

Biosolids derived Phosphorus in the St. Johns River Watershed: Implications for Legacy P Impacts

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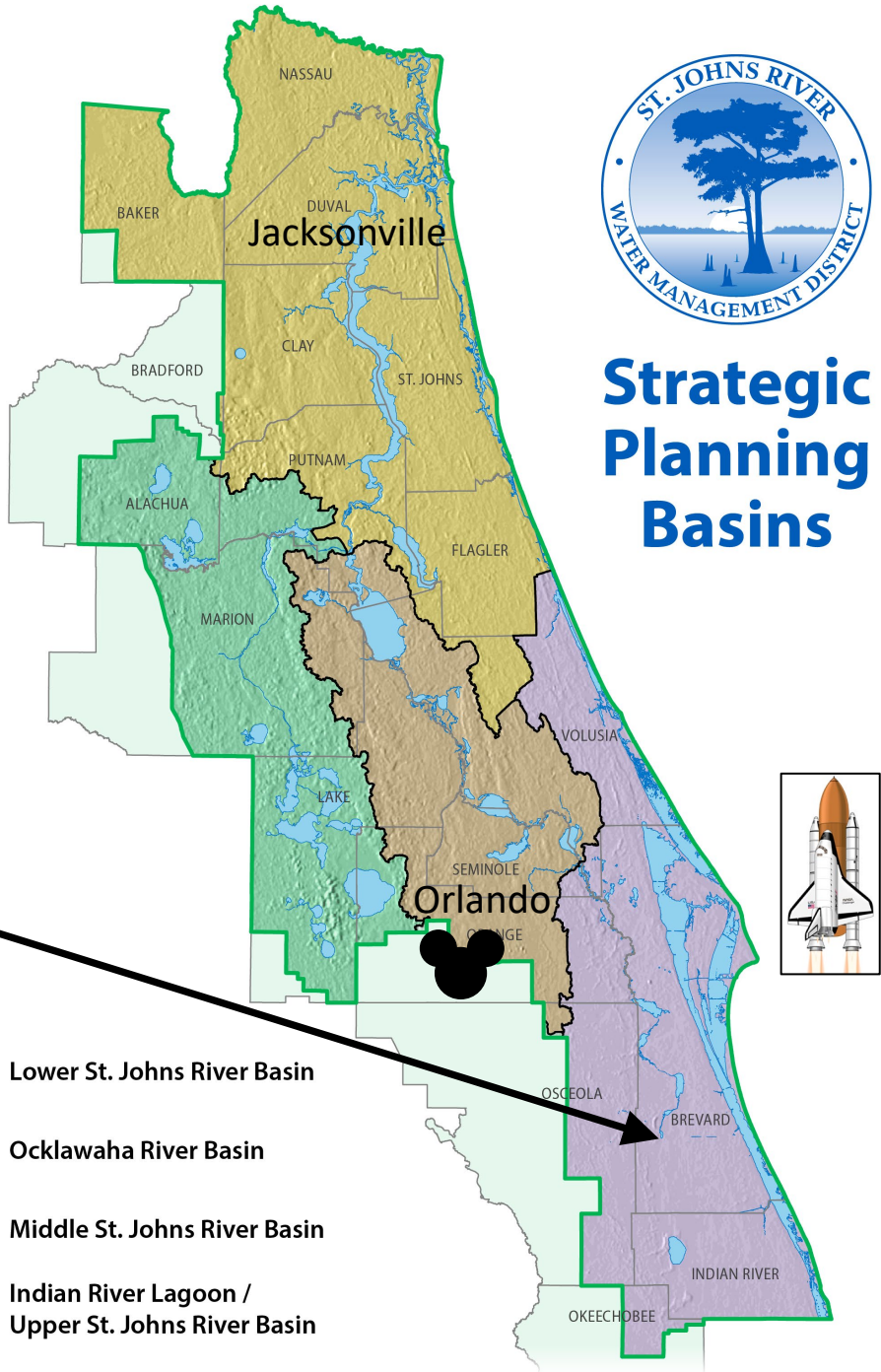


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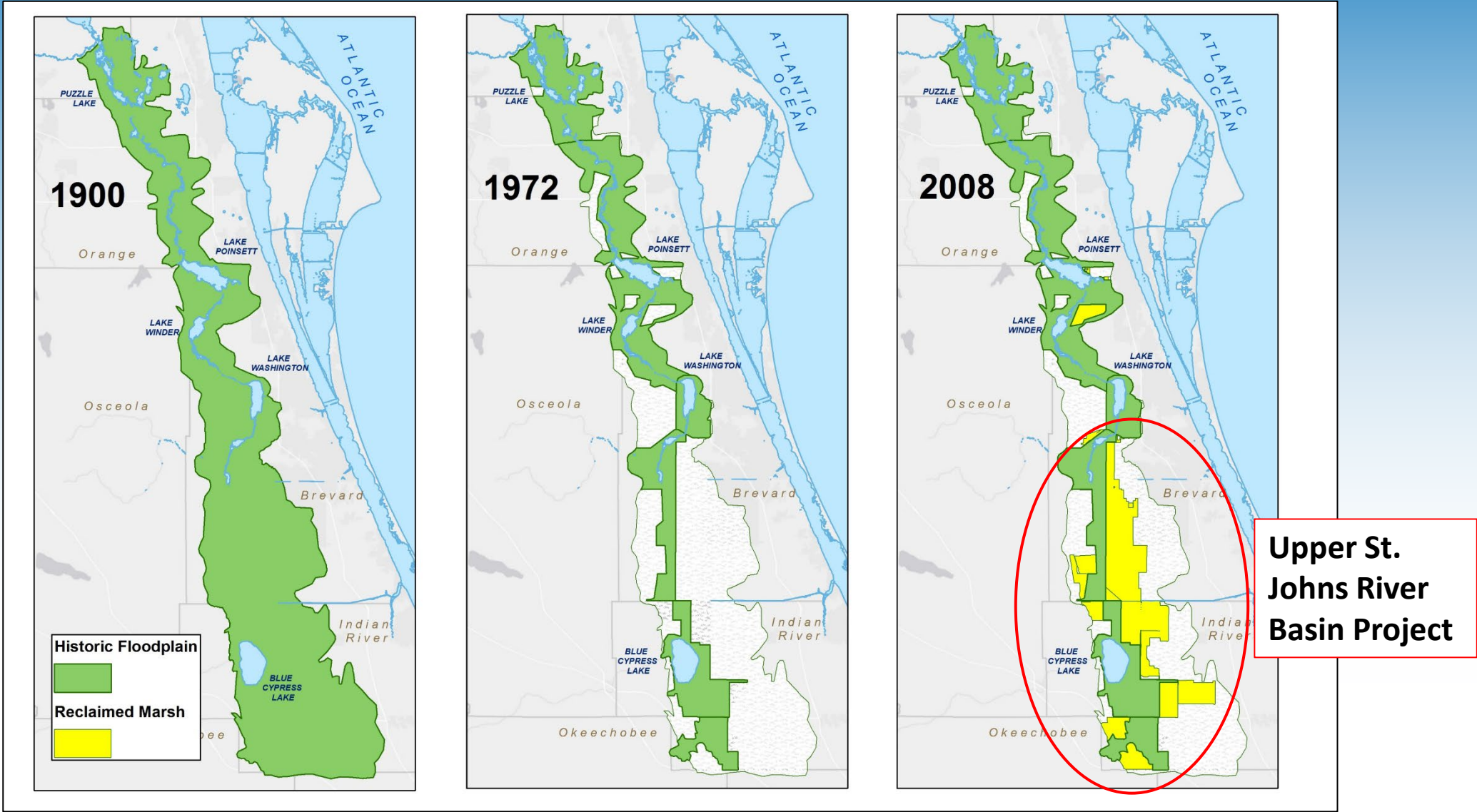
Upper St. Johns River Basin (USJRB)



