

Biosolids Applications and Nutrient Export in Tributary Watersheds of the Upper St. Johns River

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St. Johns River Water Management District

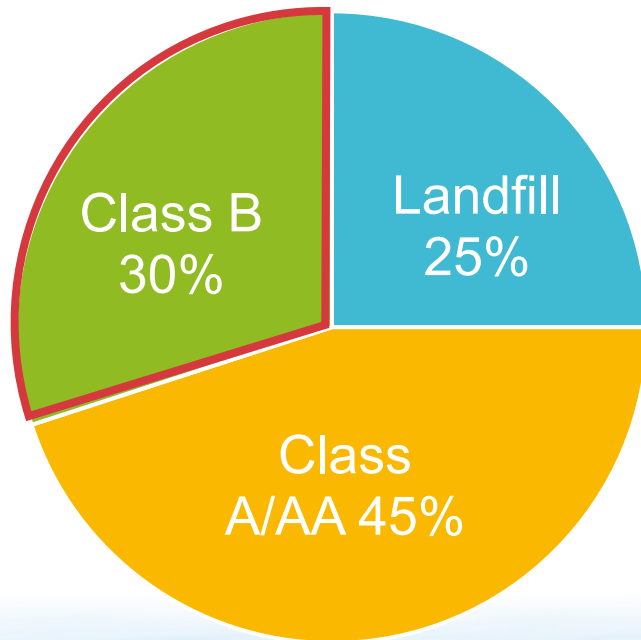
*No Affiliation

UNIVERSITY OF FLORIDA WATER INSTITUTE SYMPOSIUM
2022



Biosolids in Florida

350,000 dry tons per year



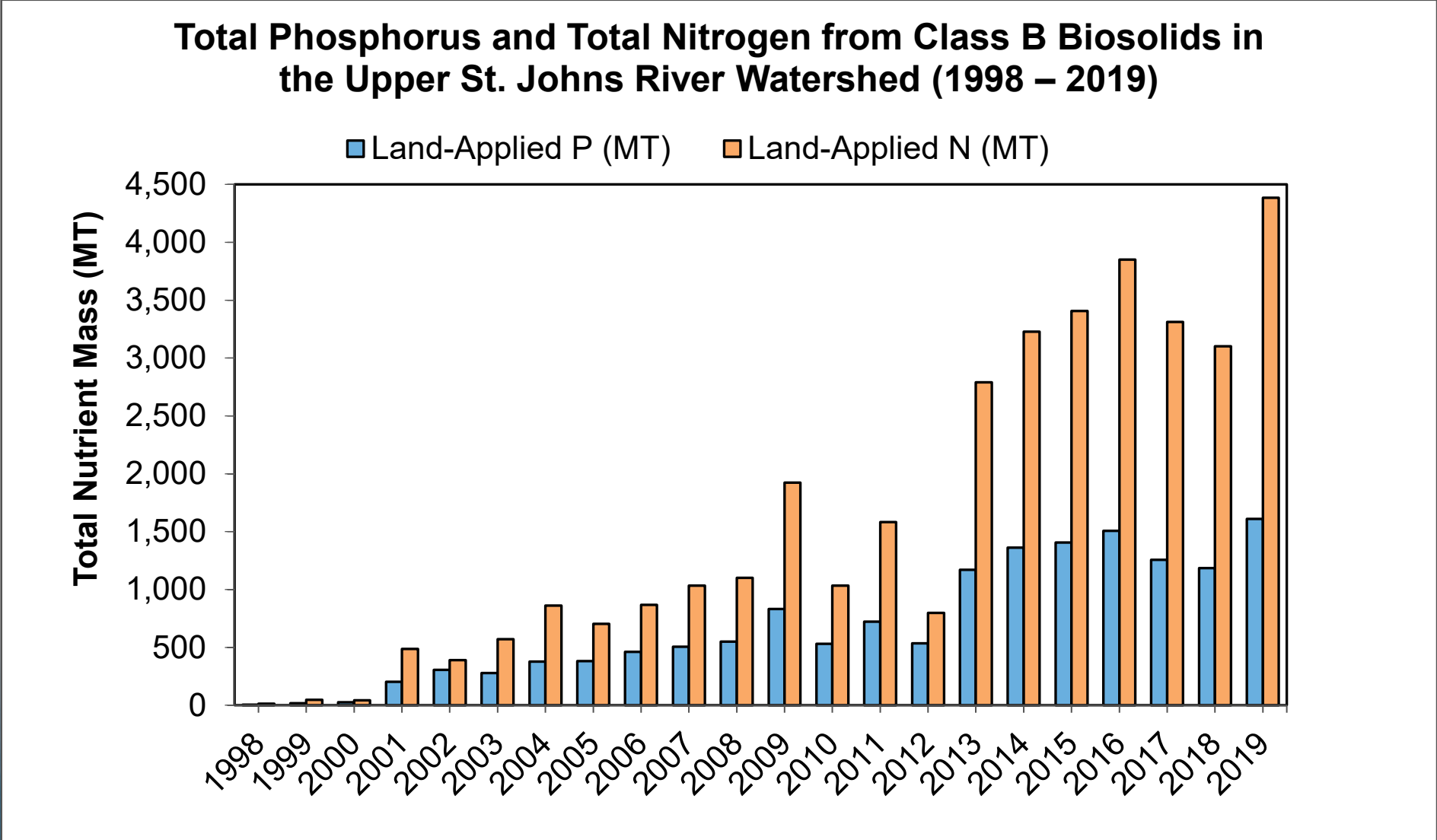
Source: FDEP 2019 Biosolids Rulemaking presentation



