

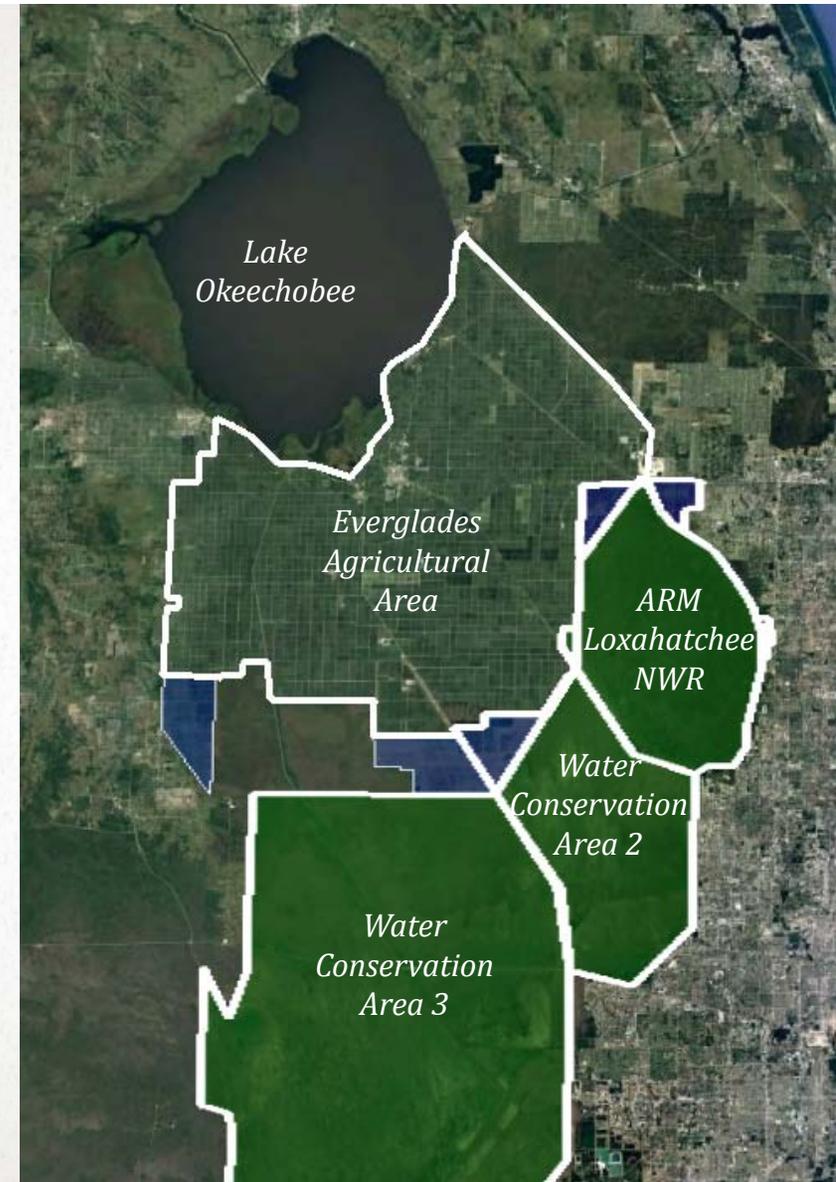
ARM Loxahatchee NWR Enhanced Water Quality Monitoring Program: Water quality status and trends

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TOC October 18, 2016

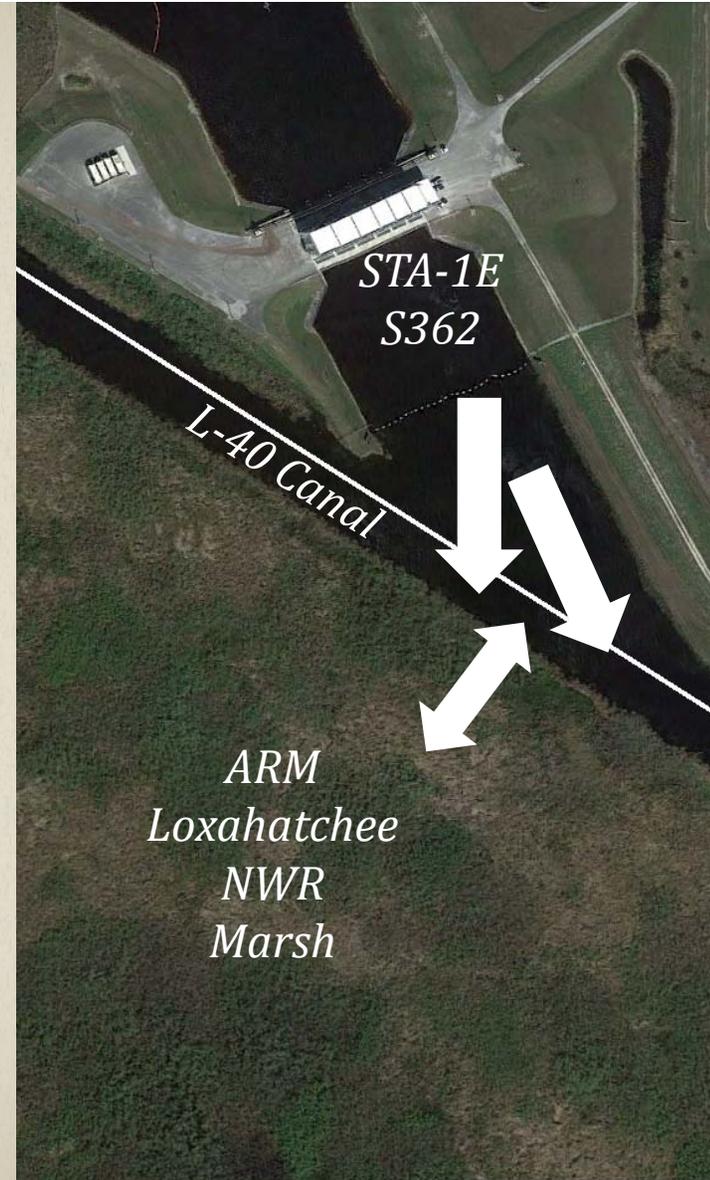
TOPICS COVERED

- Purpose and history
- Monitoring network
- TP status and trends
- Water quality based ecological status



