

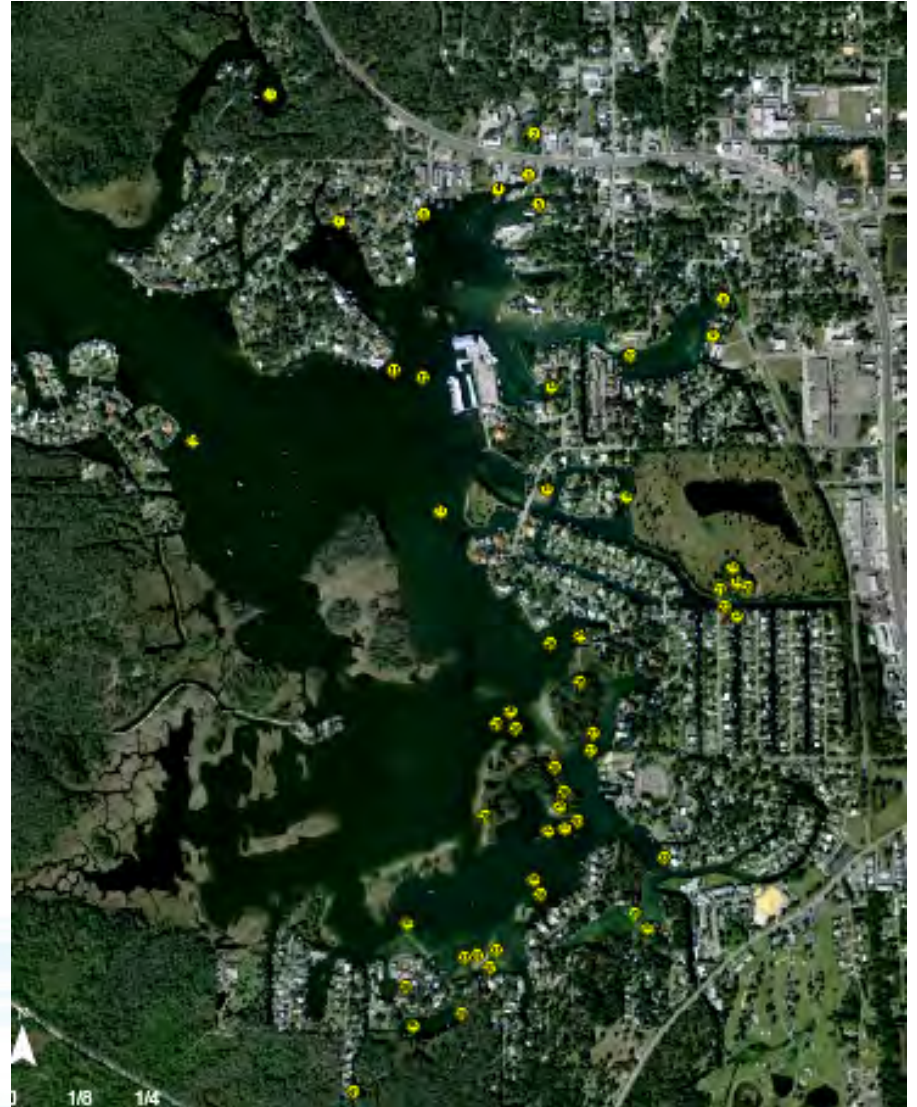
Kings Bay Overview

Gary Williams

Southwest Florida Water
Management District

Kings Bay

- Tidally influenced
- First magnitude spring group
- 70 known spring vents
- Nearly all of the freshwater discharging from Kings Bay to Crystal River is groundwater



