

Florida Department of Environmental Protection



Water Quality Evaluation and TMDL Program

Nutrient TMDL for Kings Bay (WBID 1341), Hunter Spring (WBID 1341C), House Spring (WBID 1341D), Idiot's Delight Spring (WBID 1341F), Tarpon Spring (WBID 1341G), and Black Spring (WBID 1341H)

April 23, 2014





Presentation Outline

- 1. What is a TMDL**
- 2. Verified List of Impaired Waters**
- 3. Unique Nature of Kings Bay & Spatial Trends**
- 4. Water Quality Targets**
- 5. TMDL Allocation**



What is a TMDL?

Total

Maximum

Daily

Load

- Establishes maximum amount of a pollutant that a water body can assimilate without causing exceedances of water quality standards (water quality criteria & designated uses)

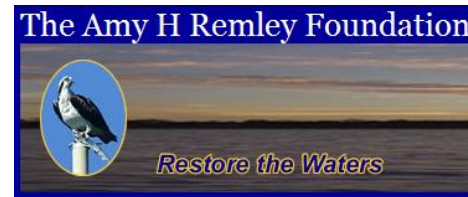


What does proposing a TMDL mean?

- It means we are proposing a formal target for achieving the water quality component of restoration.
- When we identify a waterbody as impaired (not meeting it's standard), we use the *Best Available Science* and *Local Knowledge* to come up with this target.



Who Participated?



Citizens



& Many More...



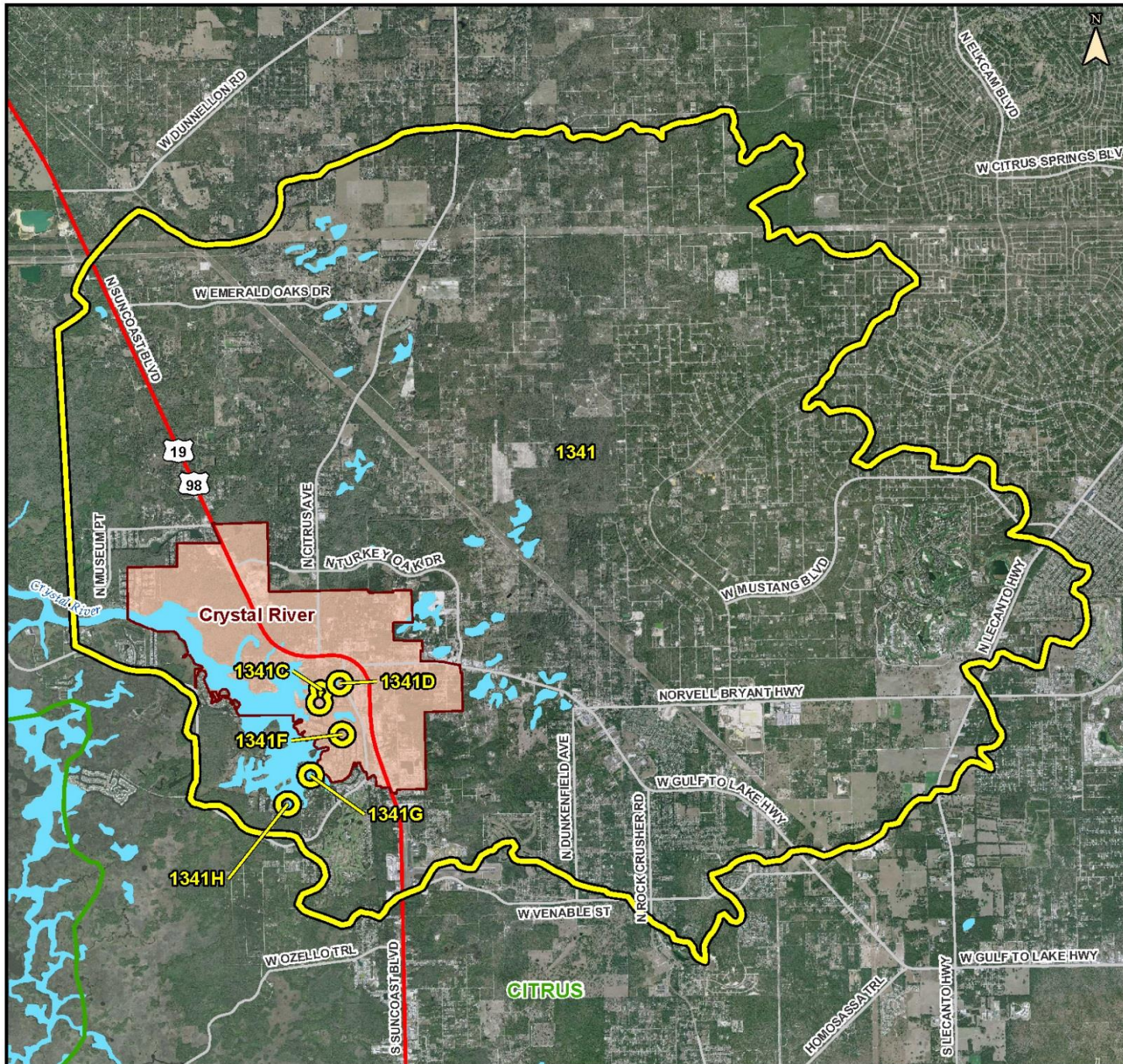
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Verified Impairments

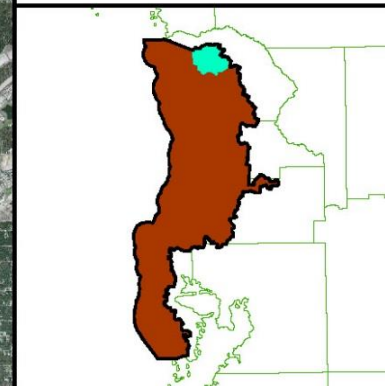
WBID	Waterbody Segment	Waterbody Type	Parameters Assessed Using the IWR	Concentration or Criterion or Threshold Not Met	Assessment Status
1341	Crystal River/ Kings Bay	Estuary	Nutrients (algal mats)	Balanced natural population of flora and fauna	Impaired
1341C	Hunter Spring	Spring	Nutrients (algal mats)	Balanced natural population of flora and fauna	Impaired
1341D	House Spring	Spring	Nutrients (algal mats)	Balanced natural population of flora and fauna	Impaired
1341F	Idiot's Delight Spring	Spring	Nutrients (algal mats)	Balanced natural population of flora and fauna	Impaired
1341G	Tarpon Spring	Spring	Nutrients (algal mats)	Balanced natural population of flora and fauna	Impaired
1341H	Black Spring (Crescent Drive Spring)	Spring	Nutrients (algal mats)	Balanced natural population of flora and fauna	Impaired



