



MEMORANDUM

AGENDA ITEM #VI.C

DATE: JULY 22, 2019

TO: COUNCIL MEMBERS

FROM: STAFF

SUBJECT: SFRPC / TCRPC JOINT COMMITTEE ON THE SOUTHEAST FLORIDA REEF TRACT

On May 20, 2019, the SFRPC and TCRPC convened a meeting of its Joint Committee on the Southeast Florida Reef Tract co-chaired by SFRPC Councilmember Beam Furr and TCRPC Councilmember Doug Smith. The meeting was held at the SFRPC Council Office located at 1 Oakwood Boulevard, Suite 250, in Hollywood, Florida 33020.

In attendance were Chair Ross, Councilmember Furr, Councilmember Levine Cava, Councilmember Coldiron, Councilmember Kaufman, and Martin County Commissioner / TCRPC Councilmember Smith. Attendees included business leaders and organizations, county and municipal representatives, the Florida Department of Environmental Protection, Florida Sea Grant, The Nature Conservancy, and Force Blue – a nonprofit organization of Special Operations veterans who work on coral reef conservation.

The draft meeting minutes, National Association of Counties Resolution in support of the reauthorization of the Coral Reef Conservation Act, and a July 15th Palm Beach Post article on a study by the FAU Harbor Branch Oceanographic Institute are included herewith for your reference. Using measurements dating back to 1984, a key finding of the study by Dr. Brian Lapointe is that “warming ocean temperatures are not the loan killer of Keys’ coral, but part of a knot of man-induced challenges that includes higher rainfall rates from climate change that wash nitrogen-enriched waters through the greater Everglades and into Florida Bay.”¹ Council staff has contacted Dr. Lapointe to request a copy of the study.

Recommendation

Information only

¹ Miller, K. (2019, July 15) Just in: Three-decade study links Florida Key’s coral demise to mainland runoff. *Palm Beach Post* Retrieved from https://www.palmbeachpost.com/news/20190715/just-in-three-decade-study-links-florida-keys-coral-demise-to-mainland-runoff?utm_content=GCOX_WPB&utm_term=071519



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Joint Committee on the Southeast Florida Reef Tract Meeting

Florida Reef Tract Work Group

Monday May 20, 2019; 2:00-4:30 P.M.

South Florida Regional Planning Council

1 Oakwood Boulevard, Suite 250

Hollywood, Florida, 33020

On May 20, 2019, the SFRPC and TCRPC convened a meeting of its Joint Committee on the Southeast Florida Reef Tract co-chaired by SFRPC Councilmember Beam Furr and TCRPC Councilmember Doug Smith. The meeting was held at the SFRPC Council Office located at 1 Oakwood Boulevard, Suite 250, in Hollywood, Florida.

Meeting Attendees:

Commissioner Doug Smith (TCRPC / Martin County), Commissioner Beam Furr (SFRPC / Broward County), Ted Astolfi (Martin County), Kathy FitzPatrick (Martin County), Stephanie Heidt (TCRPC), Mayor Greg Ross (SFRPC – Cooper City / Broward County), Commissioner Daniella Levine Cava (SFRPC - Miami-Dade County), Sean McCrackine (Policy Chief for Commissioner Danielle Levine Cava) Commissioner Michelle Coldiron (SFRPC - Monroe County), Commissioner Samuel Kaufman (SFRPC - City of Key West/ Monroe County), Chris Bergh (The Nature Conservancy), Sara Thanner (Miami-Dade County), Joanna Walczak (Florida DEP), Isabel Cosio Carballo (SFRPC), Corey Aitken (SFRPC), Allyson Williams (SFRPC), Jena McNeal (Palm Beach County), Dr. Ken Banks (Broward County), Kevin Carter (Broward County), Francois Domond (City of Hollywood), Keith Sahn (Force Blue), Kristi Kerrigan (FDEP Coral Reef Conservation Program), Maurizio Martinelli (Florida Sea Grant), Anika Hamilton (Representative Kristin Jacobs), Theresa Pinto (Commissioner Daniella Levine Cava), Janet Bowman (The Nature Conservancy) by telephone, Kareen Boutros (Broward Workshop) by telephone, Dan Linblade (Greater Fort Lauderdale Chamber of Commerce) by telephone, Jamie Monty (Coastal Systems International) by telephone.

