Section C. Completed Major Projects/ Activities
Previous Years Reporting

C.1 Summary of IRLNEP and Management Conference Accomplishments for 2015-2016

The **IRLNEP** had another successful year in FY 2015-2016 implementing the IRL CCMP. Staff administered the Program, including 15 high priority CCMP implementation projects (please see Section C.2 of this Work Plan) which ranged from support of the IRLNEP Education and Outreach contractor to restoration of native habitat along estuarine waters.

The **IRLNEP Management Conference** made up of the IRL Council continues to lead the program through our host entity transition from the St Johns River Water Management District, to the IRL Council, a newly created Independent Special District of Florida. At the time of this report, the Management Board is almost completely appointed, and the remaining Management Conference committee members are being identified. It is anticipated those committees will be seated over the next several months.

Below and on the following pages are projects that have been initiated and/or completed by members of the IRL Council and Management Board in FY 2015-2016.

The City of Titusville has initiated and/or completed numerous stormwater treatment and outreach projects.

Draa Field Stormwater Park – Construction began December 1, 2015. The treatment system consists of a 4-acre enhanced wet detention pond with littoral plantings, a permeable reactive barrier, and a constructed wetland. Nutrient removals are estimated at 915.67 lbs/year of TN and 202.52 lbs/year of TP. The project is expected to cost around $1.8 million with the City receiving $1.1 million in grants from various sources. The project is expected to be completed by the end of 2016.

Senior Center Pond Floating Vegetated Islands – Managed Aquatic Systems or BeeMATS were installed at the Senior Center wet detention pond in December 2015. The project cost $52,000 with an annual reoccurring maintenance cost of $40,000 and is estimated to remove 378.7 lbs/year of TN and 180.2 lbs/year of TP.

Littoral Zone Planting – This year the City received a grant award from the Florida Department of Environmental Protection for Littoral Zone Vegetation Planting. This project will establish littoral zone vegetation within three existing stormwater wet detention ponds. The project is expected to cost approximately $80,000 and is estimated to remove 268.44 lbs/year of TN and 108.88 lbs/year of TP. The project is expected to be complete by October 2016.

Baffle Boxes – This year the City received a grant award from the Florida Department of Environmental Protection for Titusville's Area II Stormwater Treatment Trains. The project consists of the installation of six catch basins fitted with a basket to hold a semi-hydrated blended gel polyacrylamide and mineral (PAM) block and two nutrient separating baffle boxes also fitted with PAM. The project is expected to cost approximately $600,000 and is estimated to remove 1278.98 lbs/year of TN and 243.74 lbs/year of TP.

Public Education and Outreach - The City of Titusville continues its public outreach activities providing residents and businesses with information about pollution prevention, fertilizer application regulations, the benefits of Florida-friendly landscaping, and water conservation. Between April 2015 and March 2016, educational materials including informational pamphlets, letters to residents, and an annual newsletter which highlights recent water quality projects and educates citizens about the health of the Indian River Lagoon have been provided to the City's residents. Educational information and materials are also available on the City's web site.

Living Shoreline – The City partnered with the University of Central Florida to develop a Living Shorelines Management Plan and construct a living shorelines demonstration site near Main Street in Titusville. This project is anticipated to be completed by the end of 2016.

On May 12, 2015 the City passed an ordinance enacting pet waste disposal requirements. The City continues to administer the Bag It! Trash It! Pet Waste Management Program with educational materials and maintenance of the existing dog waste stations.

In July 2015 the City enter into an interlocal agreement with the University of Florida/Institute of Food and Agricultural Services Brevard County Extension Service (UF/IFAS) to implement a Florida Yards and Neighborhoods/My Brevard Yard program in the City of Titusville. Four Florida Yards and Neighborhoods/My Brevard Yard classes were held within the reporting year.

Street Sweeping –Between April 2015 and March 2016, approximately 1,982,320 lbs. of debris were removed from street sweeping operations. This equates to the removal of 1,116 lbs. of TN and 716 lbs. of TP

Canaveral National Seashore- Mosquito Lagoon

Boating safety and Resource Protection:

Three Federal Wildlife Officers spent over 250 hours patrolling the Indian River Lagoon (IRL) by boat and enforcing State, Federal and U.S. Coast Guard regulations. The officers also worked with the Florida Fish and Wildlife Conservation Commission (FWC), and local law enforcement for resource checks, navigation/safety checks. Officers assisted State agencies and researchers with rescues of injured and sick manatees and dolphins.

Wetland Restoration:

St. Johns River Water Management District and Volusia County Mosquito Control restored approximately 125 acres of dragline ditch impacted wetlands. The ditches were scraped to return the site to its natural elevation and allow growth of native vegetation.

The University of Central Florida continued oyster restoration on reefs eroded by boat wakes, including known archeological sites. Approximately 1 acre of oyster habitat was restored and continues to conduct monitoring and research on the health of the oysters. In addition, 300 meters of living shoreline was installed to prevent erosion and restore wetland habitat. Over 9,000 volunteer hours were documented for these activities.

Funding in the amount of $400,000 combined from Florida Fish and Wildlife Conservation Commission Invasive Plant Management and National Park Serve Exotic Plant Management was used to treat over 3,500 acres of exotic plants in effort to restore habitat in and along the lagoon.

National Park Service staff from the Inventory and Monitoring group continued wetland SET monitoring at fixed locations in the Park. There is also a sonde that collects continuous water quality data and is downloaded monthly.

The deteriorating Eddy Creek finger pier was replaced using sustainable materials. Flow through decking was used to allow for sunlight to reach important seagrass habitat.

Endangered and Threatened Species

The Park continued monitoring and protection of state and federally listed species, including scrub jays, beach mice, and sea turtles. Over 7,500 sea turtle nests were deposited on the 24-mile stretch of beach.

Public Education

Canaveral National Seashore conducts education programs on a regular basis, including guided canoe and boat tours to educate visitors about the lagoon, habitats, and species. Interpretation staff gives programs on seining and fishing in the lagoon. Guided hikes are offered along trails and at Turtle Mound which is a very important archeological site. Brochures and information are provided to hundreds of guest on daily basis. The Park had an annual visitation of 1.5 million visitors. Plans are underway to revamp displays at the Visitor Center to focus on lagoon and mangrove habitat. The National Park System is celebrating its Centennial and has been providing additional education at more festivals and events. New signs have been installed at the various boat ramps to notify boaters of an App developed by the University of Central Florida to map areas of oyster reefs and other sensitive areas to avoid.