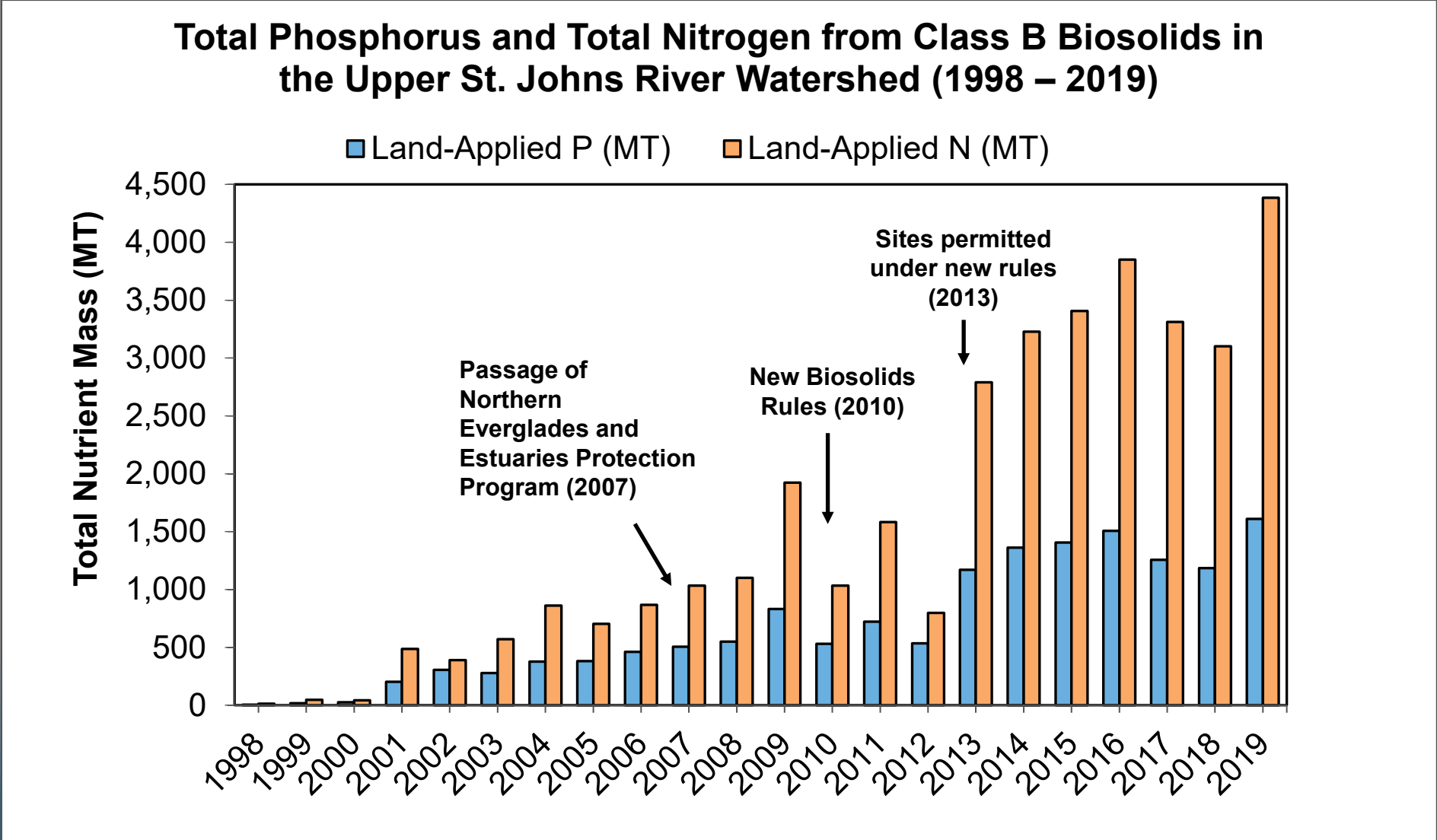
Nutrient of Concern - Phosphorus

- Typical agronomic N:P crop demands are $\sim 10 : 1$
- Class B biosolids typically have N:P at a $2.5 : 1$ mass ratio
- Nutrient management plans in Florida prior to 2021 allowed P applications in excess of crop demand if P-Index was low or medium

