

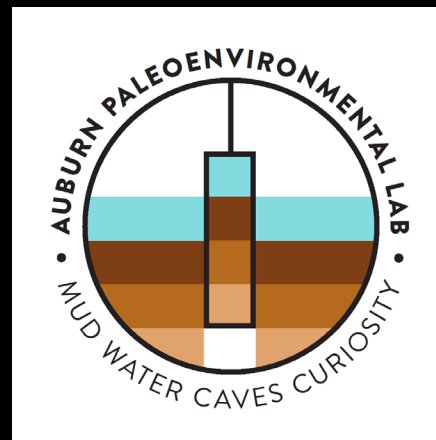
Sediment Transport and Nutrient Deposition in the Reservoirs of the ACF Basin

Dr. Matthew Waters

Associate Professor

Department of Crop, Soil and Environmental Sciences

Auburn University



Reservoir Sediment Team



Matt Waters

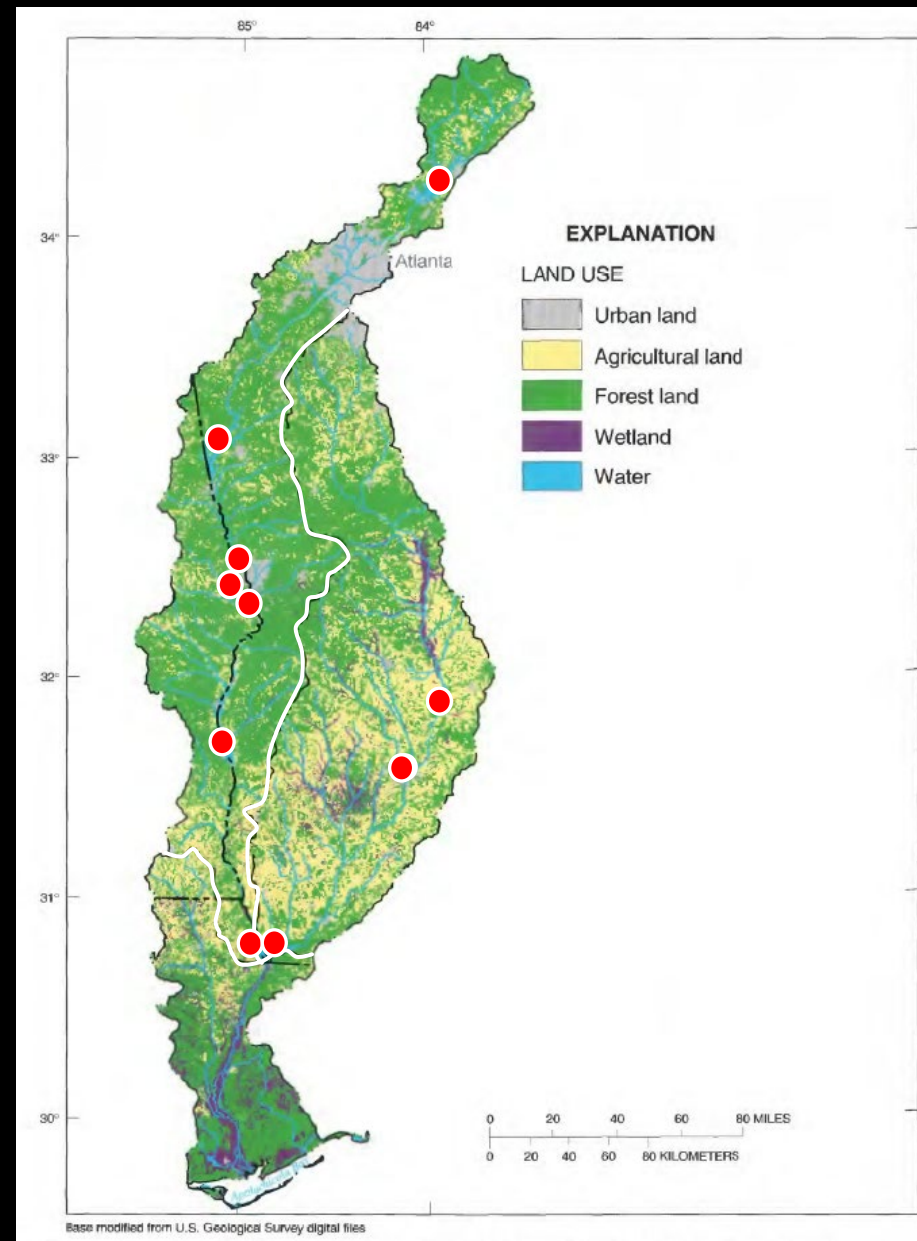


Steve Golladay



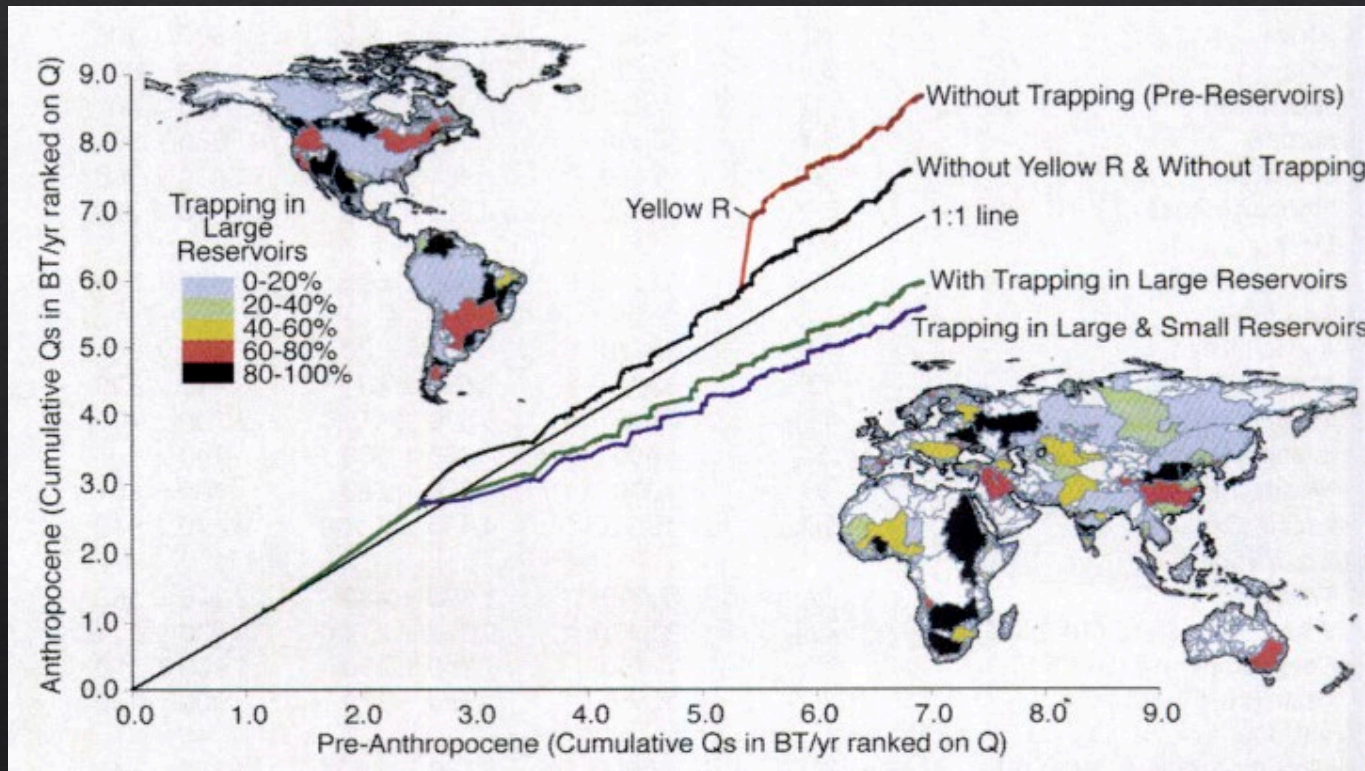
Ben Webster

ACF Reservoirs



Couch et al. 1996

Reservoir Sediment Flux



Reservoirs deposit:

- **26% of global river sediments**
(Syvitski et al., 2005, Science)
- **12% of global river phosphorus**
(P) (Maavara et al., 2015 PNAS)
- **7.4% of global river nitrogen (N)**
(Akbarzadeh et al., 2019 Global Biogeochemical Cycles)

Mud: “As above, so below”