Clean Up Projects

The Park and partners continue to conduct clean ups in the lagoon and along the ocean. Many dumpsters of debris have been removed.

Research Projects

NPS collaborates with many universities and partners for monitoring of habitats and wildlife. Research projects included dolphin health assessments and abundance by Hubbs SeaWorld and Georgia Aquarium, horseshoe crab behavior and morphology by the University of Florida, vegetation mapping by the University of Georgia, and vegetation monitoring by NASA biologists.

The Park provides housing and logistical support for University of Central Florida and in return valuable data is conducted, which includes research on climate change impact on ecosystems, brown tide effect on oyster populations, impounded restoration monitoring, and sediment elevation monitoring.

The Florida Institute of Technology is conducting an intensive lagoon data mining project for the park. This will compile all research and data collection efforts occurring within the park boundaries.

The NPS is actively engaged in a region-wide environmental assessment to address predator control to protect species.

Martin County

Water Ambassador Program:
Martin County and UF/IFAS Sea Grant Extension have partnered to now offer the Water Ambassador training program. The Martin County Water Ambassadors is an education in action program that unites and empowers residents and volunteers who have an interest in protecting local waterways and giving back to their communities. The program provides a way for motivated individuals to connect personal decisions with information about lagoon friendly practices. Cost = $30,000.

Be Floridian Now Program:
The goal of this program to bring the successful Be Floridian education campaign to the IRL watershed. Be Floridian was created by the Tampa Bay Estuary Program and has been adopted in Manatee County, Sarasota County, Pinellas County, City of St. Petersburg, City of Tampa, the National Fish and Wildlife Foundation and the Sarasota Bay Estuary Program as a way to educate residents about Florida lawn care practices and products. Each of these adopting local governments has established the summer-time fertilizer free ban (June 1- Sept 30). The program was implemented in 2015 in the St. Lucie River and Estuary watershed and will be implemented in the larger Indian River Lagoon watershed in 2016. Cost = $30,000.

Savannas Regional Restoration Project:
The Savannas Regional Restoration Project is a phased project focused on 1) improving natural habitats, 2) improving water quality, 3) alleviating community flooding and 4) optimizing water management operations in the Savannas and associated Indian River Lagoon watershed. Phase I of the project is the Water Management and Natural Systems Evaluation. Phase II of the project will be Prioritization and Implementation of Structural and Non-Structural Alternatives.
Phase I of this restoration project will help define habitat restoration and hydrologic needs, water quality and flooding problems, and provide valuable information on possible solutions for the regional system. Specifically, the Phase I component, Water Management and Natural Systems Evaluation, will allow Indian River Lagoon stakeholders to adequately understand how the system currently operates and where opportunities are available for optimized water operations, restoration needs, water quality improvements, and flood level of service projects. Cost for Phase I estimated at $400-600,000.

Volusia County

Volusia County Environmental Management Division (EMD) staff 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 sites along the Intracoastal Waterway as well as at points eastward near Bethune Beach and south of George's Bar. Several points near the Intracoastal Waterway lie near marinas, and some are near shellfish harvesting areas. Sites currently sampled are widely dispersed in the Volusia segment of Mosquito Lagoon to provide a good data set for modeling purposes for water quality requirements.

In April 2015, EMD sent 900 informational letters to fertilizer applicators in regards to the fertilizer ordinance and its training and fertilizer application requirements.

In July 2015, letters were sent to 40 retailers in Volusia County encouraging them to stock and supply fertilizer ordinance-compliant fertilizers.

In September 2015, EMD hosted the International Coastal & Halifax/Indian River Cleanup. 1357 adults and 326 children (under 12) volunteered to clean up trash along the shores of the beach, Halifax River and Indian River Lagoon. Volunteers were located at 36 sites and they removed over 7,700 pounds of trash on foot, kayak, paddle board, canoe, motorboat and by scuba.

EMD participated in "Project H2O" – a consortium of NGO's, Universities, Colleges, and other institutions with a focus on improving water quality. EMD successfully partnered with the Marine Discovery on an NEP grant to fund Project H2O activities for FY 15/16.

The Volusia County Council approved the 2016 State and Federal Legislative agendas which support funding for water quality improvements that provide dedicated funding to improve surface water quality including in the Halifax/Mosquito Lagoon estuary.

In November and December 2015, EMD held training sessions for water sampling volunteers as part of the Sea Grant/IFAS sponsored Microplastics Awareness Project to raise awareness about microplastics in our waterways. Microplastic fibers, fragments, beads, or film have been found in all of the water samples to date.

In January 2016, the County Council approved the development of an IRL Reasonable Assurance Plan (RAP) that identifies prevention and restoration activities for the Lagoon, measurable outcomes of the planned activities, and cost estimates for each activity.
A RAP allows the funding partners to apply for grants for project implementation. The RAP involves a joint project agreement between the county and the cities of Edgewater, New Smyrna Beach and Oak Hill for the development of a RAP for the Mosquito Lagoon.

In March 2016, an IRL NEP grant was executed to the Marine Resources Council to proceed with the lagoon-wide Be Floridian Now educational campaign in partnership with Volusia County and others.

In March 2016, a strategic planning meeting was held with the Marine Discovery Center to create a plan of action on fertilizer education. 2,500 Be Floridian Now fertilizer fliers were printed.

The Volusia County Marine Mammal Stranding Team assisted with 25 stranding team events in the Mosquito Lagoon.

EMD conducted 6 underwater cleanups, retrieving a total of 664.5-pounds of marine debris from the lagoon.

The Monofilament Line Recycling Program maintains over 140 recycling bins throughout the county, 50 of which are located within the Indian River Lagoon.

FAU Harbor Branch Oceanographic Institute

Indian River Lagoon Research and Education

FAU Harbor Branch, with its scientific and technology expertise, ideal geographical location, and long history of research on the Indian River Lagoon (IRL), continues to be a strong contributor to finding answers to research questions regarding the many facets of the Lagoon. Harbor Branch researchers collaborate with other research institutions, federal and state agencies, not-for-profits, governmental bodies, and other interested parties to advance this research and education.

