
5. Expanding the IRLNEP leadership role on a state and national level to promote clean water, address harmful algal blooms, plan for coastal resilience and restore natural habitats.

6. Expand and enhance communication among IRL citizens, scientists and local governments. FY 2020 showed us how quickly water quality can improve when freshwater and nutrient loads are reduced. Dry weather from January through June 2020 reduced the amounts of freshwater and nutrients entering the Lagoon and delivered good water clarity throughout the IRL. During this time, the Banana River had some of the best water clarity observed in over a decade. For many, our beaches and natural areas became highly-valued safe havens for recreation, family engagement and COVID stress relief.

Once the rainy season began, salinity in the Lagoon changed, algal blooms appeared, and water quality declined. From August through November, an intense bloom of nano-plankton turned the waters of the southern Mosquito Lagoon, Banana River and northern IRL a pea soup green color. In the southern Lagoon, summer rains raised the level of Lake Okeechobee and forced the U.S. Army Corps of Engineers to begin discharging fresh water east into the St. Lucie River Estuary and west into the Caloosahatchee River. Continuing algal blooms and high volume discharges are stark reminders that we have much work to do. IRL health can be restored if we take aggressive action to remove or reduce nutrients from all sources, beginning with wastewater and stormwater infrastructure. In 2021, historic levels of funding will be invested in Lagoon restoration. We should celebrate the success achieved with this funding, however, we also must acknowledge this is just the beginning of a long road toward Lagoon restoration and recovery.

We must maintain the resolve to live Lagoon-Friendly, take responsibility for our individual and collective impacts on the Lagoon, and work harder to reduce, and eventually remove, these impacts. Progress will be measured one action and one project at a time. The Indian River Lagoon will recover if we give it the relief it needs. Thank you for your continuing support!
National Estuary Programs:
Restoring and Protecting the Nation’s Natural Treasures

Overview of the National Estuary Program:
The U.S. Environmental Protection Agency (EPA) established the National Estuary Program (NEP) as a core water program authorized by Section 320 of the Clean Water Act. The mission of the NEP is to protect and restore the water quality and ecological integrity of the 28 estuaries designated by the U.S. Congress as “Estuaries of National Significance.” Each NEP is governed by a Management Conference composed of diverse stakeholders. The management conference is largely responsible for developing a 10-year Comprehensive Conservation and Management Plan (CCMP) to guide estuary science, restoration and stewardship. The management conference ensures the CCMP is uniquely tailored to local environmental conditions, is based on local input, and is focused on local priorities.

The IRLNEP was established in 1990 and joined the NEP in 1991. Today, the IRLNEP is the leading organization that connects local, state, federal and community partners with a common goal to restore the IRL. The U.S. EPA is a valued partner, providing funding and acting in an advisory capacity to bring technical assistance and scientific expertise to the Program. The IRLNEP also benefits by collaborating among the other 27 NEPs through the Association of National Estuary Programs (ANEP). In 2020, the IRLNEP celebrated its 30th anniversary.

For every dollar the EPA provides, NEPs leverage $22 in local funding to protect and improve coastal environments, communities, and economies. In January 2021, the U.S. Congress reauthorized the NEP, increasing the authorized funding amount from $26.5 million annually to $50 million.

There Is a Plan for Restoring the Lagoon:
The IRLNEP fully revised its CCMP for the IRL in 2019 and is using it to direct Program activities and funding through 2030. The Program will continue funding projects, tracking progress and adaptively managing as new information and understanding come to light.

The primary goal of a CCMP is to steer the IRLNEP and its partners toward implementing corrective actions that will restore the IRL to health. The IRL Vital Signs wheel contains 32 Action Plans that were developed to guide improvements to lagoon health. Each action plan was ranked in terms of how critical it is to the health of the Lagoon. Six action plans were ranked as the highest priority areas: Wastewater, Impaired Waters, Stormwater, Harmful Algal Blooms (HABs), Seagrasses, and CCMP Implementation and Financing. The IRLNEP encourages federal and state agencies, counties, municipalities, community groups and individuals to determine which Vital Signs align with their areas responsibility and work to address the problems over which they have control.

To learn more and view our call-to-action video, visit onelagoon.org.
The IRLNEP: Taking the Lead

The IRL Council and IRLNEP are committed to funding local coast share projects through an annual, competitive request for proposals process. Decisions are outcome-driven and guided by the best available science.

Harmful Algal Bloom Research and Reporting

The IRLNEP continues to focus on Harmful Algal Bloom (HAB) monitoring and mitigating the effects of HABs on the IRL. Funding is provided for:

- Annual funding for lagoonwide HAB monitoring by the University of Florida and Florida Atlantic University at Harbor Branch;
- Creation of IRLNEP Algal Bloom Consortium Task Force and funding to support publication of research results from the 2011 algal superbloom in the journal *Frontiers in Marine Science*;
- Continuation of the region’s only wet/dry atmospheric deposition monitoring station.

Upgrading Infrastructure, Reducing Nutrients and Improving Water Quality

Of the fifty-five nutrient reduction or restoration projects funded by the IRLNEP from 2015 through 2020, twenty-two quantified the pounds of nutrients removed as a result of the project:

- 13 Nutrient reduction projects eliminated 36,248 pounds of Total Nitrogen and 7,004 pounds of Total Phosphorus.
- 9 Restoration projects eliminated 6,702 pounds of Total Nitrogen and 429 pounds of Total Phosphorus.

Coastal Resilience and Climate Change

The IRLNEP worked with R.W. Parkinson Consulting and The Balmoral Group on a two-year project to prepare the IRL as a Climate-Ready Estuary. In the first phase of the project, the IRL’s vulnerabilities to climate change were identified, analyzed and evaluated. In the second phase, the risk evaluation was utilized to develop a plan to assist Lagoon communities in planning for and adapting to potential climate change effects.

Results of the this work underwent extensive peer review and were published in the scientific journal *Coastal Management* in 2021.

The IRLNEP is also actively participating in coastal resilience planning at the local, state and national levels with the East Central Florida Regional Resilience Collaborative, Florida Ocean Alliance, and the Southeast and Caribbean Disaster Resilience Team Advisory Board.
2020: A Mixed Year for Lagoon Health

How is the Lagoon Doing?

2020 was another challenging year for the Indian River Lagoon and those who live, work and play on it. The cool, dry winter and spring delivered a much-needed break from recent poor water quality. During this time, water clarity was the best it had been in recent years. This glimpse of an improved IRL caused many homeowners, boaters and anglers to hope that the Lagoon was, at last, showing signs of recovery.

However, with the onset of seasonal summer rains beginning in June, nutrient-laden stormwater and baseflow began affecting water quality. Salinities and water clarity dropped, and algal blooms began. By late July, much of the southern Mosquito Lagoon, the Banana River and northern Indian River were impacted by a severe algal bloom, which continued through December. The dominant species in this bloom was a nano-cyanobacterium (often called “blue-green algae”) that had never reached bloom conditions in the past and is not known to be toxic.

Summer seagrass monitoring in the Lagoon showed that average transect lengths (as measured from the shoreline to the furthest extent of seagrass beds) were 37% shorter than those recorded in the summer of 2019. In the absence of significant seagrass recovery, benthic macroalgae, most commonly of the genus Caulerpa, have colonized shallow areas where seagrasses once dominated. IRL scientists have seen this as a potentially encouraging sign for seagrass return in the future since macroalgae help to stabilize bottom sediments and create conditions favorable for seagrass growth. They do not, however, provide the same habitat value that seagrasses do.

Multiple, small fish kills were reported throughout the summer in residential canals in the Banana River and northern Indian River. By November, the continuing algal bloom had scientists and agencies closely watching as dissolved oxygen levels creeped to dangerously low levels. Over Thanksgiving weekend, oxygen levels dipped again, triggering a multi-day fish kill. This event prompted the IRLNEP and St. Johns River Water Management District to organize agency and county staff, county health departments, and scientists from the University of Florida and Florida Atlantic University-Harbor Branch to participate in regular updates of current Lagoon conditions. These calls were held weekly until the algal bloom began to fade in December and continue into 2021 as needed.

The southern IRL was spared the effects of Lake Okeechobee discharges until late fall. However, following heavy rains in September, the U.S. Army Corps of Engineers (USACE) activated high-volume Lake Okeechobee releases beginning on October 14. These continued until January 8, 2021 when the USACE announced a transition to dry-season operations. Discharges to the St. Lucie Estuary and Indian River Lagoon ended, while those to the Caloosahatchee River and Gulf of Mexico were reduced to 1,000 cfs (cubic feet per second) per day to both manage Lake levels and provide beneficial flow to the Caloosahatchee River. Until a more permanent solution to seasonal high-volume discharges is enacted, restoration of the Lagoon will remain a difficult challenge.

How Severe Were the 2020 Algal Blooms?