- I. The meeting began with introductions and opening remarks by Martin County Commissioner Doug Smith and Broward County Commissioner Beam Furr.
- II. The commissioners noted the desired outcomes of the meeting which include: an update of federal and state legislative action and funding on issues related to coral reef health, an update on research and other activities and how they are connected to one another, and finally, the identification of three or four issue-based legislative priorities that can form the basis of a regional agenda in advance of the 2020 state legislative session endorsed by the SFRPC/ TCRPC, counties, municipalities, business leaders, and other key stakeholders.
- III. Maurizio M. Martinelli, Coral Disease Response Coordinator (CRDC), Florida Sea Grant presented a **disease update** regarding the status of coral disease across the Florida Reef Tract (Monroe to Martin counties).
 - Maurizio stated that they are very confident that the disease is **an infectious water-borne** disease which is spreading along the reef tract through the natural system. He presented the work group with a figure which illustrated the spread of the disease from 2014 through 2018.
 - The disease appears to be **continuous**, which Maurizio states is uncommon in coral reef diseases. The disease was first recognized in 2014, with a peak in Southeast Florida 2016,

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however, they are still recording evidence of the disease through 2019. The disease impacts roughly half of the stony coral reef species in Florida. These species are extremely important as they are responsible for building the large three-dimensional structures that serve as fish habitats and coastal protection.

- Maurizio noted that there are **prevalence rates of 66 - 100%** which means that two thirds to all the corals that can be impacted by this disease will be impacted by this disease. He expands stating that this is startling as often once a coral shows signs of the disease it will die. As of 2019, roughly 300 linear mile of reef is being affected by the disease and now it has started to show up outside of Florida, in the Caribbean.
- Due to the pattern of spread in the Caribbean, it thought is that the disease might be spread through **ballast water**. Ballast water is the water a cargo ship takes in and lets out to balance the load of the ship. Remembering that this disease is water-borne they believe the ballast water may be taking in the infectious disease and spreading it elsewhere.

Commissioner Smith (TCRPC) notes that the red dots on the figure all correlate with the current shipping routes. Additionally, Commissioner Smith (TCRPC) references the international rules regarding ballast water and the difficulty in enforcing these rules. Maurizio states that the EPA is stepping in as well since the U.S. is not party to the international ballast water convention.

- **Enforcement** is an extremely crucial factor that needs to be addressed moving forward. Joanna Walczak stated that the DEP is working with and educating local shipping companies that frequent these routes about this disease and the dangers of incorrectly taking in and disposing of ballast water.
- Maurizio then gave a brief overview of the structure of the teams working to address this disease. An in-depth review of this structure is available via Maurizio's PowerPoint presentation.
- Four lead agencies: DEP, FWC, NOAA, NPS as well as additional representation from the regional planning councils and local governments, the Smithsonian, the US Geological Survey, etc.
- It is difficult to pinpoint the exact number of those involved in the process as there are over 60 partner entities involved. Joanna Walczak estimates that there are approximately 100 people in the network directly involved in researching this disease with many more indirectly working with these agencies. The funding is also multi-faceted, however, the disease research is primarily funded by the the state legislative funding through the DEP. Additionally, other partners involved such as NOAA are bringing money to the table as well.

IV. Maurizio also gave a **federal update** regarding the U.S. Coral Reef Task Force and legislation and funding. It is important to note that these funding sources fund the projects themselves but are not applicable to the staff.

- Support from the **Florida Legislature** awarded through the **DEP**
 - FY 18-19: \$1.5 million for coral disease and water quality monitoring
- Support from **Florida State** Agencies
 - **FWC** State Wildlife Grant: \$470,000
 - **DEP** Office of Resilience & Coastal Protection: \$145,000
- Support from **Federal Agencies**
 - EPA Wetland Program Development Grant: \$400,000
 - EPA Research Grant: \$91,000

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- NOAA Office for Coastal Management: \$100,000
 - NOAA Coral Reef Conservation Program: \$180,000
 - NOAA Protected Resources: \$120,000
 - Support from **other sources**
 - NFWF: \$821,000
 - NSF: \$87,000
 - Potential funding sources for FY2019/2020
 - Florida Legislature
 - Unsigned >\$2.5 million for coral reef health
 - Florida State Agencies
 - FWC Hurricane Irma Fisheries Recovery: >\$1 million
 - Federal Agencies
 - EPA Wetland Program Development Grant: \$400,000
 - NOAA Office for Coastal Management: \$100,000
 - Federal Update:
 - Potential reauthorization of the **Coral Reef Conservation Act**
 - Has not been authorized since 2000
 - Bipartisan support?
 - Potential acknowledgement by FEMA that **coral reefs are natural infrastructure**
 - FEMA recovery funds for coral reef restoration
 - May be considered protective infrastructure serving as shoreline protection
 - Increased participation (and support?) from **federal agencies**
 - EPA lead on ballast water enforcement
 - Partner with NOAA
 - Looking forward- what have we not covered yet?
 - Long term restoration in a five to ten-year scale
 - Requires infrastructure on land as well to house corals- Nurseries
 - Large scale environmental conditions
 - Chris Bergh (Nature Conservancy) stated that it is important to reiterate the economic value and critical infrastructure benefits that these reefs serve for tourism and shoreline protection related issues.
- V. Joanna Walczak gave an update regarding **the state legislation** and policy as well as the current funding.
- Overhaul within agency mandating resource managers to speak with those who establish the thresholds for various factors. Create a more streamlined process to ensure data used in an effective manner and that there is communication between different branches of DEP so that there is a coordinated approach.
 - Water quality monitoring system may also serve purpose of establishing and reducing the land-based sources of pollution.
 - DEP looking at tools to help communities with reduction of all the water quality stressors.
 - Reasonable assurance process - when willing and able FDEP can help facilitate those conversations, provide correct templates and formatting to streamline process, work with the EPA to help pool money from other sources.
 - Focused on upgrading storm water and waste water systems:
 - What we are discussing is just triage - we need to get water quality addressed in coastal Southeast Florida.