Projects and other activities related to the IRL in the past year include:

Research:

The Indian River Lagoon Observatory (IRLO): Biodiversity and Ecosystem Function of an Estuary in Transition – IRLO is a long-term, multi-disciplinary, ecosystem-based program, that addresses emerging issues of environmental health in the IRL ecosystem. Key components of IRLO include: (1) long-term ecosystem-based research, including high-frequency water quality and seagrass/macroalgal monitoring along a water quality gradient in the Central IRL initiated in 2005, that demonstrates both human impacts and the tremendous climate-related interannual variability in IRL water quality and will be used in models of estuarine health in the lagoon; (2) collaboration among various organizations working in the IRL, best exemplified by the Indian Rive Lagoon Symposium (see below); and (3) use of advance technology for observing long-term changes in the IRL, including developing a network of Land/Ocean Biogeochemical Observatories (LOBOs) which produce real-time data accessible via the internet. (*Save Our Seas* Florida specialty license plate sales granted by the HBOI Foundation: $200,986 – 10/1/14 to 6/30/15; $300,429 – 7/1/15 to 6/30/16)

Land/Ocean Biogeochemical Observatories (LOBOs) for Intensive, Real-time Water Quality Sampling in the Indian River Lagoon – IRLO research and education activities are enhanced by deployment of LOBO units that provide real-time, high-accuracy, and high-resolution water-quality data through a dedicated interactive website (http://fau.loboviz.com/). Present funding is sufficient for a network of 10 sites that is under development from Sebastian Inlet to the St. Lucie Estuary. These data provide scientists of various disciplines from many organizations reliable, continuous observatory data to better quantify and model relationships between environmental factors and biological processes in the IRL. They can also be used to follow the outcome of changes related to recovery measures and assist resource and policy managers with decision making. (Florida Department of Environmental Protection: $2,350,000 – 7/1/14 to 6/30/16; HBOI Foundation: $559,295 – 7/1/14 to 12/31/15)

Evaluating the Feasibility of Transplanting to Promote Seagrass Recovery in the Indian River Lagoon – Partnering with St. Johns River Water Management District, FAU Harbor Branch researchers established experimental plots in July 2013, at three sites which have shown no recovery following the unprecedented loss of seagrass due to the 2011 “super bloom.” Our initial results suggest that, in the absence of grazing pressure, environmental conditions present at all three sites are favorable for seagrass recovery. (SJRWMD: $30,000 – 10/1/14 to 9/30/15)

Development of a Seagrass Nursery for Restoration of Seagrass in the Indian River Lagoon – Traditional seagrass restoration efforts depend on transplantation from established beds to other locations, which damages donor beds and contradicts the management practice of no loss of habitat. This project will collect floating vegetative fragments, which are common in the IRL, to develop a seagrass nursery at the HBOI Aquaculture Park. It is estimated that the nursery will yield enough material in the course of a year for a 1-acre test planting effort. (HBOI Foundation: $111,840 – 4/20/15 to 6/30/16)

Ecology, Nutrition & Biochemistry of Macroalgal Blooms in the IRL – Because persistent macroalgal blooms can reduce the prevalence and distribution of seagrass, FAU Harbor Branch researchers are studying the composition and seasonal variability of blooms and the nutrients fueling them at more than 20 sites throughout the IRL from Jupiter Inlet to the Mosquito Lagoon. (*Save Our Seas* Florida specialty license plate sales granted by the HBOI Foundation: $59,014 – 10/1/14 to 9/30/15; $210,000 – 7/1/15 to 6/30/16)

Algal Blooms Investigation: Analysis of Submersed Aquatic Vegetation Tissue Nutrient Content and the Response of Drift Macroalgae to Extreme Levels of Salinity, Temperature and Light –This project, part of the Indian River Lagoon Algal Bloom Investigation (IRLABI), will provide a better understanding of macrophyte nutrient cycling in the IRL and how the disruption of this role may have contributed to the development and persistence of the severe phytoplankton blooms in 2011. (St. Johns River Water Management District: $418,998: 3/1/14 to 9/30/16)

Martin County Septic Tank Study – This study addresses interactions between onsite sewage treatment and disposal systems, groundwaters, and surface waters in the St. Lucie Estuary (SLE) and coastal reefs. Analyses will involve residential-area wells of varying depth; surface waters in the SLE, IRL, and nearshore coastal areas; sediments from the surface water sites; and macroalgae from the lower SLE, IRL, and coastal areas. (Martin County: $124,500 – 7/1/14 to 12/31/15)

Microbial Source Tracking in the IRL – Three years of monitoring bacteria levels in water and sediments at six Indian River Lagoon sites from northern Fort Pierce to northern Vero Beach indicate generally poor water quality, but the origin of the bacteria is not well understood. This project is working toward answers by employing tests designed to discern bacteria from human, agricultural, and wildlife sources. (*Save Our Seas* Florida specialty license plate sales granted by the HBOI Foundation: $25,000 – 10/1/14 to 9/30/15)

The Pathogenic Vibrios *in the IRL and Their Potential Threat to Human Health* – Bacteria in the genus *Vibrio* are common in coastal waters such as the IRL, and some species are known to cause disease in humans such as shellfish food poisoning and cholera. Because little is known about their presence in the IRL, this work is designed to detect three species known to cause illness, determine potential sources of infection, and assess whether seasonality is a factor. (*Save Our Seas* Florida specialty license plate sales granted by the HBOI Foundation: $12,500 – 10/1/14 to 12/31/15)

Analysis of Sediments in the IRL for Herbicides – Investigation of IRL seagrass die-offs in recent years has included analyses of sediments from 13 affected sites, most near drainage canals, that have suggested the presence of herbicides. This project will determine a more definitive conclusion

and analyze new sediments from the 13 sites as well as from healthy and degraded seagrass beds. (*Save Our Seas* Florida specialty license plate sales granted by the HBOI Foundation: $25,000 – 7/1/15 to 6/30/16)

Developing Source Tracking for Indicators of Fecal Contamination – Measures of Fecal Indicator Bacteria are used routinely to assess IRL water quality but do not identify contamination sources, which can include humans, agriculture, and wildlife. This work will analyze water samples from the central IRL using real-time polymerase chain reaction and markers for human, ruminant, and bird waste to help identify nutrient sources over the course of a year. (River Branch Foundation: $39,877 – 7/1/15 to 6/30/16)

Estuarine Impacts on St. Lucie Reef: Determining the Effects of Changing Resource Management on Florida's Northernmost Coral Reef – FAU Harbor Branch researchers have been studying the coral reef south of the St. Lucie Inlet to assess whether the freshwater discharges affecting the St. Lucie Estuary are harming the tropical coral reef species at their northern limit of distribution in the U.S. (*Save Our Seas* Florida specialty license plate sales granted by the HBOI Foundation: $200,000 – 7/1/11 to 12/31/15; Florida Sea Grant: $145,905, plus matches of $53,179 from FAU Foundation and $19,783 from Florida Fish and Wildlife Conservation Commission – 2/1/2014 to 1/31/2016)