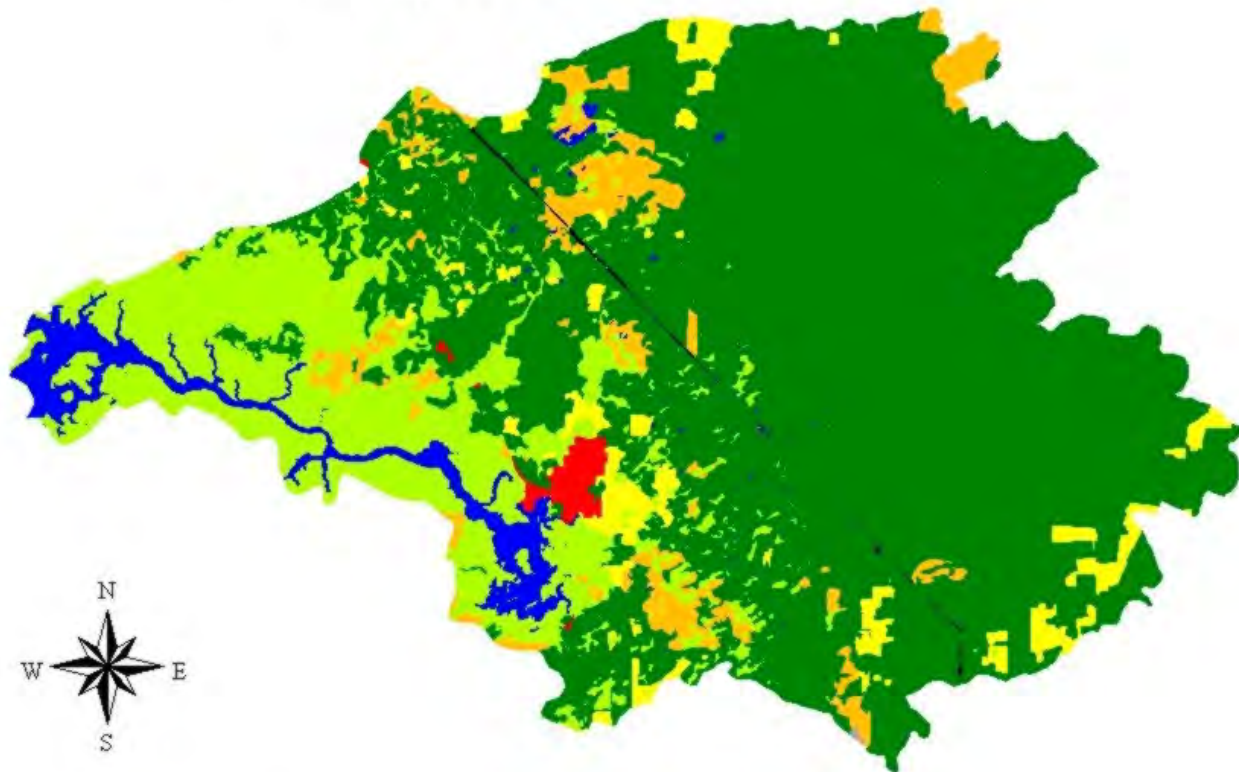
History of Change



*Kings Bay
1999*

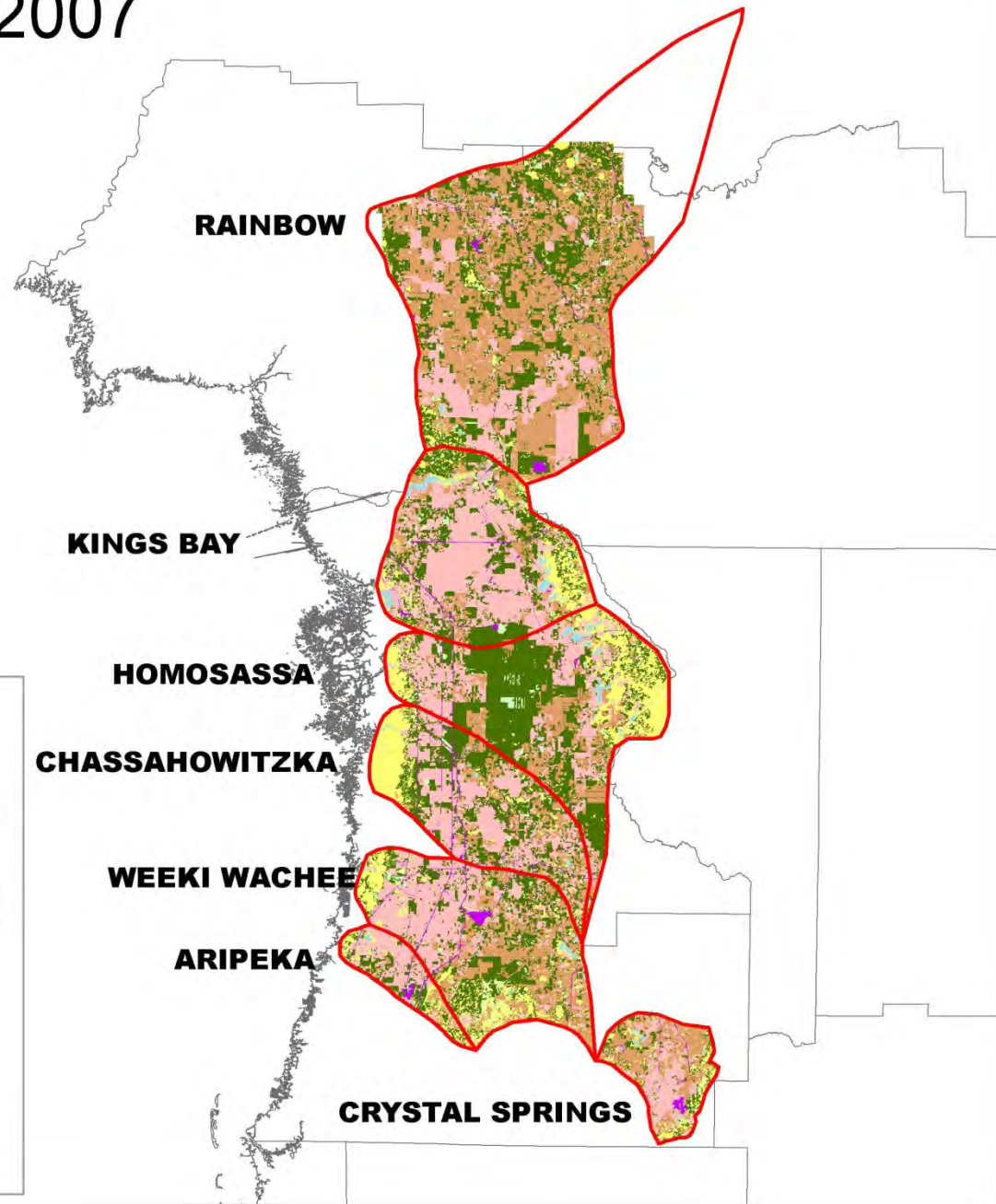
Watersheds

1944 Crystal River Watershed Landuse

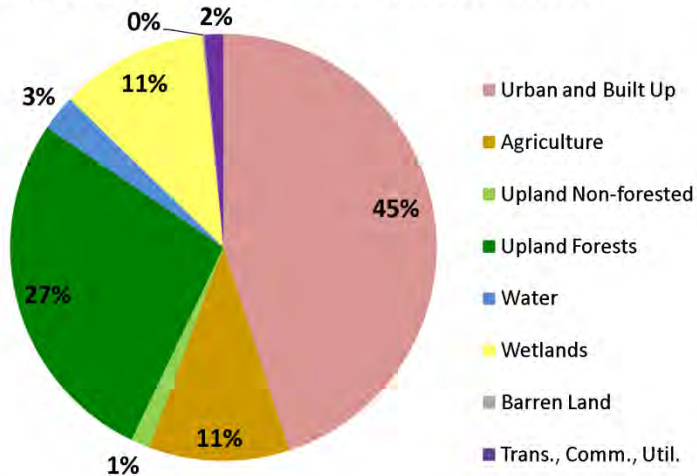


1944 Land Use/Cover	Acreage
Urban	349.92
Agriculture	1,974.90
Upland Rangeland	2,291.44
Upland Forested	29,166.87
Water	1,528.73
Wetlands	8,539.09
Disturbed Land	8.58
Transportation, Communication and Utilities	119.60

Springshed Land Use 2007

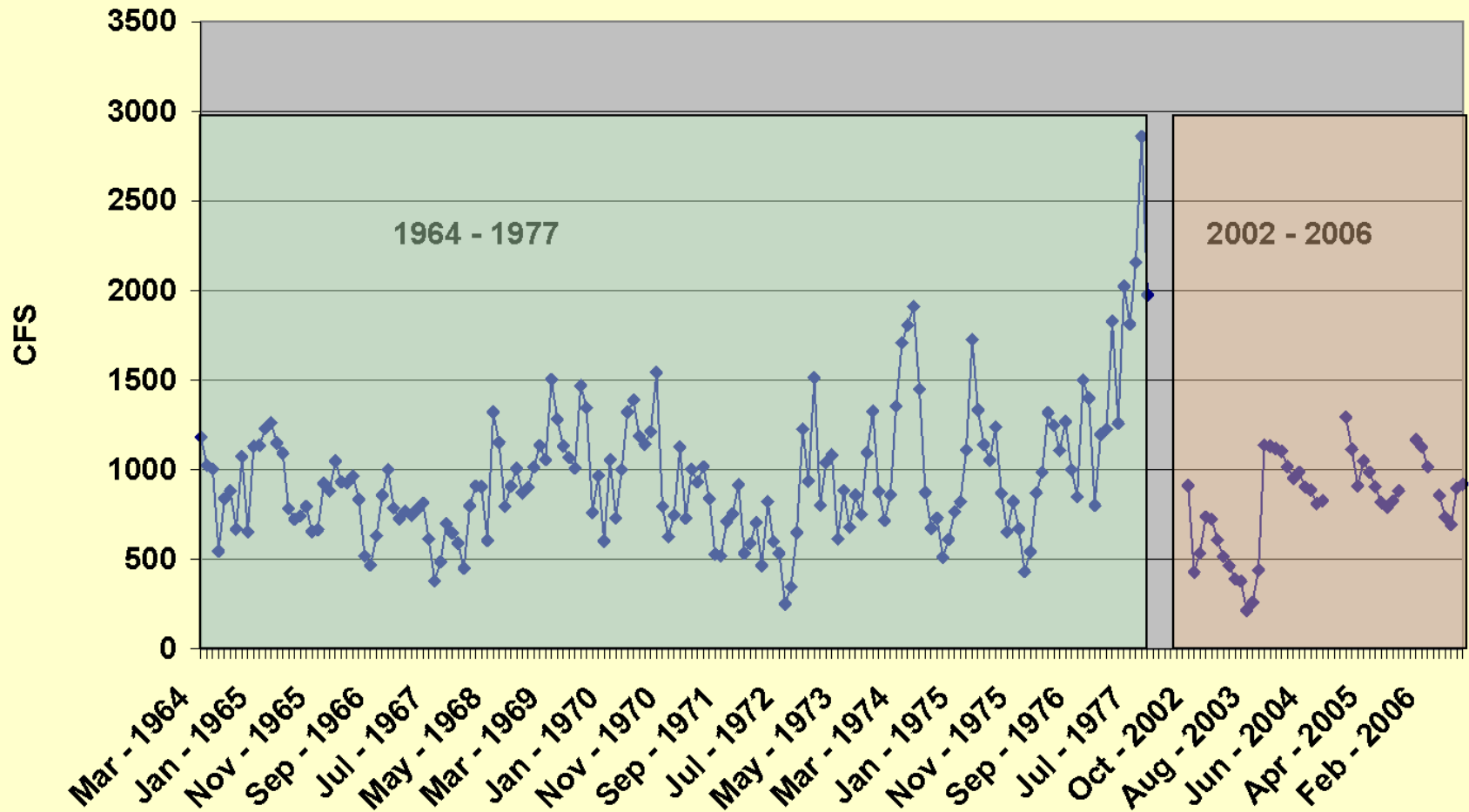


Kings Bay springshed land use/land cover in 2007.

