

# Draft Outline

## Indian River County

# Lagoon Management Plan

April 2019

### PREPARED FOR

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**Indian River County Board of County  
Commissioners**

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## ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
ArcNLET	ArcGIS-Based Nitrate Load Estimation Toolkit
BMAP	Basin Management Action Plan
DEM	Digital Elevation Model
DEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FIND	Florida Inland Navigation District
FWC	Florida Fish and Wildlife Conservation Commission
HAB	Harmful Algal Bloom
IRL	Indian River Lagoon
LEAPS	Low Energy Aquatic Plant System
LiDAR	Light Detection and Ranging
mgd	Million Gallons Per Day
NEP	National Estuary Program
NFIP	National Flood Insurance Program
SJRWMD	St. Johns River Water Management District
TIITF	Trustee of the Internal Improvement Trust Fund
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

## EXECUTIVE SUMMARY

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The Indian River Lagoon (IRL) system is a unique and diverse estuary that connects Volusia, Brevard, Indian River, St. Lucie, and Martin counties. The IRL is part of the National Estuary Program (NEP), one of 28 estuaries of National Significance. The IRL has something to offer for every resident and visitor to Indian River County including recreational and commercial fishing; sailing, kayaking, paddle boarding, and boating; site seeing and birdwatching; bioluminescent tours; dining on the waterfront; and beautiful sunrises and sunsets. The IRL provides \$7.6 billion in economic value based on the 2016 IRL Economic Valuation Update report by the Treasure Coast and East Central Florida Regional Planning Councils, and this value does not consider the \$934 million in added real estate valuation. Of the total economic benefit, \$738 million per year is directly attributed to the County.

The IRL is an estuary, which is a coastal waterbody where freshwater tributaries meet and mix with seawater. The IRL is oriented parallel to the coast with few open inlets to the east, which create a restricted, but free, exchange with the adjacent open ocean. To the west, channelized flow of canal systems into the IRL have drained the land and altered the lagoon freshwater inputs. The balance of this delicate ecosystem has been disturbed as development in the area has led to harmful impacts due to elevated levels of nutrients, sediments, and organic material entering the lagoon. Sources of these pollutants include, but are not limited to, stormwater runoff from urban and agricultural areas, excess fertilizer applications, failing septic systems, biosolids, atmospheric deposition, and organic material from uplands including leaf litter, grass clippings, and sediment. These pollutants contribute to cloudy conditions in the lagoon and feed algal blooms, both of which negatively affect the seagrass community that provides habitat for much of the lagoon's estuarine life.

Efforts have been ongoing for decades to address these sources of pollution. Despite significant load reductions, recent signs of human impact to the IRL system have been magnified. To the north of Indian River County, the 2011 "superbloom" occurred, which was an intense algal bloom in the Mosquito Lagoon, Banana River Lagoon, and North IRL. While the County was spared the most severe impacts of the "superbloom," a secondary, less intense bloom occurred in the Central IRL in the Indian River County area. Since that time, there have been recurring algal blooms and fish kills in the County's portion of the IRL. The proximity of the County to the Sebastian Inlet has lessened the effects of these algal blooms due to saltwater and freshwater exchange through the inlet. However, this access to the ocean has allowed red tide to enter the IRL, which may cause impacts to the IRL in Indian River County. To the south, releases from Lake Okeechobee dominate the issues in the IRL. Billions of gallons of freshwater, often polluted with algae, nutrients, and other contaminants, flow into the IRL through the St. Lucie River causing harmful and often toxic algal blooms and other water quality issues.

While challenges for the lagoon to the north and south are clearer, the specific challenges and priorities for the County are not as clear. This plan seeks to identify the specific issues having the greatest impacts to the County's portion of the lagoon, priorities for projects needed to have the most effect on improving the IRL, and research how these identified impacts can be reduced or eliminated.

To restore balance to the IRL, the County seeks to develop a management plan that is specific to the County's portion of the lagoon. The existing development, land uses, geography, and hydrology associated with this portion of the lagoon vary significantly from conditions in the counties to the north and south. The initial step in this process is to evaluate existing data to provide a better understanding of what the specific challenges are and what information is needed to develop a plan that provides a long-term strategic solution. To accomplish this, the County will implement the Five R's:

- **Research** to identify impacts and strategically target key items for the revitalization of the lagoon;
- **Reduce** the pollutant and nutrient inputs to the lagoon from fertilizer, failing septic systems, groundwater seepage into canals, and untreated stormwater runoff;
- **Revitalize** the ecosystem by increasing water-filtering oyster habitat, seagrass beds, lagoon related natural occurring components, and removing invasive species;

- **Rally** the community around the lagoon to monitor the progress of the long-term revitalization of the lagoon; and
- **Respond** to changing conditions, technologies, and new information by amending the plan on a three to five-year cycle to substitute actions that are successful and cost-effective for significantly improving the health, productivity, and natural resilience of the IRL.

Indian River County and the St. Johns River Water Management District (SJRWMD) have been proactive in implementing projects over the last several decades. Through these innovative projects, Indian River County has achieved annual removals of more than 53,000 pounds of nitrogen and 11,000 pounds of phosphorus, per DEP's Final 2017 Progress Report for the Central Indian River Lagoon Basin Management Action Plan.

The Indian River County Lagoon Management Plan is managed through Indian River County Departments that have diverse skill sets and the knowledge, ability, and mission to affect change in the lagoon. These departments include Utilities, Public Works, and Parks. These departments will administer the funds, apply for grants, and manage the projects necessary to **Reduce** pollutants and **Revitalize** the lagoon within the boundaries of Indian River County and provide continuous analysis and feedback to adapt the plan over time to address constantly changing conditions and trends. This Indian River Lagoon Management Plan outlines the local projects planned to meet water quality targets and improve the health, productivity, aesthetic appeal, and economic value of the lagoon. The approach to IRL management is large, multipronged, and long-term. Because of this, the County will need to implement goals and objectives in this plan using a two-phased approach. Where phase one will include general goals created to better understand what factors are impacting the health of the Indian River County portion of the Lagoon. Then the second phase will include more specific and measurable goals which will be guided by information collected during phase one. Goals and objectives outlined throughout the plan are subject to change based on information collected throughout phase one. Lagoon ecosystem response may lag several years behind completion of any project; however, Indian River County, in coordination with other stakeholders, must continue to monitor the health of the IRL by further implementing projects to advance the lagoon along the long road to recovery.

The **Revitalization** of the lagoon for its health and prosperity requires substantial and stable funding to eliminate the excess nutrient loading that is currently directly or indirectly discharged into the lagoon and to **Revitalize** the natural habitat that has been lost within the lagoon in the last few decades. Indian River County has **Responded** by using 20% of a one-cent optional sales tax fund over a consecutive five-year period. Beginning in fiscal year 2019-2020, this portion of the tax will be dedicated to IRL projects and will generate approximately \$4 to \$5 million per year. This plan will seek to align the tax funds with additional grant funds to leverage the projects that will significantly decrease input loads and/or pollutant discharges into the lagoon. Specific grant targets will be identified for each project, as will partnerships with local municipalities, the IRL NEP, and other county, state, and federal organizations to further the goal of lagoon **Revitalization**.

The comprehensive Indian River Lagoon Management Plan will be a cumulative effort between a variety of stakeholders, including the public, and will take approximately 18 months to develop. The following outline will serve as the framework for the Indian River Lagoon Management Plan, however the goals and objectives will follow an adaptive management strategy and will be crafted based on scientific information collected throughout the lifetime of the Plan.

## 1.0 INTRODUCTION

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### 1.1 GENERAL OVERVIEW

The health of the Indian River Lagoon (IRL) is facing several challenges. Some of these challenges are easily measured (such as nutrient and pollutant levels) while others are less tangible (reduction in fisheries production, reduced recreational values, reduced seagrass growth, presence of algal blooms, habitat degradation). Indian River County is seeking to identify measures that can be undertaken in a systematic approach to improve the ecological conditions, recreational value, and the overall health of the IRL for the benefit of wildlife and the public.

