Willard Spur Nutrient Cycling

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Research Team Update
Science Panel Meeting
October 23, 2012

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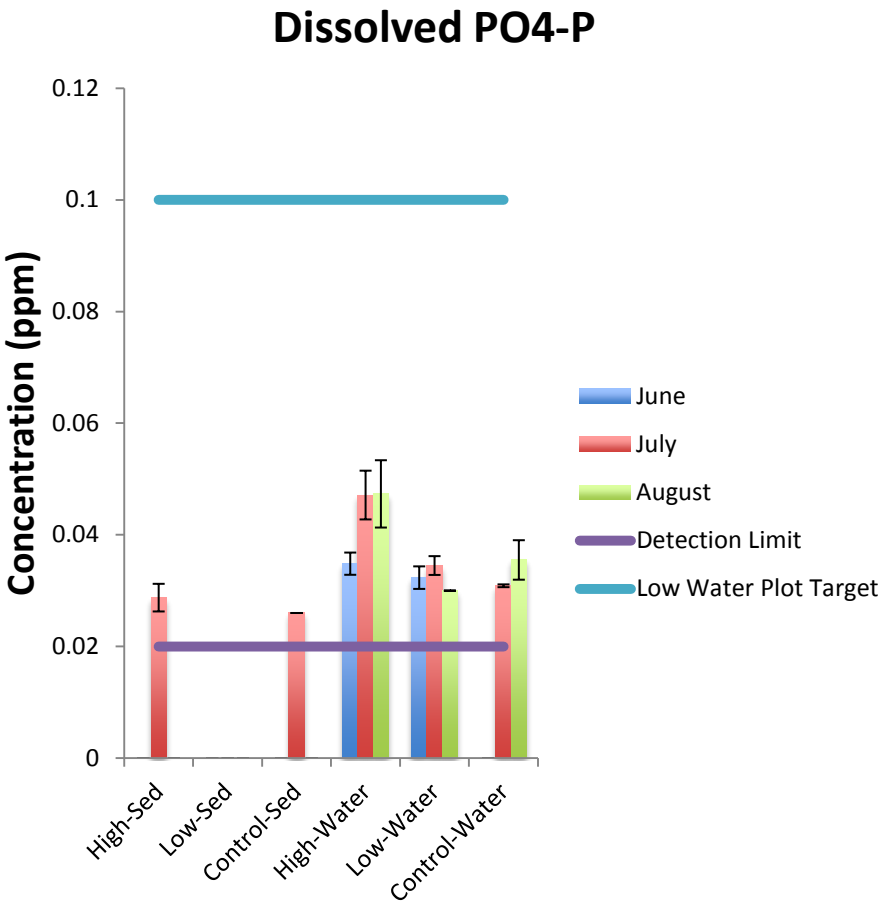
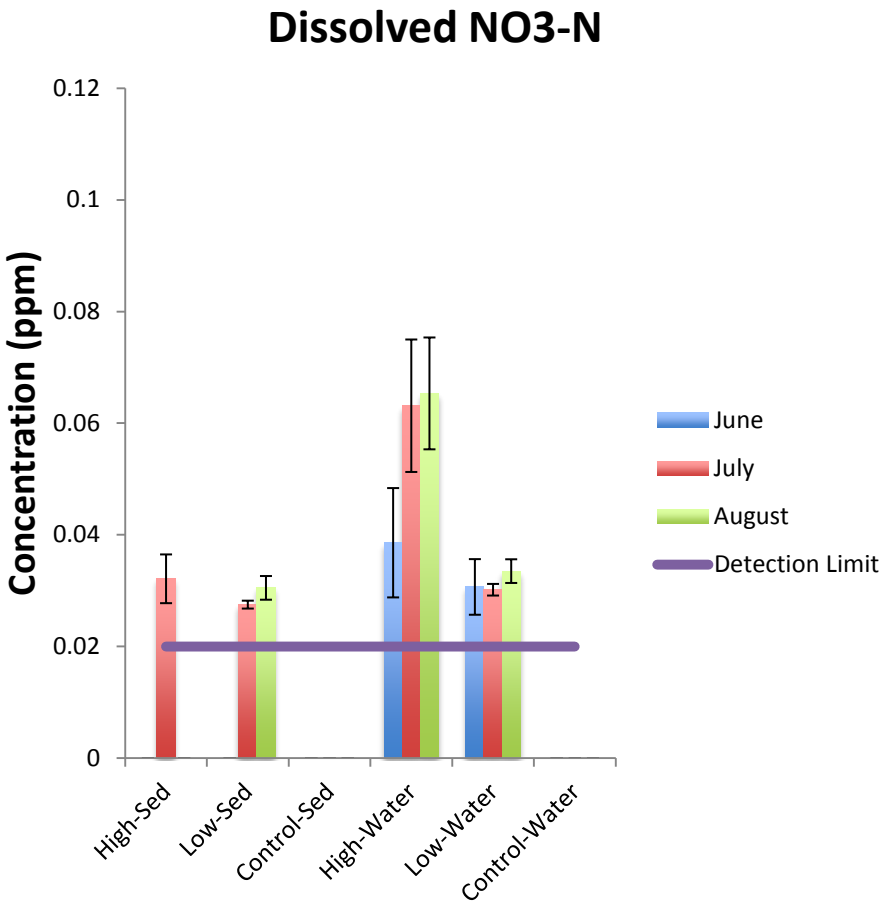
Project Milestones

- **April:** Plots installed, monitoring begins.
- **June:** Water/sediment monthly sampling begins.
- **July:** Nutrient flux experiments completed.
- **August:** Contract signed.
- **September:** Last sample event (open to discussion). Literature review submitted.
- **November-January:** Data analysis and interim report

