

Square One

Monitoring Program Development for the City of Palm Coast

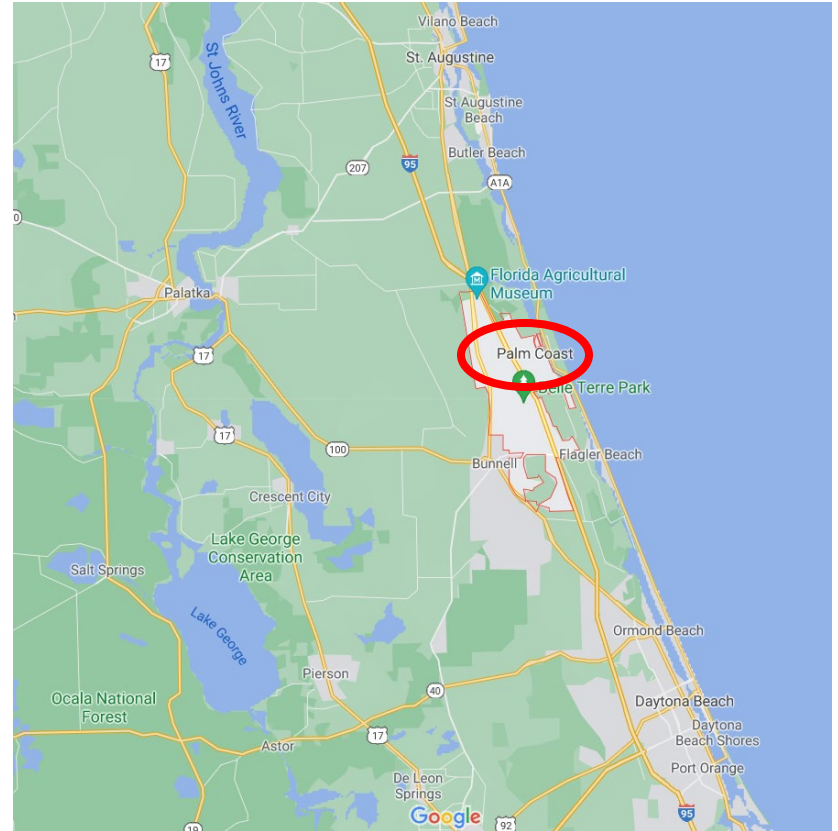
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Woolpert Inc.

FSA Annual Conference
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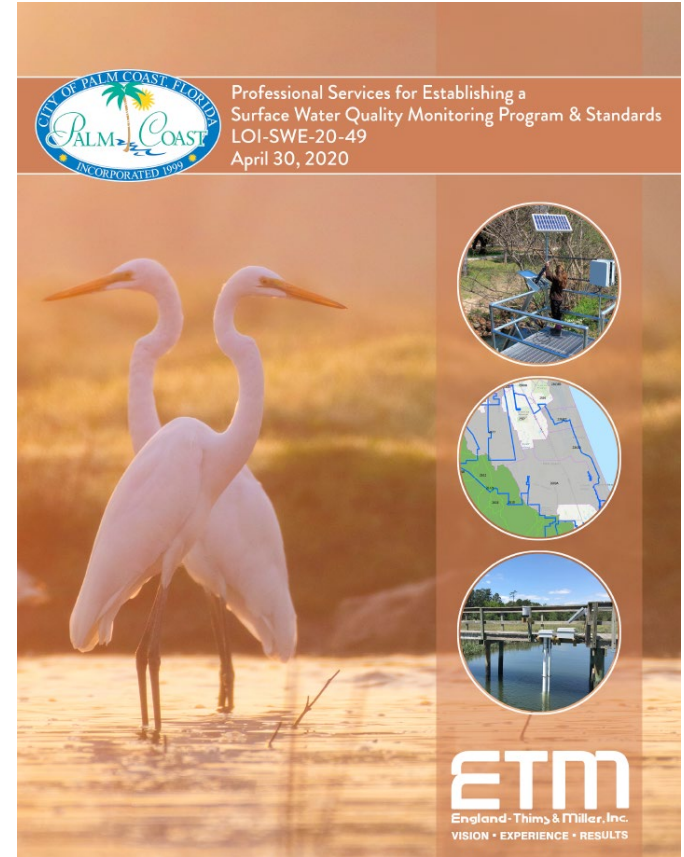
City of Palm Coast