Based on current data, it appears there are several potential sources adversely affecting the IRL in Indian River County:

- Urban stormwater runoff, which is generated by rainfall on pervious and impervious areas associated with development, picks up and transports nutrients from fertilizers and pet waste, as well as other pollutants including sediments, herbicides, and pesticides. Urban runoff also includes sediment, litter, oil, grease, and other pollutants from Florida Department of Transportation (FDOT) highways and local roadways.
- Agricultural stormwater runoff, which occurs on agricultural land and carries nutrients from fertilizers, livestock waste, pesticides, and herbicides through the canal system.
- Excess fertilizer that is applied beyond what plants have the capability to uptake. Due to the sandy soils in the basin, nutrients from excess fertilizer can enter the groundwater with little removal. This groundwater can recharge surface water in ditches, canals, tributaries, or directly to the IRL.
- Septic systems, both functioning and failing, contribute nutrient loading to the groundwater. Traditional septic systems provide little nutrient removal and depending on the age of the system, density of septic systems, soils in the area, and proximity to surface waters, can contribute a large quantity of nutrients to groundwater that will ultimately discharge to the lagoon.
- Biosolids are the solid, semisolid, or liquid residue generated during the biological wastewater treatment process. Land application of Class B biosolids is allowed on permitted sites at controlled rates in accordance with Florida Department of Environmental Protection (DEP) established site restrictions and site management requirements. However, Class AA processed biosolids are considered fertilizer and are not tracked when applied to land. The extent of potential impacts of land application of biosolids is not yet known, which may mean biosolids with high nutrient concentrations are being applied in the IRL watershed.
- Organic material from development within upland areas. This material can come from leaf litter, grass clippings, and sediment from construction. The organic material flows through canals and tributaries to the lagoon and causes a buildup of muck along the lagoon bottom, typically in deeper, lower energy portions of the IRL.
- Extensive canal system throughout the County. Many of these canals are located within water control and other special districts. These canals convey stormwater runoff from agricultural and urban areas, fertilizer, organic material, and other pollutants directly to the lagoon.
- Muck build-up along the lagoon bottom. Muck creates an environment that is not conducive to seagrass and filter feeder growth. Muck is defined as black, organic-rich (greater than 10% organic matter), mud-rich (greater than 60% silt and clay), high water content (greater than 75% water by weight, greater than 90% water by volume) sediments. The muck also fluxes nutrients into the lagoon, adding to the nutrient loading.
- Atmospheric deposition that falls on both the land and the lagoon itself: The sources of these nutrients are from power plants, cars, and other sources that burn fossil fuels. However, because of atmospheric conditions and weather patterns, not all the nutrients from atmospheric deposition are generated within the

watershed. Atmospheric deposition accounts for about 7% of the nitrogen and 1% of the phosphorus of the nonpoint source load to the IRL in Indian River County (DEP, 2009).

These nutrient sources coupled with fluctuations in salinity, and other systemic issues, have directly contributed to harmful algal blooms (HABs). These harmful algal blooms are a symptom of nutrient loading, but also cause losses of seagrasses, decline of filter feeders, fish kills, and harm to keystone species such as sea turtles, dolphins, and manatees. These effects reduce the biodiversity and have a substantial economic impact from loss of ecotourism, commercial and recreational fisheries, and other recreational and tourism related businesses along the lagoon.

**Revitalization** of biological functions and the reversal of economic losses is an essential part of IRL recovery. When the system can maintain its natural balance of nutrient recycling, seagrasses can thrive and take up nutrients, bivalves will filter the water, and fish may have a place to forage and spawn. The issue at hand is to determine the prudent order of operations for lagoon recovery, execute projects to effectively use the limited financial resources available, leverage additional financing, and enhance and **Revitalize** the IRL.

To restore the IRL's balance in this portion of the lagoon system, the County developed this outline to serve as a basis for the development of the Lagoon Management Plan to focus on actions to implement the Five R's:

- **Research** to identify impacts and strategically target key items for the revitalization of the lagoon;
- **Reduce** the pollutant and nutrient inputs to the lagoon from fertilizer, failing septic systems, groundwater seepage into canals, and untreated stormwater runoff;
- **Revitalize** the ecosystem by increasing water-filtering oyster habitat, seagrass beds, lagoon related natural occurring components, and removing invasive species;
- **Rally** the community around the lagoon to monitor the progress of the long-term revitalization of the lagoon; and
- **Respond** to changing conditions, technologies, and new information by amending the plan on a five-year cycle to substitute actions that are successful and cost-effective for significantly improving the health, productivity, and natural resilience of the IRL.

This plan will be an adaptive plan evolving along with the most current science, regulations, and changing conditions of the IRL. The first phase of the plan will focus on the **Research** action by looking at existing IRL data, identifying data gaps, and providing a better understanding of what is occurring in the County's unique area of the IRL. The planning horizon for this phase will be looking ahead two to five years. This plan will also seek to identify prospective projects and align funding sources with these projects. The plan will be updated after three to five years and will be based on the science provided by the first phase of the plan and provide a more project-based approach with emphasis on prioritization of projects to achieve measurable goals and objectives. Additional updates will be made as needed.

## 1.2 REGULATORY REQUIREMENTS FOR ADAPTING TO A CHANGING LAGOON

Concern over the deteriorating conditions within the lagoon has been a focus of local, state, and federal regulators for years. Section 303(d) of the Clean Water Act requires states to list waterbodies where water quality standards are not being achieved. Portions of the IRL were listed as impaired for dissolved oxygen by the United States Environmental Protection Agency (USEPA). Through additional assessments and information from the St. Johns River Water Management District (SJRWMD), DEP determined that all the IRL and Banana River Lagoon segments are impaired for nutrients due to impacts to lagoon seagrass. In March 2009, DEP adopted the total maximum daily loads (TMDLs) for the IRL and Banana River Lagoon, which include the portions of the Central IRL in Indian River County. The TMDLs were established to address seagrass losses associated with excessive nitrogen and phosphorus loads to the IRL. The TMDLs were determined from linear regression models that relate seagrass depth



limits to annual nitrogen and phosphorus loading, and seagrass losses were determined based on review of a composite of seagrass maps from 1943 to 1999.

The establishment of TMDLs required the initiation of the basin management action plan (BMAP) process, which establishes enforceable, more detailed load allocations for impaired waterbodies. Point source wastewater facilities with National Pollution Discharge Elimination System permits were assigned a wasteload allocation in the TMDL, which are included in each facility permit. The stormwater sources, including permitted municipal separate storm sewer systems, other urban nonpoint sources, and agricultural stormwater, were assigned allocations through the BMAP process. However, based on the recovery of seagrasses through 2009, the latest available aerial mapping data at the time of the BMAP analysis, the Central IRL stormwater entities did not receive nutrient load allocations. The Central IRL BMAP was adopted by DEP in early 2013. As this first iteration of the BMAP process was ending, the “superbloom” of 2011 occurred. This HAB plagued the North IRL and Banana River Lagoon, and a secondary bloom affected the Central IRL. Green alga, brown tide *Aureoumbra lagunensis*, and picocyanobacteria each contributed to the blooms; however, the damage to seagrasses from these algal blooms would not be understood for several years.

Since the “superbloom” of 2011, blooms of picocyanobacteria, which prefer fresh water and are capable of fixing nitrogen from the atmosphere, along with dinoflagellates and *Aureoumbra lagunensis*, which prefer more saline water and are limited by nitrogen in the water column, have created a new normal of nutrient and carbon cycling that leave the lagoon in a constant state of alarm for HABs. Seagrass data in the lagoon showed a steady decline in 2011 compared to the 2009 survey. Seagrass made a small gain in 2013 and 2015 in the Central IRL, but the latest seagrass data from 2017 again showed significant losses in the Central IRL. DEP is in the process of reevaluating the BMAP for the Central IRL, and because of the seagrass losses that have occurred in the Central IRL since the BMAP was adopted, load allocations for total nitrogen (TN) and total phosphorus (TP) will be allocated to the stakeholders in this area, including Indian River County.

### 1.3 PLAN ORGANIZATION

The plan is organized into the following sections.

