

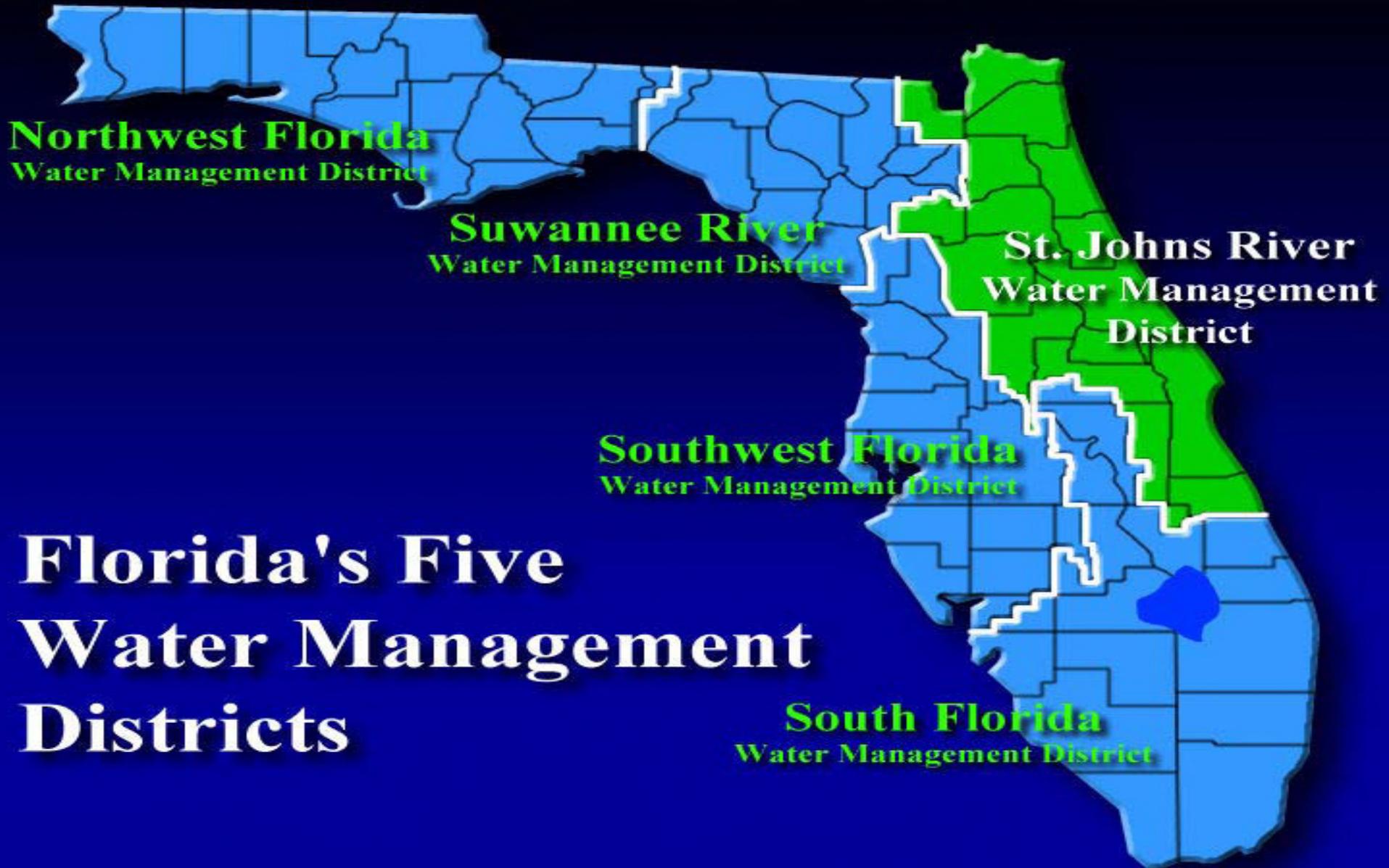
# **Water Quality Monitoring to Assess a Regional Approach to Treat Agricultural Runoff**

**National Monitoring Conference 2016**

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**Northwest Florida**  
Water Management District

**Suwannee River**  
Water Management District

**St. Johns River**  
Water Management  
District

**Southwest Florida**  
Water Management District

# Florida's Five Water Management Districts

**South Florida**  
Water Management District



**St. Johns River**  
Water Management District

# Mission of the District

Manage water resources to ensure their continued availability while maximizing both environmental and economic benefits.

## Responsibilities

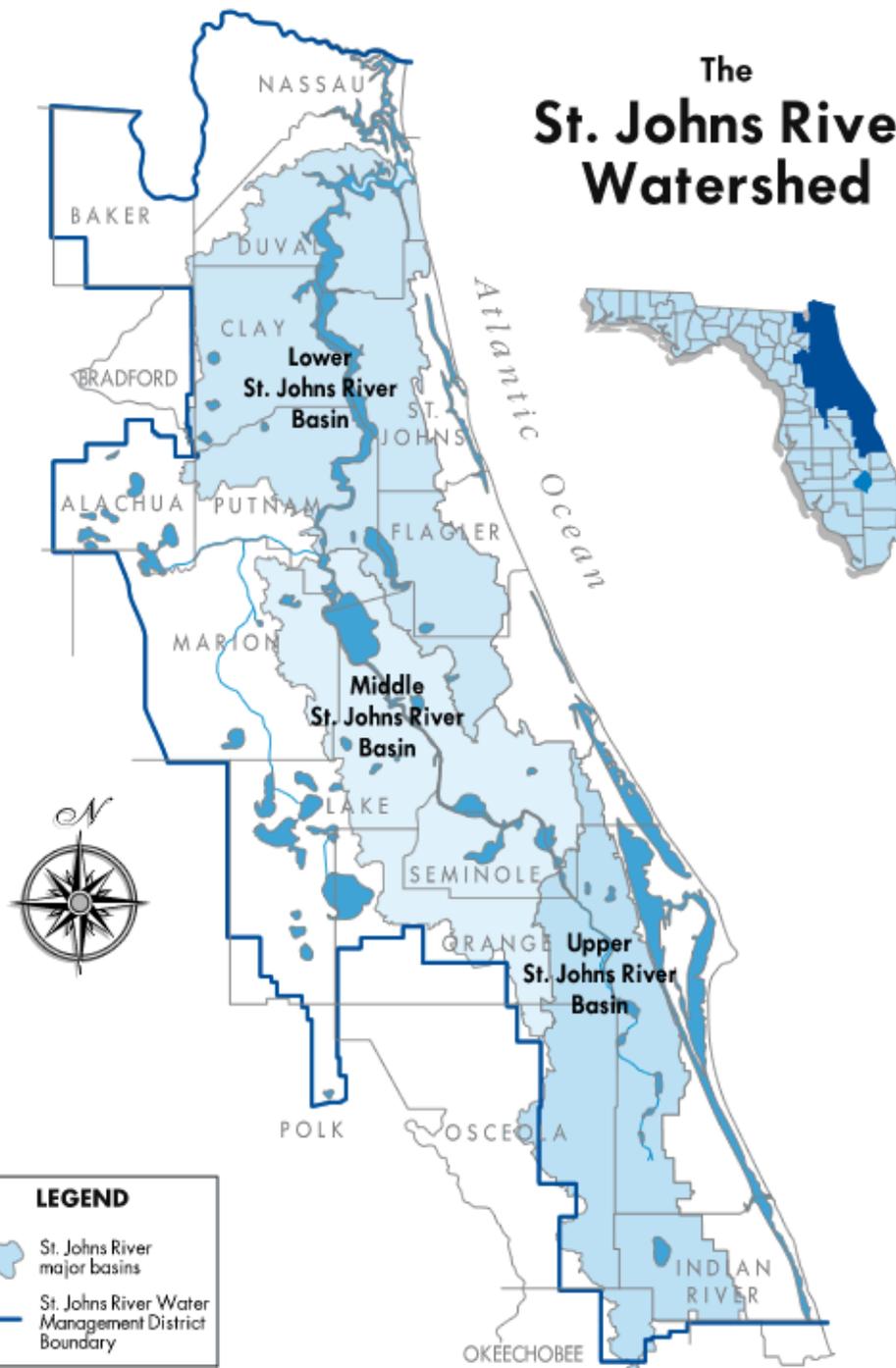
- Water supply
- Flood protection and floodplain management
- Water quality
- Natural systems



