

Monitoring Water Quality for Performance Evaluation of a Treatment Wetland

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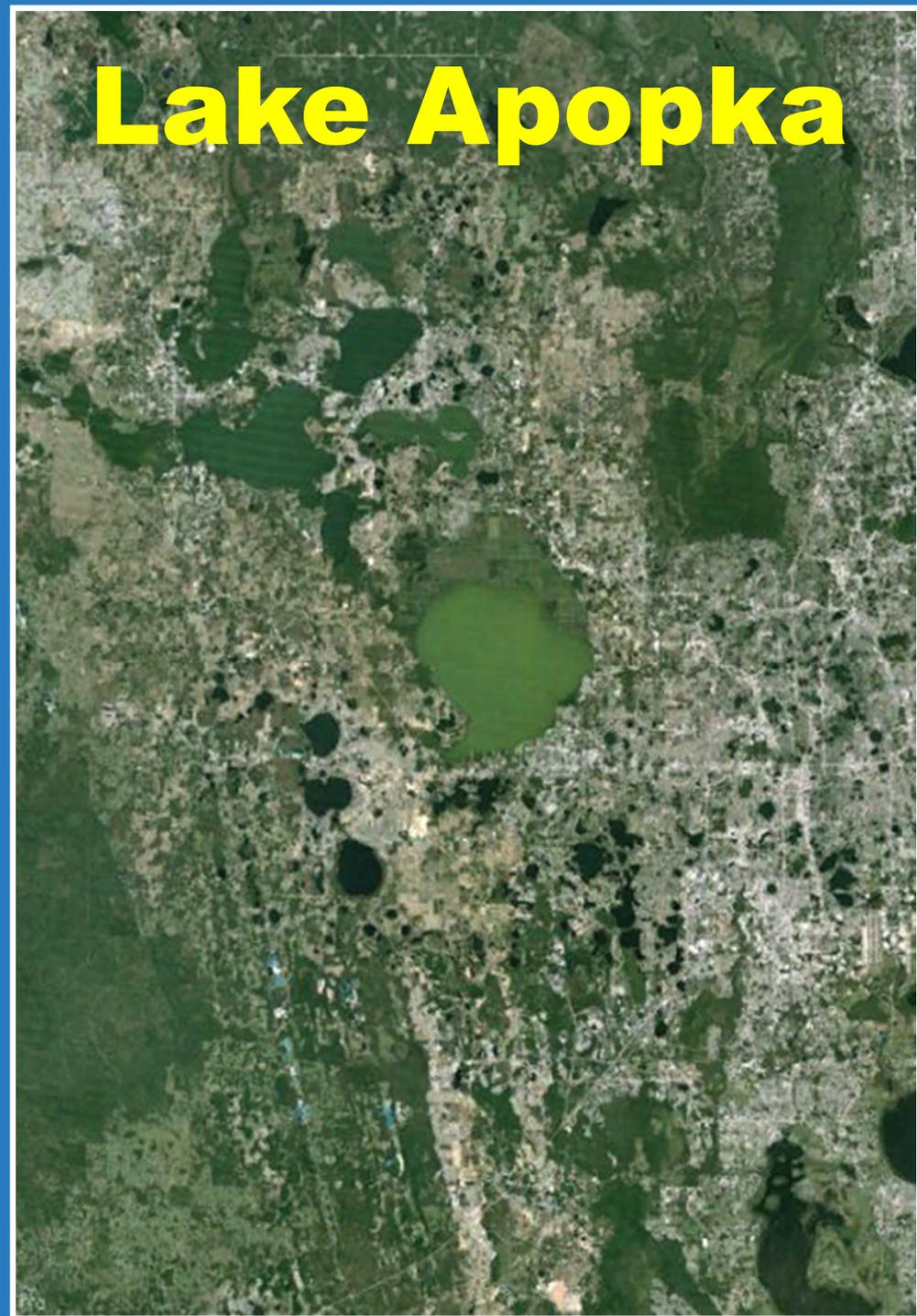
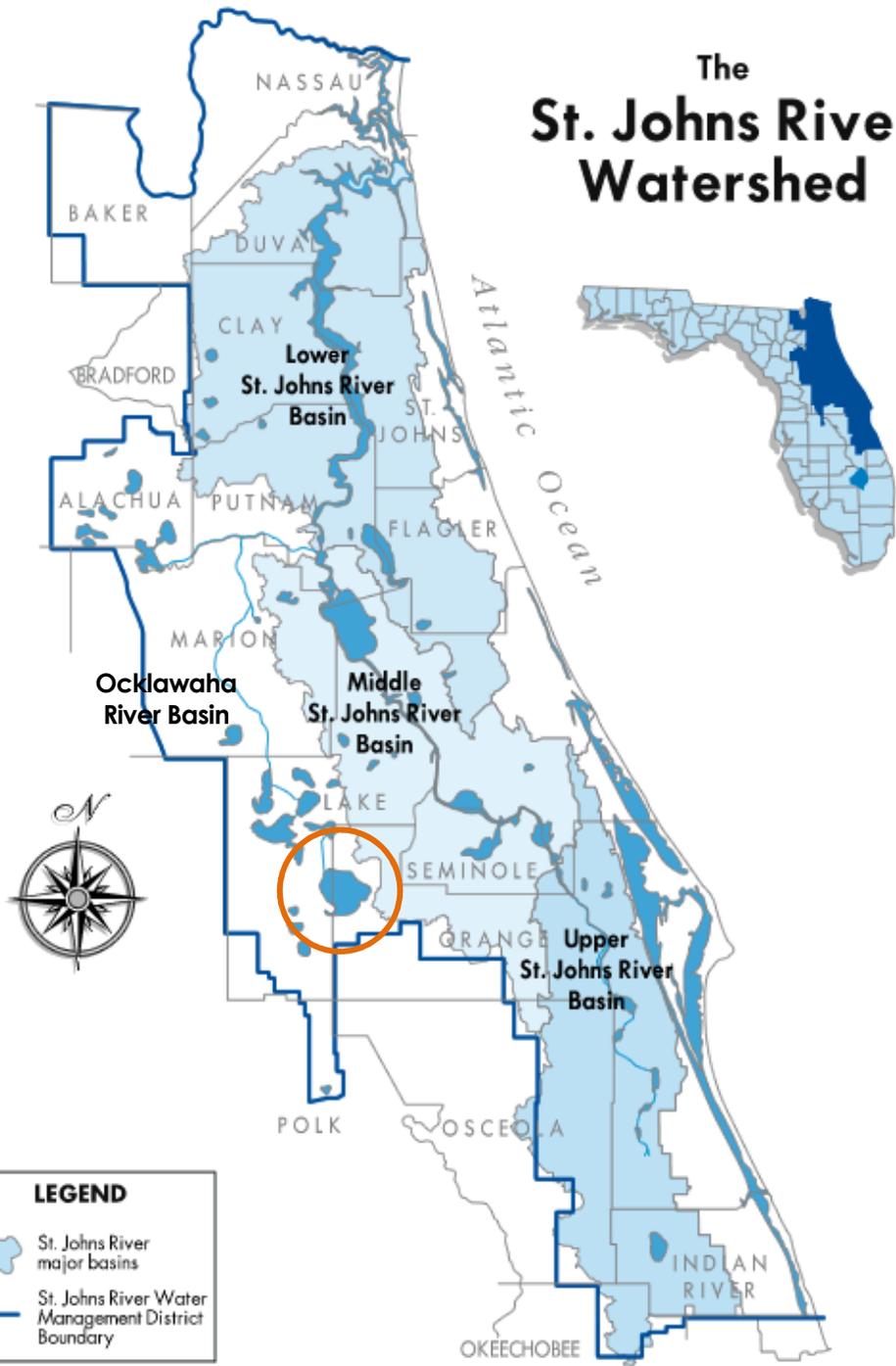
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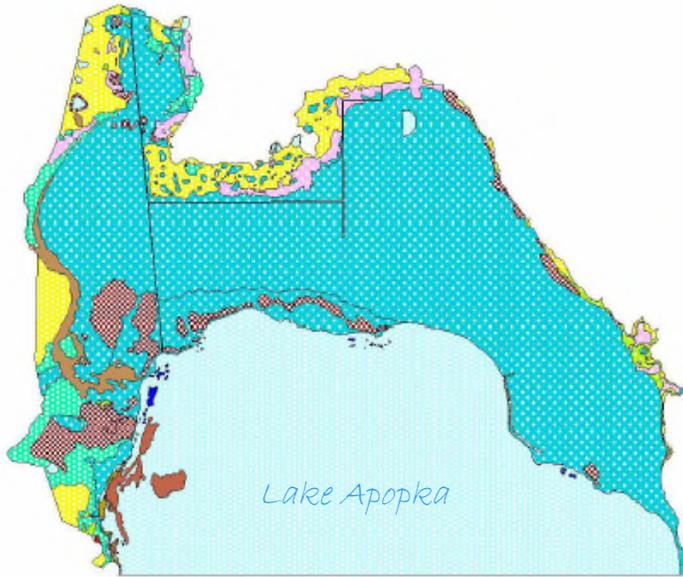