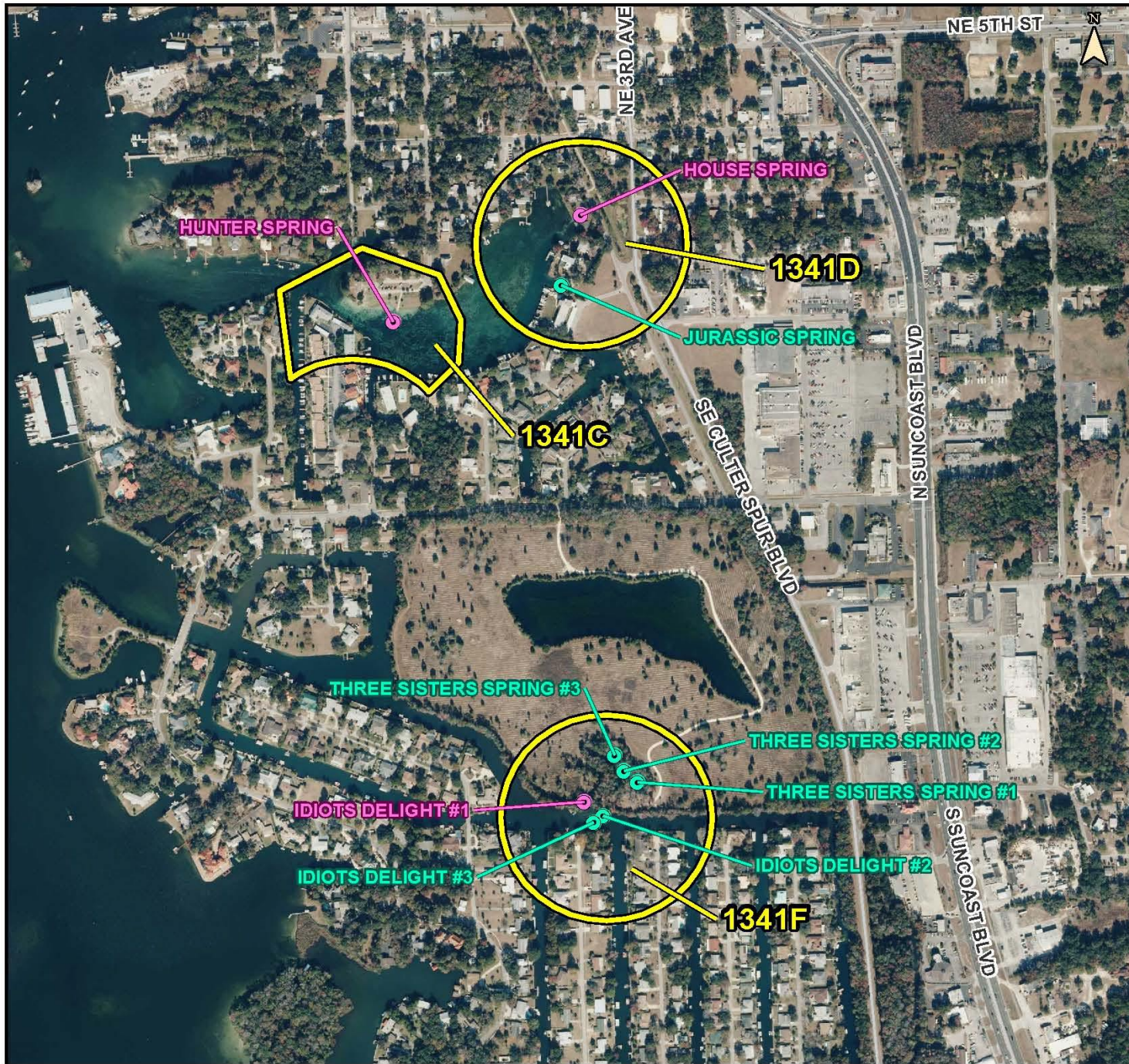
Kings Bay and Springs WBID 1341, 1341C, 1341D, 1341F, 1341G, and 1341H

Springs Coast Group 5 Basin
Geopolitical

-  Rivers and Larger Streams
-  US Routes
-  Local Roads
-  Water Bodies
-  WBID
-  City Limits
-  Counties



Map prepared April 1, 2013 by the Bureau of Watershed Restoration,
Division of Environmental Assessment and Restoration. This map is not for legal
decision making purposes. For more information or copies,
contact Kristina Bridger at (850) 245-8023, or kristina.bridger@dep.state.fl.us
(GIS) ronald.hughes@dep.state.fl.us

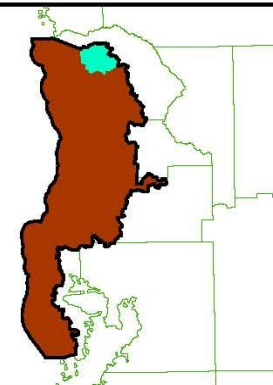


**Kings Bay and Springs
Kings Bay Focus Area
WBID 1341D, 1341C
and 1341F**

Springs Coast Group 5 Basin
Springs

Springs

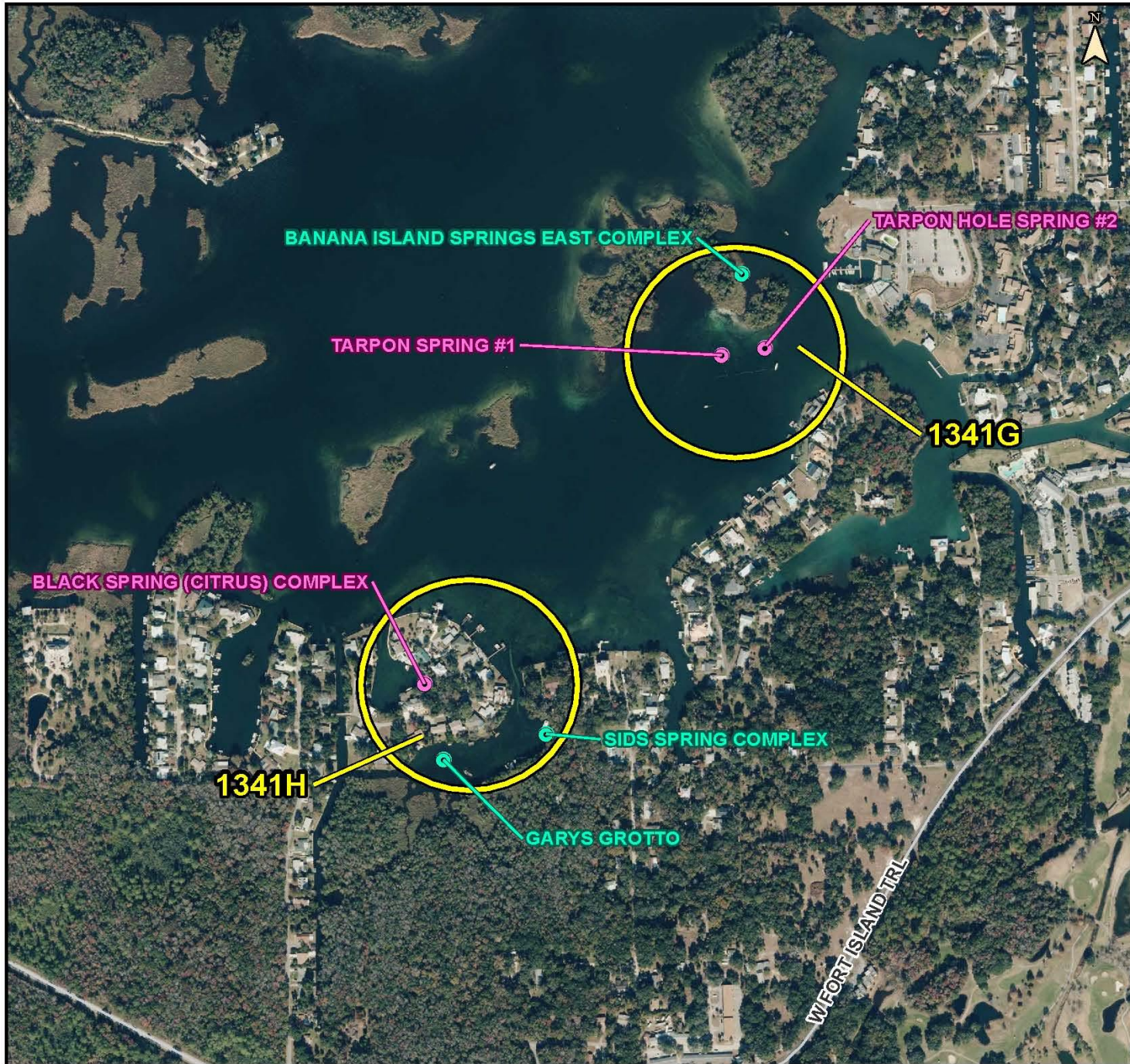
- Sampled
- Not Sampled
- Local Roads
- WBID