## The St. Johns River Watershed

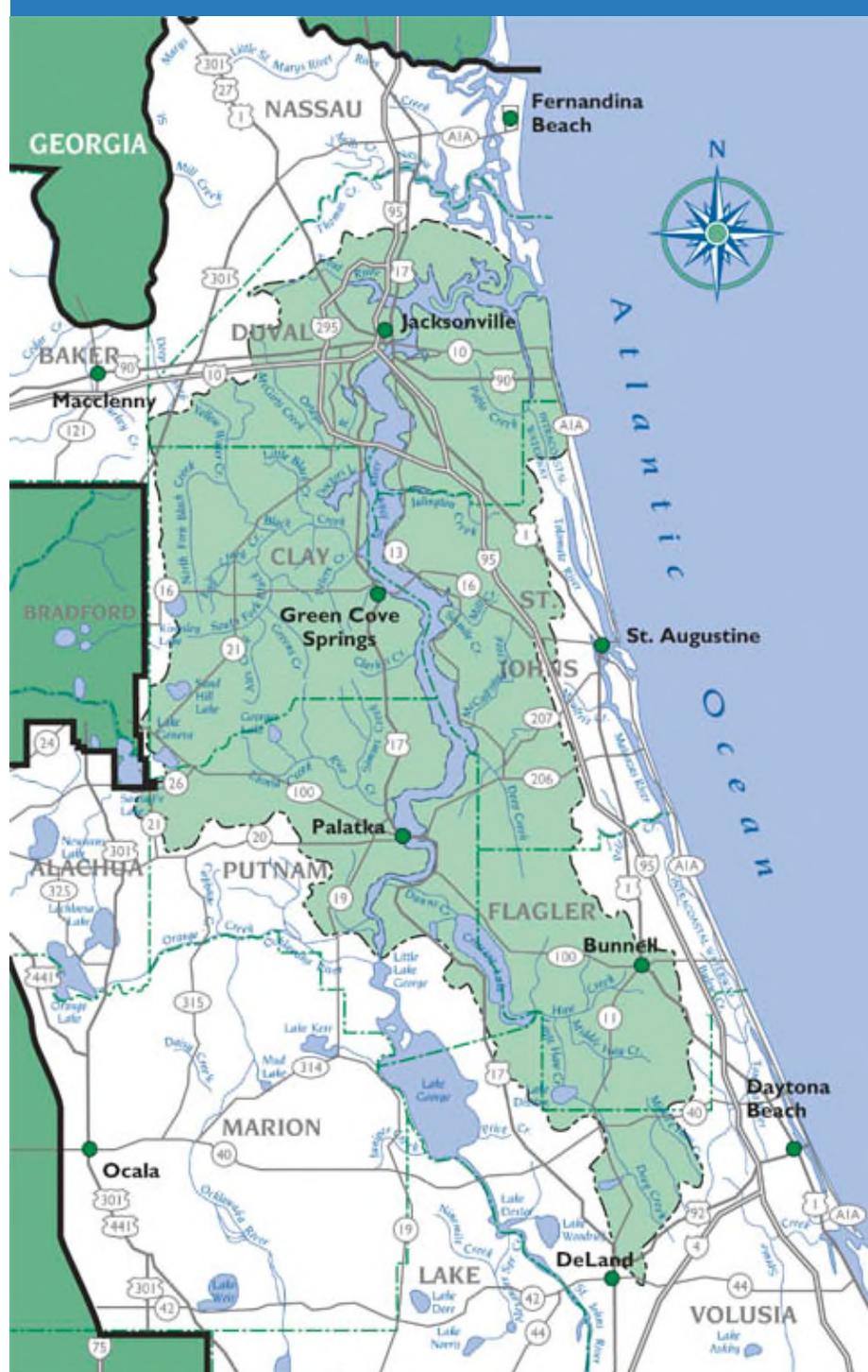
# The St. Johns River

- St. Johns River is the longest river in Florida stretching 310 miles in length
- St. Johns River is one of few rivers in the United States that flows north
- St. Johns River elevation change is less than 30 feet from headwaters to the inlet, or one inch per mile

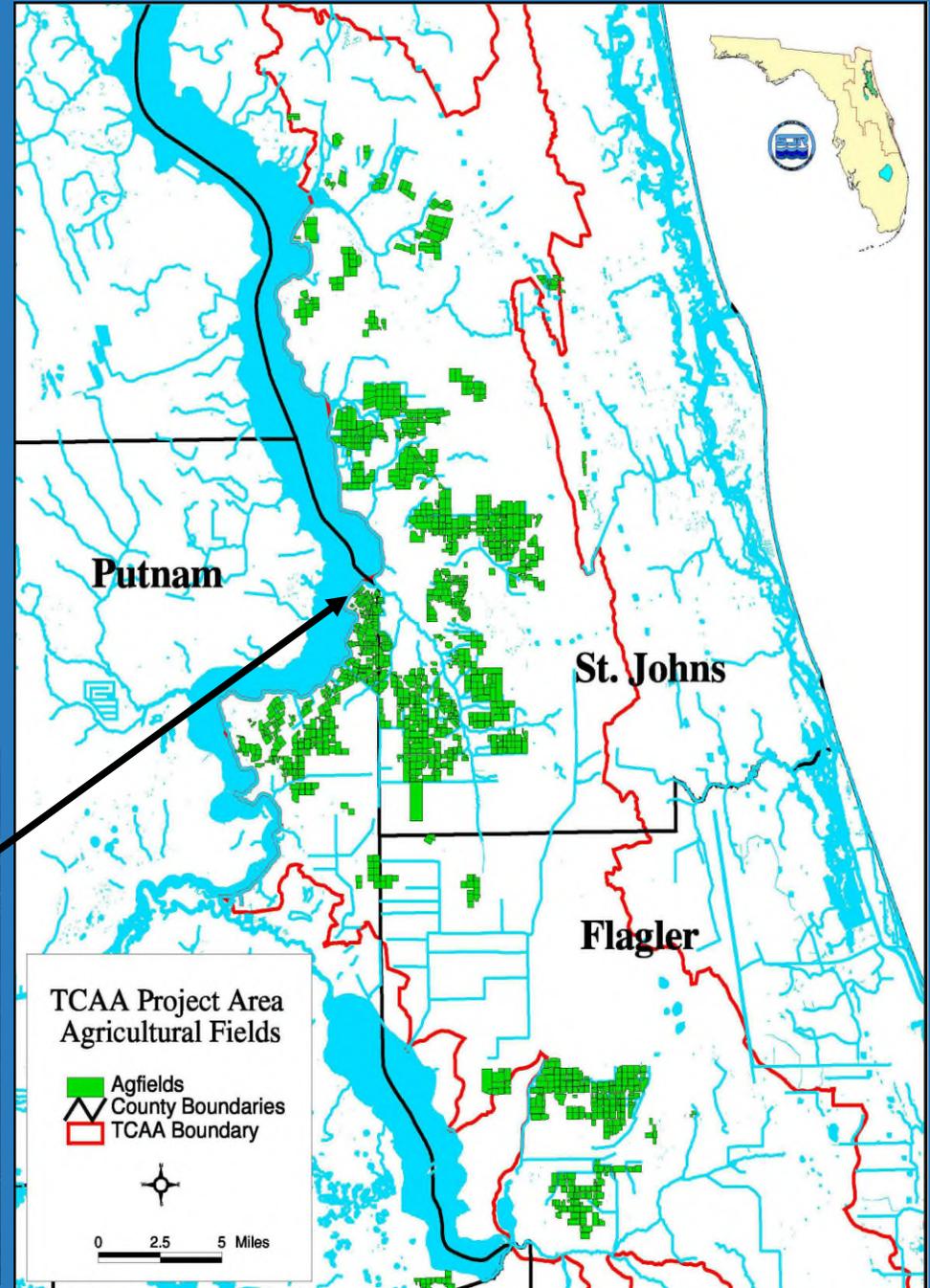


# Lower St. Johns River

- Receives drainage from 12 major tributary watersheds
- Land use is primarily rural, agricultural, and undeveloped lands to the south; urbanized lands to the north near Jacksonville



- The Tri-County Agricultural Area is comprised of watersheds with a significant amount of agricultural land use, much of which is in close proximity to the St. Johns River.
- Approximately 31,000 acres is irrigated vegetable cropland; predominantly potato, cabbage and sod.