Nutrient Concentration in the Water Column

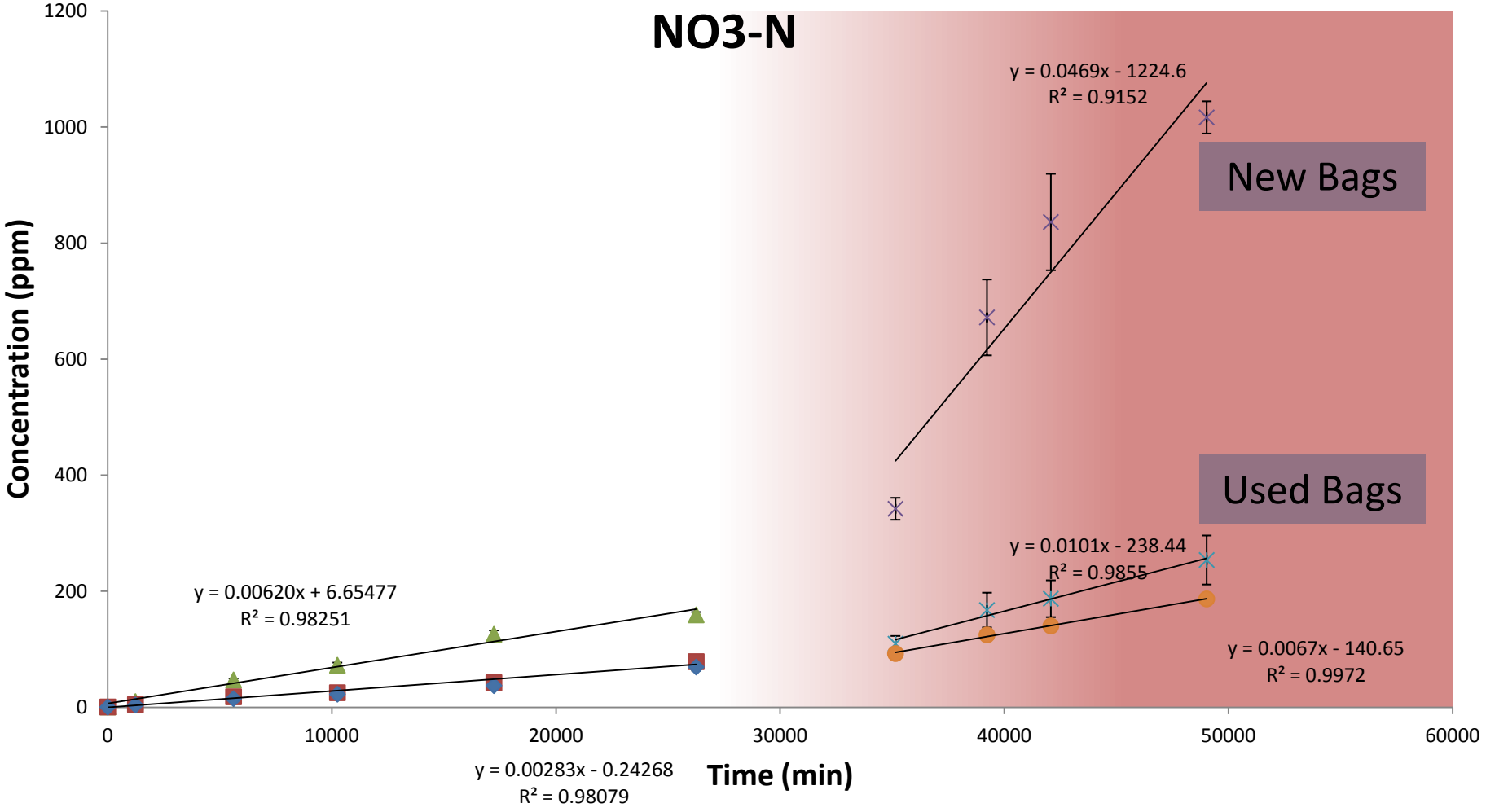




Bucket Tests: Nitrate Dissolution

Inside Tests:
50-60 °F

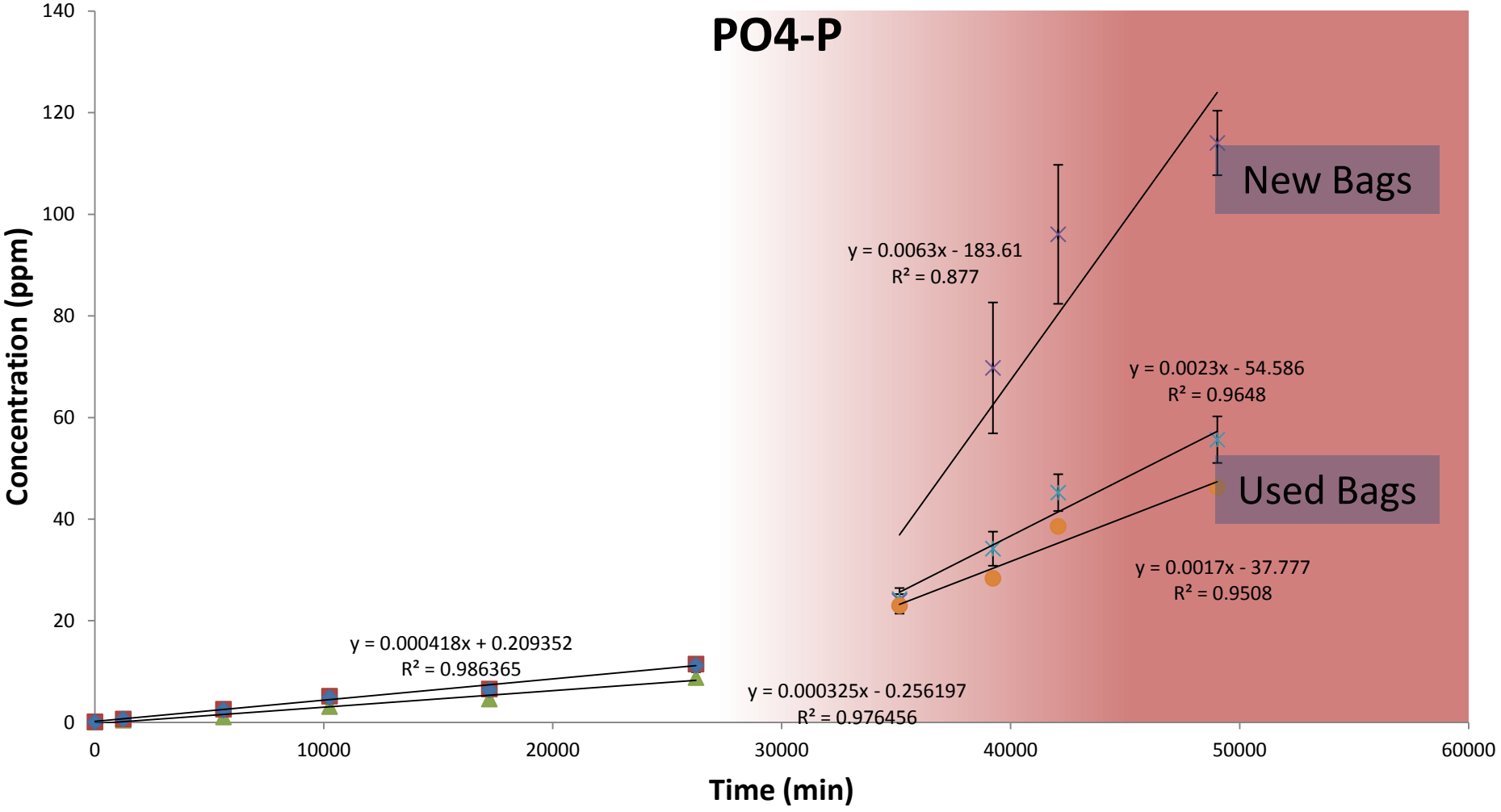
Outside Tests:
70-100 °F



Bucket Tests: Phosphate Dissolution

Inside Tests:
50-60 °F

Outside Tests:
70-100 °F