0 500
Feet



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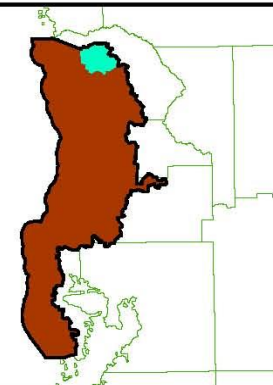


**Kings Bay and Springs
Kings Bay Focus Area
WBID 1341G and 1341CH**

Springs Coast Group 5 Basin
Springs

Springs

-  Sampled
-  Not Sampled
-  Local Roads
-  WBID



0 500
Feet



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Establishing Causative Pollutant for Nitrogen

Waterbody (WBID)	Waterbody Type	LTA_NO3	LTA_TN	Difference	% NO3 of TN	Causative Pollutant
Kings Bay (WBID 1341)	Bay	0.1	0.28	0.18	36%	Total Nitrogen
Hunter Spring (WBID 1341C)	Spring	0.49	0.55	0.06	89%	Nitrate
House Spring (WBID 1341D)	Spring	0.47	0.47	0	100%	Nitrate
Idiot's Delight Spring (WBID 1341F)	Spring	0.21	0.25	0.04	84%	Nitrate
Tarpon Spring (WBID 1341G)	Spring	0.21	0.32	0.11	66%	Nitrate
Black Spring (WBID 1341H)	Spring	0.24	0.34	0.09	71%	Nitrate

- Various sources of nitrogen exist within Kings Bay, including stormwater runoff, microbial cycling, and aquatic vegetation cycling
- Nitrate is the most abundant form of nitrogen in spring discharge



Establishing Causative Pollutant for Phosphorus

Waterbody (WBID)	Waterbody Type	LTA_OPO4	LTA_TP	Difference	% OPO4 of TP	Causative Pollutant
Kings Bay (WBID 1341)	Bay	0.013	0.032	0.019	41%	Total Phosphorus
Hunter Spring (WBID 1341C)	Spring	0.024	0.029	0.005	83%	Orthophosphate
House Spring (WBID 1341D)	Spring	0.023	0.024	0.001	96%	Orthophosphate
Idiot's Delight Spring (WBID 1341F)	Spring	0.026	0.027	0.001	96%	Orthophosphate
Tarpon Spring (WBID 1341G)	Spring	0.027	0.034	0.007	79%	Orthophosphate
Black Spring (WBID 1341H)	Spring	0.017	0.024	0.007	71%	Orthophosphate

- Various sources of phosphorus exist within Kings Bay, including tidal mixing with adjacent wetlands, stormwater runoff, sediment recycling, and aquatic vegetation cycling
- Orthophosphate is the most abundant form of phosphorus in spring discharge



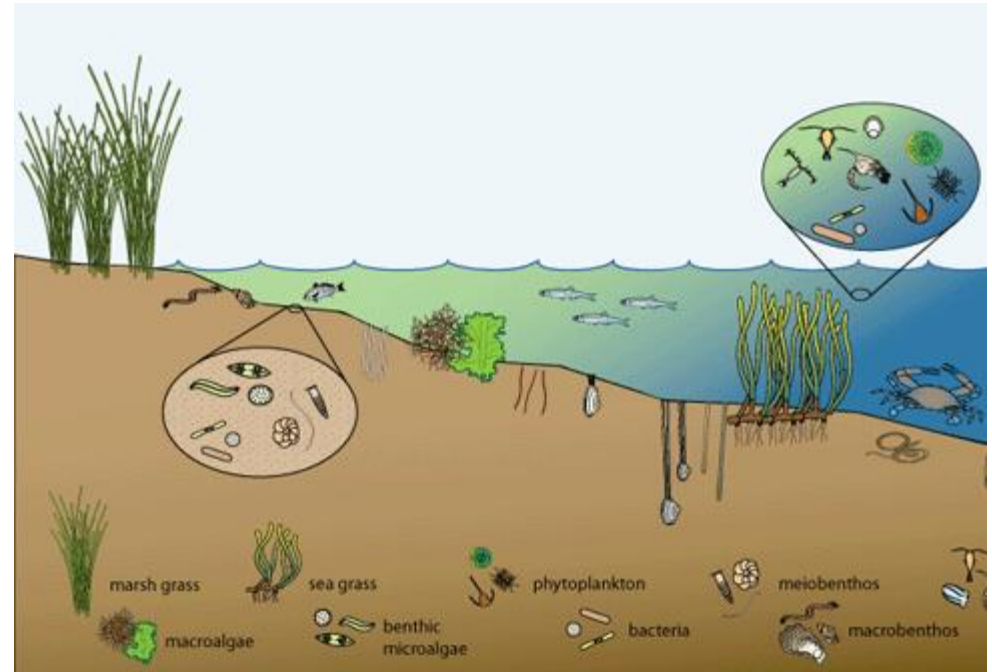
Presentation Outline

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2. Verified List of Impaired Waters
- 3. Unique Nature of Kings Bay & Spatial Trends**
4. Water Quality Targets
5. TMDL Allocation