Hastings, Fl



Federal Point



A three year (1991-93) diagnostic project quantified and qualified nutrient loading from 10 representative area farms and results indicated

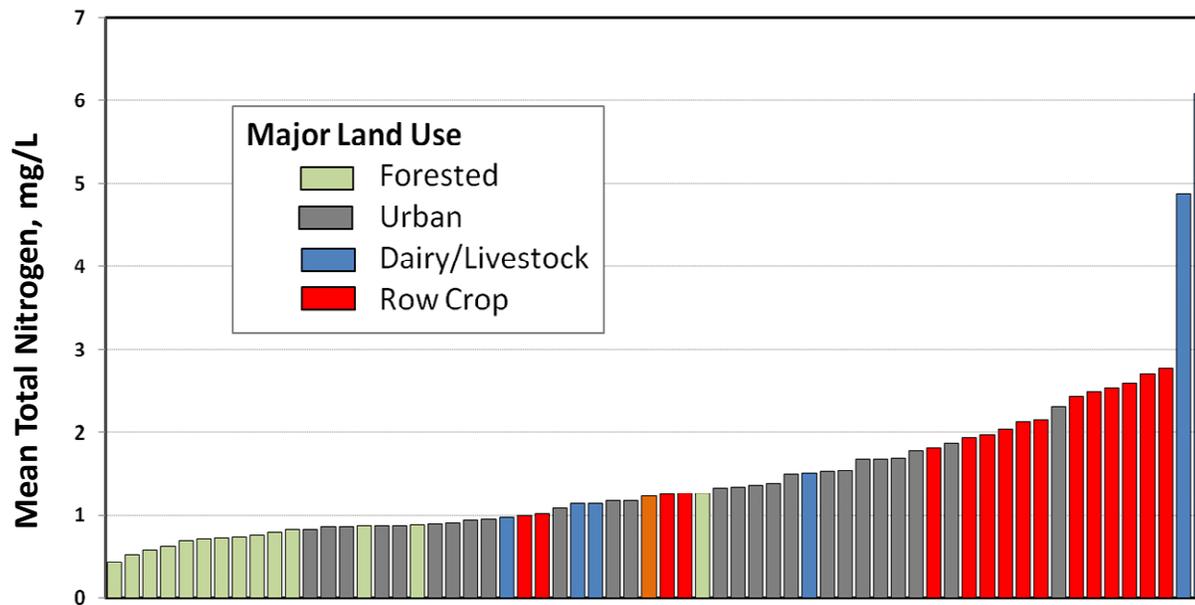


1) N and P loading is primarily associated with storm events.

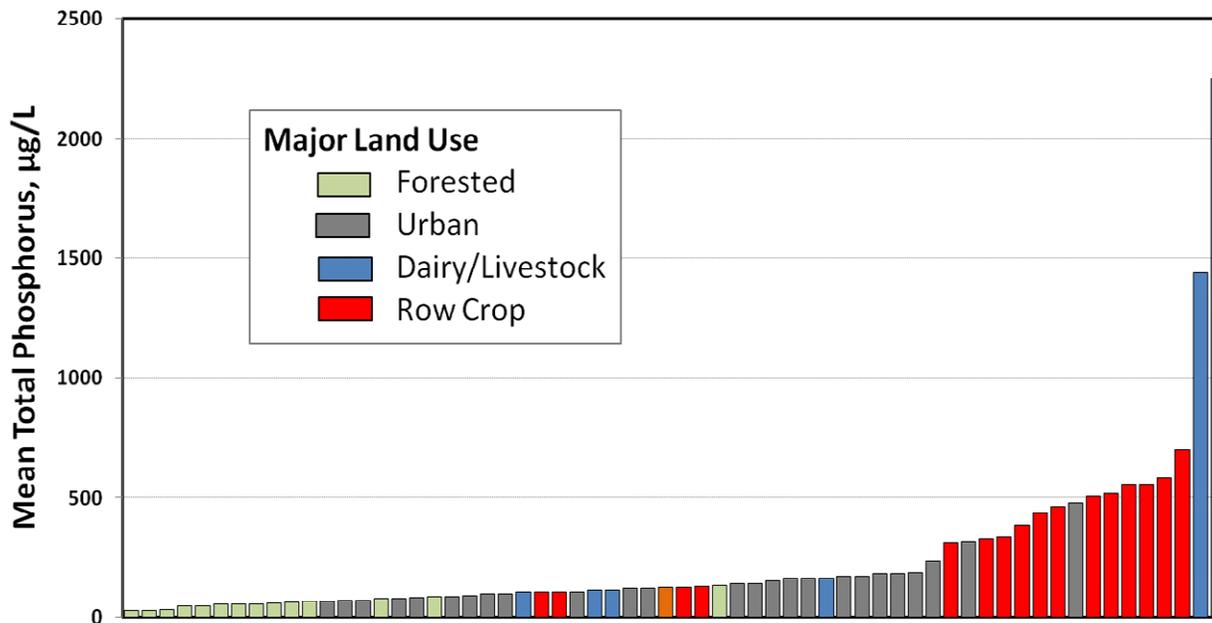
2) Nitrogen loading occurred mostly during the growing season, P loading had no seasonal trend.



**Total Nitrogen for 61 streams in the Lower St. Johns River Basin**



**Total Phosphorus for 61 Streams in the Lower St. Johns Basin**



# TMDL Reductions Required for the TCAA



- 37% Nitrogen Load Reduction
- 15% Phosphorus Load Reduction



# Agricultural Nonpoint Source Control Measures Strategy

- I. All agricultural commodities must implement in-field BMPs
- II. Construction of four Regional Stormwater Treatment (RST) Facilities to achieve the remaining agricultural reductions

**Expected RST TMDL Nutrient Reduction :**

**TN - 2,409 kg/yr**

**TP - 1,091 kg/yr**



# Dog Branch Regional Stormwater Treatment

- Regional stormwater treatment implemented as secondary treatment for Dog Branch Basin
- Watershed modeling identified Dog Branch watershed as priority basin
- Basin area – 2000 acres - 65% agricultural
- Former agronomic field