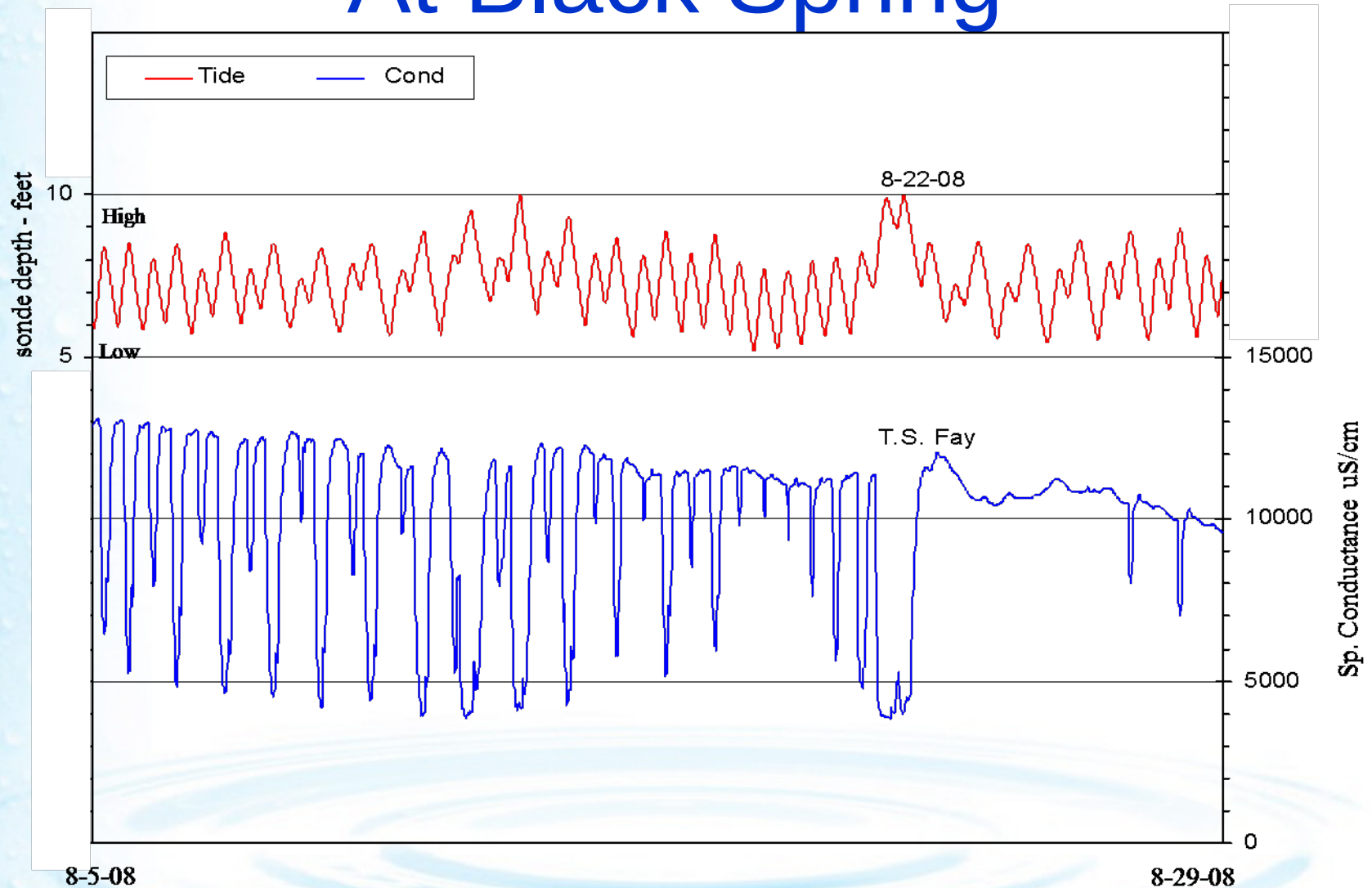


Kings Bay Discharge

Tidally Filtered Discharge at Crystal River
(Source: USGS gages 02310750 and 02310747)



Tidal Influence On Discharge At Black Spring

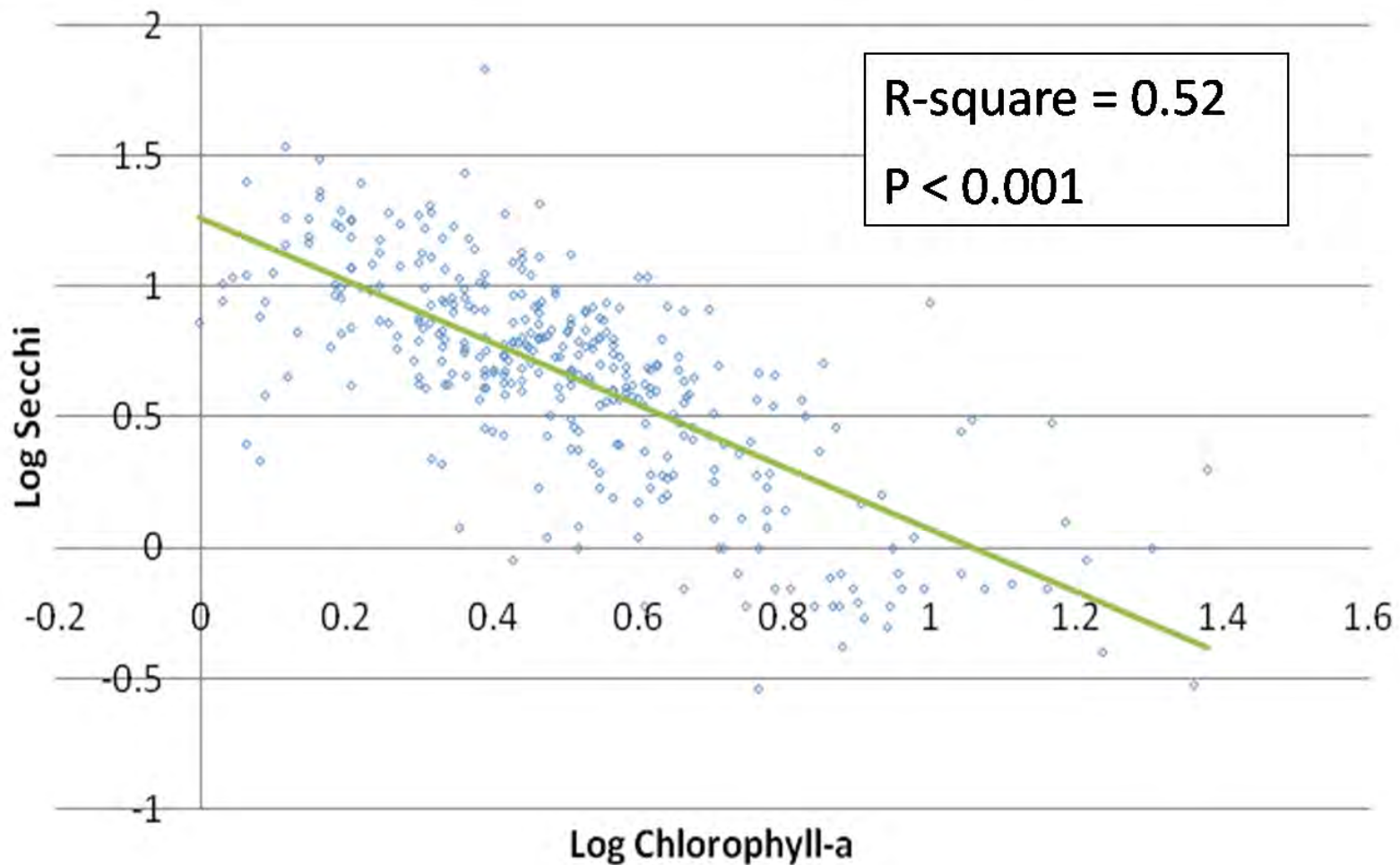


Problems Identified in 2000 SWIM Plan

- Reduced water clarity
 - Primarily affected by suspended solids in the water column
 - Phytoplankton is the most prevalent suspended solid



Water Clarity Is Strongly Associated With Chlorophyll- α



Problems Identified in 2000 SWIM Plan

- Sediment Accumulation and Resuspension
 - Sediments may be a nutrient source for algae, which can reduce water clarity
 - Sediments that get suspended in the water column (wind, waves, other physical disturbance) can temporarily reduce water clarity

2005 Sediment Study

- Repeated an early 1990s study of sediment depth and composition in Kings Bay
- Sediments are increasing in depth, becoming more organic
- Lyngbya is a primary source of sediments
- Implications for algae persistence

