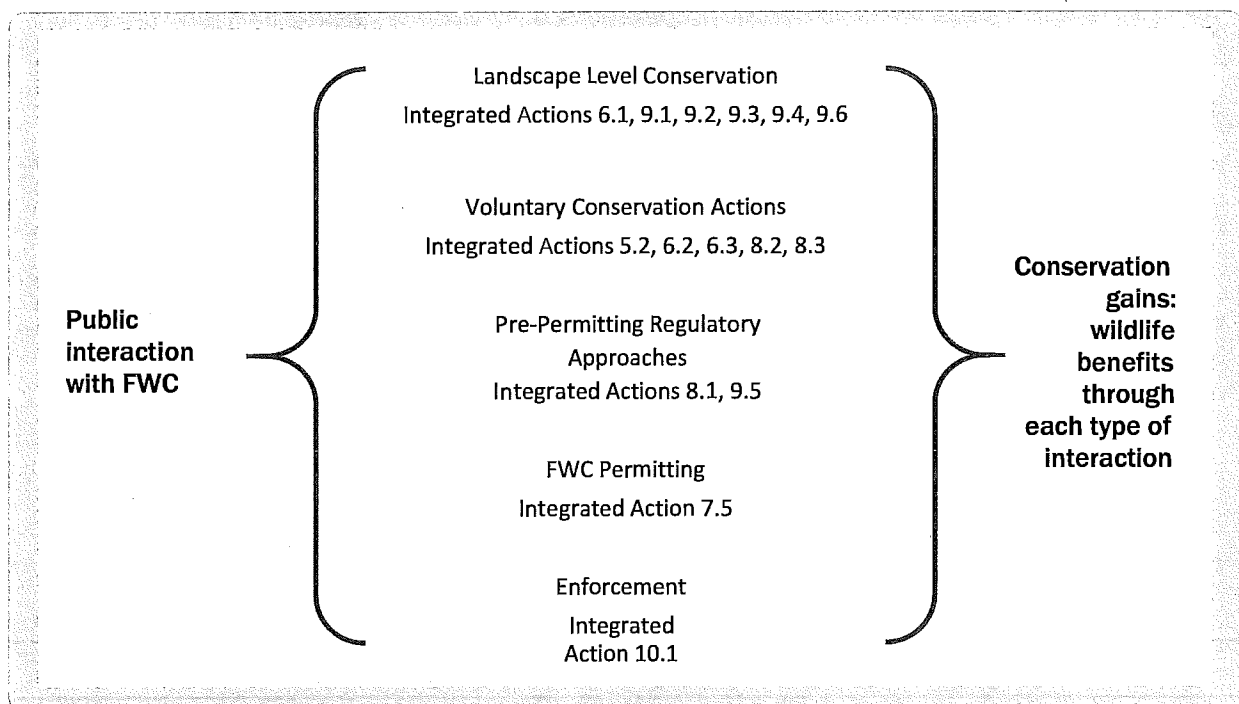


Figure 5. Means by which public interaction with FWC leads to conservation gains.

To accomplish Objective 6, FWC staff and partners will identify, out of a range of interactions described below, the key components that provide the greatest conservation gains. Targets within each of these components (e.g., acres of land management, acres of conservation easements, numbers of permits issued) will be used to account for the conservation within existing programs, and relate how this benefits the species included in this plan. Tracking these components will be the responsibility of those within FWC who administer each program.

Landscape-Level Conservation

Landscape-level conservation is the broadest level of FWC interaction. Influencing broad land-management decisions, along with identifying areas for conservation, supports wildlife diversity and can improve conditions for wildlife. Existing tools such as Florida's Cooperative Conservation Blueprint and the Critical Land and Waters Identification Project can provide the basis for identifying and prioritizing the areas for conservation (Integrated Action 6.1). The regional assessments identified in Objective 4 also play an important role in assessing

Impacts Assessment

This section addresses the anticipated impacts of implementing or not implementing Florida's Imperiled Species Management Plan. Economic impacts are assessed using information provided by the public and agencies, and through the analysis of known and projected factors. Ecological impacts are assessed through evaluation of the intended outcome; consideration of any unavoidable, unintended outcomes; and information collected from previously implemented similar actions. Social impacts are often the most difficult to project, but information from existing programs, projects, and previously implemented management actions will be considered.

These impact assessments are conducted by FWC with the assistance of additional professional economists in accordance with the definition of *Management Plan* in Chapter 68A-27, F.A.C., which states, "The management plan shall...consider and evaluate anticipated economic, ecological, and social impacts of implementing or not implementing the management plan including a projection of costs of implementing the management plan and identification of the funding sources for the costs as determined through involvement of affected stakeholders and public input." Moreover, specific changes to rules in the Florida Administrative Code may result in an economic impact. Section 120.54(3)(b), F.S., requires that all new or changed administrative rules undergo a process to determine the estimated action's regulatory costs by completing a Statement of Estimated Regulatory Costs (SERC). Working with a professional economist, FWC evaluated the 33 proposed rule changes and determined that only one would meet the dollar threshold defined in Section 120.54(3)(b), F.S. [Table 17](#) lists each rule and the determination regarding impacts that may require a SERC to be completed.

Ecological impacts

Anticipated ecological impacts were added as a requirement for state management plans in accordance with Chapter 68A-27, F.A.C., in part to assess benefits to humans and other wildlife resulting from management plan implementation. Some imperiled species are sentinels for environmental health, and actions that benefit them are likely to benefit other species. Measures implemented to protect one species, however, may not necessarily protect all species or all habitats within an ecosystem, and some measures may actually harm other taxa. These impacts are important considerations during the ecological assessment.

Potential positive impacts

Each species addressed in the ISMP plays a role in its unique environment. For some, interconnectedness is observable: the Florida mouse, gopher frog, and Florida pine snake, for example, all inhabit, and are at least partially dependent upon, gopher tortoise burrows. Conservation actions designed to benefit one of these species are likely to positively impact each of them. Increased use of prescribed fire across the landscape is the focus of many Species Action Plan actions and is an integrated conservation strategy; by implementing this strategy, many species in fire-maintained habitats will benefit. Creating new or restoring existing wetlands is likely to benefit many wading birds and amphibians like the Florida bog frog and gopher frog. State law requires the water management districts to establish and maintain minimum flows and levels (Chapter 373, F.S.). A minimum flow is "the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area" (Section 373.042(1), F.S.). In coastal areas, flows below the minimum flows and levels can deprive estuaries of important freshwater inflows necessary for healthy habitat and can cause saltwater intrusion into the aquifer. The FWC has provided input in the development of these minimum flows and levels

for springs and rivers where state-listed species occur. Conservation of spring and riparian habitats can preserve the natural resources of estuaries and adjacent wetland ecosystems. The importance of many imperiled species to the ecological welfare of upland, wetland, and aquatic habitats in Florida should not be underestimated.

The FWC has also been active in developing programs to reduce entanglement with marine debris and fishing line. Entanglement in fishing gear (hooks and monofilament or fishing line) is a significant source of mortality of brown pelicans (Schreiber and Mock 1988) and hundreds of fish, birds, and terrestrial animals in Florida are entangled in monofilament every year. Wildlife can ingest monofilament or become tangled in it, leading to drowning, starvation, infection, gastrointestinal problems, or loss of limbs (e.g., flippers, tails, wings). Staff from FWC works with various organizations to reduce entanglements in fishing gear through outreach, research, gear recovery, and gear modifications. Decreasing monofilament waste protects many organisms and makes human recreation safer and more enjoyable.

Potential negative impacts

Many wildlife species require some type of habitat management, whether done with natural or manmade tools. For example, impacts to gopher tortoise burrows during relocation may have negative effects on other dependent species, such as the Florida mouse, because these species may be more difficult to find. Mowing or roller-chopping in areas where prescribed fire is difficult to use may benefit some species, but could adversely affect "sand swimmers" such as federally listed sand skinks (*Neoseps reynoldsi*) and blue-tailed mole skinks (*Eumeces egregius lividus*). In cases where another Threatened species may be adversely affected by manipulation of habitat, decisions will need to be made on a species- and site-specific basis. For example, while fire is a powerful restorative tool critical to the health of some natural communities, some species may be at risk from prescribed fire, especially if applied during key life-cycle phases. These potential impacts should be carefully considered, and management adapted accordingly. Whenever highly imperiled species (especially those restricted by geography or habitat) coexist, land managers should prioritize the needs of those species facing higher risk of extinction.

Social impacts

Although no studies have been conducted to evaluate social impacts of the ISMP's implementation, we anticipate that conservation actions associated with those species that are more visible and charismatic will result in greater social impact than actions associated with cryptic, lesser-known species. Fox squirrels and burrowing owls, for example, are easily recognizable species, and where they inhabit urban areas they typically exude a high tolerance for human presence. Implementation of the components of the ISMP that are designed to benefit these species may thus have increased social impacts. Parker and Wang (1996) interviewed 879 Florida residents who were at least 18 years old and found that more than 90 percent of the respondents felt that laws protecting endangered species were very or somewhat important, particularly for large charismatic species like the manatee. The Santa Fe cave crayfish, conversely, inhabits a very small area in a relatively rural part of Florida and is restricted to underground aquatic caves. As with other lesser-known species, the social impacts associated with conservation actions designed to benefit this species are anticipated to be minimal.

It is important to note, however, that implementing actions which improve water or habitat quality are often perceived as positive and may carry increased positive social impacts due to the potential benefit to humans and other species. For example, reduced fuel loads resulting from prescribed fire benefit people by reducing the possibility of wildfire. Restored wetlands provide recharge sites for the aquifers and can absorb high levels

of rainfall, reducing flooding in nearby communities.

Actions focusing on education related to specific behaviors may also have a social impact. For example, Integrated Conservation Strategy 13 promotes the concept of conservation stewardship, with a specific action to increase citizen participation in reporting species locations. The data can benefit conservation efforts, but response to documenting imperiled species could vary. Some citizens may be upset by the idea that their neighbors could report imperiled species on adjacent properties, while others may feel positively and be more likely to become engaged in conservation of those species. When developed, campaigns that encourage communities to adopt a "wildlife wise" approach may suggest keeping cats indoors or limiting dogs on beaches to specific locations, actions that might have an impact on individuals' perceived freedom to manage their pets and recreate as they see fit. Social impacts may also result from the effects of incidental or intentional take permitting on developments or facilities, limiting anticipated adverse impacts to state-listed species. These can have a negative impact on developers and the projects they work on. In contrast, their effect might be positive for those residents and citizens of an area who are opposed to new developments in their neighborhoods because of the result they may have on their current quality of life. The effects may also impact the placement of public facilities, affecting the availability of public access to recreation areas or water bodies.

Economic impacts

Florida's Imperiled Species Management Plan is intended to benefit the citizens of Florida and may result in measurable economic benefits, such as financial gains to wildlife-dependent businesses or the restoration of diminished ecological-services. However, the program may also entail costs, including agency administrative and management related expenses and may also impact private businesses and other economic interests. Policy makers within FWC must consider both the marginal improvements (benefits) and marginal costs of their proposed action as part of their policy evaluation.

In their 2011 analysis of the economic benefits of wildlife viewing in Florida, Southwick Associates (2013) found that the total economic effect from 2011 wildlife viewing activities in Florida ranged from \$2.7 billion upwards to \$4.9 billion (\$2.9 billion by residents and nearly \$2.0 billion by nonresidents). Travel expenses alone generated \$2.7 billion in total economic effects and 44,623 jobs were created (Southwick 2013). Florida was the number one state in 2011 for total days of wildlife viewing by nonresident visitors, according to the USFWS (USFWS 2014). Of those coming to view wildlife, most resident and nonresident viewers were interested in observing, feeding, or photographing birds, predominately shorebirds, wading birds, and waterfowl (Southwick 2013). Many of the species addressed by this plan contribute significantly to wildlife viewing in Florida.

Table 14. Examples of stakeholders and interest categories.

Interest in imperiled species management	Examples of interested stakeholders
Agriculture	Forestry production, silviculture, livestock and crop production
Primary industry	Manufacturing, service industries, and mining
Conservation organizations	Defenders of Wildlife, Conservancy of Southwest Florida, Audubon Florida, Sierra Club, The Nature Conservancy, Florida Wildlife Federation, Florida Native Plant Society
Land development	Florida Chamber of Commerce, Florida Homebuilders Association
Local government agencies	County, city, municipal governments
Research and academic	University and private researchers
Commercial service	Consultants providing wildlife services
Private landowners	Ranchers, homeowners, private developers
Military, federal, or state land managers	U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, U.S. Forest Service, Florida Forest Service, Florida Department of Environmental Protection, Eglin Air Force Base, Water Management Districts
State government agencies	Department of Transportation, Department of Agricultural and Consumer Services, Enterprise Florida
General public	Individuals, neighborhood associations, concerned citizens
Recreational interests	Anglers, hunters, boaters, and wildlife viewers
Animal welfare	Humane Society of the U.S., ASPCA

Costs associated with implementing the plan

The direct costs to FWC were estimated through an internal FWC budget review of all anticipated labor and capital costs related to implementing the ISMP. Likewise, FWC estimated any anticipated redirection of existing labor and capital assets and reported these as agency opportunity costs.

In state fiscal year 2013-2014, the Florida Legislature approved an appropriation of \$443,036 to improve the Commission's ability to manage and conserve Florida's Threatened and nongame fish and wildlife species, with a goal of reducing Florida's Endangered and Threatened Species List. Of this appropriation, \$136,128 was considered start-up costs and nonrecurring. These funds provided the ability to contract with universities and private firms; hire Other Personal Services staff; and purchase supplies, equipment, and vehicles to achieve the following.

1. Develop and implement management plans that will result in effective management of state-Threatened species, removal of species from the state-Threatened and Species of Special Concern lists, and prevention of new listings.
2. Develop and implement research and monitoring programs to determine the status of wildlife populations that are state Threatened or in danger of becoming state Threatened and develop effective management actions to ensure their recovery and conservation.
3. Implement conservation actions, such as habitat management, population management, and providing landowner incentives, which will result in the recovery and conservation of these species.