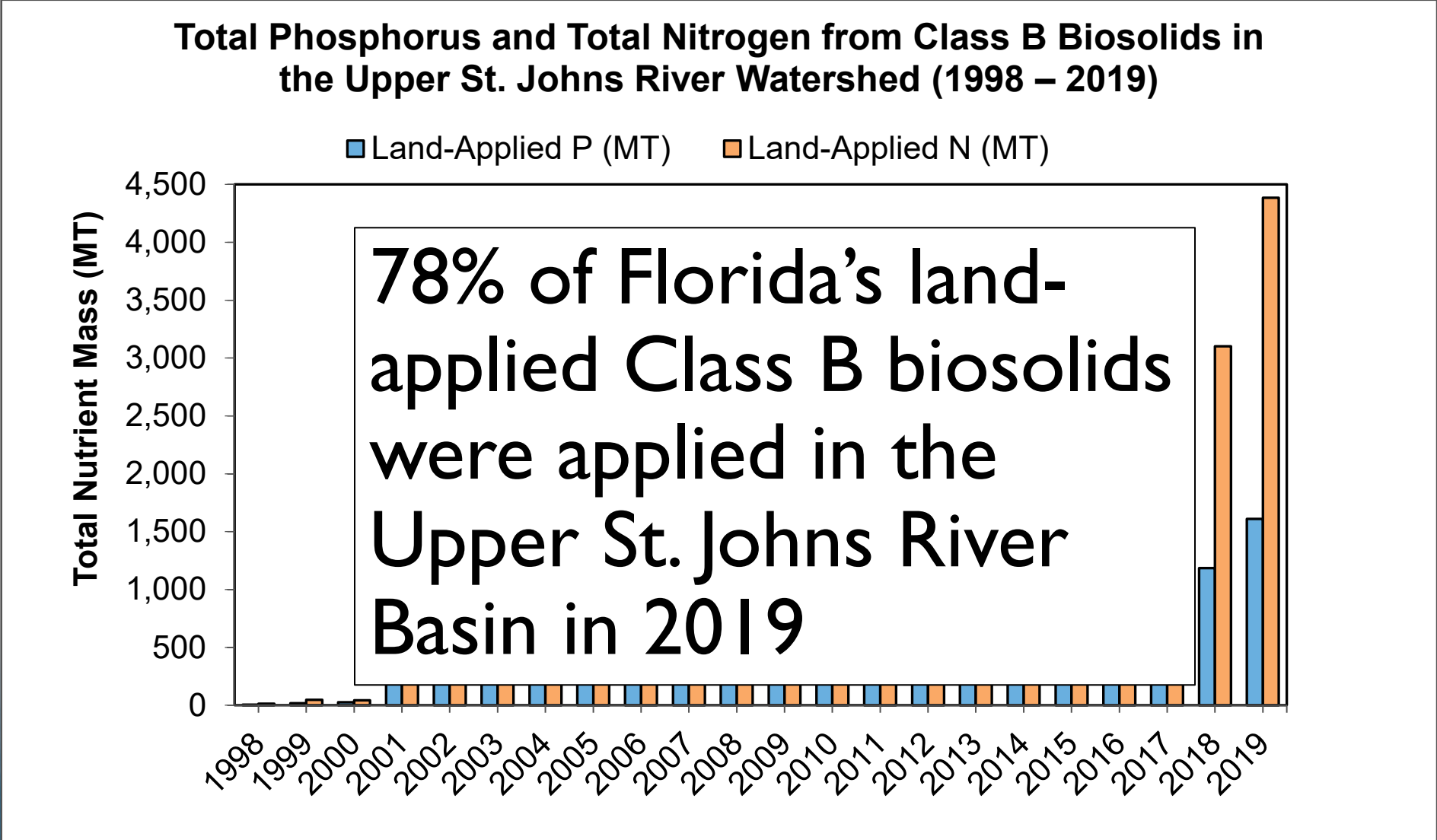
Biosolids in the Upper St. Johns River



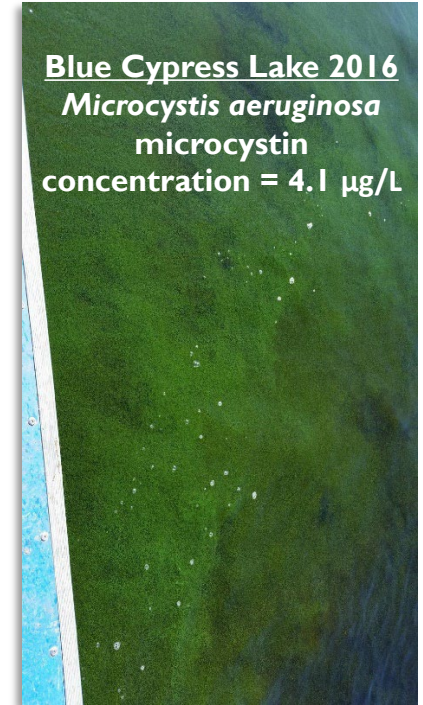