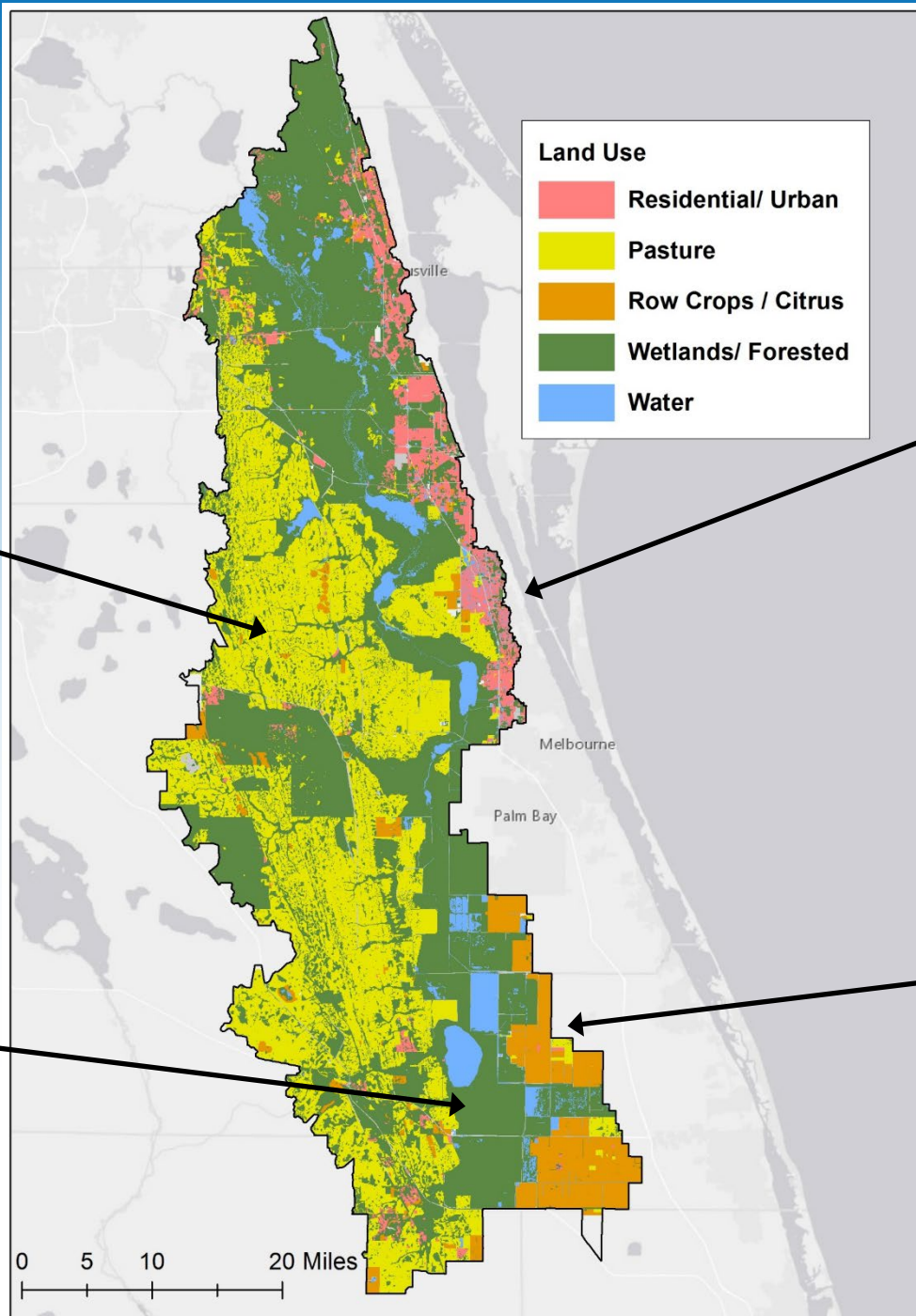
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Reclaiming and Restoring Wetlands