**Section 2.0** summarizes the plan goals and objectives. This plan seeks to identify reasonable objectives and measurable goals to **Revitalize** the IRL. These goals include regulatory requirements for nutrient load allocations, in accordance with the TMDLs and BMAP, but also go further to evaluate the legacy loads and ecological damage within the IRL as a result of eutrophication and other aspects of human interaction. This plan seeks options to **Revitalize** and repair damage to benthic communities such as seagrasses, oysters, and clams. Metrics are established to measure the progress of lagoon **Revitalization**, and measurable goals are identified for lagoon actions. For the first phase of the plan, which includes identifying the **Research** needs, the objectives are broader and more general. For the second phase of the plan, anticipated to be updated after three to five years, more specific, scientifically based, and quantified goals will be established to **Revitalize** the IRL. Goals in the second phase are subject to change based on information gathered during phase one.

**Section 3.0** describes the current projects. Parks' Conservation Lands Division, Public Works' Coastal Engineering and Stormwater Divisions, and the Utilities Department have combined forces to complete unique and innovative projects using natural processes. These projects **Reduce** nutrients entering the IRL, **Revitalize** natural and historical cultural resources, and provide access to the lagoon to educate the public and **Rally** the community to protect the IRL.

**Section 4.0** identifies prospective projects. This plan **Researches** the current and historical resources of the IRL and **Responds** to the changing conditions of the IRL. Projects were selected in each category to **Reduce** nutrients, minimize lag time in lagoon response, **Reduce** risk, **Revitalize** natural lagoon resources, and optimize the return on investment.

**Section 5.0** describes Indian River County's education and outreach efforts. Education and outreach are an important and cost-effective approach to **Revitalize** the IRL because these efforts allow the public to understand why the County is implementing projects to improve conditions and create a sense of responsible stewardship with those surrounding the IRL. In return, through positive changes in community behavior, this will prevent nutrients and pollutants from entering the lagoon system, which **Reduces** the amount of pollution that needs to be treated. The natural IRL system is affected by human interaction. Educating people on the effects of their actions and the changes that can be made to **Reduce** those impacts can **Rally** a positive response for the IRL.

**Section 6.0** identifies the **Research** needs to better understand what is needed to **Revitalize** Indian River County's portion of the IRL. This focuses on **Research** to identify and compile existing data in Indian River County including historical locations of benthic communities, water quality data, muck locations and extent, land uses, shoreline conditions, biodiversity, recreational uses, and upland sources. These data will be used to better understand what needs to occur to **Revitalize** the IRL to a state of balance. This plan also includes **Research** issues involving community development in a sustainable, responsible, and resilient manner. These areas of **Research** will allow the County to **Respond** to the changing conditions of the IRL.

**Section 7.0** describes the plan progression. This plan is adaptive and will evolve with the most current science, regulations, and changing conditions of the IRL. Two initial phases are anticipated. This plan is the first phase, which is based on a three to five-year planning horizon and focuses on **Research** to better understand the needs of Indian River County's unique section of the IRL. The second phase will be an update to the plan after three to five years and will provide a more project-based approach with emphasis on project prioritization to achieve measurable goals and objectives based on the science and **Research** established by this first phase of the plan. Each phase will focus on the Five R's: **Research, Reduce, Revitalize, Rally, and Respond**. Additional updates will be made, as needed.

**Section 8.0** identifies potential sources for plan funding. Indian River County voters approved a One Cent Optional Sales Tax Fund. Twenty percent of this fund will be dedicated for IRL protection and revitalization capital projects. This funding source is anticipated to generate between \$4 to \$5 million per year for five years starting in fiscal year 2019-2020. This plan outlines how these funds will be used to **Revitalize** the IRL, project partners for cost-sharing, and available grants to leverage tax funds. This section also describes how the plan will be implemented by coordinating efforts with stakeholders throughout this portion of the IRL. Successful implementation of this plan will involve extensive collaboration with municipalities, special districts, regulatory agencies, FDOT, local universities and research institutions, and the general public.

## 2.0 PLAN GOALS AND OBJECTIVES

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This plan seeks to identify reasonable objectives and measurable goals for actions to **Revitalize** the IRL. The objectives for this first phase of the plan are more general in nature until the **Research** can determine scientific-based goals necessary to **Revitalize** the IRL. The second phase, or first update to the plan, will occur within three to five years of phase one and will include specific and measurable goals. Phase two goals are subject to change and adapt based on information gathered during phase one and throughout the lifetime of the Plan. Goals will include regulatory requirements for nutrient load allocations, in accordance with the TMDLs and BMAP, but will go further in the evaluation of the legacy loads and ecological damage within the IRL as a result of eutrophication and other aspects of human interaction.

### 2.1 RESEARCH

**Research** is needed to identify impacts and strategically target key items for **Revitalization** of the lagoon. This first phase of the plan focuses heavily on this action, and the **Research** will help to direct the specific goals and objectives of the second phase of the plan. **Research** topics, goals, and objectives include:

- Monitoring and Data Collection Needs:
  - Phase 1 Objective: Identify existing monitoring network and survey information in the County's section of the IRL to determine data gaps and specific targets for location and type of monitoring needed.
  - Phase 2 Objective: Use the available data to prepare a monitoring plan with clear data quality objectives and implement the plan. Identify necessary water quality improvement recommendations and associated projects that will provide such improvements. Use the collected data to track the progress and effectiveness of the County's Lagoon Plan efforts.
- Hydrology and Hydrodynamics:
  - Phase 1 Objective: Work with the water control and special districts to identify the natural hydroperiod (flow regime) of the lagoon, water management control structures, available models, and effects of enhanced circulation.
  - Phase 2 Objective: Provide models to show effects of modifying the IRL and IRL watershed hydrology and hydrodynamics within Indian River County.
- Muck:
  - Phase 1 Objective: Evaluate existing database information to identify the location, aerial coverage, and nutrient flux rates for muck in Indian River County. Evaluate if there are important data gaps that may be filled with additional surveys.
  - Phase 2 Objective: Prepare a cost/benefit assessment and prioritization schedule for the dredging and/or capping of muck deposits to evaluate the need and efficiency of future muck mitigation projects.
- Biodiversity:
  - Phase 1 Objective: Identify current and historical populations and population trends for native and non-native species, including fisheries, through land use mapping. Assess trends in the natural community structure and coverage.
  - Phase 2 Objective: Prepare and implement a plan for habitat management strategies to create and **Revitalize** habitat, and evaluate success through population, coverage, and emergence of native species.

- Benthic Organisms:
  - Phase 1 Objective: Identify current and historical locations and coverage of benthic organisms including seagrass, clams, and oysters.
  - Phase 2 Objective: Determine the area necessary for **Revitalization** of the lagoon and implement **Revitalization** efforts.
    - Seagrass: Evaluate the water and sediment quality required to achieve goals. Determine the square foot of coverage to be planted or obtained through natural recruitment once sediment and water quality conditions are met.
    - Clams and Oysters: Determine the square foot of coverage of created filter feeder bars and reefs, including County oyster reef projects, and production required from commercial aquaculture.
- Stormwater:
  - Phase 1 Objective: Evaluate each drainage basin to identify loads and sources and prioritize those basins.
  - Phase 2 Objective: Prepare and implement a plan to **Reduce** loading based on locations of high source load and/or prior to discharge into the IRL.
- Septic Systems:
  - Phase 1 Objective: Identify priority areas/neighborhoods and evaluate the potential for septic system removal or upgrade in the highest priority areas using the County Septic to Sewer conversion evaluation report and ArcGIS-Based Nitrate Load Estimation Toolkit (ArcNLET).
  - Phase 2 Objective: Prepare and implement a plan for prioritized septic system removal or upgrades. Use various sources of data to obtain grant funds and TMDL/BMAP credits.
- HABs:
  - Phase 1 Objective: Collaborate with other agencies to identify conditions for nutrient and carbon cycling to evaluate causes and effects of HABs in the IRL and other estuarine environments.
  - Phase 2 Objective: Implement management strategies to monitor IRL conditions to **Research, Respond**, and protect against future HABs.
- Sea Level Rise:
  - Phase 1 Objective: Evaluate existing data for sea level rise and evaluate effects on the built environment, including stormwater systems.
  - Phase 2 Objective: Improve hazard preparedness plans, provide insights on resilient and sustainable development, and **Reduce** (improve) National Flood Insurance Program (NFIP) Community Rating System rating in Indian River County and municipalities.