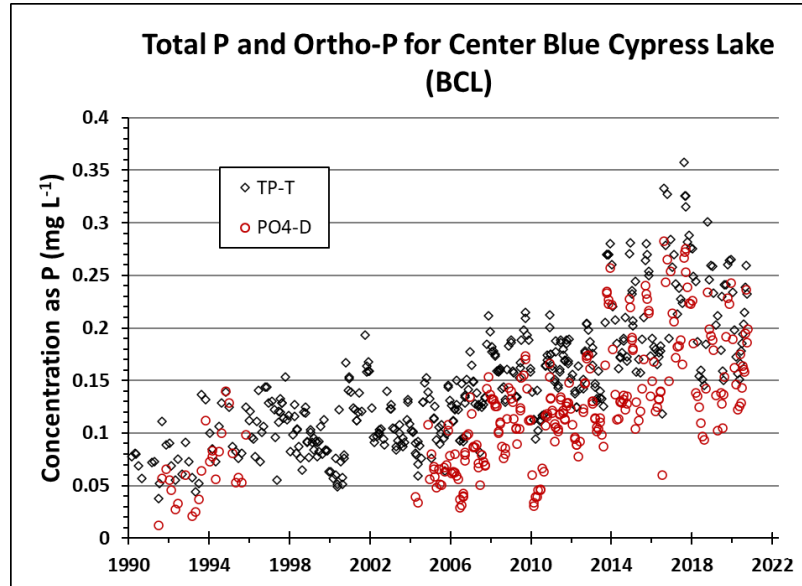
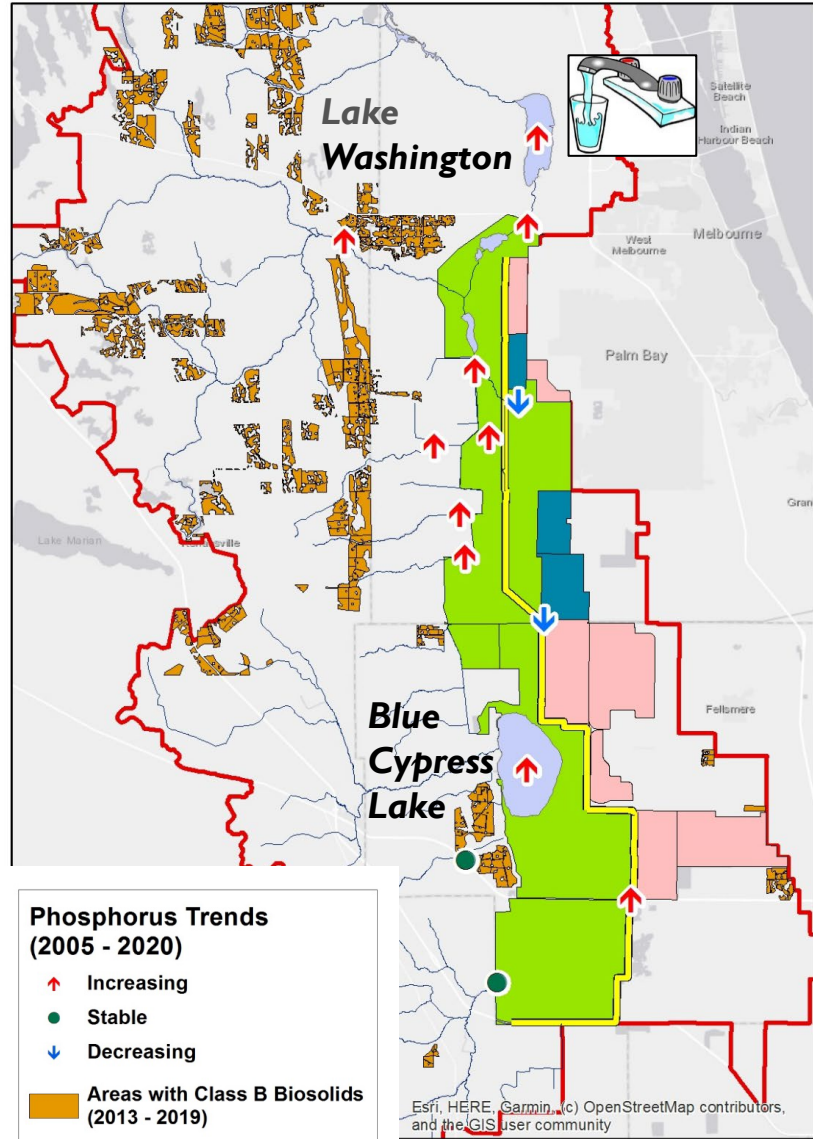
Biosolids in the Upper St. Johns River