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- Congressional asks – beyond state level funding:
 - Getting off all coastal septic- really all septic- in South Florida region:
 - Upgrading our aging sewage infrastructure, the pipelines themselves are aging and need replacement
 - Expediting the shutdown of the ocean outfalls
 - Storm water- Water quality out of FDOT projects:
 - DOT to incorporate water issues when building new corridors- reduce run off, reduce impervious surfaces.
i.e. Rain gardens, elevation of Tamami Trail
 - **Newly Established: Ecosystem Conservation Area for the Northern Reefs**
 - No management authority has been assigned, it is just a legal entity currently and the State is in need of direction on what to do with that area.
 - Legal intern looking at authorities across the agency -Opportunities for codifying that area for the legislature?
 - **Management Plan process - strategic plan that guides resource management officers**
 - Opportunity within **aquatic preserve statute**/rule to increase aquatic preserves.
 - **Critical Concern designation?** Establish areas that may be designated as areas of critical state concern.
 - **Restoration is the future of Florida, but we lack the infrastructure:**
 - Counties can support and implement this infrastructure both land use and in water nurseries.
 - Provide the genetics of those corals that did survive the disease to nurseries that can help grow the population and make them resilient to similar diseases.
 - Some corals on manmade structures (e.g., docks, sea walls) do not meet permitting requirements for removal during coastal construction projects. Could we pull those corals and harvest them in nurseries? Could possibly create boost to economy and tourist industry.
 - Have some partners that are already doing it but really need to build that infrastructure now because of how slow the coral grows
 - i.e. NSU outside area, artificial reefs, etc.
 - Onshore coral laboratories, mobile lab, put all pieces inside a shipping container and then ship it as a prefabricated coral lab
 - i.e. St. Croix
 - Don't want to concentrate all of them in one area that could potentially be wiped out. It is better to have multiple corals in different places.
 - **Identify** in each county- in each inlet area- what area is the top priority **to funnel resources too**. Quick successes and wins to show that process works, that would be best model.
- VI. **Research update** presented by Maurizio focused on Water Quality Monitoring – a priority established for the southeast region because nutrient inputs thresholds were unknown.
- Maurizio included a detailed history in his PowerPoint. Field sampling and data analysis is still occurring in 2019. The project is collecting over 2,000 samples and creating over 15,000 data points every year.
 - Three site types are utilized for data collection: outfalls (area where sewage introduced to the ocean), inlets (areas of interchange between land and sea water) and reefs (where we see most

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of our coral). Different types of data collected such as nutrients, turbidity, sediments, etc. Data samples provide four important stories:

- **You can see the influence of inlets and the outfalls on reef systems** - samples are taken at all nine inlets in the southeast region. Silicon is used as an indicator for land-based materials and at inlets you are seeing a large impact of land-based materials. Materials affecting this reef systems are also increasing the turbidity of the water.
- **There are differences among the various Inlet Contributing Areas (ICAs)** or the different parcels of land that are attached to each inlet. Managing for oceanography is much more difficult than managing for land use. To note, we lack thresholds for nutrient levels/inputs.
- **We can evaluate sites according to those established water quality thresholds**. Looking at phosphorous specifically, there are hot spots in Miami-Dade and Jupiter where levels are elevated. In comparison, nitrogen levels exceed the threshold at all evaluated sites at a level that is injurious to corals.
- **We can see large “swings” through time** - this refers to the fact that sites are not static, they change naturally through time. But, some of these events occur in short time frames, so likely the more you sample the more variability you will see. This may be attributed to natural events such as a storm.
- Quality controlled data will be available in May 2019, data analysis will occur throughout 2019 and reports have a publication goal of early 2020.
- Concerns raised regarding streamlining this process and including the same type of data collection process throughout the project timeline.
 - This will allow for more targeted ask for funding.
 - Commissioner Daniella Levine Cava (Miami-Dade) is concerned with the lack of **multi-year funding** inhibiting the type of research we need to conduct. There is a need for a recurring source of revenue to address the specific monitoring information.
 - Commissioner Smith (TCRPC) stated that there is a federal discussion to have to address the lack of **multi-year funding** in line with the emergency time line.
 - Declaration of Coral Reef Emergency? The coral reef reauthorization may allow this.