Network purpose and history

- Purpose:
 - Characterize and quantify hydrologic and water quality responses to canal and marsh water interactions
 - Provide management recommendations aimed at reducing canal water intrusion and resulting ecologic impacts
- History
 - Congressional appropriation for 1 year
 - Congress awarded a second year of funding, and the total was spread over a total of 4 years
 - Critical Ecosystem Science Initiative supported the program for seven years



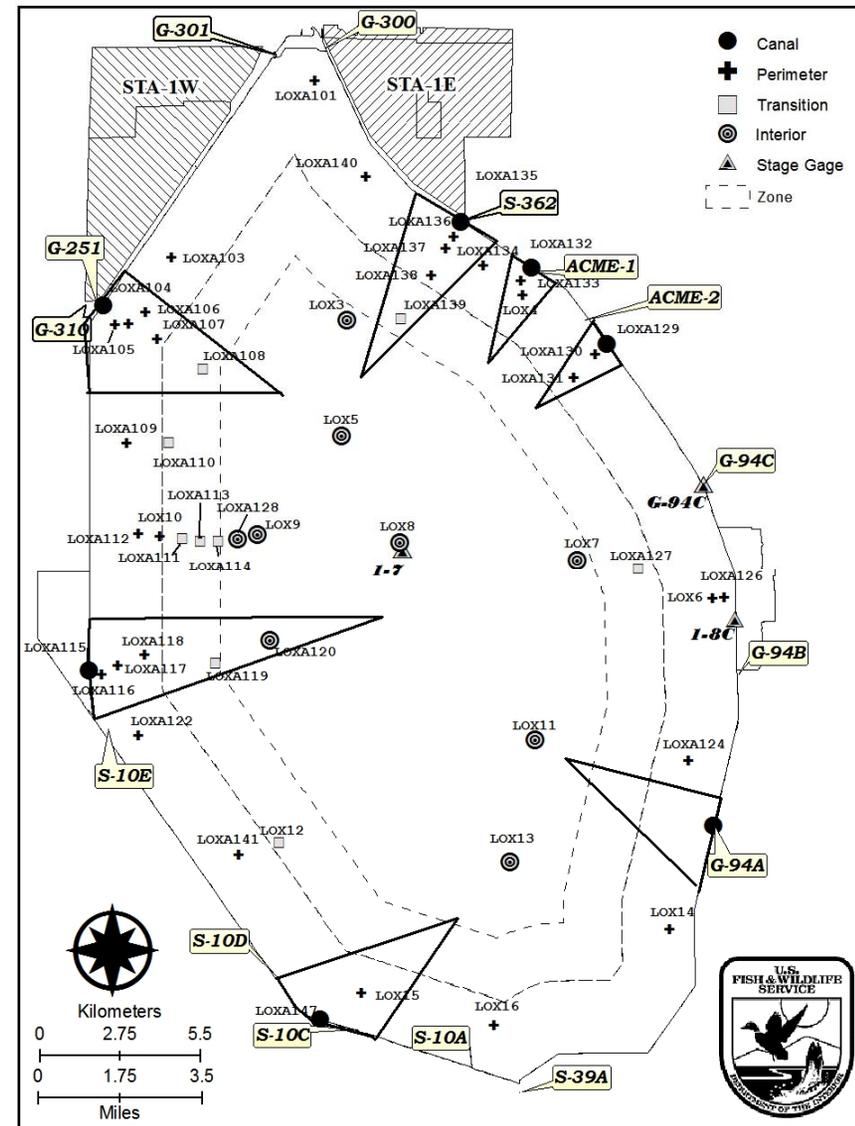
Monitoring network

- Compliance network (solid circle)
 - 14 monitoring station, mostly remote from canal
 - Data collected since at least 1978
 - 30 water quality parameters
- Enhanced monitoring network (asterisks)
 - 37 to 39 monitoring stations, mostly near canal
 - Two stations were lost to overgrowth by cattail
 - Data collected from mid-2004 through Apr 2016
 - 18 water quality parameters
 - Followed sampling protocol from SFWMD
 - Chemical analyses performed by SFWMD through 2006 and CAS thereafter
 - More than 20 site oriented along transects
 - Recording continuous conductivity – tracer of canal water