Lake Apopka

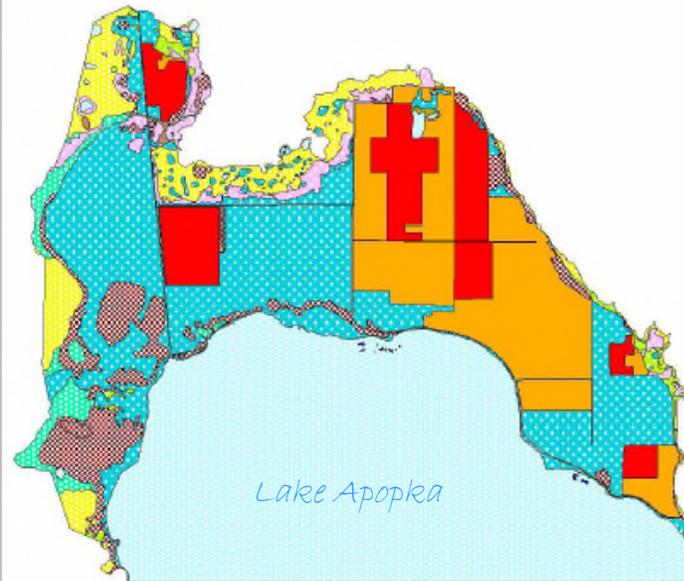
The St. Johns River Watershed



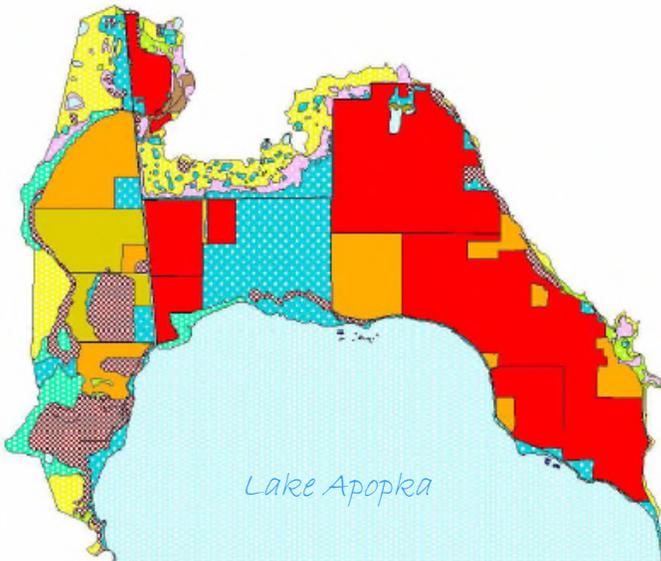
Development of Farms on the North Shore of Lake Apopka 1941-1985