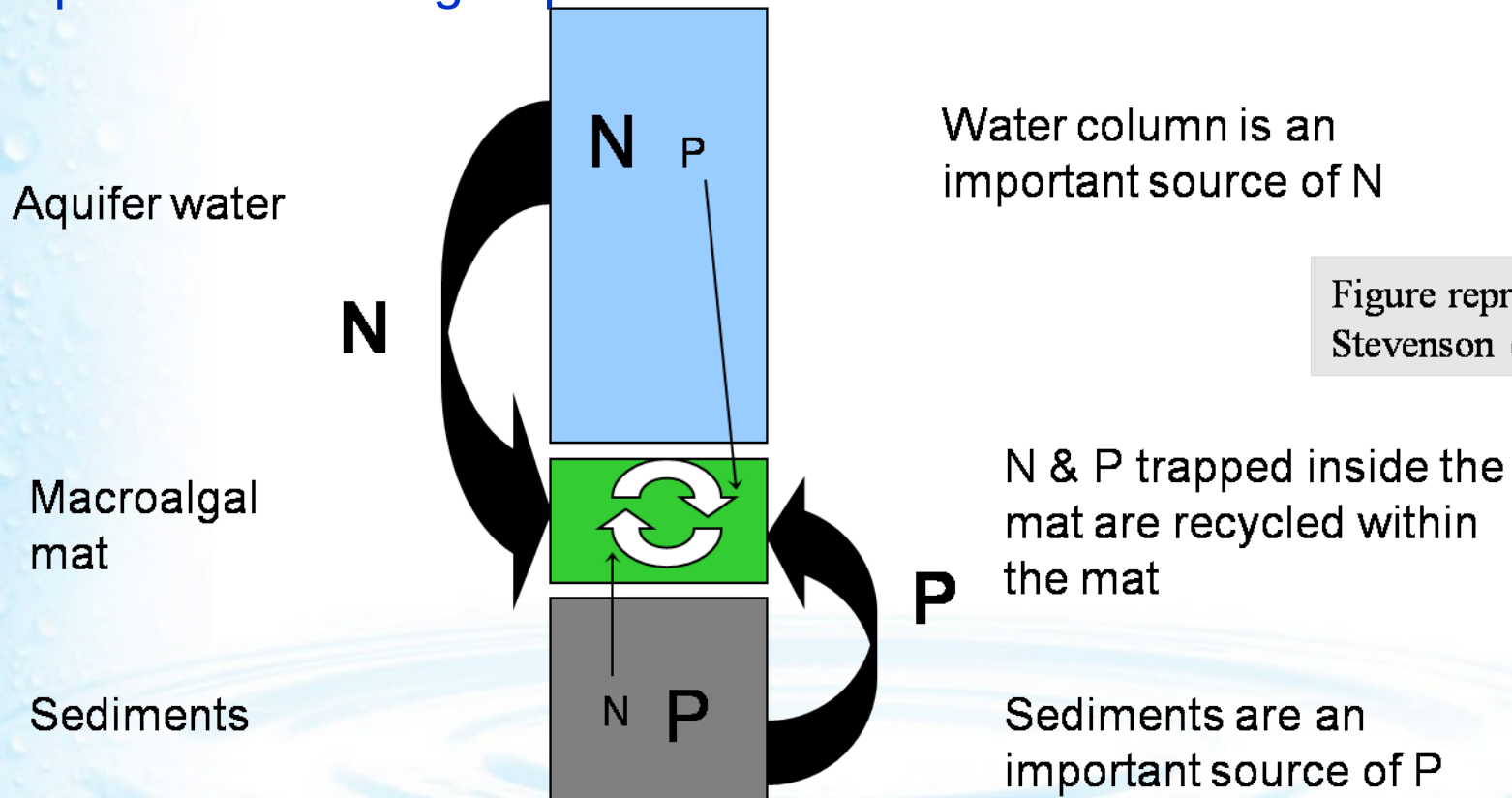
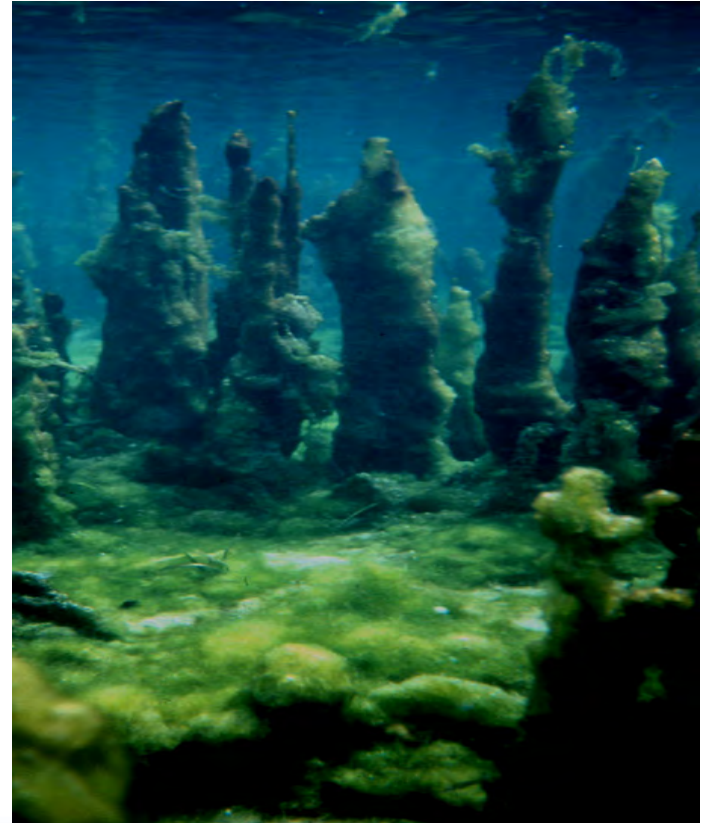


Figure reproduced from
Stevenson et al. 2004

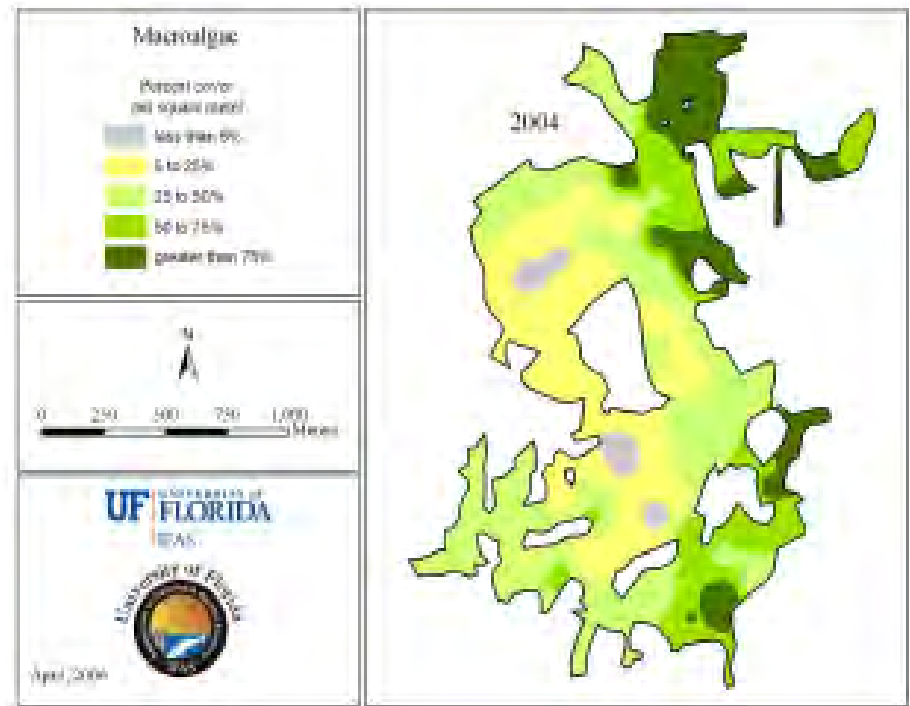
Problems Identified in Kings Bay SWIM Plan

- Aquatic plant community
 - Problem with nuisance plants, algae
 - hydrilla, water hyacinth in past
 - more recently, lyngbya, Eurasian milfoil



Vegetation Mapping

- Filamentous algae, hydrilla more prevalent near springs
- Plant community more diverse away from springs
- Annual “manatee effect”