Applying Osmocote Dissolution Rates to Willard Spur Plots

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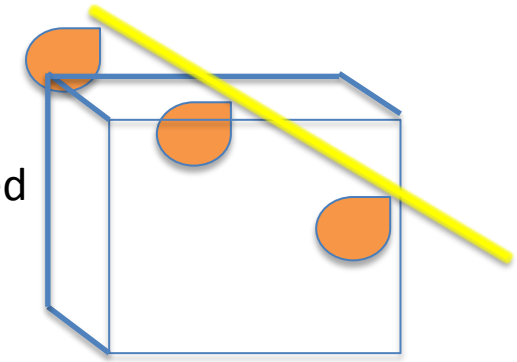
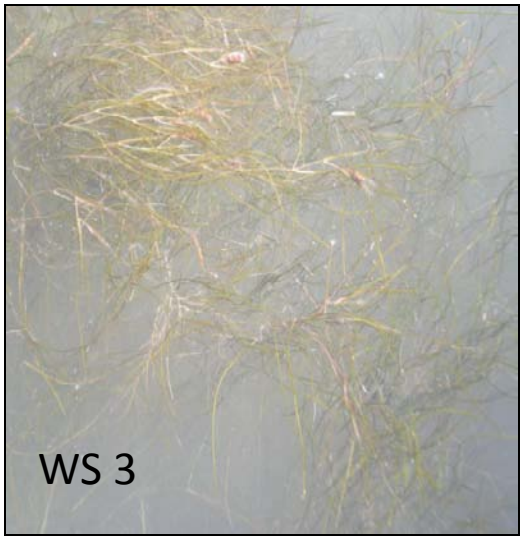
Outdoor Bucket Tests

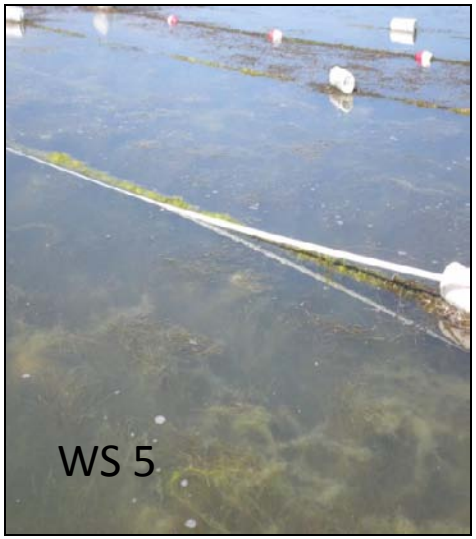
1 cell = 0.15 m^3: The approximate volume influenced by 1 bag of Osmocote in the high water column plot.