## 2.2 REDUCE

While the tipping points for the negative impacts from inputs of nutrients and biomass into the IRL may not be fully understood, reducing nutrients and biomass from entering the lagoon can have immediate and long-term positive effects. This plan will seek to find cost-effective reductions to nutrient and biomass inputs to the IRL.

- Stormwater:
  - Phase 1 Objective: Identify innovative projects and develop efficiencies in pounds **Reduced** per year of TN, TP, and biomass for proposed projects. Evaluate projects in basins by priority ranking by loading and cost-effectiveness.
  - Phase 2 Objective: Identify specific projects to **Reduce** the TN, TP, and biomass load (pounds per year) to meet or exceed the TMDL and BMAP requirements. The results will be measured in pounds of TN and TP removed and cost per pound.
- Organic Material and Sediments:
  - Phase 1 Objective: Identify areas that are contributing large quantities of organic material such as leaf litter and grass clippings, as well as sediments, to the lagoon system. Determine locations in tributaries and canals with large amounts of floating aquatic vegetation.
  - Phase 2 Objective: Establish and implement a plan to **Reduce** the amount of organic material and sediments entering the lagoon system, including a plan to mechanically harvest floating aquatic vegetation instead of using herbicides and installation of baffle boxes, sedimentation traps, and underground exfiltration systems.
- Water Consumption:
  - Phase 1 Objective: **Reduce** the volume of water used for irrigation as well as household and commercial use through education, outreach, regulations, and ordinances. The goal is to **Rally** the community to **Reduce** urban runoff and point source discharge volume.
  - Phase 2 Objective: **Reduce** the volume of water used for irrigation as well as household and commercial use through education, outreach, regulations, and ordinances. The goal is to **Rally** the community to **Reduce** runoff, potable water supply demands, and wastewater treatment plant loadings. The goal will be measured in gallons per person per day.

## 2.3 REVITALIZE

Human interactions have impaired natural IRL habitats. While a complete restoration of natural state is not possible given the built environments, a priority action to enhance and **Revitalize** seagrasses, filter feeders, planted shorelines, and wetlands will be fundamental to **Revitalize** the stability and biodiversity of the IRL.

- Seagrass:
  - Phase 1 Objective: Evaluate all available data on seagrass planting projects to assess the cost/benefit ratio and overall success. Identify what variables are present that may affect the successful establishment of seagrass. Identify and prioritize areas to **Revitalize** seagrass.
  - Phase 2 Objective: **Revitalize** seagrass beds in critical areas to achieve seagrass coverage similar to the 2009 SJRWMD Seagrass Survey. The goal will be measured in square feet of coverage to be planted or obtained through natural creation and dollars per square foot.
- Filter Feeders:
  - Phase 1 Objective: Identify and prioritize areas to **Revitalize** filter feeder bars and reefs and aquaculture.
  - Phase 2 Objective: **Revitalize** filter feeder bars and reefs and aquaculture. The goal will be measured in estimated volume of water filtered per year by created filter feeder population.

- Wetlands and Living Shorelines:
  - Phase 1 Objective: Identify and prioritize areas to **Revitalize** wetlands and living shorelines.
  - Phase 2 Objective: **Revitalize** wetlands and living shorelines. The goal will be measured in square feet of wetlands and living shorelines created and dollars per square foot.

## 2.4 RALLY

Public education, outreach, and access to the lagoon are essential to **Rally** support to **Revitalize** and preserve the lagoon; however, the effectiveness and return on this investment is not always appreciated, understood, or validated. When these programs are effective, they may represent the best and most long-term return on investment. It is important to evaluate these programs to ensure they are targeted and effective and use these data to leverage additional funds for successful educational programs.

- Educational Programs (i.e. stormwater, native planting, fertilizer, irrigation, and water quality):
  - Phase 1 Objective: Identify existing sources for educational programs, such as, but limited to, Be Floridian, IRL National Estuary Program (NEP), Keep Indian River Beautiful Lagoon Friendly Yards, Shuck-N-Share oyster recycling, and Harbor Branch Oceanographic Institute. Select programs to promote within Indian River County and conduct baseline surveys and polls to evaluate the public knowledge and perception of existing and needed programs.
  - Phase 2 Objective: Continue, add, amend, and expand educational programs based on survey results. The goal will be measured through surveys, polls, and **Research** to evaluate the public knowledge and perception of existing and needed programs.
- Clean Marinas Program:
  - Phase 1 Objective: Identify and promote marina facilities that participate in the Clean Marina Program, which are required to provide marine sanitary pump out services.
  - Phase 2 Objective: Track and promote marina facilities that participate in the Clean Marina Program. The goal will be measured by the increase in participation in this program.
- Ecotourism:
  - Phase 1 Objective: Identify and promote existing ecotourism industries that provide IRL experiences. Track tax revenue from these businesses.
  - Phase 2 Objective: Assist with growth of existing ecotourism industries that provide IRL experiences. Create a revenue goal that will be measured in dollars/year generated from the industry.
- Parks, Boat Ramps, and Access to the IRL:
  - Phase 1 Objective: Identify, plan, and develop new park areas and incorporate educational features and access to the IRL in existing and new parks wherever possible.
  - Phase 2 Objective: Identify, plan, and develop new park areas and incorporate educational features and access to the IRL in existing and new parks wherever possible. The goal will be measured in acres of park space and number of boat ramps within the IRL.

## 2.5 RESPOND

To **Respond** is to answer for something that has occurred, but to **Respond** effectively, events must be anticipated and how the community **Responds** must be planned. The IRL is changing, and a proactive approach is necessary to **Respond** to the changing needs.

- HABs:
  - Phase 1 Objective: Develop a plan for response to HABs, including emergency corrective action, education, hazard communication, and waste management for fish kills.
  - Phase 2 Objective: Update the response plan based on enhanced knowledge from additional monitoring, research, and interaction with stakeholders. The goal will be measured in number of cooperating entities and reductions in HABs.
- Sea Level Rise:
  - Phase 1 Objective: Identify and plan for issues associated with sea level rise, including stormwater infrastructure, wetlands impacts, salinity, water temperature, and more frequent and severe storms to create a more resilient community.
  - Phase 2 Objective: Improve hazard preparedness plans, provide insights on resilient and sustainable development, and incorporate resilience into projects. The goal will be measured by improvement in NFIP Community Rating System rating in Indian River County and municipalities.
- Invasive Species:
  - Phase 1 Objective: Identify current and historical populations and population trends for native and non-native species and identify and monitor emerging issues with new invasive species.
  - Phase 2 Objective: Prepare and implement a plan for management strategies for non-native species. The goal will be measured by evaluating the reduction of population and coverage of non-native species.



## 3.0 CURRENT PROJECTS

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Indian River County Departments have diverse skill sets and the knowledge, ability, and mission to affect change in the lagoon. Parks' Conservation Lands, Public Works' Coastal Engineering and Stormwater Divisions, and the Utilities Department have combined forces to complete unique projects using natural processes to achieve goals and objectives outlined above. Some of these departments, specifically in the Utilities and Public Works, manage projects with regulatory requirements that must meet TMDL reductions set by DEP; these are outlined in the annual Central IRL Basin Management Action Plan (BMAP) reports. Nutrient reductions provided below were determined using DEP's 2017 Progress Report for the Central Indian River Lagoon BMAP. Parks' Conservation Lands and Public Works' Coastal Engineering Division also seek to protect existing resources and **Revitalize** the natural environmental and processes within the IRL.

### 3.1 UTILITIES

The Utilities Department has developed projects designed to **Reduce** the pollutant loads into the IRL. Specifically, nitrogen and phosphorus are targeted for reduction to meet the TMDL.