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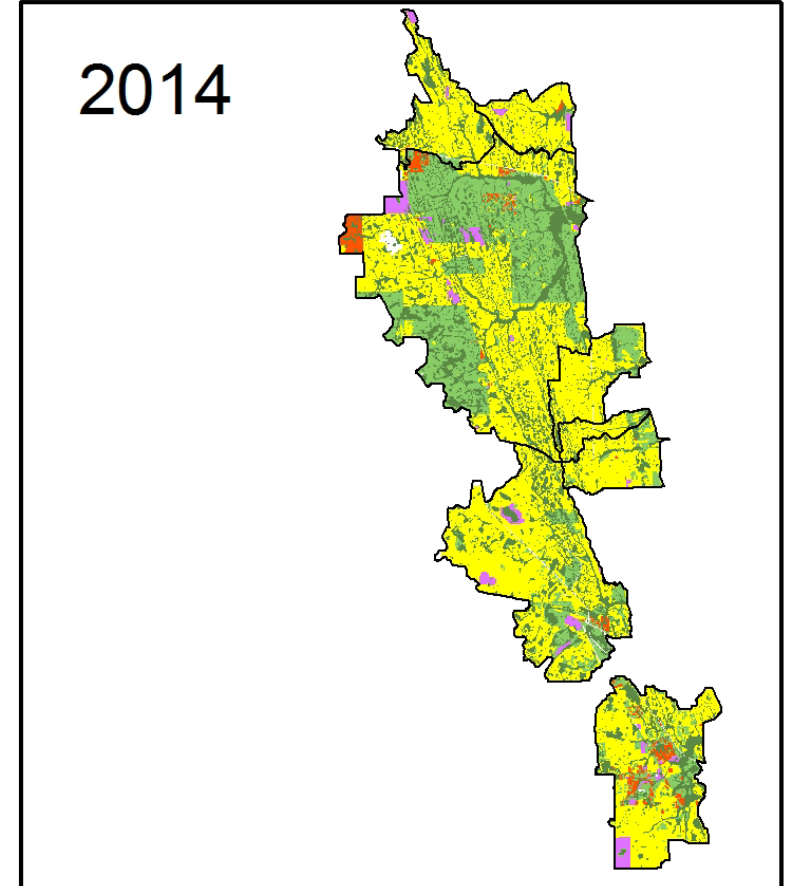
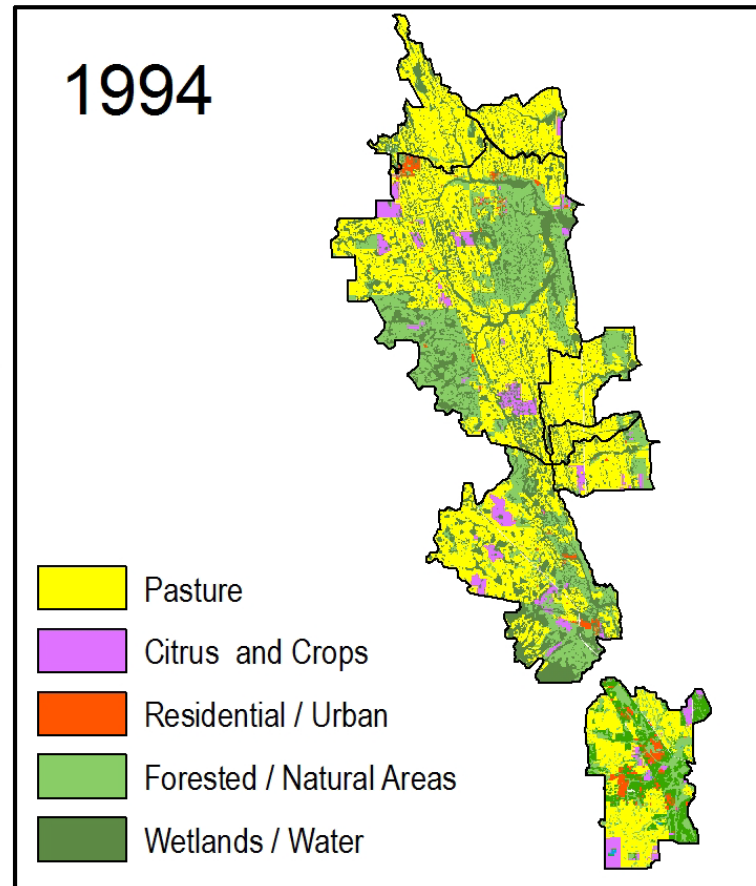
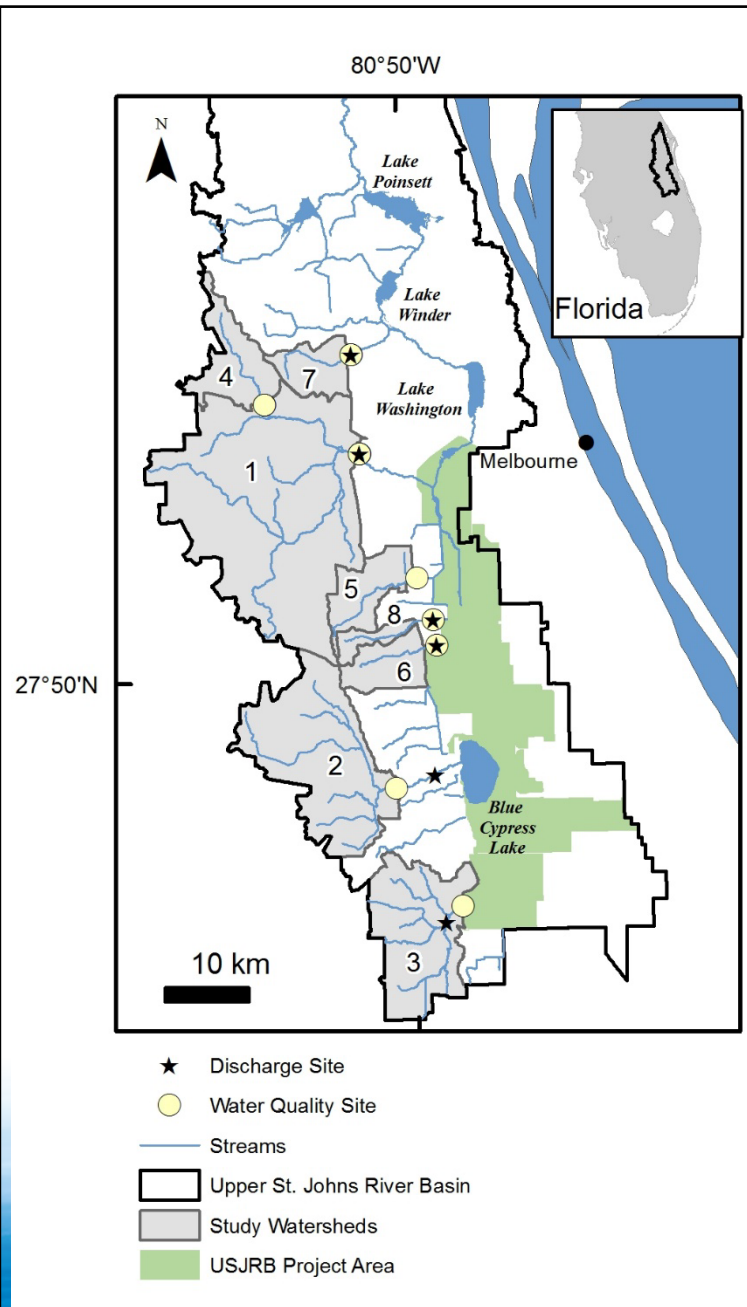