An additional \$798,675 in federal grant funding from the State Wildlife Grant program was secured and provided five years of funding to support the development and initial implementation of the ISMP (through June 30, 2016). Over the next five years, additional grant funding will be sought to ensure that the goal, objectives, and conservation actions of the ISMP are achieved. These efforts will entail an indeterminate sum of FWC matching funds and time commitments for writing grant proposals, estimated to be \$111,000. The total funds needed from grants, excluding the FWC request for proposal opportunity costs, is estimated to be \$4,085,000. Considered opportunity costs, these funds are only available for work tied to ISMP implementation. Examples of funding sources that could be sought include the State Wildlife Grant program administered by FWC, one or more of the National Fish and Wildlife Foundation grant programs, the Fish and Wildlife Foundation of Florida's Conserve Wildlife Tag grant, the U.S. Fish and Wildlife Service's Section 6 Conservation Grants, Habitat Conservation Planning grant, or similar activity (see [full SERC](#) [Environmental Economics, Inc. 2016]) for additional detail). In total, these actions represent an agency opportunity cost of approximately \$5.5 million over five years, or \$1.1 million annually. Currently, FWC spends approximately \$28 million dollars annually on conservation and management for state- and federally listed species, so ISMP-specific changes are less than 1% of the existing budget for listed species. Other public agencies (federal, state and local) are expected to incur additional expenses related to the enforcement of the ISMP, totaling \$1.5 million annually.

In addition to the initial start-up costs for the ISMP, FWC will redirect funds from other purposes to assist in its implementation. To estimate these recurring costs, the agency conducted an in-house review of its anticipated changes in marginal costs to both labor and capital in the form of conservation actions. Conservation actions will serve to achieve the objectives and actions outlined in the integrated conservation strategies and Species Action Plans. These actions are best accomplished by applying an adaptive management approach that allows for easy adjustments to policies, guidelines, and techniques based on observed conservation benefits. In total, when combined with funds allocated to support new grants, FWC anticipates redirecting at least \$2.6 million in resources to support the ISMP over the next 10 years. This is a measure of the indirect agency costs that would be committed to this effort and not available for other FWC functions.

A Framework to evaluate the economics of the ISMP and the Statement of Estimated Regulatory Cost

Florida's Imperiled Species Management Plan is intended to benefit the citizens of Florida and may result in measurable economic benefits, such as financial gains to wildlife-dependent businesses or the restoration of diminished ecological-services. However, the program may also entail costs, including agency administrative and management related expenses and may also impact private businesses and other economic interests. On either side of the ledger, policy makers should consider both the marginal benefits (improvements) and marginal costs of their proposed action as part of their policy evaluation. *Marginal benefit* refers to the amount people are willing to pay or give in order to obtain additional goods or services. *Marginal costs* are those costs associated with producing additional units of goods or services. This analysis will focus on the marginal costs associated with protecting or managing species, those costs that go beyond existing costs related to these species.

With good record keeping, many historic cost data for agencies are relatively easy to document. Even though finding cost data for private concerns may entail extensive surveys and complex analyses to reliably document, they are typically obtainable. On the other hand, estimating the economic benefits of marginal improvement in ecological services is more problematic. First of all, it is difficult to identify and tie an ecosystem's component services to human values. Even if these services are important to humans, if they lack clear markets it may be even more difficult to assign them monetary value. Yet, in spite of these difficulties the economic theory and

methodology to support the effort is well established and widely cited in the literature.

Regulatory cost is formally addressed in Chapter 68A-27, F.A.C., when it states, “[t]he management plan shall...consider and evaluate anticipated economic, ecological and social impacts of implementing, or not implementing the management plan including a projection of costs of implementing the management plan and identification of the funding sources for the cost as determined through involvement of affected stakeholders and public input.” Furthermore, Section 120.54(3)(b), F.S., encourages all new or changed administrative rules undergo a process to determine the estimated action’s regulatory costs, and in some circumstances this is required with the completion of a SERC. There are no commensurate statutory requirements for addressing marginal benefits; consequently, most economic analyses focus exclusively on changes in marginal costs.

The ISMP is a new, comprehensive conservation approach and thus there is little historical data upon which to project future cost estimates. Given this, more precise estimates of cost to implement will be incorporated as part of the ISMP’s five-year formal review.

Background - benefits and costs: a taxonomy

To help clarify interpretation of the economics and costs vs. benefits, a simple taxonomy may be helpful.

Costs

Costs associated with the ISMP can be defined as simply the amount paid or charged for something, or the loss resulting from an action. Costs can be further refined into several subcategories. The funds paid directly for a project (or action) can be termed *direct costs* and include all direct expenditures. However, most projects also involve costs and/or losses that are less obvious; these can be considered *indirect costs*. Some of the more important indirect costs include the costs or losses that result by foregoing another action or choice (*opportunity cost*), a measure of the ripple effect of redirected costs through an economy (*economic impacts*), and perhaps the most underrepresented of all costs, *negative externalities*. In the case of negative externalities, these are costs (*losses*) incurred by third parties not directly related to the project and can include both measureable losses and non-measureable losses, such as lost ecological services. An example of this could be the lost real-estate value suffered by homeowners adjacent to a noisy new airport or reduced biodiversity resulting from excessive use of pesticides.

Like any public project, the ISMP entails costs of all types. Direct costs are rather obvious and easily measured. Less obvious, but nonetheless important, are opportunity costs. These include the cost of redirecting labor and funds from other useful activities to support the ISMP. Other indirect costs, including the economic impacts of redirecting funds and any negative externalities, are even more obscure, but still worth acknowledging when present. They include the overall effects on the economy at-large by redirecting funds from one business sector to another (*economic impact*) and any possible externality suffered by unwitting third parties.

Not all costs are easily measurable. In many cases negative externalities are poorly understood, and when they involve nonmarketable goods and/or services, it is difficult to place a monetary value on their effect. On the other hand, other indirect costs are readily measurable and should be included within a benefit/cost analysis (BCA) or SERC. The opportunity costs accrued by an agency when it redirects labor and capital is often simple to document and should be measured whenever possible. To help guide this effort, Table 15 groups the basic types of costs and their typical availability. This can be viewed as the guiding taxonomy or framework for conducting either a BCA or SERC. The taxonomy allows for the systematic accounting for all costs and helps policy makers identify both the strengths and shortcomings in their final report.

Table 15. Taxonomy of possible costs (C) resulting from ISMP implementation.

I. Program development and implementation Costs	II. Indirect Costs from the program (almost never considered)
1. Direct Costs i. Directly budgeted agency expenditures made for the program ii. Direct costs to outside firms and other public agencies	1. Economic impact from successfully implementing the program: negative impacts on business sectors – impact on economic growth (gross domestic product)
2. Opportunity Costs (not directly identified in program budget) i. Agency costs in redirected labor and capital ii. Outside of agency costs in labor and capital	2. Negative externalities from successfully implementing the program: indirect costs i. Lost use value (directly measureable) ii. Lost non-use value (indirectly measurable)

Table 15 Summary:

CI.1 – ISMP direct costs – both

CI.1.i within FWC, and

CI.1.ii outside FWC

CI.2 – ISMP opportunity costs – both

CI.2.i within FWC, and

CI.2.ii outside FWC

CII.1 – Economic impact of redirecting funds among sectors of the economy from a successful ISMP

CII.2 – Negative externalities - Non-market value of the opportunity-cost of lost ecological services from a successful ISMP

CII.2.i – Lost use value

CII.2.ii – Lost nonuse value

Benefits

The benefits resulting from the ISMP are often referred to as the consumer's surplus or the value generated by this good or service to its user(s). This would represent the value imperiled species provide to people who value these animals and/or their associated habitat. When the good or service is privately produced it is considered private profit. In the case of most (if not all) imperiled species, no profits are generated to the regulatory agency and these benefits are captured by the consumers of benefits associated with the ISMP. Much like costs, benefits can be valued both directly and indirectly. In the case of direct benefits, there are analytical procedures to measure the impact of these benefits and their ripple effect through an economy. In the case of the ISMP, these benefits would include improvements to an economy resulting from implementation of the ISMP and restoration of one or more imperiled species. There are also indirect benefits that typically lack market value. In this case these benefits would include items such as improved ecological services and other non-market amenities such as improved wildlife viewing and hunting, for example. Anticipated benefits of the ISMP's implementation are outlined in Table 16.

Reporting benefits resulting from the ISMP is not required by the SERC; however, they are necessary to complete any BCA and useful to assist policy makers to see a more complete picture of their policy decisions.

Table 16. Taxonomy of possible benefits (B) of ISMP implementation.

I. Direct project Benefits	II. Indirect Benefits
1. Added, improved or restored marketable goods/services i. Direct effects (\$) ii. Positive impact on economy	1. Added, improved or restored nonmarketable goods/services i. Use value (Directly measureable) ii. Non-use value (Indirectly measureable)

Table 16 Summary:

BI.1 – Direct project benefits

BI.1.i – Direct economic effects – directly measureable economic benefits accruing to private firms and/or people as a result of the ISMP

BI.1.ii – Positive economic impact on economy – the indirect and induced economic affects also known as the economic ripple effects resulting from the actions in BI.1.i

BII.1 – Indirect project benefits

BII.1.i – Gained use value – value gained by people who use the resource benefited by the project – no actual transfer of money

BII.1.ii – Gained non-use value – value gained by people who do not directly use the resource benefited by the project – no actual transfer of money

Statement of Estimated Regulatory Costs

In Florida, Statement of Estimated Regulatory Costs requirements are limited to documenting the incremental changes in costs. As a result, a SERC will only track actual direct and indirect costs. More specifically, the criteria established by the SERC as prescribed by Section 120.54(3)(b), F.S., would limit cost items to CI.1, CI.2, and CII.1 in Table 15.

By statute, the SERC must adhere to the following format.

- An economic analysis showing whether the regulatory action directly or indirectly (CII.1)
 - Has an adverse impact on economic growth.
 - Has an adverse impact on private sector job creation or employment.
 - Has an adverse impact on private sector investment in excess of \$1 million in the aggregate within five years after implementation of the rule
 - Has an adverse impact on business competitiveness, including the ability of persons doing business in the state to compete with persons doing business in other states or domestic markets, productivity, or innovation in excess of \$1 million in the aggregate within five years after the implementation of the rule (CII.1).
 - Is likely to increase regulatory costs, including any transactional costs, in excess of \$1 million in the aggregate within five years after the implementation of the rule (CI.1, CI.2).
- A good-faith estimate of the number of individuals and entities likely to be required to comply with the rule, together with a description of the types of individuals likely to be affected by the rule (CI.2).
- A good-faith estimate of the cost to the agency, and to any other state and local government entities of implementing and enforcing the proposed rule (CI.1, CI.2).
- Estimate of any anticipated effect on state or local revenues (CII.1).

- A good-faith estimate of the transactional costs likely to be incurred by individuals and entities, including local government entities, required to comply with the requirements of the rule. As used in this section *transactional costs* are the direct costs that are readily ascertainable based on standard business practices and include filing fees, the cost of obtaining a license, the cost of equipment required to be installed or used or procedures required to be employed in complying with the rule, additional operating costs incurred, the costs of monitoring and reporting, and any other costs necessary to comply with the rule (CI.1, CI.2).
- An analysis of the impact on small businesses as defined by Section 288.703, F.S., and an analysis of the impact on small counties as defined in Section 120.52, F.S. The impact analysis for small business must include the basis for the agency's decision not to implement alternatives that would reduce adverse impacts on small businesses (C.II.1).
- Any additional information that the agency determines may be useful.

Biological staff from FWC and an economist from Florida Agriculture and Mechanical University reviewed the proposed Florida Administrative Code rule changes listed in [Table 5](#) to determine which would likely trigger an economic cost of \$1 million over five years (or \$200,000 annually). A summary of this review can be found in [Table 17](#), and the [full SERC](#) (Environmental Economics, Inc. 2016) is available for review. For rule changes thought likely to meet the impacts threshold as defined in Section 120.54(3)(b), F.S., a more detailed analysis was completed.

Over the past 5 years, only 25 permits were processed for incidental take of the state-listed species included in the ISMP. Examples of the mitigation provided by these types of projects varied from establishment of conservation easements, land acquisition, monetary donations, and addition of nest boxes to make habitat more suitable. Nine of the 25 provided no mitigation due to the status of the species or the type of permit that was being issued for human safety reasons. Economic analyses will be conducted for each Species Conservation Measures and Permitting Guidelines as they are developed, and the guidelines will continue to seek to use existing processes to limit additional regulatory impacts. The results of these analyses will be monitored by FWC to determine alternatives and ways to reduce costs by looking for new approaches to permitting and options that streamline the permitting process. It is expected that most of the economic loss experienced by these sectors will be captured by other sectors within the state's economy with little to no overall adverse economic impact.

The proposed revisions to the Rule 68A-27.003, F.A.C., will not restrict the ability of Florida businesses to compete in other states or domestic markets. Changes in regulatory and transactional costs for permitting of ISMP-related species were undetermined at the time of this report. However, the efficiencies gained will likely offset the potential costs as described above.

Because most of the species proposed for listing are either range limited or cryptic, only one proposed rule change, in paragraph 68A-27.003(2)(e), was determined likely to warrant a formal SERC; the others were considered unlikely to increase marginal costs to the statutorily-significant level (see [Table 17](#)). Within this proposed rule change, three groups of species are to be added to Florida's Endangered and Threatened Species List under Rule 68A-27.003, F.A.C., which may result in an economic impact more than \$1 million over five years (or \$200,000 annually) as defined in Section 120.54(3)(b), F.S. Following statutory protocol, FWC worked with an economist to conduct a preliminary SERC to estimate both the direct and opportunity costs associated with this proposed rule change.

The ISMP covers 37 Threatened species; 14 of these are already included as Threatened, while 23 were formerly Species of Special Concern that, when evaluated in 2010, were found to meet the criteria for Threatened

status. For many citizens, increasing protections for 23 species in the state may cause some concern; however, the specific impacts of these status changes need to be considered on a species-by-species basis.

Fourteen of the 23 species with increasing protections are found only in a small portion of the state with limited economic, social, or ecological impacts from a statewide perspective. These range-limited species include the Barbour's Map turtle, a species confined to four watersheds in the panhandle. This turtle occupies rivers designated as Outstanding Florida Waterways, for which DEP has the authority to establish rules that provide for the special category of waterbodies under Section 403.061(27), F.S., and additional considerations for activities, construction, or discharges must be considered. For species like the Santa Fe cave crayfish, a range-limited species found in only six caves in two counties in north central Florida, we anticipate negligible costs for the change in listing status. While the change in status may impact the private owners of four of the caves, or farming activities in the vicinity of the caves, conservation measures to protect this species are already covered under agricultural BMPs, and Section 810.13, F.S., prohibits dumping materials into caves.