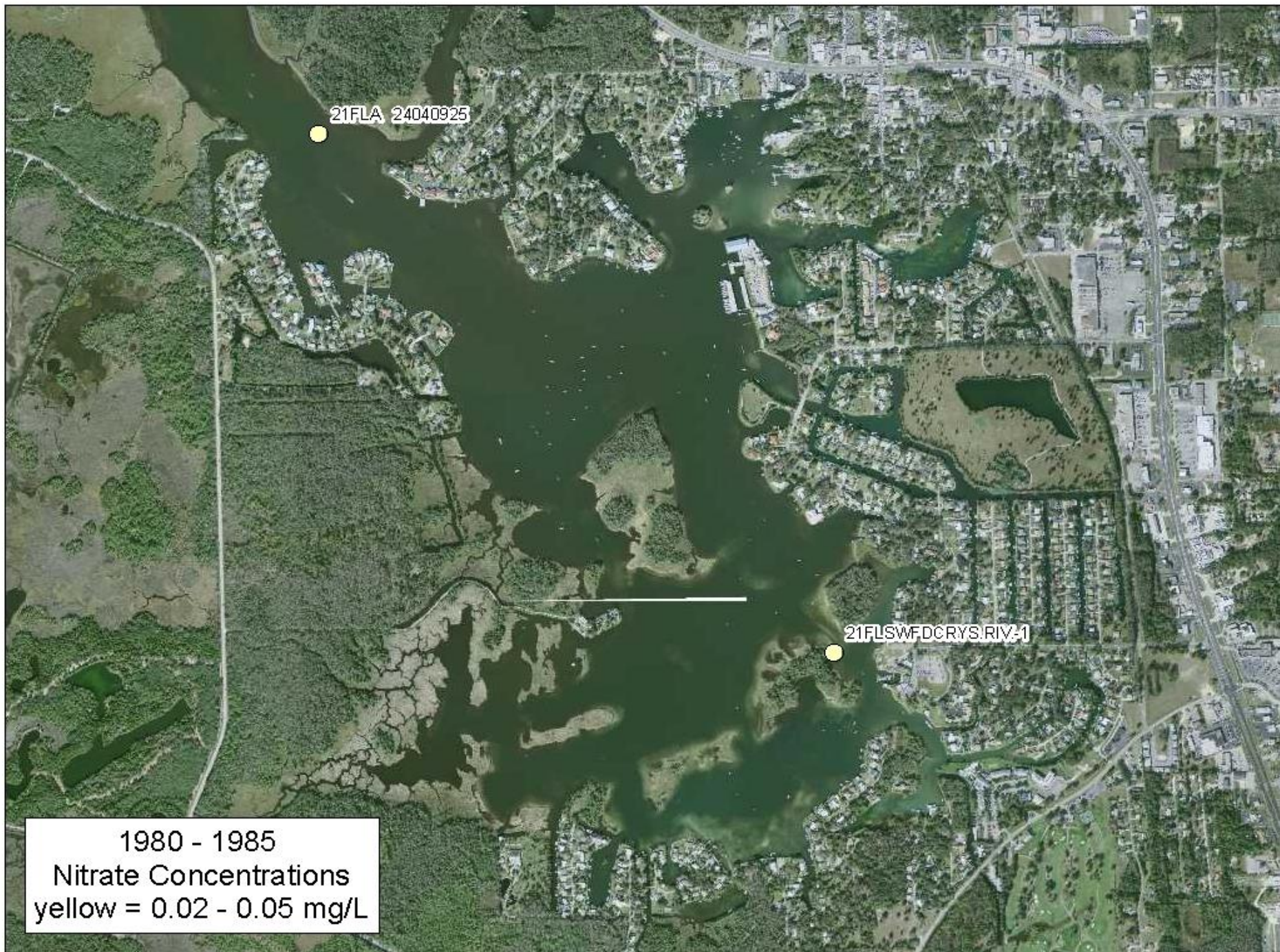


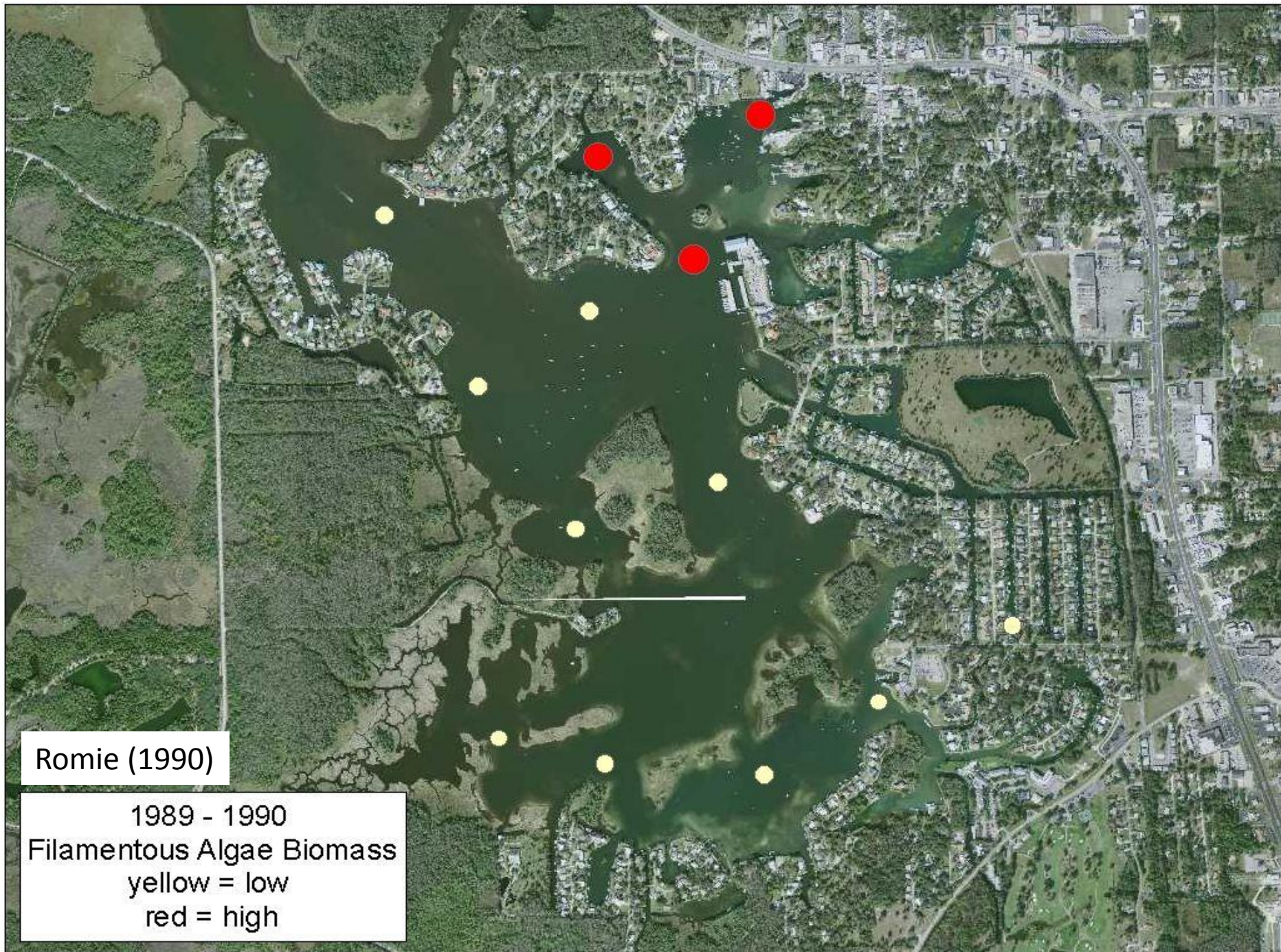
Unique Nature of Kings Bay

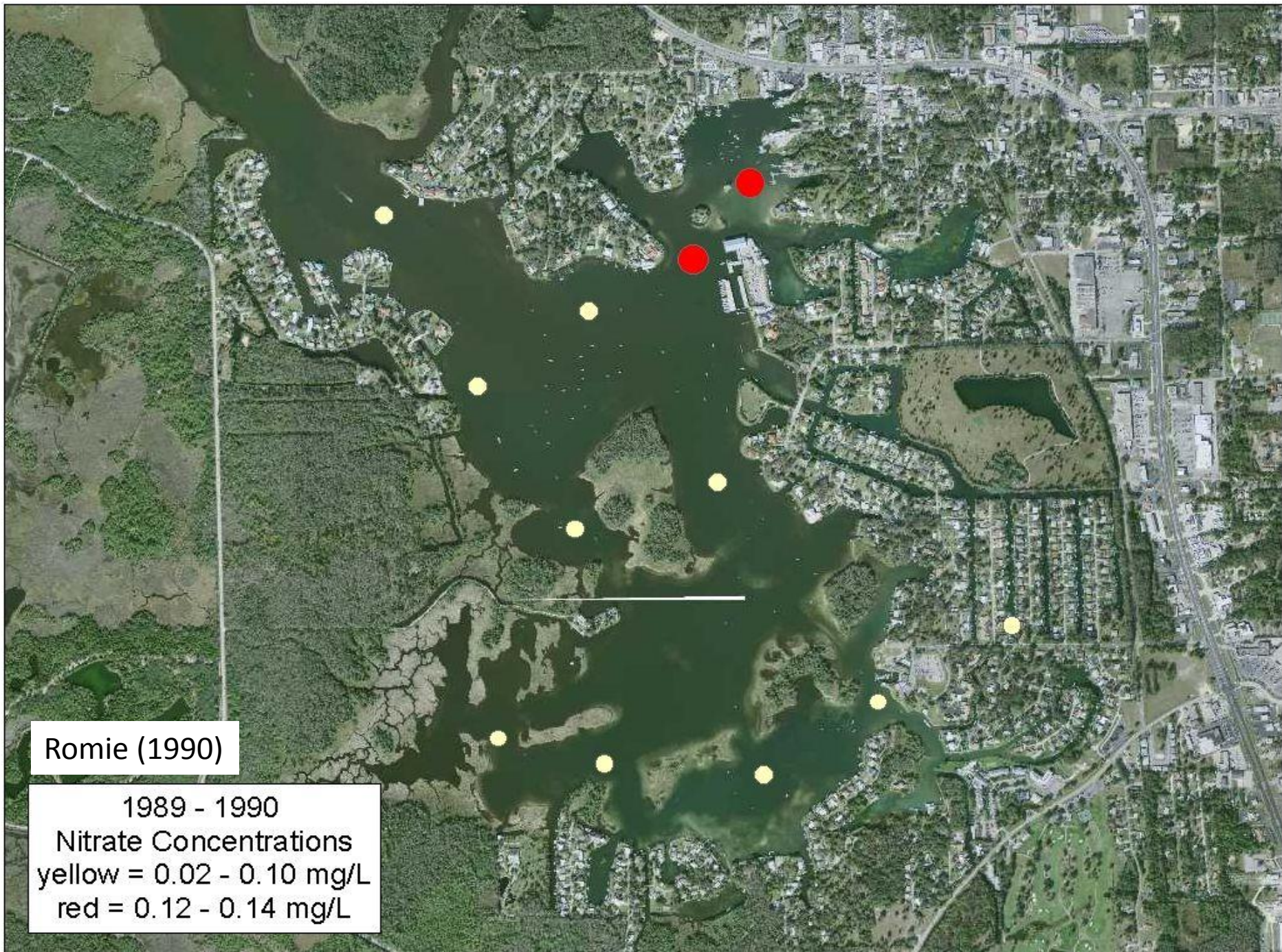
- Tidally Influenced
- 600 Acre Coastal Embayment
- Shallow Bay 3 – 10 feet
- Long Residence Time 6.25 days (X. Chen, SWFWMD)
- Warm Temperatures
- Increased Photozone Results in Accelerated Plant Growth
- Spring Discharge Source Upper Floridan, which is Very Vulnerable to Pollutants

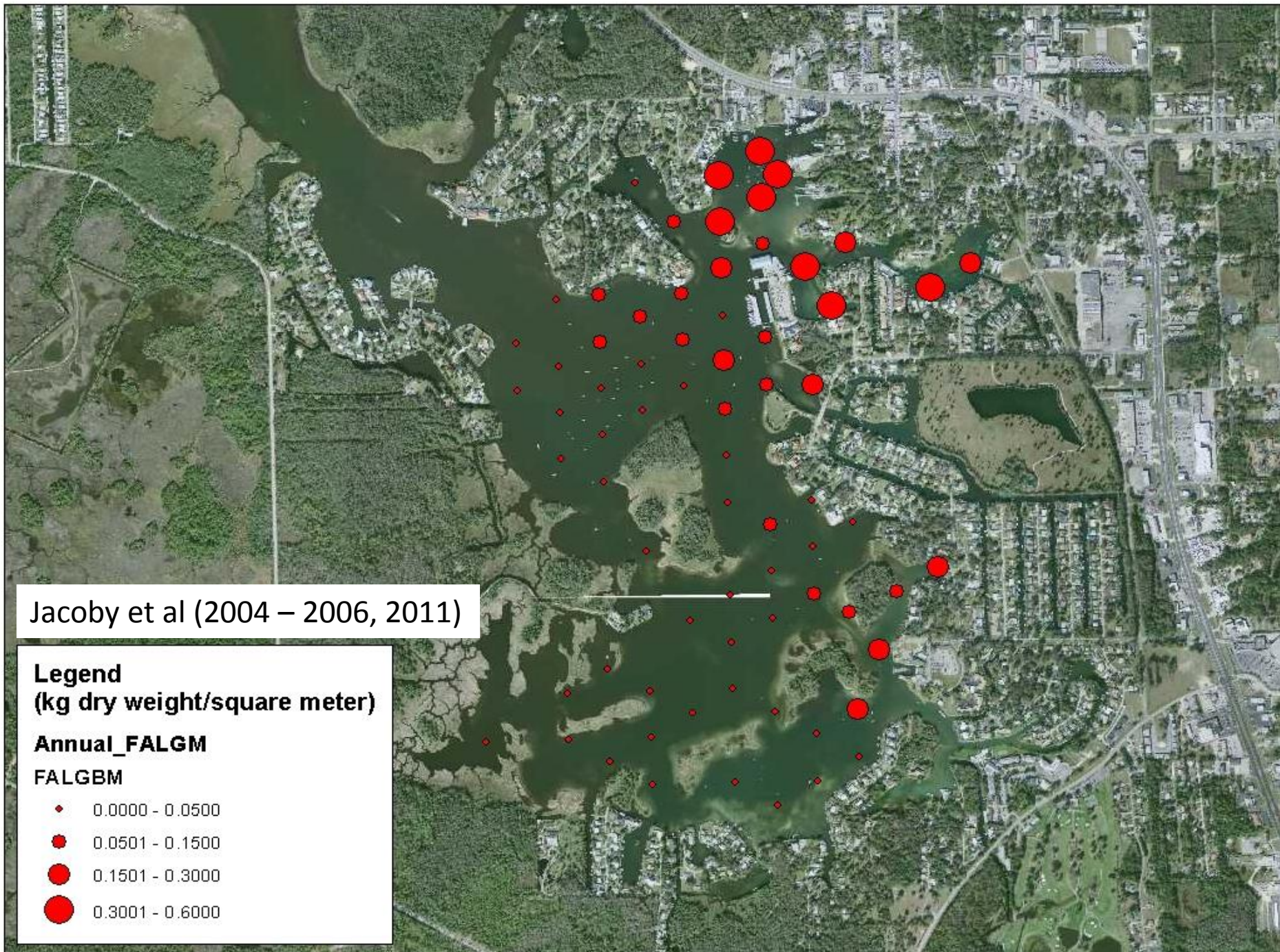


Created by Linda C. Schnaffer













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Nitrogen WQ Targets

Waterbody Name (WBID)	Waterbody	Parameter	Nitrogen Target (mg/L)*	Existing Condition Highest Annual Average (mg/L)	Year
Kings Bay (WBID 1341)	Ambient bay	TN	0.28	0.36	2008
Hunter Spring (WBID 1341C)	Spring vent	Nitrate	0.23	0.64	2012
House Spring (WBID 1341D)	Spring vent	Nitrate	0.23	0.49	2012
Idiot's Delight Spring (WBID 1341F)	Spring vent	Nitrate	0.23	0.31	2004
Tarpon Spring (WBID 1341G)	Spring vent	Nitrate	0.23	0.29	2012
Black Spring (WBID 1341H)	Spring vent	Nitrate	0.23	0.31	2010 2012