- Incorporated 1999
- Located in Flagler County
- 96 square miles
- Approximately 90k residents
- Phase 2 MS4



Monitoring Program Development

- Issued RFP in April 2020
- City had not previously collected water quality data
- ETM/Woolpert team selected



City Objectives

- Describe surface water quality conditions in the City
- Identify long term trends in surface water quality
- Monitor achievement of established Surface Water Quality Standards
- Identify and prioritize high quality and degraded surface waters
- Calculate annual nutrient and select metal loads and track progress toward achieving Total Maximum Daily Load (TMDL) targets, and
- Evaluate the overall success of the City's water quality management efforts

Project Tasks

- Develop Monitoring Strategy
- Perform Field Inspections/Site Selection
- Develop Monitoring Plan
- Station Installation
- Data Collection
- Develop GIS Application
- Conduct BMP Evaluation



“...we have a strategy”



Benefits

- Provides direction and focus
- Demonstrates alignment with mission and council goals
- Allows for budgeting and management of limited resources
- Justifies program priorities

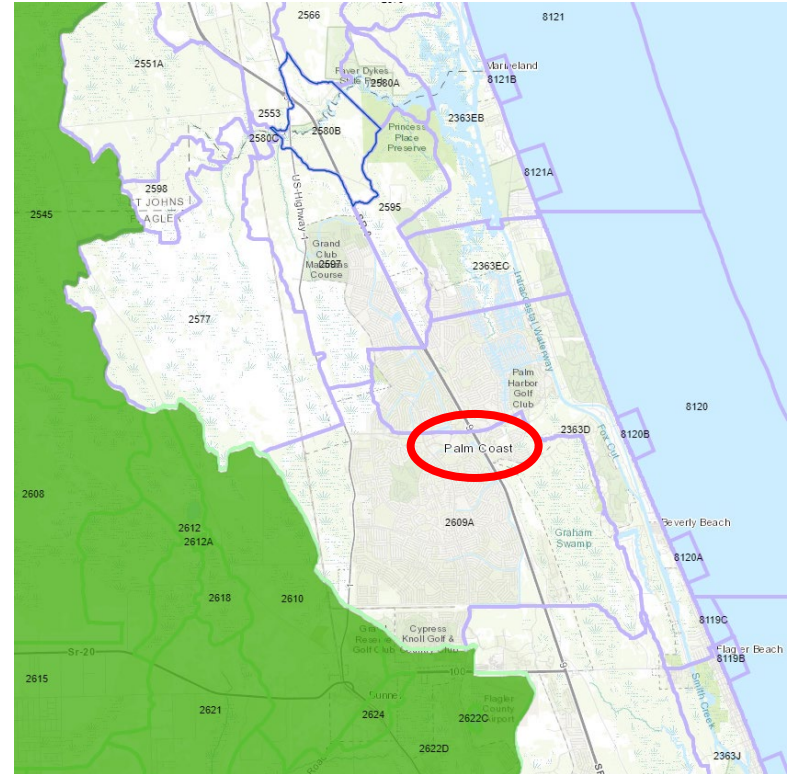
Monitoring Strategy

- Assess Regulatory Requirements
- Review Historical Data
- Evaluation Canal System SCADA Network
- Perform Risk-Based GIS Analysis
- Develop Summary Matrix



Watershed Scale

- Strategy provides planning-level guidance/focus
- Considered WBIDs, SJRWMD, and local sub-watershed coverage



Regulatory Requirements

Parameter Assesed	Verified WBID	City Watershed (SJRWMD Delineation)					
		Black Branch Tributary 1	Graham Swamp	Lehigh Canal	Long Creek	Matanzas River	Pellicer Creek
Nutrients	2609A		X	X			
	2580B						X
Iron	2363D		X			X	
	2363EC				X	X	
Dissolved Oxygen	2580B						X
Fecal Coliform	2610	X					
	2577						X
Bacteria	2363EB				X		