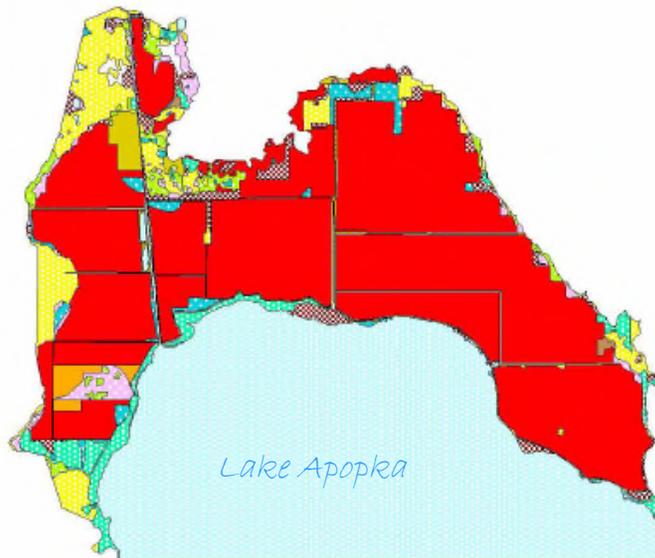
1941



1947



1953



1985

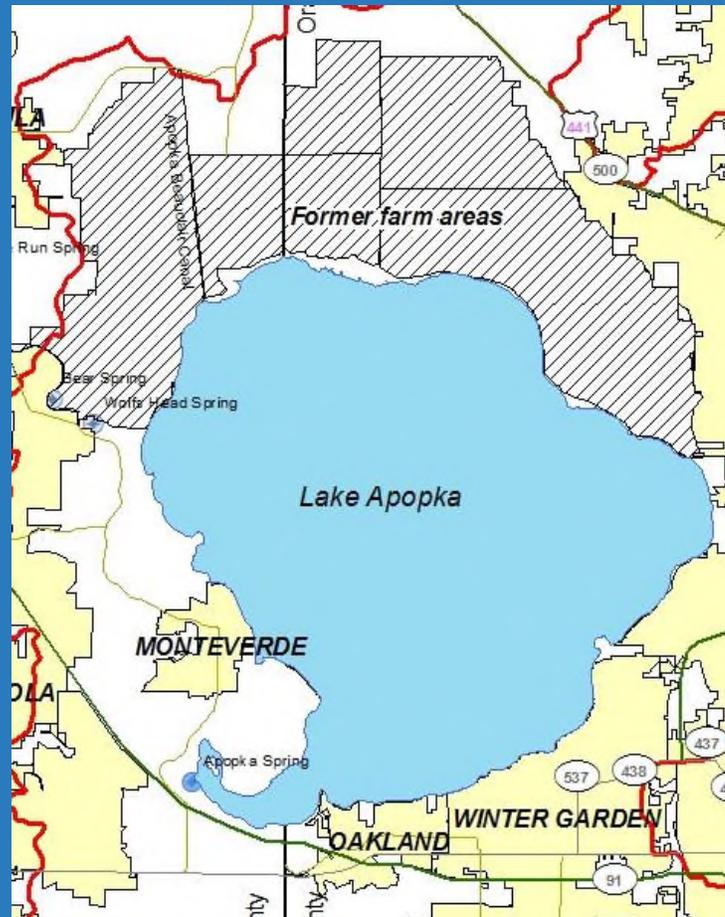
-  Shallow marsh
-  Shrub swamp
-  Hardwood swamp
-  Wet prairie
-  Muck farm in prep
-  Muck farm



Lake Apopka

1930s

- North Shore Marsh
- Mesotrophic
- Clear water
- Abundant aquatic plants
- Abundant gamefish
- Firm organic and mineral sediments



1980s

- North Shore Farms
- Hypereutrophic
- Algal blooms
- Few aquatic plants
- Few gamefish
- Flocculent, nutrient-rich sediment



The Restoration Program for Lake Apopka

- Restore farmlands to wetlands (reduce P external loading and provide habitat)
- Remove rough fish (remove P, reduce P recycling)
- Plant native species and fluctuate water levels to develop habitat
- Prevent expansion of *Hydrilla verticillata*
- Wetland filtration (remove P from lake water)