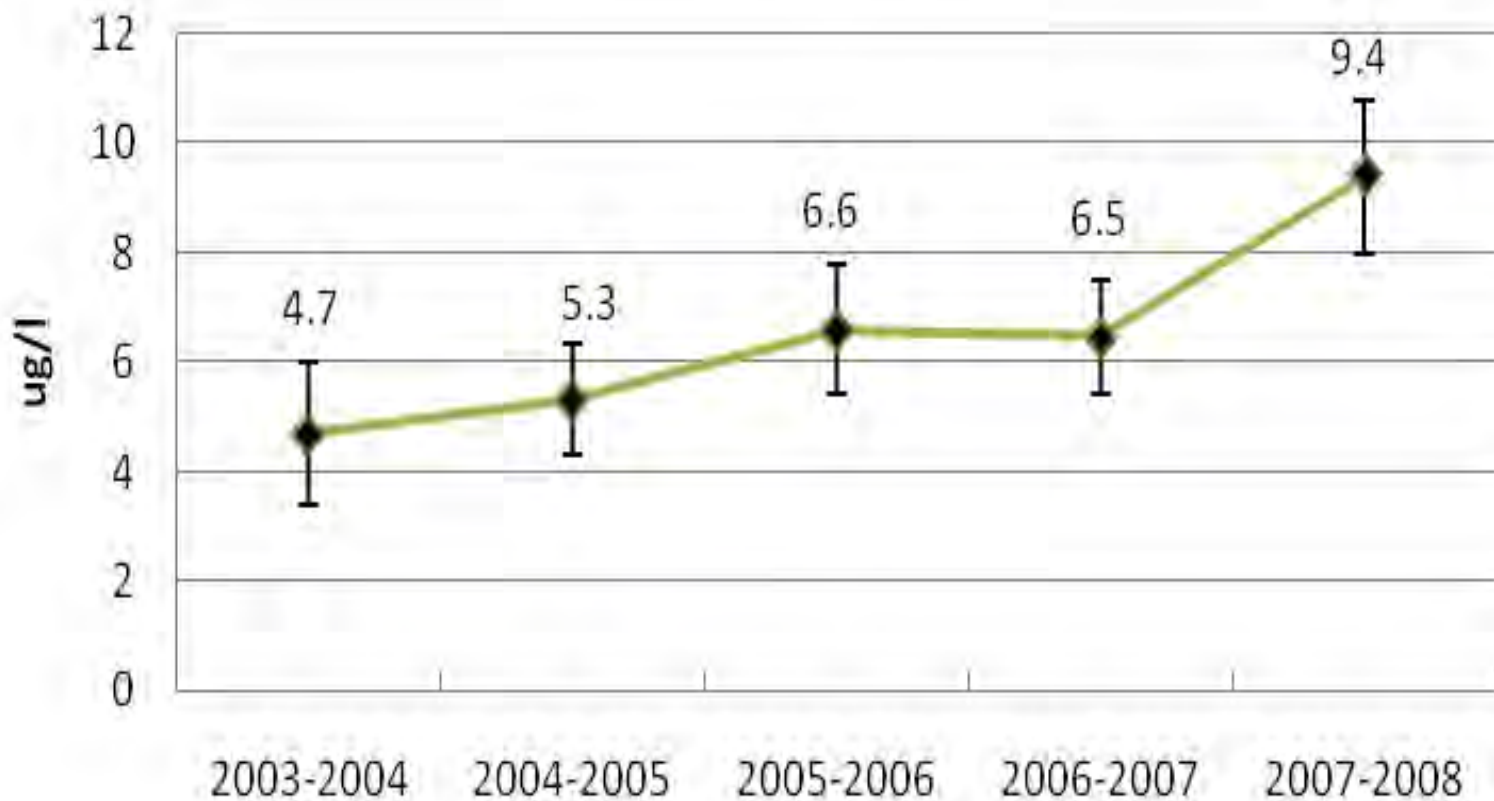


Surface Water Evaluation Program

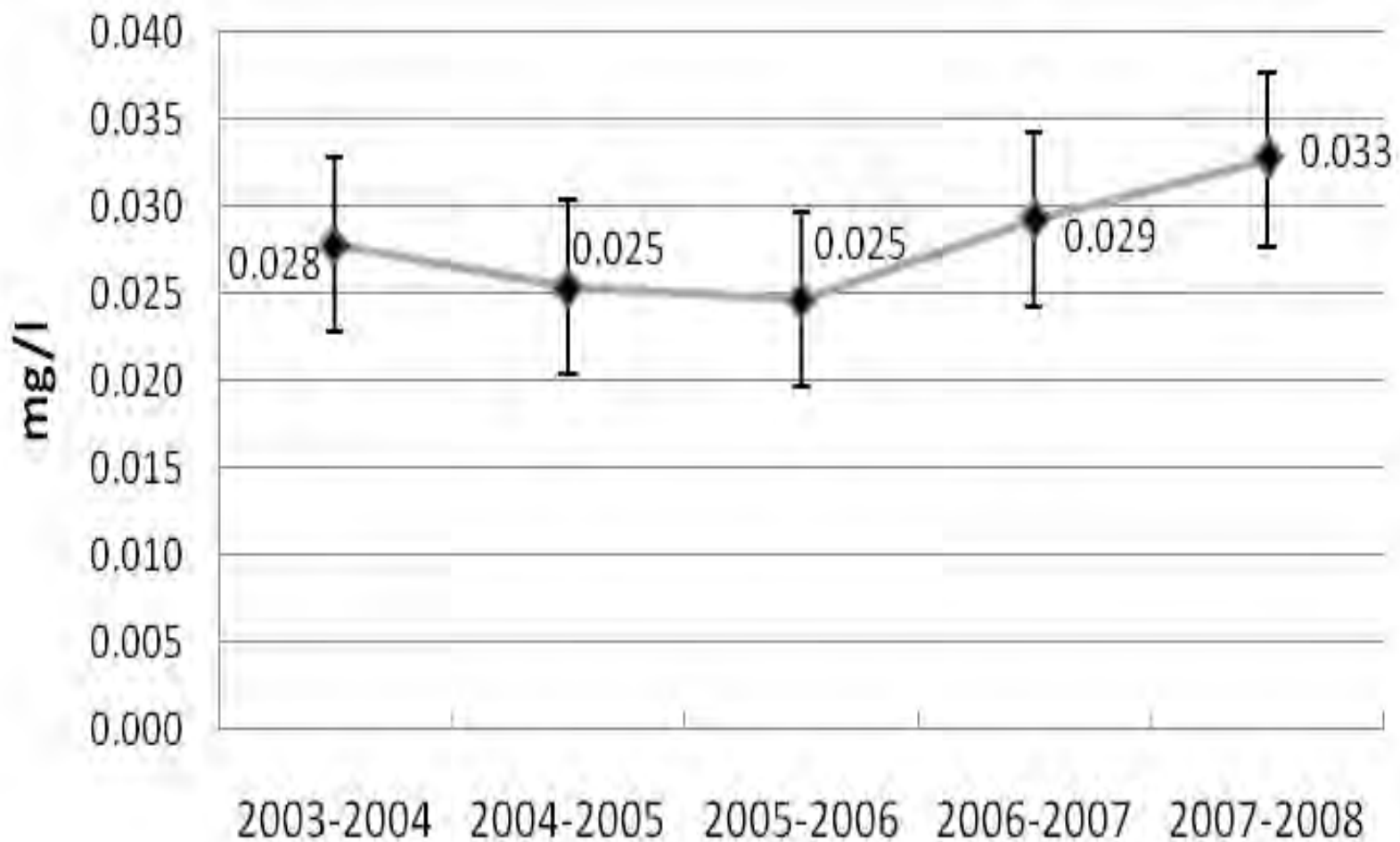
- Twelve surface water sites distributed throughout Kings Bay
- June 2003 - present
- Bi-monthly sampling
- Nutrients, chlorophyll, clarity, conductance