Recurring, ongoing vs. emergency - recurring problem, recurring funding.

- VII. Commissioner Beam Furr (Broward County/ SFRPC) led the discussion about the known issues and their impacts on coral reef health. Kevin Carter, Assistant to the Director, Broward County Water & Wastewater Services contributed information regarding the local infrastructure.
- The ocean outfall law dictates that the six ocean outfall pipes along the southeast coast must stop discharging by 2025 except for high level less than 5% of the baseline flow. i.e. those very large 6-8-inch rain events
 - The baseline flow at 60% recycled water goes to benefit those reefs.
 - Broward County has a partnership with Palm Beach County termed the Purple Pipe Partnership to limit the use of groundwater for irrigation purposes on golf courses. Broward County sends over 10.5 million gallons of water reuse to Palm Beach every day. Phase one will be completed in 2021.
 - Francois Domond gave an update regarding the City of Hollywood which is moving forward with several phases to address the outfall. The next phase includes the construction of an additional two deep water injection wells and the construction of a pump station, which will be a three-year process. The final phase focuses on the reuse phase of the outfall. Hollywood has contacted

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the City of Miramar and Sunrise to contract out approximately 4.5 million gallons of reuse a day according to estimates from Tallahassee.

- As half of the City of Hollywood is on septic the city has an Inflow Infiltration Reduction Program, which has a reserve capacity that is more than adequate.

- The issue of biosolids was also discussed. The DEP created a technical advisory committee which Broward County tracks closely. The committee releases information about where Class B biosolids are being applied and the need for closer monitoring and inspection rates.
 - DEP stated that there are 160 permitted sites in the State of Florida. The southernmost one on the east side of Florida is Indian River County. Indian River County banned biosolids due to the algae bloom occurring in the Blue Cypress Lake.
 - Commissioner Smith would like an extended discussion regarding biosolids and have a standalone biosolids ask for extended funding for tracking and monitoring.

VIII. Discussion ensued regarding appropriate organizations and levels of government to contact about the coral disease issue. Council members are attending various meetings in the coming weeks which increases the time sensitivity of this issue. These include the U.S. Coral Reef Task Force annual meeting, Florida Association of Counties (June), National Association of Counties (July), Florida League of Cities (August). The coral reef resolution needs to be updated quickly and submitted to NADO.

- Must identify a champion from each county that can help push the coral reef disease issue to the forefront.

IX. The work group discussed the next steps moving forward which included:

- Ballast water needs to be a federal policy ask.
- Coral rescue and nurseries could be federal and state policy ask.
 - The coral reef reauthorization act language needs to reflect the time sensitive issue at hand.
 - Chris Bergh (The Nature Conservancy) noted that the coral rescue ask closes this summer, so it may be more beneficial to ask for infrastructure support to house those corals.
 - **What does the infrastructure support look like financially and resource based?** 100,000 square feet? 1 million square feet spread across the region?
 - Engaging universities in this discussion outside of the State of Florida as well.
- NOAA funding - additional NOAA funding outside of the ~\$26 million that is already allocated to US coral reefs (all seven jurisdictions).
- Need for more staff at a federal and state level.
- Need for a strategic plan perhaps a compact between the seven-county region.
 - Address the septic tanks and include the counties and utility directors in data collection funding guidance.
 - How does this effect tourism-related dollars?
 - Ask - Adequately fund an updated tourism resource number
 - Economic impact study?
 - Florida Ocean Alliance- coalition of NGOs and other stakeholders received state dollars to complete a study on the economic impact of Florida's coastal economy
- Establish the thresholds for nutrient levels - what should these look like?
 - How do events (natural and manmade) effect the levels and the correlation to the impacts on the reefs?