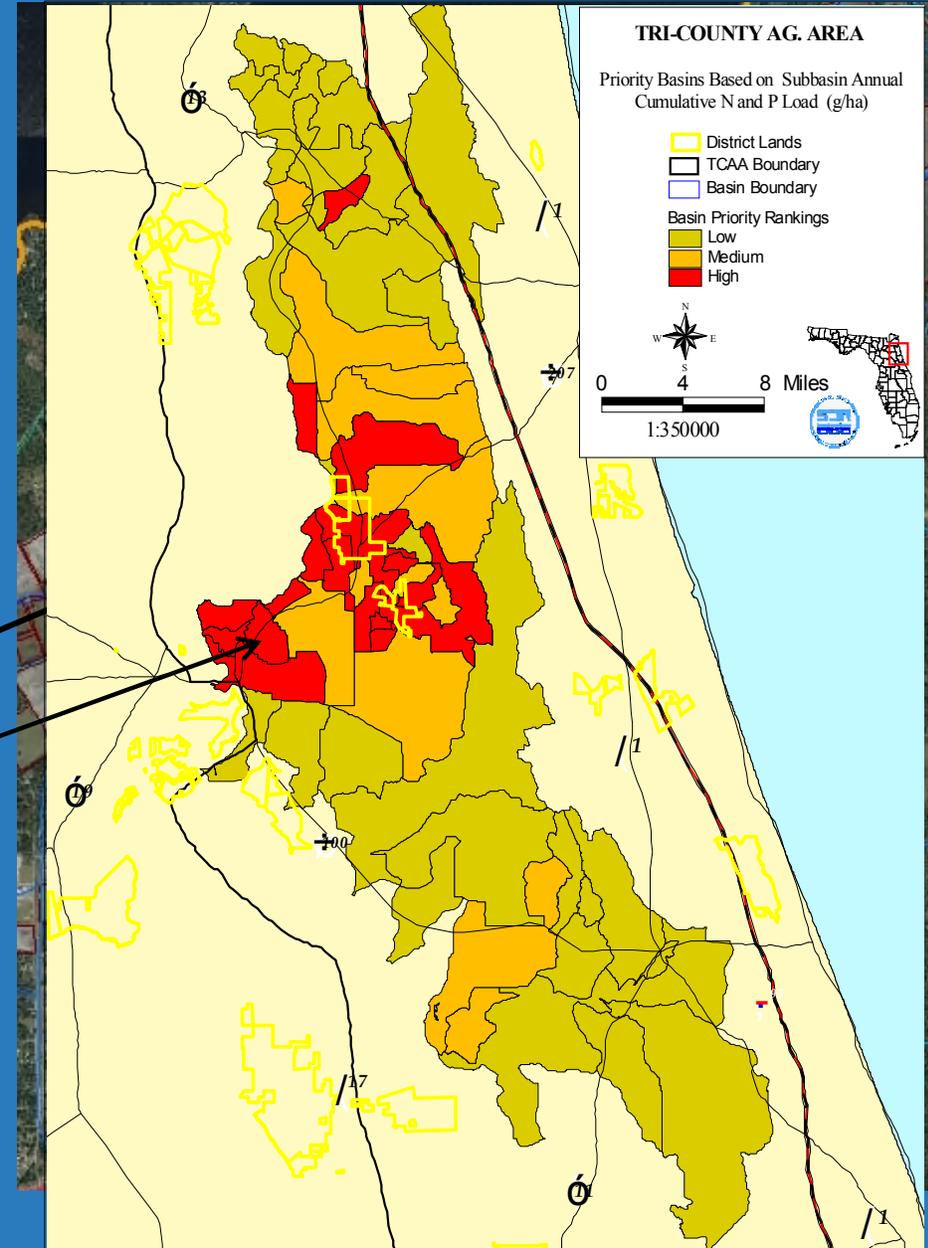
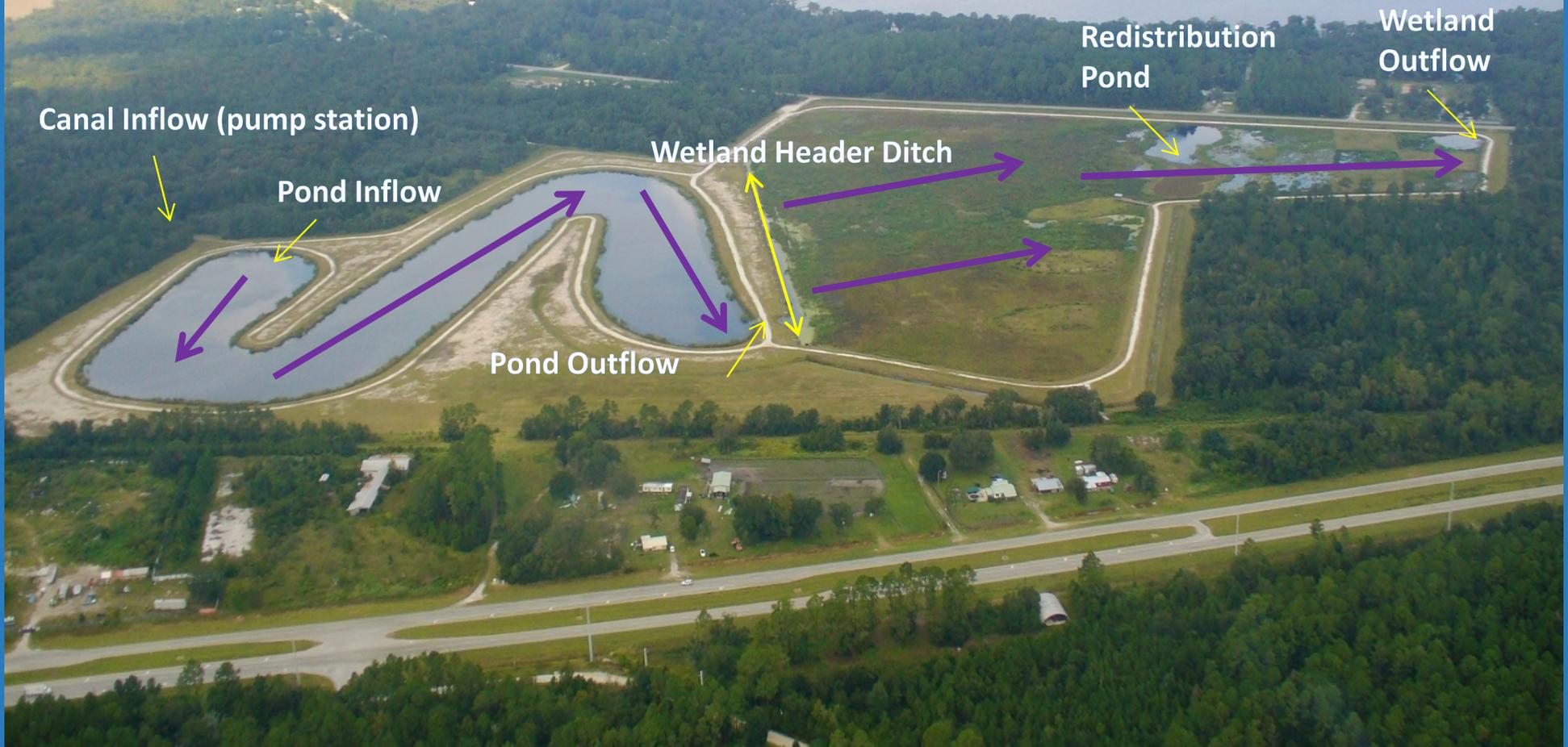