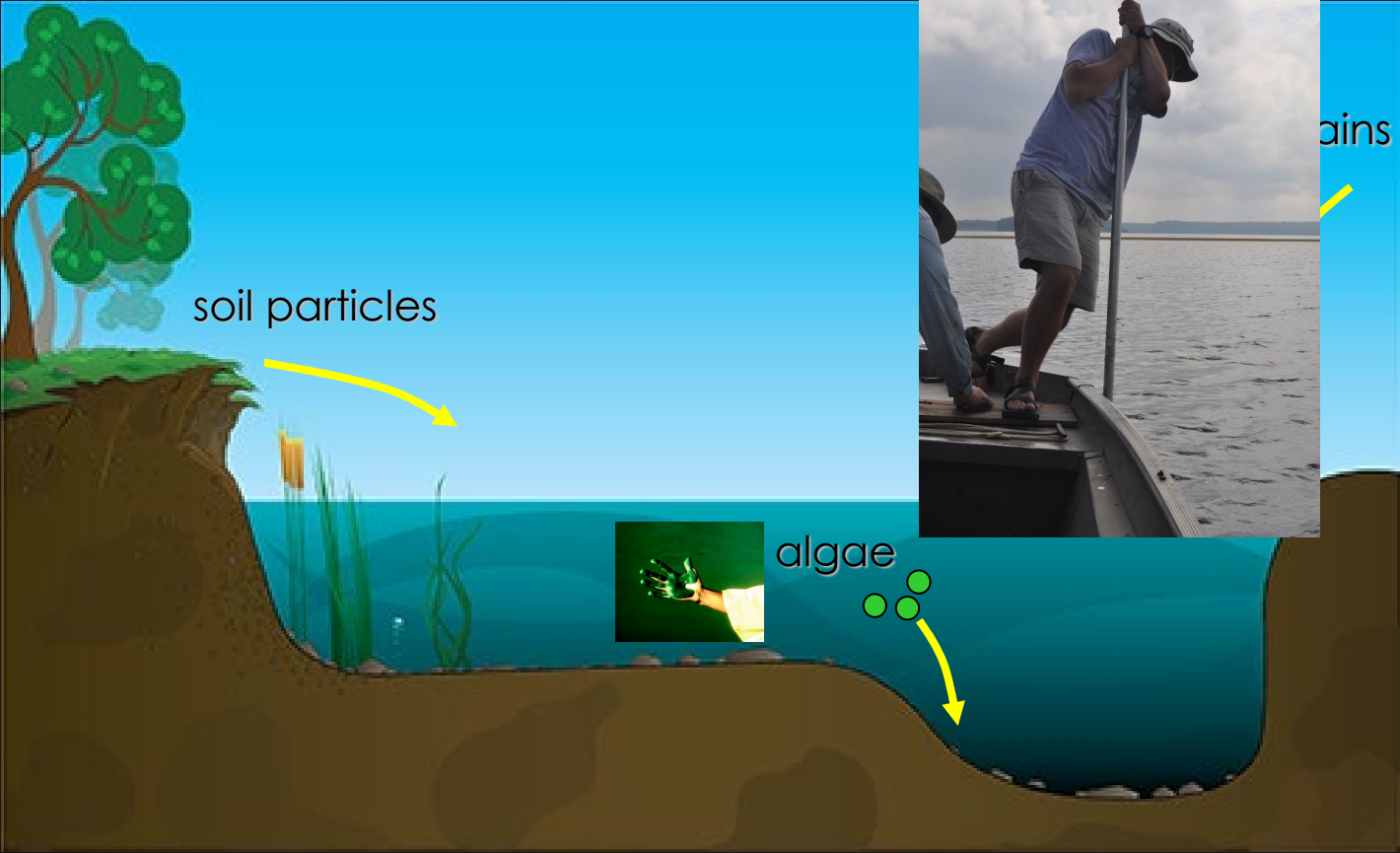
–Emerald Tablet 8th Century

- “In defense of mud”
 - –Deevey 1969

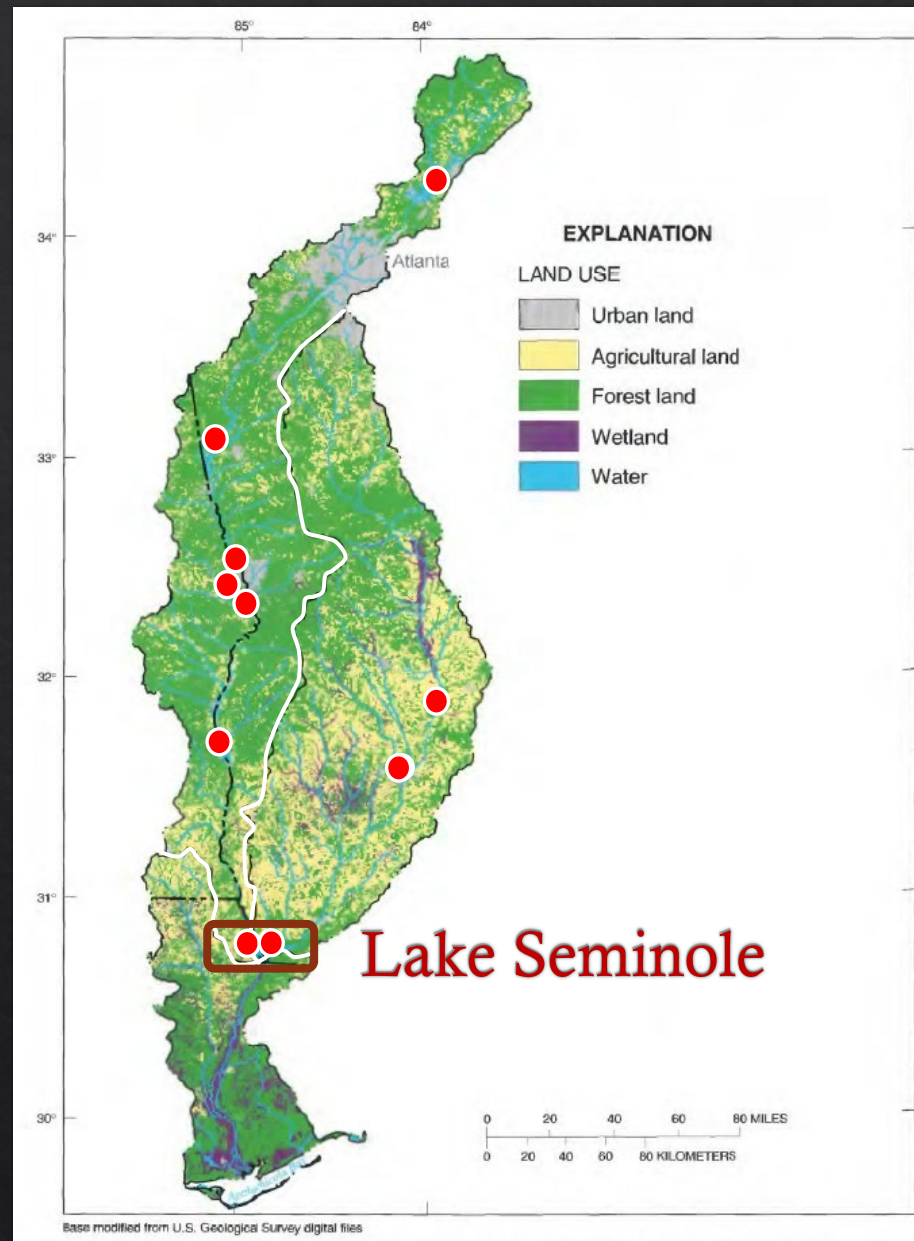


School of Athens, Raphael

Paleolimnology

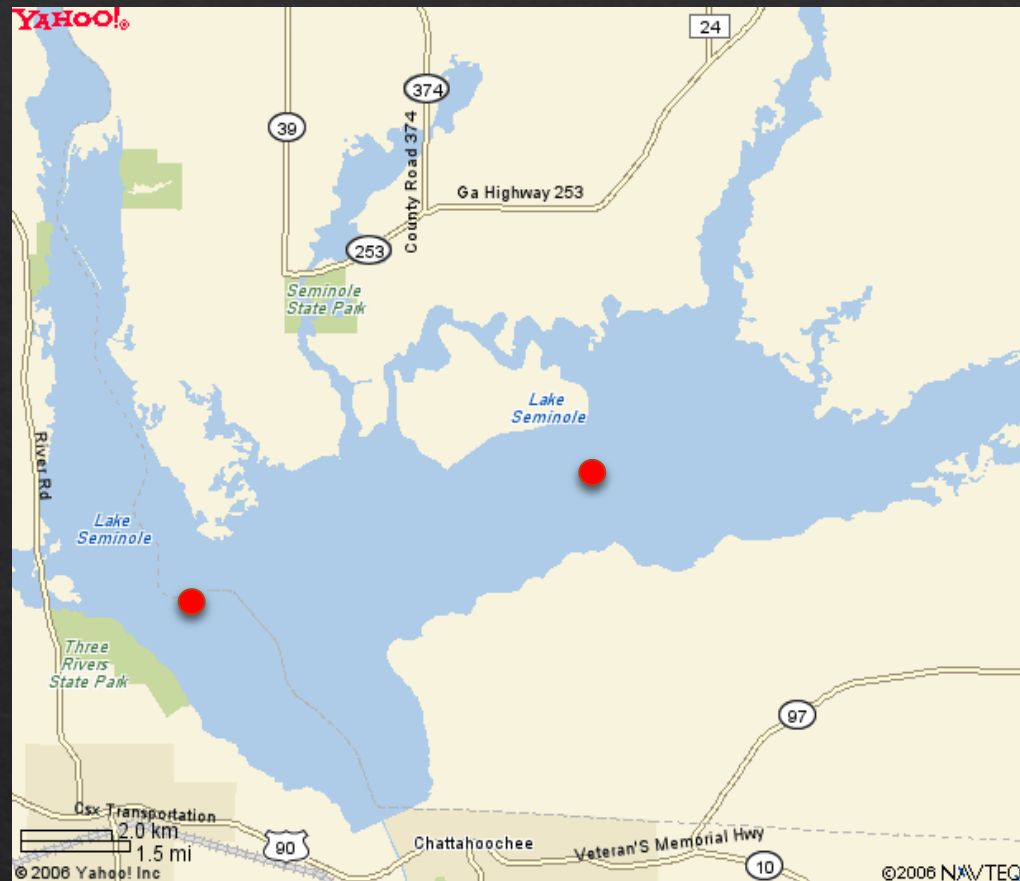


ACF Reservoirs



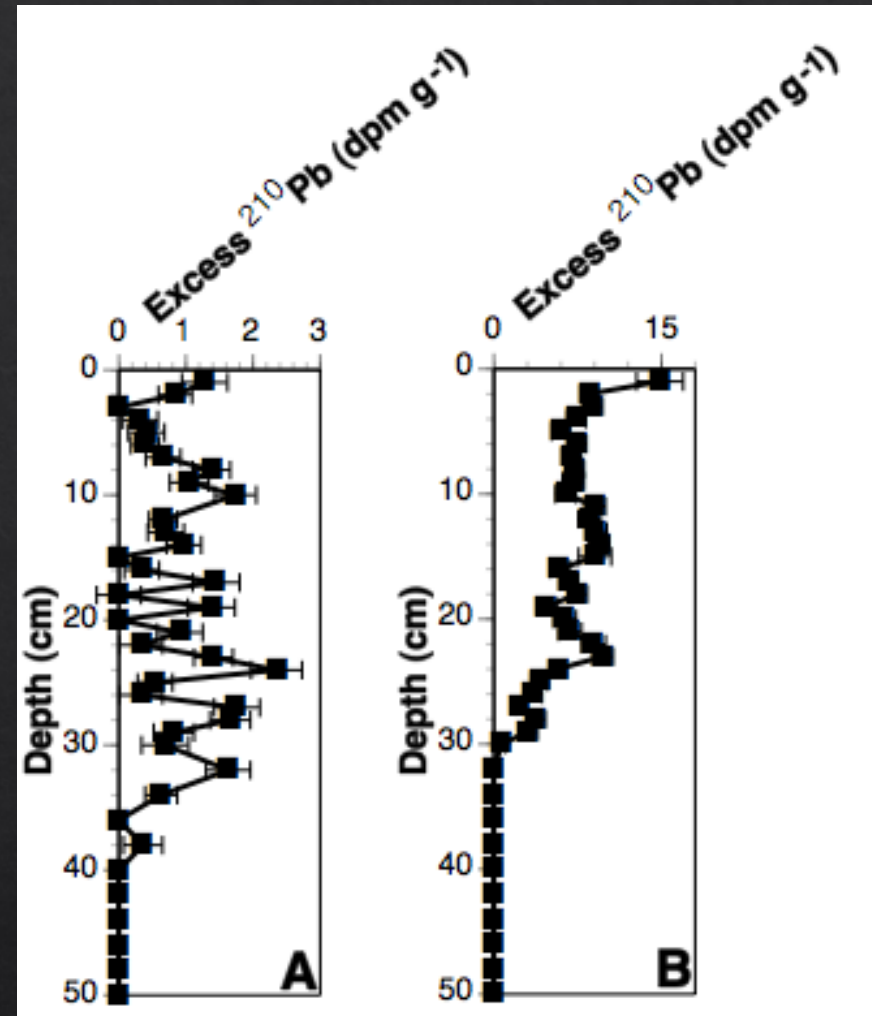
Couch et al. 1996

Lake Seminole



Sediment Delivery

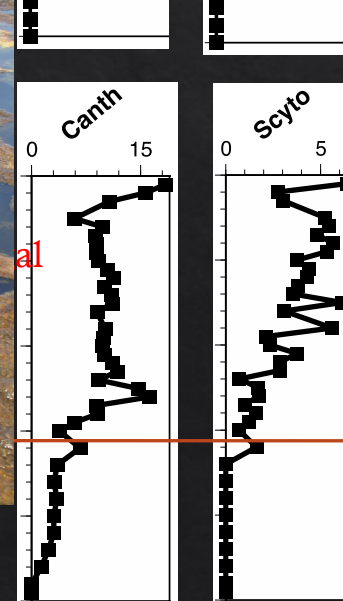
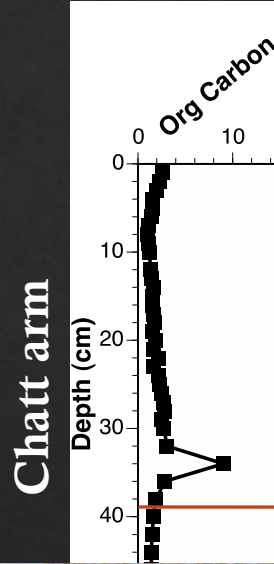
- ^{210}Pb
- ≈ 100 years old
- Flint arm:
 - 2 run-of-river dams
 - Constant sediment delivery
- Chatt arm:
 - 13 dams