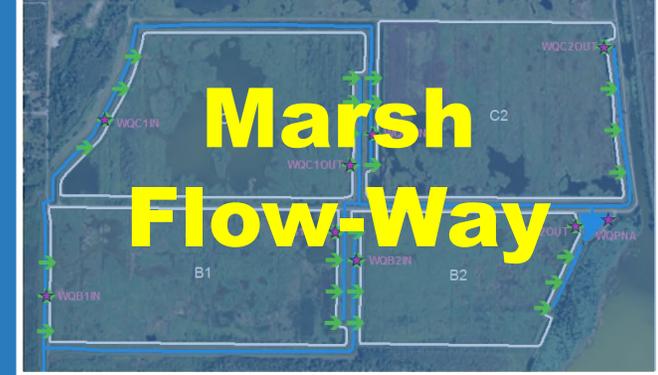


Stormwater Treatment Wetland



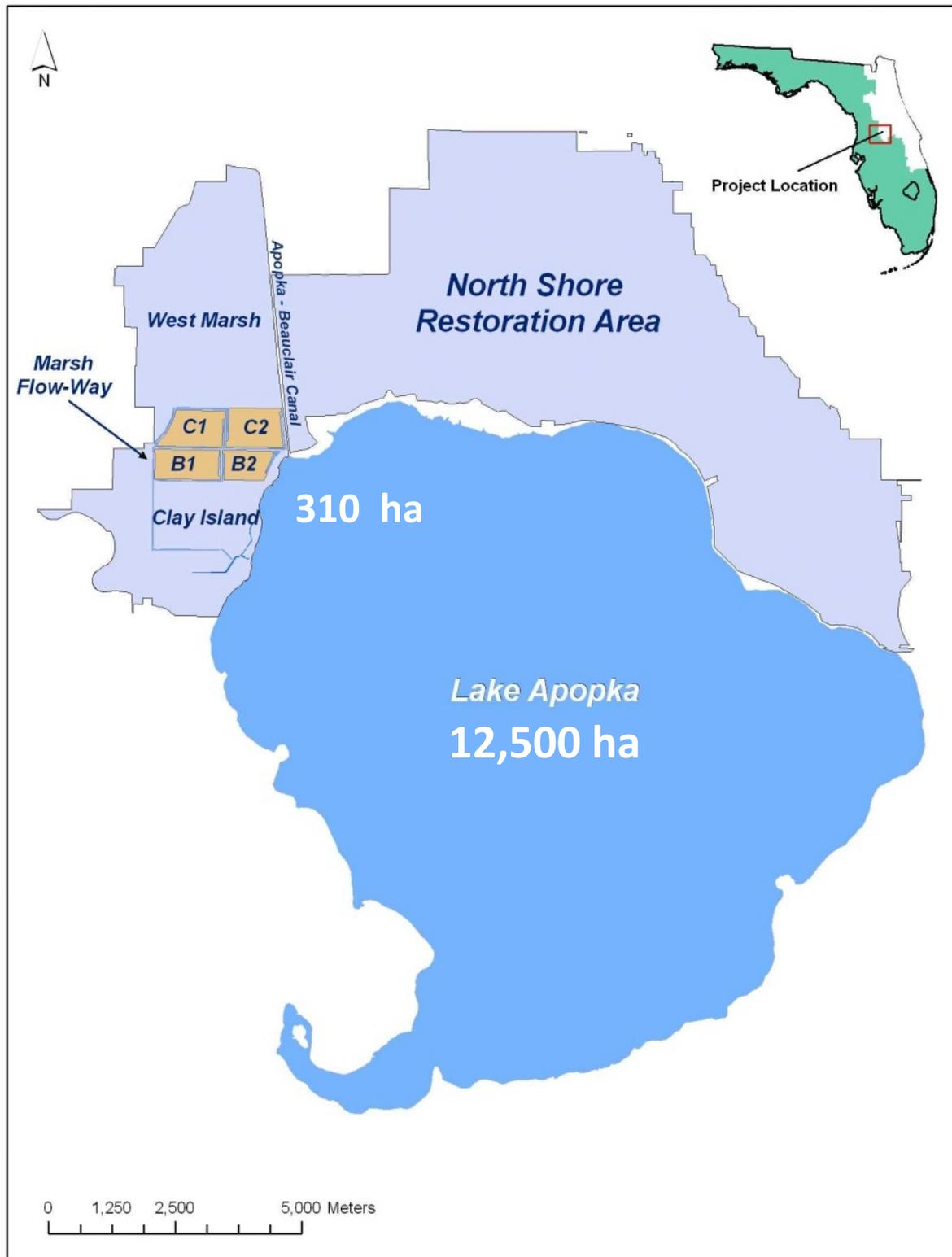
Concentration at
Outflow

Goal



Mass Removal Rate

The Marsh Flow-Way



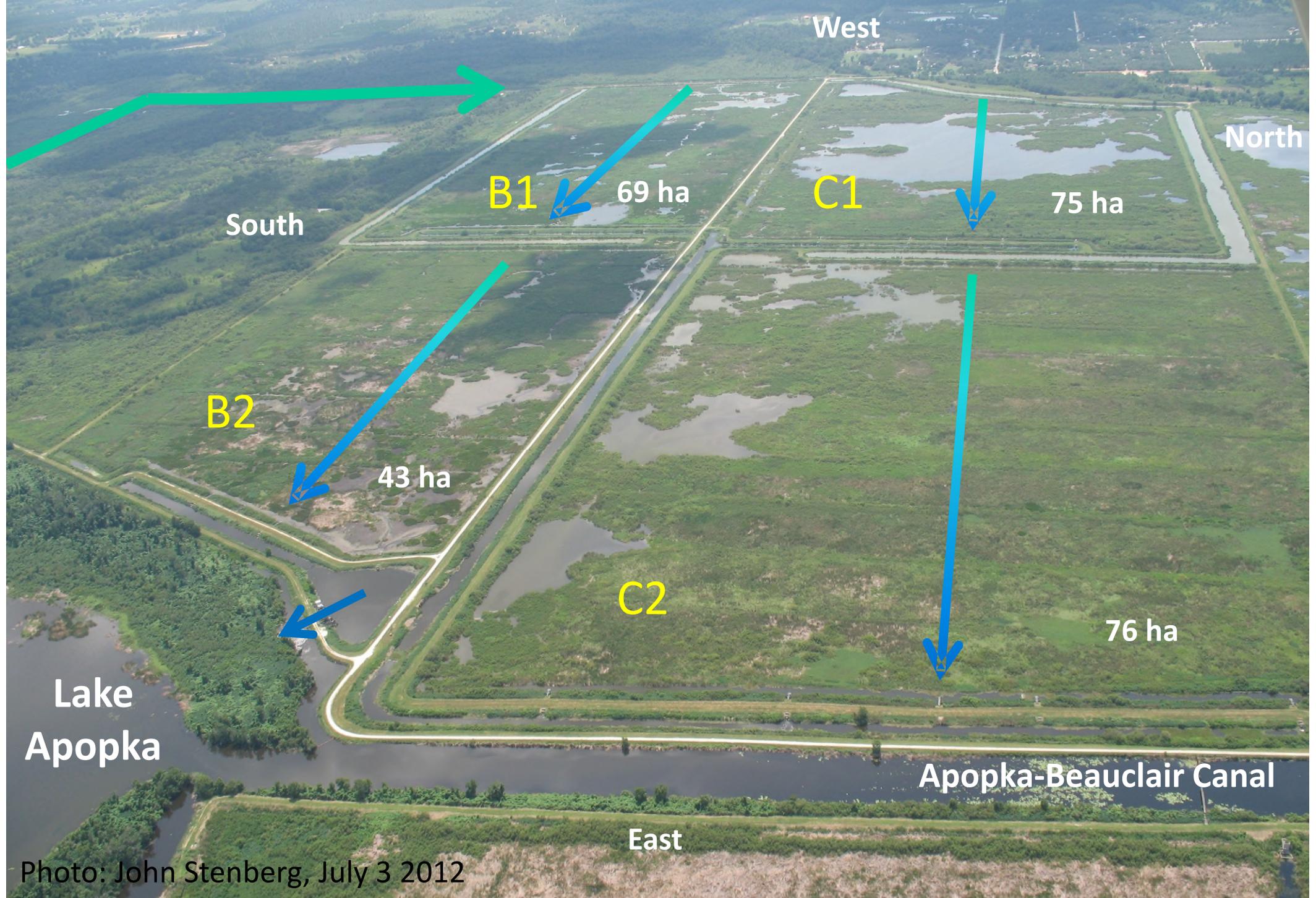


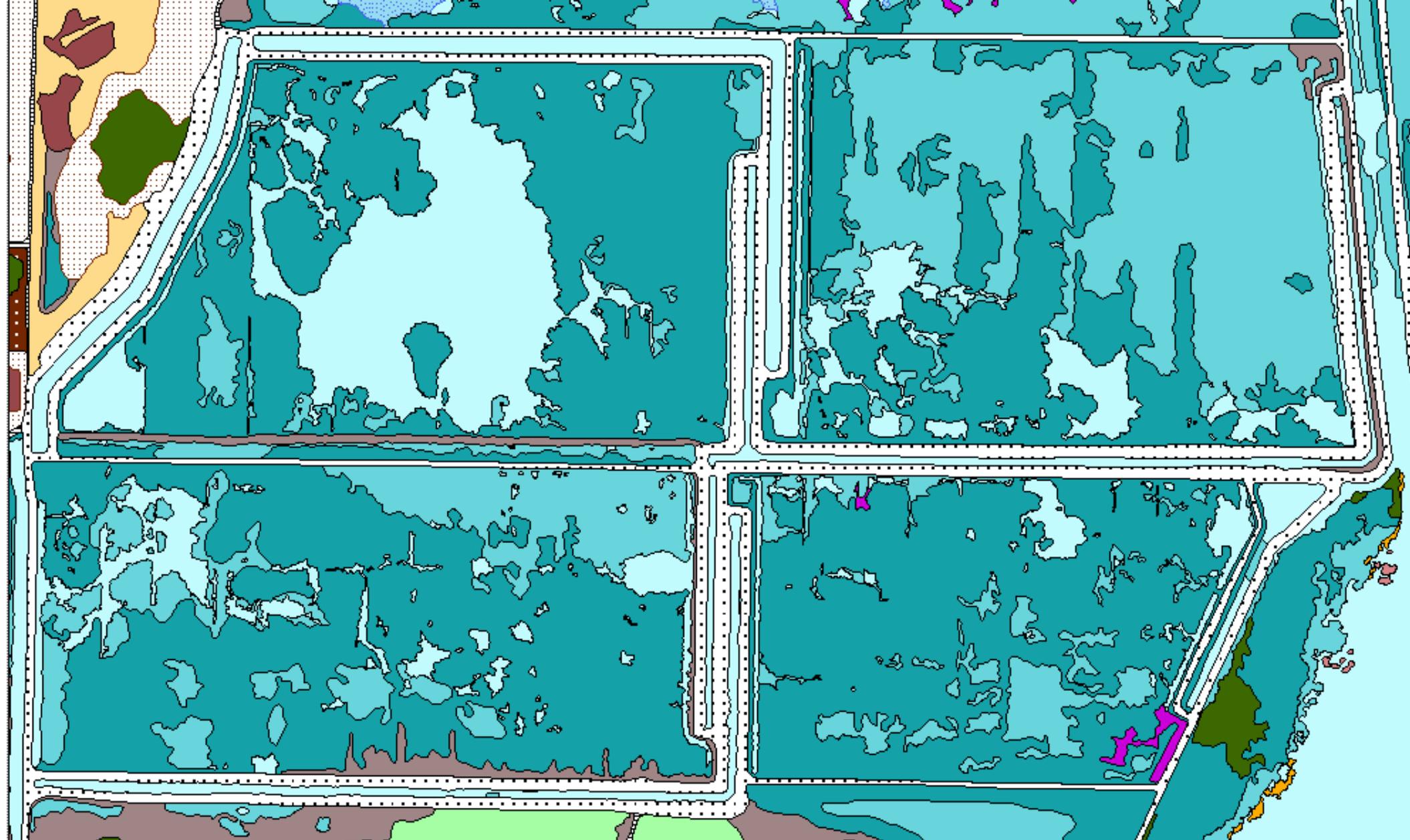
Photo: John Stenberg, July 3 2012

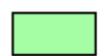
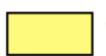
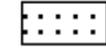


Photo: John Stenberg, June 20 2013



St. Johns River
Water Management District



- | | | | | | |
|---|--|--|---|--|---|
|  Hydric Hammock |  Transitional Shrub |  Submerged Aquatic Beds |  Wet Prairie |  Water |  Pasture |
|  Hardwood Swamp |  Dry Shrub |  Shallow Marsh |  Lakeshore Emergents |  Building |  Road |
|  Shrub Swamp |  Dry Prairie |  Deep Marsh |  Floating Marsh |  Levee |  Uplands |