The graphics above show the intensities of several algal blooms that occurred in recent years. From left to right, the 2011 algal superbloom; the brown tide bloom of 2016; mixed nano- and pico-plankton in 2019; and a species of cyanobacteria that is not known to be toxic and has never been dominant in the IRL before 2020.
IRL Council: Investing in the Future of the IRL

The IRLNEP thanks the U.S. Environmental Protection Agency and Florida investment partners for their ongoing commitments to fund restoration and protection efforts in the IRL watershed pursuant to the interlocal agreement that established the IRL Council in 2015.

- U.S. Environmental Protection Agency: $625,000
- U.S. Environmental Protection Agency Supplemental: $25,000
- South Florida Water Management District: $500,000
- St. Johns River Water Management District: $500,000
- Florida Department of Environmental Protection: $250,000
- Volusia County: $50,000
- Brevard County: $50,000
- Indian River County: $50,000
- St. Lucie County: $50,000
- Martin County: $50,000
- Sales from the Indian River Lagoon specialty license plate contribute approximately $125,000 annually.

$2,694,294
Total Expenditures
(Includes agency balance forward from FY 2019)

$2,080,086
30 Projects Funded
4 Nutrient Reduction ($546,400)
8 Restoration ($562,520)
4 Scientific Research ($257,950)
14 Community Engagement ($593,668)
Project Reserves ($119,548)

$257,558
Program Operations
(Includes Administrative Services, Administrative Costs, Facilities Expenses)

$356,650
Salaries and Benefits

Thank You to the thousands of Florida drivers who make a personal contribution to lagoon restoration by purchasing the IRL specialty license plate.
Empowering Change: IRLNEP-Funded Projects

52 Projects in Progress in FY 2020

LAGONOWIDE PROJECTS FY 2020
1. U.S. Restoration of Clam Populations in the IRL
2. Marine Resources Council's Water Quality Monitoring
3. UF and FAU: Harmful Algal Bloom Monitoring
4. IDEAS Florida: One Lagoon Comprehensive Communication Initiative
5. IRLNEP: One Community - One Voice Initiative
7. IRLNEP: Special Projects Coordinator
8. IRLNEP: Small Grants Program
9. Capacity-Building Support and Grants Writing
10. IRLNEP Support for Science Symposia and Events

LAGONOWIDE PROJECTS FY 2019
1. UT and FAU: Harmful Algal Bloom Monitoring
2. IRLNEP: One Community - One Voice Initiative
3. Tetra Tech: Florida One Lagoon Board's Guide
4. W.W. Parkinson Coastal Adaptation Planning
5. FDEP Aquatic Preserves: IRL Satellite Restoration
6. UCF: Microplastics, Oysters and the IRL
7. Capacity-Building Support and Grants Writing
8. IRLNEP Support for Science Symposia and Events

1. University of Central Florida: Tomoka State Park Living Shoreline Stabilization
2. Marine Discovery Center: Shuck-n-Share Oyster Restoration
3. Volusia County: Gabordy Canal 10th Street Stormwater Treatment Facility, Design and Engineering
4. Riverside Conservancy: Riverside Restoration for a Healthy Lagoon
5. University of Central Florida: Living Shoreline Stabilization and Oyster Reef Restoration in Mosquito Lagoon
6. Volusia County: Indian Harbor Estates Sewer Retrofit Design and Engineering
7. University of Central Florida: Shoreline Restoration Suitability Model, Phase 2: North IRL and Mosquito Lagoon
8. Sea and Shoreline: Restoration, Maintenance and Conservation of Seagrasses in the Indian River Lagoon
9. Florida Institute of Technology: Enhancing the Performance of Muck Removal Using Dissolved Oxygen
10. Brevard Zoo: Restore Our Shores - Engaging Brevard County Students in Native Plant Provision and Seagrass Restoration
11. City of Satellite Beach: Samson’s Island Submerged Land Restoration
12. Florida Inst. of Technology: Efficacy of Adding Concentrated Dissolved Oxygen to Enhance Muck Removal Projects
14. Brevard County: Mosco Sewer Line Extension
15. Wood Environmental and Infrastructure Solutions, Inc.: Atmospheric Deposition - Nutrient Monitoring
16. Wood Environmental and Infrastructure Solutions, Inc.: Atmospheric Deposition - Nutrient Monitoring
17. City of Sebastian: CRA Septic to Sewer Program
18. Coastal Resources Group: Pelican Island Restoration
19. Indian River County: West Wabasso Septic to Sewer Conversion, Phase 2
20. Indian River County: Wetland Restoration at Jones Pier Conservation Area
21. Indian River County: Lost Tree Island Conservation Area Ecological Enhancement Plan
22. Pelican Island Audubon Society: Audubon Advocates - Changing Behavior to Improve Lagoon Habitats
24. St. Lucie County: St. Lucie Water Champions Initiative
25. City of Port St. Lucie: McCoy Ranch Dispersed Water Management - Area 2
26. ORCA: Engaging the Public in Restoration and Taking Action
27. Florida Oceanographic Oyster Restoration and Discovery (FLOORED)
28. Martin County: Willsiegh Creek Stormwater Improvement Project
31. University of Florida and Florida Atlantic University: Harmful Algal Bloom Monitoring
32. Florida Department of Environmental Protection: IRL Shoreline Restoration Project
33. IRLNEP: Harmful Algal Bloom Science Coordination - EPA Supplemental Grant
34. Florida Atlantic University - Harbor Branch: One Lagoon Monitoring Plan
35. Tetra Tech, Inc.: One Lagoon Habitat Restoration Plan
38. IDEAS Orlando: One Lagoon Comprehensive Communication Initiative
39. Smithsonian Marine Station at Ft. Pierce: IRLNEP Biodiversity Inventory: Looking Ahead to 2030
41. IRLNEP: Special Projects Coordinator
42. IRLNEP: Small Grants Program
43. IRLNEP: Capacity-Building Support and Grants Writing, with Natua Strategies, T. Pinney, and Angie Brewer, Inc.
44. IRLNEP: Support for Science Symposia, Conferences and Events
45. University of Florida and Florida Atlantic University: Harmful Algal Bloom Monitoring
46. IRLNEP: “One Community - One Voice” Initiative, with IDEAS
47. Tetra Tech, Inc.: CCMP Technical Support and Data Management
48. R.W. Parkinson Consulting, Inc.: Coastal Adaptation Planning
49. FDEP Aquatic Preserves Office: IRL Shoreline Restoration
50. University of Central Florida: Microplastics, Oysters and the IRL
51. IRLNEP: Capacity-building Support and Grant Writing, with Natua Strategies, T. Pinney, and Angie Brewer, Inc.
52. IRLNEP: Support for Science Symposia, Conferences and Events
This partnership between the University of Florida (UF) and Florida Atlantic University – Harbor Branch (FAU) monitors the IRL for the presence of harmful algal bloom (HAB) species. Five sites in the northern lagoon are monitored by UF, and five sites in the southern lagoon are monitored by FAU. Sampling for phytoplankton and water quality monitoring are regularly conducted every two weeks, with other sampling conducted as needed when blooms arise. Samples are analyzed for species composition, abundance, biovolume, and biomass. When blooms are detected, the IRLNEP, St. Johns River Water Management District, South Florida Water Management District, and Florida Wildlife Research Institute are notified about the dominant species and associated water quality data.

Data are analyzed to identify regional differences in environmental factors that could be contributing to bloom conditions. Results are also used in developing models that could be useful in explaining blooms, or potentially even predicting them in the future.

Monitoring to Understand HABs: Protecting Ecological and Human Health

University of Florida and Florida Atlantic University – Harbor Branch

This partnership between the University of Florida (UF) and Florida Atlantic University – Harbor Branch (FAU) monitors the IRL for the presence of harmful algal bloom (HAB) species. Five sites in the northern lagoon are monitored by UF, and five sites in the southern lagoon are monitored by FAU. Sampling for phytoplankton and water quality monitoring are regularly conducted every two weeks, with other sampling conducted as needed when blooms arise. Samples are analyzed for species composition, abundance, biovolume, and biomass. When blooms are detected, the IRLNEP, St. Johns River Water Management District, South Florida Water Management District, and Florida Wildlife Research Institute are notified about the dominant species and associated water quality data.

Data are analyzed to identify regional differences in environmental factors that could be contributing to bloom conditions. Results are also used in developing models that could be useful in explaining blooms, or potentially even predicting them in the future.

Photos: FAU-HBOI. (a) Preparing to deploy a towed plankton net; (b) Photo of the toxic Dinoflagellate, Pyrodinium bahamense; (c) Mixed phytoplankton from a tow sample; (d) Bloom of Microcystis cyanobacteria.