 - Variable, “pulse” delivery



Chatt

Flint

Hydrilla History



Pre-Lake

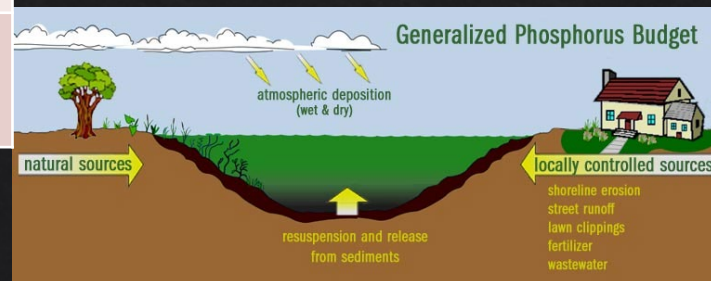
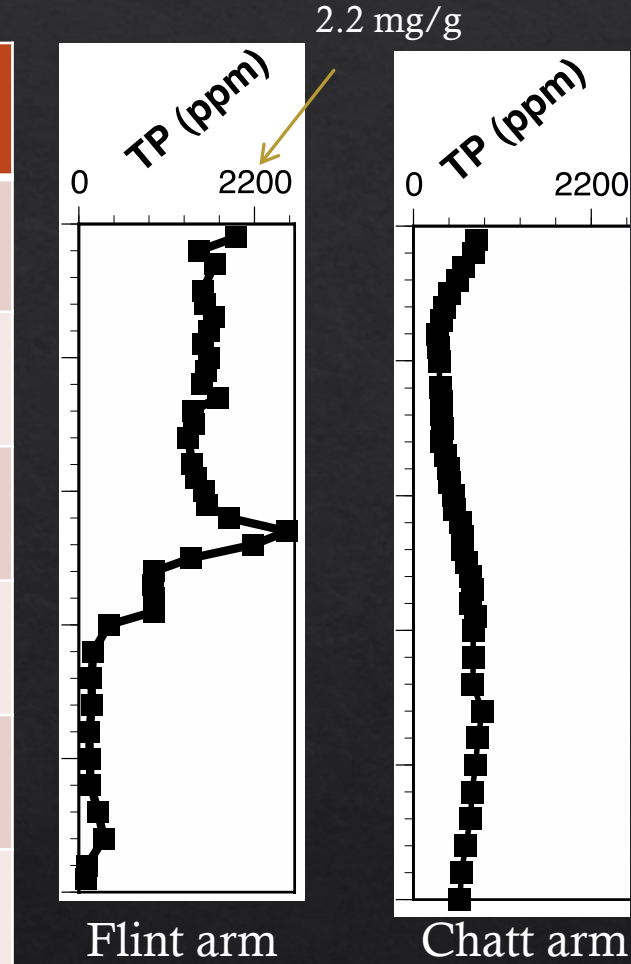
Lake

Pre-Lake

Cyanobacteria

Sedimentary Phosphorus

Lake	Sed. TP (mg/g)	Ref
Lake Seminole-Flint	1.9	This study
Lake Griffin	1.8	Schelske et al., SJRWMD 1999
Lake Apopka	1.34	Kenney et al., J. Paleo 2002
Lake Okeechobee	1.0	Torres et al., J. Paleo 2012
Everglades-WCA2A	0.8	Waters et al., J. Paleo 2012
Lake Taihu, China	0.65	Jinglu et al., J. Paleo 2007
Beaver Res, AR	0.55	Winston et al., J. Paleo 2014