#### 3.1.1 Sebastian Septic to Sewer – Phase I

The Sebastian Septic to Sewer – Phase 1 area is presently served by an arterial sanitary sewer collection and conveyance system constructed in the early 1990s. However, there remains a large population of residential and commercial entities that use septic systems. Septic systems contribute nutrient and bacteria pollution to the groundwater, which ultimately flows into the IRL and St. Sebastian River. Numerous articles have documented that septic systems are polluting the IRL. In addition, the use of septic systems limits commercial development, which in turn hinders business and employment growth in the area.

The Sebastian area was selected due to its proximity to the lagoon, depth to water table, and the economic benefits to the mostly commercial properties, in which growth has been historically hampered by septic system restrictions. Connecting the existing septic systems to the sewer system will allow for environmentally sound infrastructure growth to the area and lagoon. Additional details about the project can be found on the County's website (<http://www.ircutilities.com/Sewer-Feasibility-Study.htm>).

The project includes an area of 73 acres with an assumption of one septic system per acre. There is an estimated concentration of 30 pounds of TN per year per system and 5 pounds of TP per year per system removed from the environment. When built out and connected, a total estimated reduction of 2,190 pounds per year of TN and 365 pounds per year of TP will result from this project.

#### 3.1.2 Spoonbill Marsh Wetland Treatment System

The Spoonbill Marsh Wetland Treatment System represents a unique approach to handling the by-product created during reverse osmosis drinking water purification. This 67-acre man-made habitat uses nature's own proven treatment techniques for the removal of both nitrogen and phosphorus from the demineralization concentrate by-product and from the waters of the IRL itself. The vegetation and aquatic organisms seen throughout the marsh play an active role in efficiently removing the nitrogen and phosphorus from the blended waters.

Nutrient reductions calculated in the Spoonbill Marsh Wetland Treatment System in FDEP's 2017 Progress Report totaled approximately 12,450 pounds per year of TN and 2,157 pounds per year of TP. A link to a video presentation of the project is available on the Indian River County Utilities website at [www.ircutilities.com](http://www.ircutilities.com)

#### 3.1.3 Osprey Marsh Stormwater and Demineralization Treatment System

The Osprey Marsh Wetland Treatment System is an algal nutrient removal facility system that removes dissolved nutrients from up to 10 million gallons per day (mgd) of stormwater and from up to 1.5 mgd of reverse osmosis reject water known as demineralization concentrate. The algal turf scrubber system uses a water treatment



technology that was developed specifically to enhance water quality of polluted waters through the active cultivation of attached algae upon an engineered surface.

Nutrient reductions calculated for the Osprey Marsh system in DEP's Final 2017 Progress Report totaled approximately 12,990.0 pounds per year of TN and 2,991 pounds per year of TP.

## 3.2 STORMWATER

The Stormwater Division has developed projects designed to **Reduce** the pollutant load into the IRL. Specifically, nutrients such as nitrogen and phosphorus are targeted for reduction to meet the TMDL. These projects also **Reduce** total solids that can carry nutrients and other contaminants.

### 3.2.1 Egret Marsh Stormwater Park and Wildlife Sanctuary

Egret Marsh uses algae to remove nutrients from approximately 10 mgd of canal stormwater. The algae are harvested and not released to the lagoon. After treatment by the algae, the filtered stormwater flows through a large polishing pond and shallow marsh and returns to the canals and flows through the Main Relief Canal, eventually emptying into the lagoon. Nutrient reductions calculated in Egret Marsh in DEP's Final 2017 Progress Report totaled approximately 19,948 pounds per year of TN and 4,049 pounds per year of TP.

### 3.2.2 Osprey Acres Flowway and Nature Preserve

The flowway continues to filter water from Osprey Marsh along with unfiltered water from the South Relief Canal. Filtering occurs through a system of treatment cells using aquatic plants to remove nutrients and then to a serpentine flowway for final polishing, eventually released further down the canal and to the lagoon. The pre-completion estimated pollution removal from Osprey Acres is 3,000 pounds per year of TN and 300 pounds per year of TP.

### 3.2.3 PC Main Screening System

The PC Main screening system removes freshwater plants and trash from the Main Relief Canal before the canal empties into the lagoon. Ten screens are used to remove all floating and submerged pollutants to the diameter of a paperclip wire (1/16 inch) and the screens and their associated conveyor systems operate on motors totaling 20.5 horsepower. Nutrient reductions calculated in the PC Main Screening System in DEP's Final 2017 Progress Report totaled approximately 2,079 pounds per year of TN and 528 pounds per year of TP, and 874,000 pounds of trash, plants, and other debris.

### 3.2.4 System Maintenance

The Road & Bridge Division provides maintenance throughout the county in support of a healthy IRL. This maintenance includes a street sweeping program that sweeps a total of 422 lane miles per year. Nutrient reductions calculated for street sweeping in DEP's Final 2017 Progress Report totaled 365 pounds per year of TN and 234 pounds per year of TP. The division also conducts a ditch cleaning program, which includes 860,138 linear feet of ditches that are cleaned and maintained about 4 times per year. These data are not currently outlined in the annual BMAP report.

## 3.3 CONSERVATION LANDS

The primary purpose and objective of the County Parks' Conservation Lands Program is to protect, **Revitalize**, and sustain endangered ecosystems and associated rare and endangered species in Indian River County. Secondary objectives include passive public recreation, preservation of open space, groundwater quality protection, flood protection, protection of historical and cultural resources, and general preservation of "quality of life."

### 3.3.1 Jones' Pier Conservation Area

The Jones' Pier Conservation Area is part of the rich history of late 19<sup>th</sup> century/early 20<sup>th</sup> century settlement in Indian River County. In 1889, Seaborn Jones and his family homesteaded 160 acres on Orchid Island. Mr. Jones and his neighbors built the "Orchid-Narrows Road" which is now known as Jungle Trail (listed in 2003 on the National Register of Historic Places). The 16-acre conservation area that was purchased by the County in 2011 is part of this original homestead. The County acquired the site from the Jones' family with assistance from the Florida Communities Trust. As part of the purchase, the County committed to implementing a management plan for the site that **Revitalizes** ecological value, while at the same time utilizes the site for public access and display of educational and historical exhibits.

As part of this plan, a portion of the old grove on the Jones' site is planned to be converted into a four-acre saltmarsh. The wetland will provide many ecological and public benefits including creating potential habitat not common anymore to the area; removing exotic species; circulating lagoon waters through the site to provide water quality enhancement; re-grading altered areas to improve connectivity between natural areas; re-directing runoff through the wetlands to aid in improving discharges to the lagoon; re-vegetating with native upland species; ongoing site maintenance and monitoring; and extensive public educational opportunities.

### 3.3.2 Lost Tree Island Conservation Area:

The Lost Tree Islands form part of the 508-acre Lost Tree Island Conservation Area (LTICA) that includes upland, wetland and submerged land forms in the Indian River Lagoon. The topography of these islands has been modified by placement of spoil dredged from the Intracoastal Waterway channel. Much of the native vegetation on these islands has been out-competed by non-native species such as Australian pines (*Casuarina equisetifolia*) and Brazilian pepper (*Schinus terebinthifolius*).

Three wetland mitigation projects, totaling approximately 19-acres of created habitat, have been constructed on the two of the islands. In April 2019 the County applied for funds from the Indian River Lagoon National Estuary Program towards the design of a fully engineered habitat enhancement plan for the site. This design will provide a site design that is resilient and sustainable; creates diverse natural wetland and upland habitat; provides water quality benefits through the creation of flow-way wetlands; eliminates nuisance and exotic species; and provides educational and recreational opportunities for the public. The LTICA enhancement plan has been included in the County's current Capital Improvement Plan. The enhancement plan is intended to be flexible so that habitat creation can occur in phases, as funding is available.

### 3.3.3 Indian River Lagoon Greenway

The Indian River Lagoon Greenway is a 37-acre conservation area that is managed through a cooperative agreement with the Indian River Land Trust (IRLT). The IRLT and the Florida Inland Navigation District (FIND) own the adjacent parcels. The site is one of the most heavily utilized conservation tracts in the County, and includes a mixture of maritime hammock and mangrove communities.