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- Currently DEP has funding for monitoring aspect, but the establishment of new thresholds is a regulatory process through the agency.
- What research is necessary to move that process forward?
- Research and restoration funding short-term and long-term. How does that correlate to the reauthorization act?
 - Research is being covered by the legislative funding to the disease response effort.
 - The infrastructure for restoration still needs to be addressed - goes back to the nursery conversation.
 - In terms of congressional asks the need for a coral disease response coordinator?
 - There is not a person at the federal level designated to aid states in issues such as these.
- Increased funding for water infrastructure:
 - What does that look like relative to outfalls, aging pipes and infrastructure and storm water?
 - Water Infrastructure Finance Initiative Act?

RESOLUTION

Proposed Resolution Supporting the Reauthorization of the Coral Reef Conservation Act

Issue: Coral reefs in Florida and throughout the United States and its territories are critically threatened due to increasing global and local stressors. In particular, the Florida Reef Tract, North America's only coral barrier reef, is currently facing an unprecedented coral disease outbreak.

Proposed Policy: NACo supports reauthorization of the Coral Reef Conservation Reauthorization Act of 2000. Additionally, NACo urges Congress to authorize and appropriate additional annual funding dedicated to improving the health of the nation's coral reefs.

Background: According to the Florida Department of Environmental Protection, the disease currently impacts roughly half of Florida's 45 stony corals, including key reef building species, five species listed pursuant to the Endangered Species Act, and many charismatic coral species. The disease has high species-specific prevalence rates and high whole-colony mortality rates, leading to significant declines of susceptible species on impacted reefs. This is particularly relevant to states such as Florida that heavily depend on their coral reefs to bring in tourism dollars. In fact Florida's coral reefs attract more than 16 million visitors every year, bring more than \$6 billion in sales and income revenue annually, and support more than 71,000 full- and part-time jobs. Additionally, coral reefs serve as the "rainforests of the sea" for their biodiversity and are an essential part of the food web for commercial and recreational fishing. The health of coral reefs has a direct impact on the condition of Florida's environment and on the health of the economy through the tourism and commercial fishing industries. Well-paying American jobs in the tourism, commercial fishing, recreational fishing, boating, and outdoor industries depend on the nation's coral reefs. Florida's reefs also provide more than \$675 million in flood protection benefits to people, property and jobs every year, rising to as much as \$1.6 billion during a severe storm.

As Congress moves toward addressing this growing threat, we believe the following issues need to be addressed and/or actions taken to combat coral reef loss:

1. Reauthorization of the Coral Reef Conservation Act of 2000, or creation of new authority(ies) that maintains current funding levels, and provides new reoccurring funding with the following goals:
 - a. Establish an emergency mechanism with an appropriate level of funding scaled to the risk and urgency of the issues and needs of the U.S. coral reef. An example of such an emergency would be large-scale coral disease outbreaks, coral reef bleaching events, crown of thorns outbreaks, etc.
 - b. Provide infrastructure funding for establishment of new, and expansion of existing, coral propagation nursery infrastructure, including maintenance and staffing, to ensure future large-scale ecosystem restoration is possible.
 - c. Dedicate new funding to state and territorial coral reef management agencies to address increasing local threats to the US's coral reefs.
 - d. Issue a congressional authorization for the U.S. Coral Reef Task Force (USCRTF), which gives full representation to state and territorial governments.

- e. Establish a U.S. Department of the Interior authorization to conserve coral reefs in our national parks, national wildlife refuges, and marine national monuments.
 - f. Establish consistent legal definitions for coral, coral reef, and coral reef (and associated hardbottom) ecosystems.
 - g. Support public-private partnerships that advance coral reef conservation and stewardship.
2. Fully incorporate valuation data from the U.S. Geological Survey’s new report “*Rigorously Valuing the Role of U.S. Coral Reefs in Coastal Hazard Risk Reduction*” into federal decisions.
- a. Recommend that Federal Emergency Management Agency join the USCRTF as a voting member; incorporate coral reefs as “natural infrastructure”; and incorporate findings to justify emergency access to funds for assessment, triage, and restoration of coral reefs after extreme events (e.g., hurricanes, bleaching events, etc.).
 - b. Recommend that U.S. Army Corps of Engineers join the USCRTF as a voting member and use findings from the USGS report to conduct cost/benefit analyses and compensatory mitigation reviews for all currently planned projects that may impact coral reef and hardbottom habitats.
 - c. Recommend that the US Department of Transportation (DOT) work within the USCRTF to review and incorporate plans to reduce stormwater and pollution run off in DOT projects located in coastal areas near coral reefs.
 - d. Recommend that NOAA, in coordination with the states and territories, update the economic value of coral reefs for each region and establish a regular update schedule for these studies.

Fiscal/Urban/Rural Impact: Coral reefs support jobs in the tourism, commercial and recreational fishing industries in counties. Healthy coral reefs would have a positive employment impact on both urban and rural counties.