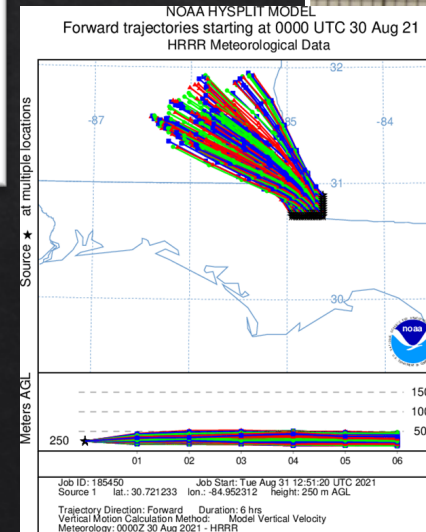
Benthic Biota



- 4 Billion
- 5-180 days



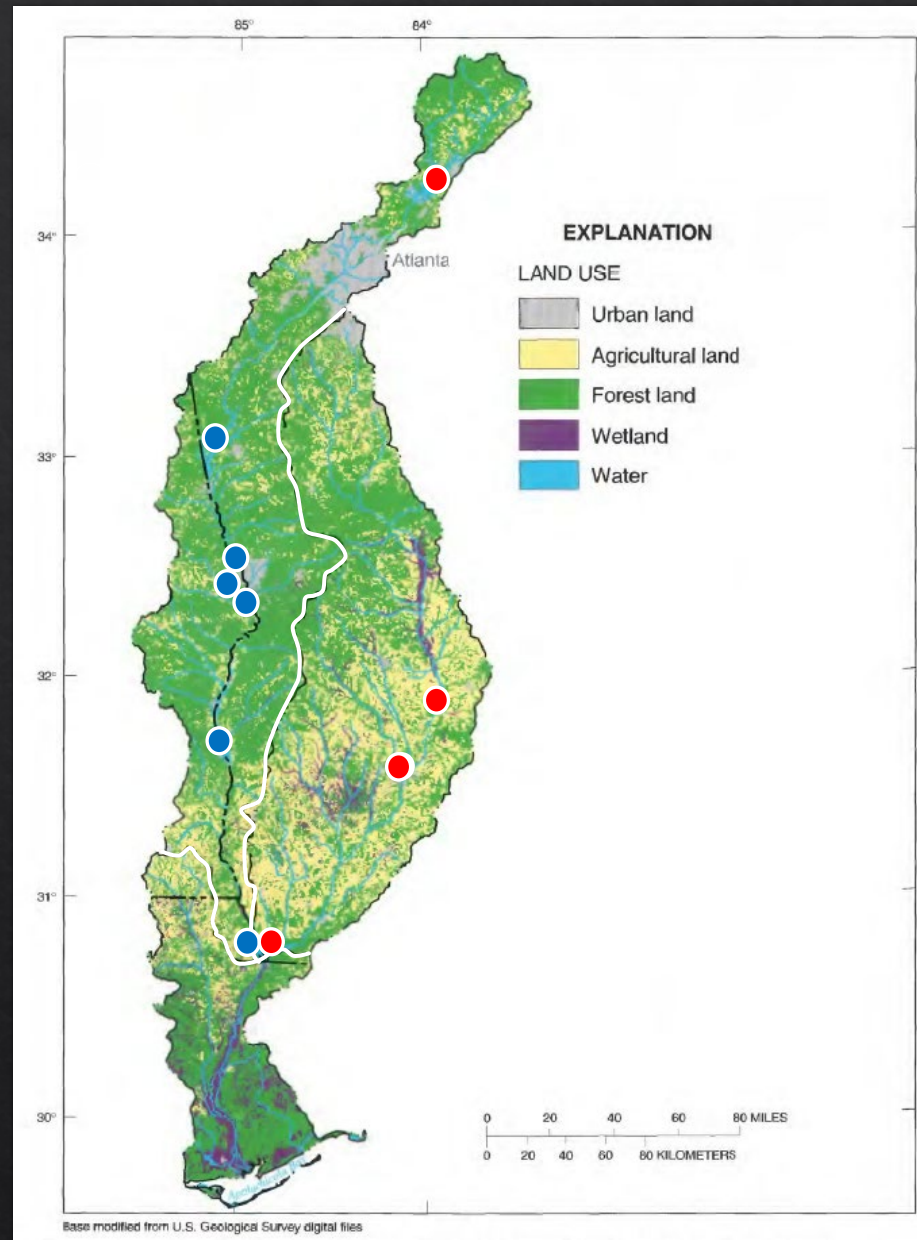
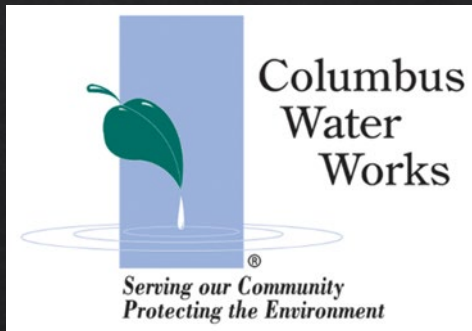
Corbicula



- Emergence of:
 - Nutrients
 - Pollutants

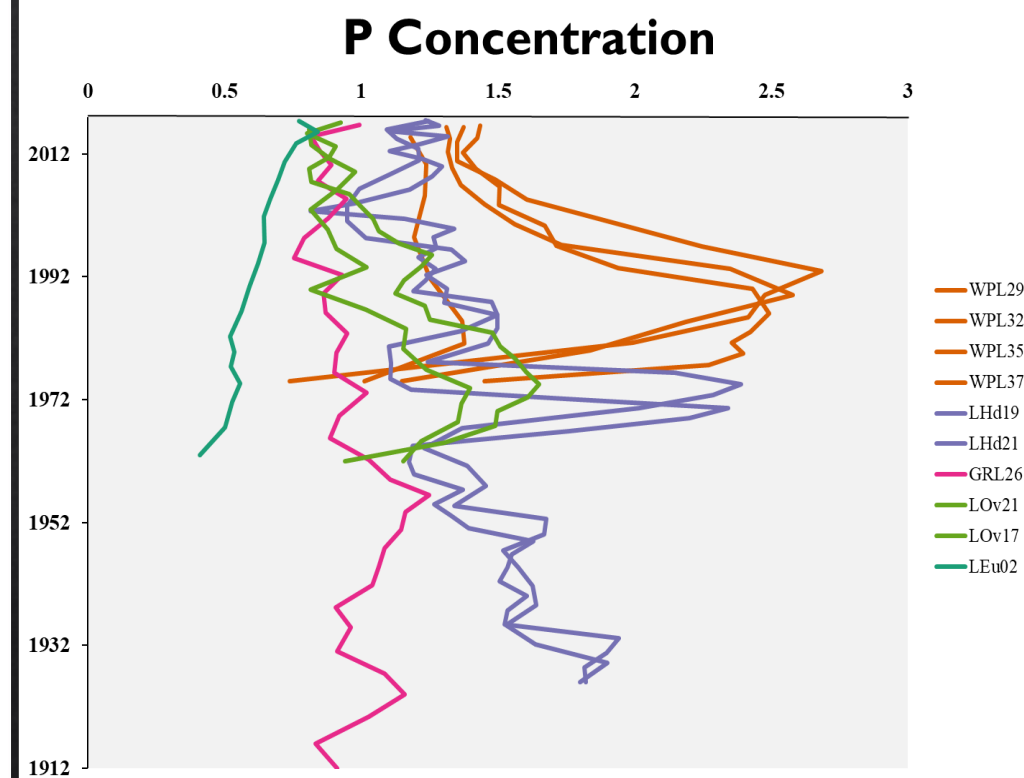
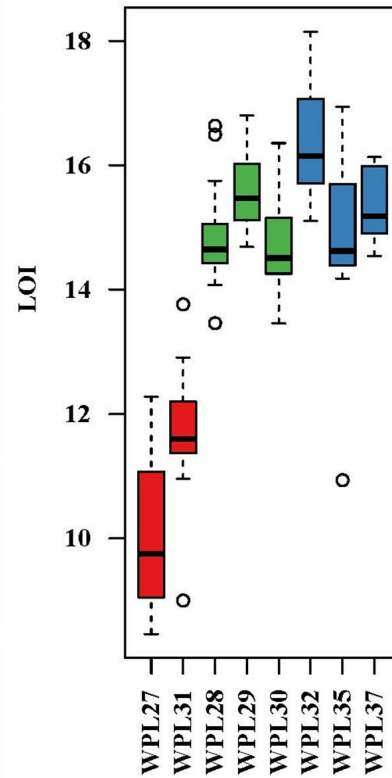
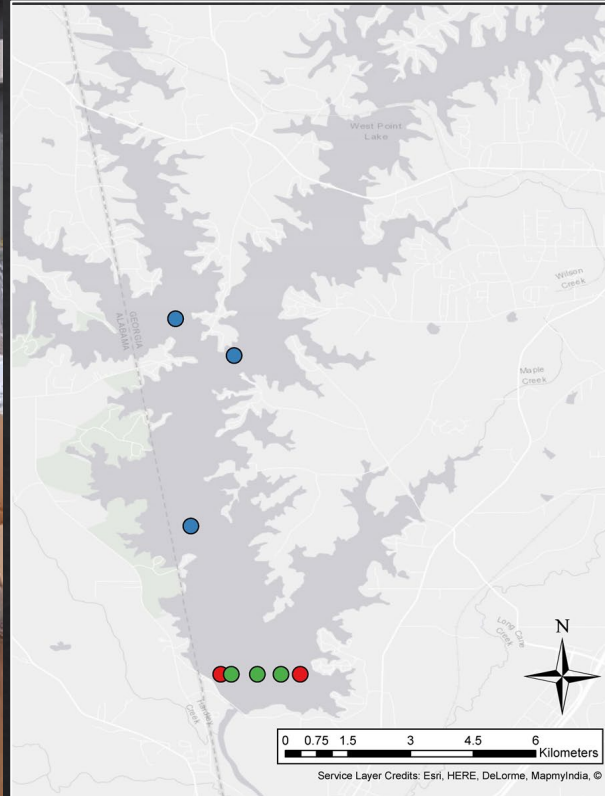
Mayflies