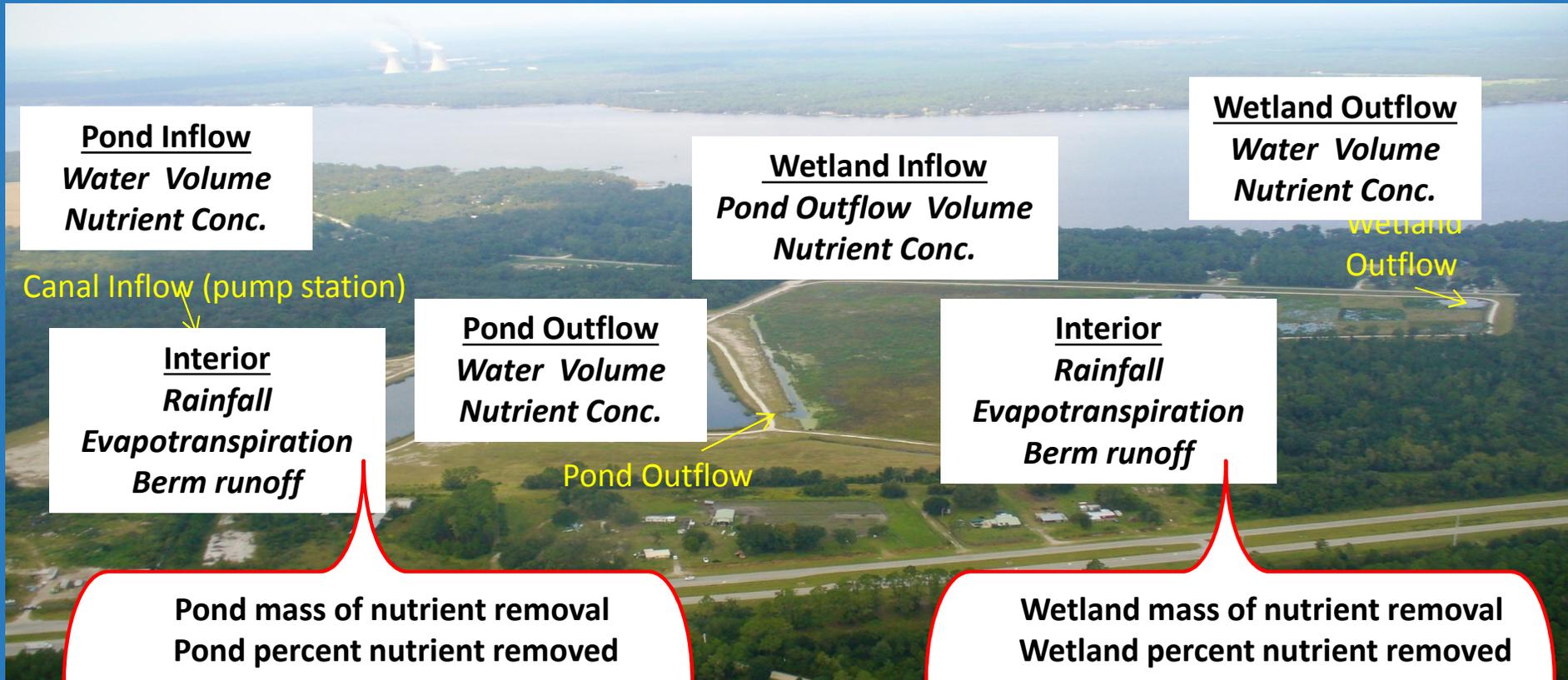
Figure 5. Priority Basins Based on Subbasin Annual Cumulative N & P Load (g/ha).

# Dog Branch RST – BMP Treatment Train

*11 hectare wet detention pond + 23 hectare constructed treatment wetland*



# System Performance Monitoring



- RST - Water Quality (base flow and storm water samples)
- RST - Water levels and pumped inflow (cfs) measured
- RST - Rainfall
- Analyze water samples for nitrate-nitrite, ammonium, total phosphorus, various

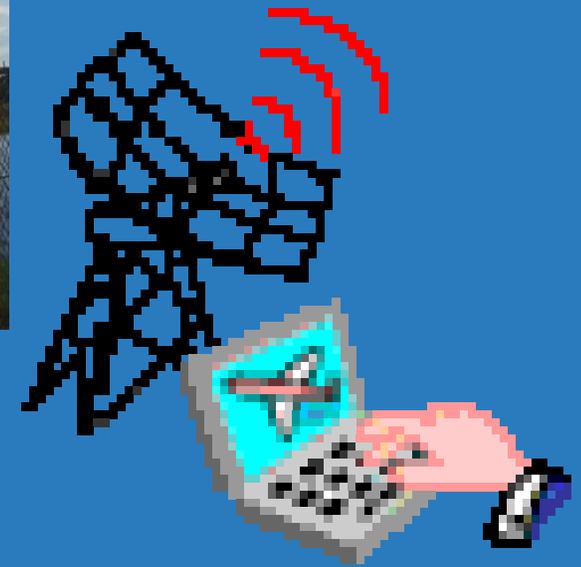
**RST System mass of nutrient removal**  
**RST System percent nutrient removed**



# System Performance Monitoring



Cellular modem  
Telemetry data  
transmission



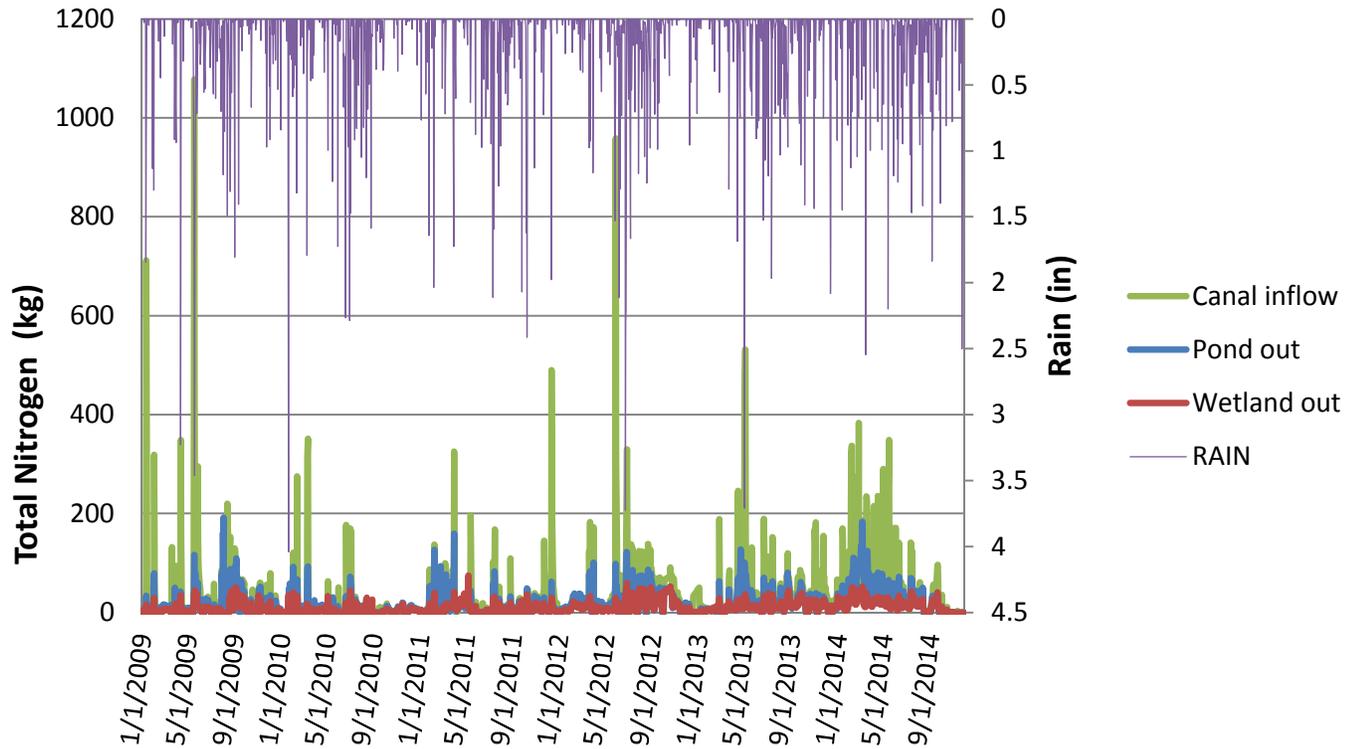
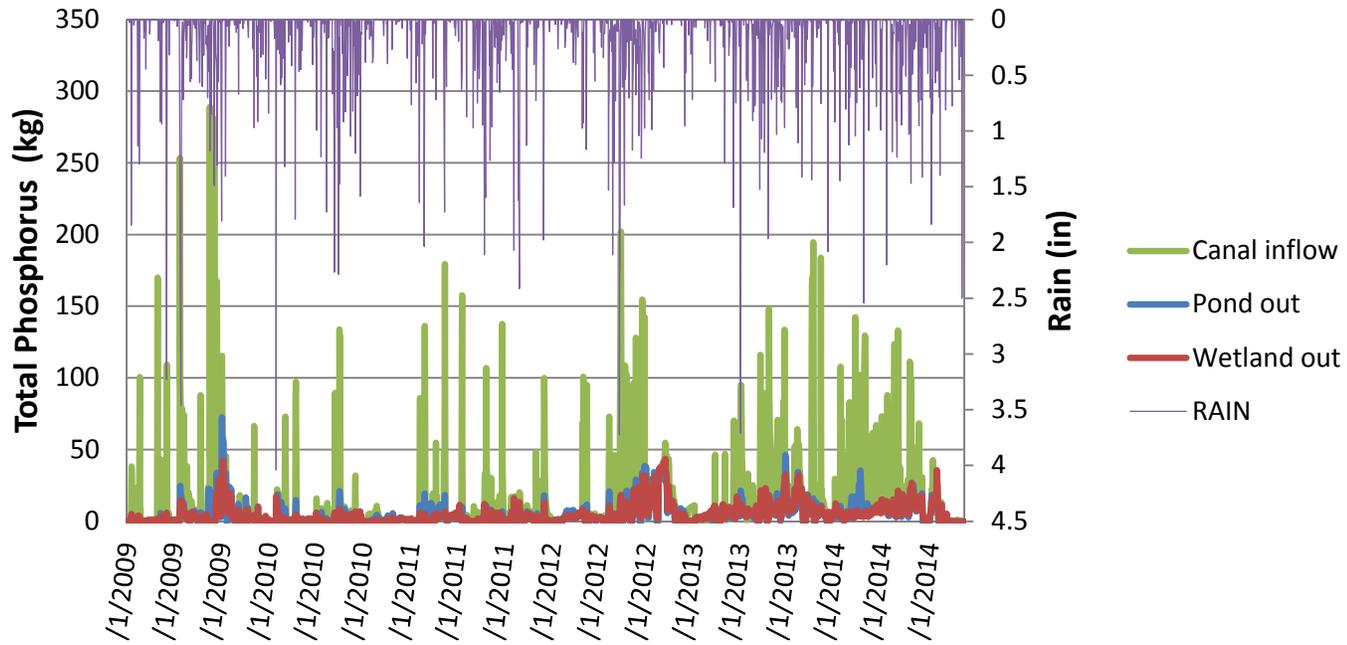
District Headquarters