Your NEP at Work: IRLNEP-Funded Projects FY 2020:

Numbers following project names correspond to map locations for FY 2020 IRLNEP projects. FY 2019 projects are not described below but remain on the map as active projects. For details of these projects, see the IRLNEP 2019 Annual Report at onelagoon.org/resources.

Gabordy Canal 10th Street Stormwater Treatment Facility, Design and Engineering (3)
Sponsor and Partners: Volusia County
Outputs: Project will complete 100% design and engineering plans (D&E) as well as required permitting services for a wet detention pond designed to intake baseflow and small storm flows that are conveyed by the Gabordy Canal before they discharge into the Mosquito Lagoon.
Outcomes: Project will improve water quality in flows conveyed to the IRL by the Gabordy Canal. Nutrient reductions of 5,600 lb./yr. of Total Nitrogen, 1,400 lb./yr. of Total Phosphorus, and 35,000 lb./yr. of Biological Oxygen Demand (BOD) are expected.
IRLNEP Contribution: $100,000
Partner Match: $100,000
Total Project Cost: $200,000

Riverside Restoration for a Healthy Lagoon (4)
Sponsor and Partners: Riverside Conservancy
Outputs: Two gifted, yet disadvantaged, high school conservation leaders will develop a youth-led restoration program at Veteran’s Memorial Park in Edgewater, Florida. Approximately 500 linear feet of living shoreline and oyster reef will be restored.
Outcomes: The Project will engage and mentor youth on career paths toward environmental restoration and conservation; provide improved habitat and ecological benefits, and provide under-represented communities with climate-adaption and resiliency access and resources.
IRLNEP Contribution: $15,000
Partner Match: $25,000
Total Project Cost: $40,000

Living Shoreline Stabilization and Oyster Reef Restoration in Mosquito Lagoon (5)
Sponsor and Partners: University of Central Florida, Marine Discovery Center; Coastal Conservation Association
Outputs: The project will restore 4-6 oyster reefs of approximately 0.25-acre each in Mosquito Lagoon; deliver a minimum of 10 restoration events; stabilize 1,000 linear feet of shoreline; and recycle and distribute 150,000 pounds of oyster shell
FY 2020 IRLNEP-Funded Projects

through the Marine Discovery Center’s Shuck & Share Program.

Outcomes:
Recovery calculations estimate 10,000 live oysters surveyed after 5 years; erosion prevention; reduction of landfill waste; provision of a stable source of shell for future restorations; and engagement of 500 individuals who will contribute 1,500 hours of volunteer labor.

IRLNEP Contribution: $ 88,585
Partner Match: $ 88,106
Total Project Cost: $176,691

Indian Harbor Estates Sewer Retrofit Design and Engineering (6)
Sponsor and Partners: Volusia County, City of Oak Hill
Outputs: Project delivers 100% Design and Engineering to convert the neighborhood of Indian Harbor Estates from septic to sewer. This will allow all household wastewater to be treated at the County’s Southeast Regional Wastewater Treatment Plant.

Outcomes: A near-immediate reduction in nutrient concentrations is expected, including elimination of 4,600 to 7,600 lb./yr. of Total Nitrogen and 1,200 to 1,800 lb./yr. of Total Phosphorus.

IRLNEP Contribution: $100,000
Partner Match: $150,000
Total Project Cost: $250,000

Restoration, Maintenance and Conservation of Seagrasses in the Indian River Lagoon (8)
Sponsor and Partners: Sea and Shoreline, Atkins Global
Outputs: The project restores two acres of seagrass habitat within the Indian River Lagoon and documents the factors that influence success to inform future efforts. This effort includes installation of nursery-grown seagrass plugs, maintenance of the site, and monitoring project outcome over three years.

Outcomes: Project demonstrates the effectiveness of various seagrass planting techniques to advise future management decisions. Ecological benefits include sediment stabilization, nutrient reduction, habitat creation, and increased biodiversity.

IRLNEP Contribution: $ 95,872
Partner Match: $125,473
Total Project Cost: $221,345

Enhancing the Performance of Muck Removal Using Dissolved Oxygen (9)
Sponsor and Partners: Florida Institute of Technology, Lapin Services, City of Cocoa Beach
Outputs: Project tests the efficacy of using concentrated dissolved oxygen to aide decomposition of organic matter and reduce nutrients in a muck management area. Based on previous research, the project is expected to remove over 20 pounds of Nitrogen/day and approximately 1 pound of Phosphorus/day.

Outcomes: If proven successful, this method may provide lagoon managers a lower-cost and environmentally-friendly, 21st century tool for treating dredge water. Project also provides significant nutrient reductions, improved water clarity and water quality in the managed area.

IRLNEP Contribution: $ 82,950
Partner Match: $ 83,300
Total Project Cost: $166,250

Restore Our Shores: Engaging Brevard County Students in Native Plant Provision and Seagrass Restoration (10)
Sponsor and Partners: Brevard Zoo, Seagrass Ecosystems Analysts; Brevard County Environmentally Endangered Lands
Outputs: Brevard Zoo will work with schools to educate students about restoration techniques. Students will participate in growing and fostering 500 mangrove plants and 500 plugs of the shoreline grass, Spartina, that will later used in habitat and shoreline restorations. At least 30 community events will be conducted and 860 volunteer hours are expected to be contributed.

Outcomes: The project supports student engagement in hands-on lagoon restoration; provides materials for use in habitat restoration; and encourages increased stewardship of the IRL and community support for restoration efforts.

IRLNEP Contribution: $61,740
Partner Match: $31,240
Total Project Cost: $92,980
Understanding the Distribution and Abundance of Microplastics in the IRL

University of Central Florida, Marine Discovery Center, FDEP Aquatic Preserves, UF/IFAS, Smithsonian Marine Station and Florida Oceanographic Society

In 2020, University of Central Florida continued its collaboration with other partners to investigate the distribution and abundance of microplastics in the Indian River Lagoon. This work includes monthly water sampling of 35 sites, quarterly sampling of 12 oyster reefs and completion of experiments to test the retention of microplastics within both juvenile and adult oysters.

Analysis to date shows that microplastics are found throughout the IRL. Oysters in the southern IRL were found to have the highest densities of microplastics, 95.4% of which are fibers. Further, the density of microplastics in the IRL fluctuates throughout the year. Experimental trials found that oysters both take in and excrete microplastics.

To date, 65 citizen scientists have dedicated 1,257 hours to microplastics training, sampling, and analysis. A total of 54 workshops have been held to train citizen scientists and inform various audiences about microplastics in the environment.

Photos: UCF. (a) Preparing to take samples from an oyster; (b) Photo of microplastic fibers; (c) samples prepared for analysis; (d) Sample of oyster feces examined for the presence of microplastics.

Samson’s Island Submerged Land Restoration (11)
Sponsor and Partners: City of Satellite Beach, Marine Discovery Center; University of Florida; FAU-Harbor Branch; Seagrass Systems Analysts; Florida Oceanographic; Florida Institute of Technology; Florida Fish and Wildlife; Marine Resources Council; Keep Brevard Beautiful; Friends of Gamble Rogers and North Peninsula State Parks; Balance for Earth; East Central Florida Regional Planning Council.

Outputs:
Volunteers will utilize a variety of techniques and species to restore submerged lands on the east side of Samson’s Island. Oysters, clams, and seagrasses will be installed, maintained and monitored throughout the project. Maps will be produced showing progress of each species.

Outcomes:
This pilot-scale project will assist in determining the feasibility of larger-scale restorations at similar locations. Community engagement and stewardship will be improved. As the restoration proceeds and matures, improved water quality and clarity, sediment stabilization, and erosion prevention will be achieved.

IRLNEP Contribution: $ 65,549
Partner Match: $ 42,324
Total Project Cost: $107,873

Micco Sewer Line Extension (14)
Sponsor and Partners: Brevard County.

Outputs:
The project installs approximately 1.4 miles of force main to convert 31 residential and commercial properties from septic to sewer. A new lift station and approximately 28 grinder pumps and lateral lines will also be installed at developed properties.

Outcomes:
Immediate elimination of 1,359 lbs. Total Nitrogen per year to the Central Indian River Lagoon, which is approximately 0.24% of the Stormwater Allocation of the TMDL for the Central IRL Basin Management Action Plan.

IRLNEP Contribution: $ 246,400
Partner Match: $2,393,226
Total Project Cost: $2,639,626

Atmospheric Deposition - Nutrient Monitoring of the Indian River Lagoon (15)
Sponsor and Partners: Wood Environmental and Infrastructure Solutions, Inc., St. Johns River Water Management District, Indian River County Environmental Health Department.

Outputs:
This long-term IRLNEP initiative estimates nutrient loads from atmospheric deposition at a Sebastian Inlet monitoring station. This station is included in the national Clean Air Status and Trends Network (CASTNET) and is the only one in operation for the entire lagoon watershed. Modeling based on these data contributes to quantifying the IRL’s nutrient budget.