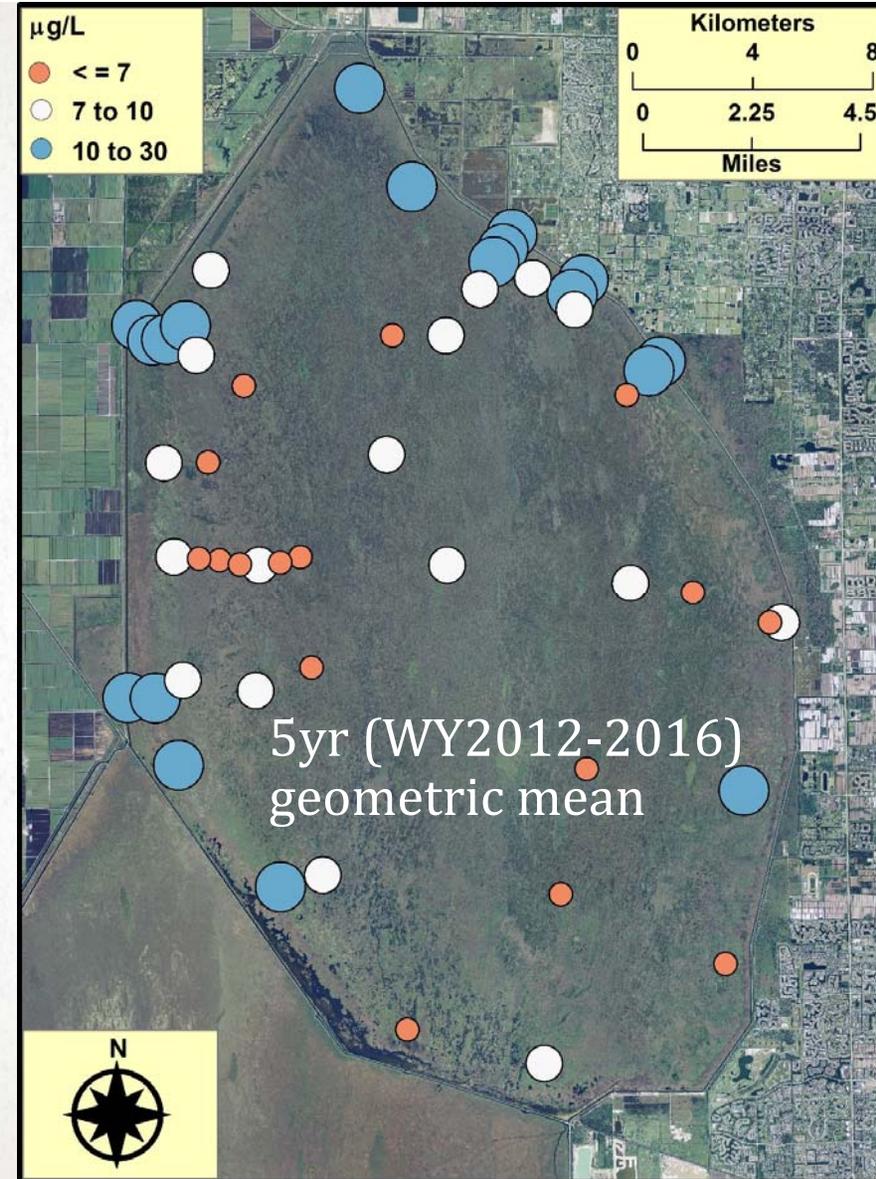
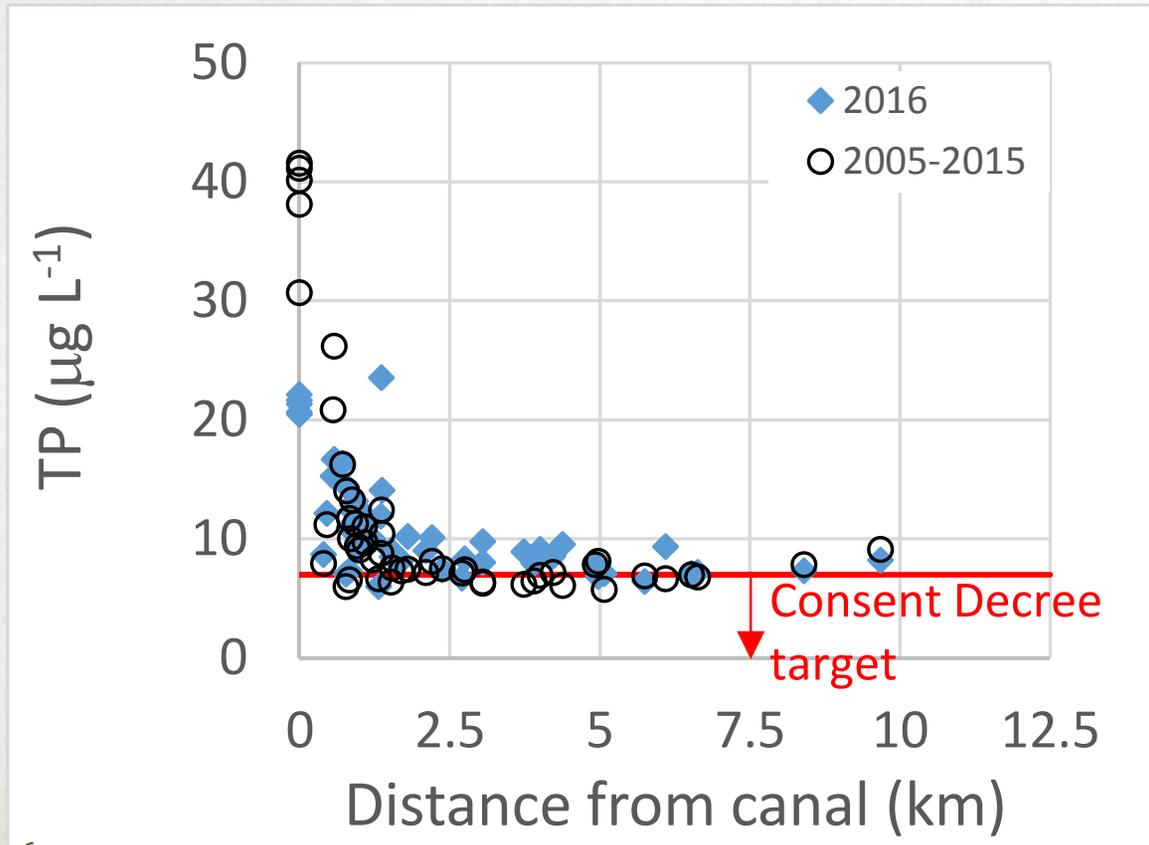
Water quality