*Field Observations and Laboratory Experiments



Phosphorus WQ Targets

Waterbody Name (WBID)	Waterbody	Parameter	Phosphorus Target (mg/L)*	Existing Condition Highest Annual Average (mg/L)	Year
Kings Bay (WBID 1341)	Ambient Bay	TP	0.032	0.037	2012
Hunter Spring (WBID 1341C)	Spring Vent	Orthophosphate	0.028	0.027	2010
House Spring (WBID 1341D)	Spring Vent	Orthophosphate	0.028	0.025	2012
Idiot's Delight Spring (WBID 1341F)	Spring Vent	Orthophosphate	0.028	0.030	2004
Tarpon Spring (WBID 1341G)	Spring Vent	Orthophosphate	0.028	0.031	2005
Black Spring (WBID 1341H)	Spring Vent	Orthophosphate	0.028	0.026	2004

*Field Observations and Laboratory Experiments



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TMDL Allocation

$$\text{TMDL} \cong \sum \text{WLAs}_{\text{NPDES wastewater}} + \sum \text{WLAs}_{\text{NPDES Stormwater}} + \sum \text{LAs} + \text{MOS}$$

TMDL = “Point Sources” + “Nonpoint Sources” + Margin of Safety

- Σ = “sum of”
- WLA = “wasteload allocations”
- LA = “load allocations”
- MOS = “margin of safety”