ACF Reservoirs Chattahoochee Study

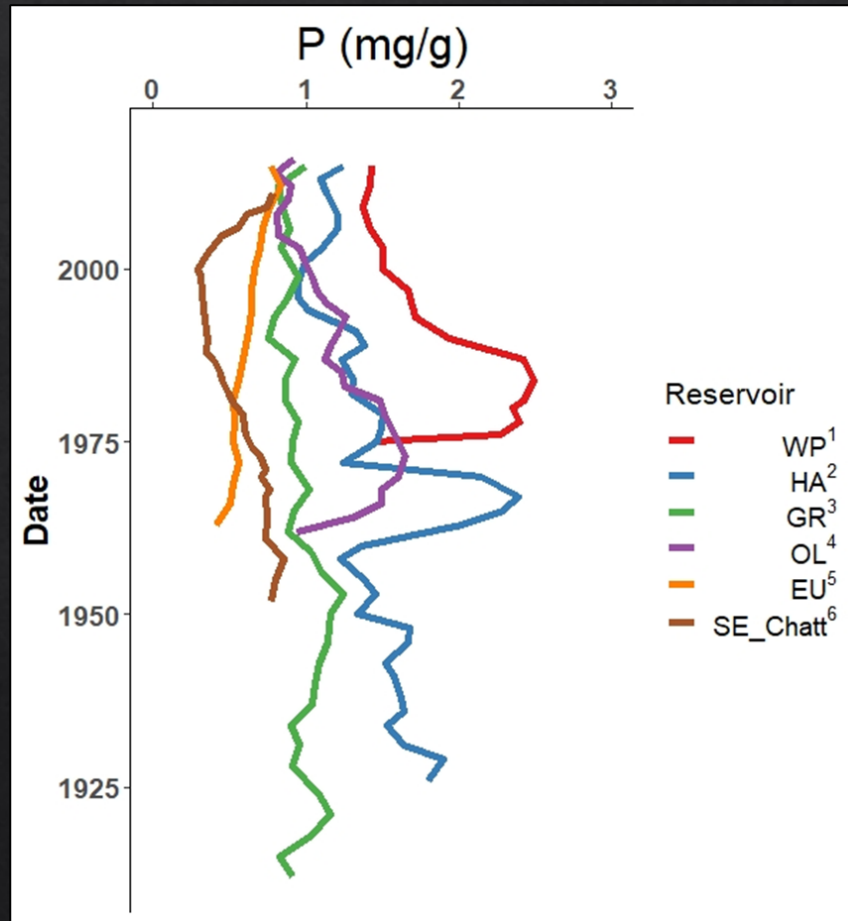


Couch et al. 1996

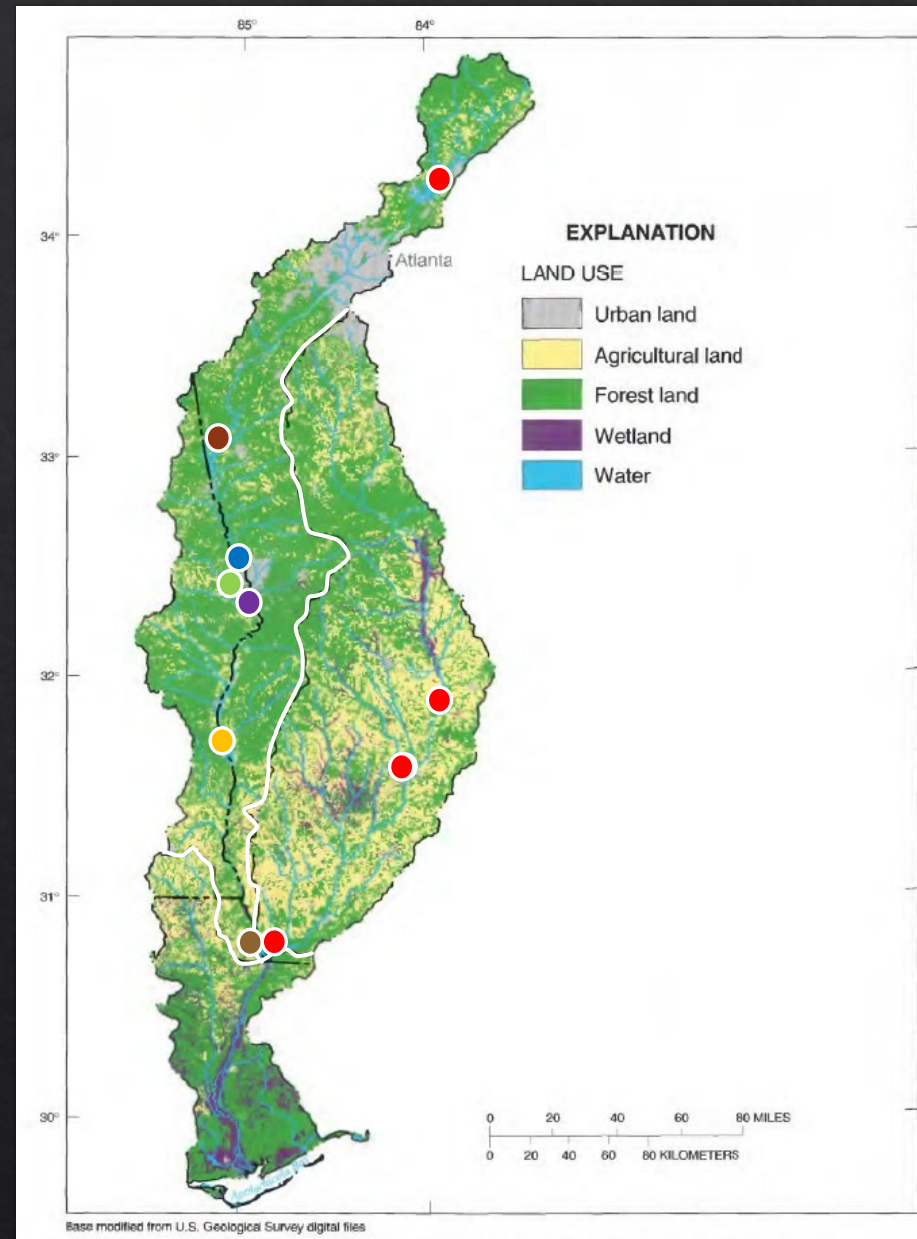
Reproducibility



ACF Reservoirs Chattahoochee Study



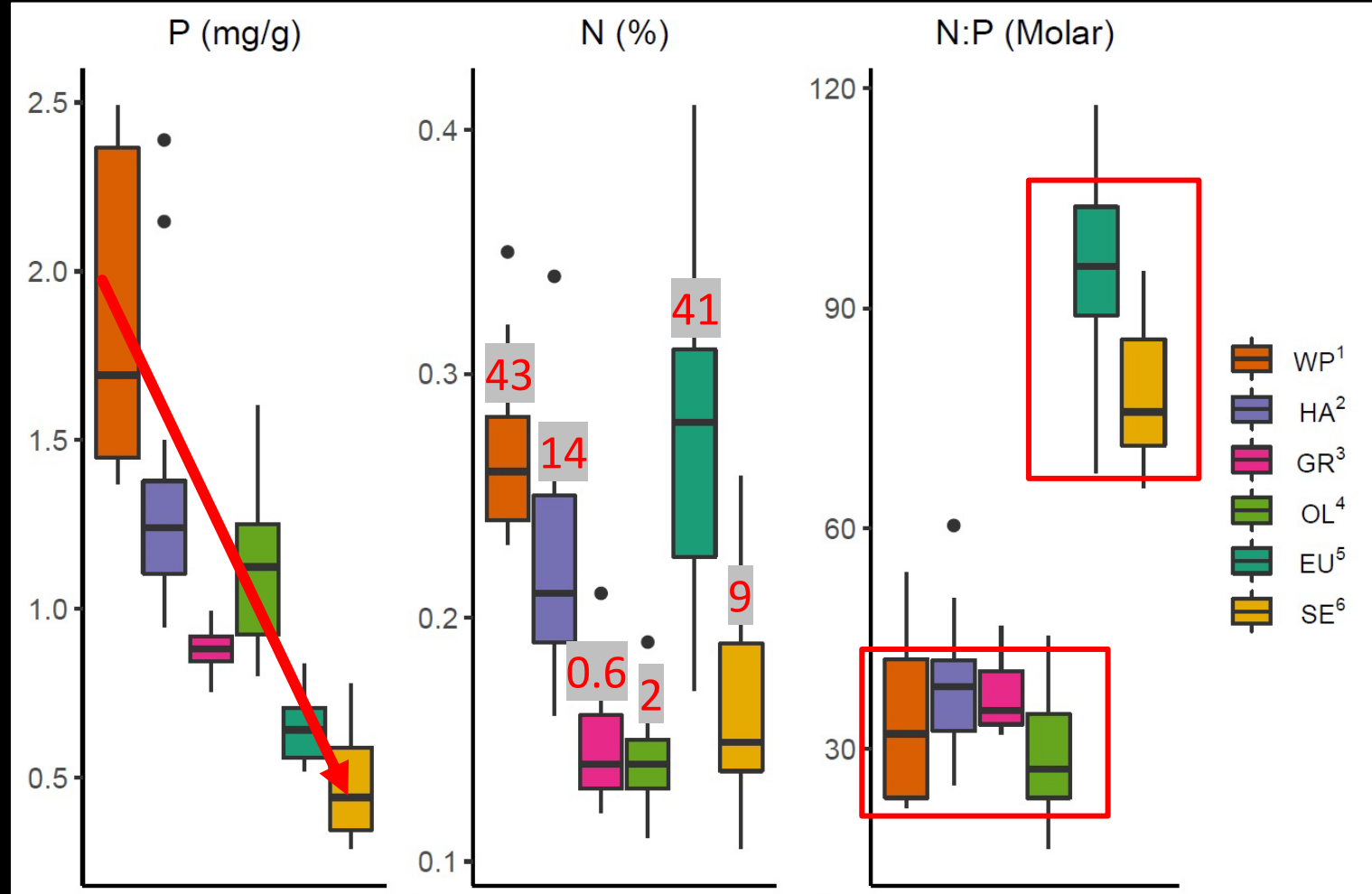
Webster et al. 2021



Couch et al. 1996

Urban Watershed Trends

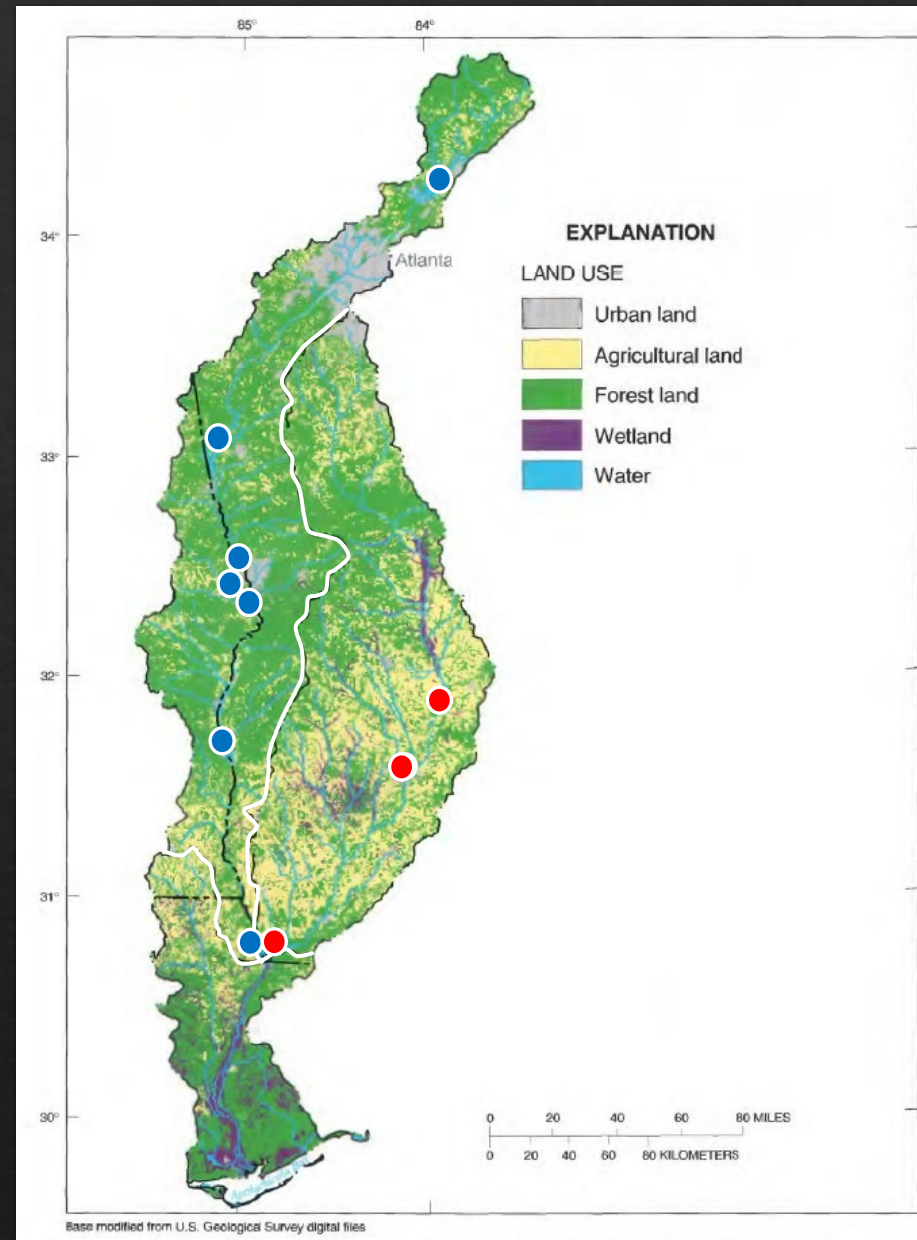
- ◇ P driven by geographic order (initial reservoir)
- ◇ N driven by retention time
 - ◇ (Finlay et al. 2013)
- ◇ Possible relationship of N:P and *Hydrilla verticillate*