St. Johns River
Water Management District



Dynamic management to sustain performance

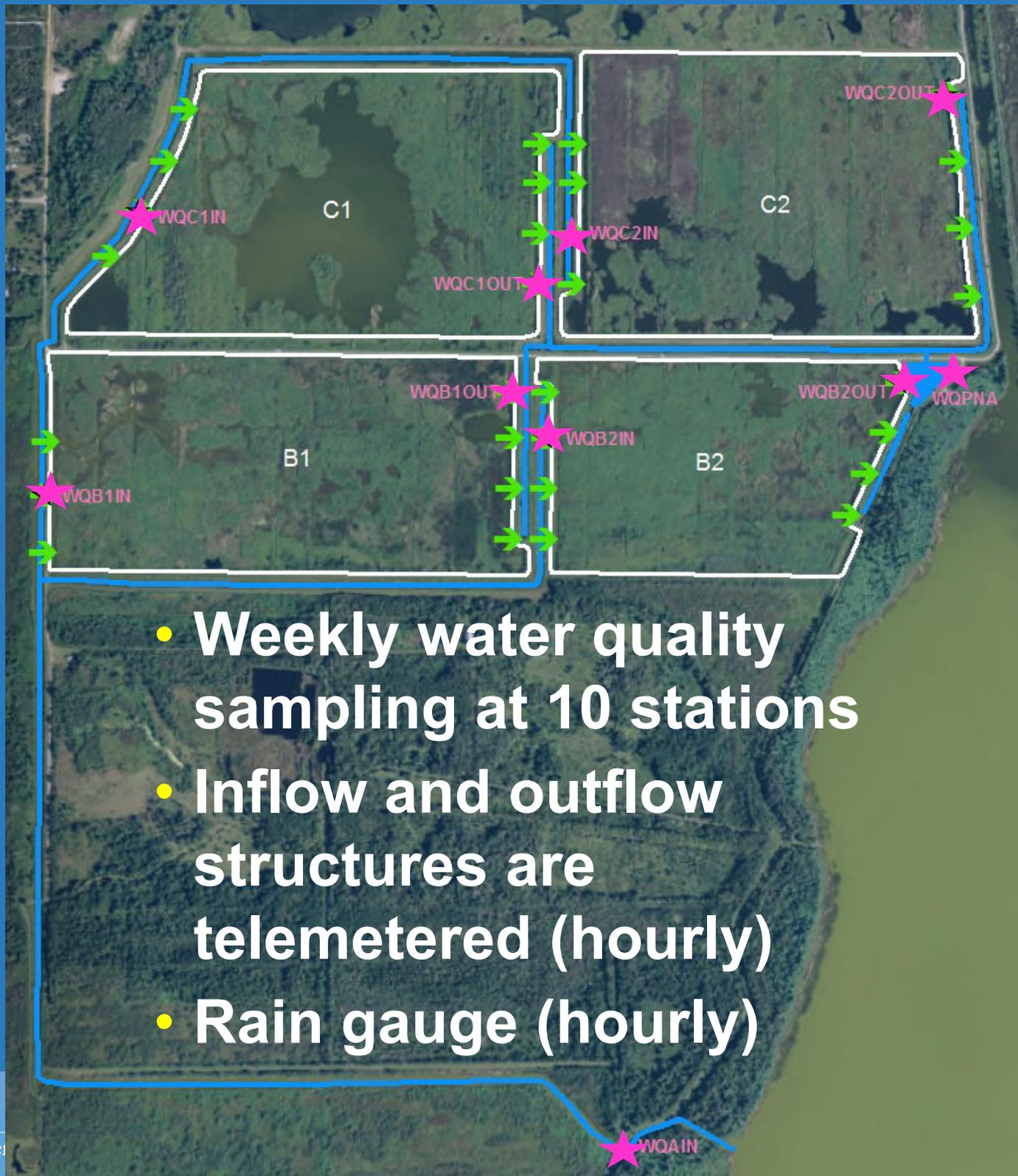
Major Maintenance

- Finger dike construction
- Ditch cleaning
- Mowing
- Alum injection

Minor Maintenance & Operation

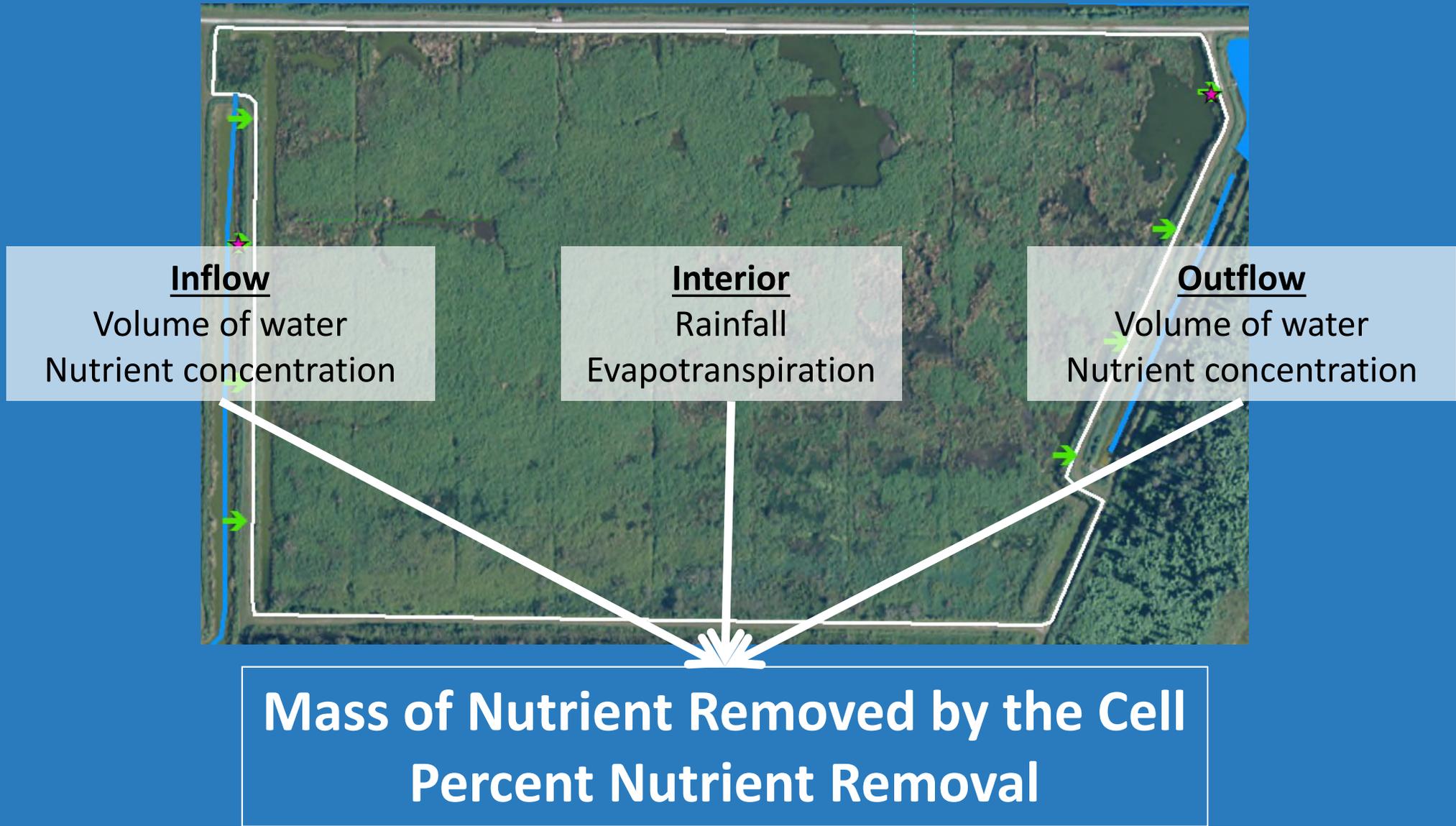
- Manipulating levels and flows
- Drawdown, resting
- Turning off/on cells
- Planting