Outcomes:
Long-term data collection provides a robust dataset for use in TMDL determinations and BMAP development. Data are used for model testing and developing management scenarios.

IRLNEP Contribution: $25,000
Partner Match: Not Required
Total Project Cost: $25,000

City of Sebastian: Community Redevelopment Authority (CRA) Septic to Sewer Program (17)
Sponsor and Partners: City of Sebastian

Outputs:
The project incentivizes property owners to convert businesses or residences within the City’s CRA from septic to sewer. The program reimburses up to $5,000 per property for costs incurred to connect to the Indian River County sanitary sewer system.

Outcomes:
This program has the capability of incentivizing the conversion of the majority of septic systems in the CRA. A long term benefit is the removal of excess nutrients and other pollutants, improved water quality and water clarity to support seagrass growth.

IRLNEP Contribution: $100,000
Partner Match: $100,000
Total Project Cost: $200,000
Pelican Island Restoration (18)
Sponsor and Partners: Coastal Resources Group, Landon Moree and Associates; Everglades Headwaters National Wildlife Refuge; Indian River County Mosquito Control District; U.S. Fish and Wildlife Service.
Outputs: This project restores approximately 300 linear feet of existing reef and breakwater using bagged fossil shell to enhance wave attenuation in protection of Pelican Island. The project will protect critical wetlands and habitat. New GIS mapping will document the current size of Pelican Island, benefiting its long-term management.
Outcomes: This project protects the 3.2-acre island from further erosion and protects the gains made by previous restorations. It will support wading, roosting and nesting habitat for important bird species. Creation of hardbottom habitat will allow filter feeder colonization and water quality benefits and will improve the resilience of the island to the effects of sea level rise.
IRLNEP Contribution: $35,000
Partner Match: $35,000
Total Project Cost: $70,000

Lost Tree Island Conservation Area (LTICA) Ecological Enhancement Plan (21)
Sponsor and Partners: Indian River County
Outputs: LTICA is a managed tract that the County is obligated to enhance and preserve through an agreement with the Florida Communities Trust. The project will develop an engineering plan and construction specifications for the enhancement of LTICA, which consists primarily of man-made spoil islands.
Outcomes: The plan includes resilient site design, water quality benefits, establishment of high marsh habitat, enhanced mangrove shorelines, maritime hammock habitat, and enhanced seagrass habitat. Nuisance and invasive plants will be eliminated and the plan will incorporate a variety of passive recreation components.
IRLNEP Contribution: $65,000
Partner Match: $184,800
Total Project Cost: $249,800

Willoughby Creek Stormwater Project: Reducing Nutrients and Sediments and Managing Freshwater Inputs to the IRL
Martin County
Completed in 2020, the Willoughby Creek Stormwater Quality Improvement Project constructed an 8.24-acre treatment train of deep, wet detention lakes, shallow water Stormwater Treatment Areas (STAs), and 2 control structures. The project was designed to capture and treat the first inch of runoff from the 385 acres upstream of the watershed that consist primarily of commercial and industrial properties along US Highway 1. The project will maximize the storage capacity, attenuation and residence time of stormwater runoff in order to achieve the highest possible pollutant load reductions.
Approximately 10,641 lbs./yr. of Total Nitrogen (TN), 2,551 lbs./yr. of Total Phosphorus (TP), and 58,689 lbs./yr. of Total Suspended Solids (TSS) will be removed from stormwater prior to its discharge into the St. Lucie River Estuary, a nutrient impaired waterbody with an adopted TMDL and BMAP.
Photos: IRLNEP. (a) Construction of the Willoughby Creek Stormwater Improvement Project; (b) Construction of a deep wet detention lake; (c) Infrastructure installation; (d) Project signage showing funding partners.
Buffered Shoreline Project: Engaging the Public in Restoration and Taking Action (26)

Sponsor and Partners: Ocean, Research and Conservation Association (ORCA)

Outputs: The project delivers design, installation and monitoring of three buffered shoreline variations to encourage the use of shoreline buffering. Educational programs will be implemented using the site to engage the public and promote the use of living and buffered shorelines.

Outcomes: Immediate effects include the beautification of the park and the reduction of nutrient and sediment runoff to the lagoon. The completed project will give Martin County residents a pathway for taking personal action to address lagoon health.

IRLNEP Contribution: $40,000
Partner Match: $40,000
Total Project Cost: $80,000

Restoration of Clam Populations in the Indian River Lagoon for Water Quality (29)

Sponsor and Partners: University of Florida, Florida Fish and Wildlife; St. Johns River Water Management District; Research Aquaculture, Inc.; Coastal Conservation Association of Florida

Outputs: The goal of the project is to initiate IRL clam restoration by planting hardy varieties of native clams spawned in the aquaculture hatchery at the UF Whitney Lab on scales that provide for reproductive success. Brood stock will be established and maintained at 2 facilities. Volunteers will be engaged to participate in repatriating 2-3 million seed clams at several locations.

Outcomes: This project supports efforts to restore healthy seagrasses in the IRL by improving water quality in localized areas utilizing filter feeding clams. Additional benefits include reestablishing IRL clam populations for future recreational and commercial harvest and documenting the reliability and feasibility of the methods used for future tech transfer.

IRLNEP Contribution: $103,322
Partner Match: $105,591
Total Project Cost: $208,913

Water Quality Monitoring Network - Informing Habitat Restoration (30)

Sponsor and Partners: Marine Resources Council, Marine Discovery Center; Florida Oceanographic Society; Blue Siren, Inc; Florida Institute of Technology

Outputs: This project improves the data quality and accessibility of the Citizen Water Quality Monitoring Network. Multiple datasets from four organizations will be melded into a single data entry and analysis platform. Over 100 citizen scientists will be engaged in water quality data collection and data will be integrated with the FDEP WIN repository.

Outcomes: Improved quality of citizen scientist knowledge in sampling and reporting data; enhanced data management, accessibility and data transparency.

IRLNEP Contribution: $10,942
Partner Match: $24,000
Total Project Cost: $34,942

Harmful Algal Bloom Monitoring (31)

Sponsor and Partners: University of Florida and Florida Atlantic University–Harbor Branch

Outputs: Ten sites will be sampled twice per month for composition, abundance, biovolume and biomass of phytoplankton, and identification of HAB species. Collected data will be used to model bloom drivers. When HABs are detected, the IRLNEP and state agencies will be notified.

Outcomes: Timely distribution of sampling information will improve knowledge of the current state of the IRL and allow more responsiveness among agencies and stakeholders. Improved modeling will assist in identifying environmental drivers that trigger algal blooms and inform efforts to ameliorate conditions where algal blooms thrive.

IRLNEP Contribution: $100,000
Partner Match: Not Required
Total Project Cost: $100,000
**Demonstrating the Viability of a Land-Based Seagrass Nursery to Accelerate Seagrass Recovery**

Florida Atlantic University–Harbor Branch, Florida Fish and Wildlife, St. Johns River Water Management District, Coastal Conservation Association Florida

As resource managers work to improve IRL water quality to levels sufficient to sustain seagrass health, some degree of seagrass planting may be needed to supplement existing seagrass areas until they again become self-sustaining. A recent feasibility study indicated that seagrass recovery in the IRL may be hampered by an insufficient supply of both seeds and vegetative fragments that would normally be present in the environment to help replenish seagrass beds. Even if water quality were sufficient to sustain active seagrass restoration programs, the capacity to grow and readily supply seagrasses for transplant does not currently exist outside of small scale demonstration projects.

The goal of this project is to develop and utilize nursery techniques to propagate donor seagrasses for a pilot-scale seagrass restoration effort. A closed, land-based tank system was established at FAU-Harbor Branch to propagate the seagrass, *Halodule wrightii*, also known as shoal grass. To date, the nursery has produced enough shoal grass for a pilot-scale test of the viability of using nursery-grown seagrasses in restoration programs. Three 0.25-acre sites were selected and planted with nursery-raised seagrass stock. Sites are being monitored regularly to measure growth and survival. With this proof of concept successful, IRL seagrass restoration will be able to move forward with new technologies and stocks of seagrasses awaiting transplant to areas of the Lagoon with sufficient water quality to sustain them.

**IRL Shoreline Restoration Project (32)**

**Sponsor and Partners:** Florida Dept, Environmental Protection Aquatic Preserves Office, Florida Fish and Wildlife, Hubbs-SeaWorld Research Institute, University of Florida Extension, Environmental Learning Center, St. Lucie County, Manatee Observation Center, SEA a Difference Environmental Svcs.

**Outputs:** This project restores mangrove fringe and other native habitats using living shoreline methods. Community volunteers in 4 counties will assist in the installation of projects that restore 200 m of shoreline and create nesting habitats for listed species such as horseshoe crabs, diamondback terrapins, and shorebird species.