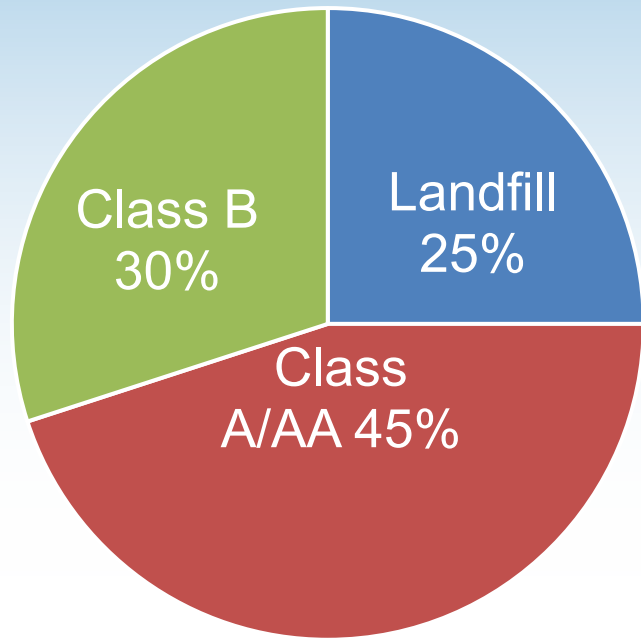


An Agricultural Watershed

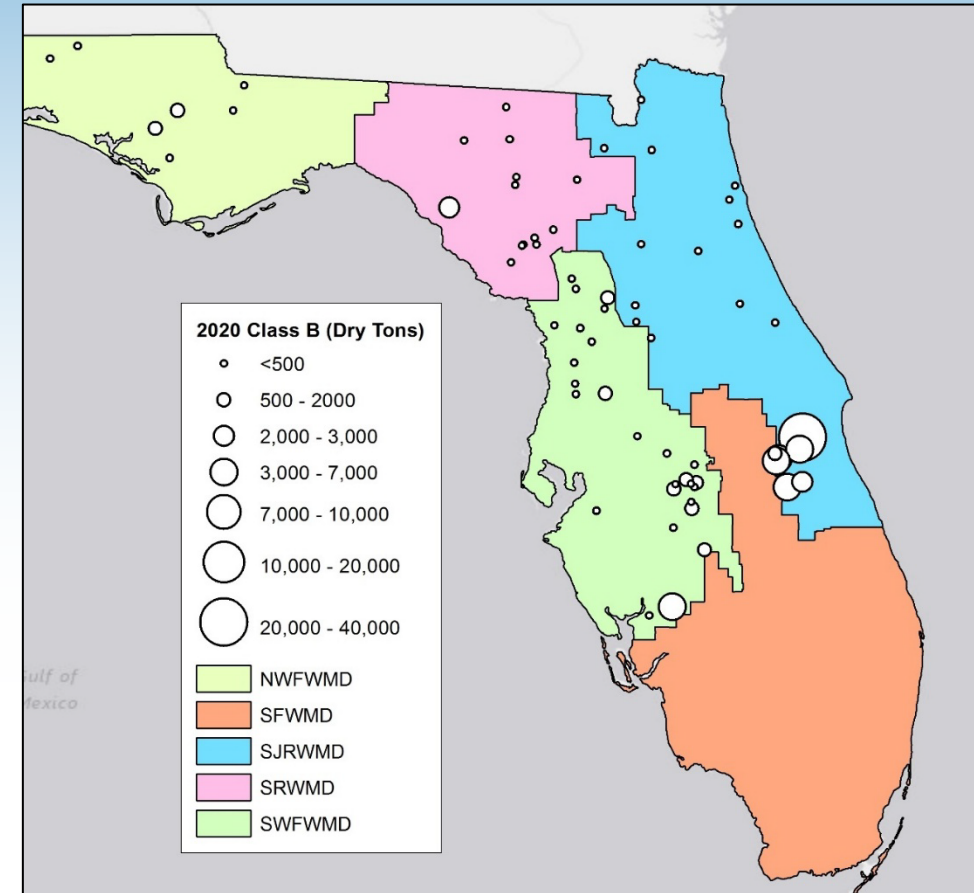


Class B Biosolids in the USJRB

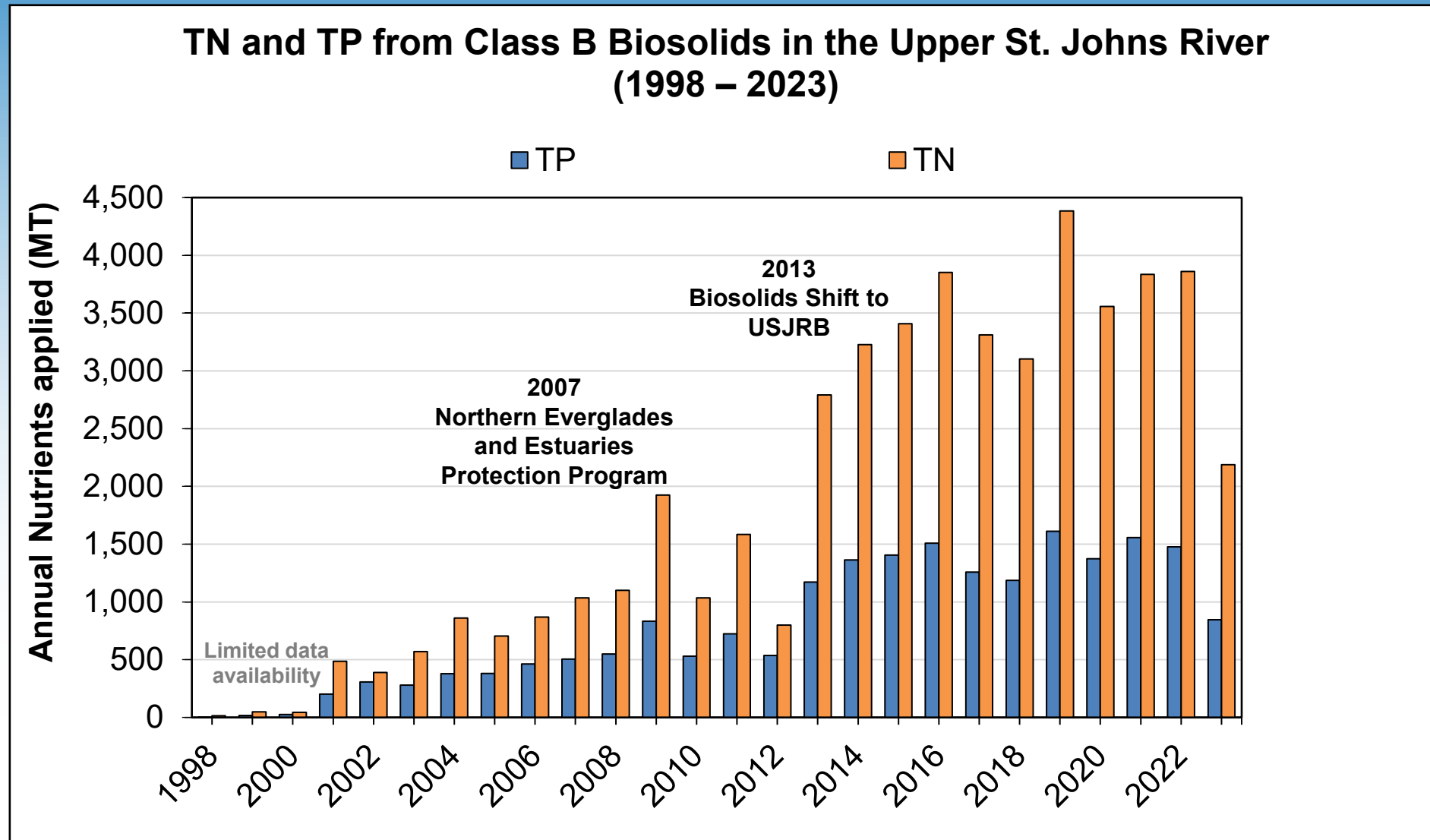
Florida's biosolids
~350,000 dry tons per year
(and growing)



By 2020, 70 – 80 % of all Class B Biosolids generated in Florida was applied to pasture in the USJRB



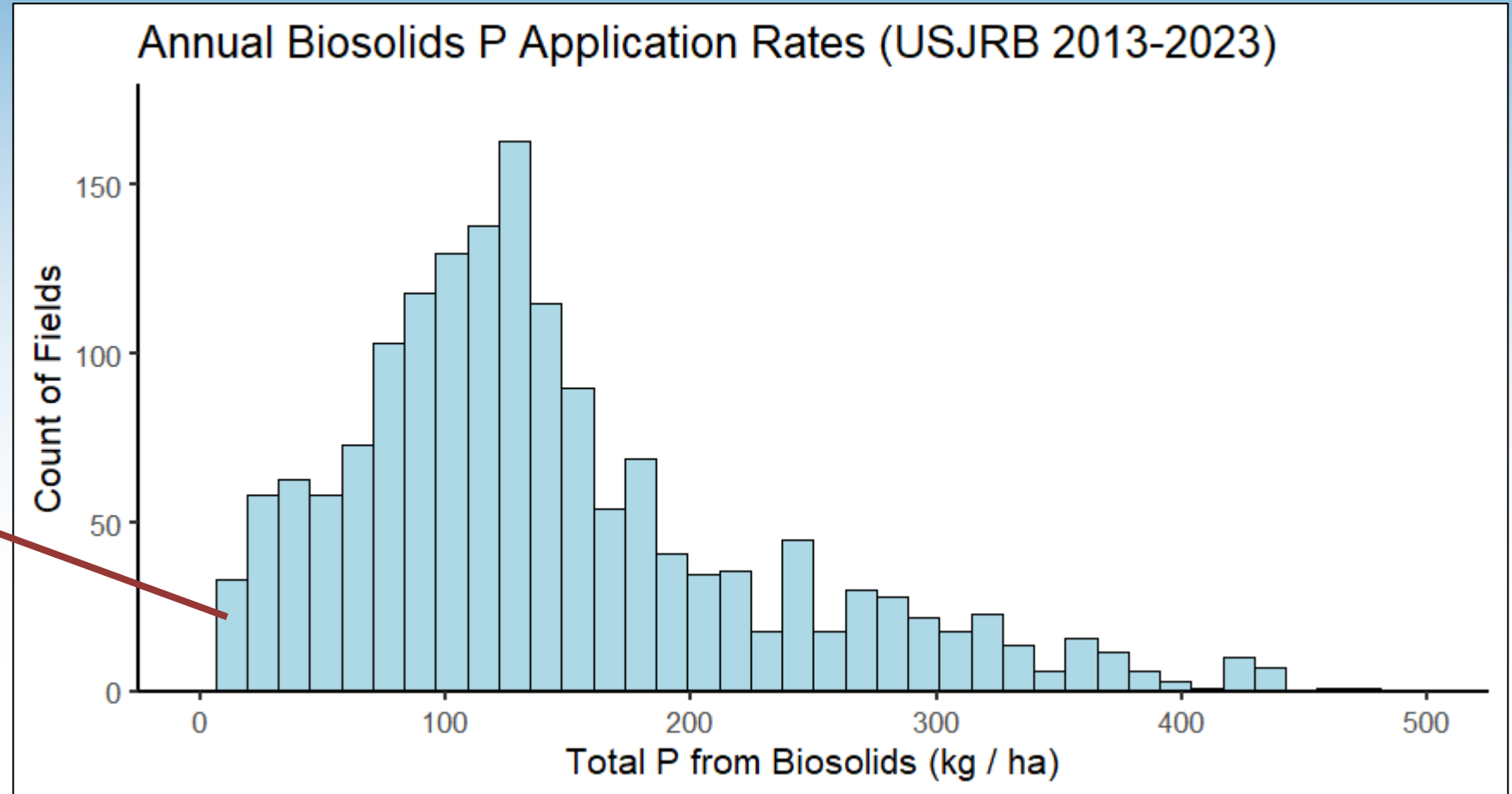
Shift in South Florida Class B Biosolids to the USJRB