Sponsor(s): Doug Smith, Commissioner, Martin County, Fla.; Marty Cassini, Intergovernmental Affairs Manager, Broward County, Fla.

ARTICLES

https://www.palmbeachpost.com/news/20190715/just-in-three-decade-study-links-florida-keys-coral-demise-to-mainland-runoff?utm_content=GCOX_WPB&utm_term=071519

JUST IN: Three-decade study links Florida Keys' coral demise to mainland runoff

By [Kimberly Miller](#)

July 15, 2019

Posted at 2:00 PM Updated at 2:59 PM

HIDE CAPTION

Brian Lapointe, Ph.D., senior author of a new report on coral die off in Looe Key, and a research professor at FAU Harbor Branch. (Contributed Florida Atlantic University)

HIDE CAPTION

A dying brain coral in Looe Key in the lower Florida Keys pictured in March 2016. Found in the Caribbean, brain coral can grow up to six feet tall and live for up to 900 years. (Photo credit: Brian Lapointe, Ph.D., Florida Atlantic University Harbor Branch Oceanographic Institute)

HIDE CAPTION

Diseased Elkhorn coral in Looe Key in the lower Florida Keys pictured in 2016. (Photo credit: Brian Lapointe, Ph.D., Florida Atlantic University Harbor Branch Oceanographic Institute)

HIDE CAPTION

A snorkeler swims above healthy Elkhorn corals off Key Largo in the Florida Keys in the early 1980s. Named for its antler-like shape for its colonies, the Elkhorn coral is one of the most important corals in the Caribbean. Current populations are struggling to recover from coral disease and bleaching. Elkhorn coral once dominated coral reefs in the Florida Keys. Today, less than 5 percent of these corals remain in the Florida Keys. (Photo credit: Larry Lipsky)

HIDE CAPTION

Brian Lapointe, Ph.D., senior author and a research professor at FAU Harbor Branch, swims above bleached coral reefs in Looe Key in September 2015. (Photo credit: Marie Tarnowski)

A landmark 30-year study of ailing coral in the Florida Keys shows [nutrient-supercharged water from as far north as Orlando](#) is contributing to the death of an ancient ecosystem that evolved to thrive in a fertilizer-free environment.

The research, published Monday in the international journal Marine Biology, was led by Florida Atlantic University's Harbor Branch Oceanographic Institute using measurements that date back to 1984. The breadth of the data makes it the longest record of its kind anywhere in the world, according to FAU.

A key point of the findings is that warming ocean temperatures are not the lone killer of Keys' coral, but part of a knot of man-induced challenges that includes higher rainfall rates from climate change that wash nitrogen-enriched waters through the greater Everglades and into Florida Bay.

[>> RELATED: Dangerous Lake O phosphorus flow 10 times state goal last year](#)

While Florida has focused for 30 years on cleaning Everglades-harming phosphorus from the southerly flow of water, nitrogen, which the study links to coral death, is less controlled for even as the effort to send more water south increases under the Comprehensive Everglades Restoration Plan.

Looe Key, which is about 6 miles south of Big Pine Key, was the focus of the study.

“While warming is part of the story, it’s only one part,” said Harbor Branch research scientist Brian LaPointe, who was the lead author on the study. “When we went back and critically looked at the pattern of coral mortality we see that there are periods after major water releases and heavy rainfall where the rate of coral die off increased.”

LaPointe tied higher coral die offs to three periods of time — the mid 1980s, 1996 to 1999, and 2013 — all years of heavy rainfall or increased releases of water to Everglades National Park, where it naturally flows through sloughs into Florida Bay.

[>> RELATED: What’s up with sunscreens and Florida’s coral reefs?](#)

The mean cover of coral in the Florida Keys National Marine Sanctuary in 1977 ranged between 30 to 70 percent, according to sanctuary research coordinator Andy Bruckner. By 1995 when permanent monitoring stations were first established, the overall mean cover was about 12 percent, with some sites still as high as 25 to 70 percent.

By 2010, the mean cover was 6 percent. Today it’s about 4 percent, although there are some mid-channel patch reefs with as much as 50 percent.

“Citing climate change as the exclusive cause of coral reef demise worldwide misses the critical point that water quality plays a role too,” said study co-author James W. Porter, emeritus professor of ecology at the University of Georgia. “While there is little that communities living near coral reefs can do to stop global warming, there is a lot they can do to reduce nitrogen runoff.”