Water Quality Impacts of St. Lucie River Plume on Northern End of the Florida Reef Tract – This work is aimed at characterizing St. Lucie River freshwater plumes in terms of water quality (e.g., nutrients, dissolved oxygen, turbidity) and its contributors (i.e., Lake Okeechobee, St. Lucie watershed) to create a numerical model of the physical and biogeochemical processes governing this system. (NOAA: $59,556, plus $59,930 in match from the HBOI Foundation – 7/1/15 to 12/31/16)

Ventilation Rates of the IRL Through its Inlets – The exchange of water between the ocean and IRL is an important factor influencing the quality of water in the estuary, which in turn helps determine the favorability of conditions for the growth of seagrass, the development of harmful algal blooms, and the health of resident animals. This project employs a selection of underwater, surface, and aerial technologies to shed light on water exchange as well as the influence of precipitation fluctuations due to events and/or seasonal patterns on lagoon water quality. (*Save Our Seas* Florida specialty license plate sales granted by the HBOI Foundation: $51,462 – 7/1/14 to 6/30/15; $100,527 – 7/1/15 to 6/30/16)

Sources of Nitrogen & Phosphorus Inputs to the IRL – To help determine how land-use changes are affecting the IRL and enable science-based management decisions, FAU Harbor Branch scientists are analyzing stormwater from tributary relief canals and rivers in Indian River County to measure concentrations and determine sources of nitrogen and phosphorus. (Indian River Lagoon National Estuarine Program: $24,840, plus $7,664 in match from *Save Our Seas* Florida specialty license plate sales granted by the HBOI Foundation, $7,236 in match from FAU, and $1,961 of in-kind support from Marine Resources Council – 10/1/13 to 5/15/15)

Wild Dolphin Stranding Response, Care & Research – As a member of the NOAA National Marine Fisheries Service Marine Mammal Health and Stranding Response Network, FAU Harbor

Branch is responsible for responding to marine mammal stranding incidents in the IRL and near-shore ocean waters between the Sebastian and St. Lucie Inlets. The team also serves as a resource to assist with strandings, transport, disentanglements and rehabilitation of dolphins throughout the IRL and state. (*Protect Wild Dolphins* Florida specialty license plate sales granted by the HBOI Foundation: $150,625 – 1/1/15 to 12/31/15; $150,000 – 1/1/16 to 12/31/16)

IRL Bottlenose Dolphin Photo Identification – FAU Harbor Branch has been conducting photo identification studies of IRL bottlenose dolphins since 1996, and has identified more than 1,700 individual dolphins. Among the findings enabled by this data is identification of a distinct IRL stock now breeding its third generation since the study began, and insights into breeding and social behavior. The program is expanding to include remote biopsy sampling to support ongoing research collaborations in the study of contaminant burdens and develop innovative projects to assess health, stress and brevotoxin effects. (*Protect Wild Dolphins* Florida specialty license plate sales granted by the HBOI Foundation: $462,520 – 1/1/15 to 12/31/15; $572,000 – 1/1/16 to 12/31/16)

Factors Affecting IRL Dolphin Locational Preferences: Water Quality and Prey Aggregation – FAU Harbor Branch researchers have been following the movements of Indian River Lagoon bottlenose dolphins since 1996, and this work is intended to shed light on the influences of water quality and the spawning of their preferred prey species. Water quality data will be provided primarily by Harbor Branch's land-ocean biogeochemical observatory units, known as LOBOs. The fish assessments will include acoustic studies to determine if the dolphins are using passive listening or echolocation to find prey. (*Protect Wild Dolphins* Florida specialty license plate sales granted by the HBOI Foundation: $69,872 – 12/10/14 to 12/31/15)

Epidemiology, Pathology & Population Health Science – FAU Harbor Branch epidemiology research focuses on the health of IRL bottlenose dolphins as an indicator of the health of the ecosystem and potential implications for human health. Studies include a new approach to identification and characterization of a fungal infection that occurs in dolphins and humans, the use of MRI to investigate the effects of environmental chemicals on dolphin central nervous systems, molecular identification of dolphin viruses, and the study and archiving of tissues from stranded dolphins. (*Protect Wild Dolphins* Florida specialty license plate sales granted by the HBOI Foundation: $207,787 – 1/1/15 to 12/31/15; $246,000 – 1/1/16 to 12/31/16)

IRL Graduate Research Fellowships – Proceeds from the Harbor Branch Oceanographic Institute Foundation's 2014 *Love Your Lagoon* fundraising gala support seven competitively awarded graduate student fellowships focused on IRL research. Topics include seagrass restoration, algal blooms, pathogenic bacteria, and species diversity and interaction. (HBOI Foundation: $80,996 – 7/1/14 – 6/30/15)

Outreach and Education:

FAU Harbor Branch works to foster IRL research via the annual **Indian River Lagoon Symposium**, which it hosts and organizes as part of a multi-institution steering committee. The event attracts approximately 300 scientists, resource managers, and students, and provides a forum for all active researchers and agencies working in the IRL to share research findings and discuss challenges and opportunities. The program and abstracts are available at: http://indianriverlagoon.org/symposium.html.

On December 7 and 8, 2015, FAU Harbor Branch hosted **Connecting IRL Data With Users**, a workshop convening scientists, policymakers, developers, and other stakeholders to discuss the different types of IRL data being collected and ways to improve dissemination. The meeting was sponsored by the HBOI Foundation and the River Branch Foundation.

The breadth of Harbor Branch IRL research is reflected in its *Mission: Ocean Discovery* public outreach program, which includes the **Ocean Science Lecture Series**, a forum for Harbor Branch researchers and guest speakers to inform the public about their work; the Immersion Tour program, which offers visitors an up-close look at the Harbor Branch site and its laboratories; the **Ocean Explorers Children's Camp**, a day camp providing introductions to marine ecosystems; and the **Ocean Discovery Visitor's Center**, a museum-style visitor center that features interpretations of Harbor Branch research and nearby marine environments including the IRL via a continually evolving array of interactive exhibits, small live animal tanks, video, and other displays. The Harbor Branch **IRL video** is another outreach tool that provides an overview of the estuary and some of the ways the institute is investigating its challenges (see www.youtube.com/watch?v=1v6KlaUA18Q&list=UU6YvxeMtmn-a5NbhMKvk-Jg).