Biosolids are an imbalanced fertilizer

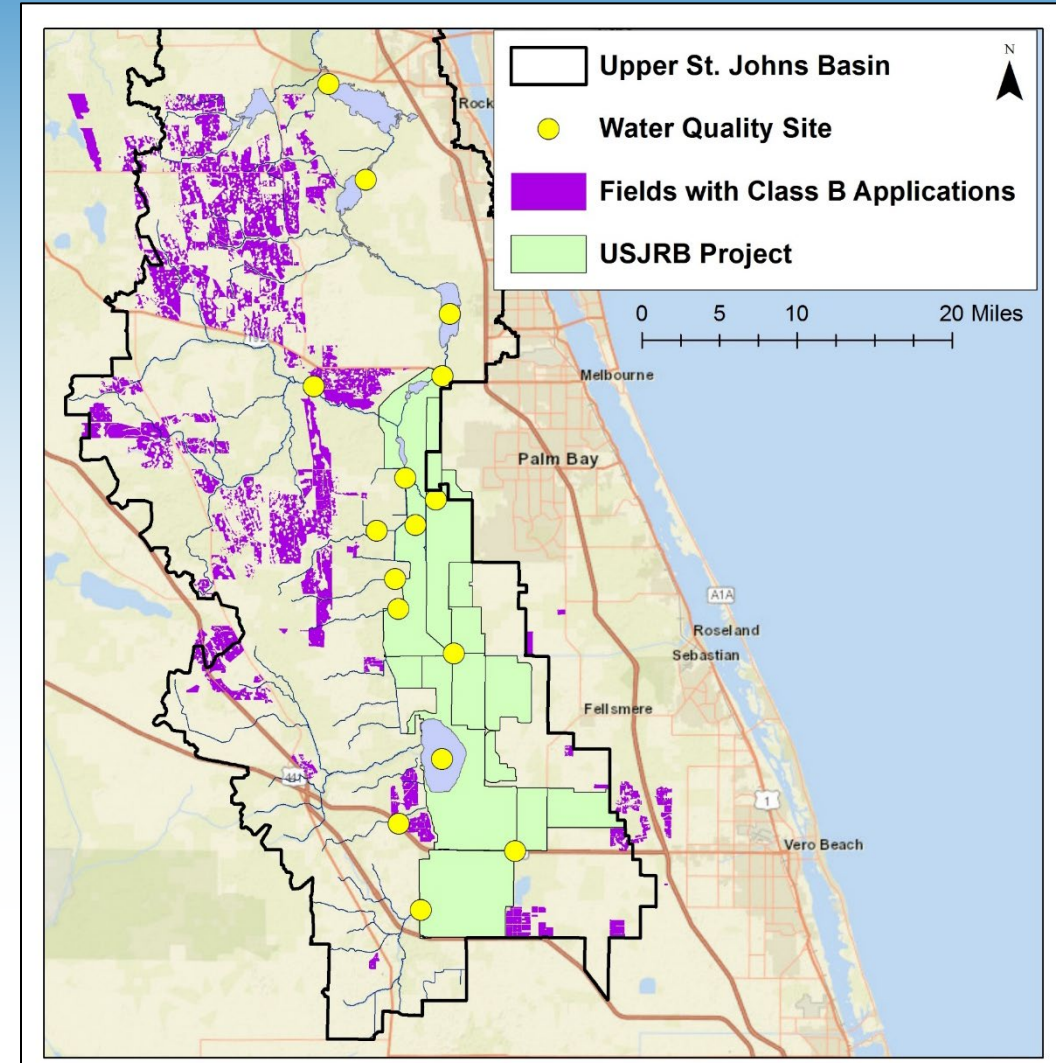
Excess P at N based application rates

University of Florida
Recommended
Bahia grass
fertilization
 $0 - 19 \text{ kg P ha}^{-1}$



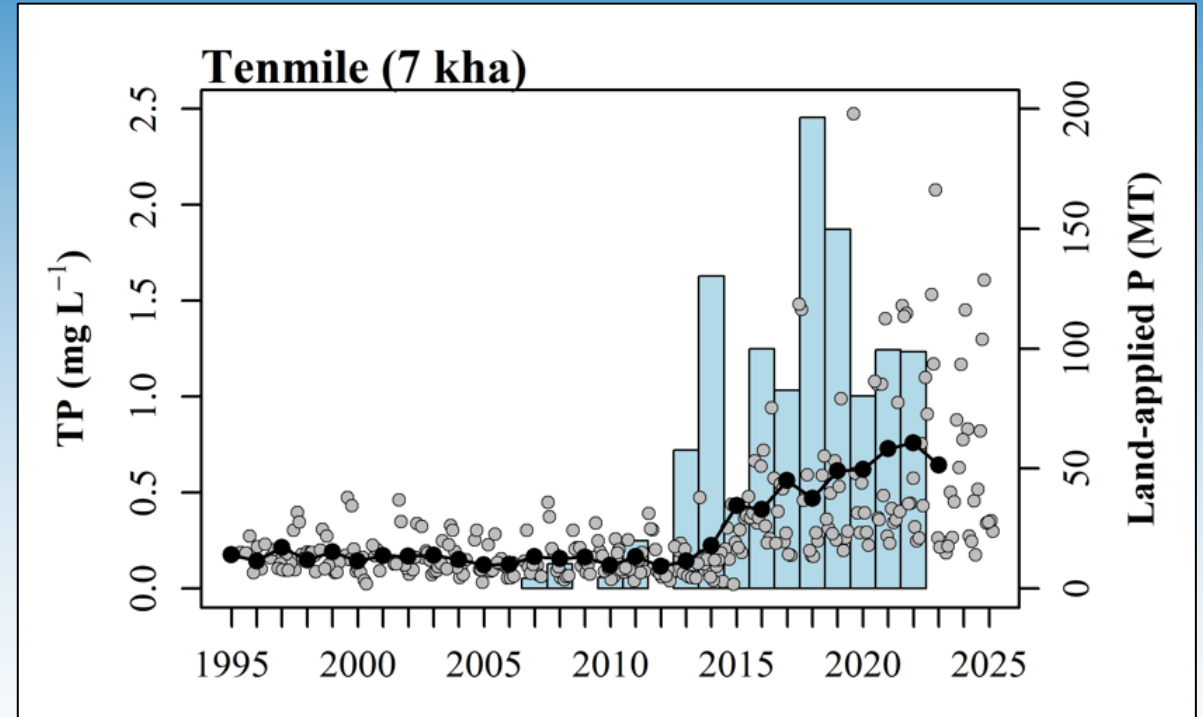
Upper St. Johns River Management Concerns

- Status and Trends analysis showed increasing P in watersheds receiving biosolids
- N & P impairments in the Florida Department of Environmental Protection (FDEP) Impaired Waters Assessment
- Algal Blooms



Watershed Loading Study

- Weighted Regression on Time, Discharge, and Season (WRTDS)
- 8 study watersheds
 - ❑ Timing and magnitude
 - ❑ \uparrow P load 36 MT yr⁻¹
 - ❑ \uparrow N load 32 MT yr⁻¹



Research Article

Trends in phosphorus fluxes are driven by intensification of biosolids applications in the Upper St. Johns River Basin (Florida, United States)

Andy Canion , Victoria Hoge, John Hendrickson, Thomas Jobes & Dean Dobberfuhl

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Canion et al., 2022. *Lake and Reservoir Mgmt.* 38(3) 215–217.