*City has negligible overlap into watersheds with TMDLs or BMAPs

Historical Data Review

- Limited data was available from FDEP, SJRWMD, and Lakewatch
- Summarized data for four watersheds

SJRWMD Watershed Name	End of Record	Total Number of Sites	FDEP		SJRWMD		Lakewatch	
			Count	Type	Count	Type	Count	Type
Black Branch	2008	3					3	L
Bulow Creek	Prior to 2008	1	1	S				
Gore Lake Outlet	2009	11	10	L, W	1	L		
Graham Swamp	2016	12	5	L, S	1	L	6	L
Hulett Branch	2016	1	1	S				
Lehigh Canal	2017	10	8	S			2	L
Matanzas River	2016	27	1	S	1	E	25	L, S, E
Pellicer Creek	2014	3	2	S	1	S		
Tank Lake Outlet	Prior to 2008	8	7	L, S	1	S		

L = Lake Site

S = Stream Site

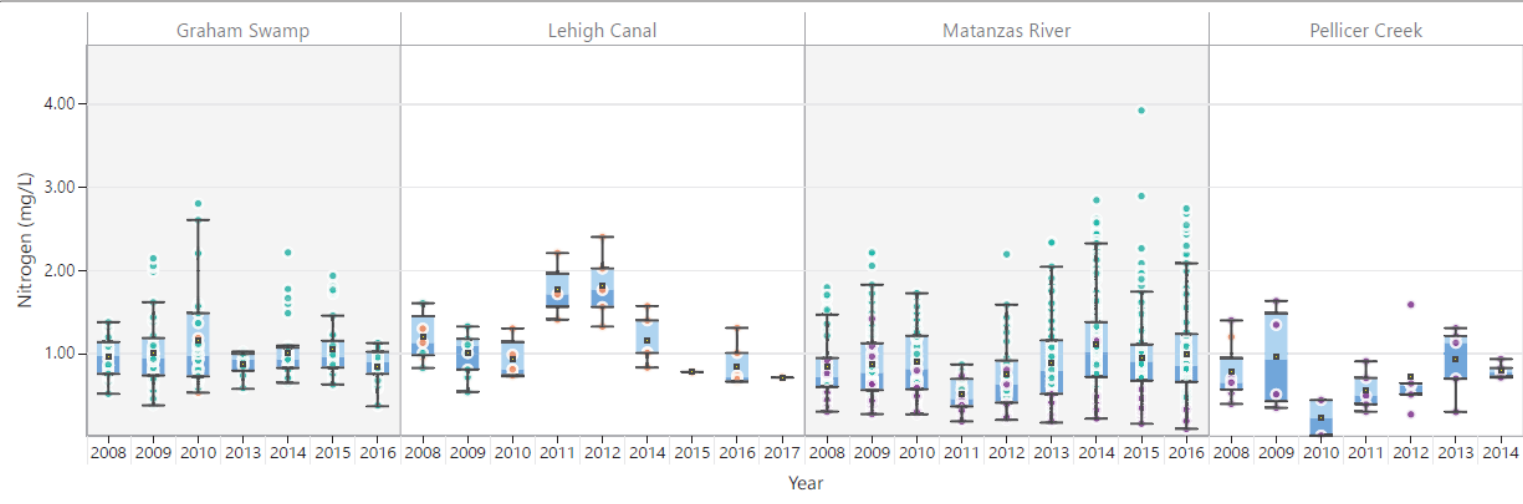
E = Estuary Site

W = Well Site

Total Nitrogen (mg/L)

*Whiskers represent the max/min value within 1.5x the interquartile range.