The County has had discussions with FIND concerning the potential development of a flow-way marsh that would be located on both County owned and FIND properties. The goal would be to incorporate several different elements including: providing a natural buffer to adjacent development; allowing for increased water quality treatment of the by-product of dredging; potential treatment of stormwater from a large FDOT ditch that traverses the FIND property; creation of a high marsh to provide wildlife habitat, water quality improvements, and additional attenuation opportunities; and augmenting the existing trail network to provide additional wetland viewing.

## 4.0 PROSPECTIVE PROJECTS

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Projects will be selected based on the most cost-effective options in each category to maximize nutrient reductions, minimize lag time in lagoon response, **Reduce** risk, **Revitalize** natural lagoon resources, and optimize the return on investment.

### 4.1 UTILITIES

Although Indian River County Utilities Services provides sewerage services to over 28,950 accounts, an estimated 30,369 septic systems still remain in use in Indian River County (Schulke, Bittle & Stoddard, LLC., 2017). Even septic systems properly working can contribute nutrients to the lagoon. The nutrient removals, provided below, assume 30 pounds per year per system for TN and 5 pounds per year per system for TP. However, each system does not have the same discharge to the IRL. Factors such as soil type, density of septic systems, and proximity to waterways contribute to the discharge of nutrients to waterways. The ArcNLET model can be used to estimate the nitrogen loads each septic system contributes directly to the IRL, and this model can be used to obtain TMDL credits for septic to sewer conversion.

#### 4.1.1 West Wabasso Septic to Sewer – Phase 2

The Utilities Department plans to convert 57 septic systems to central sewer and construct stub-outs for 47 vacant properties for future connection. The project area has a mixed land use of primarily residential with a few commercial properties and is a financially disadvantaged community. The objective of this work is to eliminate groundwater contamination caused by the poor treatment efficiencies of existing septic systems. The elimination of 57 septic systems and providing services to 47 vacant properties will **Reduce** nutrient loading to the lagoon by an estimated 3,120 pounds per year of TN and 520 pounds per year of TP.

#### 4.1.2 Sebastian Septic to Sewer – Phase 2

Look at a cost share between City of Sebastian and County, also potential for IRL NEP grant, to conduct ArcNLET modeling for these areas. This model determines the load at the receiving waterbody, not the load from the septic system. This will be the basis for TMDL credits for septic system conversion and assist with acquiring grant funds.

### 4.2 STORMWATER

#### 4.2.1 North Relief Canal Low Energy Aquatic Plant System (LEAPS™)

The unique LEAPS™ will remove nutrients through a system of plants that absorb nutrients from the canal water, filtering the stormwater before returning it to the canal and IRL. This project is under final design. The project is estimated to remove up to 8,500 pounds per year of TN and 1,400 pounds per year of TP. The pre-completion nutrient reductions estimated for LEAPS™ (Moorhen Marsh) in FDEP's Final 2017 Progress Report totaled approximately 20,700 pounds per year of TN and 4,000 pounds per year of TP.

#### 4.2.2 North and South Relief Canal Mechanical Water Lettuce Removal Systems

This project will use a long reach excavator to remove water lettuce from the North and South Relief canals to prevent excess nutrient loading to the lagoon. Two locations in these canals have already been identified for accumulating a large amount of water lettuce annually. The project is estimated to remove up to 5,900 pounds per year of TN and 1,400 pounds of per year of TP.

#### 4.2.3 Baffle Boxes

Second generation/nutrient separating baffle boxes have chambers with partitions connected to a storm drain. Stormwater flows into the first section of the box where most pollutants settle out. Water then overflows into the next section to allow further settling before the water ultimately overflows to the stormwater pipe or receiving

waterbody. Floating trays within the baffle box capture nutrients, suspended solids, organic material, trash, oils, and grease to prevent them from dissolving in the stormwater. Biosorption activated media can be added to the baffle box to create an environment with denitrification that increases nutrient removal. When regularly and properly maintained, baffle boxes may substantially reduce TN, TP, and suspended solids.

Baffle boxes could be installed in areas with a lot of organic material, such as leaf litter, or trash to capture those materials before they enter the stormwater system. Baffle boxes could also be installed on County, municipality, and FDOT outfalls to major tributaries, canals, and the lagoon to reduce the amount of pollutants discharged to surface waters.

### 4.3 CONSERVATION LANDS

There are 12 parcels that are either County-owned, or co-owned with other partners, that may be considered within the proposed lagoon enhancement plan, including Lost Tree Island, which is a 508-acre property acquired by local municipalities in 2003. This property has opportunities for shoreline and spoil island restoration.

#### 4.3.1 Oslo Riverfront Conservation Area

Approximately 298 acres of undeveloped mature coastal hammock, scrubby flatwoods, and impounded estuarine wetlands located on the north side of Oslo Road adjacent to the IRL in Indian River County. An FDOT drainage ditch flows through the property from U.S. 1 to the IRL. There may be opportunities for wetland vegetative enhancement and improved hydrology that may be beneficial to the lagoon.

#### 4.3.2 Round Island South Conservation Area

Approximately 65 acres of maritime hammock and impounded wetlands located between State Road A1A and the IRL on the barrier island. The southern boundary of the site is the Indian River County line. The large wetland impoundment contains a mixture of herbaceous saltmarsh flats and mangroves and is one of the more diverse estuarine wetlands in the area. There are potential opportunities for establishment of a more diverse living shoreline along some sections of the impoundment. This area is known to be extensively used by manatees; therefore, all proposed activities would need to be consistent with manatee protection guidelines.

#### 4.3.3 Round Island Riverside Park

To the north of Round Island South Conservation Area, the County owns two spoil islands that are part of Round Island Park. A boardwalk has been constructed to connect the smaller of the two islands to the barrier island. This approximately 7.5-acre island is dominated by exotic species and would be a potential site for habitat **Revitalization** and water quality improvements such as creation of wetlands along the shoreline, creation of sand flats for avian habitat, and creation of native uplands.

#### 4.3.4 Oyster Bar Marsh

Approximately 96 acres of maritime hammock and impounded wetland, located between State Road A1A and the IRL on the barrier island. The site is approximately one-half mile north of Round Island County Park. The County has been working in partnership with the Indian River Land Trust and with the Indian River County Mosquito Control District to install culverts connecting the impoundment to the lagoon that will improve flushing.

#### 4.3.5 Prange Island Conservation Area

Located in the lagoon just south of the 17<sup>th</sup> Street Causeway Bridge, and immediately north of the southern Vero Beach city limit, there are two undeveloped islands that comprise the project: the larger (southern) island, known as Prange Island, containing approximately 16.6 acres above mean high water, and the smaller (northern) island, known as Little Prange Island, containing approximately 5.8 acres above mean high water. Prange Island is located near an Ais Indian village site called Jece on the adjacent barrier island. A prehistoric shell-midden is reported on Prange Island, but the precise location of the site is unknown at this time. The island's name comes from the Prange

family who homesteaded there in the later 1800s. The Prange family farmed the island, raising crops of beans and potatoes, and transported produce, fish, and turtles from the island to Flagler's Florida East Coast Railroad stop in Vero Beach.

Prange Island is unique in that the southern lobe of the island is not man-made and contains an intact maritime hammock community. Both islands are surrounded by a fringe of mangroves, and the main island contained a 4.4-acre seagrass bed along the northwest shoreline (not recently confirmed). Exotic species dominate the northern portion of Prange Island and the upland portion of Little Prange Island.

In areas where there is heavy exotic invasion, there is potential to create a mixture of upland and wetland communities that may benefit the lagoon from both a habitat and a water quality perspective.

#### 4.3.6 Captain Forster Hammock Preserve

Captain Forster Hammock Preserve consists of 111 acres acquired by the County and Trustee of the Internal Improvement Trust Fund (TIITF) in 1996 and 1998. The preserve includes several different community types such as sandy dunes and coastal scrub along the eastern portions of the preserve, and maritime hammock and mangroves within the western portion. The section of the preserve abutting the lagoon was damaged from salt water inundation as a result of Hurricane Matthew and may have the potential to be **Revitalized** in a manner that will provide significant benefits to the lagoon.