The IRL also is an integral part of the curricula for Harbor Branch educational programming, which includes **Semester By The Sea**, a semester-long undergraduate immersion in marine science; **graduate student training** for FAU students pursuing advanced degrees in biological and environmental sciences; the **Harbor Branch Summer Intern Program**, competitive program that attracts top undergraduate and graduate students worldwide for a 10-week immersion in marine science and engineering projects; the **Marine and Oceanographic Academy**, a magnet high school program located at Harbor Branch and created in partnership with the St. Lucie County School District; **H_20 to Go Summer Research Institute**, a week-long, residential research institute for high school students focused on the interconnectedness and complexity of South Florida water systems and the environmental issues facing them; and the **Indian River County Junior Scientists Fellows Program**, a partnership with the Indian River Land Trust to engage high school students in the research and care of an environmentally sensitive, 185-acre preserve located along the IRL.

South Florida Water Management District (SFWMD) continues to lead localized IRL restoration efforts and CCMP implementation throughout the southern IRL watershed.

In 2015, the South Florida Water Management District published the second three-year update to the St. Lucie River Watershed Protection Plan including project construction progress, research and monitoring results and integrated strategies for moving forward to benefit the watershed. Regional projects with both water storage and water quality benefits progressed. For example, expedited constriction began on the

Comprehensive Everglades Restoration Plan (CERP) Indian River Lagoon South – C-44 Reservoir/Stormwater Treatment Area (STA) (St. Lucie Watershed) Project to help improve water quality in the St. Lucie River and Estuary.

Since 2005, the South Florida Water Management District has been working with a coalition of agencies, environmental organizations, ranchers and researchers to enhance opportunities for storing excess surface water on private, public and tribal lands. In addition to utilizing regional public projects, the Dispersed Water Management Program encourages property owners to retain water on their land rather than drain it, accept and detain regional runoff, or do both. The ultimate goal for the Dispersed Water Management Program is to assist in providing 192,921 acre-feet of retention/storage throughout the Northern Everglades watershed. 86,658 acre-feet of water retention/storage has been made available to date with an additional 106,263 acre-feet planned, pending funding.

SFWMD through the CERP RECOVER program is monitoring IRL and St. Lucie River benthos, submerged aquatic vegetation, oyster reefs and water quality parameters in partnership with the U.S. Army Corps of Engineers. Data is reported in the System Status Report (SSR) on Evergladesplan.org. The 2014 System Status Report is complete and available on the website.

Nutrient loading from the sediments to the water column in shallow South Florida estuaries is one of the key processes that determines the rate at which estuarine water quality will respond to reductions in loading from the surrounding watershed. Synoptic measurements of sediment-water exchanges of nitrogen, phosphorus and dissolved oxygen were made during the dry season of 2008. Similar measurements were made during the wet season of 2014. A final report for the 2014 study will be available this year.

The Coastal Ecosystem Section is developing and calibrating a water quality model and a nutrient budget for the St. Lucie Estuary.

The WaSh Model for the St. Lucie Watershed was recently updated and is currently being refined and enhances to meet FDEP's needs for future iterations of the St. Lucie BMAP.

The **St. Lucie River Issues Team** was formed by the South Florida Ecosystem Restoration Working Group in May 1998 and is managed by SFWMD. The Issues Team mission is to develop federal, state and stakeholder consensus on an action plan that would accelerate progress toward improving water and habitat quality in the St. Lucie River Estuary and IRL. This action plan assessed current problems in the estuary and lagoon and set direction for achieving improvements in both water quality and estuarine ecosystem functions (e.g., fish and wildlife habitat).

The Issues Team has continued to solicit, rank and submit projects to the Florida Legislature. And to date, has received $63.7 million from the Florida Legislature, and an additional $2 million in federal funding for over 114 individual projects in Martin and St. Lucie counties.

Current Issues Team projects are as follows:

White City Drainage Project – Citrus and Saeger Avenues: St. Lucie County plans to construct roadside swales and a 4-acre detention pond to treat and attenuate stormwater runoff from a low-lying 42-acre residential neighborhood.

Updating the SLE Watershed Model: South Florida Water Management District is updating the existing SLE watershed model to serve as an analytical tool for evaluations of stormwater management and nutrient loading reduction practices in the St. Lucie River and Estuary watershed by extending the model simulation, testing the water quality module and analyzing and refining model calibration in the C-24, C-23 and C-44 basins.

Martin County Golf Course Water Quality Retrofit: Martin County is providing water quality treatment for the first inch of runoff for the original 234-acre golf course in the amount of 19.5 acre-feet by retrofitting three existing culverts with risers each equipped with a weir and bleeder, and the installation of a 6" diameter bleeder pipe at a fourth location within the existing on-site golf course lakes prior to discharging to the St. Lucie Estuary, via Willoughby Creek.

All American Ditch Water Quality Improvement Project: Martin County proposes to install a water quality weir and fill, and re-grade a portion of All American Ditch to divert stormwater runoff to a proposed pipe system that will convey the flows south to a Lake and Stormwater Treatment Area (STA), configured in a treatment train system, located on a 36-acre parcel. The lake will provide residence time, reduce velocities and allow for sediments to settle out of the water column. The STA will be planted with both emergent and submergent plants for filtration and nutrient uptake.

North Stuart Septic to Central Wastewater Collection System Conversion Project: The City of Stuart is proposing to convert properties currently on septic, to a low pressure sewer system. The basin is located north of the Roosevelt Bridge and borders the St. Lucie River. The basin consists of 118 new residential properties and 35 commercial properties, totaling an estimated 265 equivalent residential connections.

Vacuum Truck: the City of Port St. Lucie proposes to purchase a vacuum truck to assist the City in the removal of polluted sediments from catch basins, curb inlets and baffle boxes throughout the City, preventing them from entering the St. Lucie River.

Snug Harbor Septic to Sewer Conversion Project: The City of Stuart is proposing to convert properties currently on septic, to a low pressure sewer system. The basin is located along the north side of St. Lucie Boulevard between 4 Winds Drive and SE Ocean Boulevard and borders the St. Lucie River. The basin consists of 100 residential properties.

The Phillip C. Gates Structure: The Treasure Coast Resource Conservation and Development Council proposes to retrofit an existing gated structure that spans the Fort Pierce Farms Canal 1 channel 140-feet wide and 22-feet deep. The structure's four gates will be retrofitted with split gates so that part of the gate(s) remain down when releasing water. This will hold back sediment that would normally be flushed to the Indian River Lagoon. The sediment deposited upstream of the structure will be cleaned out on a regular basis.