Four of the species fall under the policy for Permitting Standards for Incidental Take of Cryptic Species, which outlines the importance of seeking information on species to meet the definition of scientific benefit. These include species like the Florida pine snake, Georgia blind salamander, Sherman's short-tailed shrew, and Florida Keys mole skink. For the Florida Keys mole skink, which is confined to Monroe County, changes to the listing status will not have negative economic impacts because verified sighting information and associated habitat characteristics can constitute a scientific benefit for applicants interested in acquiring an incidental take permit.

Fourteen of the species are included by the water management districts and DEP as wetland dependent; for these species, the ISMP proposes a new, streamlined approach to consider regulatory processes that address wetlands and incorporate protections for state-listed species. If the permits issued by other agencies adequately address FWC requirements for issuing a listed-species take permit, then these regulatory processes can fulfill the requirements of Chapter 68A-27, F.A.C., with minimal additional application process. The ISMP and species-specific Guidelines allow existing state processes for wetland permitting to address take with minimal additional mitigation costs. In order to create additional efficiencies, FWC is working with other state agencies, and much of the mitigation that is required for these wetland habitats may already be creating conservation gains for wetland dependent species. An analysis by economists Hazen and Sawyer (2016) found that the draft permitting guidelines for the Everglades mink, which includes this policy to allow state wetland permitting to address mitigation, resulted in no increased regulatory costs for that species. Consideration of these other regulatory processes when addressing take of state-listed species is among the approaches presented in the Law and Policy chapter. These include species such as Marian's marsh wren, Scott's seaside sparrow, Wakulla seaside sparrow, and Worthington's marsh wren (collectively referred to as the saltmarsh songbirds); saltmarsh top minnow; and southern tessellated darter. The saltmarsh songbirds are dependent on salt marshes dominated by smooth cordgrass (*Spartina alterniflora*) and black needlerush (*Juncus roemerianus*), much of which is under public ownership or regulated by DEP. Review of the last five years of permitting and commenting data found that FWC was asked to comment on approximately 2,600 projects with the potential to impact wildlife statewide, and of those projects nearly 40% were wetland related; potential impacts to wildlife were identified in less than half of these (1,121 projects), and 27% of those projects were wetland permitting projects, leading us to believe that at least a quarter of all projects will have increased efficiencies from the rule changes.

Most of the proposed rules that remove regulation or simply clarify rule language will not result in an economic impact to Floridians. Table 17 summarizes these potential considerations for assessing impacts of changes in listing status and Table 18 summarizes the factors that were considered in the assessment of potential costs associated with rule changes from Rule 68A-27.003, F.A.C.

Some rule changes reduce or eliminate regulation, providing potential benefits to some Florida citizens. The addition of a section to Rule 68A-16.003, F.A.C, which allows take of inactive nests of birds not listed as state Threatened, will align that rule with the policy on Nest Removal for Inactive Single-Use Nests of State-Threatened Birds, and eliminate the requirement for permits to remove these inactive nests. The FWC's Osprey Nest Removal Guidelines will be updated as part of implementing associated policies. Another change within the rule structure is to allow management plans or permitting guidelines to provide authorizations for certain activities. These authorizations are in lieu of any permitting needs, and should streamline regulation associated with some actions that also benefit human safety, such as right-of-way maintenance that improves sight lines and sign visibility for drivers in areas occupied by imperiled species. And finally, by adding human safety as a potential reason for issuing intentional take permits, FWC can increase capacity to respond effectively to situations where state-Threatened species and human safety are in conflict.

Eight species with increasing protections have been petitioned for federal listing. These include the reddish egret, Sanibel Island rice rat, Sherman's short-tailed shrew, and Key ringneck snake. Though increasing state regulations may have some cost to the citizens of Florida, development and implementation of the ISMP may help preclude federal listing, which may be a cost savings to the public. As of 2016, 19 species included in this plan have been petitioned for federal listing with the USFWS. Before recommending final listing actions, USFWS can consider the regulatory approaches and conservation actions outlined in this plan and the individual Species Action Plans, and these documents may help to preclude federal listing. Costs associated with regulatory actions for federally listed species are typically much higher than those associated with state-listed species, so precluding federal listing would be a benefit to the citizens of Florida. From 1989-2010, state and federal agencies spent an average of over \$631 million per year on listed species (Surrridge and Li 2014). Despite this expenditure, Surrridge and Li (2014) found that only 48 percent of listed species have been reported as stable or improving in the long term, highlighting the need to take action to preclude listing and to prioritize actions that could reallocate funding for at-risk species. An analysis conducted by the Balmoral Group projected that the total costs associated with avoidance, minimization, and mitigation for the wood stork (*Mycteria americana*) came to an annual total of \$2,593,810 (Balmoral Group 2016).

For some species that are remaining state Threatened, Species Conservation Measures and Permitting Guidelines have been drafted and released for public review. For many of the species that are considered wetland dependent or rely on water bodies for essential behavioral patterns (i.e., to breed, feed, and shelter), it can be difficult to assess the costs associated with conservation measures and permitting guidelines. For example, the Balmoral Group's 2016 analysis found that since the ERP process is already required for species like the Florida sandhill crane, and the costs incurred whether or not cranes are present, the costs are incremental and the incremental change in processing costs is relatively small (Balmoral Group 2016). The private sector's total estimated regulatory costs associated with the Florida Sandhill Crane Conservation Measures and Permitting Guidelines range from \$1,485,319 to \$2,370,499 annually. Over five years, the estimate goes up to \$12,076,915 because of the anticipated increase in the annual number of permits reviewed and issued. Almost all experts interviewed for the analysis indicated that it was difficult to separate costs of sandhill crane guideline compliance from existing costs to comply with freshwater wetland protection rules and as such, this estimate can be considered an upper bound.

Species Conservation Measures and Permitting Guidelines can also be consistent with existing regulations and guidance. For species in Monroe County, like the white-crowned pigeon and many state-listed reptiles like the Key ringneck snake and the Florida brown snake, the Monroe County Development Code addresses impacts to critical habitats like mangrove islands and tropical hardwood hammock, and is consistent with the draft Guide-

lines (Hazen and Sawyer 2016). Many of the specific conservation measures for white-crowned pigeons described in the draft Guidelines are already required by existing land development regulations in Monroe County. Monroe County environmental regulations state that hardwood hammocks greater than 12 acres are located in the Native Area land use (zoning) district, and regulations and clearing requirements for these areas are discussed in Section 130-3941 of the Monroe County Land Development Code. These regulations are similar for the Village of Islamorada and the City of Marathon, and mitigation costs are based on the replacement costs of specific plants and trees and can range from \$5,000 to \$60,000 per site. According to Monroe County, a standard hammock lot has about 3,000 square feet of clearing, which usually results in a mitigation fee ranging from \$5,000 to \$15,000, and occasionally close to \$20,000 (Hazen and Sawyer 2016). These fees are directed to the Monroe County Environmental Land Management and Restoration Fund, which is used only for land management and not land acquisition. The Monroe County Comprehensive Plan Land Authority purchases properties for conservation purposes, including hardwood hammocks. For those costs not covered by the county regulations, it is estimated that costs to avoid, minimize, and offset take of state-listed species in patches of tropical hardwood hammock greater than 12 acres in size could be up to \$127,640 over the next five years (Hazen and Sawyer 2016).

For cryptic species that inhabit forested wetlands, like the Everglades mink, estimating costs for implementing draft Guidelines relies heavily on the jurisdiction of other state agencies like DEP and the South Florida Water Management District. An economic analysis conducted by Hazen and Sawyer (2016) estimated that if implemented, surveys, avoidance, and minimization measures could range between \$14,804 and \$42,382 per site, with mitigation credits ranging from \$34,560 to \$172,000 per credit of freshwater forested wetland. Many of the avoidance measures outlined in the draft Guidelines (such as avoiding killing or injuring mink when observed, and allowing Everglades mink observed during construction activities to move safely away) are likely to have minimal costs. The ERP process can act as a multispecies option for Everglades mink and other species that use shallow freshwater marshes, swamp forests, coastal marshes, and mangroves. In many cases, mitigation provided through the ERP process may be sufficient to cover take of Everglades mink and would likely already be required by landowners planning to develop land on or near freshwater wetlands where mink are expected to roam. The draft Guidelines, relative to what is already required of the landowner under Florida's ERP regulations, are expected to incur no marginal cost (Hazen and Sawyer 2016).

Listed Species

- Anastasia Island Beach Mice.
- Gopher Tortoise, Indigo Snake & The **Florida** Mouse.
- **Listed** Birds: SE American Kestrel, Little Blue Heron, Tricolored Heron, White Ibis, and Wood Stork.
- Manatee.
- Right Whale.
- Sea Turtles.
- Bald Eagle.
- Fox Squirrel (**Florida** Fish & Wildlife Conservation Commission)

FRONT matrix

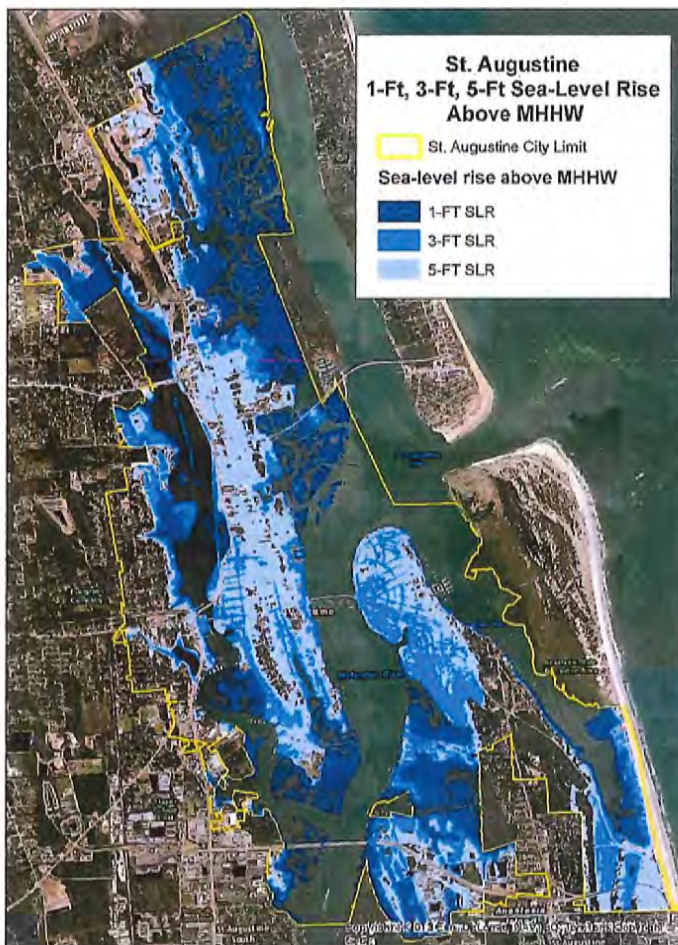
- Anastasia St. park
- Fort grounds
- Fort more

Adapting to Rising Tides

Coastal Resilience in St. Augustine: Baseline of Our Past, Beacon for Our Future

STUDY NARRATIVE

April 2016



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Executive Summary

Overview

For decades to come, St. Augustine, and coastal communities worldwide, will be increasingly affected by progressively rising seas. How the City prepares for the inevitability of sea level rise (SLR) is paramount to the success of the City's future resilience. This white paper, entitled Adapting to Rising Tides (ART), provides an *Introduction* to the SLR issue, an examination of *SLR Trends* from global to local, and a series of *SLR Projection* maps of the potential community *Impacts* given the City's geographic context. ART then summarizes the *Local Impacts*, discusses *Adaptation Strategies* currently being explored by other jurisdictions, and concludes with a list of *Next Steps* for the City to consider for the nearer- and longer-term future.

First Steps

The insights of ART provide a basis for City-wide policy discussions. ART suggests that the outcomes of these discussions may inform relevant amendments to the goals, objectives, policies, and strategies the City adopts in its statutorily-mandated Comprehensive Plan (Plan). For example, a new SLR Resiliency element may be added to the Plan. However, there is adequate capacity within the statutory framework for Plans in Florida to absorb and accommodate SLR goals, objectives, policies, and strategies throughout complementary existing elements.

Capital Improvements Element & Program. The University of Florida Resilient Communities Initiative (UFRCI) believes that productive City-wide discussions would engender implementation priorities that can be memorialized in the Capital Improvements Element (CIE) and Capital Improvements Program (CIP) of the City's Plan. The CIP is a good first step toward implementation of SLR adaptation activities, because the CIP helps to guide the City's budgetary investment priorities and is where policy starts becoming programmatic.

Intergovernmental Coordination, Cooperation, & Collaboration. The City need not face its SLR challenges alone. Like the multiscale driving factors and impacts of SLR, the City is part of a larger response web of local, regional, state, and federal scale actors and agencies. While the City-wide SLR adaptation discussion proceeds with jurisdictional concerns and considerations foremost, the City will probably be best-served by collaborating with these other entities at every level. This includes the City availing itself to the collaborative context of its ongoing partnership with UFRCI. Given the City's prominence as the Nation's Oldest City, it occupies a unique position to embrace the leading edge of the global conversations and actions to adapt to SLR.

Next Steps

The *Next Steps* and *Appendix* sections provide a suggested roadmap for further study on the development and implementation of City policies, procedures, and projects for SLR adaptation. As considered above, the ultimate strategies to adapt the City to the SLR challenge are policy decisions for City leaders to consider over the coming months, years, and decades. As rising tides force the governing bodies of coastal jurisdictions to make difficult decisions and allocate finite resources to adapt to the challenges that SLR portends, the policy and the planning efforts that support them are unlikely to be definitive or dispositive. The effort should be ongoing and reiterative as new information and greater knowledge is gained as to the ongoing effects of SLR, and as strategies are deployed and tested for their successes.