Class B Biosolids Applied Research & Response

2015 - 2017

Initial District Data
Collection & Analyses,
FDEP discussions



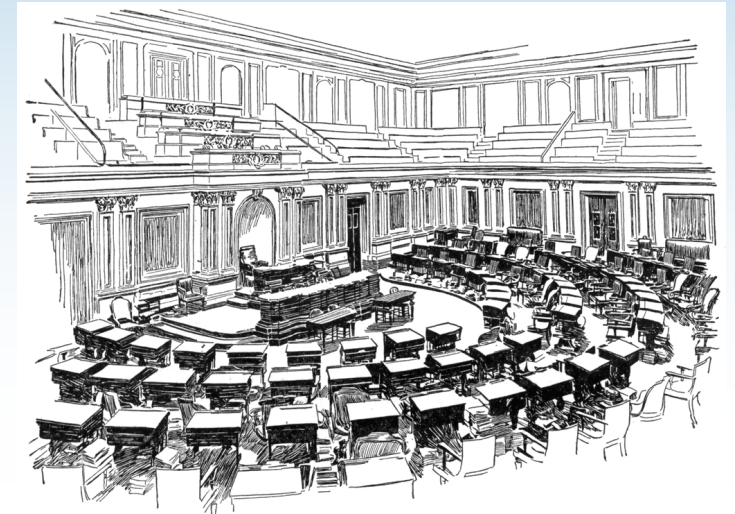
2018 - 2019

FDEP Biosolids Technical
Advisory Committee



2020 - 2023

Florida Legislature
adopts new FDEP land
application rules



FDEP-funded Biosolids Investigation

Large
Watersheds

Expanded Water Quality Sampling

Field Scale Data Collection

Remediation Pilot