Watershed Year	Graham Swamp						Lehigh Canal						Matanzas River						Pellicer Creek					
	Count	Avg	Med	Min	Max	Geo Mean	Count	Avg	Med	Min	Max	Geo Mean	Count	Avg	Med	Min	Max	Geo Mean	Count	Avg	Med	Min	Max	Geo Mean
2008	26	0.96	0.98	0.52	1.38	0.93	7	1.21	1.14	0.83	1.61	1.17	54	0.85	0.73	0.30	1.80	0.76	7	0.79	0.66	0.40	1.40	0.72
2009	54	1.02	0.95	0.38	2.15	0.94	9	1.01	1.10	0.54	1.33	0.98	112	0.87	0.78	0.28	2.22	0.79	4	0.96	0.93	0.35	1.64	0.79
2010	38	1.17	0.98	0.53	2.81	1.06	8	0.93	0.81	0.73	1.30	0.90	71	0.90	0.82	0.27	1.73	0.82	2	0.23	0.23	0.02	0.45	0.09
2011							3	1.78	1.72	1.41	2.22	1.75	23	0.51	0.46	0.19	0.87	0.48	5	0.56	0.50	0.30	0.91	0.52
2012							5	1.82	1.77	1.33	2.41	1.78	40	0.76	0.63	0.21	2.20	0.64	5	0.73	0.62	0.27	1.59	0.62
2013	12	0.87	0.94	0.58	1.03	0.86							103	0.90	0.80	0.17	2.35	0.76	5	0.93	1.13	0.30	1.31	0.82
2014	36	1.02	0.94	0.65	2.22	0.97	5	1.17	1.02	0.84	1.57	1.14	200	1.11	1.03	0.22	2.85	0.98	5	0.80	0.78	0.72	0.94	0.79
2015	36	1.06	0.97	0.63	1.94	1.01	1	0.78	0.78	0.78	0.78	0.78	191	0.95	0.91	0.16	3.93	0.85						
2016	36	0.85	0.90	0.37	1.13	0.82	6	0.85	0.72	0.66	1.31	0.82	198	0.99	0.86	0.10	2.75	0.87						
2017							1	0.72	0.72	0.72	0.72	0.72												
Total	238	1.01	0.94	0.37	2.81	0.95	45	1.15	1.02	0.54	2.41	1.08	992	0.95	0.84	0.10	3.93	0.83	33	0.75	0.70	0.02	1.64	0.62



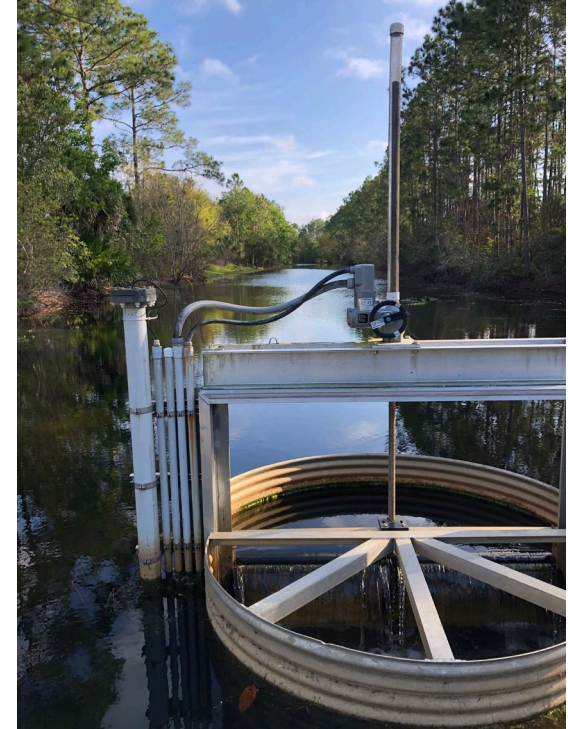
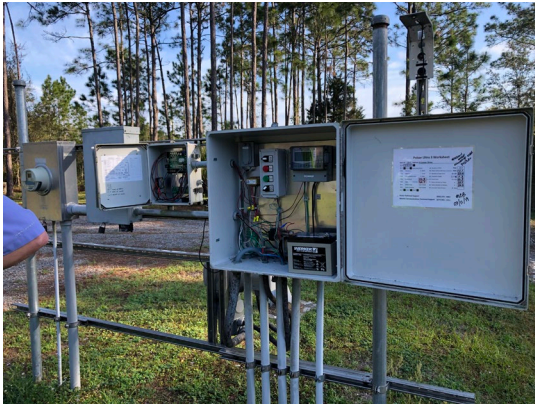
Priorities by Watershed