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1 Introduction and Purpose

Of the numerous challenges facing coastal communities in the foreseeable future, one of the most pernicious is that of **relative sea level rise (SLR)**. Accepted projections for tidal and storm surge levels for the Northeast Florida coast over the next 15 to 85 years suggest SLR from 0.25 – 6.67 feet (0.08 – 2.03 meters). At these levels the infrastructure, neighborhoods, and historic properties in the City of St. Augustine’s lower-lying areas will be adversely affected. Upgrading the form and function of public infrastructure may improve the community’s resilience to the economic, environmental, and social disruptions that will likely accompany Northeast Florida SLR.

1.1 Coastal Florida: Economically Valuable, Ecologically Vulnerable

Because of Florida’s low elevation and extensive coastal line (more than 1200 miles), the State is particularly vulnerable to the effects of SLR. An estimated 75% of Florida’s 19.5 million population lives in coastal countiesⁱ and those counties “generate 79% of the state’s total annual economy”ⁱⁱ. Florida’s coasts also include productive ecosystems which support plant and animal life, provide food sources and invaluable ecosystem services. Florida ranks first nationally in coastal recreation participation at an estimated value between \$5.36 billion to \$23.75 billion annually.ⁱⁱⁱ

Potential negative effects that could result from SLR, include but are not limited to:

- Permanent inundation of low-lying coastal areas;
- Increased intermittent coastal flooding from storms and/or higher spring tides resulting in damage to physical public infrastructure (e.g., roads, bridges, lift stations), homes, businesses, civic and cultural resources, and related critical facilities;
- Reduction in capacity, or complete failure, of stormwater management systems;
- Beach and shoreline erosion and migration;
- Alteration, degradation, or collapse in coastal habitats, ecosystem services, and managed natural resources; and
- Impacts to groundwater via saltwater intrusion, further magnified by increased consumptive use and extraction with population growth.

1.2 St. Augustine: Baseline of Our Past, Beacon for Our Future

As the “oldest continuously occupied settlement of European and African American origin in the United States,” St. Augustine is a national treasure. The City was founded in 1565, in part, because of its location on a natural harbor accessible to the Atlantic Ocean.

By design, the central part of the city and adjacent fortifications were originally constructed on lands assumed to remain dry from sea and storm given known coastal and inland floodplain trends at that time. Over several centuries, the City gradually expanded along the natural coastal ridge that spans the east coast of Florida. The lower-lying lands east of the ridge, toward the Intracoastal Waterway (ICW) and beyond to the Atlantic Ocean, are those areas mostly likely to be negatively affected by incremental SLR.

Given the longevity and history of the City, the iterative planning for SLR scenarios through the year 2100 is reasonable and necessary, if not imperative. Like a lighthouse alerting sailors to the impending

shift from sea to land, the City has a profound opportunity to serve as a national beacon highlighting the strategic resilience and adaptive capacity planning needed for all coastal cities in this new era of changing shorelines and floodplains.

National Landmarks at Risk

Union of Concerned Scientists



A recent report from the Union of Concerned Scientists, *National Landmarks at Risk*, compiles a selection of case studies that highlight the urgency of SLR threats to the nation's most cherished monuments and historic sites, including the City. Castillo de San Marcos, North America's oldest masonry fort, is threatened by rising tides and is featured on the cover of that report. The "living seawall" completed by the National Park Service in 2011 adjacent to Castillo de San Marcos and other issues facing the historic district are referenced in the report. This is recognition at the highest levels that the well-being of the City is inherent to the well-being of the many historic assets to which the City is a steward and should encourage the City and its larger governance partners in their future collaboration endeavors.

1.3 Purpose of this Study

This study provides an overview of the potential SLR risks faced by the City and the opportunities for fostering resilience and adaptive capacity through local government action, leadership, and planning in collaboration with other arms of governance and forms of community involvement. This study narrative, and its associated appendices, provide the following decision support services to the City: (1) inform the community of current SLR trends and projections; (2) suggest potential land use and land cover SLR impacts; (3) provide theoretical time frames and "tipping points" during which critical City assets become inundated; and (4) summarize future action planning and outreach opportunities.

2 Sea Level Rise (SLR): Global vs. Relative Trends and Projections

2.1 Study Nomenclature

This section uses terms that may need clarification. "SLR" refers to sea level rise. "Global" SLR refers to a planetary average. "Relative" SLR refers to a local comparison between a single tide gauge and a single point on land. "Trend" refers to actual historical measurements. "Projection" refers to hypothetical future estimates. For the purposes of this study and unless preceded by the phrase "global average," all references to "SLR" make use of the "relative SLR" specific to the City.

2.2 Global Average SLR Trends

Global or "eustatic" sea level has risen about 8 inches over the last century and is projected to rise an additional 12 to 48 inches (0.31 to 1.22 meters) by 2100.^{iv} While the average rate of global SLR over the last century was 0.67 inches (17.0 mm) per decade, however, the rate has increased to 1.26 inches (32.0 mm) per decade over the last twenty years.^{v, vi} Two (2) primary factors contributing to global SLR: (1) thermal expansion from ocean warming and (2) net water volume increases from the melting of glaciers and ice sheets.^{vii} See **the Appendices** for additional information.

2.3 Relative SLR Trends

We often hear the term, "global sea level rise," when considering coastal risk. However, sea levels are not rising uniformly across the globe. Some locations are experiencing greater rates of sea level rise than the global average, while others are experiencing lower. The differences are related to factors such

as whether the land near the shore is sinking (subsidence) or rising (uplift), ocean currents, wind patterns, etc. When estimating the potential effects of sea level rise for a particular geographic area, it is critical to evaluate **relative** or local sea level rise.

Relative sea level rise (SLR) refers to how much sea levels are rising relative to a point on land. Relative SLR is estimated using local or relative sea level trends, which are calculated using historical measurements or observations of local sea level at individual tide stations. As such, relative SLR is more important for local decision support than global average SLR.

The National Oceanic and Atmospheric Administration (NOAA) operates a permanent network of tide stations across the United States to collect data on local water levels, tides, and currents. Tide gauges have been used in the U.S. since the late 1800s to reliably measure water levels.

2.4 Northeast Florida Relative SLR Trends

Generally, the east coast of the United States, including North Florida, has been gradually sinking since the last glacial peak approximately 20,000 years before present.^{viii} Two (2) tide stations exist in proximity to St. Augustine: (1) Fernandina Beach and (2) Mayport. In operation since 1898, the Fernandina Beach tide gauge records show relative SLR of about 8 inches (203.2 mm) in the last 100 years, at a rate of 0.81 inches (20.6 mm) per decade.^{ix} Similarly, the Mayport tide gauge records show relative SLR of about 8 inches (203.2 mm) since the tide gauge started collecting data in 1928, at a rate of 0.98 inches (24.9 mm) per decade.^x While the Fernandina Beach rate of relative SLR is similar to the observed rate of global SLR over the past century, the Mayport rate of relative SLR is about 20% higher.

2.5 Northeast Florida Relative SLR Projections

Sea level trends, which are based on historical local sea level observations, are used with models of future scenarios of sea level to estimate what sea levels might be at a given point in the future. Given the longer historical data record, relative SLR trends from the Fernandina Beach tide station were used to estimate projected future sea levels within this study. Trends from this tide station were overlaid with two (2) sets of future sea level projections for evaluation and mapping: (1) the U.S. Army Corps of Engineers (USACE) and (2) the National Climate Assessment, commonly referred to as the NOAA projections. See **the Appendices** for a more complete explanation of this study's projection methodology, including alternative projections from the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR5) and the Southeast Florida Climate Compact.

Utilizing the USACE Sea-Level Change Curve Calculator, USACE and NOAA sea level rise projections were compiled by decade from the year 2030 through the year 2100 using relative SLR trends from the Fernandina Beach tide station (**Table 1** and **Figure 1**). The table below shows five projections (two projections are equivalent), with resulting amounts of relative SLR from 0.25 – 6.67 feet (0.08 – 2.03 meters).

Table 1. USACE and NOAA Relative Sea Level Rise (SLR) Projections, 2030 – 2100.

Year	Projected Amount of Relative Sea Level Rise (Feet)				
	NOAA Low & USACE Low	NOAA Int Low & USACE Int	NOAA Int High	USACE High	NOAA High
2030	0.25	0.38	0.66	0.79	0.99
2040	0.32	0.52	0.98	1.17	1.50
2050	0.38	0.68	1.35	1.63	2.10
2060	0.45	0.86	1.77	2.17	2.81
2070	0.52	1.06	2.26	2.77	3.63
2080	0.58	1.27	2.80	3.45	4.54
2090	0.65	1.50	3.39	4.21	5.56
2100	0.72	1.75	4.05	5.04	6.67

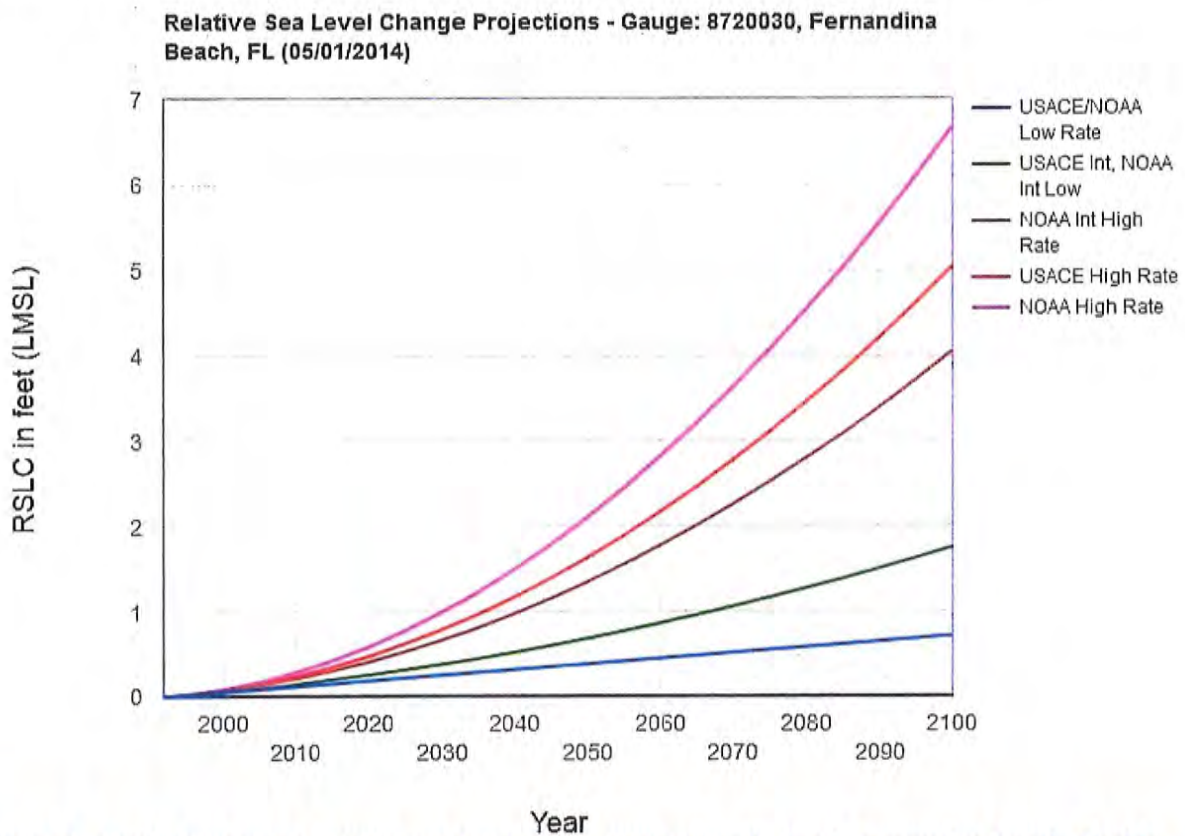


Figure 1. USACE and NOAA relative sea level change projections (in feet), Fernandina Beach, Florida.

3 Relative Sea Level Rise (SLR): Potential St. Augustine Local Impacts

3.1 Relative SLR Inundation Mapping Methodology

This paper utilized a “bathtub” model for mapping SLR on top of high tide (Mean Higher High Water – MHHW – tidal datum). A Digital Elevation Model (DEM), sourced from Lidar data, was used to identify low-lying areas. Six (6) relative SLR scenarios (6-inches, 1-foot, 2-foot, 3-foot, 4-foot, and 5-foot) were initially mapped to get an overview of the amounts of estimated relative SLR over the next century and to decide with which scenarios to conduct map overlays. Under only six (6) inches of relative SLR, approximately 23% of the City’s land area is affected, the majority of which is salt marsh. By three (3) feet of relative SLR, the potentially affected land area of the City rises to 42% and impacts extend into the built infrastructure.

Because of the limited scope of this report, the following three (3) scenarios were used to evaluate potential impacts to the City: **1-foot, 3-foot, and 5-foot of relative SLR on top of MHHW**. These scenarios represent reasonable planning thresholds, both in the amount of land area impacted and the projected time period for impacts. A scenario of one-foot of SLR would affect approximately 25% of the City’s area and is projected to occur as early as 2030, or as late as 2070. While the one-foot scenario only affects 2% more area than the 6 inch scenario, the results of impact analyses using a one-foot scenario will yield a higher level of confidence because of the margin of error within the elevation data. Furthermore, one-foot and three-foot SLR scenarios were used in the regional SLR analysis *Planning Matanzas*.

A three-foot SLR scenario would affect approximately 42% of the City and is projected to occur as early as 2070, or as late as 2100. As detailed in this report, the three-foot SLR scenario could significantly impact the City’s assets and built environment. Finally, a five-foot SLR scenario would affect approximately 68% of the City and is projected to occur no earlier than 2085. While the impacts to the City under this scenario are the greatest, the time frame for potential impacts is towards the end of this century.

Using the three relative SLR scenarios, simple GIS overlays were conducted to evaluate the potential impacts to the City of St. Augustine’s built and natural environments. Additional details on these methods can be found in the Study Appendices.

While SLAMM (Sea Level Affecting Marshes Model) has been used for other regional analyses, this study used a bathtub model. Both the bathtub model and SLAMM identify low-lying areas vulnerable to flooding from sea level rise. SLAMM results go further to identify land use changes that could occur if developed areas transition to wetland and open water. Because of the limited scope of this report and because much of the City is already urbanized, this study did not assume that developed areas would transition to wetland or open water. This land use transition adaptation strategy should be subject of continuing community dialog.