**Outcomes:** The project provides resilience protection for adjacent uplands, fish and wildlife habitats and protection of shorelines from erosion and storm damage. The educational and volunteer components promote stewardship for shoreline wildlife and use of living shorelines as an alternative to hardened structures.

**IRLNEP Contribution:** $47,452

**Partner Match:** $62,398

**Total Project Cost:** $109,850

**Harmful Algal Bloom Science Coordination (33)**

**Sponsor and Partners:** IRLNEP, Florida Dept. Environmental Protection, Florida Fish and Wildlife, St. Johns and South Florida Water Management Districts,

**Outputs:** Convene the IRLNEP Algal Bloom Consortium, created in 2020 as an IRLNEP Task force; use modeling to evaluate the 'ecological lift' provided by potential projects; develop fact sheets and other information for the public to explain HAB science and state of knowledge; convene a HAB science summit; assist the HAB task force to communicate current knowledge.

**Outcomes:** Enhanced coordination, cooperation and communication among the HAB scientific community throughout Florida; improved public awareness about algal bloom causes and appropriate mitigation actions; over time, shared knowledge translates to improved water quality.

**IRLNEP Contribution:** $25,000

**Partner Match:** Not Required

**Total Project Cost:** $25,000

**One Lagoon Monitoring Plan (34)**

**Sponsor and Partners:** Florida Atlantic University–Harbor Branch Oceanographic Institute, St. Johns River Water Management District, Florida Fish and Wildlife, Martin County, ORCA, Florida Institute of Technology, Brevard County, South Florida Water Management District, Smithsonian Marine Station, Marine Resources Council, University of Central Florida

**Outputs:** The Plan focuses on identifying current assets and gaps. It will develop a strategic approach to comprehensive and fully integrated coastal monitoring of the IRL. The project team will conduct workshops to establish and categorize known data sources, indicators, and needs. The team will present a synopsis of their results at the Indian River Lagoon Symposium 2021.

**Outcomes:** Enhanced communication, coordination, cooperation, and collaboration are expected outcomes. Over 3 to 5 years, improved data collection, improved delivery of information, reduced challenges and fewer gaps in data. Over the long term, a robust database could be created that allows for real-time modeling and visualization.

**IRLNEP Contribution:** $50,000

**Partner Match:** $52,710

**Total Project Cost:** $102,710
### One Lagoon Habitat Restoration Plan (35)

**Sponsor and Partners:** Tetra Tech, Inc.

**Outputs:** Project develops a lagoonwide habitat restoration plan to address seagrasses, wetlands, filter feeders, living shorelines and spoil islands. The plan provides guidance to the IRLNEP Management Conference and partners to identify and prioritize restoration and coordination.

**Outcomes:** Expected outcomes are enhanced decision-making to restore and maintain biological diversity and coastal resilience and enhanced prioritization of habitats targeted for restoration.

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### One Lagoon Asset Mapping (36)

**Sponsor and Partners:** Applied Ecology, Inc., Brevard County, City of Cocoa Beach, and Florida Inst. of Technology.

**Outputs:** This project provides targeted GIS mapping of natural habitats, human-built infrastructure, stakeholder networks and other lagoonwide topics. An ArcGIS geodatabase will be created with a platform equipped to share, visualize, and analyze data.

**Outcomes:** Position the IRLNEP as the primary source for accurate lagoonwide GIS data and mapping; increased communication between ecosystem managers and scientists; enhanced modeling, real-time visualization and cloud analytic capabilities.

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### State of the Lagoon Technical Report (37)

**Sponsor and Partners:** Applied Ecology, Inc., Stetson University, Florida Institute of Technology, University of Central Florida, Florida Atlantic University–Harbor Branch, Marine Resources Council.

**Outputs:** This 5-year project will generate a state-of-the-IRL technical report. The contractor will work directly with the IRLNEP Management Conference and staff to acquire and synthesize data, develop indicators, graphics, mapping, and other elements that will contribute to a final technical report assessing the current state of the IRL.

**Outcomes:** The final report will establish a scientific baseline of current IRL knowledge to inform updates to the CCMP. Expected outcomes include increased communication between managers and scientists; building a multi-disciplinary task force willing to guide report development; and delivering a synthesis of scientific knowledge to inform restoration and policy.

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### One Lagoon Comprehensive Communication Initiative (38)

**Sponsor and Partners:** IRLNEP, IDEAS Orlando, other contract support as determined by competitive procurement.

**Outputs:** Funding supports implementation of the “One Lagoon - One Community - One Voice” communication strategy. Funding will be applied to brand activation, website enhancements, production of 32 short videos for use on the web and social media, ten 2-minute videos based on Lagoon-Friendly living, and a formalized social media program and policy.

**Outcomes:** Expected outcomes are enhanced brand recognition via website and print collaterals, successful communication of a value proposition for the IRLNEP that expands funding for IRL restoration, delivery of a strategic campaign in alignment with the revised CCMP.

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### IRLNEP Biodiversity Inventory (39)

**Sponsor and Partners:** Smithsonian Marine Station at Fort Pierce

**Outputs:** Project completely updates and reorganizes the IRL Species Inventory website, transfers the Inventory to a new website developed as a biodiversity management system.

**Outcomes:** Improved citizen knowledge, understanding and stewardship for the IRL and its species; preservation and expansion of the IRL Species Inventory, improved engagement of students and researchers; addition of new records from recent studies and technological advances.

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### One Lagoon Boater’s Guide (40)

**Sponsor and Partners:** Marine Resources Council, Florida Fish and Wildlife Conservation Commission, Florida Fish and Wildlife Research Institute, Florida Inland Navigation Trust, Sebastian Inlet Tax District, Brevard County, and Volusia County

**Outputs:** This project updates the popular IRL Boater’s Guide, last published in 1996, with a focus on Lagoon-Friendly boating practices, safety and enhanced information-sharing. An inventory and map of certified Clean Marinas, updated seagrass maps, public marinas and boating access; and updated geo-referenced data on lagoon resources will be included.

**Outcomes:** The project is expected to enhance citizen awareness of Lagoon-Friendly boating practices and boating safety. Boaters will be better-informed about where to access the lagoon, enjoy recreational activities, access clean marinas, and improve their stewardship for the Lagoon.

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### Special Projects Coordinator (41)

**Sponsor and Partners:** IRLNEP

**Outputs:** This EPA-funded staff position addressed EPA concerns about staff size and program capacity. The Coordinator focused on meetings and internal communications; social media, ADA compliance, and oversight of special projects including the IRL Envirothon; the annual SHORE conference, the IRL Science Symposium, and administration of the IRLNEP small grants program.

**Outcomes:** The coordinator will improve community engagement with the IRLNEP via social media, outreach to communities and target audiences. Over the long term, the commitment to engagement will assist the program in regionalizing the IRLNEP mission.

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### IRLNEP: Small Grants Program (42)

**Sponsor and Partners:** IRLNEP and various outreach partners.

**Outputs:** IRLNEP funding supports small IRL projects costing between $500 and $5,000 with a focus on community engagement, stewardship, water quality and habitat restoration. Funding enables community groups, teachers, schools, and non-profit organizations to provide IRL-focused outreach and educational programs.

**Outcomes:** Over the long term, the project leads to improved citizen awareness and knowledge, improved habitat and water quality and improved IRL stewardship.

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Despite a common misconception that little is being done to address IRL health, 2020 was a busy year for the IRLNEP and our partners throughout the watershed.

IRLNEP community partners reported a total of 260 projects that were underway or completed during 2020. The following pages highlight some of the projects our partners are implementing to benefit IRL health and restoration.

**Capacity-Building Support and Grant Writing (43)**

**Sponsor and Partners:** IRLNEP, Natua Strategies, T. Pinney and Associates, Angie Brewer, Inc.

**Outputs:** Three consulting companies, each with expertise in particular focus areas, are available to assist the IRLNEP with building capacity among the Program’s local government and community partners through new revenue source identification, research and grant writing assistance provided at no cost to IRLNEP partners.

**Outcomes:** Local governments and community partners build their capacities and fund IRL-focused projects that protect or enhance water quality and habitats. Since 2018, the IRLNEP has invested $49,588 in grant writing services. Grant writers have returned $3,604,525 in awarded grants, a 73:1 return on investment.

**IRLNEP Contribution:** $50,000

**Partner Match:** Not required

**Total Project Cost:** $50,000

**Support for Science Symposia, Workshops, Conferences and Events (44)**

**Sponsor and Partners:** IRLNEP and various partners

**Outputs:** The IRLNEP will assist community partners with technical support, development and delivery of high-quality conferences, workshops, symposia and events that are aligned with CCMP priorities.

**Outcomes:** This project expands community outreach and education to better-inform stakeholders, citizens and resource managers about the IRL and its challenges. It advances the IRLNEP mission and leverages available funds efficiently.