Small
Watersheds

Edge of field and
Groundwater

Soils

ECT

APPLIED
ECOLOGY

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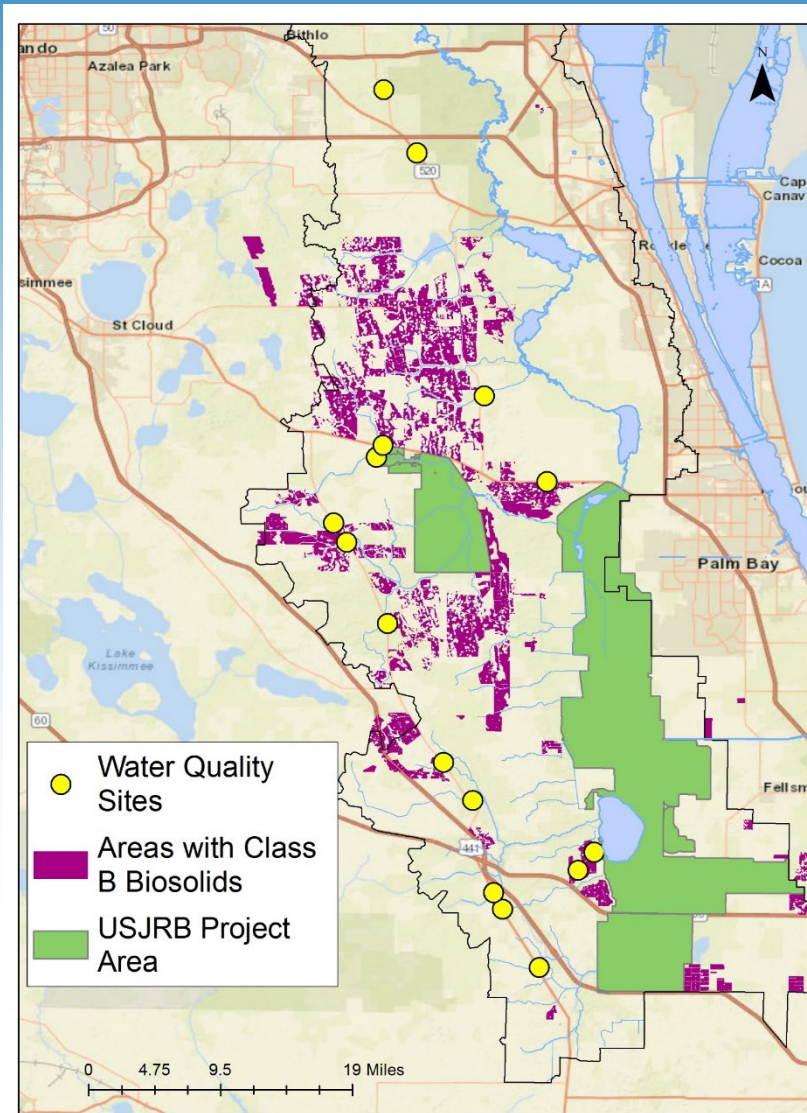
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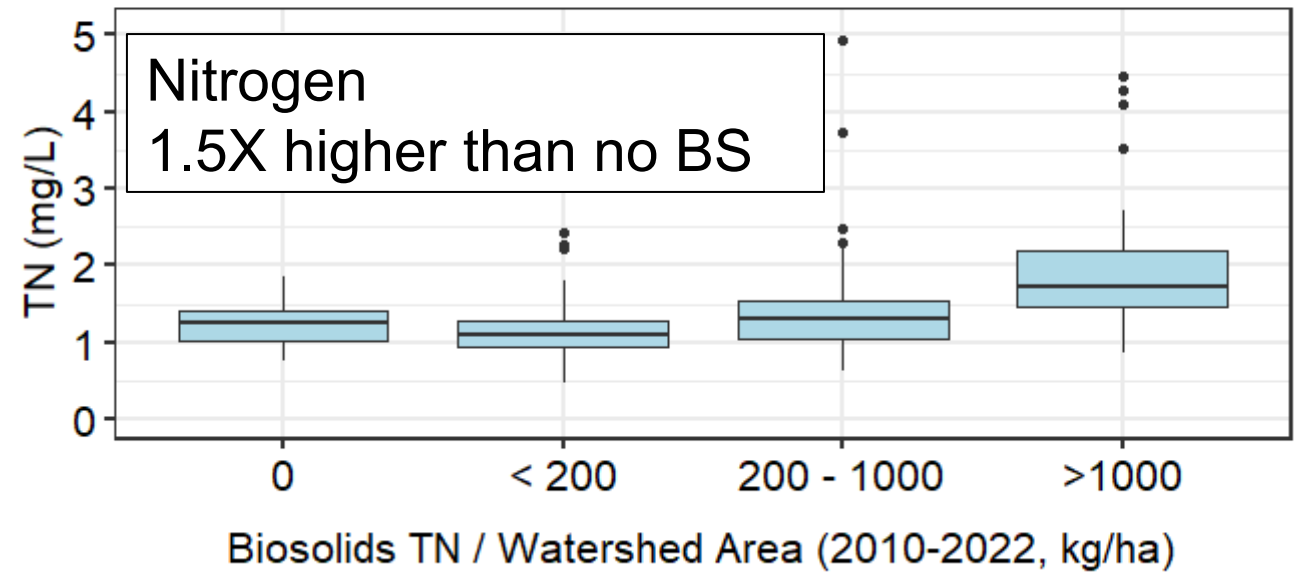
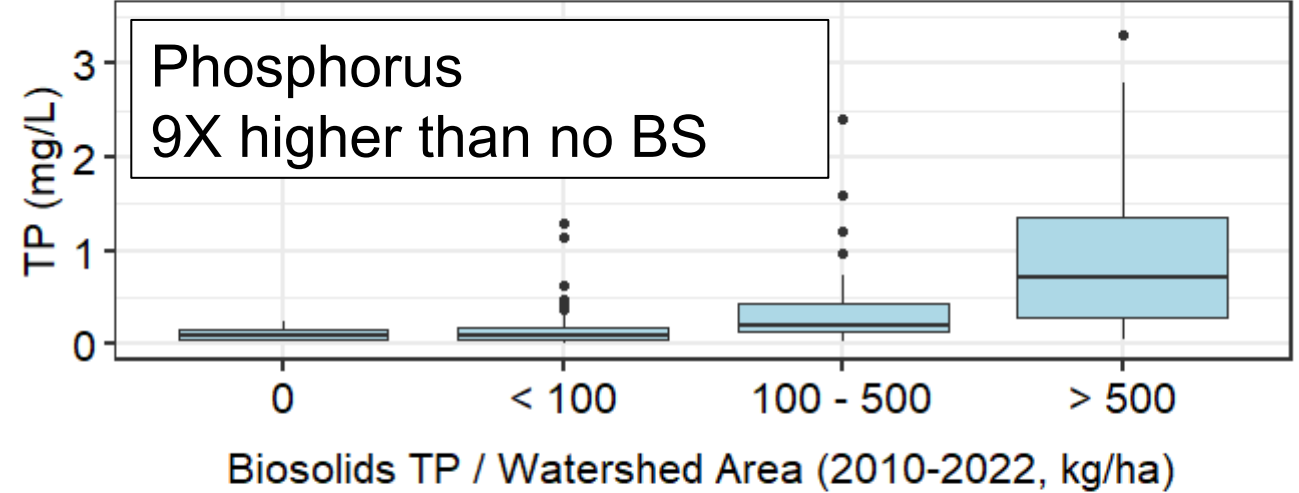


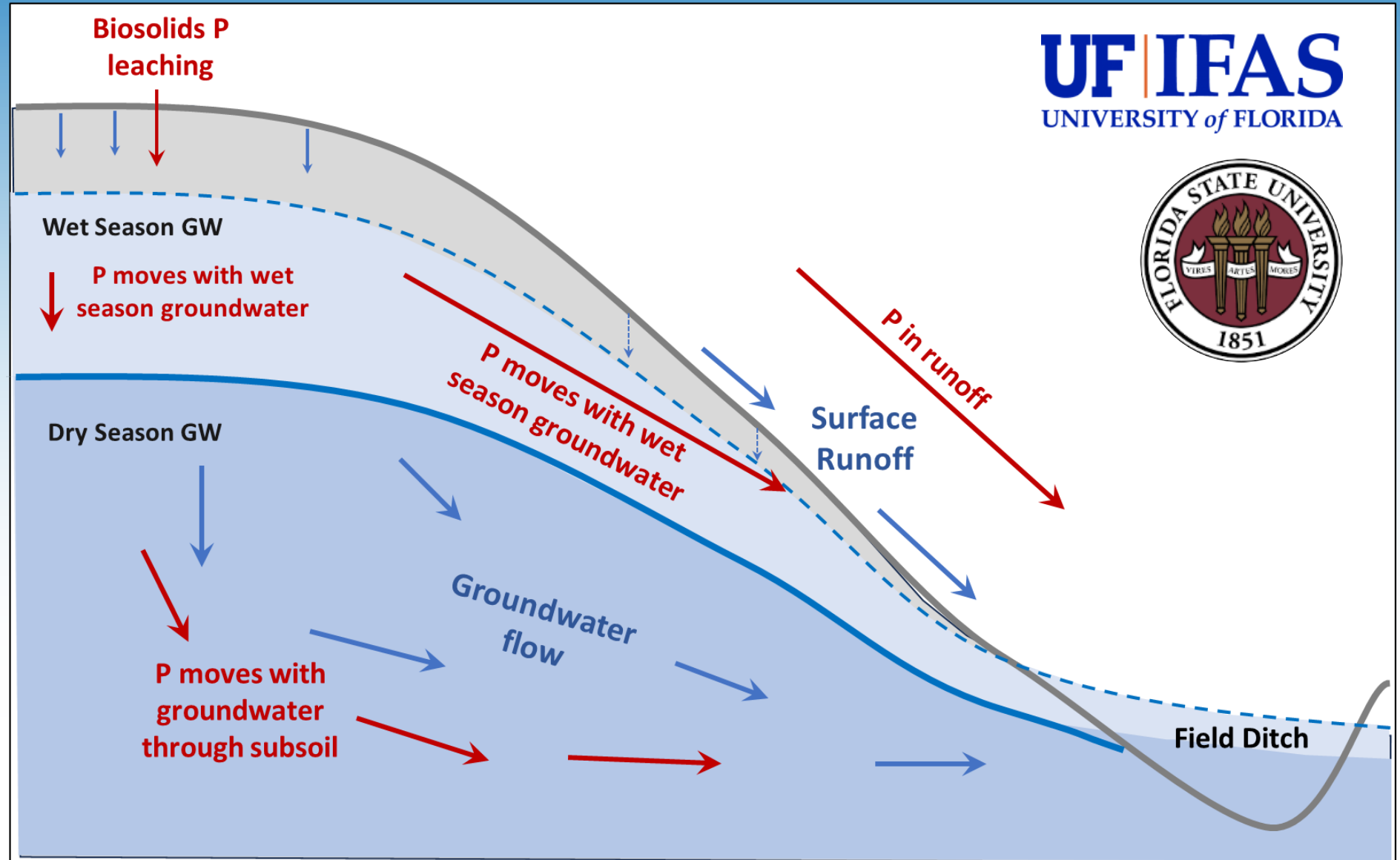
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Storm Event Results