ACF Reservoirs Whole Basin Study

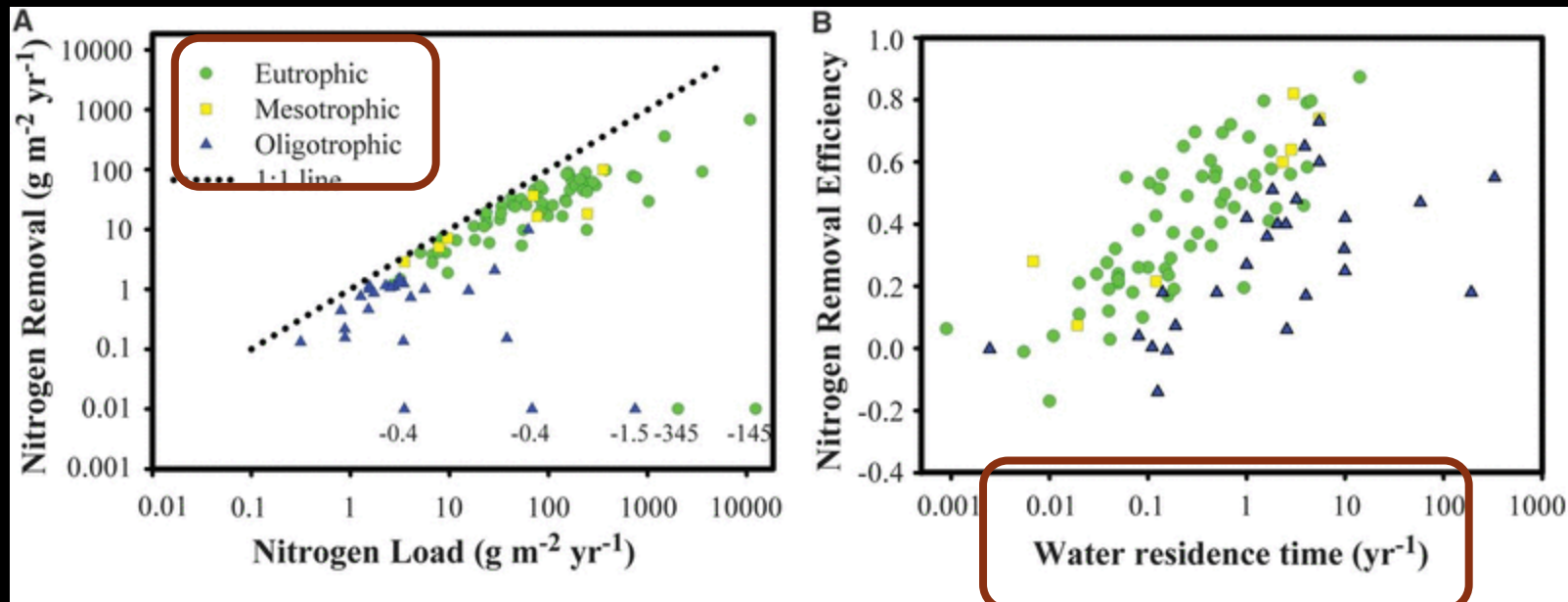


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ICHAUWAY



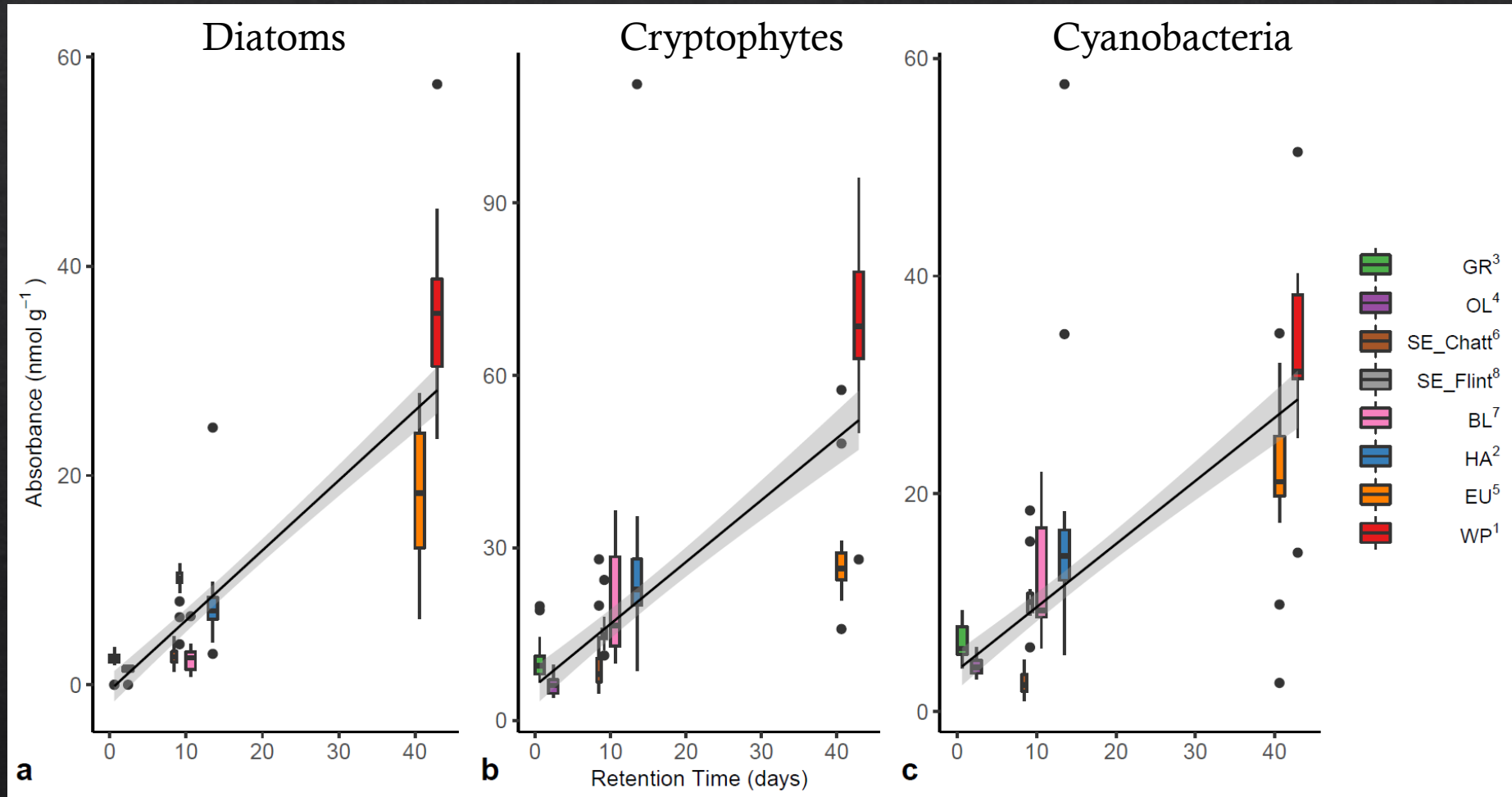
Couch et al. 1996

- ◇ Do the trends we see in the Chattahoochee watershed persist in the Flint Watershed?
- ◇ Are the primary producer responses related to differences in nutrient deposition?
- ◇ Could *Hydrilla v.* be driving the N:P of sediments?