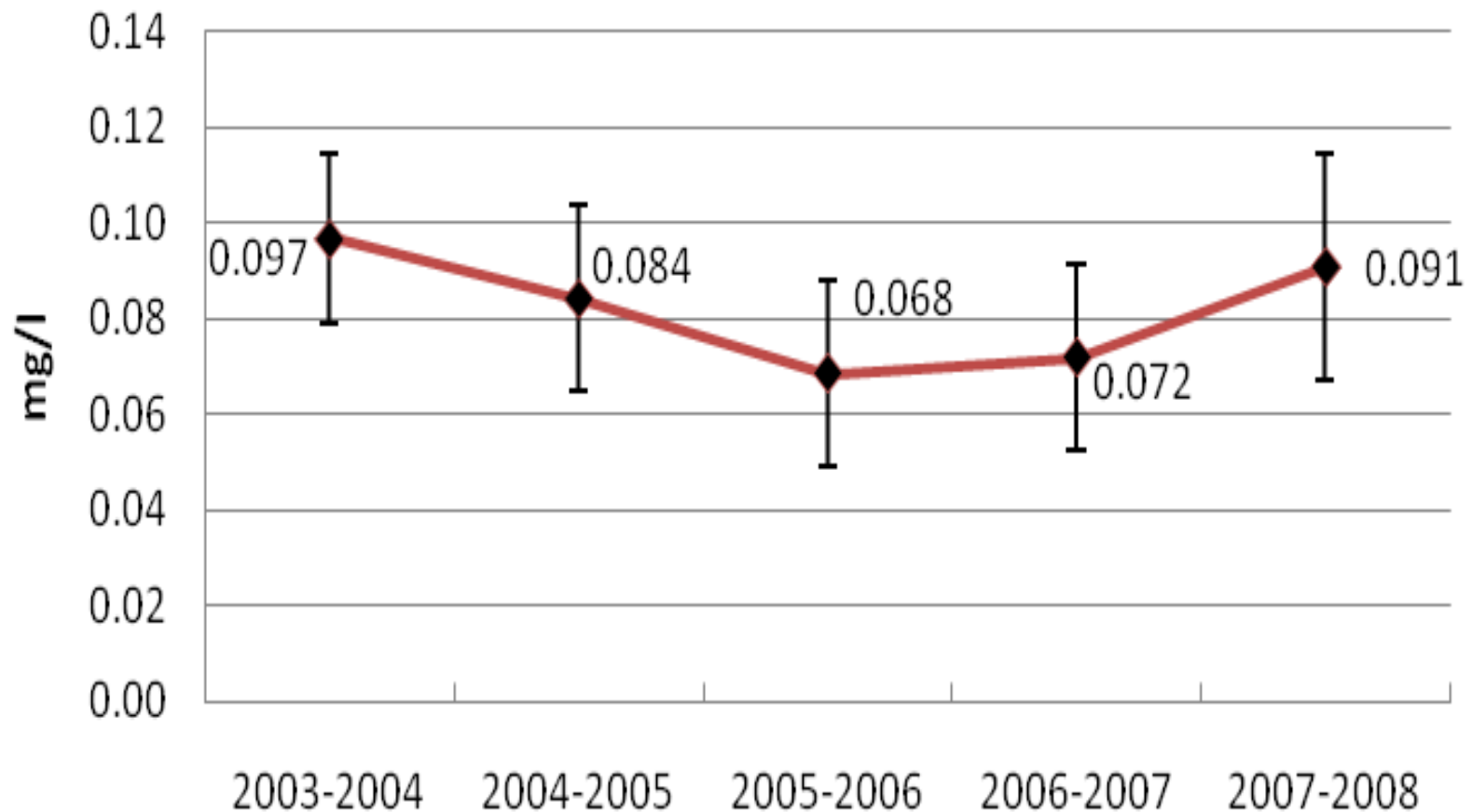
Chlorophyll- α (SE) By Water Year



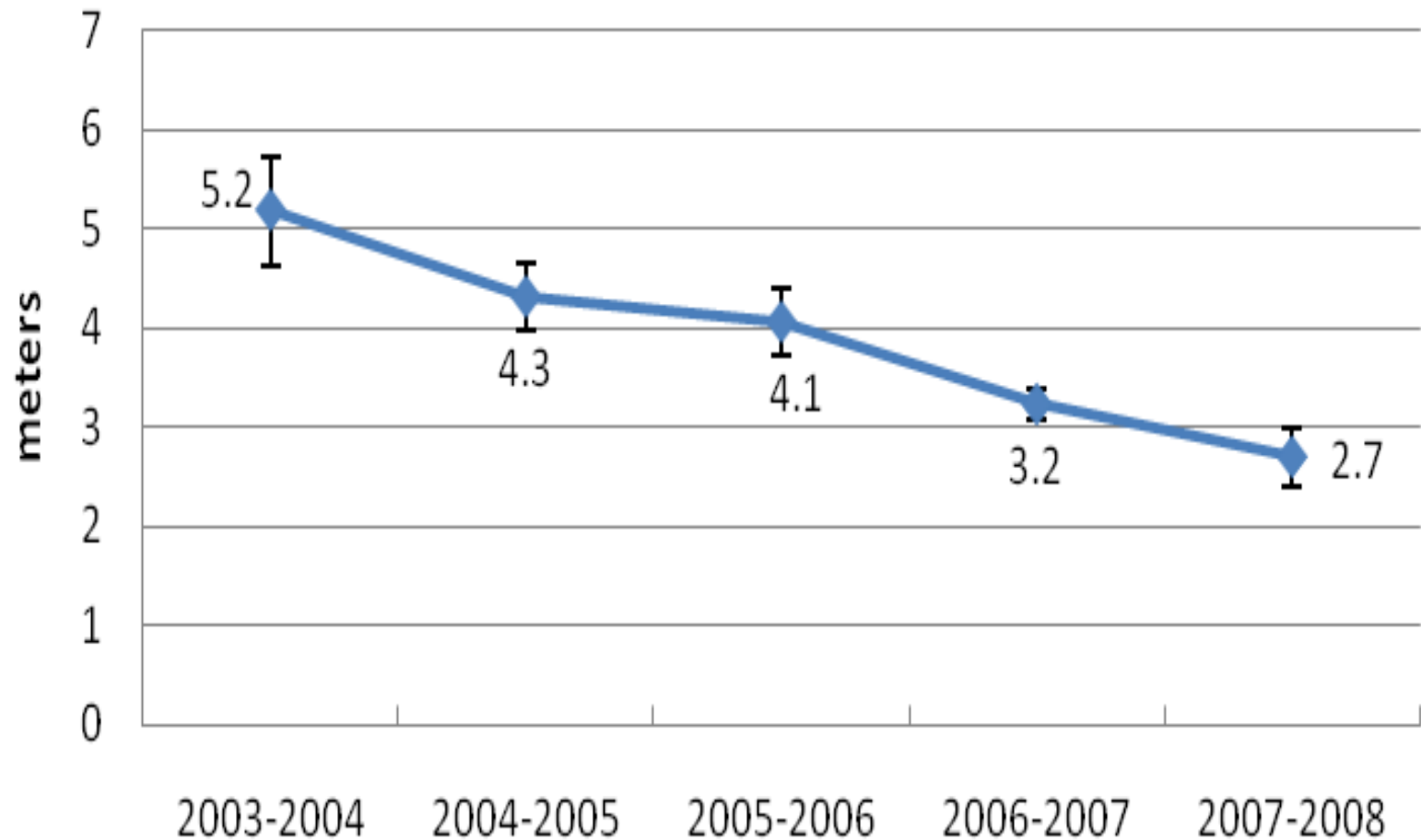
Mean Total Phosphorus (SE) By Water Year