Table 4: Historical Data Parameters of Concern

Watershed	P	N	Chl-a	DO	TSS	Iron
Graham Swamp	X		X			
Lehigh Canal	X	X	X	X		
Matanzas River	X	X	X	X	X	X
Pellicer Creek	X					X

Canal Network

- Eighteen (18) stations located on fresh and saltwater canals; includes Mission managed SCADA systems
- Many include actuators for remote flood control and irrigation
- Additional stage gages located across City



Water Quality Risks/Consequences

- Criticality-based analysis (asset management approach)
- GIS centric using available data only
- Consider human health and recreational impacts
- Risks include sources outside of City's control

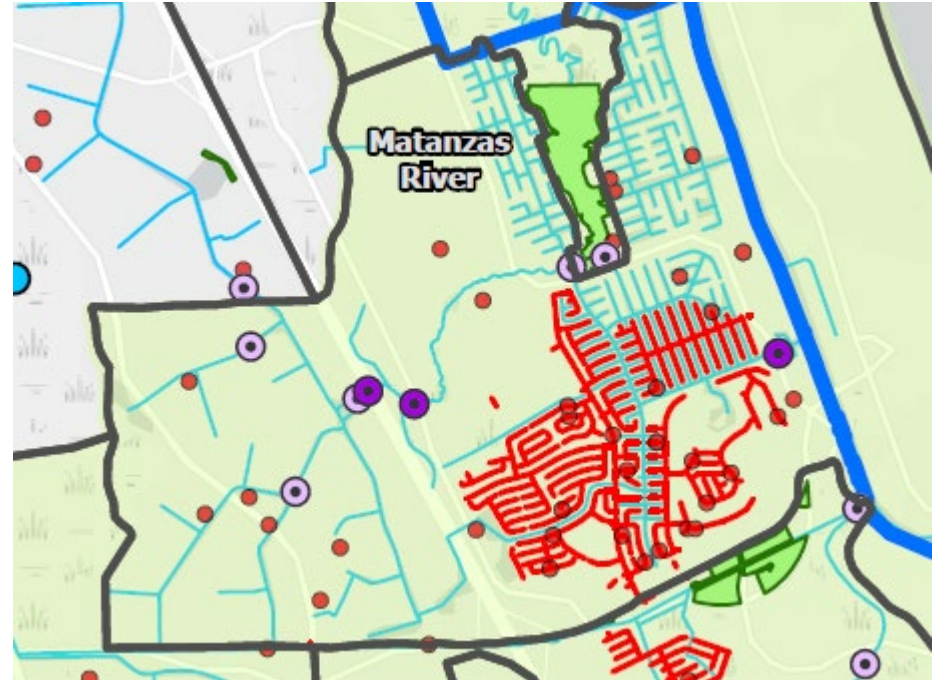
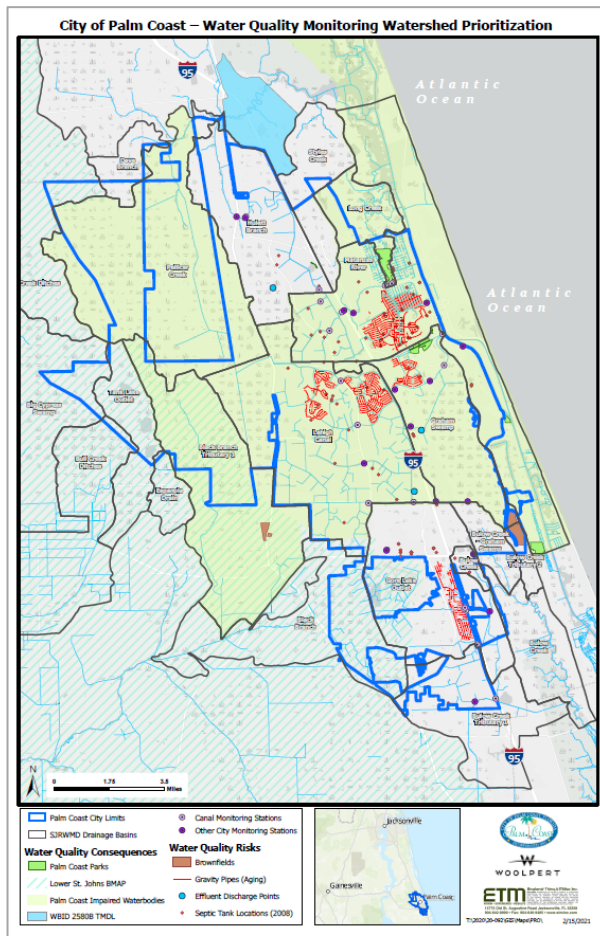
Available Data Sources