Water Quality



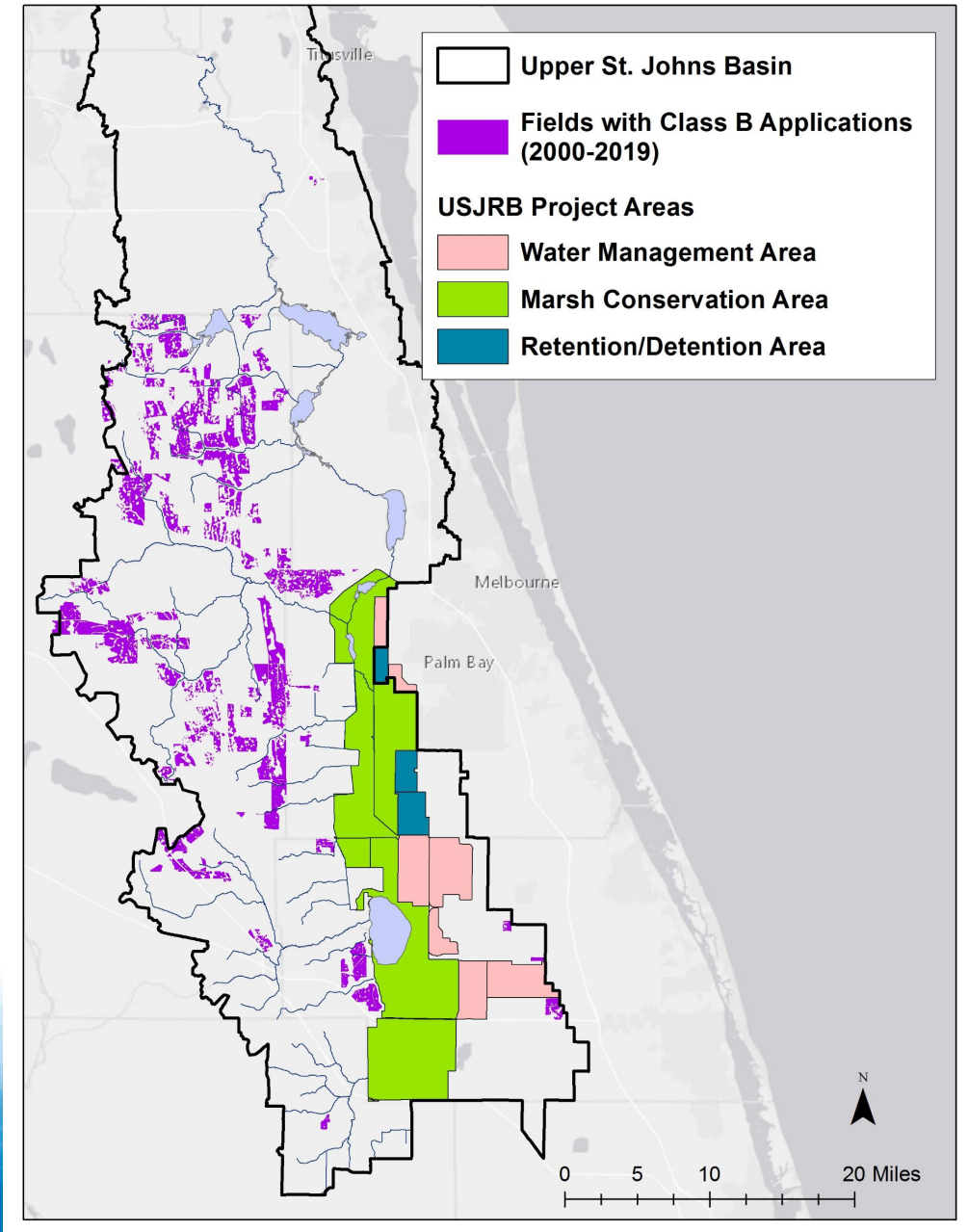
Watershed Study

25 years of monitoring data



Land Application Data

- Land applied **Class B** biosolids from 2000 – 2019
- Annual total nitrogen (TN) and total phosphorus (TP) application rates
- Florida Department of Environmental Protection OCULUS database