3.2 Potential St. Augustine Relative SLR Impacts

The following categories were analyzed for potential impacts: (a) Low-lying land areas; (b) Land use types; (c) Land cover types; (d) Critical infrastructure and asset types; and (e) Historical and cultural resources.

3.2.1 Low-Lying Areas Affected

The first analyses included calculation of the land area, land use types, and land cover types potentially impacted at three (3) increasing intervals of relative SLR. **Table 2** summarizes these three (3) scenarios of projected relative SLR (one-foot, three-foot, and five-foot) and the corresponding time frames when that amount of relative SLR is projected to occur. The acres, square miles, and percent of the City inundated under each level of relative SLR (**Table 2** and **Figure 2**) are based on the USACE and NOAA projections (**Table 1**). It should be noted that the time frame in **Table 2** does not include historic sea level trend (USACE Low and NOAA Low rates), which only projects 8 inches of relative SLR by 2100 and does not account for ocean warming or glacial melt.

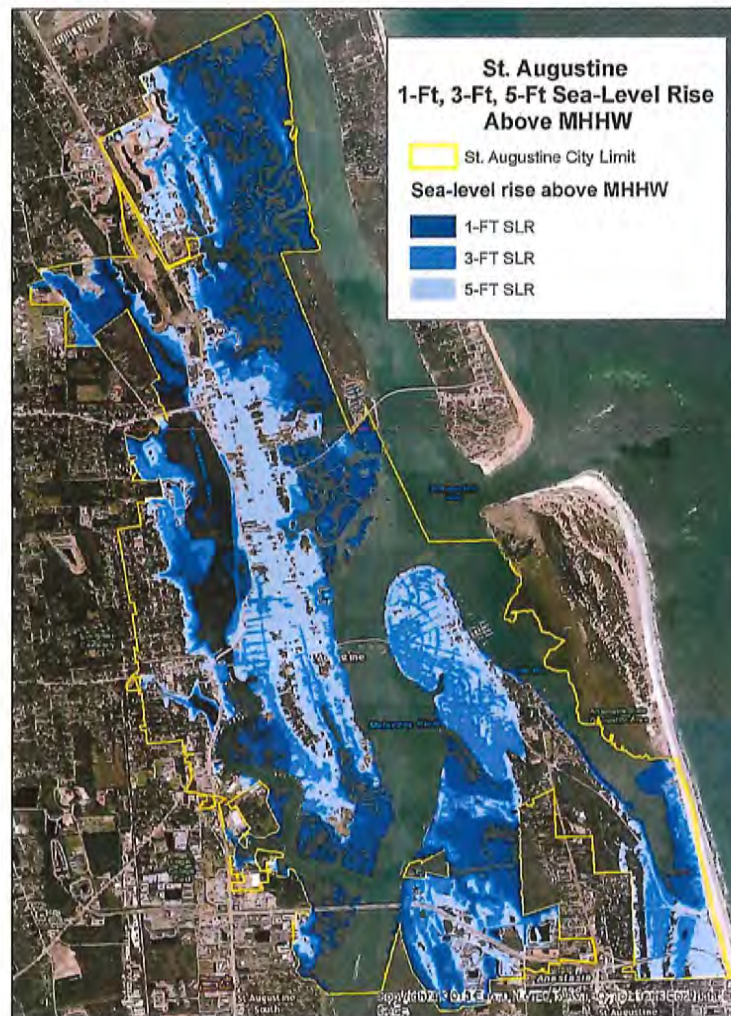


Figure 2. One-foot, three-foot, and five-foot scenarios of relative SLR over MHHW in the City of St. Augustine. Full size images are available within the Appendices.

Table 2. Area of City Impacted for Three Relative SLR Scenarios Over MHHW.

RSLR Above MHHW (Feet)	Time Frame (Year)	City Area (Acres)*	Area Inundated		
			(Acres)	(Sq. Miles)	(% of City)
1.0	2030 – 2070	5,362	1,353	2.11	25.22%
3.0	2070 – 2100+	5,362	2,260	3.53	42.15%
5.0	2085 – 2100+	5,362	3,672	5.74	68.48%

*Total City Acres of 5,362 or 8.38 square miles was used for the analyses in this report. This number is based on the dry land area identified in the Digital Elevation Model within the City Boundaries.

3.2.2 Land Cover Types Affected

Table 3 details the land cover types potentially affected under the three relative SLR scenarios (**Figure 3**). The percentages listed for each scenario in **Table 3** represent the proportion of each impacted land cover type to the total area for that type. These percentages are meant to indicate the major land cover types affected under each SLR scenario. Not surprisingly, the land cover type most affected under these three scenarios of relative SLR is Salt Marsh. These salt marshes provide critical ecosystem services for the area. Inundation of these salt marshes may diminish the protective storm surge buffering function they currently serve.



Figure 3. Visual area of potentially impacted land cover types for three relative SLR scenarios over MHHW. Full size images are available within the Appendices.

Table 3. Acreage of Potentially Impacted Land Cover Types for Three Relative SLR Scenarios MHHW.

City Land Cover		1-Foot SLR Impacts		3-Foot SLR Impacts		5-Foot SLR Impacts	
(Type)	(Acres)	(Acres)	(%)	(Acres)	(%)	(Acres)	(%)
Salt Marsh	2022.6	1207.9	59.7	1265.9	62.6	1269.3	62.8
Transportation	838.4	4.7	0.6	173.5	20.7	465.5	55.5
Residential, Med. Density (2-5 DU/AC)	749.3	12.0	1.6	178.0	23.8	424.5	56.7
Mixed Hardwood-Coniferous	291.4	11.9	4.1	110.6	38.0	220.7	75.7
Residential, High Density (> 5 DU/AC)	310.1	3.0	1.0	50.5	16.3	199.9	64.5
Commercial and Services	373.8	2.5	0.7	36.7	9.8	173.3	46.4
Shrub and Brushland	236.4	8.0	3.4	66.9	28.3	159.8	67.6
Maritime Hammock	321.6	1.2	0.4	52.8	16.4	154.1	47.9
Institutional	247.8	2.8	1.1	27.7	11.2	144.1	58.2
Parks and Zoos	80.7	1.8	2.2	20.9	25.9	49.7	61.6
Cultural - Terrestrial	92.6	2.2	2.4	24.8	26.8	48.2	52.1
Mangrove Swamp	42.9	38.6	90.0	41.1	95.8	41.6	97.0
Beach Dune	60.2	4.2	7.0	20.4	33.9	34.6	57.5
Community rec. facilities	34.0	0.7	2.1	8.5	25.0	29.9	87.9
Rural Open	35.9	1.1	3.1	15.4	42.9	28.5	79.4
Mesic Flatwoods	26.8	1.5	5.6	25.2	94.0	26.6	99.3
Mixed Scrub-Shrub Wetland	27.1	7.1	26.2	18.6	68.6	24.3	89.7
Marshes	22.4	5.6	25.0	16.3	72.8	21.3	95.1
Wet Prairie	20.3	2.0	9.9	19.6	96.6	19.8	97.5
Urban Open Land	127.9	0.1	0.1	1.7	1.3	15.1	11.8
Coastal Uplands	13.7	4.2	30.7	12.9	94.2	13.7	100.0
Hydric Pine Flatwoods	17.1	0.0	0.0	5.8	33.9	13.7	80.1
Coastal Grassland	11.5	1.9	16.5	9.6	83.5	11.2	97.4
Mixed Wetland Hardwoods	27.9	0.0	0.0	6.8	24.4	11.1	39.8
Non-vegetated Wetland	9.8	8.3	84.7	8.6	87.8	8.6	87.8
Estuarine	1791.2	7.2	0.4	7.8	0.4	8.0	0.4
Other Wetland Forested Mixed	16.1	0.0	0.0	5.5	34.2	7.9	49.1
Sand Beach (Dry)	30.7	6.6	21.5	7.4	24.1	7.5	24.4
Residential, Low Density (< 2 DU/AC)	12.0	0.3	2.5	2.4	20.0	6.1	50.8
Sewage Treatment Pond	12.9	0.2	1.6	1.0	7.8	4.8	37.2
Industrial	15.0	0.1	0.7	1.3	8.7	4.5	30.0
Utilities	7.7	0.1	1.3	3.0	39.0	3.6	46.8
Stormwater Treatment Areas	4.7	0.1	2.1	1.1	23.4	2.8	59.6
Wet Flatwoods	2.7	0.0	0.0	2.0	74.1	2.3	85.2
Artificial Impoundment / Reservoir	88.6	0.2	0.2	1.2	1.4	2.3	2.6
Floating / Emergent Aquatic Vegetation	1.7	0.0	0.0	1.4	82.4	1.7	100.0
Tidal Flat	47.5	1.3	2.7	1.4	2.9	1.4	2.9
Riverine	71.7	1.0	1.4	1.4	2.0	1.4	2.0
Cultural - Lacustrine	1.3	0.0	0.0	1.3	100.0	1.3	100.0
Cypress	1.8	0.0	0.0	0.0	0.0	1.2	66.7
Urban Open Forested	0.9	0.0	0.0	0.1	11.1	0.9	100.0
Field Crops	0.5	0.2	40.0	0.5	100.0	0.5	100.0
Extractive	2.1	0.0	0.0	0.0	0.0	0.3	14.3
Total Impact (All Types)	8151.3	1351.0	16.6	2258.0	27.7	3668.0	45.0

3.2.3 Land Use Types Affected

Next, land use types were overlaid with the relative SLR scenarios to give context to the types of affected land area. **Table 4** details the land uses of the potentially affected areas under three critical relative SLR scenarios. The percentages listed for each scenario in **Table 4** represent the proportion of each impacted land use type to the total area for that type. These percentages are meant to indicate the major land use types affected under each SLR scenario. The land uses most affected are Public/Semi-Public, Acreage Not Zoned for Agriculture, Residential, Vacant Residential, and Recreation. **Figure 4** visually represents the impacted land use types detailed in **Table 4**.

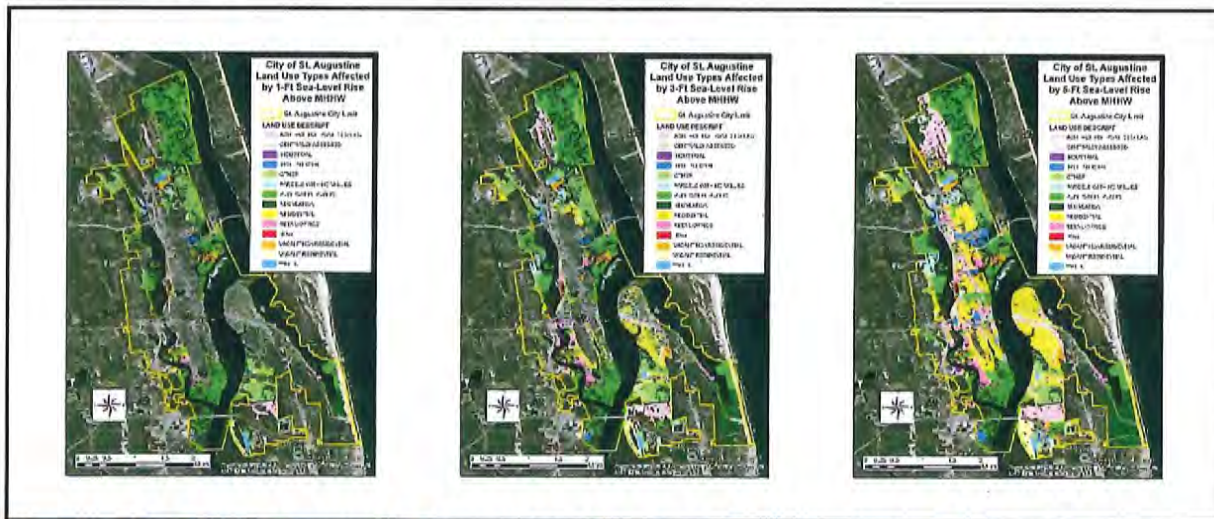


Figure 4. Visual area of potentially impacted land use types for three relative SLR scenarios over MHHW. Full size images are available within the Appendices.

Table 4. Acreage of Potentially Impacted Land Use Types for Three Relative SLR Scenarios MHHW.

City Land Use		1-Foot SLR Impacts		3-Foot SLR Impacts		5-Foot SLR Impacts	
(Type)	(Acres)	(Acres)	(%)	(Acres)	(%)	(Acres)	(%)
Public / Semi-Public	1778.3	592.5	33.3	704.9	39.6	826.5	46.5
Residential	1000.6	35.4	3.5	220.7	22.1	605.7	60.5
Parcels / No Value (Water, Roads)	2362.3	63.0	2.7	251.2	10.6	516.0	21.8
Other (Mostly open land)	639.7	377.5	59.0	404.7	63.3	412.7	64.5
Acreage Not Zoned for Agriculture	435.8	72.1	16.5	175.6	40.3	306.0	70.2
Retail / Office	565.5	30.4	5.4	85.5	15.1	237.3	42.0
Recreation	333.7	35.0	10.5	107.2	32.1	214.0	64.1
Vacant Residential	322.6	38.9	12.1	131.9	40.9	212.8	66.0
Institutional	218.2	15.9	7.3	35.9	16.5	131.8	60.4
Vacant Non-Residential	241.3	46.0	19.1	70.9	29.4	111.0	46.0
Water	62.9	30.8	49.0	40.9	65.0	44.8	71.2
Centrally Assessed	66.4	8.2	12.3	19.0	28.6	29.6	44.6
Industrial	41.4	0.3	0.7	2.3	5.6	11.0	26.6
ROW	21.6	4.9	22.7	7.3	33.8	10.5	48.6
Total Impact (All Types)	8090.3	1351.0	16.7	2258.0	27.9	3668.0	45.3

3.2.5 Critical Infrastructure and Asset Types

To assess the impact of relative SLR on the City's critical infrastructure and public assets, the following five (5) categories were analyzed: (1) Social Services/ Government Buildings (including but not limited to fire and police stations, City Hall, post offices, and libraries); (2) Key cultural attractions on the National Register of Historic Places (including the Castillo de San Marcos and the Cathedral Basilica of St. Augustine, which were selected for their national and local prominence and high visibility in the city); (3) Schools and Universities (primarily public schools); (4) Parks and Recreational Facilities; and (5) Public Works Facilities (including lift stations, manholes, and the location of the Wastewater Treatment Plant on Riberia Street). The asset categories were each overlaid with the three (3) relative SLR scenarios to assess if, and when, an asset might be impacted. **Table 5** summarizes the potentially affected stormwater facilities (mapped in **Figure 5** and **Figure 6**). **Table 6** lists the potentially affected City government building assets (mapped in **Figure 7**). **Table 7** lists the potentially affected parks and recreational facilities (mapped in **Figure 8**).