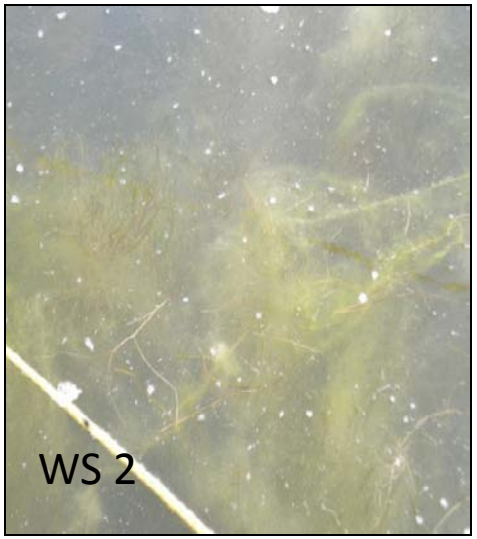


Predicted concentrations in high water column plot based on dissolution rates from ***bags removed from the high plot.***			Predicted concentrations in the high water column plot based on dissolution rates from ***new bags.***		
Residence time of volume (hour)	NO3-N Conc. in cell (ppm)	PO4-P Conc. in cell (ppm)	Residence time of volume (hour)	NO3-N Conc. in cell (ppm)	PO4-P Conc. in cell (ppm)
24	0.918	0.209	24	4.264	0.573
12	0.459	0.105	12	2.132	0.286
6	0.230	0.052	6	1.066	0.143
3	0.115	0.026	3	0.533	0.072
1	0.038	0.009	1	0.178	0.024