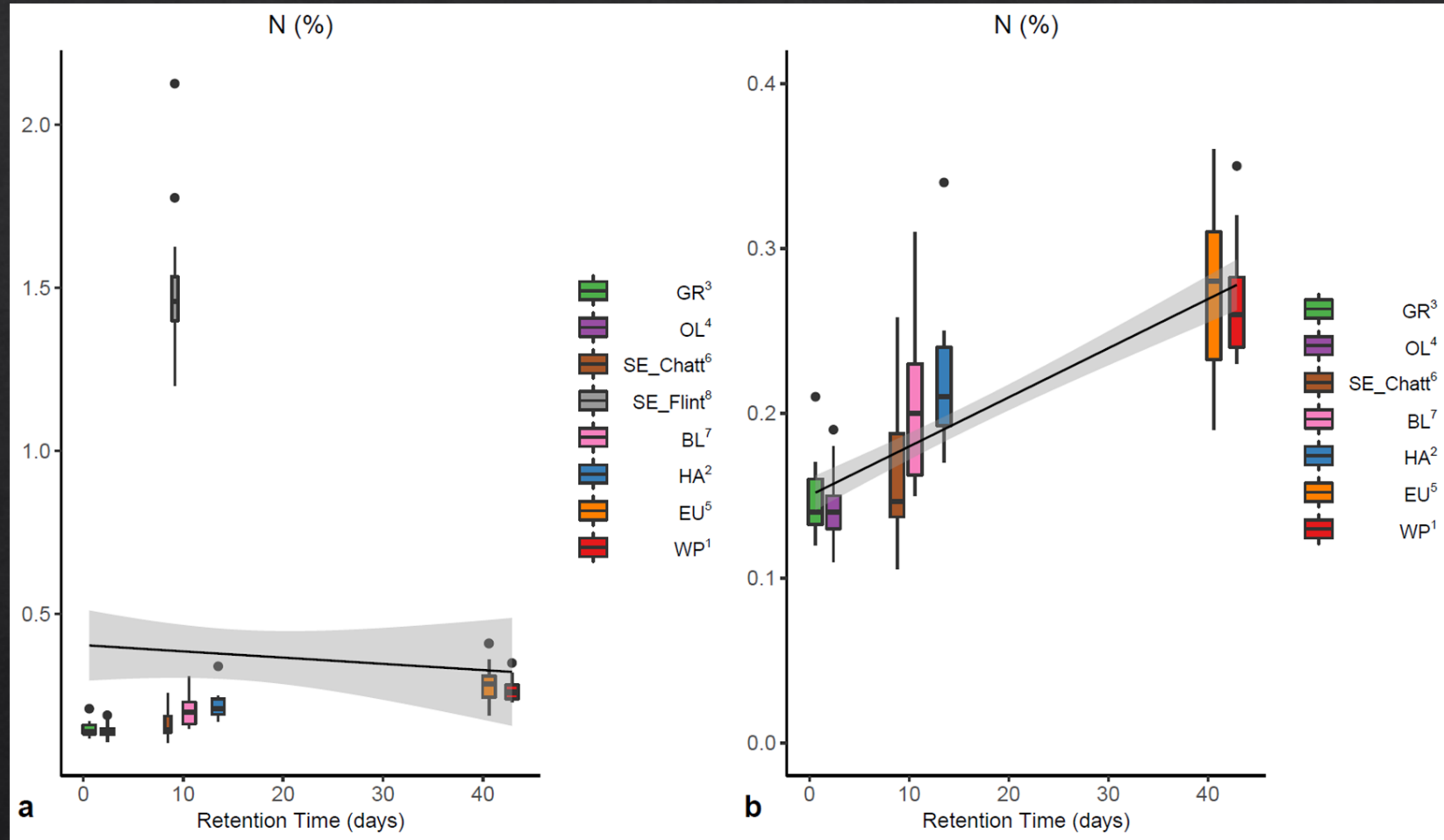


Finlay et al. 2013, Science

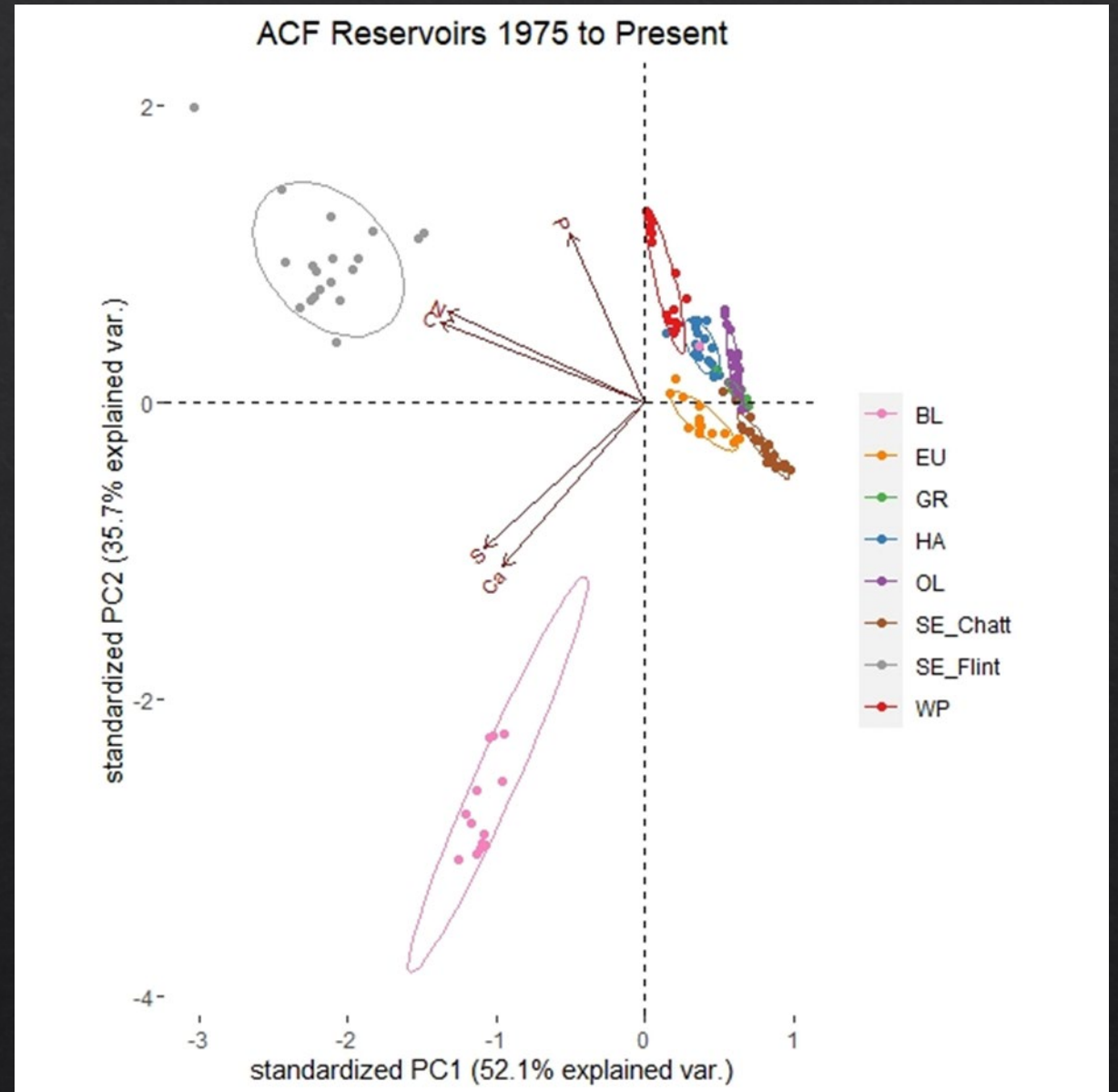
Retention Time-Primary Producers



Retention Time-Nitrogen

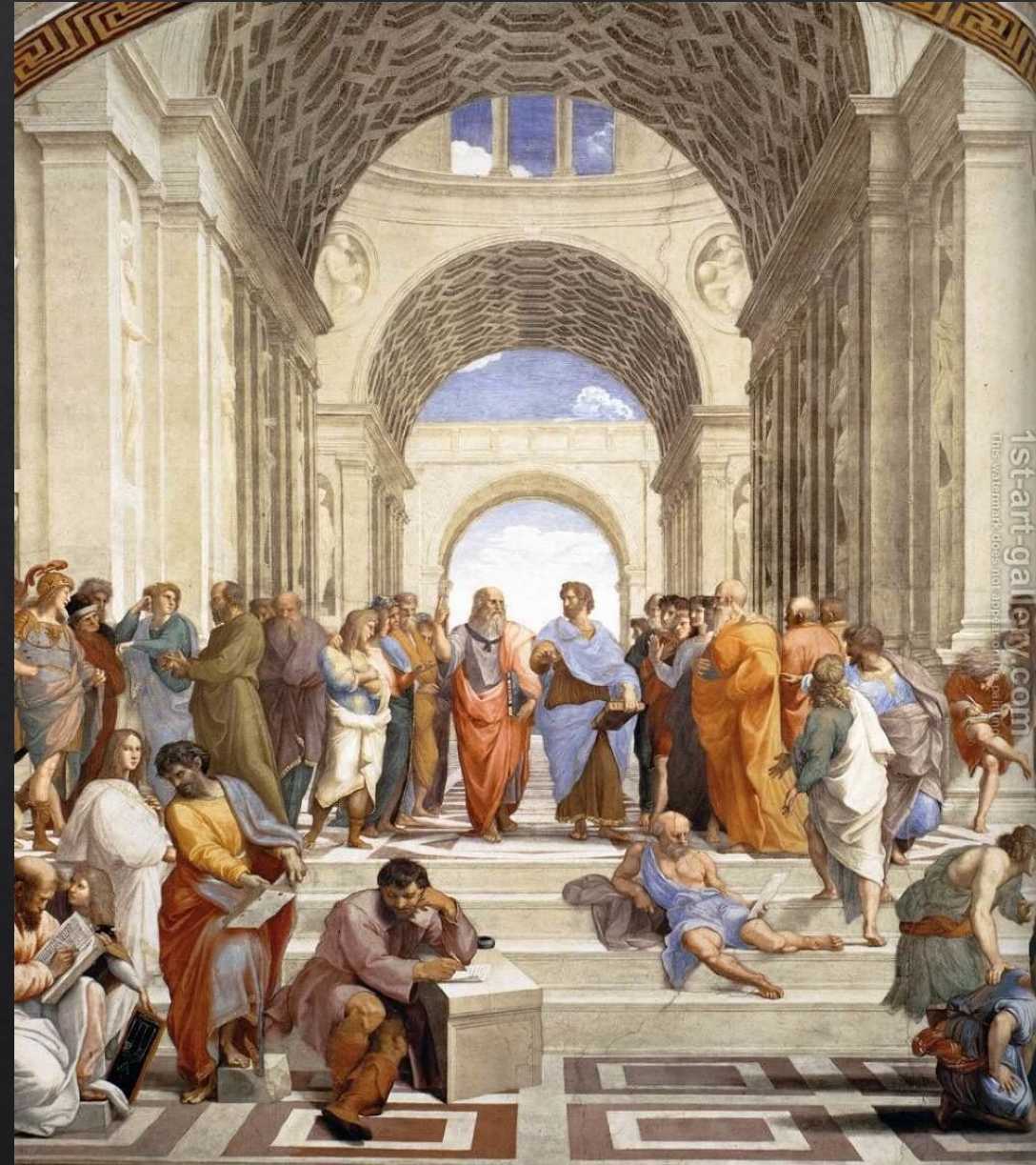


Nutrient movement through the Flint. . .



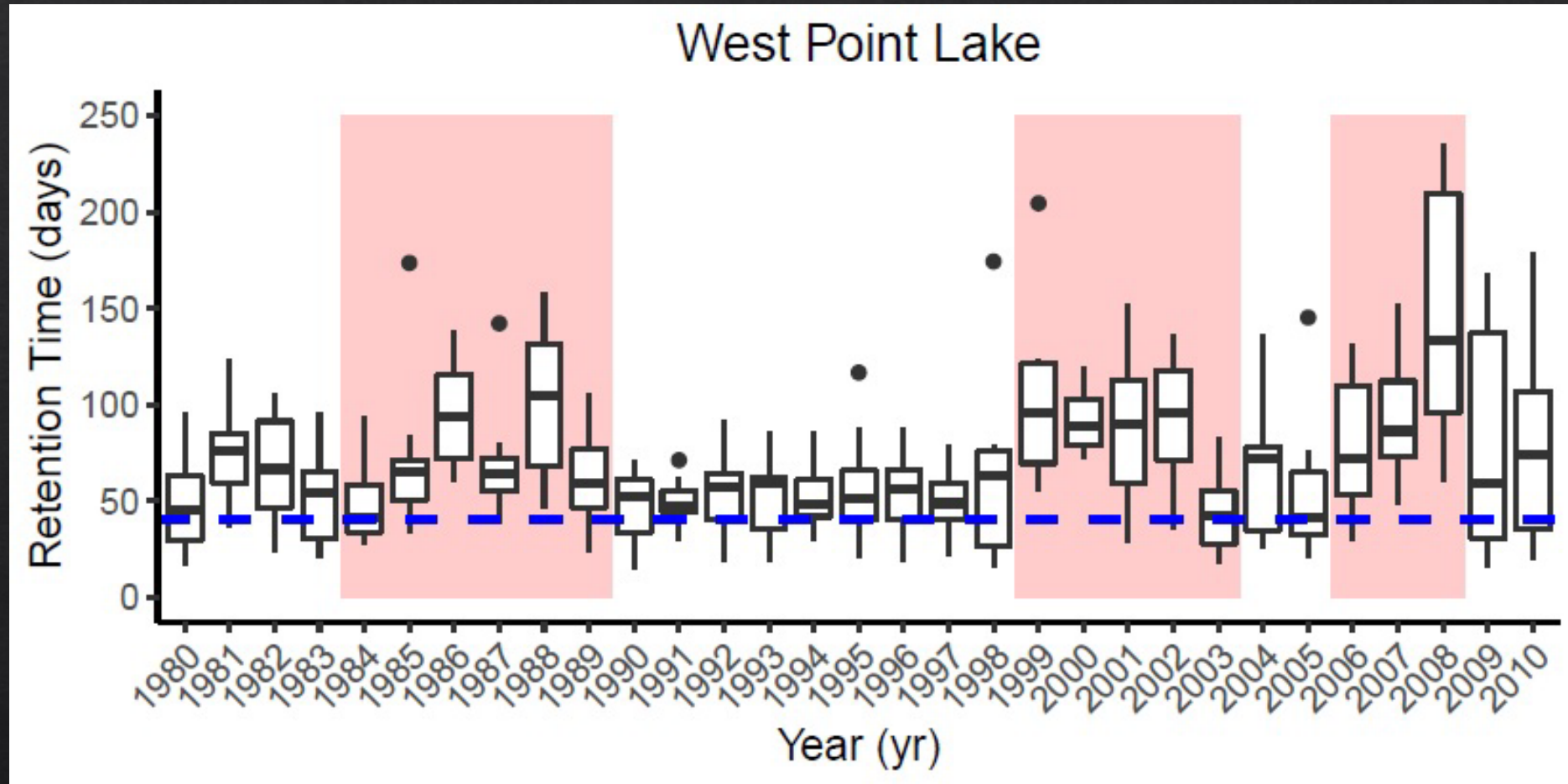
“As above, so below” –Emerald
Tablet 8th Century

“As below, so above” –Emerald
Tablet 8th Century



School of Athens, Raphael

Linking Climate-Retention Time-Nutrients



Go to Ben's poster and ask about this!

Questions?

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