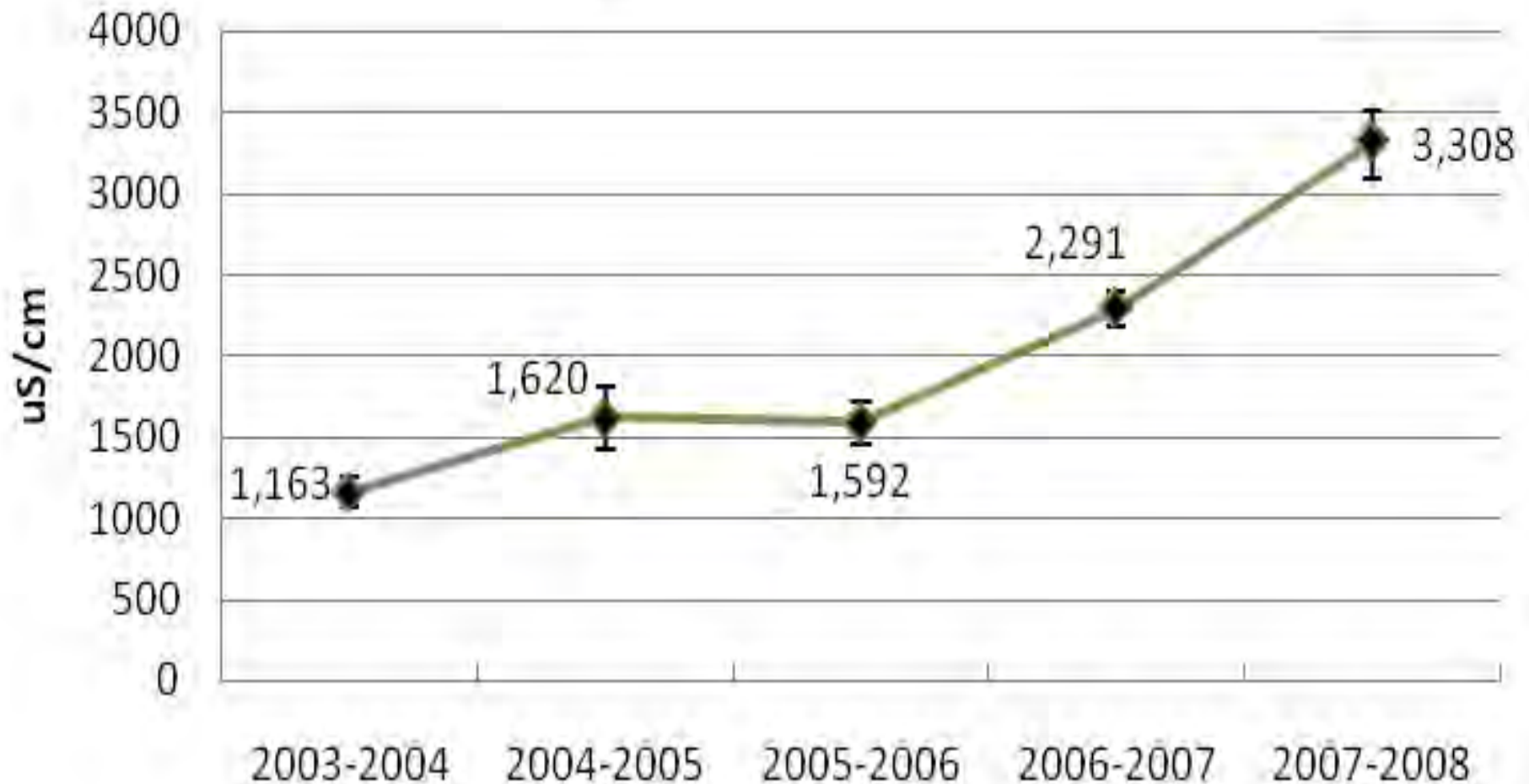
Mean NO_x (SE) By Water Year



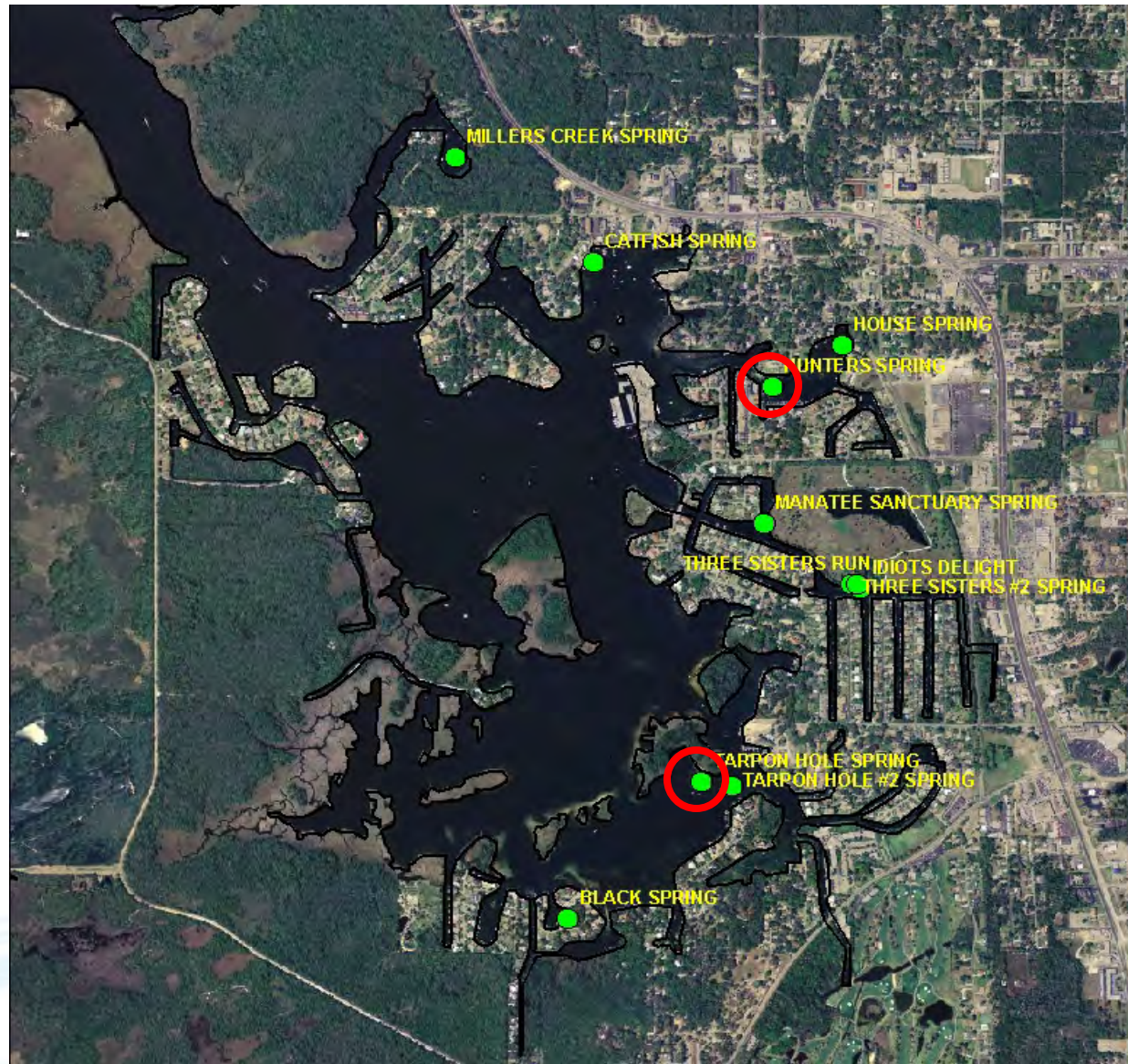
Mean Secchi Distance (SE) By Water Year



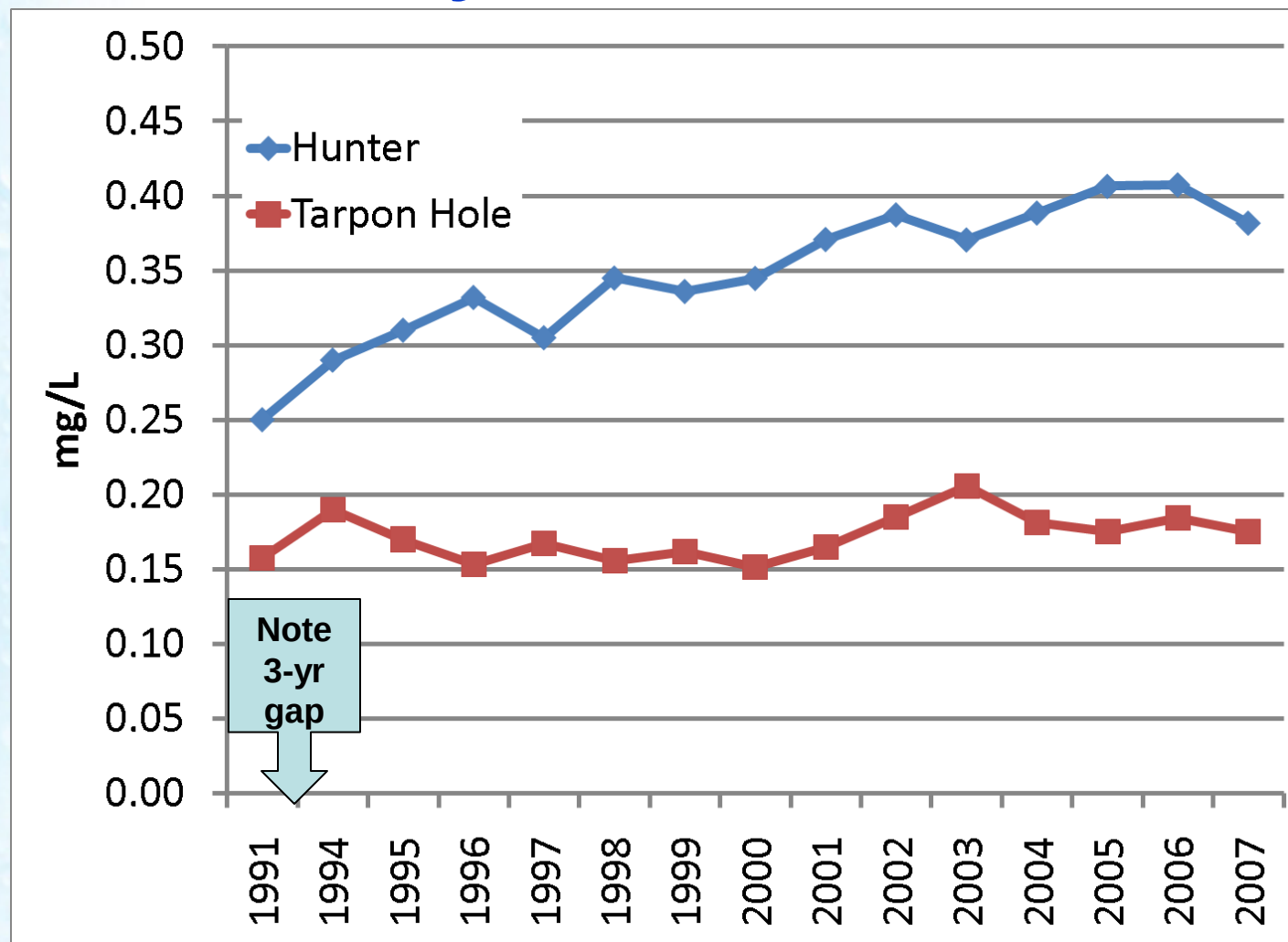
Mean Specific Conductance (SE) By Water Year