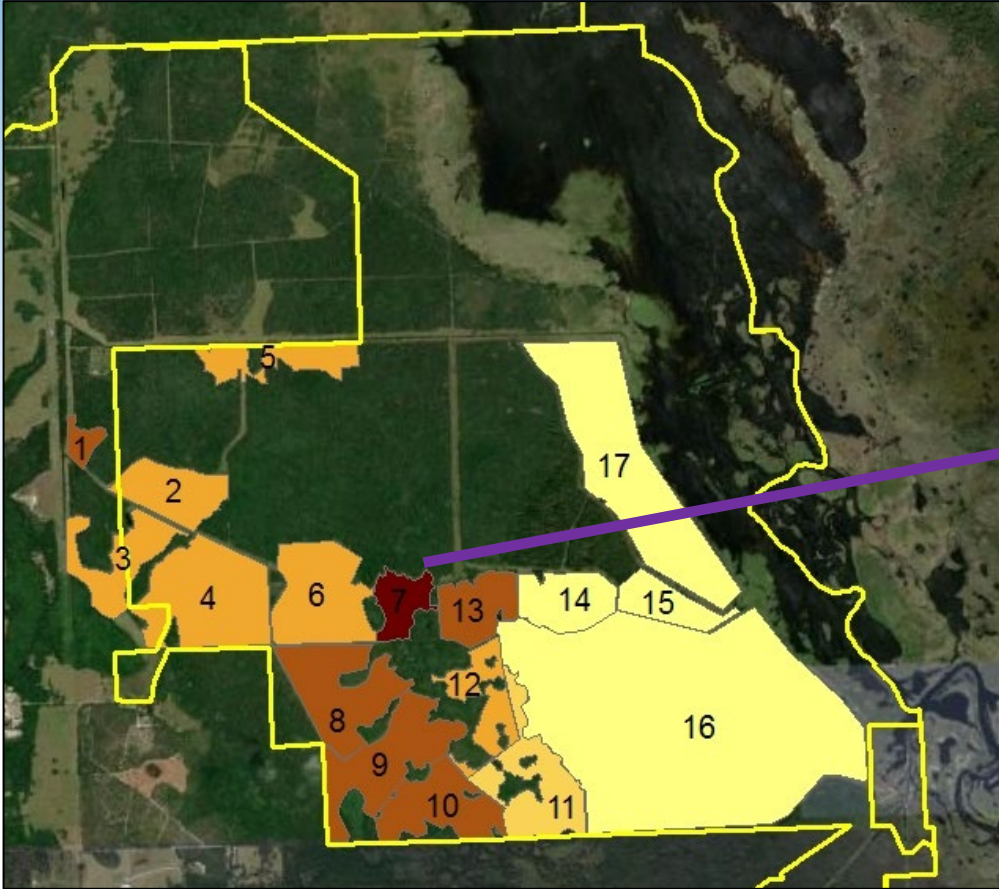
Biosolids Storm-Event Grab Samples





Environmental Remediation Technologies Pilot

In Situ Field Mesocosm Experiments



A	B	C	D
E	F	C	B
E	C	A	F
D	B	D	B
A	F	E	B
C	C	A	D
D	B	A	B
A	C	F	D
D	B	A	C
E	C	D	B
A	D	E	B

40 X 1 m² plots
with top ranked
Phosphorus
Immobilizing
Technology

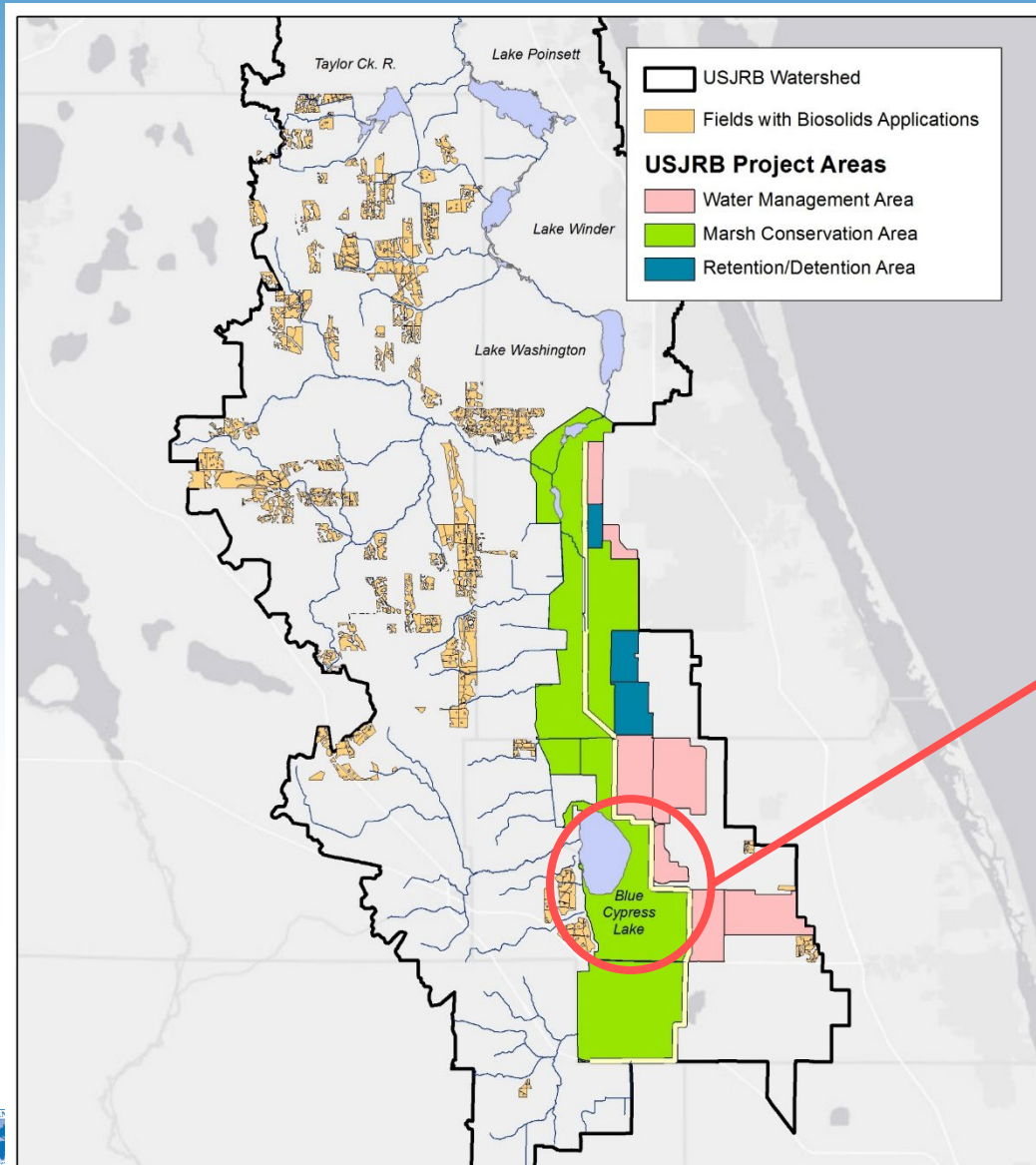
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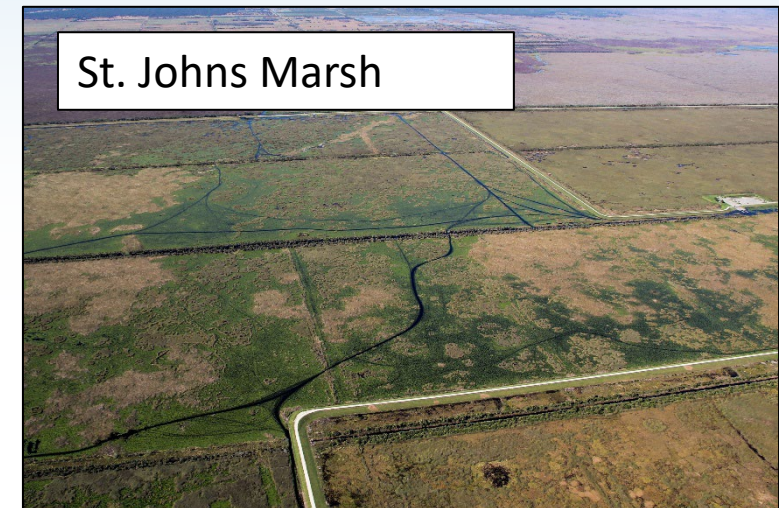
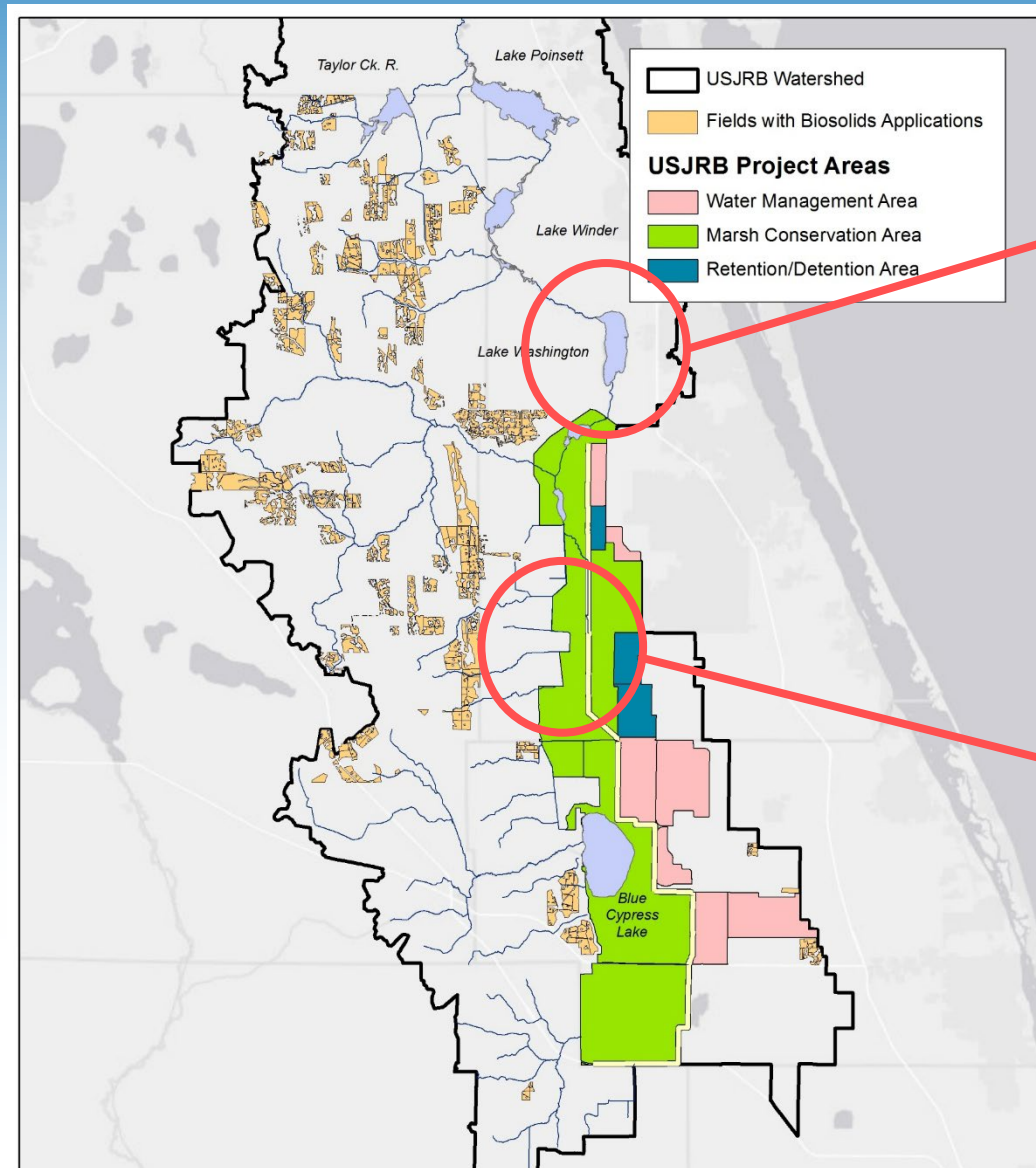
Lake and Wetland Sediment & Soil Sampling