#### 4.3.7 Pelican Island National Wildlife Refuge

The Pelican Island National Wildlife Refuge contains a mosaic of over 5,400 acres of wildlife habitat along the barrier island in northern Indian River County. The refuge is designated as a National Historic Landmark, a Wetland of International Importance, and a candidate Marine Protected Area. The original holdings within the refuge have expanded over time through acquisition efforts by the United States Fish and Wildlife Service (USFWS), state of Florida, and local governments. Indian River County owns, or shares ownership, on approximately 200 acres within the refuge. The County works closely with the USFWS to ensure that management of the areas is targeted at maximizing the potential wildlife habitat. The County intends to continue this collaboration to identify opportunities for projects that can enhance conditions within the lagoon.

#### 4.3.8 Archie Smith Fish House

The Archie Smith Fish House is part of the historical working waterfront in Sebastian along Indian River Drive. The property includes a small tract (0.07 acres) on the east side of Indian River Drive with two buildings and the dock structure extending approximately 240 feet into the IRL. There are several historically significant structures on the property: the historical residence just east of the public road, the dock, and the icehouse near the end of the pier. West of Indian River Drive, the property consists of approximately 1.1 acres of developed and undeveloped lands. The County plans to **Revitalize** these facilities as part of the management plan for the site. Part of this **Revitalization** may include identifying opportunities to enhance seagrass or oyster habitat in proximity to the site or evaluating the shoreline to determine if there are opportunities for creating a living shoreline.

#### 4.3.9 Spoil Island Enhancement Opportunities

The Indian River lagoon Aquatic Preserve's Island Designation System had identified 43 islands within Indian River County. These islands are managed as conservation or recreation areas. Many of these islands are also designated by the Florida Fish and Wildlife Conservation Commission (FWC) as Critical Wildlife Areas and are closed to public access.

Spoil islands offer a unique opportunity to blend several of the objectives identified in this plan. The plan will discuss how the County could work with other governmental entities such as the Florida Inland Navigation District (FIND), Indian River Lagoon Aquatic Preserves, DEP, and FWC to enhance habitat. In addition to the ecological aspects of the **Revitalization**, there would be potential increase in recreational opportunities.

#### **4.3.10 South Oso Riverfront Conservation Area**

The 143-acre conservation area is located on the south side of Oslo Road (9th Street SE), east of US Highway 1. A large portion of the site consists of mangrove dominated wetlands abutting the Lagoon. A large FDOT ditch traverses the site and ultimately discharges into the Lagoon. There is potential to provide pre-treatment of the stormwater associated with this ditch through modifications to the site; these improvements may also serve to provide additional wildlife habitat.

#### **4.3.11 Harmony Oaks**

This 90-acre conservation area is directly adjacent to the Lagoon just to the north of the St. Lucie County boundary. The mangrove wetlands on the site are part of a large impoundment system, and may provide an opportunity to enhance water quality via filtration of nearby un-treated stormwater. In addition, removal of several of the dikes that are not utilized may provide an opportunity to create a more diverse wetland community.

### **4.4 COASTAL ENGINEERING**

Continue identifying living shoreline and stabilization projects across county.

#### **4.4.1 Jungle Trail Shoreline Enhancement**

Living shoreline project to naturally protect historical Jungle Trail.

#### **4.4.2 A1A Shoreline Enhancement**

Living shoreline project to naturally protect State Road A1A and the pedestrian sidewalk for approximately two miles south of Sebastian Inlet. This area was damaged during Hurricane Matthew and the sidewalk was turned into rock rubble along the shoreline



## 5.0 EDUCATION AND OUTREACH

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### 5.1 COUNTY FERTILIZER AND LANDSCAPE MANAGEMENT ORDINANCE

In 2013, the Indian River County Board of County Commissioners passed the Fertilizer and Landscape Management Ordinance that restricts the use of fertilizer and helps prevent excess nutrients (nitrogen and phosphorous) from entering the lagoon. The ordinance states that no fertilizer containing phosphorous is to be used and no fertilizer containing nitrogen can be applied during the rainy summer season. The ordinance also includes other best management landscape practices such as blowing grass clippings back into the yard.

### 5.2 STORMWATER EDUCATION

The Stormwater Educator conducts many methods of education and outreach to Indian River County to inform students and adults about the importance of pollution prevention including fertilizer, pet waste, illicit discharge of chemicals, erosion, construction pollution, agricultural runoff, litter, and more. Currently the Stormwater Division presents on a regular basis to 4<sup>th</sup> grade students throughout the school district, the Audubon Afterschool Advocates, the Youth Sailing Foundation, Environmental Learning Center visitors, County employees, homeowner associations County-wide, and local professional groups such as Kiwanis and Rotary.

### 5.3 WATER QUALITY

There are potential enhancements, such as filtration of lagoon waters through lagoon preserves, living shorelines, and bivalve filtration, that can be added to projects to help improve water quality. This would involve incorporating these elements into existing preserves as well as any future acquisitions that may be implemented. The County has already incorporated these concepts into the Jones Pier project and plans to include wetland **Revitalization**/creation into the three other preserves described above in **Section 4.3**. In addition to park projects, individual property owners should be encouraged to replace sea walls with living shorelines. The County has received grant funding for this project that includes the development of environmental education displays and programming that will engage the public to take a more active role in efforts to improve conditions in the lagoon.

### 5.4 BIOSOLIDS

Approximately 70% of Class B biosolids in the state are applied in Indian River, Brevard, and Osceola counties. All biosolids applied to land application sites must meet the pathogen reduction requirements for Class AA, Class A, or Class B biosolids. No treatment requirements exist for nutrients when producing biosolids, which may lead to biosolids with high nutrient concentrations being applied in the IRL watershed. As a result, it will be important to track where biosolids are being applied, determine the nutrient content, if possible, and track levels of nutrients in the soil. DEP recently created a Biosolids Technical Advisory Committee to evaluate current management practices and potential opportunities for enhancements to better protect Florida's water resources, and workshops began in November 2018 and were completed in January 2019. Class A and AA Biosolids are not tracked for land application and are treated as fertilizer in the industry.

## 6.0 RESEARCH NEEDS

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Indian River County will work with SJRWMD, IRL NEP, DEP, Indian River Farms Water Control District, Local Municipalities, and others, to obtain as much existing data as possible for our plan **Research** and to encourage our partners to conduct and fund research to determine the components that should be focused on to improve the health of the lagoon.

### 6.1 MONITORING AND DATA MANAGEMENT

Review and compile all historical records available for current and historical resources. Compile National Pollutant Discharge Elimination System data, LOB data, Kilroy data, muck presence data, and seagrass data, current and historical bivalve data, and hydrodynamic data.

Throughout the two phases of the Lagoon Management Plan, prepare a Monitoring and Data Management Plan based on readily available data and additional data collected during phase one.

### 6.2 SEAGRASS BEDS

Review historical information on the locations and extent of seagrass in the Indian River County portion of the IRL. Use SJRWMD data on the seagrass transects (lengths and densities of the seagrass beds) and aerial imagery of seagrass locations to evaluate historical seagrass extent, current extent, and changes over time. Review water quality data and muck location information to determine where conditions may allow for seagrass growth and where projects to improve conditions will be needed before seagrass can regrow. Collaborate with other organizations, such as SJRWMD, FWC and Harbor Branch Oceanographic Institute, to evaluate pilot studies to test different techniques for seagrass planting to determine a viable method for assisting with seagrass **Revitalization** in this portion of the lagoon.

### 6.3 MUCK REMOVAL

Muck is defined as black, organic-rich (greater than 10% organic matter), mud-rich (greater than 60% silt and clay), high water content (greater than 75% water by weight, greater than 90% water by volume) sediments. The muck sediment contains nutrients and serves as an internal “legacy load” of nutrients that releases (fluxes) nutrients back into the water column. These sediments inhibit the growth of natural benthic communities and flux nutrients to overlying water. Research will include the review of available muck mapping data to evaluate the presence and quantities of muck. Evaluate costs and benefits for additional surveys to provide a data set that will allow the County to prioritize for muck removal. Evaluate nutrient flux from muck deposits to determine the nutrient loading to the IRL.