[>> RELATED: The Invading Sea: Can South Florida be saved from sea-level rise?](#)

The study emphasizes yet another way man’s reroute of the state’s historic plumbing system to make way for homes and farms has harmed the environment, and how challenges continue even as the Army Corps of Engineers and South Florida Water Management District attempt fixes through the Comprehensive Everglades Restoration Plan, or CERP.

CERP was authorized by Congress in 2000 as a blueprint for projects aimed at returning the system to a more natural state and preserving what is left. The plan has an estimated 50-year timeline with a price tag of about \$10 billion.

A decade before CERP, the federal government sued Florida for poisoning the Loxahatchee National Wildlife Refuge and Everglades National Park with outside effluent, such as phosphorus. The high levels of phosphorus led to an overgrowth of cattails that out-competed the natural river of grass.

[>> VIDEO: Thirty years of unique data show what’s really killing Florida’s coral reefs](#)

In 1992, a court order set limits on phosphorus levels, which forced the creation of storm water treatment areas to clean water before sending it south. Today, more than 57,000 acres of storm water treatment ponds have been built — 20,000 acres more than what was required in a legal settlement.

Nitrogen levels in runoff have dropped with the cleanup of the phosphorus, but are still too high for healthy coral during high runoff events, LaPointe said.

“One of our biggest challenges is that much of the nutrients originate outside of the Florida Keys as a result of Everglades discharges, Florida Bay water and degraded water masses that come from mainland Florida,” said Bruckner, the sanctuary research coordinator. “The Florida Keys has made

great strides in reducing nutrient input through implementation of sewage treatment plants, but there is still runoff and much of the rest of Florida is still on septic tanks.”

An overabundance of nitrogen disrupts the symbiotic relationship in coral that has allowed it to grow in low-nutrient waters. Microscopic algae that live in coral tissue provide oxygen and food in the form of sugar to the coral through photosynthesis, while the coral polyp provides nitrates and carbon to the algae.

Bruckner praised LaPointe’s research, but said the primary cause of coral bleaching events is temperature and increased ultraviolet radiation. He noted that mass coral die offs have occurred in remote areas not influenced by artificial nutrients.

Global sea surface temperatures rose at about 0.13 degrees per decade between 1901 and 2015, but can spike during some years such as 2015 when a global coral bleaching alert was issued by the National Oceanic and Atmospheric Administration. That year, temperatures in the Caribbean, Cuba, the Bahamas, Haiti and the Dominican Republic reached 87 to 89 degrees, while average temperatures run 84 to 85.

Still, LaPointe hopes the study will help guide future environmental projects.

“We are seeing all of this worsen as our population grows and nitrogen loads to our waters increase,” he said. “There was a balance that evolved over hundreds of millions of years and it was doing very well up until we came along.”

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[@KmillierWeather](#)

<https://www.palmbeachpost.com/news/20180930/new-dangerous-lake-o-phosphorus-flow-10-times-state-goal-last-year>

NEW: Dangerous Lake O phosphorus flow 10 times state goal last year

By [Kimberly Miller](#)

Posted Sep 28, 2018 at 12:01 AM

Updated Sep 30, 2018 at 12:20 PM

Hurricane Irma's torrential rains flooded Lake Okeechobee with more than 450 metric tons of phosphorus in a single month, contributing to a fertilizer dump that [nourished this summer's harmful algae bloom](#) and surpassed the state's phosphorus goal 10 times over.

Between May 2017 and this past April, 1,046 metric [tons of phosphorus soured Lake Okeechobee](#), carried [largely in runoff from](#) farms, dairies, cattle ranches and communities north of Florida's freshwater center.

About 6 percent of the water and 7 percent of the phosphorus that went into the lake during the same time period came from areas south of Lake O, according to the South Florida Water Management District.

Scientists predicted an algae bloom was possible after Irma's September soaking drove lake levels up 3 feet in a month, but the extent of the phosphorus loading wasn't clear until results were released during a September meeting of the district's Water Resources Analysis Coalition, or WRAC.

Staff graphic

"Last year was a fluke because of the way the rain came with Irma, but it's a high point in a chronic problem," said Audubon Florida scientist Paul Gray, who specializes in Lake Okeechobee research. "Clearly we haven't done near enough to fix it."

RELATED: White House approves massive reservoir to hold Lake O overflow

Phosphorus and water

The five-year average flow of phosphorus into the lake, including last year, was 598 metric tons. In each of the four years previous, the range of phosphorus was between 415 metric tons and 574 metric tons.

The state goal set in 2001 is 105.

"That's hard, but I'm not going to say impossible," said Drew Bartlett, deputy secretary of ecosystem restoration for the Florida Department of Environmental Protection during the WRAC meeting. "If I start saying impossible, then I start encouraging people to give up and I'm not looking to do that."