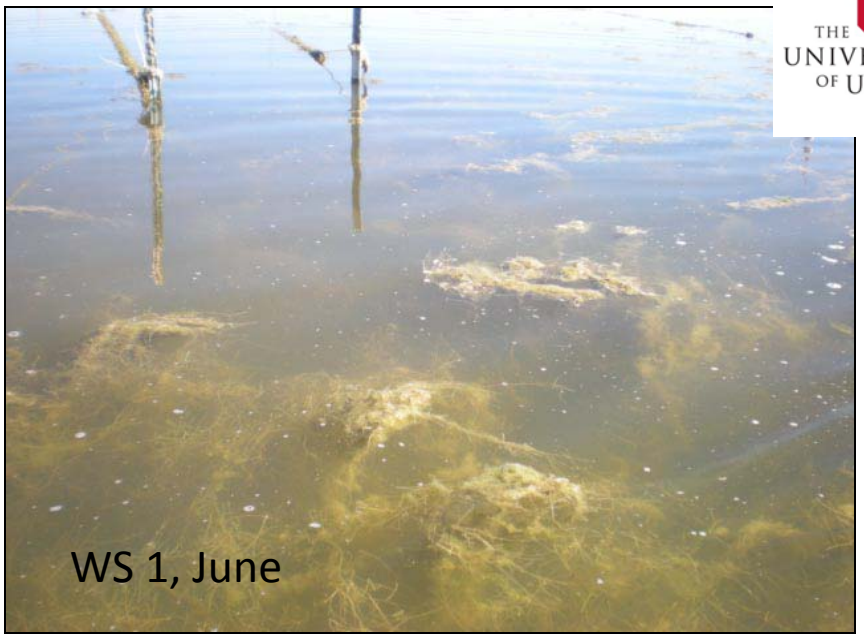
Overview of Plant Observations



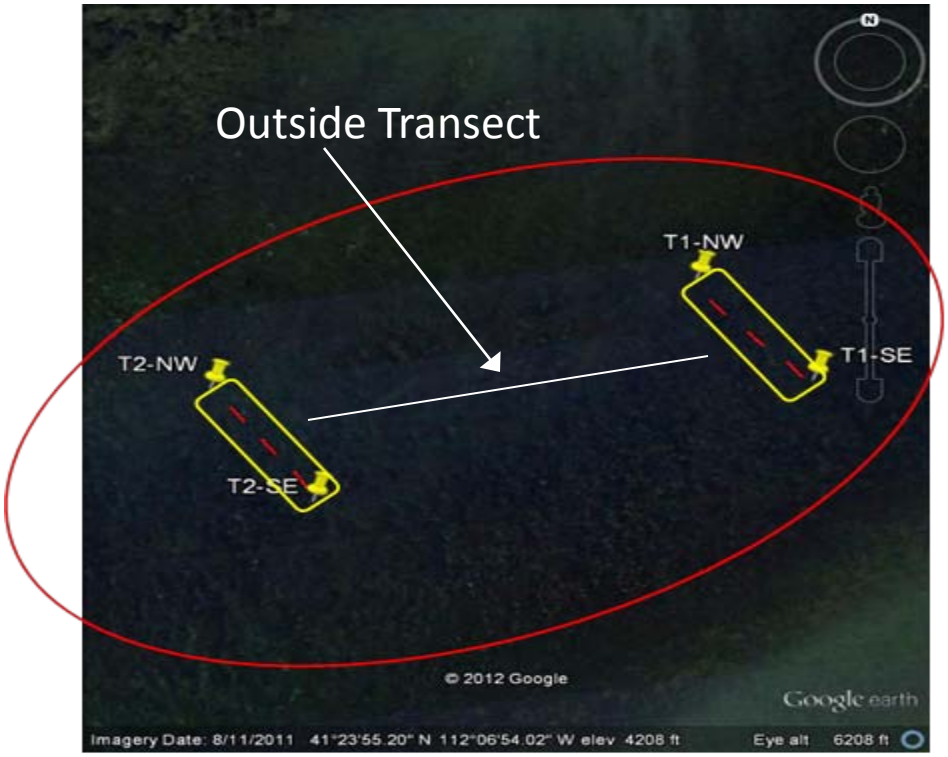


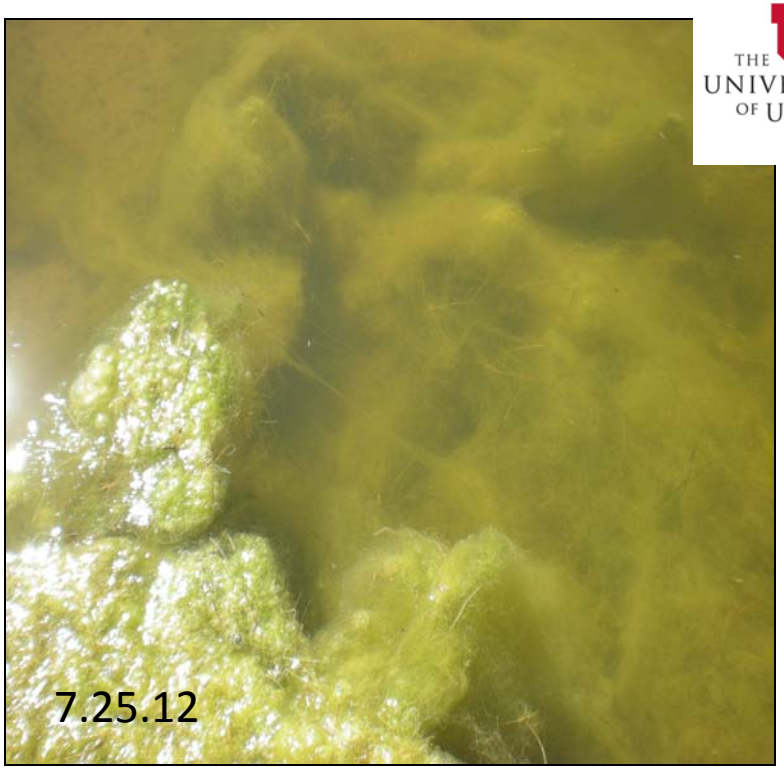


- **Mid-May**
  - SAV was established densely inside and outside all plots.
  - More epiphyte cover in amendments (sediment and water column) than controls.



- **June – July: Floating Plant Debris**
  - Plants within all plots showed signs of senescence in June and many were dead by the end of July.