Figure 5. Potentially affected lift stations for three relative SLR scenarios over MHHW. Full size images are available within the Appendices.

Figure 6. Potentially affected sewer manholes for three relative SLR scenarios over MHHW. Full size images are available within the Appendices.

Table 5. Summary of Potentially Affected Public Works Facilities for Three Relative SLR Scenarios Over MHHW.

City Public Works Assets		1-Foot SLR Impacts		3-Foot SLR Impacts		5-Foot SLR Impacts	
(Type)	(Total #)	(#)	(%)	(#)	(%)	(#)	(%)
Lift Stations	45	2	4	18	40	32	71
Manholes	1578	6	0	437	28	1097	70
Waste Water Treatment Plant (1 plant,	1	1	100	1	100	1	100
Total Impact (All Types)	1624	1351	83	2258	139	3668	226



Figure 7. Potentially affected city building assets for three relative SLR scenarios over MHHW. Full size images are available within the Appendices.

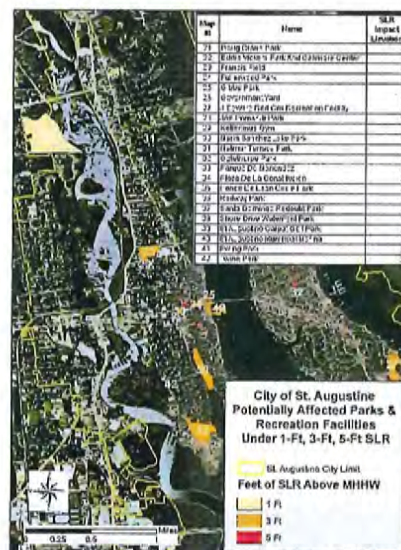


Figure 8. Potentially affected city parks and recreational facilities for three relative SLR scenarios over MHHW. Full size images are available within the Appendices.

Table 6. Potentially Affected City Building Assets (Social Services/ Government Buildings, Cultural Attractions, and Schools) for Three Relative SLR Scenarios Over MHHW.

Asset Category	Map ID	Asset Name	SLR Impact Elevation (Feet)
Social Services/ Government Buildings	1	City of St. Augustine Fire Dept. Main Station	5
	2	Replacement Station 7 (Proposed Replacement)	3
	3	St Augustine Police Department	3
	4	Lightner Museum City Hall Complex	3
	5	National Guard Armory	5
	6	National Guard Headquarters of Florida (Barracks)	3
	7	St Augustine Branch Post Office	5
	8	St Augustine Historic Downtown Parking Facility	5
	9	St Johns County Main Library	5
	10	St Johns County School Board	3
	11	St Johns County Visitors Center	5
Cultural Attractions	12	Castillo de San Marcos	1
	13	St Augustine Alligator Farm	5
	14	St Augustine Amphitheatre	5
	15	The Cathedral Basilica of St. Augustine	5
Schools and Universities	16	Flagler College	3
	17	Florida School for the Deaf and Blind	3
	18	Ketterlinus Elementary School	3
	19	University of St. Augustine	3

Table 7. Potentially Affected Parks and Recreation Facilities for Three Relative SLR Scenarios Over MHHW.

Asset Category	Map ID	Name	SLR Impact Elevation (Feet)
Parks and Recreation Facilities	21	Doug Crane Park	3
	22	Eddie Vickers Park And Galimore Center	3
	23	Francis Field	3
	24	Fullerwood Park	3
	25	Gibbs Park	3
	26	Government Yard	5
	27	J Edward Red Cox Recreation Facility	3
	28	Joe Pomar Jr Park	1
	29	Ketterlinus Gym	3
	30	Maria Sanchez Lake Park	3
	31	Nelmar Terrace Park	1
	32	Oglethorpe Park	5
	33	Parque De Menendez	3
	34	Plaza De La Constitucion	3
	35	Ponce De Leon Circle Park	3
	36	Railway Park	5
	37	Santo Domingo Redoubt Park	5
	38	Shore Drive Waterfront Park	1
	39	St Augustine Carpet Golf Park	3
	40	St Augustine Municipal Marina	3
	41	Swing Park	5
	42	Twine Park	3

3.2.6 Historical and Cultural Resources

To assess the potential impacts of relative SLR on the City's historical and cultural resources, GIS data from the Florida Master Site File was utilized. The Florida Master Site File, which is maintained by the Florida Division of Historical Resources, is an inventory of historic resources including cemeteries, districts, and structures. These historic resources in the Florida Master Site File may or may not be listed in the National Register of Historic Places (NRHP), which is an official federal designation of historical significance. Historic sites listed on the NRHP, as well as historic cemeteries and historic structures were overlaid with the three (3) scenarios of relative SLR and impacts are summarized below in **Table 8** and **Table 9**, as well as visualized in **Figure 9**, **Figure 10**, and **Figure 11**.

The Florida Master Site File lists 12 historic cemeteries within the City, none of which would be affected under a one-foot relative SLR scenario. Five (5) historic cemeteries would be potentially affected under a three-foot relative SLR scenario, and 11 historic cemeteries would be potentially affected under a five-foot relative SLR scenario (**Table 8** and **Figure 9**).

The Florida Master Site File lists approximately 3,288 structures recorded on its inventory within the City of St. Augustine. These structures are primarily private residences. At the one-foot relative SLR scenario, only four (4) structures (all private residences) are potentially affected. At the three-foot and five-foot relative SLR scenarios, approximately 922 and 2,291 structures, respectively, are potentially affected (**Table 8** and **Figure 10**).

Furthermore, 31 sites are individually listed on the National Register of Historic Places within the City. Under a one-foot relative SLR scenario, four (4) of these sites would be potentially affected, including the Castillo de San Marcos National Monument. Under a three-foot relative SLR scenario, another 11 sites would be potentially affected, and under a five-foot relative SLR scenario, another nine (9) sites would be potentially affected. See **Table 9** and **Figure 11** below for the list of specific sites potentially affected under the three (3) relative SLR scenarios.



Figure 9. Potentially affected historic cemeteries for three relative SLR scenarios over MHHW.
Full size images are available within the Appendices.

Figure 10. Potentially affected historic structures for three relative SLR scenarios over MHHW.
Full size images are available within the Appendices.

Table 8. Summary of Florida Master Site File Affected Historic Structures and Cemeteries for Three Relative SLR Scenarios Over MHHW.

Florida Master Site File - Historic Resources		1-Foot SLR Impacts		3-Foot SLR Impacts		5-Foot SLR Impacts	
(Type)	(Total #)	(#)	(% Private)	(#)	(% Private)	(#)	(% Private)
Florida Master Site File - Historic Structures	3,288	4	100	922	79	2291	81
Florida Master Site File - Historic Cemeteries	12	0	N/A	5	N/A	11	N/A

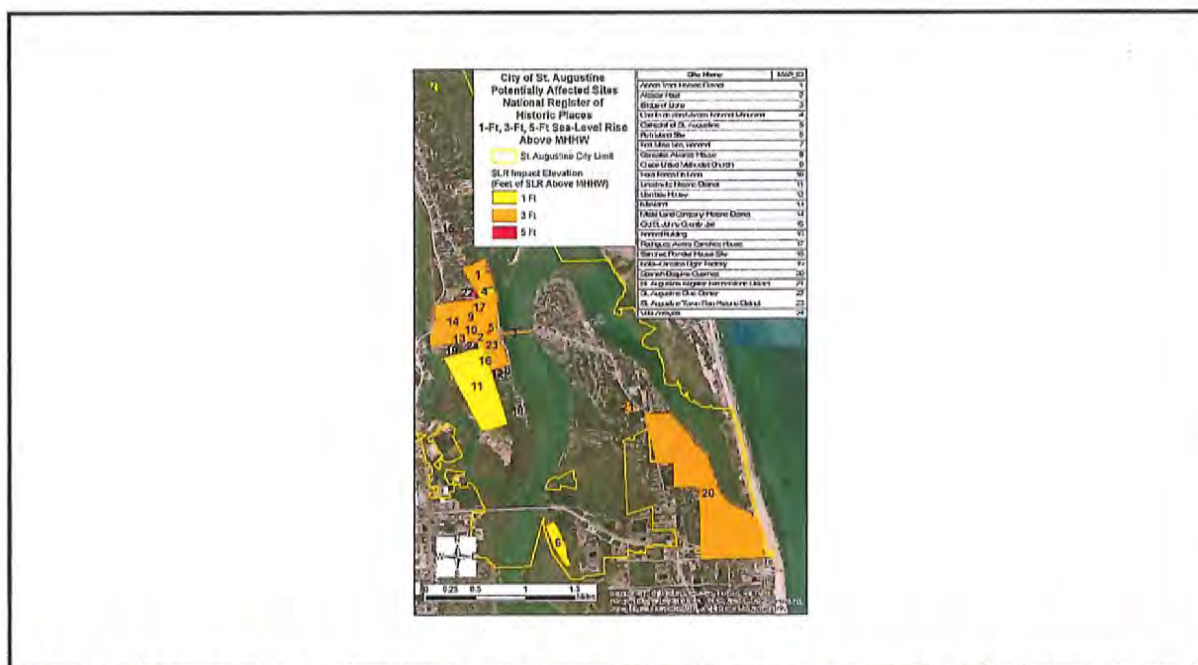


Figure 11. Potentially affected National Register of Historic Places for three Relative SLR scenarios ver MHHW. Full size images are available within the Appendices.

Table 9. Summary of Potentially Affected Sites on the National Register of Historic Places for Three Relative SLR Scenarios Over MHHW.

Site Name	SLR Impact (Feet above MHHW)	Site Name	SLR Impact (Feet above MHHW)
Castillo de San Marcos National Monument	1	Solla—Carcaba Cigar Factory	3
Fort Mose Site, Second	1	Bridge of Lions	3
Fish Island Site	1	St. Augustine Alligator Farm Historic District	3
Lincolnville Historic District	1	Gonzalez-Alvarez House	5
St. Augustine Town Plan Historic District	3	Cathedral of St. Augustine	5
Spanish Coquina Quarries	3	Rodriguez-Avero-Sanchez House	5
Abbott Tract Historic District	3	Sanchez Powder House Site	5
Model Land Company Historic District	3	Llambias House	5
Alcazar Hotel	3	Markland	5
Hotel Ponce De Leon	3	St. Augustine Civic Center	5
Grace United Methodist Church	3	Villa Zorayda	5
Record Building	3	Old St. Johns County Jail	5

3.3 Summary of Potential St. Augustine Local Impacts

Under the scenarios of one-foot, three-foot, and five-foot relative SLR, 25%, 42%, and 69% of the City's land area would be permanently inundated or submerged. The following sub-sections describe in more detail the major potential impacts for each of the three scenarios, based on GIS analyses conducted for this study.

3.3.1 One-Foot Relative SLR Over MHHW Scenario

Approximately 1,353 acres or 25% of the City's land area would be inundated with one (1) foot of relative SLR, which is ***projected to occur as early as 2030, or as late as 2070.***

The majority of this impacted area is Salt Marsh (approximately 89%) and Mangrove Swamp (approximately 3%). In relation to relative sea levels, these tidal ecosystems are typically among the lowest elevation, and the most heavily impacted, land cover types under all relative SLR scenarios. The effects of rising tides on salt water marsh habitats is well documented in Florida, and scientists suggest it is imperative to implement conservation and adaptation measures of these tidal ecosystems as quickly as possible.^{xi}

Analysis shows potential inundation to the Castillo de San Marcos National Monument, but that could be protected by the current seawall. Analysis also shows limited inundation on the perimeter of the Wastewater Treatment Plant property, in close proximity to the plant's northern most treatment structures.

Large areas of impacted salt marsh include the areas along the Tolomato River in the northeastern part of the City, along the San Sebastian River in the western part of the City, along the Matanzas River in the southern part of the City, and along Salt Run on the western side of Anastasia Island and Anastasia State Park. Land uses potentially affected include Public/ Semi-Public (approximately 44% or 592 acres), Open Land (approximately 28% or 378 acres), Acreage not zoned for agriculture (approximately 5% or 72 acres), and Vacant Non-Residential (approximately 3% or 46 acres).

3.3.2 Three-Foot Relative SLR Over MHHW Scenario

Approximately 2,260 acres or 42% of the City's land area would be inundated with three (3) feet of relative SLR, which is ***projected to occur as early as 2070, or as late as 2100.***

Salt marsh comprises a majority (approximately 56%) of the affected area, but within this scenario impacts also begin to extend into urbanized land uses. Land cover classes affected include Residential Medium Density two to five (2-5) dwelling units per acre (approximately 178 acres or 8%), Transportation (approximately 174 acres or 8%), Mixed Hardwood-Coniferous (approximately 111 acres or 5%), and Shrub and Brushland (approximately 67 acres or 3%).

Land uses potentially affected include Public/ Semi-Public (approximately 705 acres or 31%), Open Land (approximately 405 or 18%), Acreage not zoned for agriculture (approximately 176 acres or 8%), Residential (approximately 221 acres or 10%), Vacant Residential (approximately 132 acres or 6%) and Recreation (approximately 107 acres or 5%).

Residential areas on the western and northern parts of Anastasia Island are significantly impacted. Impacts to the City's public works facilities can also be seen under a three-foot relative SLR scenario, including 18 lift stations and 437 manholes potentially submerged and continued inundation on the

property of the Wastewater Treatment Facility. Notable assets potentially impacted at the three-foot relative SLR scenario include City Hall, the Police Department, National Guard Headquarters of Florida, Flagler College, the Florida School for the Deaf and Blind, and the St. John's School Board. Additionally, more significant inundation occurs around the Castillo de San Marcos National Monument. Parks and recreational facilities are also impacted, with 14 of the 23 facilities located in the City affected at the three-foot relative SLR scenario.

3.3.3 Five-Foot Relative SLR Over MHHW Scenario

Approximately 3,672 acres or almost 69% of the City's land area would be inundated with five (5) feet of relative SLR, which is ***projected to occur no earlier than 2085***.