Data logger wireless communication

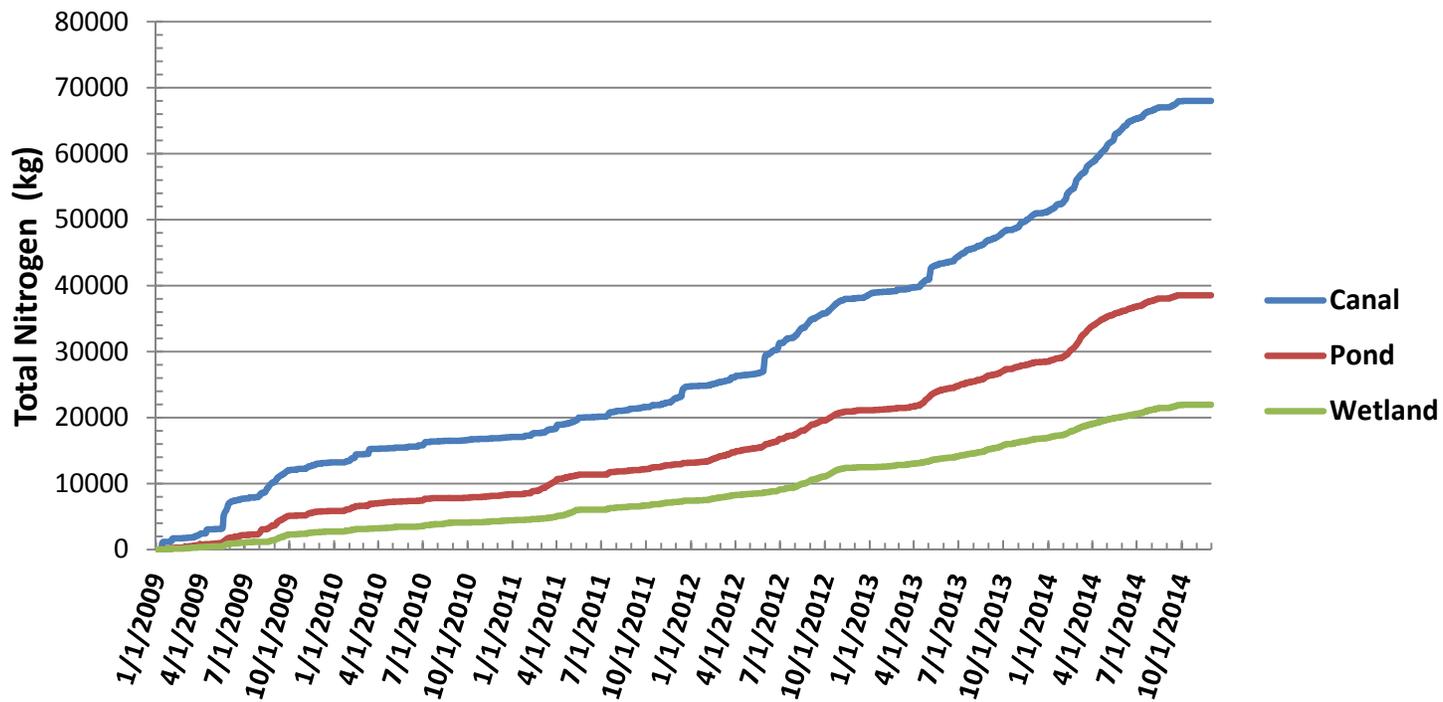
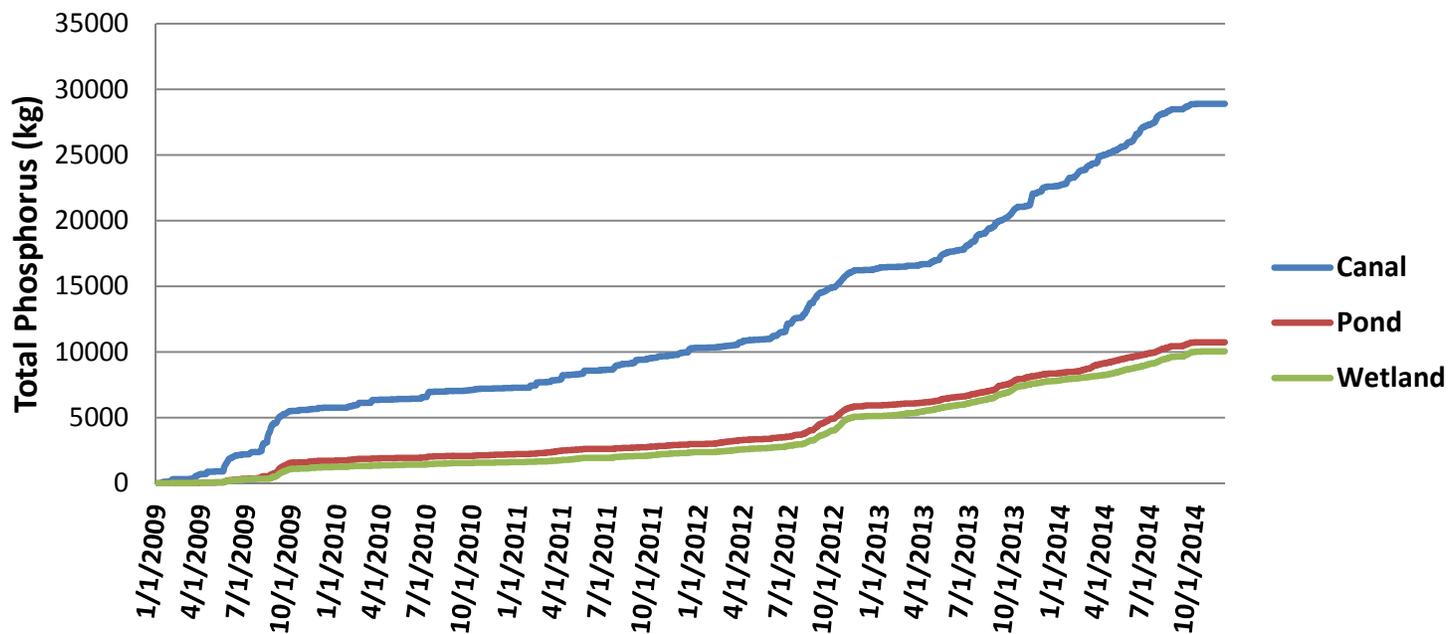
Perform long – term water quality analysis and hydrologic monitoring to assess performance of the treatment system.