    - Massive collection of floating plant debris trapped by ropes during June.
    - Was the SAV crash that followed driven or accelerated by the floating debris?

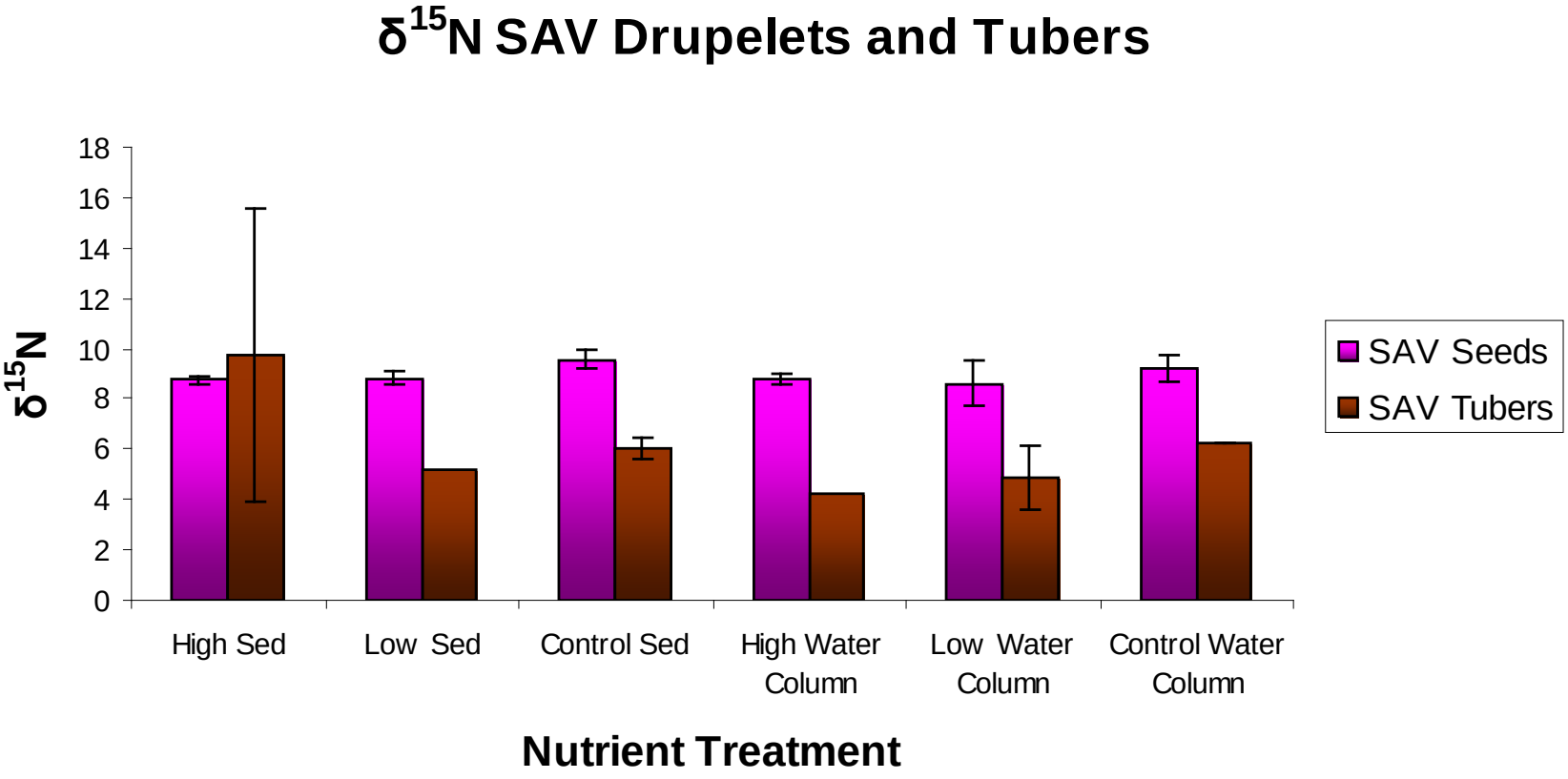




- **Comparison with outside of plots**
  - Transect between sediment and water column plots showed more SAV (relative to within the plots) by the end of July.
  - Outside cover similar to plot cover by end of September.