Risks

- Aging Sanitary Sewer
- Septic Tanks
- Wastewater Effluent
- Brownfields
- Zoning

Consequences

- Palm Coast Parks
- Lower St. Johns BMAP
- Pellicer Creek TMDL
- Impaired Waters



Additional Considerations

- Portion of each watershed within City limits
- Existing stream gages operated by other parties



Watershed Tiers

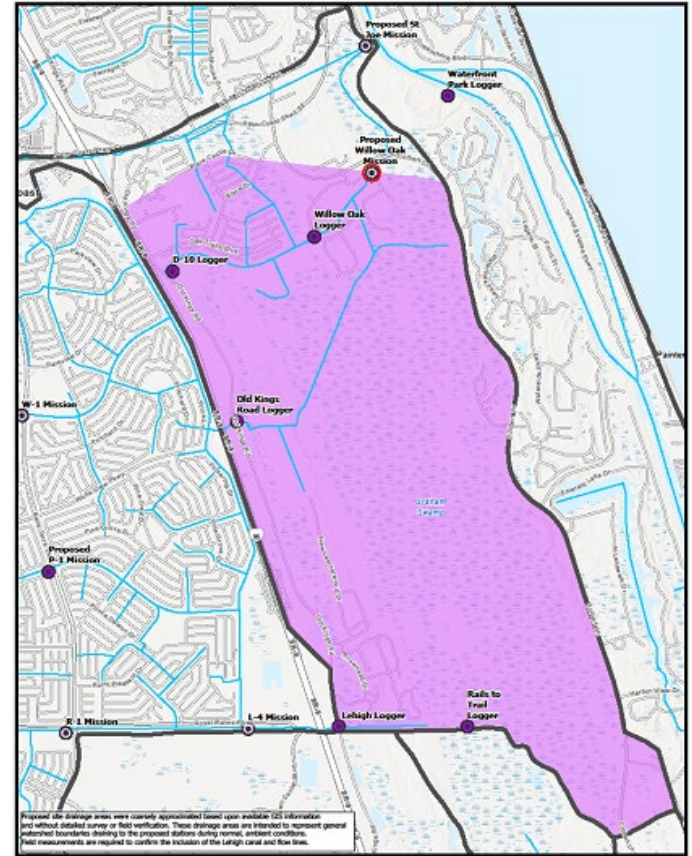
- Developed summaries for each watershed
- Identified 7 high priority watersheds; selected 4 for initial field inspection/evaluation
- Additional watersheds noted for future consideration

Monitoring Plan

- General data collection
 - Continuous monitoring
 - Discrete sampling
- Data management
- Site selection within each priority watershed
- Site-specific sensor/systems recommendations



Graham Swamp



Graham Swamp



Example Recommendations

- Install 4-inch PVC well to the upstream face of the broad-crested weir at the outlet of Big Mulberry Creek
- Install a Mission or Campbell DCP, depending on City's decision for long-term DCP provider
- Establish radio communication between the Big Mulberry Creek station and the City Canal station
- Install YSI EXO 2 sonde for continuous/real-time data collection
 - pH
 - DO
 - Conductivity
 - Temperature
- Install a Hydrological Services TB-4 tipping bucket rainfall gage
- Integrate the rainfall gage and YSI EXO 2 sonde into the existing Mission DCP or prospective Campbell DCP
- Collect seasonal high flow and low flow grab samples

Take Aways

- Do your homework
- Leverage available data from other entities
- Obtain buy-in from management
- Document and implement a well-conceived strategy
- Phasing has its benefits



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Questions?



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