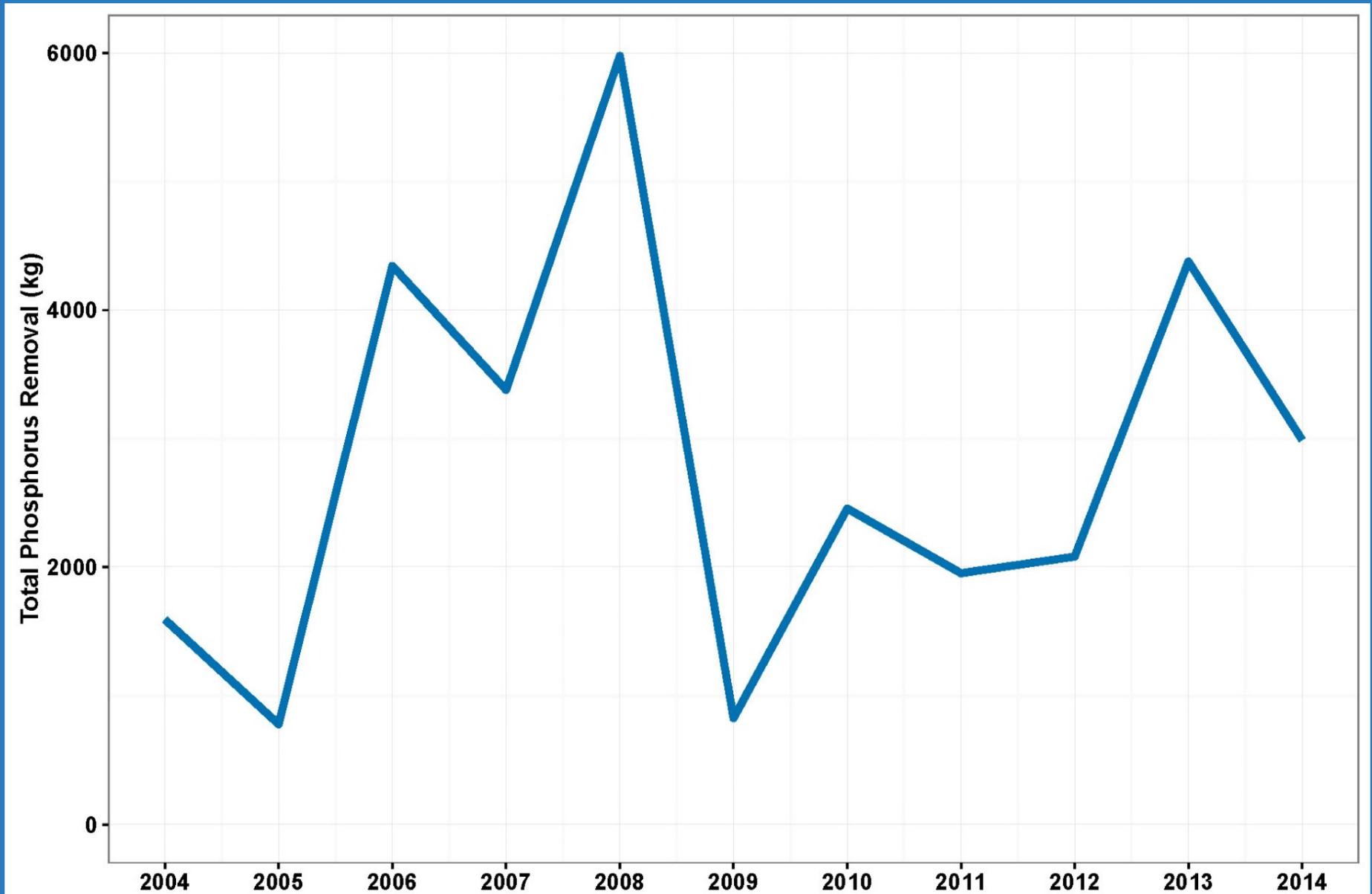


- Weekly water quality sampling at 10 stations
- Inflow and outflow structures are telemetered (hourly)
- Rain gauge (hourly)