South Sewall's Point Road Baffle Boxes: The Town of Sewall's Point proposes to install nine baffle boxes at various outfalls along South Sewall's Point Road that currently discharge into the Indian River Lagoon where little to no water quality treatment exists now. The baffle boxes will serve approximately 18 acres of residential property adjacent to the Indian River Lagoon.

Manatee Pocket – Southwest Prong Baffle Box Project: Martin County proposes to install a nutrient separating baffle box within County road right-of-way, at the intersection of SE Cove Road and SE 45th Street that will provide sediment and nutrient treatment over an approximately 200-acre basin.

Paradise Park Stormwater Improvements, Phase 4 – Construction: St. Lucie County proposes to provide stormwater conveyances and treatment systems as well as road grading and paving in the Paradise Park

subdivision where no treatment exists now. Phase 4 is approximately 51.8-acres of residential property located adjacent to the C-25 Canal, which drains to the Indian River Lagoon.

Veteran's Memorial Park: The Treasure Coast Resource Conservation and Development Council proposes to install a treatment train to provide water quality for runoff from a 44.1-acre drainage basin. Veteran's Memorial Park in on the Indian River Lagoon and is part of the drainage basin that discharges untreated stormwater through two outfalls located in the park directly into the Indian River Lagoon.

Land/Ocean Biogeochemical Observatories (LOBOs) for Intensive, Real-time Water Quality Sampling in the St. Lucie Estuary: Harbor Branch Oceanographic Institute proposes to install a LOBO that will provide real-time comprehensive suite of critical environmental data that are directly relevant to understanding ecosystem change which is necessary for management of the St. Lucie Estuary and Indian River Lagoon.

Issues Team projects completed in since April 2015 include:

Harbor Branch Preserve: The St. Lucie County Mosquito Control District restored tidal flow to a 178-acre impounded salt marsh by restoring a perimeter ditch, reconstructing dikes to secure the impoundment structure and installing 20 culverts and a 24,000 GMP pump station to provide connection between the wetland and the Indian River Lagoon.

The Collection of Fertilizer Nutrient Loading Data to Support the Establishment of Strict Residential Fertilizer Ordinances in Martin and St. Lucie Counties: Florida Tech. provided needed data that will either prove or refute whether St. Lucie and Martin counties should formulate fertilizer ordinances that are more restrictive in certain aspects than those ordinances currently existing.

Characterization and Beneficial Use of Muck Sediment from St. Lucie County Waterways: the University of Florida/IFAS chemically characterized the nutritional value and potential contaminants in the muck sediments which will assist in developing technology for beneficial use of muck sediments for improving highway, parks, or vegetation grass media.

Heathcote Park/Virginia Avenue Canal Stormwater Retrofit: The City of Fort Pierce and St. Lucie County constructed a treatment train including the installation of six different Stormwater Best Management Practices (BMPs) on 60 acres of jointly owned land. The improvements provide water quality benefits for 1,242 acres of highly developed urban area.

Quail Run Stormwater Management Retrofit: The Town of Sewall's Point reduced nutrient and sediment loadings currently out falling to the Indian River Lagoon by constructing and exfiltration trench and baffle box which routed stormwater flow to an existing dry detention area at the end of Quail Run Lane, adjacent to the Indian River Lagoon.

Oyster Restoration and Estuary Observatory System for the St. Lucie Estuary: The Florida Oceanographic Society restored oyster habitat at two sites in the St. Lucie Estuary (SLE), established 4 Kilroy monitoring stations within the SLE and created a water quality-themed exhibit at the Florida Oceanographic Coastal Center.

Nitrogen (N) Speciation and Phosphorus (P) Transport from Agricultural Fields to the Indian River Lagoon: This research project evaluated the bioavailability change of N and P in stormwater during transport from its origin to destination and related N and P bioavailability to speciation dynamics and sediment chemistry.

St. Lucie Estuary Oyster Reef Habitat Restoration Project: Martin County will restored oyster reefs in the St. Lucie estuary by constructing 4-acres of habitat and a living shoreline. This restoration will improve water quality, provide habitat for hundreds of species, and increase resiliency to climate change induced sea level rise.

The **Indian River Lagoon License Plate Program** was established to support habitat restoration, water quality improvement, and associated education projects. The South Florida Water Management District is responsible for administering Indian River Lagoon License Plate funds for projects in St. Lucie, Martin and Palm Beach counties.

Indian River Lagoon License Plate projects that were completed in FY2015 include:

Lake Charles Exotic Removal Project: The project involved the removal of exotic vegetation and the re-planting of native vegetation of an estuarine shoreline within the Lake Charles Property Association located within the Indian River Lagoon watershed in St. Lucie County.

Be Floridian Project: The goal of this project was to bring the successful "Be Floridian" education campaign to the Indian River Lagoon/St. Lucie Estuary watershed. The program worked with local governments that adopted strong fertilizer ordinances to educate their residents using the resources of the program and to work with partner companies, and retail sales outlets.

The Florida Department of Environmental Protection (FDEP) has contributed funding to a number of local government projects designed to improve water quality in the Indian River Lagoon (IRL) and its tributaries. FDEP has staff involved with research and restoration activities benefiting the Indian River Lagoon as well.

Indian River Lagoon Basin

In January 2013, FDEP adopted Basin Management Action Plans for the Indian River Lagoon (IRL) stakeholders to implement actions toward achieving the nutrient TMDLs. FDEP held a technical meeting April 2015 to update stakeholders on the status of Brevard County's Spatial Watershed Iterative Loading (SWIL) model, the results of the Step 1 Seagrass Compliance Analysis, and the draft load estimation reduction for the Central Indian River lagoon. An annual BMAP update meeting was held May 2015 to review the BMAP Annual Progress Reports, to present results of the Step 2 Seagrass Compliance Analysis, and to provide several stakeholders an opportunity to discuss their ongoing projects. Based on the seagrass compliance tests results, stakeholders in the Central Indian River Lagoon were told they would have required reductions.

The next annual meeting will be held May 2016. During this meeting, the FDEP will present to the stakeholders the most recent Step 1 and Step 2 Seagrass Compliance Analysis results, water quality monitoring results, and an update on the SWIL model. There will also be a discussion regarding project verification, mapping efforts, and funding.