Decades-old problem escalates

The state has tried to reduce phosphorus levels in the lake for decades after calamitous decisions to drain wetlands for development rerouted Florida's unique natural flow to the river of grass.

A major algae bloom on Lake Okeechobee in 1986 motivated lawmakers to pass the Surface Water Improvement and Management Act that required state agencies to develop a phosphorus reduction plan for Lake Okeechobee with an annual inflow goal of 361 metric tons.

When no substantial phosphorus reductions were measured through the 1990s, lawmakers passed the Lake Okeechobee Protection Act in 2000. It called for developing the Lake Okeechobee Protection Plan and led to a new average annual phosphorus goal of 105 metric tons from inflow.

Those goals were supposed to be met in 2015.

RELATED: Lake Okeechobee ailing but not dead

With still no substantial reductions, an overarching Basin Management Action Plan for restoring Lake Okeechobee was developed in 2014. The plan includes many of the same tactics as earlier plans such as requiring individual land owners and municipalities in watersheds north of the lake to adopt “best management practices” to reduce their phosphorus loads.

The practices can include projects as simple as building grassy swales for runoff and fencing cattle out of canals, to creating 2,000-acre water treatment areas for removing nutrients and changing how runoff flows through manure-heavy dairy farms.

Bartlett said 166 phosphorus reduction projects have been completed under the Lake O action plan with an additional 54 underway.

A Great Blue Heron stands by blue-green algae on the shores of Lake Okeechobee in Clewiston, Florida, July 10, 2018. (Greg Lovett / The Palm Beach Post)

A five-year review is scheduled for next year. The new deadline to meet the phosphorus goal is 2034.

“We have a long way to go,” Bartlett said.

Part of the challenge is so-called “legacy phosphorus” that has been embedded in soils for decades and is washed out during heavy rains.

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In September 2017, the upper and lower Kissimmee basins that flow into Lake Okeechobee each received more than 12 inches of rain, which is nearly double the normal amount, according to the water management district.

Lake Okeechobee itself got 10.94 inches, which is 5.28 inches more than the typical September.

A wet October followed with the 16-county region averaging 3.44 inches more rainfall than normal.

In the El Niño year of 2016, a deluge of rain pushed 508 metric tons of phosphorus into the lake, triggering another widespread algae bloom that spread noxious green goop down the St. Lucie estuary that summer.

There is a 65 to 70 percent chance of an El Niño forming this winter, according to the Climate Prediction Center.

“If we get another El Niño year, hold onto your hat,” Gray said. “That will set the stage for another bad summer.”

More than half of Lake O still contaminated

As of Sept. 20, NOAA satellite images showed about 55 percent of Lake Okeechobee was still contaminated with algae, which can be toxic to humans, causing respiratory irritation, nausea and more serious health problems including liver failure if people swim or drink algae-laden water.

phosphorus also encourages the growth of cattail stands, which crowd out native flora and fauna.

About 44 percent of the watershed north of Lake Okeechobee is agriculture. Communities, roads and utilities make up 11 percent, according to the Florida DEP. The remaining 45 percent includes wetlands, upland forests and lakes.

In the past five years, an annual average of 96 percent of the water and 95 percent of the phosphorus flowing into Lake O was from the north, northeast or northwest, according to the district.

“Nutrient control is critical, because we cannot control the weather,” said Karl Havens, director of Florida Sea Grant at the University of Florida.

RELATED: Quick fix for Lake O algae woes uses land now roamed by cows

Gary Ritter, assistant director for government and community affairs with the Florida Farm Bureau, said some farms north of the lake have worked since the 1970s to reduce phosphorus contributions but haven’t had the same federal and state resources as cleanup efforts south of the lake.

Algae from Lake Okeechobee floats in the water before being released into the St. Lucie River at the St. Lucie Lock and Dam in Stuart, Florida, July 27, 2018. (Greg Lovett / The Palm Beach Post)

The 1991 settlement of a federal lawsuit against the district and DEP for water quality violations south of Lake Okeechobee forced officials to clean up farm runoff and discharges from sugarcane fields before it reached the Loxahatchee National Wildlife Refuge and Everglades National Park. The settlement triggered the construction of storm water treatment areas south of the lake and new rules on water testing.

“It might be that we’re going to have to do some drastic things north of the lake like what has been imposed south of the lake,” said WRAC member Newton Cook. “Like, if you don’t drop your phosphorus 25 percent, something bad is going to happen to you.”

Bartlett said there is no law requiring the 105 goal be achieved by 2034. If it isn’t met, clean-water plans will be reevaluated and additional projects considered.

“We’ve made a fine mess of things,” Gray said.