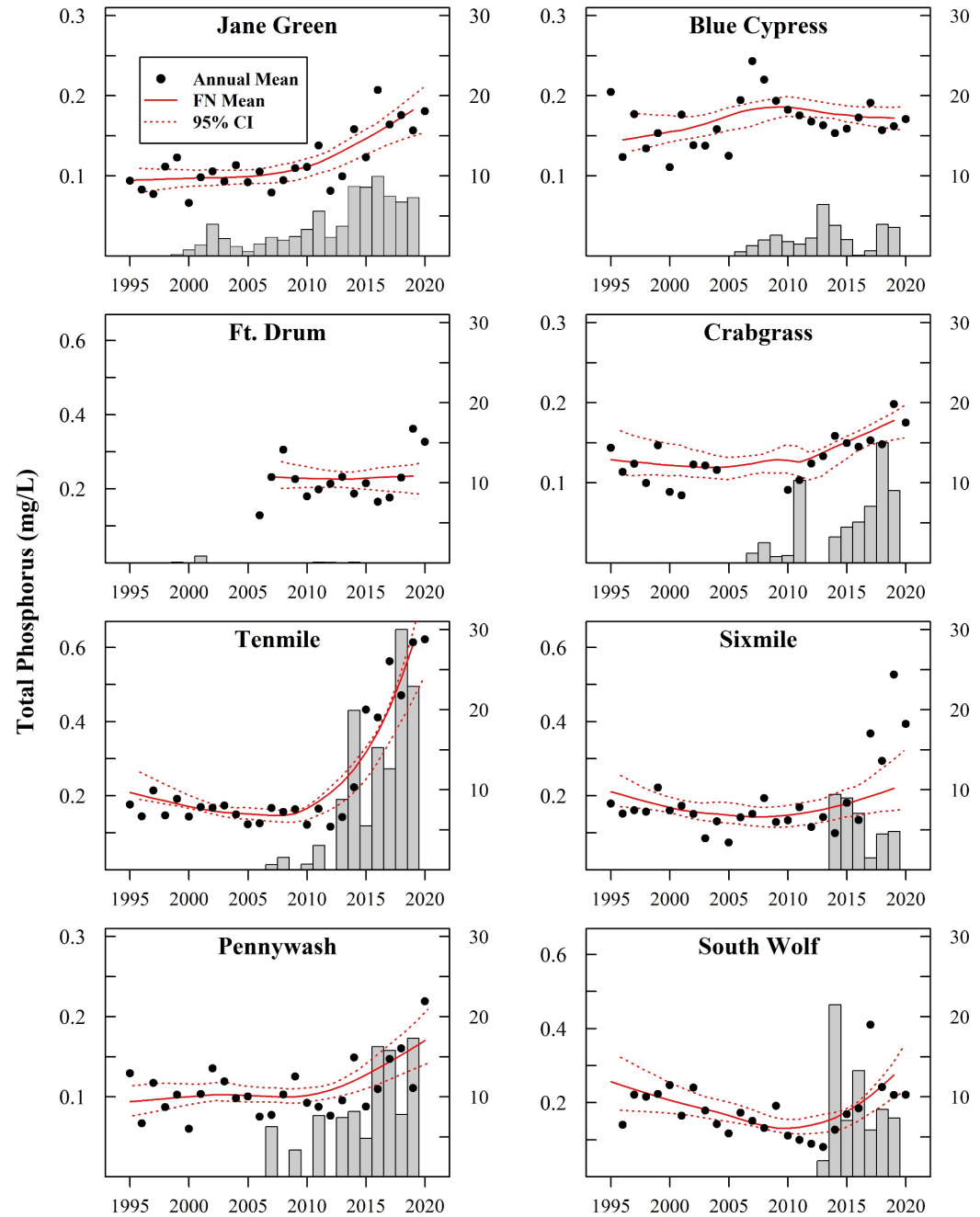
Weighted Regressions on Time, Discharge, and Season (WRTDS)

- Simple, highly-flexible smoothing model
- Daily flow data used to predict daily concentration
- Can evaluate non-linear and non-monotonic trends
- Flow-normalization to evaluate trends not related to hydrologic excursions (\neq flow-weighted)



USGS R package:
<http://usgs-r.github.io/EGRET/>

Trends in Biosolids Applications and TP concentration



Total Biosolids-P, Normalized to Watershed Area (kg/ha)