- Spatial patterns and status
- Temporal trend



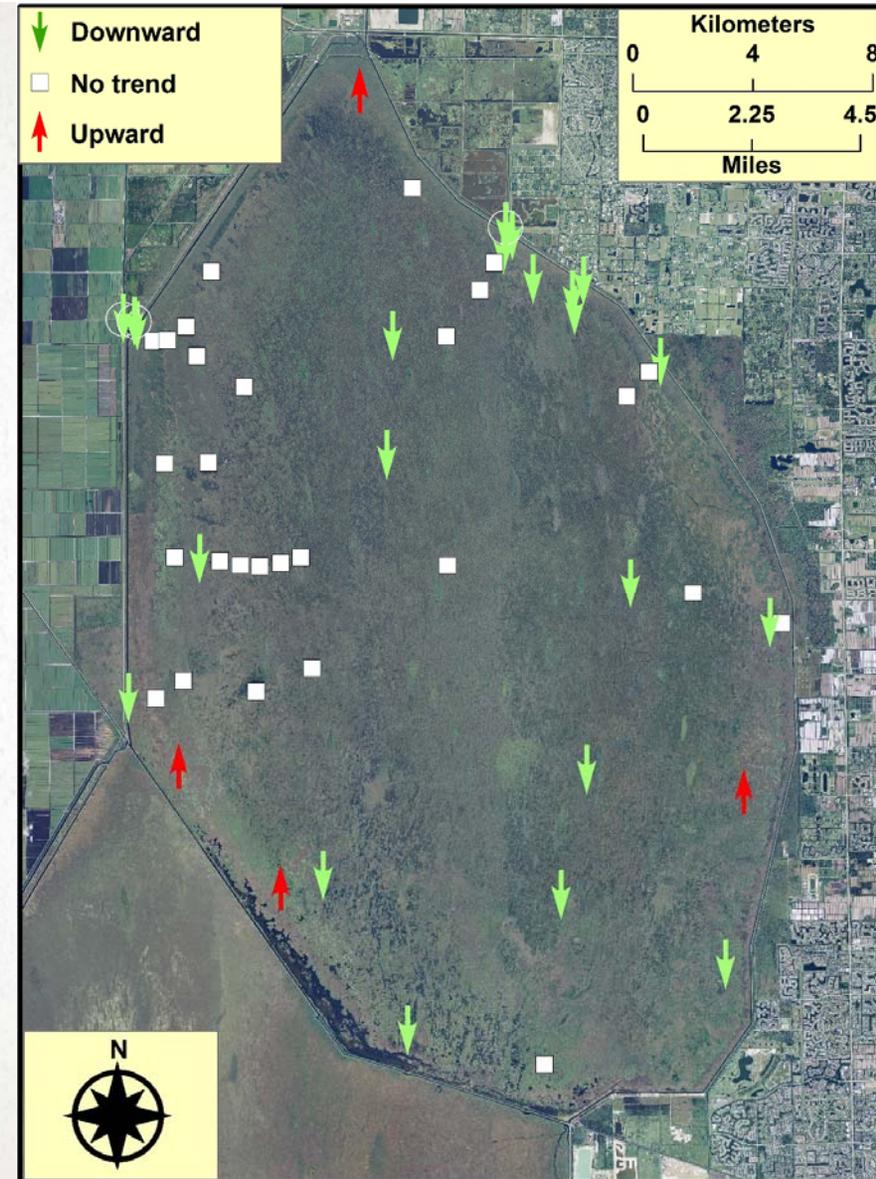
Total phosphorus status

- WY geometric mean TP



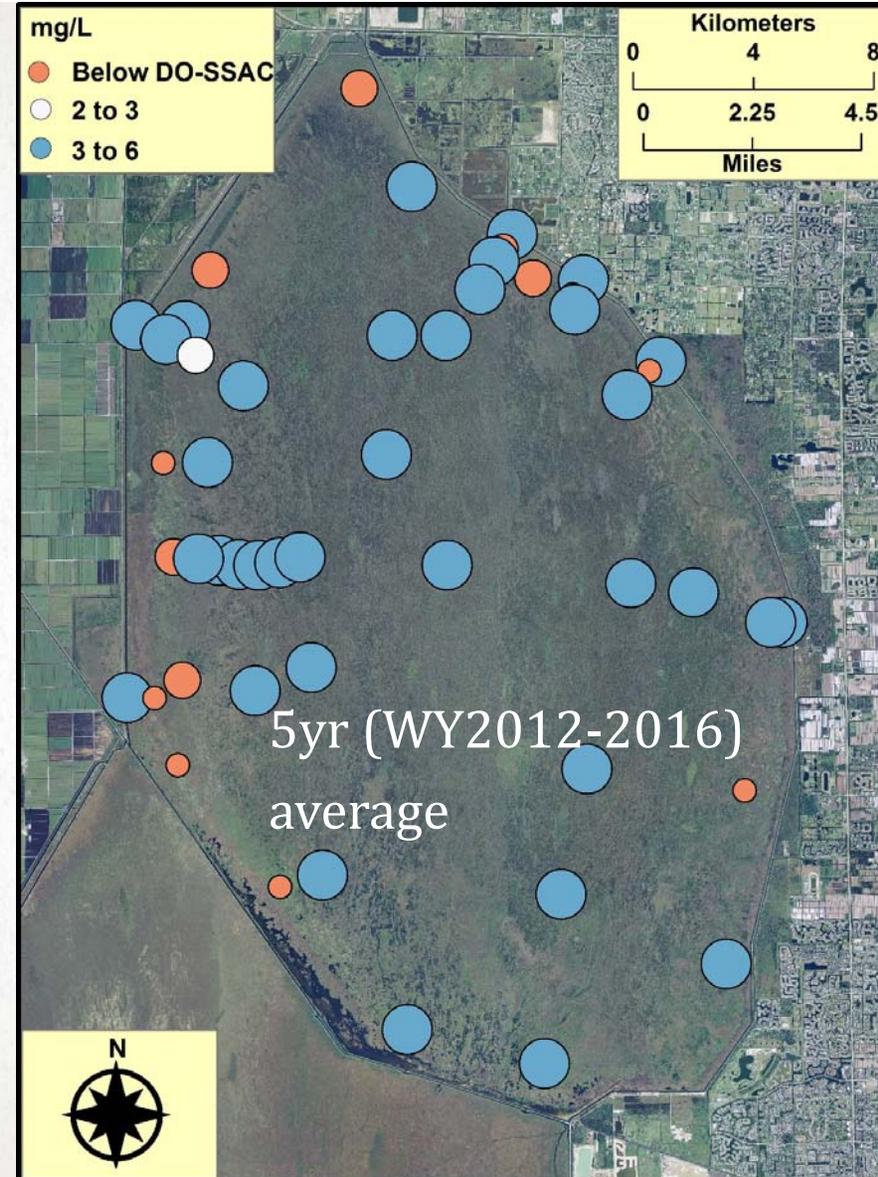
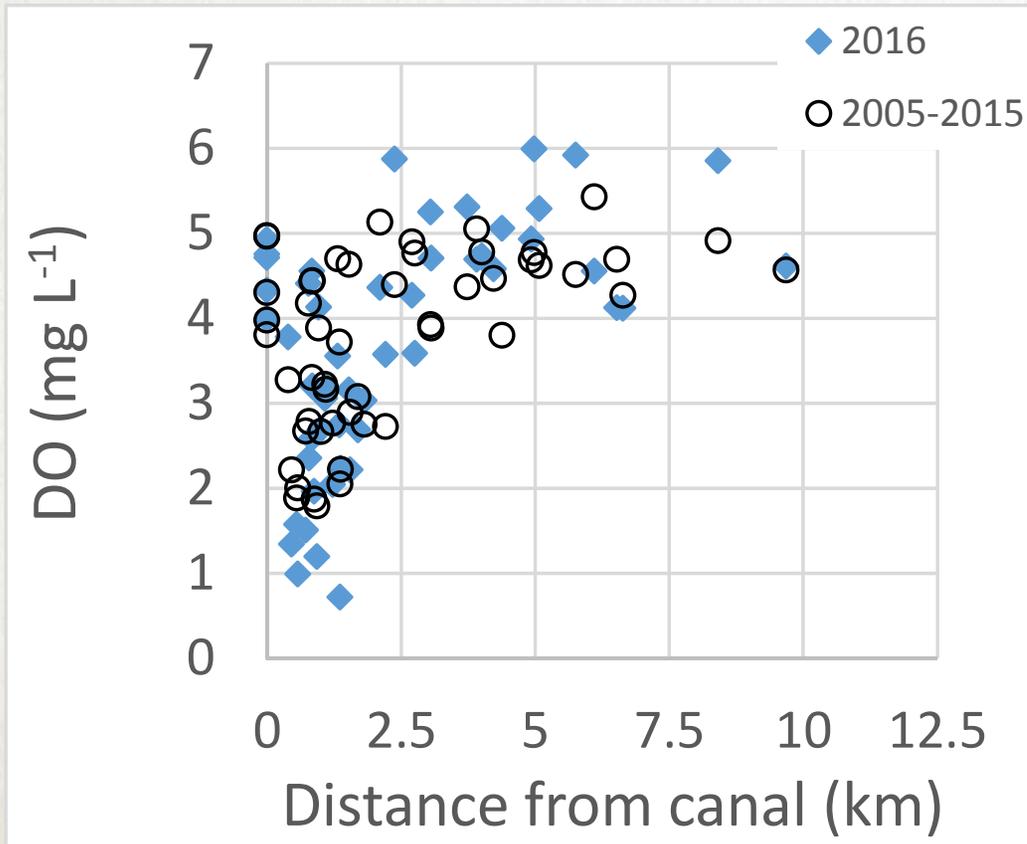
Total phosphorus trends

- Kendall seasonal trend evaluated at $\alpha = 0.1$
- Period of record Jun 2004 – Apr 2016
- STA and canal annual trends declined by between 2 and 4 ppb per year
- Marsh annual trend rates were 1 ppb or less