Research and Modeling:

FDEP, in conjunction with the St John's River Water Management District (SJRWMD), continues seagrass mapping efforts in the lagoon. Results for the 2015 Seagrass Mapping will be received by the FDEP at the end of March 2016. The lagoon-wide mapping effort provides an overall picture and trends of the seagrass resources in the IRL. These maps serve as important management tools for obtaining a

current inventory of this resource, identifying "healthy" areas that may deserve special protection efforts, and identifying potential "problem" areas that require further investigation.

FDEP continued to work with Brevard County, Brevard County's consultants, and other agencies including SJRWMD to refine the SWIL model. An advantage of the SWIL model is that it simulates surface runoff and baseflow separately so the loading can be split to help determine how best to treat the loads. The SWIL model can also be used to conduct high frequency data analysis since it has monthly instead of annual loading information.

Projects:
The City of Melbourne received State Revolving Fund (SRF) loans from FDEP in 2013 and 2014 totaling approximately $6.5 million to make energy efficiency improvements at the 7.0 million gallon per day D.B. Lee water reclamation facility. Construction began in March of 2015 and is expected to be complete in the summer of 2016.

The City of Cape Canaveral received two SRF loans from FDEP in 2013 and 2014 totaling approximately $7.6 million to complete various improvements to the wastewater treatment plant including the rehabilitation and upgrade of the oxidation ditch, the rehabilitation of the sludge belt press, and the installation of diffusers in the equalization tank. Also included in these loans are stormwater improvements that include pipe replacement, streetscaping, and ditch dredging. Construction has started and is expected to be complete in the summer of 2017.

The City of Cocoa Beach received a SRF loan from FDEP in 2014 and amended in 2015 for a total of $7.2 million to rehabilitate the sewer system to reduce the infiltration and inflow in the wastewater collection system. This loan also includes stormwater improvements that will provide treatment to reduce nutrients along the Minutemen Causeway. The stormwater portion of this project is also receiving grant funds from FDEP, see the Cocoa Beach project below.

The St. Johns River Water Management District was awarded state funding in 2014 for an amount of $10,000,000 for the design, planning and dredging to remove 150,000 cubic yards of muck from the Eau Gallie River, which will remove approximately 288 tons of TN and 62 tons of TP.

The City of Titusville was awarded $800,000 of state funding in 2014 and was awarded $388,825 of a 2014 319(h) grant for the Titusville Draa Field Water Quality Improvement Park. The treatment system consists of a 4-acre enhanced wet detention pond, permeable reactive barrier, constructed wetland, pond aeration, pervious paving. The park will offer passive recreation with a multiuse trail, environmental education opportunities, and will serve as a trailhead for the Rails-to-Trails pathway that is directly adjacent to the site. In addition, the Draa Field Stormwater Park will provide flood protection for a 106-acre drainage basin that has historically been subjected to flooding.

The City of Cocoa Beach was awarded state funding in 2014 for $400,000 and was awarded $544,550 of a 2014 319(h) grant for the Minuteman Corridor Stormwater LID and Streetscape Improvement Project. This project will implement low impact development BMPs including rain gardens, rain tanks, tree filters and pervious pavers for a 22.18 acre watershed (subbasins B-1 through B-4 that share a single outfall to the Banana River Lagoon). The project will be implemented from the dune line westward for five blocks to Cedar Avenue.

Brevard County Natural Resources Management Department was awarded a TMDL grant in 2014 in the amount of $116,752 for the Merritt Ridge Pond Floating Vegetative Island. This project consists of installing a Floating Vegetated Island (FVI) on one of two adjacent existing wet detention ponds constructed by Brevard County along Fortenberry Road as retrofit projects to reduce loading to a

nutrient impaired segment of the Indian River Lagoon.

The City of Vero Beach received a TMDL grant in 2015 for $250,000 for the Lateral E Inlet Retrofit project to replace existing stormwater inlets with portions of FlexiPave permeable pavement to trap gross floatables.

The City of Edgewater received a TMDL grant in 2015 for Lamont Street Stormwater Improvements including exfiltration trenches and baffle boxes for $159,300.

The City of Sebastian received a TMDL grant for $67,000 for the Working Waterfront BMP Project which will install a treatment train including shallow grassy swales, conveyance drainage pipe, Floc Logs, and nutrient removing baffle boxes.

The City of Ft Pierce received a 2014 319 grant for the Phase 2 Veterans Memorial Park Stormwater Improvements for $345,500 to include bio-swales and pervious pavement to improve the treatment train.

The City of Palm Bay received an Appropriation in 2016 for $250,000 for the expansion of a treatment train that drains a 172 acre watershed through industrial and commercial areas.

St. Lucie Basin

The FDEP adopted the Basin Management Action Plan for the St. Lucie River and Estuary in May 2013. This plan is a collaborative effort of Martin, Okeechobee, and St. Lucie counties along with multiple cities, water control districts, and other stakeholders. FDEP held the second annual BMAP update meeting in August 2015 to inform stakeholders on BMAP progress and discuss various projects being implemented by local agencies.

The second BMAP Annual Progress Report from December 2015 contained all new projects in the BMAP area. These projects were given load reductions and then added to the previous year's reduction total. Currently the St. Lucie River and Estuary BMAP is on target for its 5-year phase 1 goal reductions. Stakeholders have been actively engaged in the process and are implementing new and innovative projects around the basin to help improve water quality.

Research and Modeling:

DEP, in conjunction with the South Florida Water Management District (SFWMD), has completed an effort to update the St. Lucie Estuary Watershed Model (WaSH Model) to better meet the needs of the BMAP. This effort includes enhancements to the modeling code, updates to the water quality component, and further model calibration to observed water quality and quantity data. The spatial resolution is improved over the previous WaSh Model and will assist in providing more detailed analysis of cells and how projects can impact water quality. This model will be used in the second 5-year BMAP phase to produce allocations and assess projects.

Lake Okeechobee Basin

In December of 2014, FDEP adopted the Lake Okeechobee BMAP to implement restoration efforts for the lake which is impaired for total phosphorus. The BMAP sets a multi-year plan in place for restoration of the lake, and includes over $700 million worth of projects aimed at reducing phosphorus pollution from the surrounding landscape. The BMAP estimates that throughout the first ten years over 100 metric tons per year of phosphorus will be eliminated from entering the lake, a direct result of both projects and actions taken by the coordinating agencies and various partners working towards the restoration goal. FDEP will be conducting the first annual BMAP update meeting in late spring 2016 to provide information on various BMAP related activities including significant efforts to revise the Watershed Assessment Model.