### 6.4 COMMUNITY DEVELOPMENT CONSIDERATIONS

The Coastal Management Element of the County’s Comprehensive Plan was revised on June 5, 2018 to update information and incorporate goals, objectives, and policy changes related to planning for sea level rise impacts as mandated by the state. Based on the analysis conducted during the comprehensive plan update, privately owned estuarine wetlands and undeveloped lagoon island conservation areas were determined to be the most vulnerable areas with respect to sea level rise inundation impacts. It is estimated that more than 85% of existing coastal wetlands are at risk of inundation under the three-foot sea level rise scenario. Consistent with the Coastal Management Element, sea level rise objectives and policies, and this Lagoon Management Plan’s objective to improve and maintain lagoon resiliency, the actions summarized below should be implemented:



- Obtain and use updated County light detection and ranging (LiDAR) and digital elevation model (DEM) data (previous data from 2007). Also obtain and use LiDAR data with bathymetric survey data where necessary to conduct hydrologic modeling and analysis. These data will improve sea level rise inundation mapping, resiliency evaluations, and future decision-making.
- Complete a resiliency study to identify public properties and infrastructure at risk to sea level rise impacts under various inundation scenarios. This study should include data on finished floor elevations for public structures and infrastructure, modeling of critical stormwater conveyance systems, and groundwater/salt water intrusion modeling. Information from this study will assist with coordinating sea level rise adaptation and mitigation planning, implementation activities with municipalities and water control districts, evaluation of the National Flood Insurance Community Ratings System, and applying changes to improve rating.

## 7.0 PLAN PROGRESSION

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The Lagoon Management Plan will be implemented in two phases to identify the **Research** needs; select the projects required to **Reduce** nutrients inputs; **Revitalize** the natural IRL systems; **Rally** public support, understanding, and funding for long-term lagoon **Revitalization**; and **Respond** to the changing lagoon system.

This first phase of the plan is **Research** focused, and identifies gaps in the existing data, provides new areas of needed **Research**, and implements well understood cost-effective projects to continue the process to **Revitalize** the IRL. This process will be long and difficult, given the current state of the IRL and the added pressures of an increasing population, climate change, and limited funds. This first phase will provide the science-based approach to efficiently plan and implement projects and programs to **Revitalize** the IRL.

The second phase will be a plan revision after three to five years. This second phase will use the data collected and lessons learned from this first phase of the plan to provide an update that is focused on clearly defined objectives with specific measurable goals. Projects will be selected based on their ability to achieve the plan objectives in the most cost-effective manner possible.

## 8.0 PLAN FUNDING AND COORDINATING EFFORTS

### 8.1 PLAN FUNDING OPTIONS

Indian River County voters approved a One-Cent Optional Sales Tax Fund. The Indian River County Board of County Commissioners approved an allocation of 20% of this fund for IRL protection and revitalization capital projects. This fund is estimated to be \$4 to \$5 million per year for five years starting in fiscal year 2019-2020. To implement the plan projects in a timely manner, the County will seek to use sales tax funds to leverage matching funding from grants and appropriations. Examples of other funding programs (many from DEP 2018) are:

- Funding for various IRL projects is currently planned in the County's 5-year Capital Improvement Program. As additional data are gathered through the **Research** phase of this plan, the information obtained will focus funding decisions for future IRL projects.
- Section 319 grant program – DEP administers funds received from USEPA to implement projects or programs that reduce nonpoint sources of pollution. Projects or programs must benefit Florida's impaired waters, and local sponsors must provide at least a 40% match or in-kind contribution. Eligible activities include demonstration and evaluation of urban and agricultural stormwater best management practices, stormwater retrofits, and public education.
- TMDL grants – Funding for projects related to the implementation of TMDLs may be available through periodic legislative appropriations to DEP. When funds are available, the program prioritizes stormwater retrofit projects to benefit impaired waters, similar to the Section 319 grant program.
- SJRWMD – In general, projects considered for funding shall benefit one or more of the four district core mission areas, including: (1) water supply – to include water conservation, alternative water supply development or water resource development; (2) water quality – to include water quality/nutrient loading reduction; (3) natural systems restoration – for projects that show measurable resource benefits to streams, lakes, wetlands, springs or aquifers; and (4) flood protection – for projects that address flood protection issues on an intermediate or regional scale. Assistance may be provided from ad valorem tax revenues or from periodic legislative appropriations for alternative water supply development and Surface Water Improvement and Management projects. The amount of funding available, matching requirements, and types of assistance may vary from year to year.
- IRL NEP – The IRL Council funds projects each year through their work plan process (<http://www.irlcouncil.com/>).
- FDOT – FDOT funds projects through their Five Year Adopted Work Program. There may be opportunities to enhance projects included in the program to provide additional water quality treatment for FDOT roads, rights-of-way, and outfalls.
- Budget Appropriation – The Florida Legislature may solicit applications directly for projects, including water projects, in anticipation of upcoming legislative sessions. This process is an opportunity to secure legislative sponsorship of project funding through the state budget.
- Clean Water State Revolving Fund loan program – This program provides low-interest loans to local governments to plan, design, and build or upgrade wastewater, stormwater, and nonpoint source pollution prevention projects. Discounted assistance for small communities is available. Interest rates on loans are below market rates and vary based on the economic wherewithal of the community. The Clean Water State Revolving Fund is Florida's largest financial assistance program for water infrastructure.
- Florida Rural Water Association Loan Program – This program provides low-interest bond or bank financing for community utility projects in coordination with the DEP's State Revolving Fund program. Other financial assistance may also be available.

- Rural Development Rural Utilities Service Guaranteed and Direct Loans and Grants – The U.S. Department of Agriculture’s program provides a combination of loans and grants for water, wastewater, and solid waste projects to rural communities and small incorporated municipalities.
- Small Cities Community Development Block Grant Program – The Florida Department of Economic Opportunity makes funds available annually for water and sewer projects that benefit low- and moderate-income persons.
- State Housing Initiatives Partnership Program – Florida Housing administers the program, which provides funds to local governments as an incentive to create partnerships that produce and preserve affordable homeownership and multifamily housing. The program is designed to provide very low, low- and moderate-income families with assistance. Funding may be used for emergency repairs, new construction, rehabilitation, down payment and closing cost assistance, impact fees, construction and gap financing, mortgage buy-downs, acquisition of property for affordable housing, matching dollars for federal housing grants and programs, and homeownership counseling (<http://www.floridahousing.org>).
- Rural Development Funding – The U. S. Department of Agriculture provides funds that will cover the repair and maintenance of private septic systems. The amount of funds available, as well as the specific purposes for which grants are intended, changes from year to year. Additional details are posted on the Department of Agriculture’s website (<https://www.rd.usda.gov/programs-services>).
- FIND – FIND Waterways Assistance Program provides grant funding for waterway related projects including navigation channel dredging, channel markers, navigation signs or buoys, boat ramps, docking facilities, fishing and viewing piers, waterfront boardwalks, inlet management, environmental education, law enforcement equipment, boating safety programs, beach re-nourishment, dredge material management, environmental mitigation, and shoreline stabilization.
- National Oceanic and Atmospheric Administration – The Coastal Partnership Initiative was developed to promote the protection and effective management of Florida’s coastal resources in four specific priority areas: (1) resilient communities, (2) coastal resource stewardship, (3) access to coastal resources, and (4) working waterfronts.
- FWC – FWC provides funding through grants such as the Florida Boating Improvement Program, Boating Infrastructure Grant, and Florida’s State Wildlife Grants Program that promote recreational boating or improve wildlife habitat.

## 8.2 COORDINATING EFFORTS WITH LOCAL STAKEHOLDERS

Coordination among the County, state agencies, water management districts, County municipalities, water control and other special districts, FDOT, universities and research institutions, the public, and federal regulatory agencies will be a key component to **Rally** support and funding for the long road to IRL **Revitalization**.

## 9.0 REFERENCES

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