Blue Cypress Lake and Marsh Conservation Area

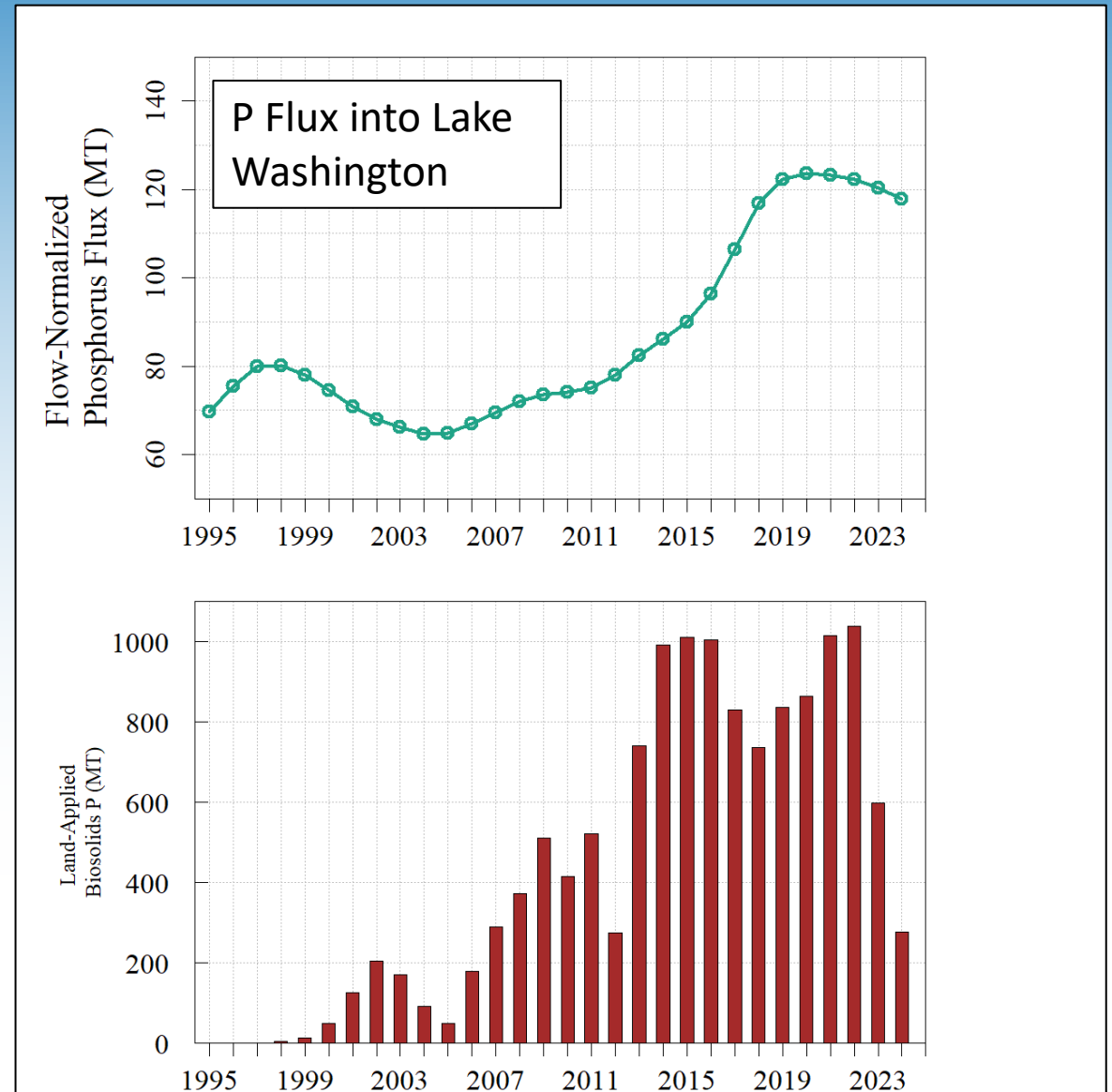


Lake and Wetland Sediment & Soil Sampling



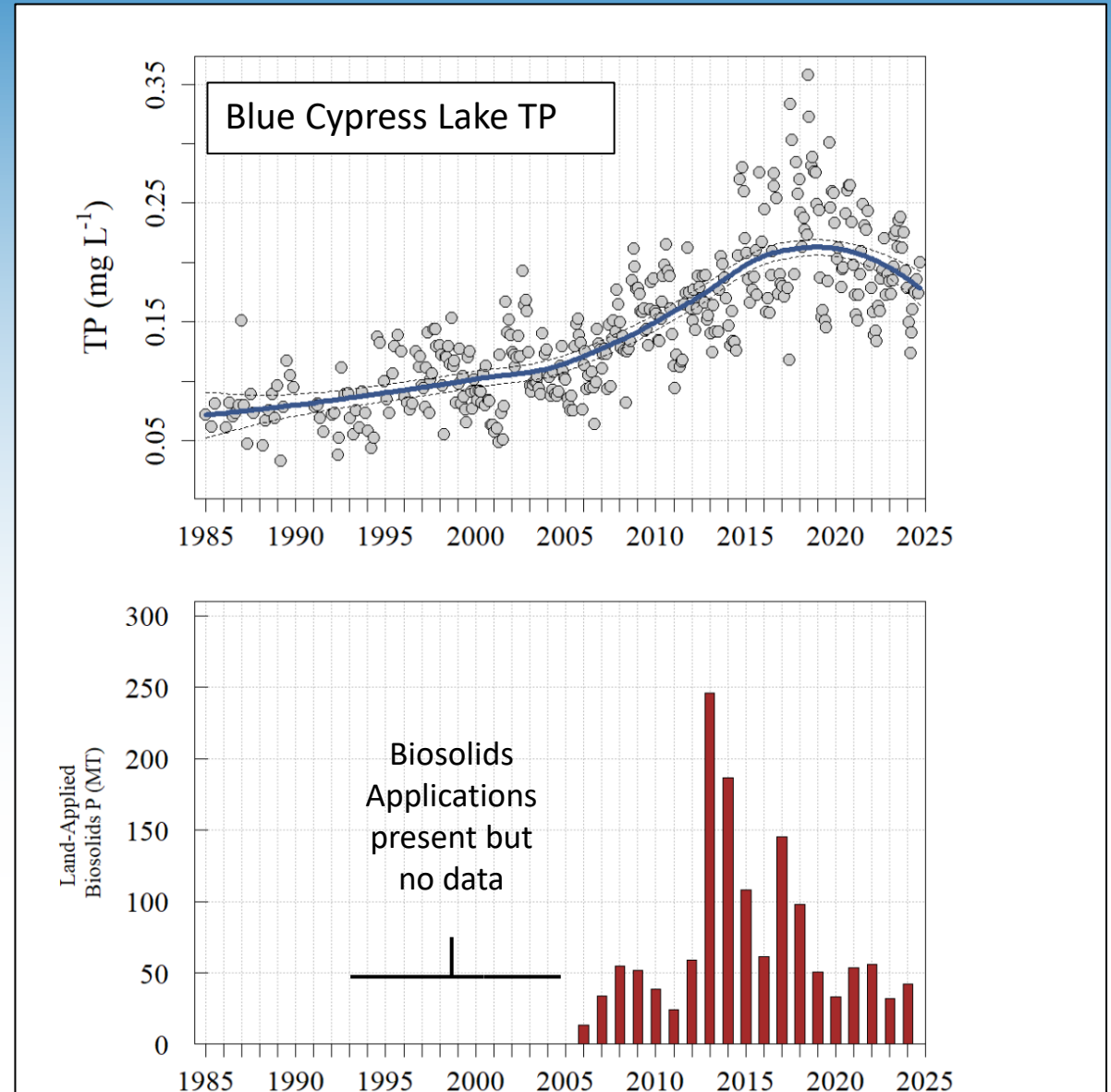
Applications are declining – Recovery Trajectory?

- New Florida regulations in full effect by 2024
- Flow-normalized P flux appears to have stabilized

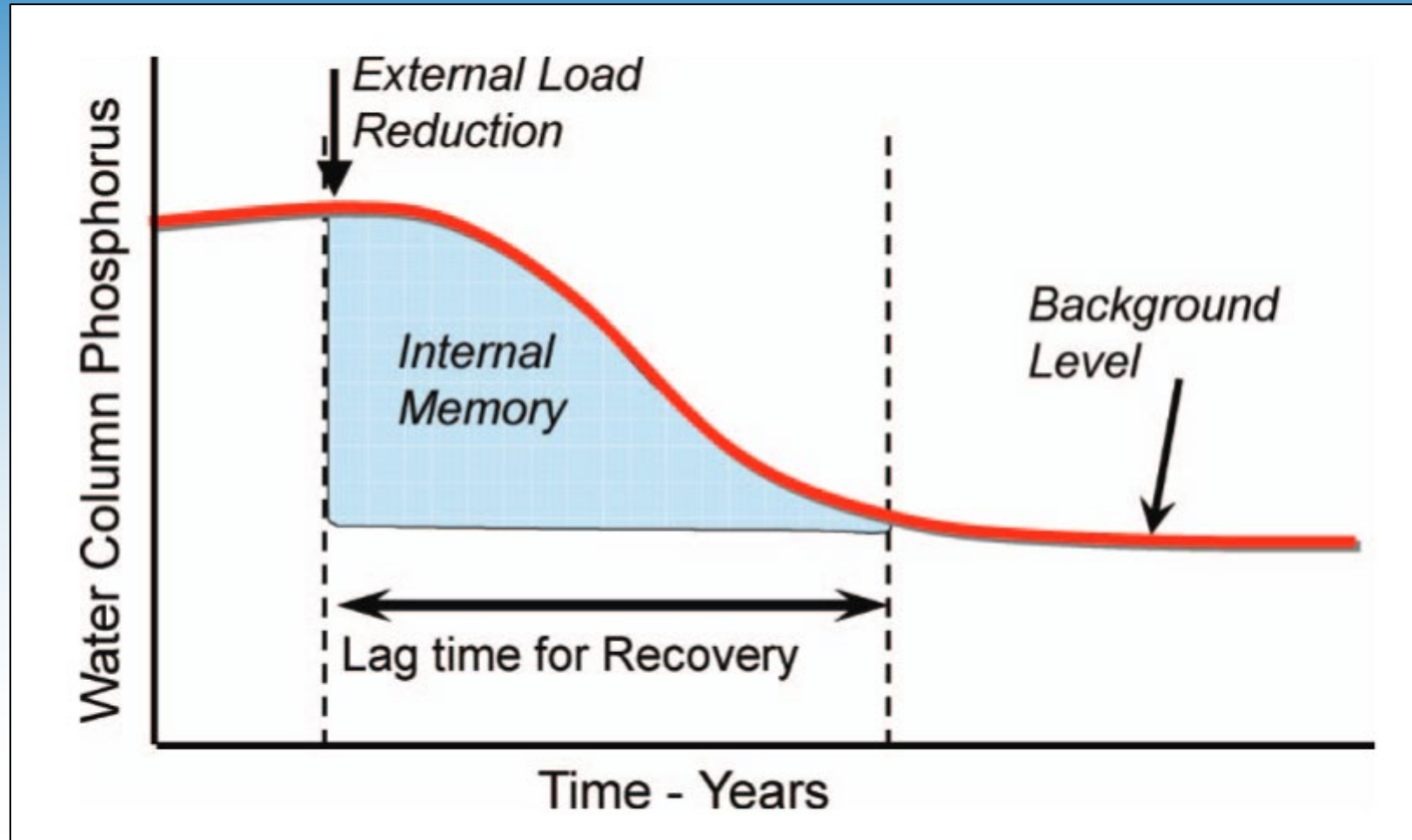


Applications are declining – Recovery Trajectory?

- 2018 Indian River County Biosolids Moratorium
- Concentrations declining but with a delayed response



How long will Legacy P affect downstream waters?



Reddy, K.R., Newman, S., Osborne, T.Z., White, J.R. and Fitz, H.C., 2011. Phosphorous cycling in the greater Everglades ecosystem: legacy phosphorous implications for management and restoration. *Critical Reviews in Environmental Science and Technology*, 41(S1), pp.149-186.

Thank You

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- Many more...