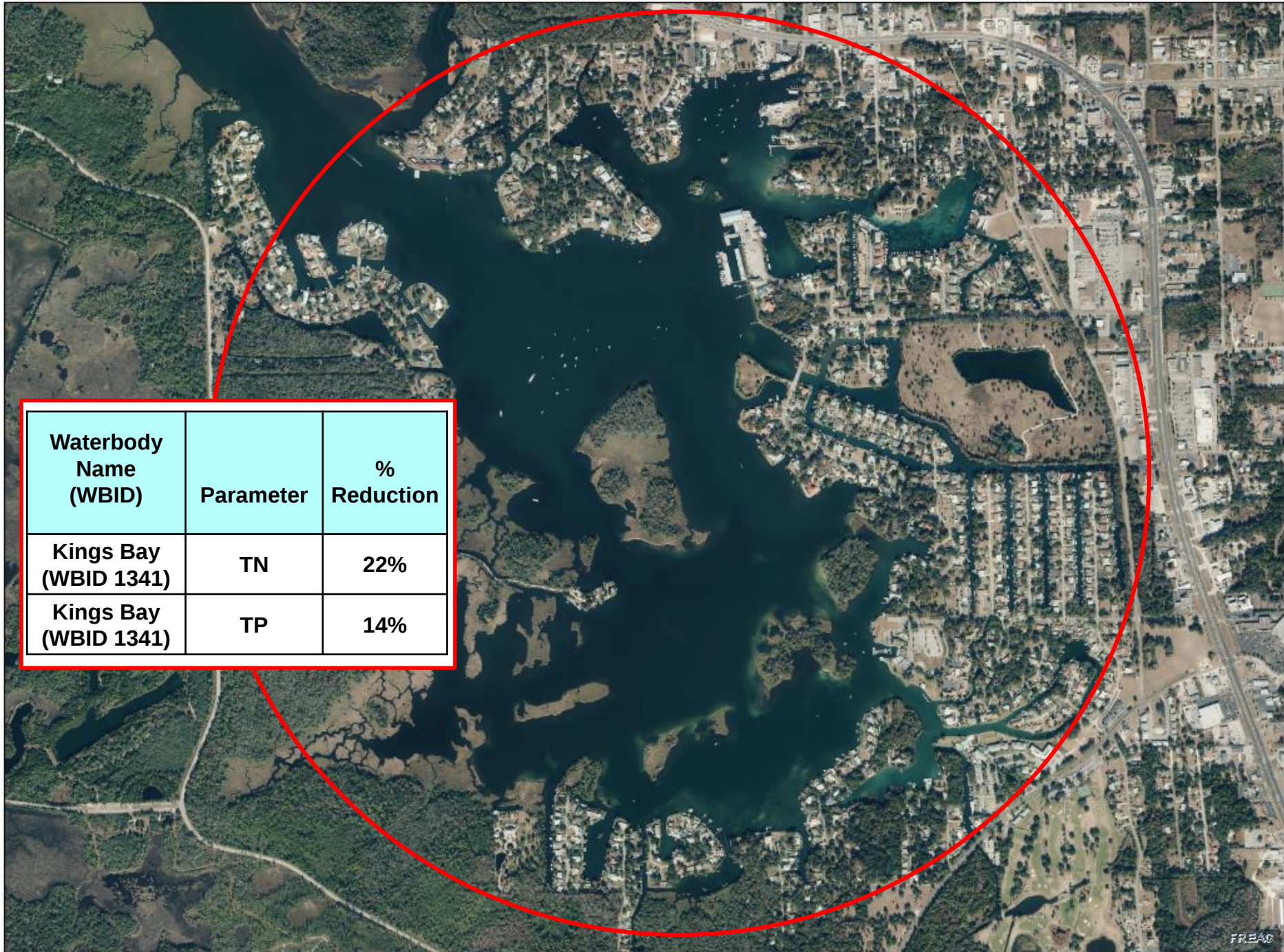


Representation of TMDL Allocations

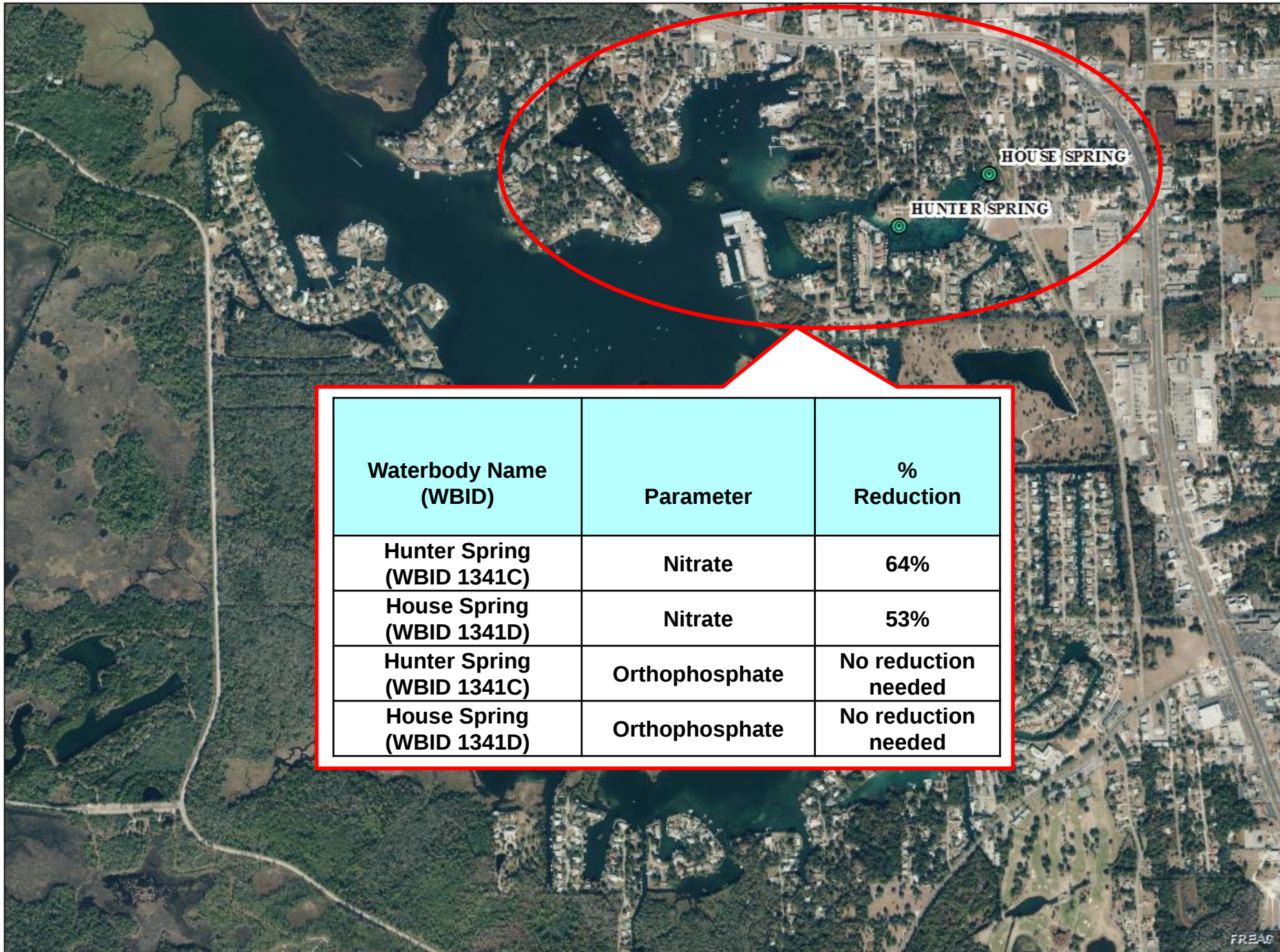
General Categories

- Wasteload Allocations (WLA) = Point Sources
 - NPDES Wastewater & Industrial Facilities
 - NPDES Stormwater Discharges - MS4 permits
 - Represented as a percent reduction
- Load Allocations (LA) = Nonpoint Sources
 - Nonpoint source contributions from Urbanized and Agricultural areas and/or activities not included in MS4s
 - Wastewater Application Sites
 - Septic Tanks (OSTDs)
 - Represented as a percent reduction
- Margin of Safety (MOS)
 - Implicit MOS

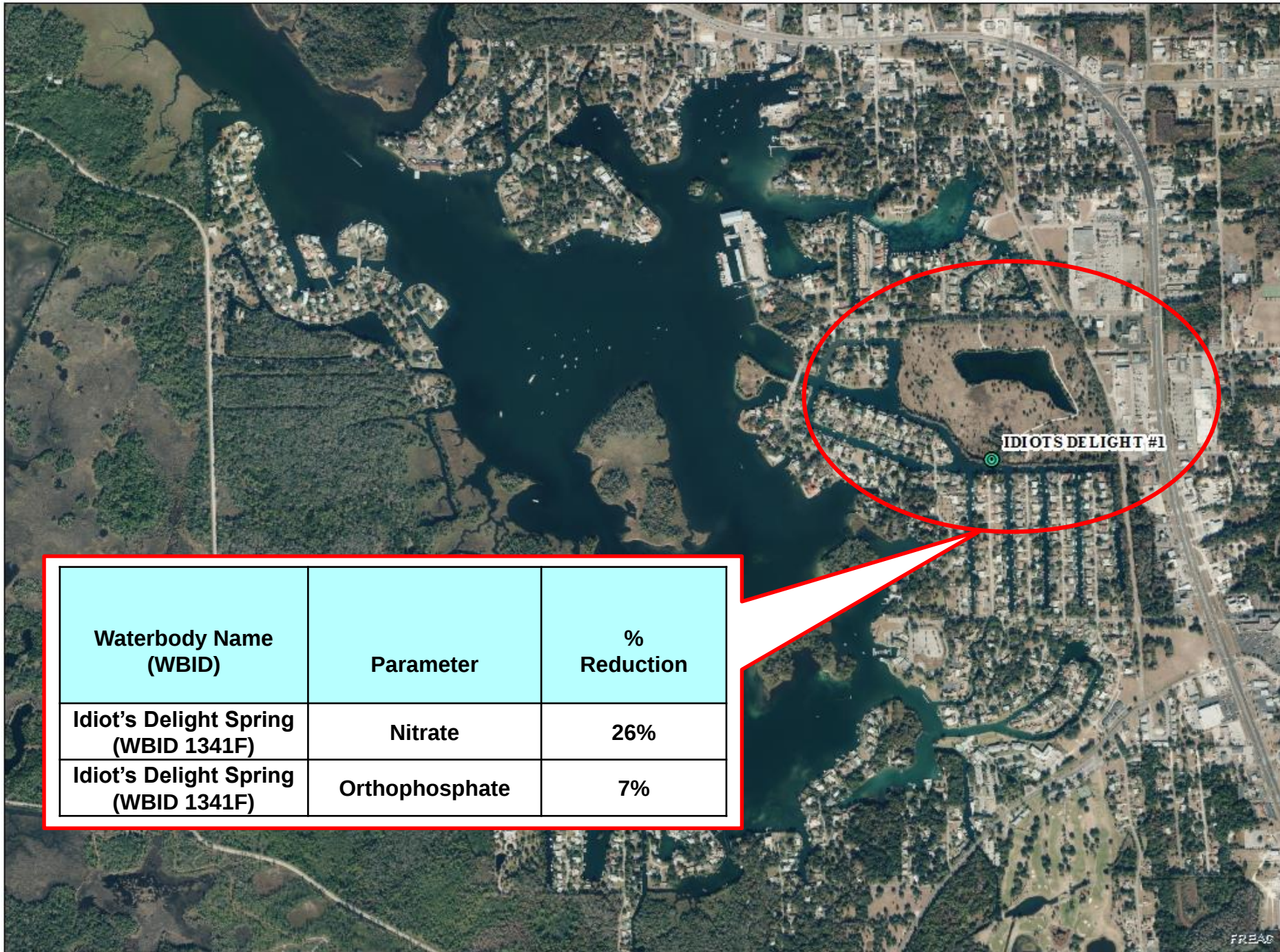
Waterbody Name (WBID)	Parameter	TMDL (mg/L)	Wasteload Allocation for Wastewater	Wasteload Allocation for NPDES Stormwater % Reduction	LA % Reduction	MOS
Kings Bay (WBID 1341)	TN as annual average	0.28	N/A	N/A	22%	Implicit
Kings Bay (WBID 1341)	TP as annual average	0.032	N/A	N/A	14%	Implicit
Hunter Spring (WBID 1341C)	Nitrate as annual average	0.23	N/A	N/A	64%	Implicit
Hunter Spring (WBID 1341C)	Orthophosphate as annual average	0.028	N/A	N/A	No reduction needed	Implicit
House Spring (WBID 1341D)	Nitrate as annual average	0.23	N/A	N/A	53%	Implicit
House Spring (WBID 1341D)	Orthophosphate as annual average	0.028	N/A	N/A	No reduction needed	Implicit
Idiot's Delight Spring (WBID 1341F)	Nitrate as annual average	0.23	N/A	N/A	26%	Implicit
Idiot's Delight Spring (WBID 1341F)	Orthophosphate as annual average	0.028	N/A	N/A	7%	Implicit
Tarpon Spring (WBID 1341G)	Nitrate as annual average	0.23	N/A	N/A	21%	Implicit
Tarpon Spring (WBID 1341G)	Orthophosphate as annual average	0.028	N/A	N/A	10%	Implicit
Black Spring (WBID 1341H)	Nitrate as annual average	0.23	N/A	N/A	26%	Implicit
Black Spring (WBID 1341H)	Orthophosphate as annual average	0.028	N/A	N/A	No reduction needed	Implicit