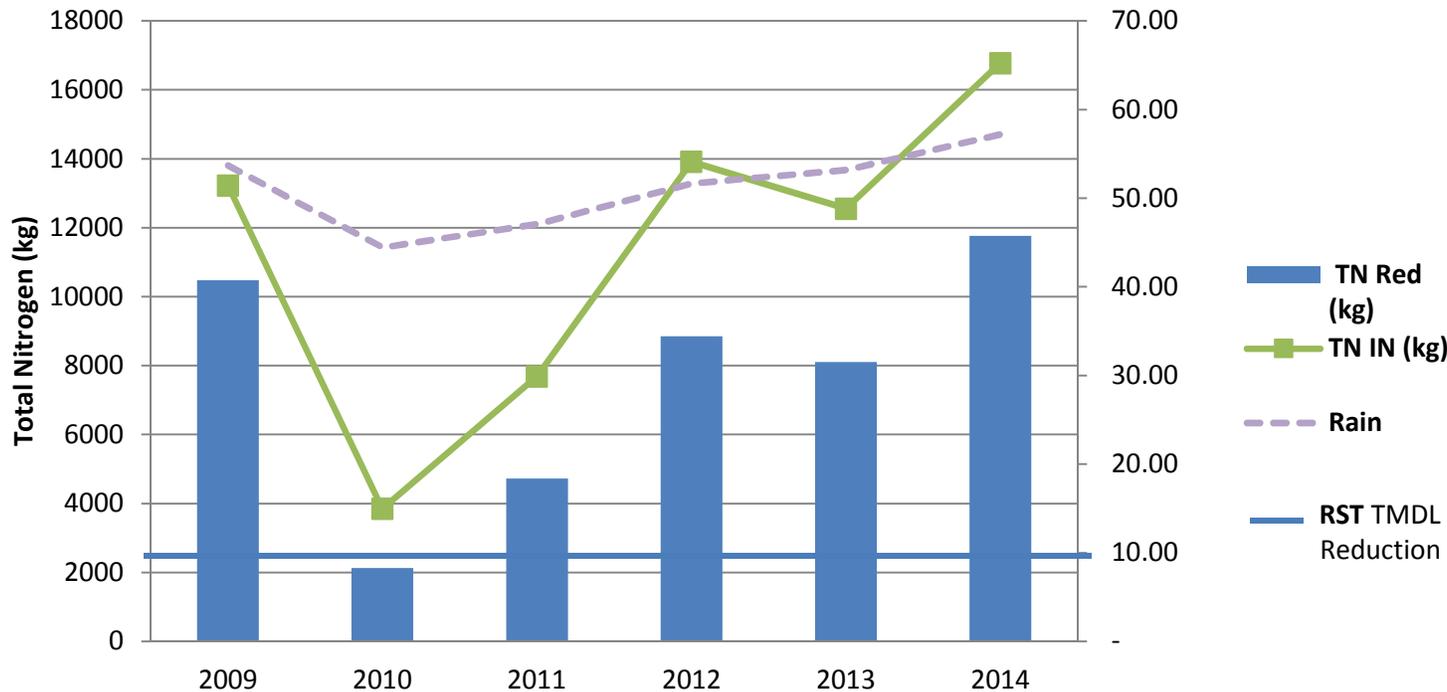
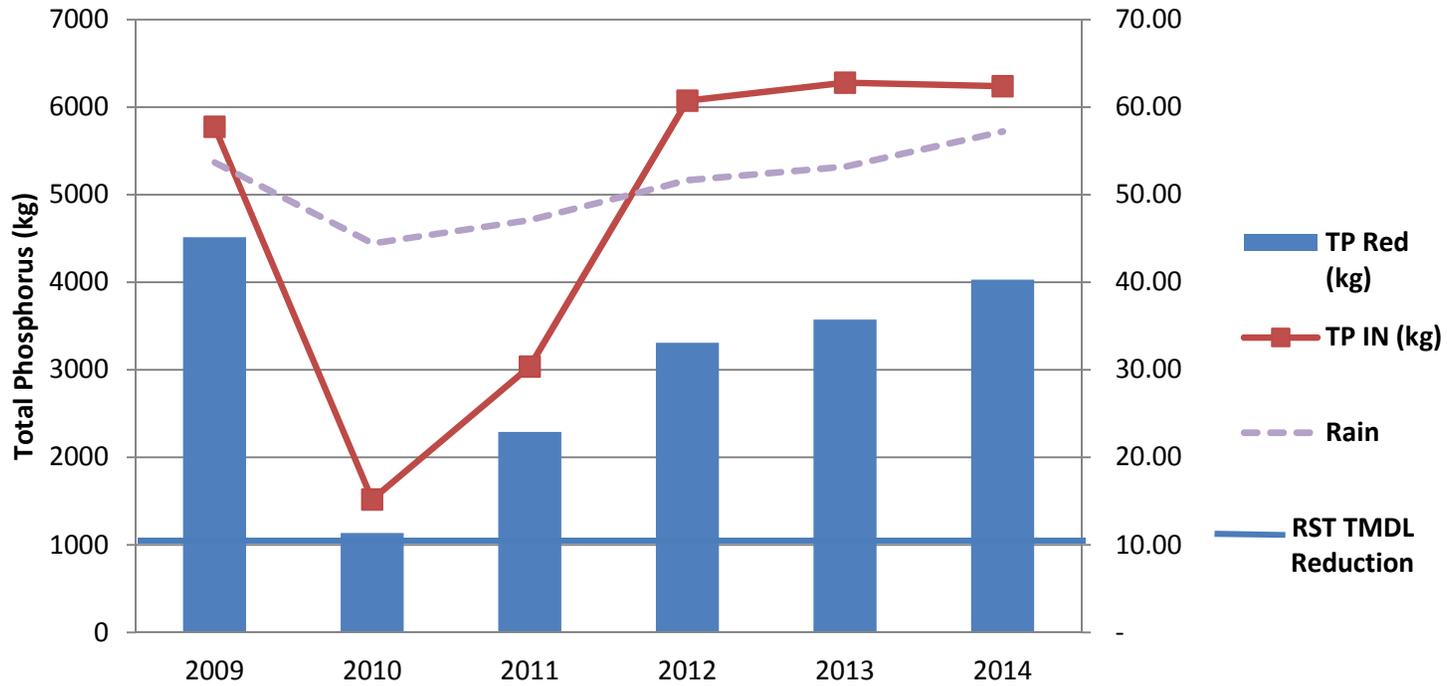
# Dog Branch System Performance



# DBR RST – Cumulative Load



## Dog Branch RST - Annual Reduction



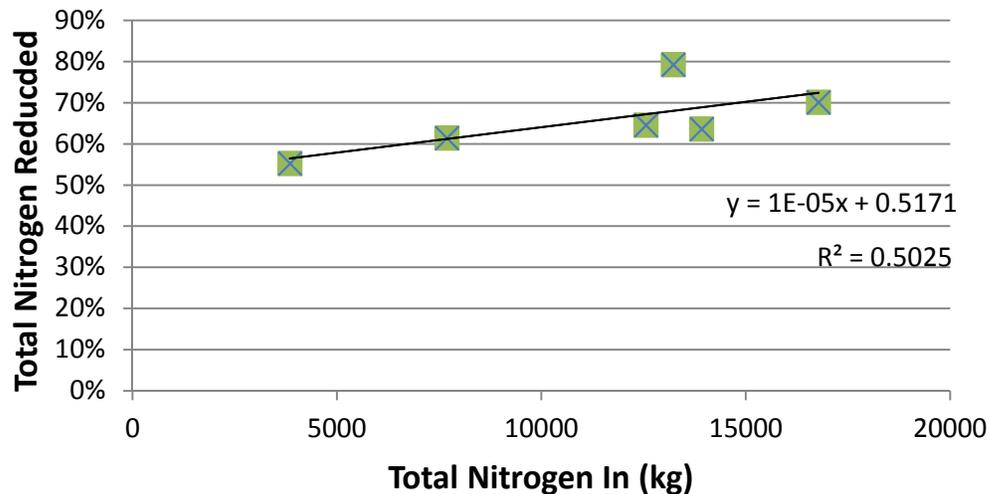
# Dog Branch System Performance

Year	TN IN (kg)	TN Out (kg)	TN Red (kg)	%Reduction TN	TP IN (kg)	TP Out (kg)	TP Red (kg)	%Reduction TP
2009	13227	2747	10479	79%	5771	1255	4515	78%
2010	3849	1722	2127	55%	1518	379	1138	75%
2011	7691	2966	4724	61%	3036	744	2291	75%
2012	13915	5063	8852	64%	6071	2760	3310	55%
2013	12555	4451	8103	65%	6278	2705	3572	57%
2014	16778	5012	11765	70%	6237	2206	4030	65%