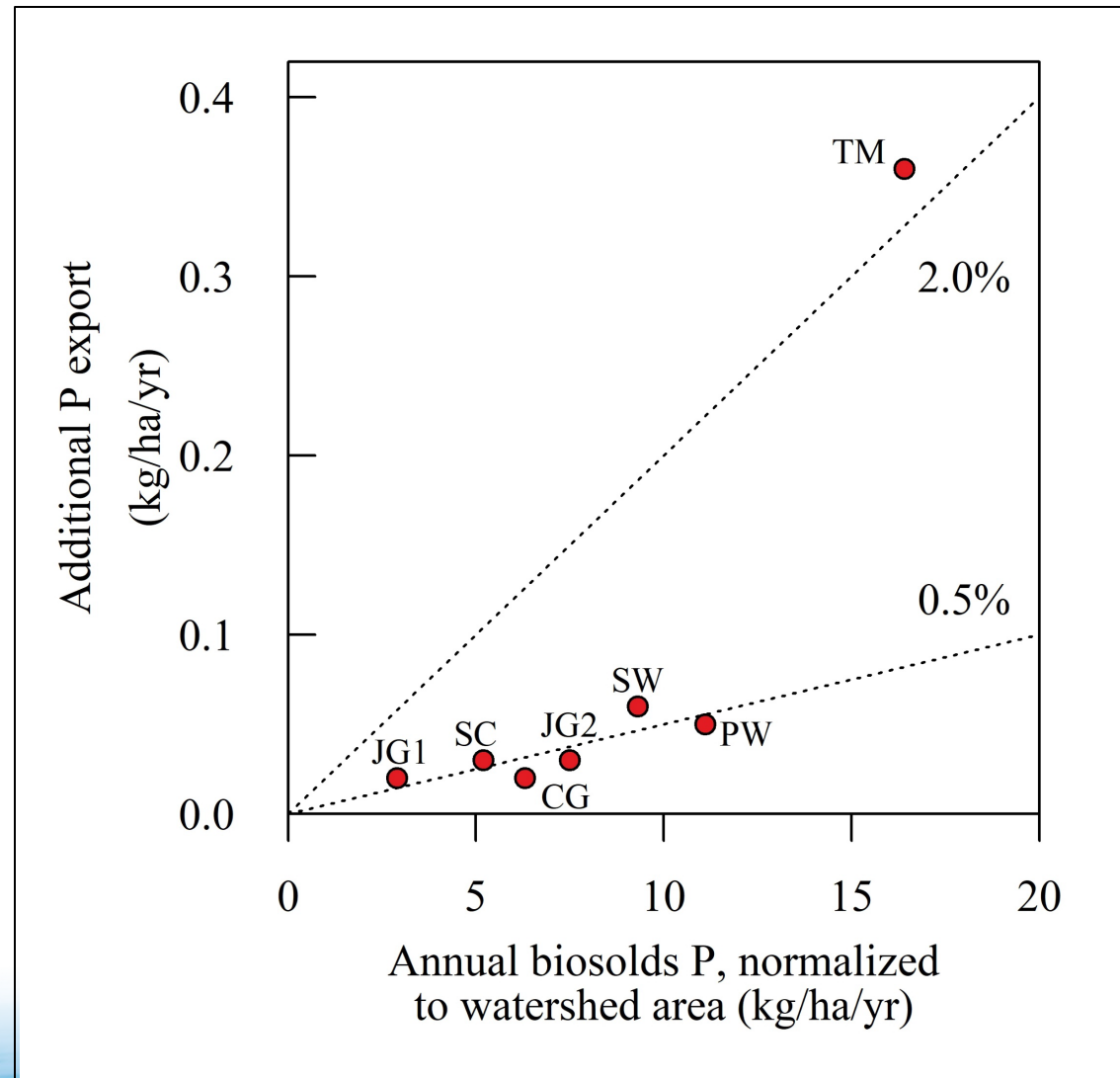
Bootstrap Trend Test

Total Land Application and Flow-normalized trend by watershed (2013 – 2019)

	Total Land Applied P (MT)	Trend in Flow-Normalized P Flux (MT)
Jane Green Creek	3369	15.3 **
Tenmile Creek	753	16.4 **
Blue Cypress Creek	527	-2
Pennywash Creek	345	1.7 *
Crabgrass Creek	343	1.2 *
Sixmile Creek	198	1.2 *
S. Wolf Creek	136	0.9 *
Ft. Drum Creek	3	0.5

* $p < 0.05$, ** $p < 0.01$

**What percent
biosolids P
export would be
required to drive
current trends?**



Watershed Study Conclusions

- Strong correlation in timing and magnitude of biosolids application and P export
- No support for alternative explanations (erosion, land use change, wastewater sources)
- Small losses of biosolids P from the landscape may translate into substantial changes in water quality (especially with a high density of application areas)
- TMDL for Lake Hell 'n Blazes requires 49 MT of TP load reduction, however WRTDS models estimated additional TP load of 32 MT yr⁻¹.

F.A.C. 62-640 New Regulations (2021)

- Stricter limits on Class B applications with seasonal high water table shallower than 6 inches
- Application rates determined based on N and P, application limited to most restrictive nutrient
- New Monitoring Requirements

More info: <https://floridadep.gov/water/domestic-wastewater/content/dep-chapter-62-640-fac-rulemaking>

FDEP funded Study

Biosolids Assessment