In earlier relative SLR scenarios, many properties and assets are only partially submerged due to relative SLR. However, under a five-foot relative SLR scenario, many properties and assets become completely submerged. Land cover classes affected include Salt Marsh (approximately 1,269 or 35% of impacted area), Transportation (approximately 466 acres or 13%), Residential Medium Density two to five (2-5) dwelling units per acre (approximately 425 acres or 12%), Mixed Hardwood-Coniferous (approximately 221 acres or 6%), Residential High Density greater than five (5) dwelling units per acre (approximately 200 acres or 5%) and Commercial and Services (approximately 173 acres or 5%).

Land uses most affected include Public/ Semi-Public (approximately 764 acres or 26% of impacted area), Open Land (approximately 410 acres or 14%), acreage not zoned for agriculture (approximately 241 acres or 8%), Residential (approximately 440 acres or 15%), Vacant Residential (approximately 174 acres or 6%) and Recreation (approximately 172 acres or 6%).

Major impacts would be seen in residential areas, social service facilities, government buildings, historic districts, stormwater facilities, parks and recreational facilities, and more. Notable assets impacted include the Cathedral Basilica of St. Augustine, Fire Department Main Station, St. Augustine Civic Center, St. Augustine Amphitheater, and St. John's County Main Library. While these impacts can appear troubling, given the earliest estimated time frame for those relative SLR amounts, the City has several decades to design and develop adaptive strategies.

4 Next Steps: Community Adaptation Strategies and Tools

Given existing knowledge, guidance, and preliminary local government implementation, the City may choose to consider five major categories of adaptation strategies and five major categories of adaptation tools worthy of the City of St. Augustine's future consideration.

4.1 Planning for Relative SLR in the City

To date, the most comprehensive resource in Northeast Florida to address relative SLR is the recently completed *Planning for Sea Level Rise in the Matanzas Basin* project, led by the University of Florida and the Guana Tolomato Matanzas National Estuarine Research Reserve (GTM NERR). The three-year project, funded by the NERR System Science Collaborative, engaged local stakeholders within a population area of 150,000 residents, across 264,000 acres within St. Johns and Flagler Counties, and "investigated the Matanzas area's vulnerability to sea level rise and identified [locally relevant, spatially explicit] potential adaptation strategies."

Planning for Sea Level Rise in the Matanzas Basin

Project Homepage: <http://planningmatanzas.org/>

Document and Data Library: <http://planningmatanzas.org/documents/>

4.2 Adaptation Strategies

Current consensus, though still evolving, relative SLR adaptation strategies to develop and deploy include the following: (1) protection; (2) accommodation; (3) managed retreat or relocation; (4) avoidance; and (5) procedural. The basic purposes and applicability of these five (5) strategies are described below. Several existing resources (referenced in the Appendices) offer additional implementation and/or case study details. It is important to note that not all of these strategies may be suitable to the City and more thorough future evaluation will be necessary. **Protection strategies** (e.g., hard or soft armoring) may be applicable to valued assets with significant location-dependence, yet are unsuitable for infrastructure alteration or relocation. **Accommodation strategies** (e.g., redesigning, reengineering) may be applicable to valued assets which are suitable to alteration to reach sufficient elevation thresholds to avoid scenario-based inundation risks. **Managed retreat or strategic relocation strategies** (e.g., voluntary setbacks, transfer of development rights, easements) may be applicable to expendable assets with higher vulnerability to SLR and coastal hazards. **Avoidance strategies** (e.g., guiding urban development away from high risk areas) may be applicable to governmental policies, processes, and practices which define future land use planning. **Procedural strategies** (e.g., vulnerability assessments, community outreach and education) may be applicable to governmental policies, processes, and practices which deal with data collection and storage, geospatial and visual analytics, and related information technologies.

4.3 Adaptation Tools

Common relative SLR adaptation tools for the City to investigate for implementation include the following: (1) coordination, cooperation, collaboration, and decision support; (2) planning; (3) regulatory; (4) financial: government spending; and (5) financial: taxes, trusts, and market-based.

4.3.1 Learning from the Lessons of Other Institutions and Agencies

At the regional and local levels in Florida it is important to build upon the work done by others and to thoroughly examine the specific impacts of relative SLR in each locale. The State of Florida does not currently have a comprehensive statewide relative SLR adaptation strategy. However, much work has been done at the federal level, and in other states, regions, and cities, that can be applied to Northeast Florida. In addition, organizations such as the Florida Department of Economic Opportunity (DEO), the St. Johns River Water Management District (SJRWMD), and the Army Corps of Engineers (ACE) have adopted or implemented guidelines that assist in creating local strategies. **The materials referenced in the Appendices to this study summarize and point to these resources.**

4.3.2 Intergovernmental Coordination, Cooperation, and Collaboration

Policies, procedures, and jurisdictional boundaries vary. Regardless, no governmental entity is an island unto itself. The City is inextricably part of a larger web of local, regional, state, federal and global actors and agencies. We cannot overemphasize the fact that tools to address complex national and natural security challenges like SLR require continuous and mindful intergovernmental coordination, cooperation, and collaboration.

The State of Florida comprehensive plan regulations provided in [Section 163.3177\(6\)\(h\), F.S. 2015](#) require an Intergovernmental Coordination Element to clearly identify interacting governmental units

and coordinating mechanisms to address any potential inter-jurisdictional impacts from urban development. The scope and scale of the relative SLR threat and successful adaptation suggest that the City voluntarily revise the existing comprehensive plan elements, as appropriate, or alternatively, implement a stand-alone element with specific goals, objectives, policies, and strategies to establish a clear and comprehensive community-wide approach to relative SLR. A good opportunity to engage the community and local stakeholders would be the next Evaluation and Appraisal Review (EAR) of the City's Comprehensive Plan, which is due in December 2018. Once adopted, this element or provisions in appropriate elements will provide the basis and rationale for prioritized implementation through the City's Capital Improvement Plan and land development regulations. **Table 10** provides a useful matrix identifying important intergovernmental roles and agents. In conclusion, we note that the Adaptation Tools section of the Appendices references several especially useful resources for providing local government decision support.

Table 10. Possible coordination roles and collaborative agents working toward SLR and coastal hazard mitigation and adaptation within Florida local governments.^{xiii}

SLR / Hazard Mitigation & Adaptation Role	Emergency Management				Growth Management, Planning, & Building				Public Works	Environmental Protection		Administrative & Elective			
	SLR & coastal hazard data analyst(s)	Recovery operations expert(s)	Mitigation operations expert(s)	Evaluation & shelter expert(s)	Planning & zoning official(s)	Growth management planner(s)	Community development planner(s)	Building code official(s)	Electric & gas utility official(s)	Public works official(s)	Natural resource manager(s)	Hazardous waste manager(s)	City/County manager	City/County attorney	Budget & finance chief
Prepare, review, & update LMS hazards identification & vulnerability assessment	✓			✓					✓		✓	✓			
Prepare, review, & update CEMP hazards analysis	✓			✓							✓	✓			
Assess natural hazard constraints in FLUE land suitability analysis	✓				✓	✓			✓	✓	✓	✓			
Analyze proposed dev/redevelopment in hazard areas for FLUE review & update any proposed FLUM amendments	✓			✓	✓	✓	✓				✓	✓			
Re-evaluate community exposure & vulnerability after disasters	✓			✓	✓			✓	✓	✓					
Review & update SLR / hazard mitigation policies in LMS, PDRP, AAA, & Comprehensive Plan	✓		✓	✓	✓	✓	✓	✓			✓	✓			
Review & update SLR / hazard mitigation structural projects in LMS, AAA, & CIE	✓		✓	✓	✓				✓	✓	✓	✓			
Review & update hazard redevelopment policies in LMS, PDRP, AAA, & Comprehensive Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
Review & update PDRP operations policies and procedures		✓			✓		✓	✓	✓	✓			✓	✓	✓
Participate as member of Recovery Task Force	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓

5 Endnotes

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- ⁱ Wilson, Steven G. and Thomas R. Fischetti. (May 2010). *Coastline Population Trends in the United States: 1960 to 2008*. Current Population Reports. U.S. Census Bureau. p. 4. <https://www.census.gov/prod/2010pubs/p25-1139.pdf>
- ⁱⁱ Florida Oceans and Coastal Council. (December 2010). *Climate Change and Sea-Level Rise in Florida: An Update of the Effects of Climate Change on Florida's Ocean & Coastal Resources*. pp. 1-2. <http://www.dep.state.fl.us/oceanscouncil/reports/>
- ⁱⁱⁱ Pendelton, Linwood H. *The Economic and Market Value of Coasts and Estuaries: What's at Stake?* pp. 167-168. http://www.habitat.noaa.gov/pdf/economic_and_market_valueofcoasts_and_estuaries.pdf
- ^{iv} Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds. 2014: *Climate Change Impacts in the United States: The Third National Climate Assessment*. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2. <http://www.globalchange.gov/nca3-downloads-materials>
- ^v IPCC. (2013). *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.- K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp, doi:10.1017/CBO9781107415324. <http://www.ipcc.ch/report/ar5/wg1/>
- ^{vi} Mitchum, Gary. T. (August, 2011). *Sea Level Changes in the Southeastern United States: Past, Present, and Future*. University of South Florida. Florida Climate Institute and Southeast Climate Consortium. <http://www.floridawca.org/node/271>
- ^{vii} The Earth's oceans absorb approximately 90% of the heat trapped by excess greenhouse gases in the atmosphere. About 40% of the historically observed sea level rise (SLR) can be attributed to thermal expansion from ocean warming, while 60% can be attributed to glacial and ice sheet melt. Source: Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds. 2014: *Climate Change Impacts in the United States: The Third National Climate Assessment*. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2. <http://www.globalchange.gov/nca3-downloads-materials>
- ^{viii} Gillis, Justin. January 13, 2014. *The Flood Next Time*. The New York Times: Environment Section. http://www.nytimes.com/2014/01/14/science/earth/grappling-with-sea-level-rise-sooner-not-later.html?smid=tw-share&_r=0
- ^{ix} Mean Sea Level Trend. Tide Gauge 8720030: Fernandina Beach, FL. (NOAA). http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8720030
- ^x Mean Sea Level Trend. Tide Gauge 8720218: Mayport, FL. (NOAA). http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8720218
- ^{xi} Noss, Reed F., Joshua S. Reece, Thomas Hctor, Michael Volk, and Jon Oetting. *Adaptation to Sea-Level Rise in Florida: Biological Conservation Priorities*. Grant Report. Kresge Foundation, August 27, 2014. <http://dx.doi.org/10.13140/2.1.4068.2881>.
- ^{xii} Excerpted and adapted from *Protecting Florida's Communities: Land Use Planning Strategies and Best Development Practices for Minimizing Vulnerability to Flooding and Coastal Storms*. Florida Department of Community Affairs. 2005. p 48. http://research.fit.edu/sealevelriselibrary/documents/doc_mgr/449/Florida_Community_Protection_-_DCA_2005.pdf

Conservation and Coastal Management Element**Coastal Management Goal**

To prevent loss of life and damage to property in the coastal areas from the effects of natural disasters, including sea level rise and intense rain events, while encouraging appropriate public access to and use of coastal areas.

CCM Objective 10

In the event that public or private property in the City is damaged by a natural disaster, the postdisaster redevelopment will reduce or eliminate the risk of human life and property damage by natural hazards which includes sea level rise and intense rain events. The measurable target for this objective is that, in the event property is damaged or destroyed by a natural disaster, postdisaster redevelopment will be in accordance with: (1) the densities and intensities of land use established by the Future Land Use Plan; (2) the criteria for developing in the Conservation Overlay Zones implemented by the City Code; and (3) requirements of the Building Code.

CCM Objective 13

The City will reduce natural hazard impacts through compliance with FEMA regulations, participation in the NFIP's Community Rating system (CRS), and by targeting vulnerable properties for mitigation.

CCM Policy 13.1: The City shall continue to participate in the Federal Emergency Management Agency's National Flood Insurance Program and Community Rating System in order to achieve higher flood insurance premium discounts.

CCM Policy 13.2: Development and redevelopment in the City will be consistent with or more stringent than the flood-resistant constructions in the Florida Building Code and applicable floodplain management regulations set forth in 44 C.F.R part 60.

CCM Objective 14

The City will promote the development of adaptation strategies and engineering solutions for areas vulnerable to coastal flooding, tidal events, storm surge, flash floods, stormwater runoff, salt water intrusion and other impacts related to climate change or exacerbated by sea level rise, with the intent to increase the City's comprehensive adaptability and resiliency capacities.

CCM Policy 14.1: To assess the impacts of sea level rise and increased rainfall, at a minimum, the City will draw upon the Coastal Vulnerability Assessment: City of St. Augustine and Strategic Adaptation Plan for St. Augustine, Florida, or similar detailed vulnerability assessment. The City's basis for measuring sea level rise may be revised from time-to-time in acknowledgement of evolving data and associated vulnerabilities.

CCM Policy 14.2: Strategies for preparing for sea-level rise, such as increasing road surface elevation standards, subsurface stabilization, stormwater management and drainage, and adjustment of bridge heights to allow for navigation, should be collectively assessed and implemented where appropriate.

Adaptation strategies may apply to the following:

- a. Public infrastructure planning, siting, construction, replacement, operation, and maintenance;

- b. Emergency management;
- c. Stormwater management;
- d. Land development regulations;
- e. Building codes;
- f. Comprehensive planning; and
- g. Other functions

CCM Policy 14.3: Any construction activities seaward of the coastal construction control lines (CCCL) established pursuant to s. 161.053 will be consistent with Chapter 161: Beach and Shore Preservation. Infrastructure and roadway improvements within already developed public rights-of-way will be maintained as required to meet minimum level of service standards.

CCM Policy 14.4: Armoring or other shoreline stabilization efforts by property owners shall not disrupt or harm adjacent or nearby properties.

CCM Policy 14.5: The City shall engage stakeholders, county departments and other agencies to increase planning and implementation of natural erosion prevention and hazard mitigation.

CCM Policy 14.6: The City shall promote the installation of low impact development (LID) or green infrastructure (GI) on public property and encourage its installation on private property. Potential types of LID/GI include but are not limited to:

- a. Bioretention cells and rain gardens;
- b. Permeable pavements;
- c. Cisterns and detention basins;
- d. Bioswales; and
- e. Green roofs

Future Land Use Element FLU

Objective 9:

The City will assess its land development that recognizes the adverse impacts of sea level rise and as rainfall and storm patterns intensify.