**IRLNEP Contribution:** $25,000

**Partner Match:** Not required

**Total Project Cost:** $25,000
Volusia County initiated the Ariel Canal Water Quality Improvement Project, located in the Oak Hill area of Volusia County. This large-scale stormwater retrofit includes installation of a treatment facility that will remove an estimated 1,300 pounds of Total Nitrogen and 210 pounds of Total Phosphorus annually from base flow and roadway stormwater runoff.

In September 2019, Volusia County’s Environmental Management Division (EMD) hosted the International Coastal and Halifax/Indian River Cleanup. 1,631 people volunteered to clean up trash at 32 sites, removing 7,302 pounds of trash and recyclables. Additionally, EMD’s Monofilament Recycling Program and Underwater Cleanups have collected an additional 731 pounds of monofilament fishing line and marine debris from within the lagoon watershed.

Volusia County EMD continues to monitor numerous sites in Mosquito Lagoon for water quality. Since 1988, monthly and quarterly collections have been continuous for the northern stretches of the Lagoon from Ponce Inlet south to Oak Hill, with additional sites along the Intracoastal Waterway and points eastward near Bethune Beach and George’s Bar.

Volusia County EMD operates the Marine Science Center (MSC), as well as a sea turtle hospital and seabird rehabilitation center at Ponce Inlet to educate the public about the marine environments and species. In October of 2019, the MSC installed a new seagrass exhibit with tank-raised seahorses to showcase the importance of habitat to the health of the Indian River Lagoon. More than 99,300 visitors passed through the MSC in the last year.

Partner Projects in Volusia County:

Volusia County’s Marine Mammal Stranding Team assisted with 34 marine mammals in distress within the Indian River Lagoon. This included 8 Bottlenose dolphins, 25 manatees, and 1 North Atlantic Right whale. Work was performed in partnership with Florida Fish and Wildlife Conservation Commission, Hubbs-SeaWorld Research Institute, Marineland Research Institute, Volusia County Beach Safety and Sheriff’s Marine Unit.

Volusia County EMD funded a Be Floridian Now Coordinator to engage with community residents through public presentations, educational exhibits, public events, newspaper articles, social media and radio/television interviews. Be Floridian Now is a program that encourages homeowners to reduce their use of fertilizers and pesticides.

Canaveral National Seashore continued monitoring and protection of state and federally listed species, including scrub jays, beach mice, and sea turtles. Over 13,000 sea turtle nests were deposited on the 24 mile stretch of beach. The park eradicated 2,000 acres of exotic plants on the barrier island system and lands adjacent to the lagoon. Staff offer guided hikes, canoe and boat tours to educate visitors about the lagoon, habitats, and species. Interpretation staff give programs on seining and fishing in the lagoon. New displays at the Visitor Center focus on lagoon ecology and mangrove habitats.

Canaveral National Seashore, NASA, Merritt Island National Wildlife Refuge and FWC developed a small working group to focus on and address lagoon issues such as research needs, messaging for the public, and coordinating efforts. Work was conducted by contractors and resource management staff.

St. Johns River Water Management District (SJRWMD) is working with the City of Edgewater on a reclaimed water reservoir. This project includes the construction of water main extensions, a new reuse storage reservoir and wetland outfall intended to eliminate effluent discharges to the IRL. Estimated load reductions are 4,929 lbs./yr. Total Nitrogen and 1,643 lbs./yr. Total Phosphorus.
Partner Projects in Brevard County:

As part of the Brevard County Save Our Indian River Lagoon project plan, funded through a 10-year, 1/2-cent sales tax, Brevard County has constructed a number of projects that address the removal of nutrients from stormwater and groundwater entering the Indian River Lagoon:

- **Nine septic to sewer conversion** projects are being implemented or are in the planning phase. When completed, these projects will provide centralized wastewater treatment to 565 residences, decommissioning their septic tanks to remove an estimated 17,116 lbs. of Total Nitrogen annually.
- **Eleven muck removal** projects are being planned or implemented in Brevard County. Some are being done in partnership with SJRWMD. Combined, muck removal from projects in Cocoa Beach, Merritt Island, Rockledge, Grand Canal, Eau Gallie, Pineda, Titusville, NASA Causeway, and Indian Harbour Beach will eliminate 2.8 million cubic yards of muck from the IRL. Expected nutrient reductions from these projects are 408,656 lbs. annually of Total Nitrogen and 21,465 pounds of Total Phosphorus.
- **Eight baffle boxes** were constructed in Titusville (6) and Melbourne (2). These second-generation units were outfitted with nutrient reducing media that filters stormwater, removes sediments and reduces nitrogen. Combined, these projects will remove 15,257 lbs. of Total Nitrogen and 2,697 lbs. of Total Phosphorus annually.
- **Nineteen bioreactor or biosorption** activated media projects were implemented to assist with nutrient reduction. Bioreactors utilize wood chips or other materials to encourage the growth of nitrogen-removing bacteria. As nutrient-laden stormwater or groundwater passes through a bioreactor, bacteria take up nitrogen, process it, and release it to the atmosphere as harmless nitrogen gas. Biosorption relies on materials that help bacteria bind heavy metals to effectively remove them from water. Together, these projects are expected to remove 16,365 lbs. of Total Nitrogen and 2,290 lbs. of Total Phosphorus each year.

Brevard County and SJRWMD partnered to implement the Crane Creek/M1 Flow Restoration project, which will treat stormwater and baseflow west of Evans Road in Melbourne and return it to the St. Johns River. The project will include an operable diversion structure in the M-1 Canal, a pump station, force main, and stormwater treatment area. Estimated load reductions to the IRL are 24,000 lbs./yr. Total Nitrogen and 3,100 lbs./yr. Total Phosphorus.

Brevard County, Brevard Zoo, and Dr. Robert Virnstein partnered to implement the Grasses in Classes Program as part of the Zoo’s Restore Our Shores Program. This project engages students in growing Spartina grass, mangroves, and tank-grown seagrasses to be used in restoration projects. Once completed, this project will restore twelve seagrass plots measuring 40 square-feet each, provide 500 plugs of Spartina and 500 mangroves for restoration work.

Brevard Zoo’s Restore Our Shores program completed 2 projects and has 6 additional projects being implemented. Five oyster reef projects along lagoon shorelines restored 32,632 sq. ft. of oyster habitat, while 3 additional projects completed 425 linear feet of shoreline restoration by installing native grasses and mangroves.

SJRWMD and the City of Cocoa Beach partnered on upgrading the City’s water reclamation facility. This project includes various treatment plant upgrades required to enhance plant performance and improve reliability. These improvements will reduce the potential for surface water discharges to the Banana River during wet seasons. Reductions of approximately 3,600 lbs./yr. of Total Nitrogen and 1,200 lbs./yr. of Total Phosphorus are anticipated.

SJRWMD and the City of Rockledge partnered to implement denitrification improvements to the Gus Hipp Ditch. This project will install Bio-Sorption Activated Media (BAM) along approximately 1,700 linear feet of the ditch’s canal bottom. Total annual load reductions of 5,185 lbs./yr. Total Nitrogen and 790 lbs./yr. Total Phosphorus are expected.

NASA/Kennedy Space Center (KSC) continued a series of long-term projects focused on IRL ecology:

- KSC’s seagrass monitoring program has continuously collected data from 1983 to present and includes 37 transect monitoring locations. Thirty-one sites are located in the KSC portion of the Banana River and six are located in the southern portion of Mosquito Lagoon.
- KSC also monitors carbon and water flux between Spartina marsh and the atmosphere. Results from this study quantify the role wetlands play in carbon storage and provide a baseline for understanding the effects that climate change and sea level rise will have on local carbon dynamics.
- Other projects include monitoring habitat use and nesting success of wading birds on KSC; monitoring American alligator populations in KSC waters; fish and sea turtle tracking; and support of the Florida Atlantic Coast Telemetry (FACT) Network, a collaboration of marine scientists using acoustic telemetry to better understand and conserve important fish and sea turtle species.
Indian River County and SJRWMD partnered on the Moorhen Marsh LEAPS Project, which constructs a Low Energy Aquatic Plant System (LEAPS). The facility will treat water from Indian River Farms Water Control District’s North Relief Canal by using aquatic plants to uptake nutrients from canal water. This treatment will be followed by an algal treatment that reoxygenates water while removing additional nutrients. A created wetland will provide further nutrient reduction. Treated water will be returned to the North Relief Canal, which discharges to the IRL. Estimated nutrient load reductions are estimated at 7,600 lbs./yr. Total Nitrogen and 1,250 lbs./yr. Total Phosphorus.

Indian River County’s second phase of the Historic Jungle Trail Stabilization project installed a living shoreline and a natural progression of native plants to prevent further shoreline erosion due to wave energy and boat use.