- **Aug – Sept: Composition trends within plots**
  - Forageable SAV die-off showed no recovery in sediment amendments by August or September; only a slight re-growth in all water column plots & sediment control in August with little improvement by September.
  - Surface algae uniform in cover by end of August in High Sediment plot and moderately so in the Low Sediment plot (but not very thick in either plot).
  - CEDE expanded its distribution into the plots by end of September.

Plant Isotope Data



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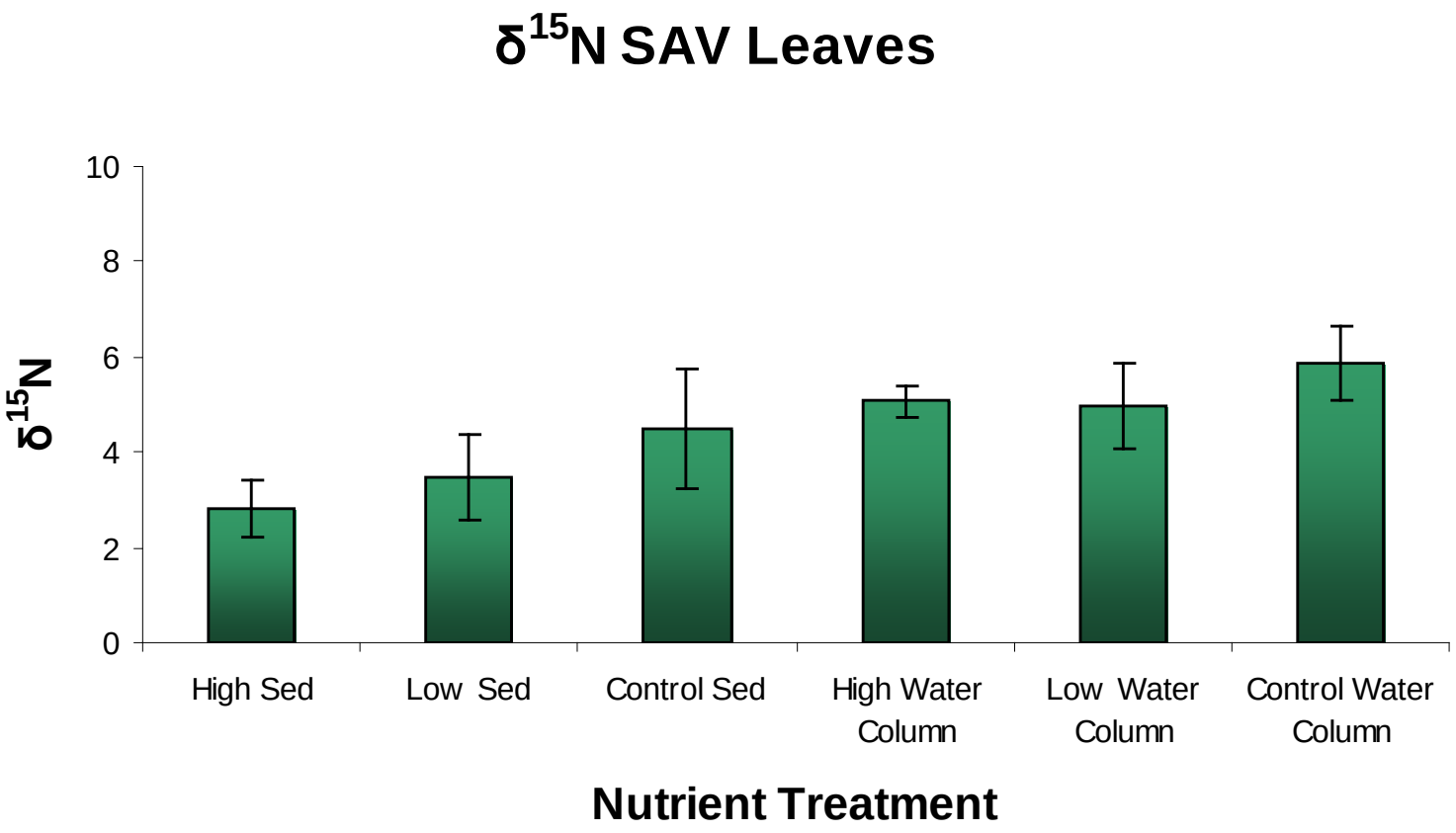
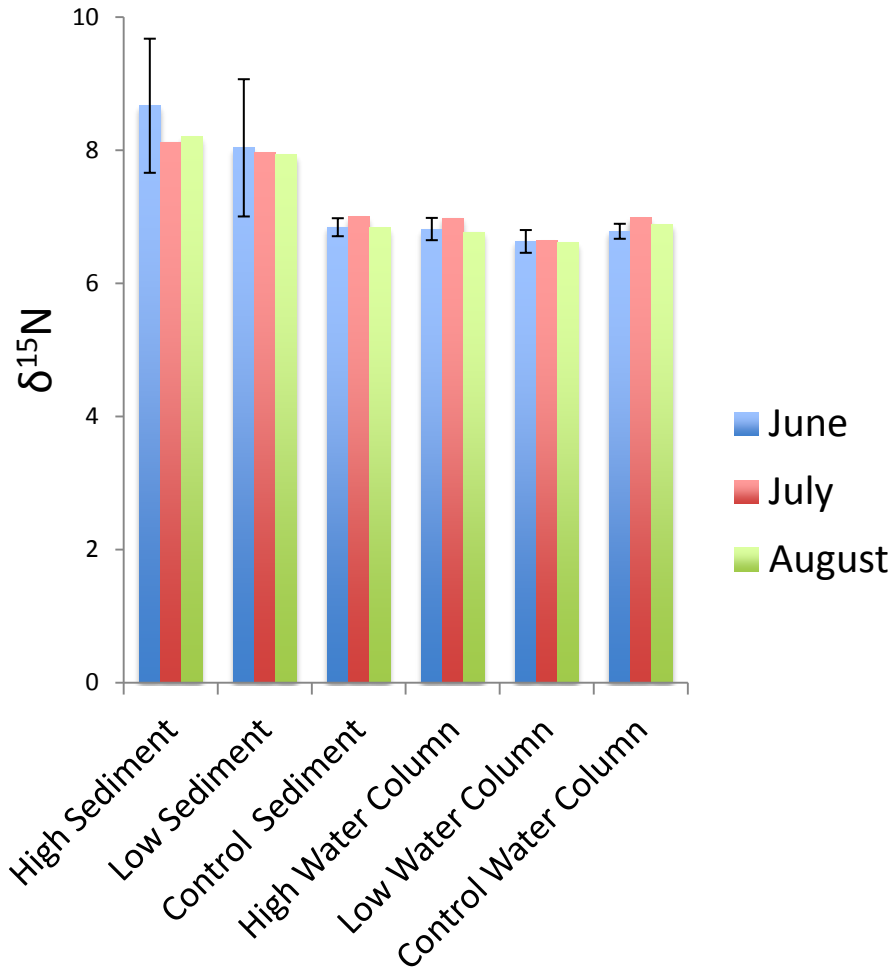
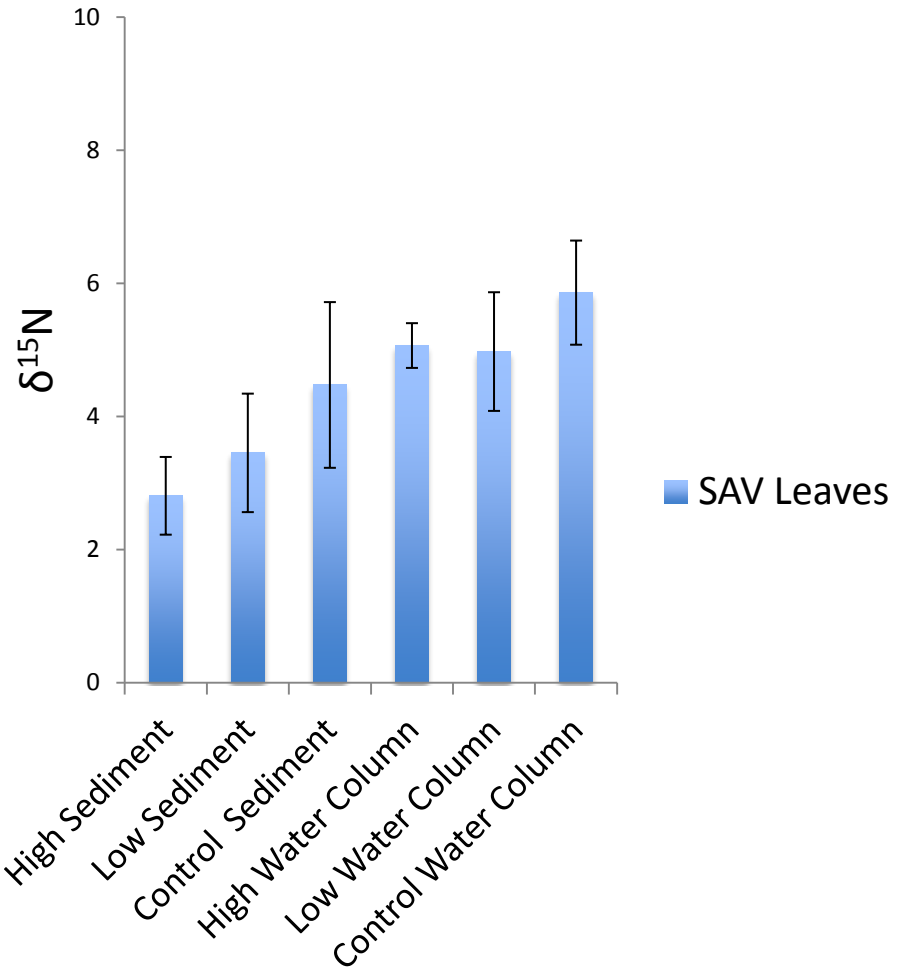


Sediment and Plant $\delta^{15}N$ Isotope Values

Sediment: Total $\delta^{15}N$



Plant Leaves: Total $\delta^{15}N$



Nutrient Fluxes In Willard Bay Wetlands

Mitch Hogsett, Ramin Nasrabadi, and Ramesh Goel*

Oct 23th, 2012

Objectives

- Evaluate nitrogen and P fluxes in six plots
- Evaluate if any biological activity is contributing to the fate of nutrients

Initially we planned on using our original closed top aluminum chambers- low water level and SAVs pose challenges

