Interagency Coordination for Water Quality Monitoring in the Lake Worth Lagoon

Phyllis A. Klarmann[1], James Councilman[1], Matthew Mitchell[2], Christopher Buzzelli[3]
[1]South Florida Water Management District; [2]Palm Beach County Dept. of Environmental Resources Management; [3]Coastal Ecosystems, LLC

INTRODUCTION

- Lake Worth Lagoon (LWL) is a shallow, subtropical estuary in Palm Beach County, FL.
- It is highly urbanized, with man-made connections to an expanded watershed via the Central & South Florida Project canals and water control structures.
- Controlled freshwater inputs and runoff to LWL are conveyed through the C-17, C-51, and C-16 canals.
- The greatest volume of inflows are from the LWL watershed, with an estimated average of 10% inflow originating from Lake Okeechobee.
- LWL has experienced changes in habitat quality (e.g., anoxic/hypoxic, silty sediments) and habitat loss (i.e., declines in seagrass 2013 onward), which may be informed by trends in water quality.

Fig 1. John's Island/restored oyster reefs, in the central LWL, downstream from C-51 (fig credit: PBCERM)

COOPERATIVE AGREEMENT

- Palm Beach County (PBC) and the South Florida Water Management District (SFWMD) entered into a cooperative agreement to conduct water quality monitoring in LWL in 2007 (CA #4600002755).
- Monitoring supports the LWL Management Plan, providing long-term trend analysis of major water quality constituents, essential for formulating appropriate management response to maintain or improve water quality.

15 YEARS OF WATER QUALITY MONITORING IN LAKE WORTH LAGOON

History

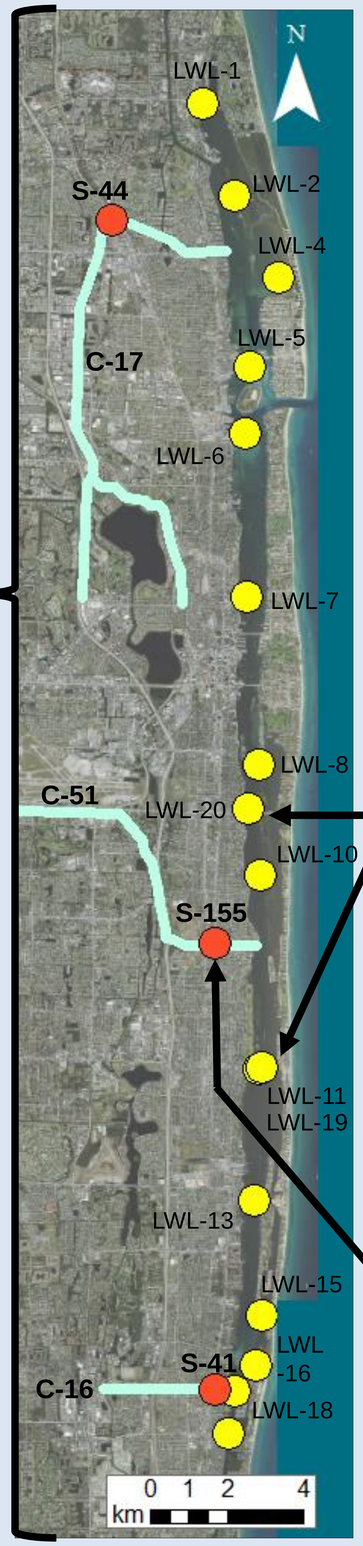
- First Cooperative Agreement (CA) was established in 2007 for a 5-year period; 5-year renewals occurred in 2012 and 2017 for monthly grab sampling only.
- PBC Environmental Resources Management collects samples; SFWMD laboratory analyzes samples and uploads data to DBHYDRO.
- An amendment to the CA in 2020 added additional salinity & nutrient monitoring (see right).
- **A new 5-year agreement is under development for 2023-2028.**

Monthly Sampling

- 18 Stations (LWL-1 – LWL-18)
- 4 Stations discontinued in 2015 (LWL-3, 9, 12, & 14) as the sites were statistically comparable to adjacent sites, and therefore removed to save costs/time; metals analysis was also removed in 2015.
- 14 monthly grab stations continue.

Fig 2. Agency staff collecting WQ samples. Temperature, secchi depth, and other parameters are also measured.

- **Analyzed parameters include**:
  - Dissolved Oxygen, pH, Salinity
  - Total Nitrogen (TN)
  - Ammonia nitrogen (NH4)
  - Nitrite-Nitrate nitrogen (NOx)
  - Total Phosphorus (TP)
  - Orthophosphorus (OPO4)
  - Total Suspended Solids (TSS)
  - Turbidity (NTU)
  - Chlorophyll (CHL)



Continuous Salinity Sondes

- Continuous salinity sondes are solar-powered and send data via SFWMD's telemetric, SCADA network.
- Installed to understand impacts to salinity in the central lagoon resulting from freshwater inflows.
- LWL-20 will be fully installed on the Southern Blvd bridge north of C-51 in 2023; a temporary site (LWL-20A) was installed on a channel marker nearby while the bridge undergoes construction.
- LWL-19 is south of C-51, on a boardwalk adjacent to Snook Islands Natural Area.

Fig 4. LWL-19 (left); temporary LWL-20A (top right); and soon-to-be permanent LWL-20 (bottom right)

Nutrient Monitoring

- An autosampler was installed at the S-155 structure where freshwater inflows are delivered from the C-51 canal.
- Includes weekly composite and monthly grab samples.
- Collections aim to identify possible nutrient loading from C-51 and upstream sources.

Fig 3. S-155 (left) and auto-sampler (right)

WATER QUALITY TRENDS

- Coastal Ecosystems, LLC was contracted to conduct data analysis of monthly grab samples for the period of record 2007-2022.

Parameter	LWL Segment		
	North	Central	South
Salinity			
Chlorophyll			
Total N			
Total P			
TSS			
Turbidity			

Table 1. Summary of trends in several major WQ parameters 2007-2020. Red cell indicates significant increasing trend.

- WQ in North and South segments benefit from proximity to inlets.
- C-51 is contributing to declining water quality in the Central Segment: CHL, TN, TP, TSS, and turbidity increased in the Central Lagoon over the 13-year period analyzed.
- CHL, TN, TP are correlated to inflow, and to each other, in all three segments
- This reveals considerable uncertainty associated with TSS and turbidity processes in LWL.

LWL INITIATIVE WATER RESOURCES WORKING GROUP

These data and other projects related to lagoon water and sediment quality are presented at thrice-annual LWLI working group meetings. To join the email distribution list, please email pklarman@sfwmd.gov

lake worth LAGOON