Indian River County’s North County Sebastian Septic to Sewer – Phase 1 project is connecting existing septic systems to the county sewer system. Included are 73 acres with an assumption of one septic system per acre. Total estimated nutrient reductions of 2,190 pounds per year of Total Nitrogen and 365 pounds per year of Total Phosphorus are expected upon completion of the project.

The City of Sebastian’s Sustainable Sebastian Initiative consists of six primary tasks to be championed by the Natural Resources Board (NRB) to promote sustainable practices, encourage the use of native plants in home landscapes, promote policy and code changes that improve the City’s livability and promote the quality of local water bodies.

SJRWMD is evaluating the benefits of implementing 2 dispersed water storage projects with Fellsmere Joint Venture and Graves Brothers. These projects would use fallow citrus groves and other private lands for retention of stormwater to reduce excess freshwater and nutrients currently being released to the IRL. The Fellsmere project would create an approximately 2,000-acre reservoir, while the Graves Brothers project would create a 200-acre reservoir. Combined, these projects would reduce nutrient loading to the IRL by 27 metric tons of Total Nitrogen and 4 metric tons of Total Phosphorus annually.

The IRL Council and its community partners wish to thank the Florida Legislature and Governor DeSantis for their commitment of $25 million in the State’s 2021 budget for water quality improvements to the IRL. Administered by SJRWMD, this 1-year program is funding 33 projects in all five lagoon counties. Projects include stormwater improvements, septic to sewer conversions, water reclamation, nutrient source tracking, living shorelines, installation of baffle boxes, and filter feeder restoration. These projects are expected to reduce annual loadings of pollutants by 715,000 pounds of Total Nitrogen and 56,000 pounds of Total Phosphorus.
Partner Projects in St. Lucie County:

Florida Fish and Wildlife Conservation Commission (FWC), in partnership with SFWMD, is analyzing fisheries-independent monitoring data to identify fish nursery habitats in the St. Lucie Estuary and Loxahatchee Rivers.

Florida Atlantic University-Harbor Branch Oceanographic Institution (FAU-Harbor Branch) is working to improve methods of phytoplankton and harmful algal bloom monitoring in the Southern Indian River Lagoon. This project will develop and analyze a growing archive of images, data, and algal toxin measurements to develop machine learning methods of algal classification. This work will enable rapid identification of toxic species and lead to a better understanding of harmful bloom dynamics.

FAU-HBOI continues its Indian River Lagoon Observatory (IRLO), a long-term, multi-disciplinary project providing high-frequency water quality and seagrass/macroalgal monitoring along a water quality gradient in the south central IRL. This project has developed an advanced technology for observing long-term changes in the IRL. IRLO’s network of environmental sensors and weather stations allows collection of continuous real-time, high-accuracy water quality and weather data through a dedicated interactive website and allows for improved collaboration among various organizations working to monitor and improve water quality in the IRL.

FAU-HBOI continued its interdisciplinary study assessing the distribution and concentration of harmful algal bloom toxins (microcystin, nodularin, BMAA, saxitoxin) in IRL waters, the food chain, and ultimately, in resident dolphin populations. Assessing the concentration of these toxins within an IRL food chain that is potentially shared by both dolphins and humans could have significant public health impacts, where dolphins serve as the sentinel species for understanding future health threats to humans.

hubbs seaworld, in collaboration with KSC Ecological Programs, Harbor Branch Oceanographic Institute at Florida Atlantic University, Georgia Aquarium Conservation Field station, Volusia County Environmental Management and St. Johns River Water Management District, continued a capture-recapture analysis of abundance and demographic parameters of IRL bottlenose dolphins. The project estimates abundance, adult survival, and temporary emigration for the IRL dolphin stock and models the resulting data. Results thus far show dolphin abundance ranges from 981 in winter to 1,078 in summer with a mean of 1,032. Further analysis will enable managers to evaluate the impact of fisheries-related takes as well as enable future comparisons of demographic parameters for a dolphin population that continues to sustain large-scale-mortality events and human-based impacts.

Smithsonian Marine Station (SMS) is conducting a study to examine the biodiversity of the IRL’s sponges. Although the IRL is considered a highly biodiverse estuary, records of sponges are lacking. Previous inventories of IRL sponges list less than 20 species, but recent surveys estimate that the 156-mile long estuary supports 100-150 taxa. This project is surveying and identifying sponges throughout the IRL using traditional and modern genomics approaches, which will allow for a more accurate biodiversity assessment of these under-represented and important filter feeders.

St. Lucie County Environmental Resources Department is preparing for the construction of Teague Hammock Preserve, a 300-acre wetland and surface water storage project adjacent to the future C-23/C-24 South Reservoir, part of the Comprehensive Everglades Restoration Plan. Recently, invasive species management via prescribed fire has recruited an abundance of bird life to the site. Once completed the project will provide nutrient reduction benefits, groundwater recharge, restoration of natural hydroperiods, and improved habitat functions for fish and wildlife.

St. Lucie County continued the Ten Mile Creek Oxbow Restoration Project at the Richard E. Becker Preserve. Restoration of the oxbow is expected to improve water quality, habitat function, and floodplain storage, while reducing nutrients and suspended solids in the north fork of the St. Lucie River.

St. Lucie County is planning stormwater improvements to the Harmony Highlands subdivision northwest of the City of Ft. Pierce. Untreated surface water currently runs off to the Ft. Pierce Farms Water Control District (FFFWCD) Canal No. 1 to the north, and South Florida Water Management District’s (SFWMD) C-23 Canal to the south. To facilitate design and construction, the project has been divided into 5 phases and design and engineering have begun.

St. Lucie County is preparing to construct a stormwater improvement project on Melville Road in White City. This project will provide flood attenuation and water quality improvements for 175 acres of poorly draining residential homes. Phase 1 of the project includes constructing a stormwater system to serve the eastern portion of the neighborhood and a new retention pond on a 14-acre parcel. Future phases will address the western portion of the neighborhood and construct a water quality treatment train that includes dry and wet retention and pond vegetation. When completed, this project is expected to reduce Total Nitrogen by 787 pounds and Total Phosphorus by 145 pounds annually.
Partner Projects in Martin County:

Smithsonian Marine Station at Ft. Pierce (SMS) continued its benthic infauna monitoring program in the Indian River Lagoon and St. Lucie River Estuary. Communities of organisms that live in sands on the lagoon bottom are important indicators of ecosystem change because they have limited mobility, reproduce quickly and respond predictably to environmental stressors. Fifteen locations are regularly monitored for water quality and sediment characteristics. By tracking the abundance and diversity of the infauna, a picture of overall ecosystem health can be reported.

FAU-HBOI continued its Land/Ocean Biogeochemical Observatories (LOBOs) for water quality sampling in the St. Lucie Estuary and Indian River Lagoon. This project supports five real-time water quality and weather stations in the St. Lucie Estuary (SLE) and nearby IRL. These data provide scientists reliable, continuous observatory data to better quantify and model relationships between environmental factors and biological processes in the SLE and IRL. The data also assists resource and policy managers with information to inform decision making.

Martin County’s Septic to Sewer (S2S) Conversion Program continues to connect homes and businesses currently on septic systems to the county’s wastewater collection and treatment system. This long-term initiative that launched in the spring of 2015 is being completed in phases, beginning with properties in areas where engineers have determined the need is greatest. Martin County has committed to converting 10,000 septic systems to sewer in the next decade. Last year, the County converted approximately 1,200 septic systems to sewer.

Martin County’s Keep Martin Beautiful cleanup program prevented 372 tons of trash, debris, and sediment from entering county waterways through drainage system vacuuming and street sweeping practices.

Martin County, in partnership with Florida Fish and Wildlife, is restoring the natural hydrology of the Jensen Beach Impoundment. In the aftermath of Hurricane Irma, over 50 acres of mangrove habitat in the 150-acre impoundment was lost due to prolonged high water levels and poor water quality. By restoring hydrology and improving connectivity to the IRL, the project will create favorable conditions for mangroves to re-establish. Other improvements include the installation of four new culverts, dredging 15,000 linear feet of ditches, and construction of a new pervious parking area, canoe/kayak launch, and a pavilion to enhance recreational opportunities.

SFWMD’s Coastal Ecosystems Section is continuing two projects to better understand impacts of freshwater releases from Lake Okeechobee. One project is analyzing the effects of low-level dry season releases on productivity in the lower-salinity zone of the estuary that typically contains more freshwater organisms. The other study seeks to better understand the abundance, distribution, and species composition of phytoplankton in the St. Lucie Estuary by season and under differing flow and salinity regimes.

Martin County, through its Connect to Protect Program, is continuing its commitment to connect properties currently using septic systems to centralized wastewater systems.