Performance Evaluation

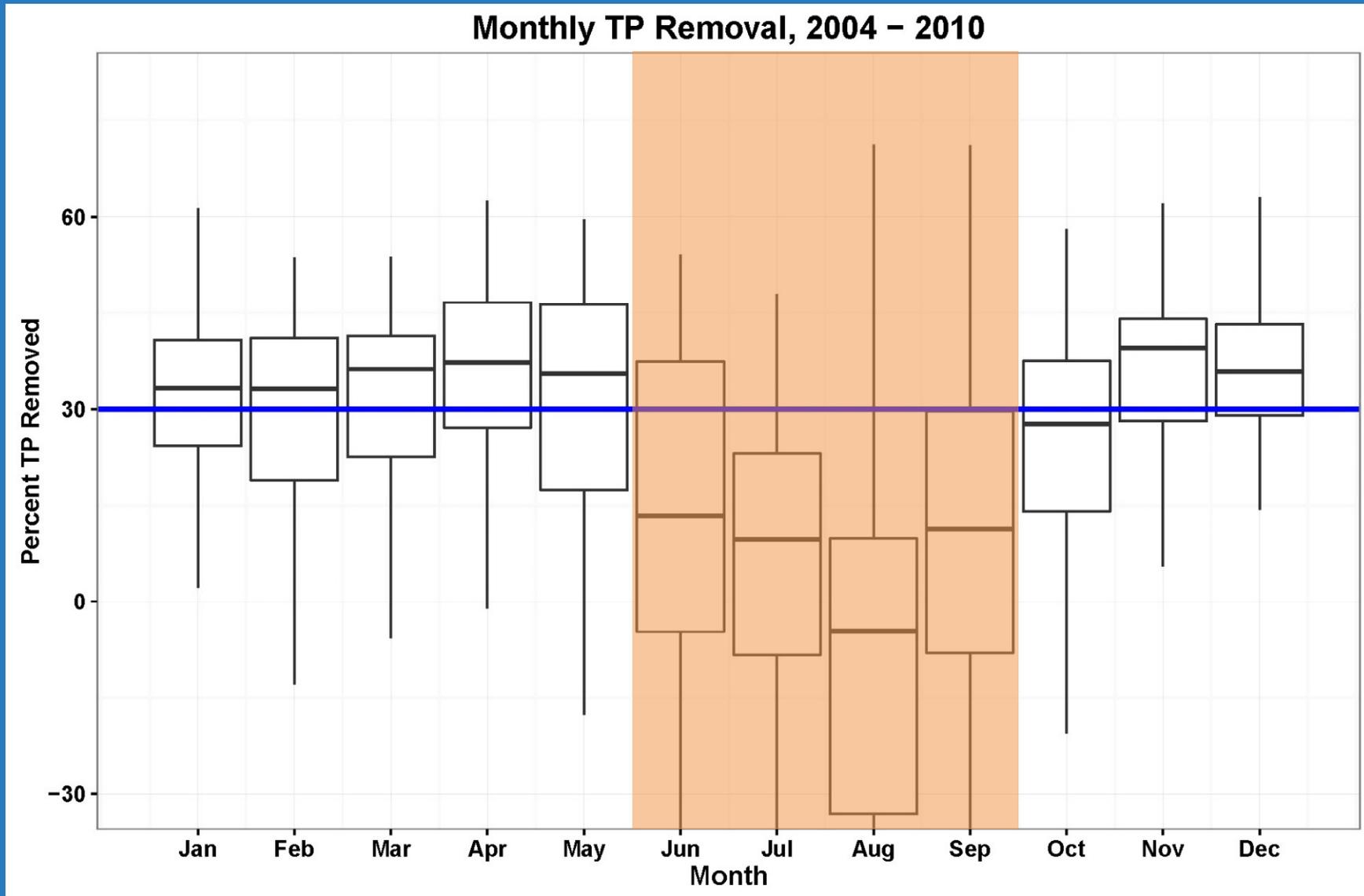


Annual Total Phosphorus Removal



Data drives operational decisions

- Operational Goal: >30% TP Removal



Data drives operational decisions

- Operational Goal: >80% TSS Removal

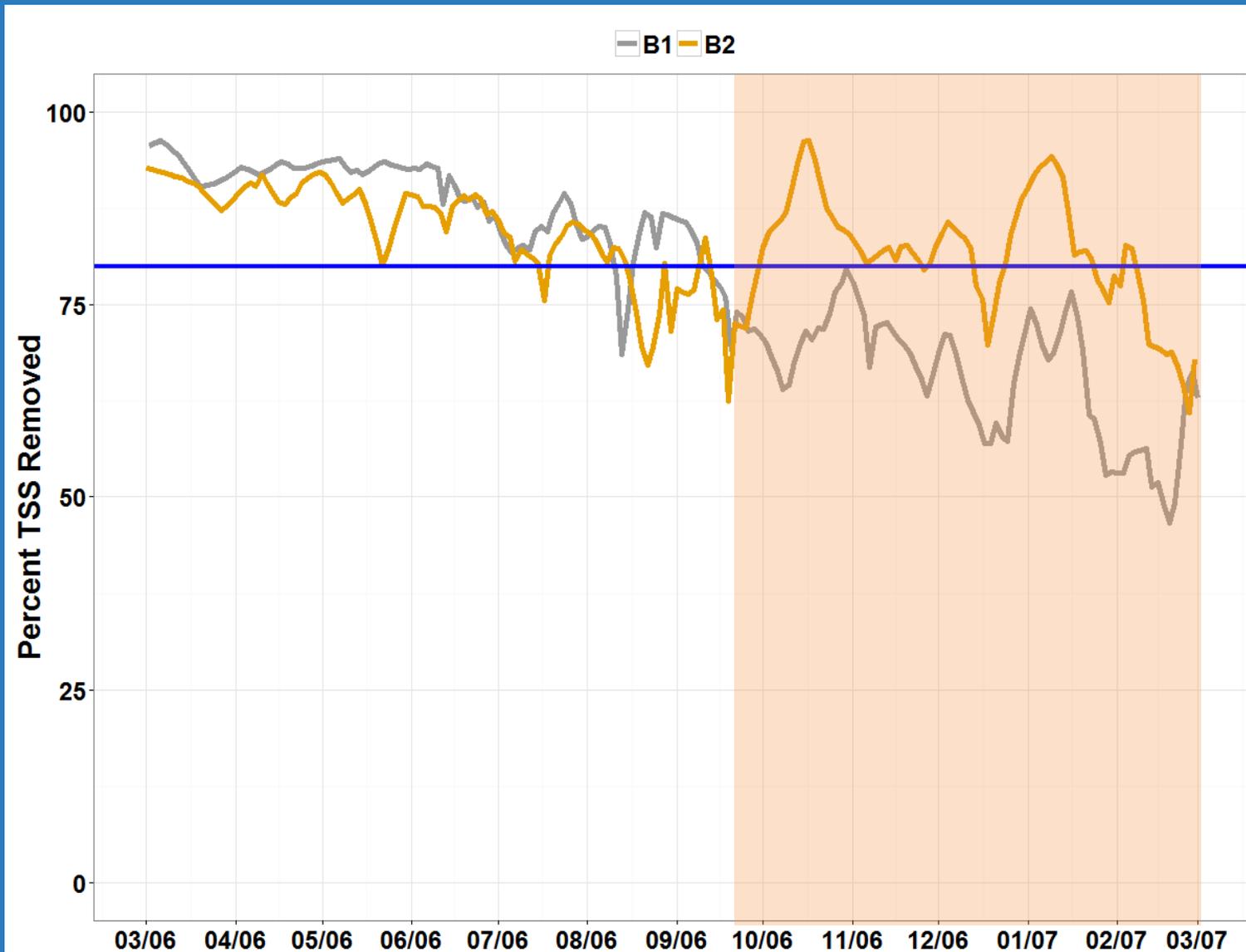




Photo: John Stenberg, April 4 2007



St. Johns River
Water Management District



St. Johns River
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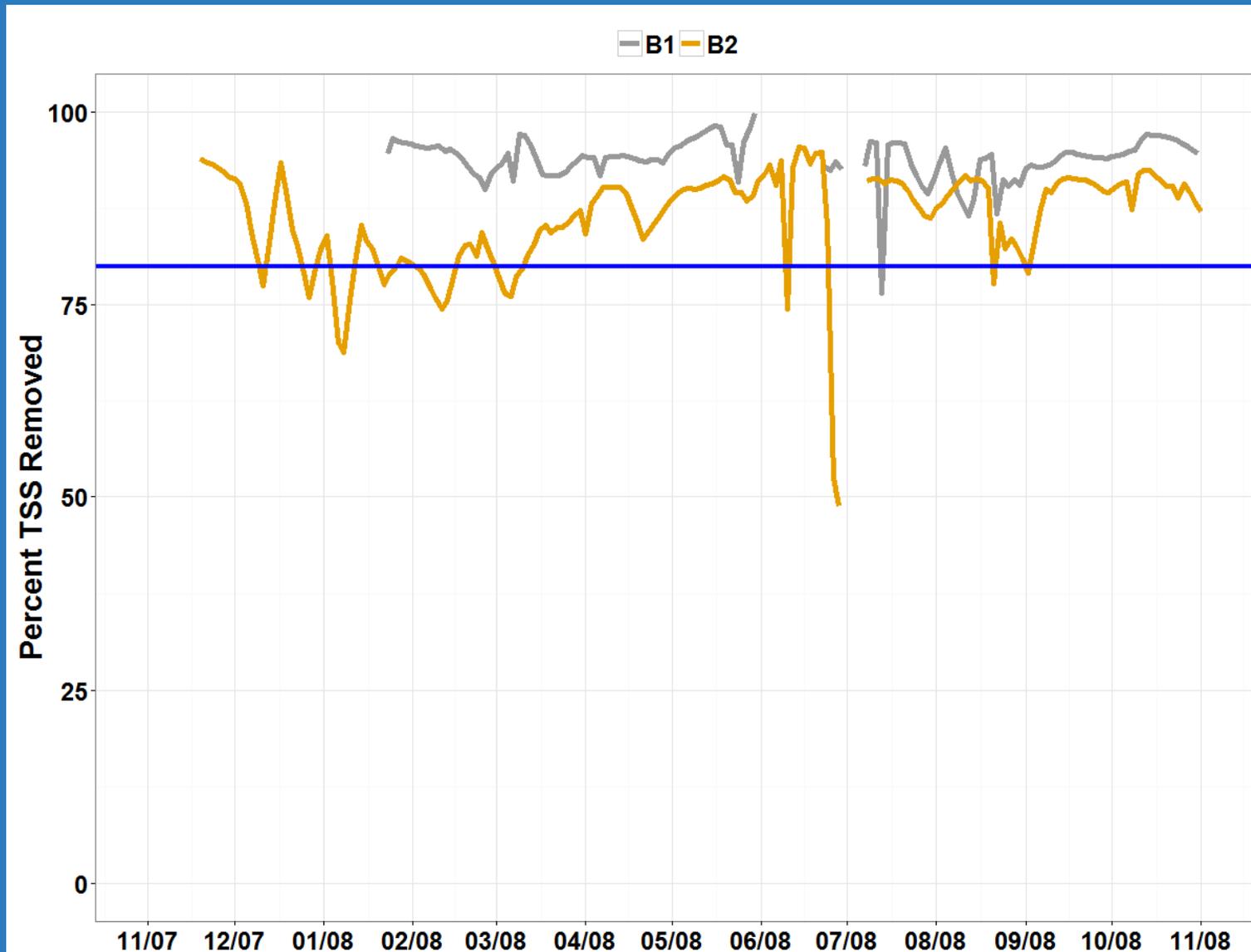
Photo: John Stenberg



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Data drives operational decisions

- Operational Goal: >80% TSS Removal



Water Quality Monitoring to Inform Adaptive Management

Performance Evaluation

Provides rapid detection of problems in individual cells or the whole system

- Seasonal changes
- Flow
- Short-circuiting

Informs short- and long-term operational decision-making



Questions?