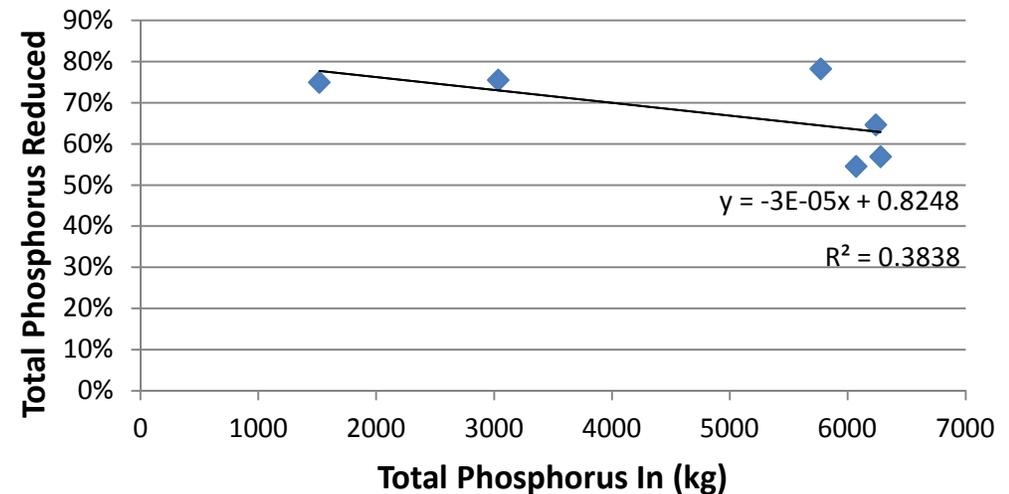
## Annual Average Reduction

TN	TP
66%	67%

### Total Nitrogen In vs. TN Reduced



### Total Phosphorus In vs. TP Reduced



# Dog Branch Regional Stormwater Treatment Conclusions

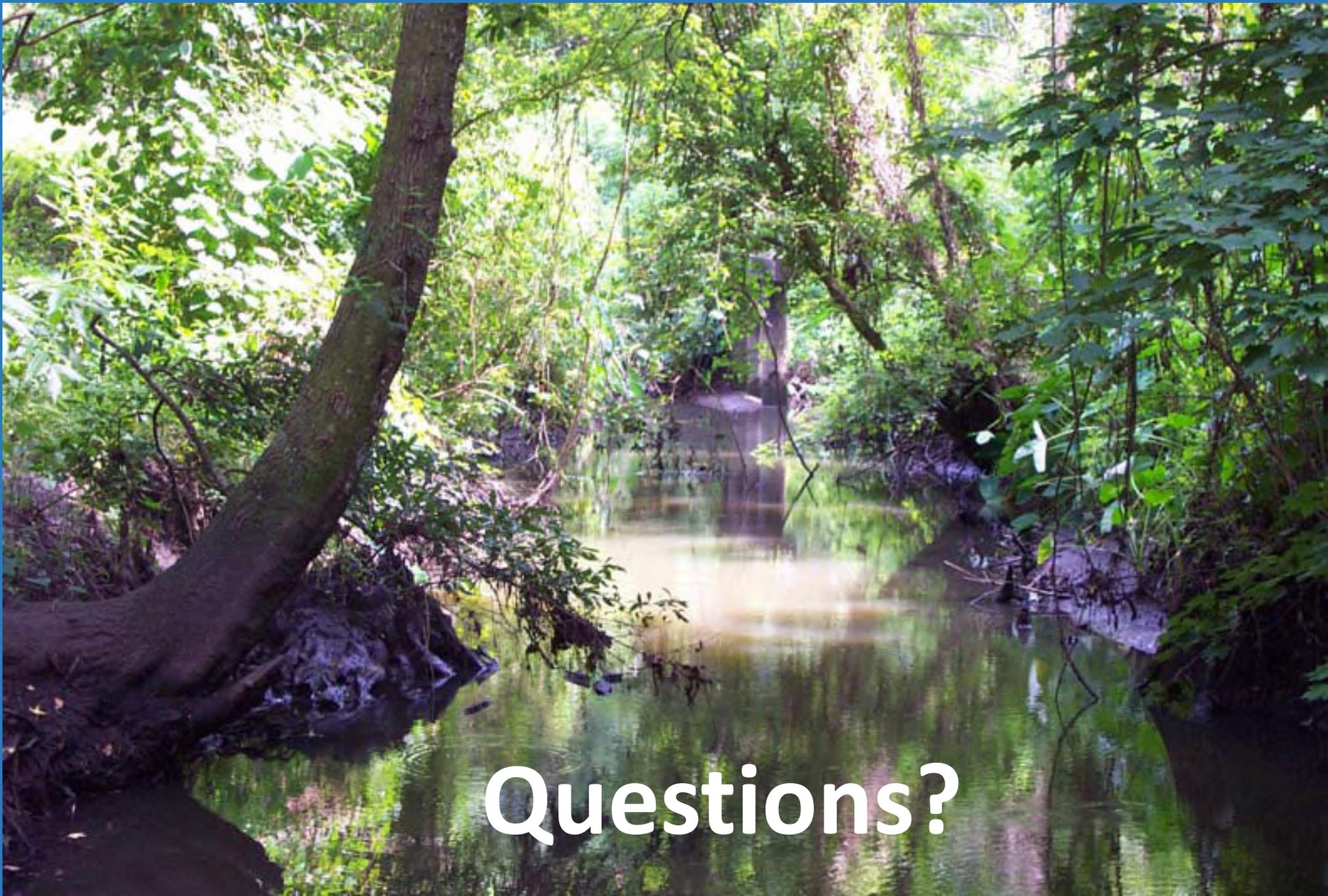
- *Performance monitoring is required to understand RST system delivery, behavior and performance.*
- *DBR BMP treatment train design is effective in treating both nitrogen (wetland) and phosphorus (pond) loads entering the system.*
- *RST treatment removal is greater during years with more rainfall compared to years with less rainfall.*



# Dog Branch Regional Stormwater Treatment Conclusions – cont.

- *The DBR RST annual average reduction exceeds the estimated TN (2,409 kg/yr) and TP load reductions (1,091 kg/yr) required by LSJR Main Stem TMDL.*
- *DBR RST is effective in treating agricultural discharges in the Dog Branch Watershed.*





Questions?



# Property Acquisition

- A 20-year dream of the previous property owner's was to see the "Edgefield" parcel of land turned into a public facility that could preserve the aesthetics of the area for the public.
- The District worked with the couple and was able to purchase the 230 acre property (including the residence) in 2001 with Florida Forever Funds.
- The facility was completed in 2007, with a total cost of 3.4 million dollars (incl. purchase price). Construction of the project was completed with funds from the National Oceanic and Atmospheric Administration's Coastal Impact Assistance Program, Florida Department of Transportation mitigation funds, and special legislative appropriations.