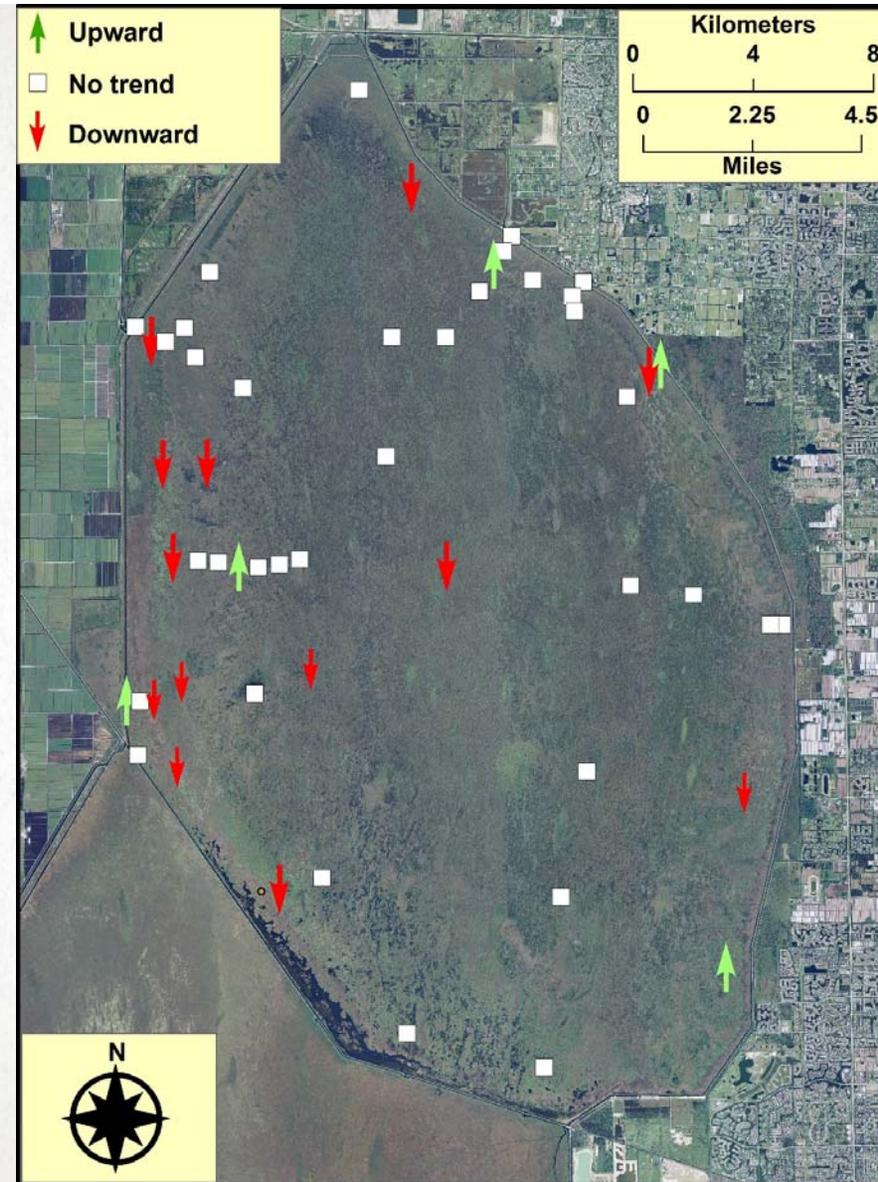
Dissolved oxygen status

- WY average DO



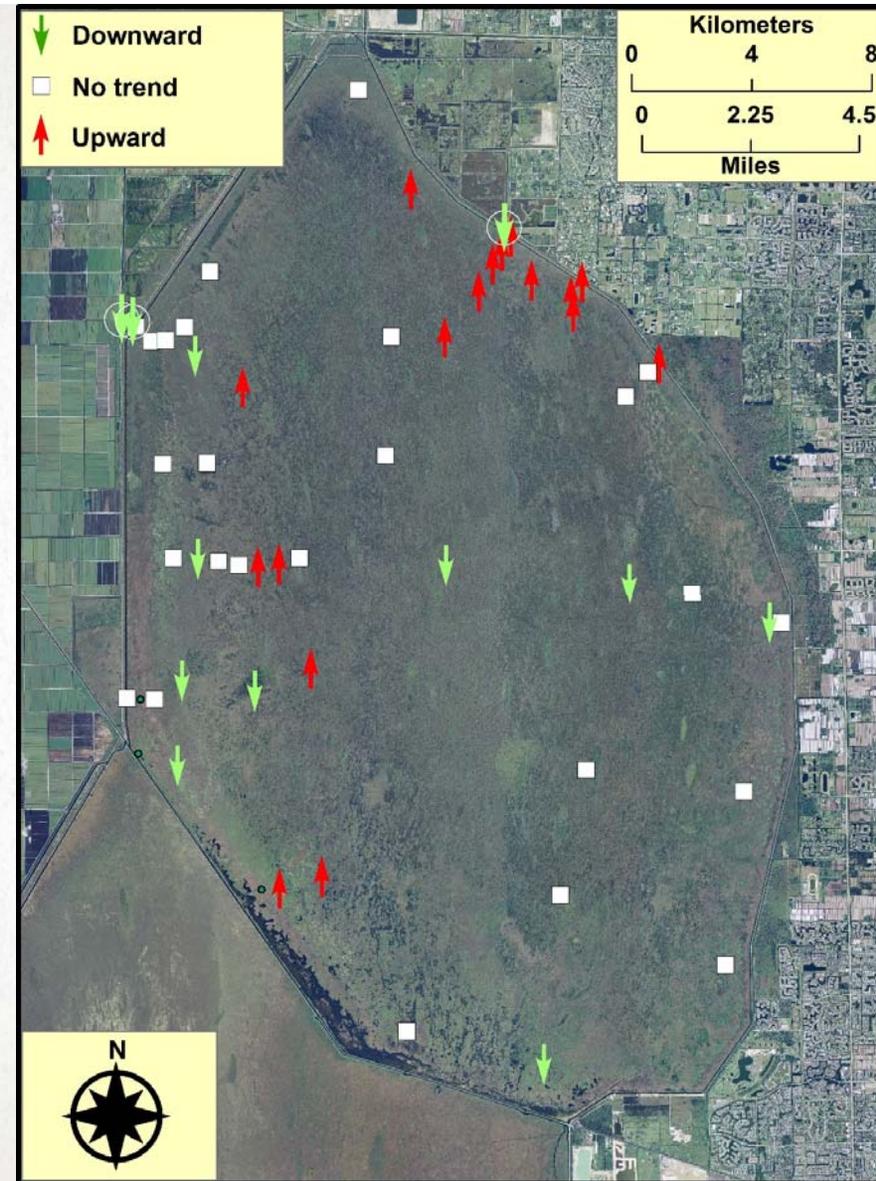
Dissolved oxygen trends