Research and Modeling:
FDEP, in conjunction with the coordinating agencies implementing the Lake Okeechobee BMAP, is in the process of updating the Watershed Assessment Model or WAM. This update will include incorporation of the southern sub-watersheds into the overall WAM domain, inclusion of more recent data, and refinements to the overall model outputs.

U.S. Fish and Wildlife Service,

Merritt Island National Wildlife Refuge

Boating safety and Resource Protection:
Two Federal Wildlife Officers spent over 200 hours patrolling the Indian River Lagoon (IRL) by boat and enforcing State, Federal and U.S. Coast Guard regulations. At least four hours each workday were spent checking bank anglers, totaling over 1,500 hours annually. The officers also worked details with the Florida Fish and Wildlife Conservation Commission (FWC) for marine sanitation, BUI, resource checks, and navigation/safety checks. Over 100 citations and warnings were issued for fishing violations, 35 citations and warnings were issued for boating violations and 14 citations and warnings were issued for manatee zone violations. These Federal Wildlife Officers worked four search and rescues each year on the IRL. Boating hours have dropped since last year while bank fishing compliance check hours have increased. Poll and Troll Zone (PTZ) complaints have increased markedly and as a result, PTZ citations doubled from the last year. ($100K)

Management of Impounded Marsh and Environmentally Sensitive Lands:
MINWR manages 26,000 acres of impounded wetlands (55 impoundments; 140 miles of levees; 430 water control structures) to enhance waterfowl and migratory bird food production, control mosquito breeding, and enhance healthy salt marsh habitat. Water levels and salinity are monitored and managed. Staff monitored the productions of submerged aquatic vegetation in the impoundments managed for wintering waterfowl. Management actions are conducted in coordination with conservation initiatives such as the North American Waterfowl Management Plan, U.S. Shorebird Plan, and North American Waterbird Conservation Plan. The Refuge continues to conduct an experiment in subsided marsh restoration in cooperation with the SJRWMD and Brevard County Mosquito Control. Experimental cells in the T-10-D impoundment are being filled to evaluate methods for raising the marsh floor elevation. (50K)

The refuge monitors and maps invasive non-native plant infestations to track effectiveness of herbicide treatments and ensure follow-up treatments. Staff, volunteers and contractors treated 1,400 acres of exotic plants ($375K).

Prescribed fire is the primary habitat management tool for coast scrub habitat. Between October 2014 and September 2015, 10,125 acres were prescribed burned on MINWR ($350K)

Approximately 2,500 feral hogs were removed from the refuge by staff and permitted trappers ($35K).
Endangered and Threatened Species Management
Population monitoring was conducted on several federal threatened and endangered species: Florida scrub jays, sea turtles, and Southeastern beach mice. Scrub jays were monitored to determine their response to the prescribed burn program. Beach mice were surveyed to determine the presence/absence

of the species across the coastal landscape and correlate with desired habitat conditions (partners: NPS, NASA, Air Force). This past summer, 1486 loggerhead, 861 green and 11 leatherback sea turtle nests were counted along the six miles of refuge beach. Post emergence analyses were conducted to determine hatchling success. Predation of nests was monitored and predator control measures implemented to minimize nest predation. ($155K)

Public Involvement and Education
MINWR hosts over 1 million visitors each year. The refuge conducts environmental education programs for local schools and on-site and off-site outreach programs. Many of the visitor activities/programs highlight the IRL. Interpretive signs at boat ramps, the Manatee Observation Deck, and Haulover area provide information to visitors about the IRL

Cleanup Projects
The Refuge has an "Adopt an Area" program with 20 groups conducting four cleanups per year at designated sites. Additionally, 10 scout groups conducted clean ups at Dummitt Cove and Haulover Canal. Several families also conducted cleanups on the refuge. Volunteers empty trash cans at five refuge boat ramps, two times a week ($10K). In partnering with Keep Brevard Beautiful, the Refuge conducts an annual Trash Bash and the International Coastal Cleanup in September 2015 at Haulover Canal. The refuge maintains monofilament containers at seven locations on the Refuge.

Interpretive Programs, Workshops and Festivals
In partnership with Anglers for Conservation, the Refuge hosted two "Hook Kids on Fishing" programs where approximately 100 children and their family members attended. Refuge staff and volunteers provide scheduled manatee programs at the Manatee Observation Deck and Bairs Cove boat ramp throughout the year ($5K).

Projects
The Refuge started construction to replace the Bio Lab boat ramp. The ramp will consist of a push-slab concrete ramp and ADA accessible kayak launch. Estimated completion date is April 2016 ($160k).

Environmental Education
Approximately 3,000 students participate in various environmental education programs each year. A total of seventeen environmental educational programs pertaining to the IRL will be presented for the time frame of October 2015 through May 2016. Program topics include seining, water quality, mangroves, manatees, and wetland management. In addition, Brevard Zoo conducted Lagoon Quest Programs at the Refuge's Sendler Education Pavilion which is located along the shoreline of the lagoon. This program involves 4th grade students participating in seining and water quality activities. The Refuge has initiated planning for a new 8,100 square foot ($4.6 million) Community Conservation and Education Center, which will serve as a coastal nature and conservation education center. Construction is expected to start in late 2017.

Signs
The Refuge maintains signage for the Poll/Troll Zone in Mosquito Lagoon, IRL informational signage at four boat ramps, Bird Island Interpretive signs and kiosks located at Haulover Canal and manatee and IRL signs at the Manatee Observation Deck. In addition, manatee, sea-grass and IRL brochures are given out at the refuge visitor center and at kiosks located at several locations on the Refuge.

St Johns River Water Management District

Indian River Lagoon Algal Blooms Investigation

The Indian River Lagoon Algal Blooms Investigation continued throughout the year. All teams made significant progress. Sampling to better quantify atmospheric inputs continued, and sampling to characterize loads generated by storm events was completed. Significant groundwater inputs were documented, with water quality samples taken to document contributions to the nutrient budget. Flux of nutrients from muck was measured, and additional focus was placed on characterizing changes in flux due to changes in temperature. Drift algae was mapped, and experiments demonstrated mortality under stressful conditions. Physiological investigations focused one of the key phytoplankters responsible for the superbloom showed that they could use organic nutrients, which means they may outcompete other taxa. Zooplankton, infauna and epifauna were sampled to characterize spatial and temporal variation in their abundance, and grazing experiments documented rates of consumption, including consumption of phytoplankton responsible for the superbloom. Discussions continued to shape the modeling that will form the core of efforts to synthesize results and generate useful management actions.