SFWMD and USDA’s Natural Resources Conservation Service are constructing the Allapattah Wetland Restoration Project. Located in the C-23 basin, this project conserves 13,000 acres of land, including 6,700 acres of hydrologically restored wetlands. As part of the project, SFWMD built 14 miles of berms, installed 12 water control structures and 19 ditch plugs that raised water levels on the property to restore its habitat value. Allapattah Flats will also store and treat stormwater runoff and is estimated to store up to 13,000 acre-feet of excess water annually, which will prevent nutrients from entering the St. Lucie Estuary and IRL.

SFWMD and the U.S. Army Corps or Engineers, through the CERP RECOVER program, are monitoring southern IRL and St. Lucie Estuary seagrasses, oyster community characteristics and water quality parameters. An updated map of St. Lucie River Estuary oyster reefs has been produced, and other results are informing ecosystem management and policy-making.
Thousands of Volunteers Making A Difference:

Whatever your interest, everyone can do something to help improve the IRL.

The lagoon community owes a tremendous debt of gratitude to the thousands of volunteers who contribute their time and energy to oyster, shoreline and seagrass restoration, monitoring wildlife, tracking water quality, and many other volunteer or citizen-science projects.

Particularly in this pandemic year, when you continued supporting the projects that matter to you, we just want to say,

Thanks for all that you do!
One Community: IRLI² Network

The IRL Innovators and Investors (IRLI²) network comprises community-minded business and industry leaders who have pledged direct funds and/or in-kind resources to the IRLNEP to help achieve our mission. Members of this distinguished network are dedicated to linking thought, knowledge, and technology to innovative ideas that identify and implement solutions to the complex problems facing the Indian River Lagoon.

In Memoriam

The IRLNEP extends its appreciation to Brenda Blackburn and the friends and family who continue to make donations in memory of Christopher Blackburn, who passed away in 2019.

One Community: IRLNEP Management Conference

Thank You to Our Management Conference Volunteers

Robert Musser, Canaveral Port Authority
Judy Orcutt, Citizen
Brett Powell, Indian River County
Gary Ritter, Florida Farm Bureau Federation
Kevin Shropshire, City of Rockledge
Dr. James Sullivan, FAU/ Harbor Branch
Laurie Thompson, Brevard Co. Tourist Development Council
Robert Ulevich (Chair), Polymath Consulting Services, Inc.
Charles Vogt III, Florida Department of Health
Dr. Greg Wilcox, Riverside Conservancy

Science, Technology, Engineering and Modeling (STEM) Advisory Committee:

Anne Birch, The Nature Conservancy
Dr. Kevin Cooper, Indian River State College
Dr. David Cox, Indian River Soil & Water Conservation District
Bob Day, IRLNEP (Retired)
Dr. Chris De Bodisco, Stetson University
Jessica Frost, South Florida Water Management District
Frank Golani, Citizen
Dr. Denis Hanisak, FAU/ Harbor Branch
Dr. Adelajne Ho, Bethune-Cookman University
Dr. Chuck Jacoby (Chair), St. Johns River Water Mgmt. District
Kevin B. Johnson, Florida Institute of Technology
Dr. Lisa Krimsky, University of Florida/IFAS
Dr. Andrei Laude, Embry-Riddle Aeronautical University
Dale McGiniss, Eastern Florida State College
Dr. Richard Paperno, FL Fish & Wildlife Conservation Comm.
Dr. Valerie Paul, Smithsonian Marine Station at Ft. Pierce
Mark Perry, Florida Oceanographic Society
Dr. Mitchell Roffler, Fishing Oceanography, Inc.
Dr. Lesa Sotto, Marine Resources Council
Megan Stolen, Hubbs-SeaWorld Research Institute
Chad Truxell (Vice-Chair), Marine Discovery Center
Dr. Linda Walters, University of Central Florida
Dr. Edie Wilson, Ocean Research and Conservation Assoc.

Citizens’ Advisory Committee:

D. Greg Braun, Martin County
Brown Brouwer, Volusia Co.
Becky Bruner, Martin Co.
Frank Catino (Chair), City of Satellite Beach, Brevard Co.
Mike Connerton, Anglers for Conservation, Brevard Co.
Dr. Graham Cox, Indian River Co.
Paul Faifeita, Clean Water Coalition of Indian River Co.
Cynthia Hall, VanDeVoorde Hall Law, Indian River Co.
Becky Harris, Martin County
Adam Locke, St. Lucie Co.
Cheri McPhail, Brevard Co.
Jim Moir, Rivers Coalition, Martin Co.
Jo Nesomn, Martin Co.
North Patey, Volusia Co.
Doug Patterson, Brevard Co.
Capt. Billy Rotne, Tail Hunter Charters, Volusia Co.
Gayle Ryan, Martin Co.
Dr. Lesa Sotto, Marine Resources Council, Brevard Co.
Heather Stapleton, Indian River Co.
Jim Urick, Brevard Co.
Jayce Wayles, Marine Discovery Center, Volusia Co.
Keith Winston, Brevard Zoo, Brevard Co.
Looking Ahead:

IRLNEP STRATEGIC PRIORITIES FOR FY 2021 AND BEYOND:

- **Breaking News!** The IRLNEP has been awarded $963,470 to implement a FDEP Innovative Technology Grant focused on integrating Harmful Algal Bloom (HAB) data across a variety of different platforms to establish a virtual HAB information center.

- Continuing development of several long-range planning and technical documents required by the EPA to guide CCMP project implementation:
  - Strategy for Financing CCMP Implementation
  - One Lagoon Monitoring Plan
  - One Lagoon Habitat Restoration Plan
  - State of the Lagoon Technical Report
  - IRLNEP Communication and Outreach Plan

- Science 2030 document to identify research gaps and priorities
- Continuation of the IRLNEP small grants program
- Updated Boater’s Guide to the IRL
- Expanded lagoon-wide citizen engagement and outreach program
- Continuing work to secure full Congressional appropriation for the NEP as authorized by the U.S. Congress in January 2021
- 10 new projects will receive funding in FY 2022:
  - 5 Water quality ($566,600)
  - 1 Habitat restoration ($199,994)
  - 2 Community-based restoration ($116,500)
  - 2 Science/Innovation ($110,787)

FY 2021 Projected Expenditures:

- **Total Expenditures** $3,499,351
- **25 Projects**
  - 1 FDEP Innovative Technology Grant ($963,470)
  - 4 Nutrient Reduction ($593,974)
  - 4 Restoration ($328,617)
  - 6 Scientific Research ($355,566)
  - 10 Public Engagement/Education ($479,155)
  - Project Reserves ($86,872)
- **Program Operations** $2,807,652
  - (Includes Administrative Services, Administrative Costs, Facilities Expenses)
- **Salaries and Benefits** $420,498

Photo: J. Linder
There Is No “One Thing”
THE FIGHT FOR A HEALTHY LAGOON OCCURS ON MULTIPLE FRONTS

One of the most common questions people ask about the Lagoon is, “What’s the one thing that needs to be fixed before the Lagoon recovers?” It’s a simple question with a complex answer. The short answer is, there is no one thing. It has taken decades for the problems in the Lagoon to manifest into the turning point we see today. We are beyond simple, inexpensive fixes. If we’re to bring the Lagoon back to health, we need to attack its problems on multiple fronts simultaneously. We must:

- Convert homes and businesses utilizing traditional septic systems to centralized sewer systems or advanced septic systems that remove more nitrogen; AND improve wastewater treatment plants to bring them up to 21st century advanced wastewater standards.
- Plan and implement large, regional stormwater projects; AND identify and implement those small stormwater projects that will improve local flooding and stormwater pollution issues.
- Dredge the large legacy loads of muck that continue to add nutrients to the Lagoon on a daily basis; AND become better at controlling erosion and runoff to better control muck at its source.
- Conserve natural lands to help prevent flooding, plan for climate change, and maintain wildlife corridors and critical habitats; AND restore degraded habitats and natural hydrology to impacted areas to improve habitat quality for wildlife and enhanced quality of life for people.
- Conduct scientific research to fill the knowledge gaps that will help us better understand Lagoon ecology; AND better report and utilize significant findings so we can better restore the Lagoon, improve its water quality, and make it clear that improved research informs improved policy-making and management.
- Invest in innovative technologies to accelerate restoration efforts; AND be good stewards of public funding by enhancing efficiencies and finding cost savings.
- Invest in community engagement and education focused on the Lagoon so homeowners and citizens can address the problems they contribute to; AND encourage federal, state and local governments and agencies to take control of the issues they contribute to, appropriately fund upgrades to outdated and failing infrastructure and prevent nutrients and sediments from entering the IRL, allowing it to recover.

The challenge is marshalling our collective will to solve the problems we’ve created. Lasting solutions will take vision, responsibility and resolve.
“There’s a sunrise and a sunset every single day, and they’re absolutely free. Don’t miss so many of them.”
— Jo Walton