- Annual marsh trend rates were 0.2 mg L^{-1} or less



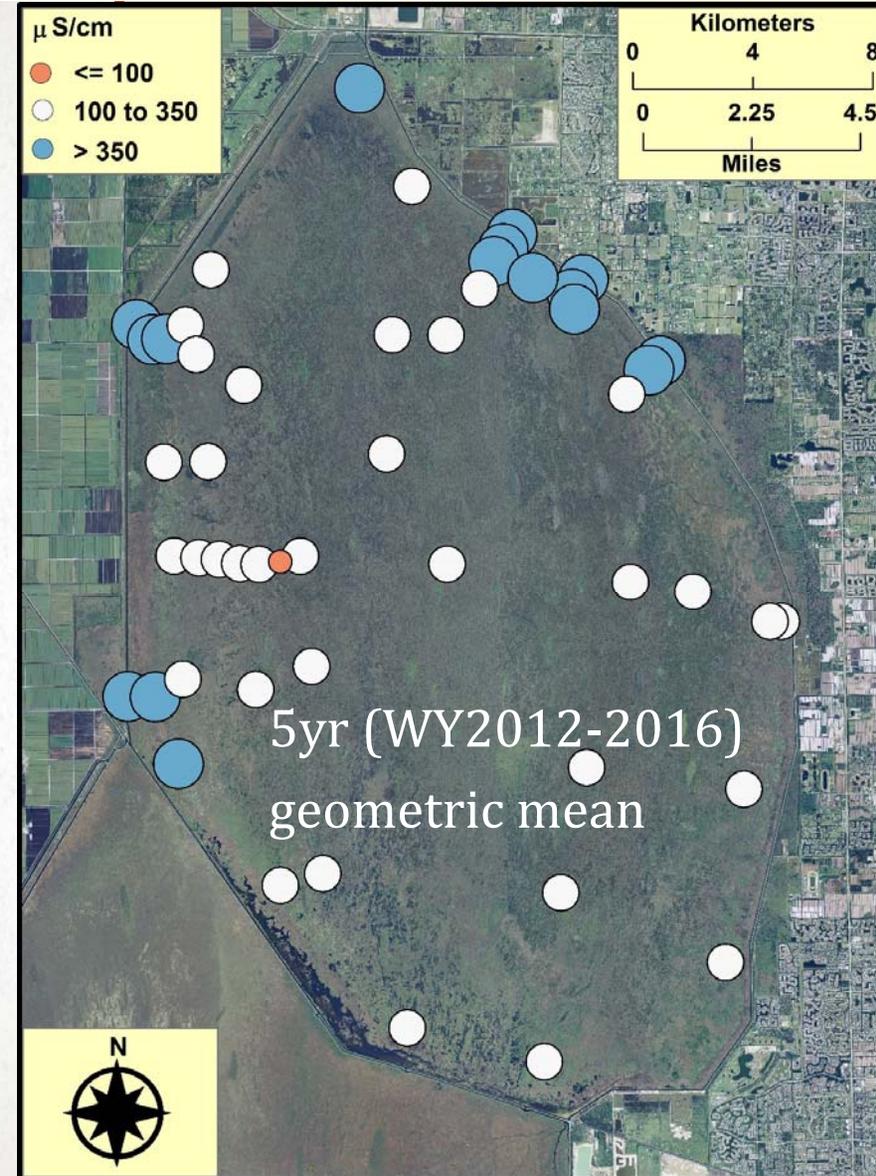
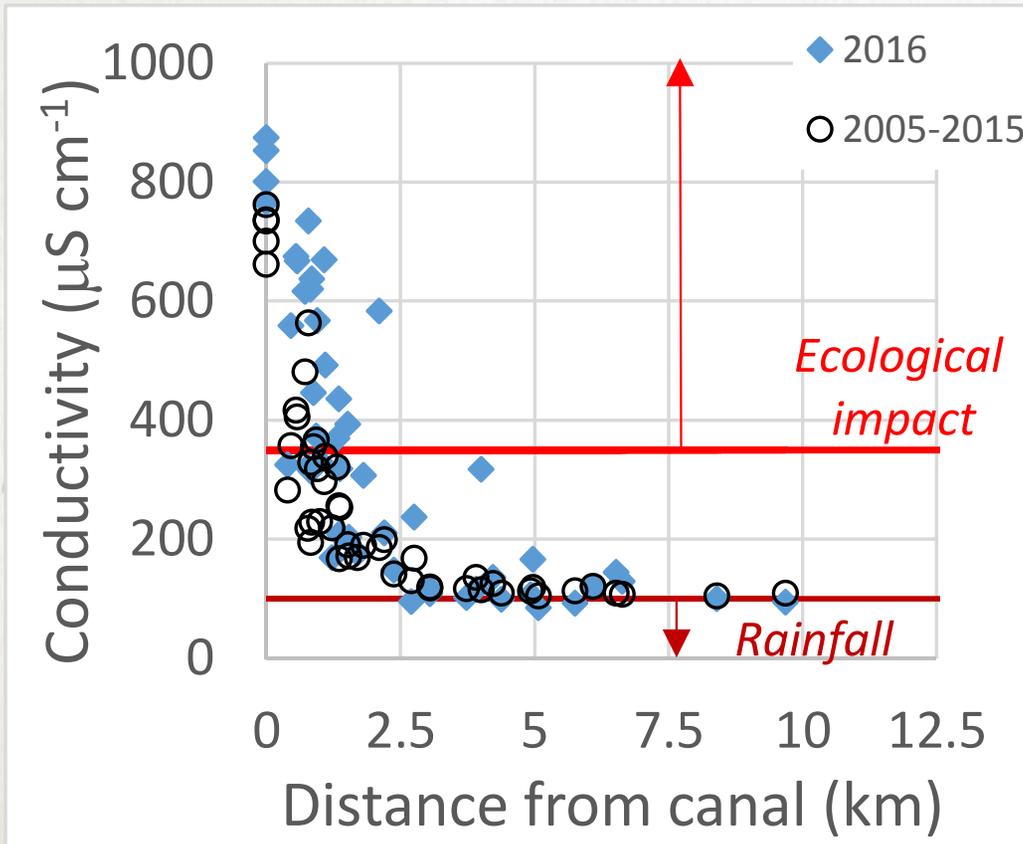
Sulfate trends