FLU Policy 9.1: To assess the impacts of sea level rise and increased rainfall, at a minimum the City will draw upon the Coastal Vulnerability Assessment: City of St. Augustine and Strategic Adaptation Plan for St. Augustine, Florida. The impacts will be reassessed at 5-year intervals or as new sea level data becomes available that would be significant enough to warrant new analysis.

Transportation Element

TE Goal: To maintain a coordinated, multi-modal transportation system which provides for the safe, efficient, and economical movement of people, goods, and services, which is consistent with the Future Land Use Plan, recognizes the impact resulting from sea level rise and higher, more intense rainfall, conserves energy, and protects the City's natural, cultural, and historical resources.

Transportation Objective 1.6: The City shall take steps to improve its transportation system that protects the lives and property of its residents from the effects of natural disasters including high tide events, storm surge, flash floods, stormwater runoff and sea level rise.

Policy 1.6.1: When evaluating new development proposals or redevelopment proposals, the City staff and elected officials will require developers to build in a manner that lessens risk to transportation public investments and private property, particularly those areas identified in the Conservation and Coastal Management Element map series and the Coastal High Hazard Area shown in Future Land Use element map series.

Housing Element

Housing Goal: No new goal is needed. The existing goal is pretty all-encompassing and is broad enough that it could be considered to covers issues such as SLR and intense rainfall as part of the "...sound and satisfying living environment..." and "...improved structural and aesthetic conditions..." language.

Housing Objective 6: For housing areas that are prone flooding due to rising sea levels and intense rainfall, the City will address the susceptibility and develop solutions that result in building back in a manner which reduces the vulnerability to flood hazard consistent with the City's postdisaster redevelopment policies.

Policy 6.1: To review and implement ways that housing stock either, new or retrofit, are built in stronger and safer ways using professional building standards such as ones that are promoted by organizations such as, National Institute of Standards and Technology (NIST).

Infrastructure Element Sanitary Sewer Sub-element

SS Goal: Wastewater facilities shall continue to be provided in an efficient manner supporting the intended development of the City depicted by the Future Land Use Map. However, any proposed future extension or expansion of wastewater facilities in areas affected by sea level rise or significant rain events will be discouraged.

SS Objective 1.5: The City shall act to discourage expansion of wastewater facilities in areas susceptible to sea level rise and increased rainfall.

SS Policy 1.5.1: The City will review Coastal Vulnerability Assessment: City of St. Augustine, Florida and Strategic Adaptation Plan for St. Augustine, Florida and implement appropriate wastewater system improvements, paid from utility revenues.

Potable Water Sub-element

PW Goal: Potable water facilities shall continue to be provided in an efficient manner supporting intended development of the City depicted by the Future Land Use Map; however, any proposed future extension or expansion of wastewater facilities in areas affected by sea level rise or significant rain events will be discouraged.

PW Objective 1.6: The City shall act to discourage expansion of potable water distribution system in areas susceptible to sea level rise and increased rainfall.

PW Policy 1.6.1: Potable water facilities shall continue to be provided in an efficient manner that recognizes the potential impact of climate change and supports the intended development of the City depicted by the Future Land Use Map.

Solid Waste Sub-element

SW Goal: Solid waste services and facilities shall continue to be provided in an efficient manner supporting intended development of the City depicted by the Future Land Use Map; however, any proposed future extension or expansion of solid waste facilities in areas affected by sea level rise or significant rain events will be discouraged.

SW Objective 1.3: The City shall act to discourage expansion of solid waste services and facilities in areas susceptible to sea level rise and increased rainfall.

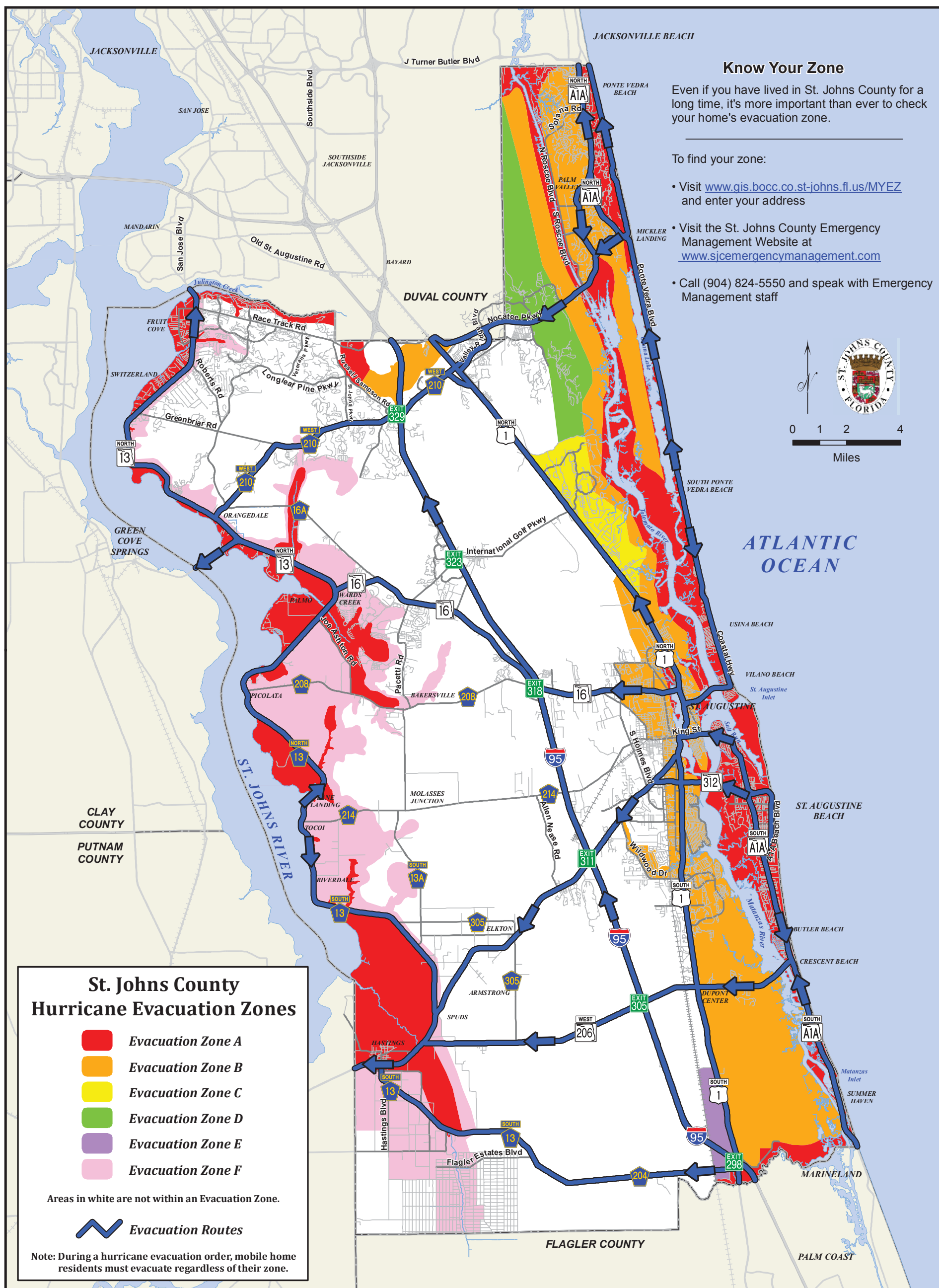
SW Policy 1.3.1: Solid waste services and facilities shall continue to be provided in an efficient manner that recognizes the potential impact of climate change and supports the intended development of the City depicted by the Future Land Use Map.

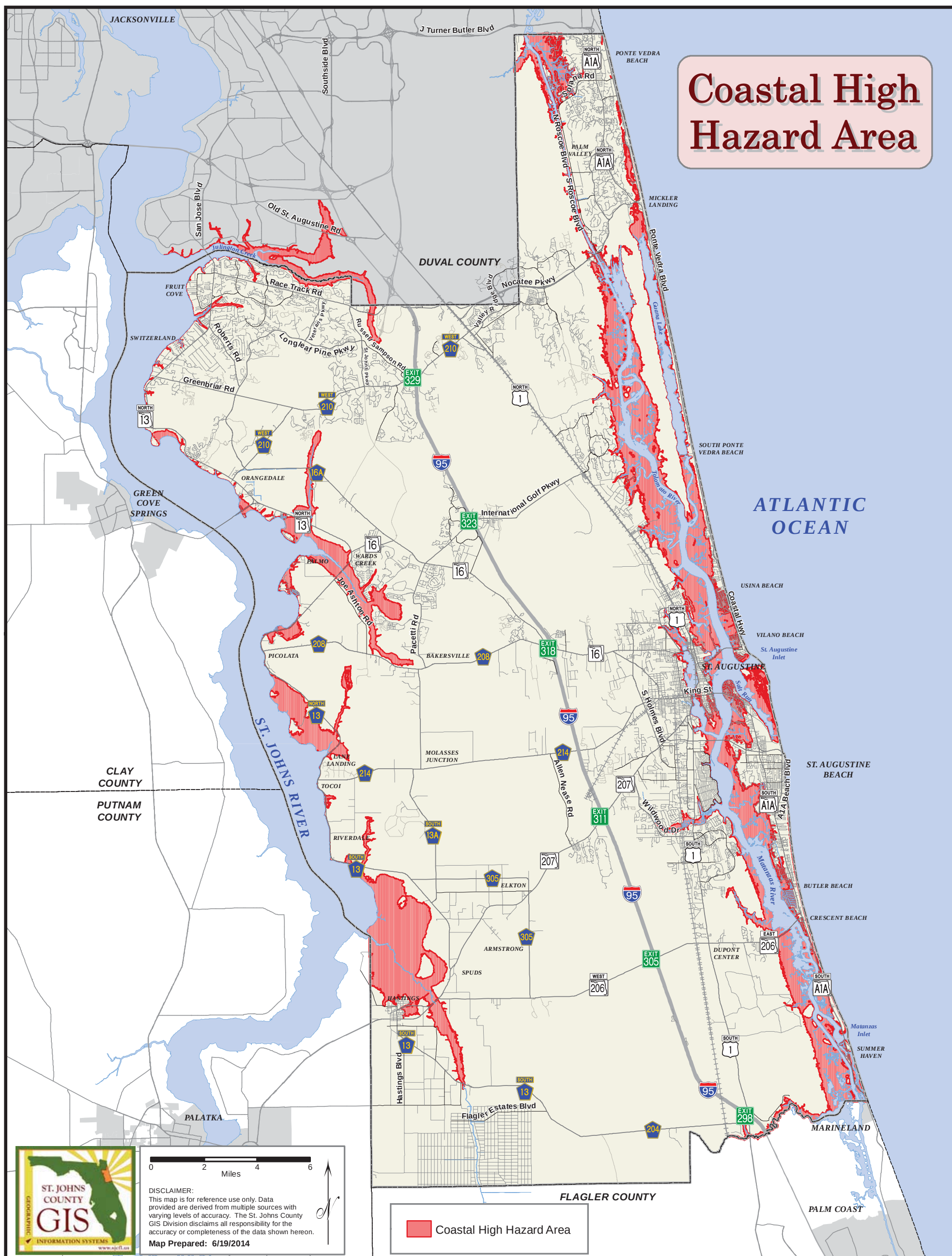
Intergovernmental Coordination Element

ICE Policy 3.8 – The City may collaborate with adjacent municipalities, the State, and regional partners as appropriate to develop strategies for responding to sea level rise, including consideration of the effects of sea level rise on potable water sources, saltwater intrusion, wastewater treatment facilities and the water table.

ICE Policy 3.9 – The City shall participate in, when appropriate, coordinated governmental, nongovernmental, and other appropriate agencies' proposed application requests for funding adaptation implementation projects.

ICE Policy 3.9 – The City shall participate in regional flood hazard assessments such as multijurisdictional local mitigation strategies, regional evacuation studies, and similar risk assessments to identify flood risk which results from high-tide events, storm surge, flash floods, stormwater runoff, and the related impacts of sea-level rise. Participation in regional studies are intended to result in coordinated strategies to mitigate impacts or remove properties and critical infrastructure from flood risk areas.







LEGEND

Flood Zones

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A - No base Flood Elevations determined.
- ZONE AE - Base Flood Elevations Determined.
- ZONE AE Floodway - The Floodway is a channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
- ZONE AH - Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO - Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE VE - Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

OTHER FLOOD AREAS

- ZONE X SHADED - Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 1% annual chance flood.
- ZONE X - Areas determined to be outside the 0.2% annual chance floodplain.
- AREA NOT INCLUDED

Data Source: Federal Emergency Management Agency (FEMA) - December 7, 2018.

Map Revisions

LETTER OF MAP CHANGE (LOMC)

- LOMC - FIRM Data Not Revised

CBRA Zones

Coastal Barrier Resources Systems (CBRS)

- CBRA Zones



**St. Johns County
Flood Zones Map**

01.534.5

Miles

DISCLAIMER:
This map is for reference use only. Data provided are derived from multiple sources with varying levels of accuracy. The St. Johns County GIS Division disclaims all responsibility for the accuracy or completeness of the data shown herein.
Map Prepared: 12/7/2018



Historic Preservation Element

HP Goal: Protect, maintain and enhance the historic integrity and ambiance within the City of St. Augustine amid changing environmental circumstances while encouraging economic growth and the identification, preservation, continued use, and adaptive reuse of existing historic structures.

HP Objective 3: Continue to identify, preserve and encourage the adaptive reuse of historic structures in all areas of the City, recognizing that preservation must in some cases entail adaptation to changing environmental circumstances.

CITY OF ST. AUGUSTINE

MEMORANDUM

TO: Planning and Zoning Board

DATE: May 21, 2019

RE: Item 5
Discussion and Public Comment Related to the Draft Recreation and Open Space Element of the Comprehensive Plan including Draft Goals, Objectives and Policies

This item will be rescheduled for a Workshop at a future date.

If you have any questions or require additional information please contact myself or David Birchim at our office by calling (904) 825-1065 or by email at either askinner@citystaug.com or dbirchim@citystaug.com.



Amy McClure Skinner
Deputy Director
Planning and Building Department