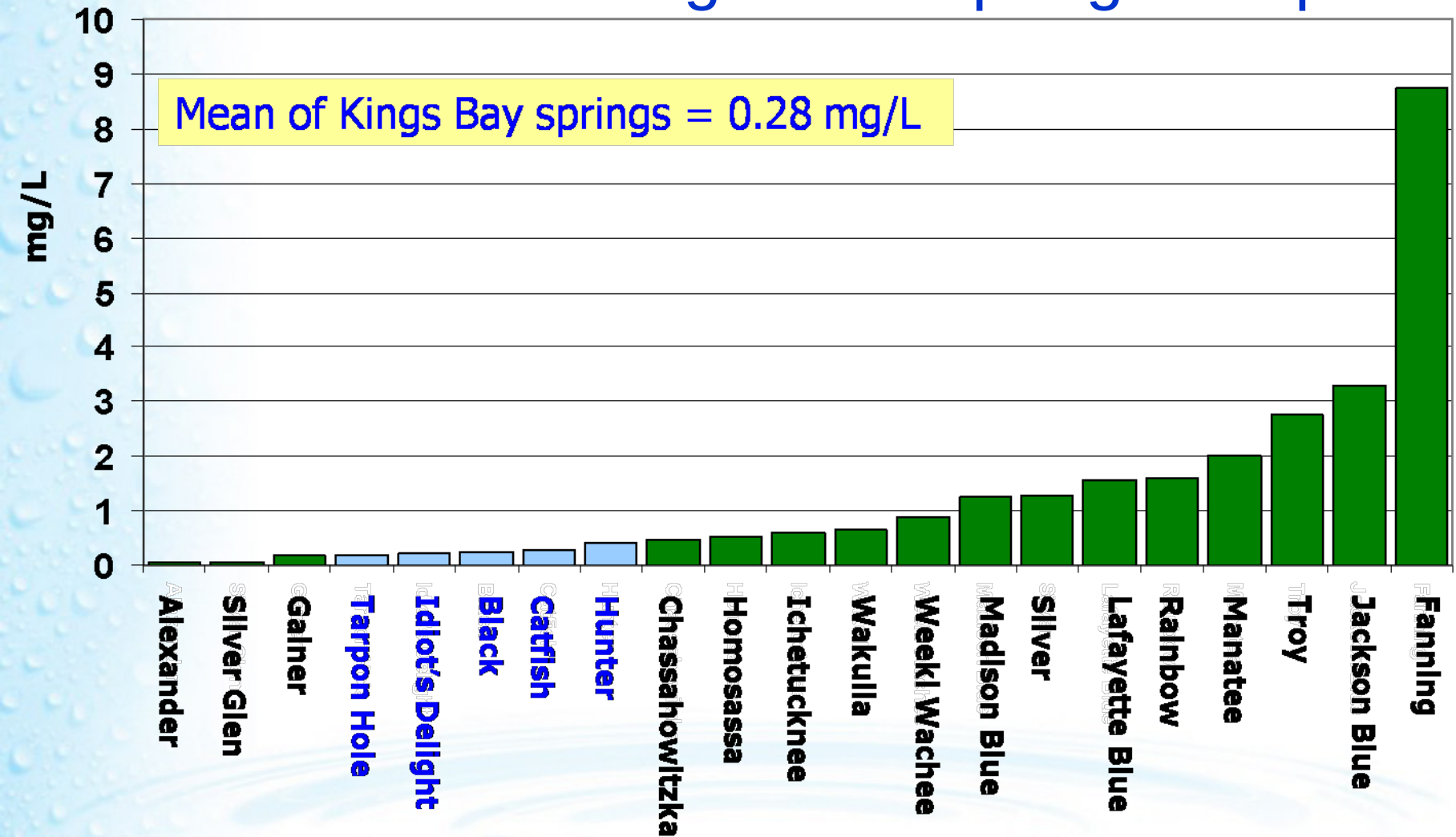
Monitoring Nutrients in Spring Discharge



Mean NOx In Vent Discharge By Water Year



2006 Nitrate Levels of Kings Bay Springs Relative to Other First Magnitude Spring Groups

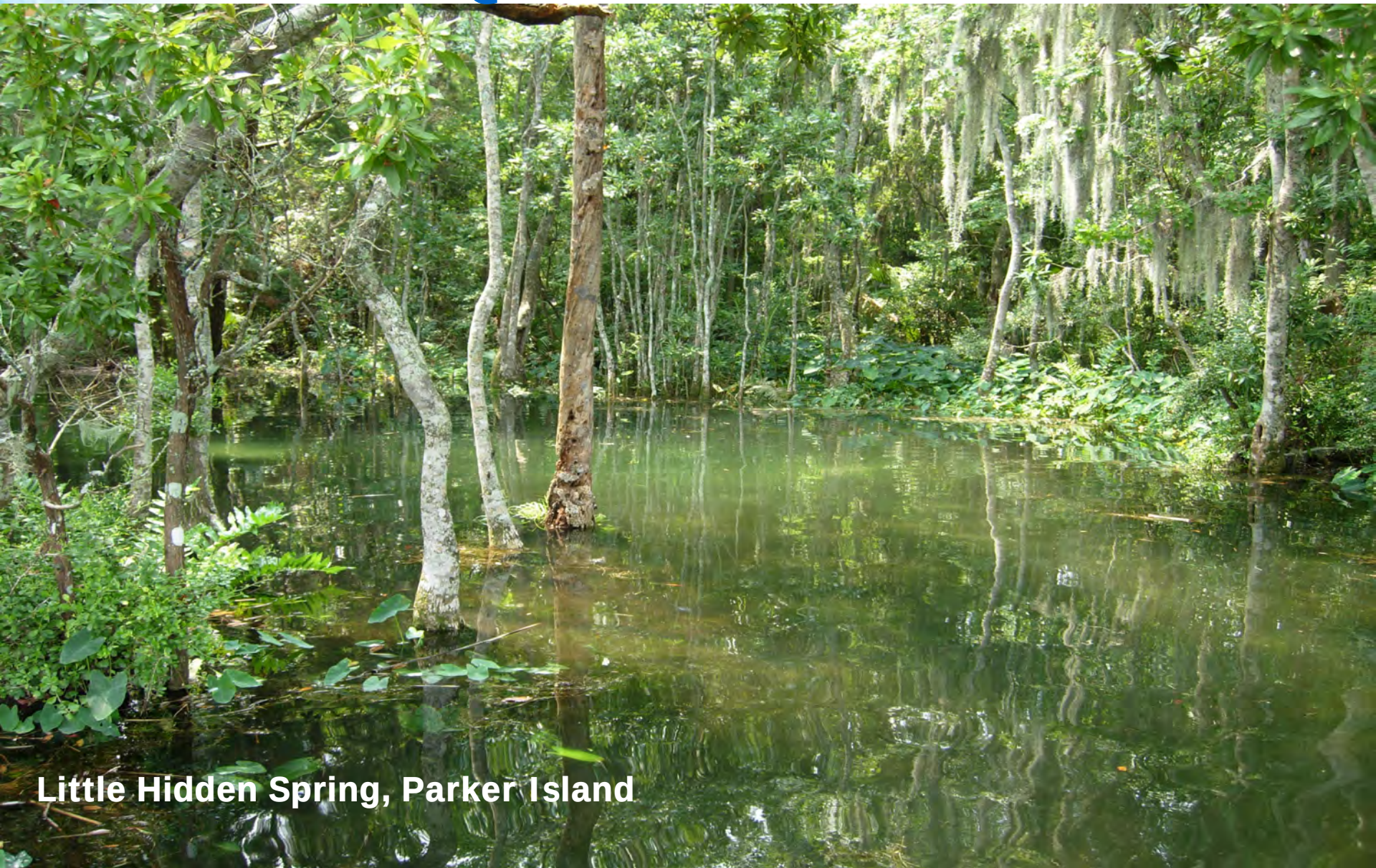


Aquatic Plant Management

- FDEP responsibility, carried out by Citrus County
- Mechanical harvesting of filamentous algae in designated areas
- Chemical control of water lettuce, water hyacinth when needed



Questions?



Little Hidden Spring, Parker Island