Calculations

Sediment Nutrient Flux

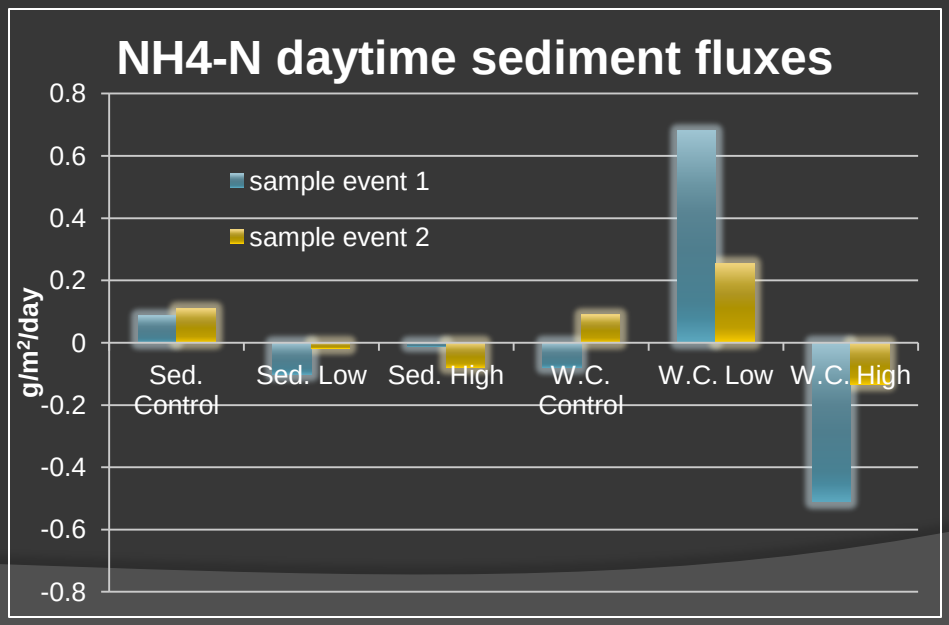
= (Total Flux obtained using open bottom chamber) – (rate of change in water column obtained using closed bottom chamber)

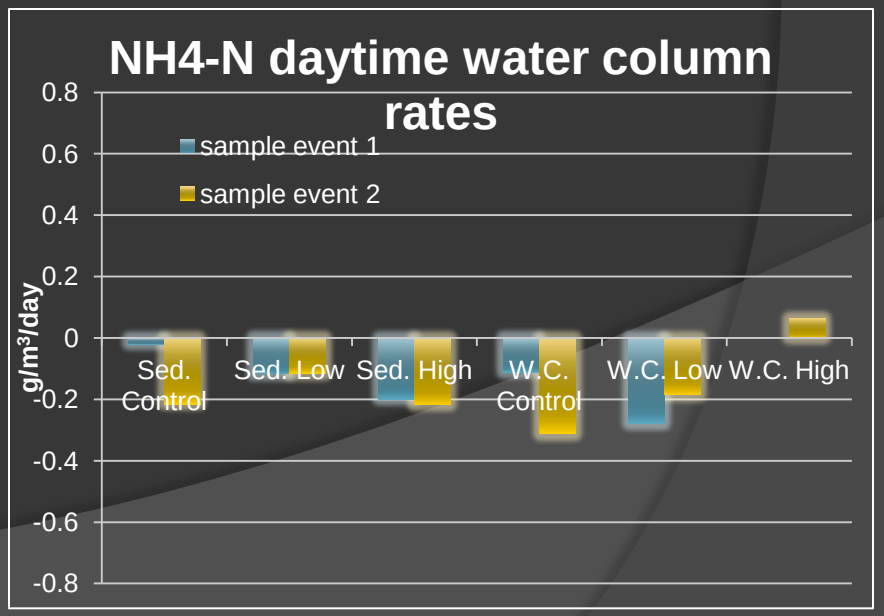
Results- Flux Data

Plot	Date	Sediment Flux ($g/m^2/day$)				W.C. ($g/m^3/day$)			
		NH_4-N	NO_2-N	NO_3-N	PO_4-P	NH_4-N	NO_2-N	NO_3-N	PO_4-P
W.C. High plot	7/31/2012	-0.135	0.011	-0.039	_	0.065	-0.048	0.012	_
W.C. Low plot	7/31/2012	0.254	-0.198	0.029	_	-0.185	-0.053	-0.01	_
W.C. Control	7/31/2012	0.089	-0.084	_	_	-0.312	0.077	_	_
Sed. High plot	7/26/2012	-0.08	-0.135	-0.034	_	-0.218	-0.005	-0.031	_
Sed. Low plot	7/26/2012	-0.017	-0.025	-0.002	_	-0.115	0.038	-0.05	_
Sed. Control	7/26/2012	0.109	0.06	_	_	-0.216	-0.096	_	_

Negative net sediment flux means is towards sediments or overall consumption on sediments- Sediment flux (accounts for water column nutrient dynamics)

Negative water column flux means overall consumption in the water column only





Discussion Points

- **Experimental Design**
  - Redesign plots: Fence installed from startup and submerge ropes in plots for suspending fertilizer bags.
  - Adding transects between plots to understand ambient concentrations on a larger scale than the plots.
- **Sediment and Water Column Treatments**
  - Remove fertilizer in October and monitor sediment N isotopes in November and December (2012).
  - Pre-amendment sampling (2013).
- **Plants**
  - More sampling early on (April-May).
  - Greater focus on plant-nitrogen partitioning.
- **Nutrient Flux**
  - Longer duration experiments (> 3 hours).
  - Use dark chambers to minimize PP.
  - Sediment cores in lab versus chambers in field.

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Questions?