- STA annual trend rates ranged 2 to 5 mg L⁻¹
- Canal annual trend rates were about 1.4 mg L⁻¹
- Marsh annual trend rates were less than 1 mg L⁻¹



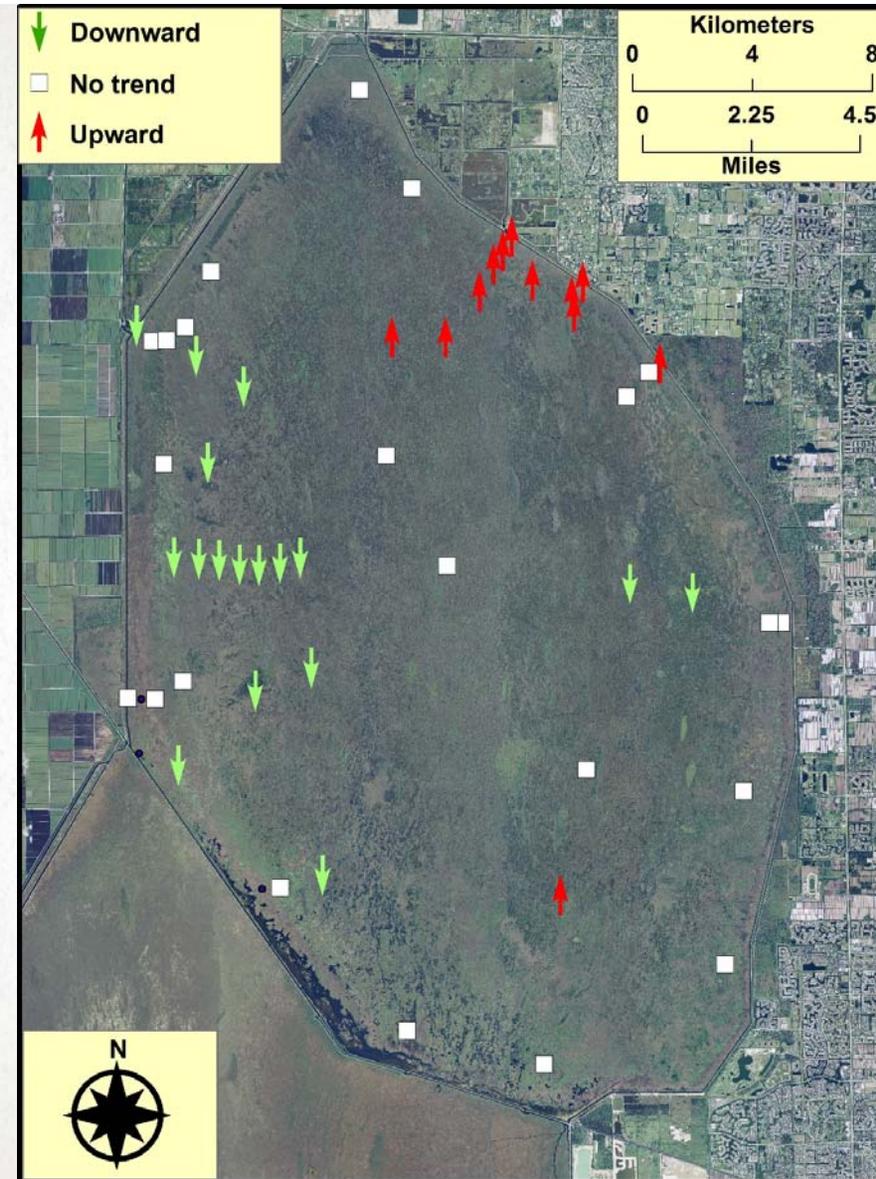
Conductivity status

- WY geometric mean conductivity



Conductivity trends

- Canal annual trend rates
 - Downward: $7 \mu\text{S cm}^{-1}$
 - Upward: ranged 16 through $20 \mu\text{S cm}^{-1}$
- Marsh annual trend rates
 - Downward: ranged 3 through $8 \mu\text{S cm}^{-1}$
 - Upward: 3 through $24 \mu\text{S cm}^{-1}$



Take home points

- TP
 - Interior concentration 10 ppb or less; many less than 7 ppb
 - Most perimeter concentrations greater than 10 ppb
 - Downward trends in inflow, canal, and marsh concentrations
- DO
 - DO-SSAC
 - Interior marsh: greater than
 - Perimeter marsh: less than
 - Many areas have dense vegetation
 - Declining trends on the west side
 - Two sample stations lost to cattail expansion

Take home points

- SO_4
 - MeHg production promotion range
 - Interior marsh: less than
 - Perimeter marsh: within
 - Upward trends downstream of STA1E
 - Downward trends downstream of STA1W
- Conductivity
 - Periphyton composition impact level
 - Interior marsh: less than
 - Perimeter marsh: greater than
 - Upward trends downstream of STA1E
 - Downward trends downstream of STA1W