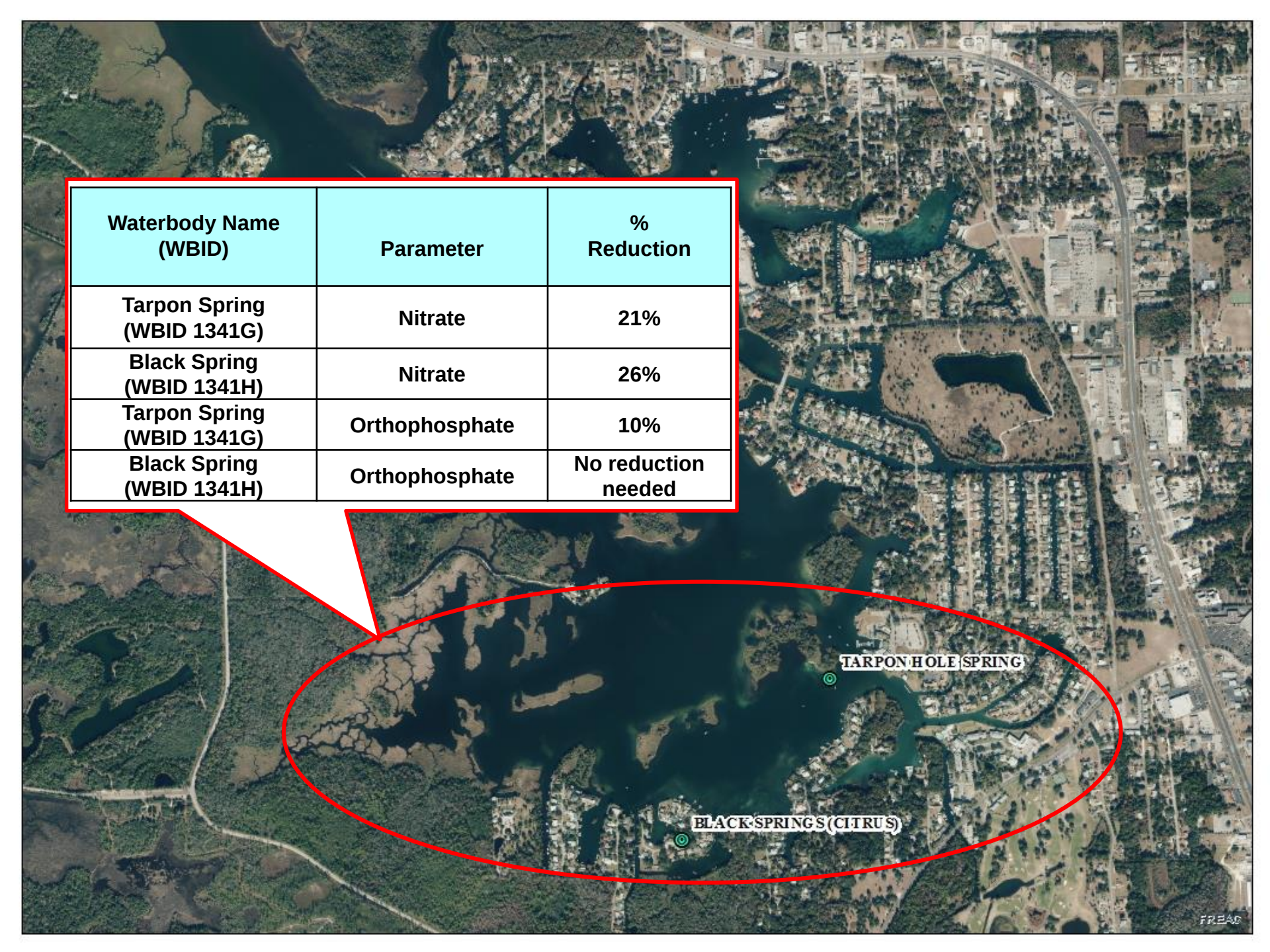
Waterbody Name (WBID)	Parameter	% Reduction
Kings Bay (WBID 1341)	TN	22%
Kings Bay (WBID 1341)	TP	14%



Waterbody Name (WBID)	Parameter	% Reduction
Hunter Spring (WBID 1341C)	Nitrate	64%
House Spring (WBID 1341D)	Nitrate	53%
Hunter Spring (WBID 1341C)	Orthophosphate	No reduction needed
House Spring (WBID 1341D)	Orthophosphate	No reduction needed



Waterbody Name (WBID)	Parameter	% Reduction
Idiot's Delight Spring (WBID 1341F)	Nitrate	26%
Idiot's Delight Spring (WBID 1341F)	Orthophosphate	7%



Waterbody Name (WBID)	Parameter	% Reduction
Tarpon Spring (WBID 1341G)	Nitrate	21%
Black Spring (WBID 1341H)	Nitrate	26%
Tarpon Spring (WBID 1341G)	Orthophosphate	10%
Black Spring (WBID 1341H)	Orthophosphate	No reduction needed

TARPON HOLE SPRING

BLACK SPRINGS (CITRUS)



Reassessment of the TMDL

“Once the target concentration is consistently achieved, the WBID will be re-evaluated to determine if an imbalance of flora and fauna still exists as a result of algal smothering. If such a condition still exists, the TMDL will be reassessed as part of the Department’s watershed assessment cycle. The target concentration may be changed if the Department determines that further reductions are needed to address the imbalance. The purpose of a TMDL is to set a pollutant reduction goal that, if achieved, will result in attainment of the designated uses for that waterbody.”



For More Information on the TMDL

TMDL website:

<http://www.dep.state.fl.us/water/tmdl/index.htm>

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Questions?