Springs Ecosystem Super-group Nitrogen Dynamics and Metabolism

Mesocosm SAV Growth Experiments

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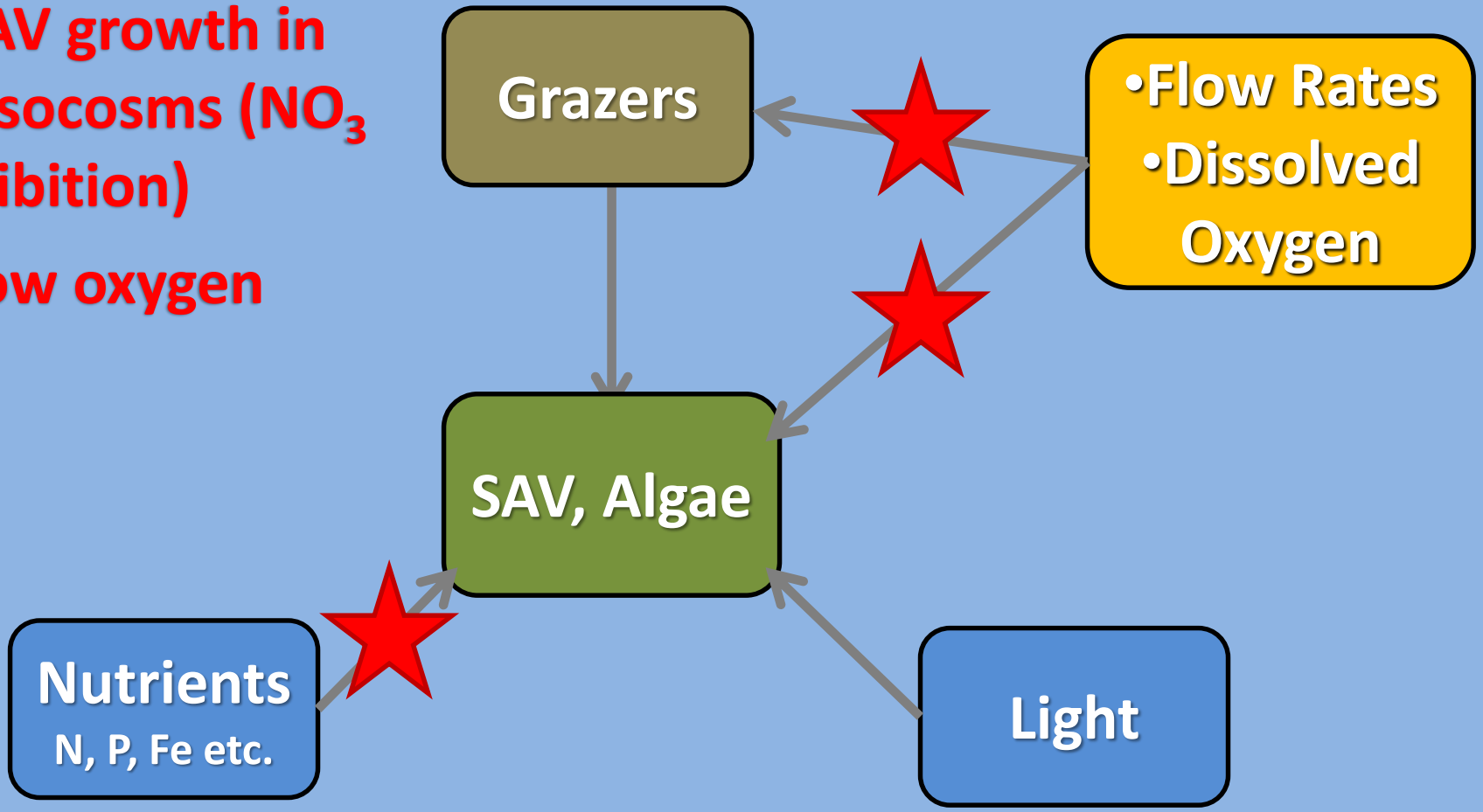
Acknowledgements

Objectives

- Test the potential for nitrate inhibition of SAV
- Investigate additional stressors on SAV growth (sediment type, Oxygen stress, Fe-P-Mo)
- Determine relationship between algal abundance and flow velocity
- *Investigate grazer susceptibility to hypoxia (respirometry)*

Mesocosm studies with SAV

- SAV growth in mesocosms (NO_3 inhibition)
- Low oxygen



stolen from M. Cohen

Experimental Design

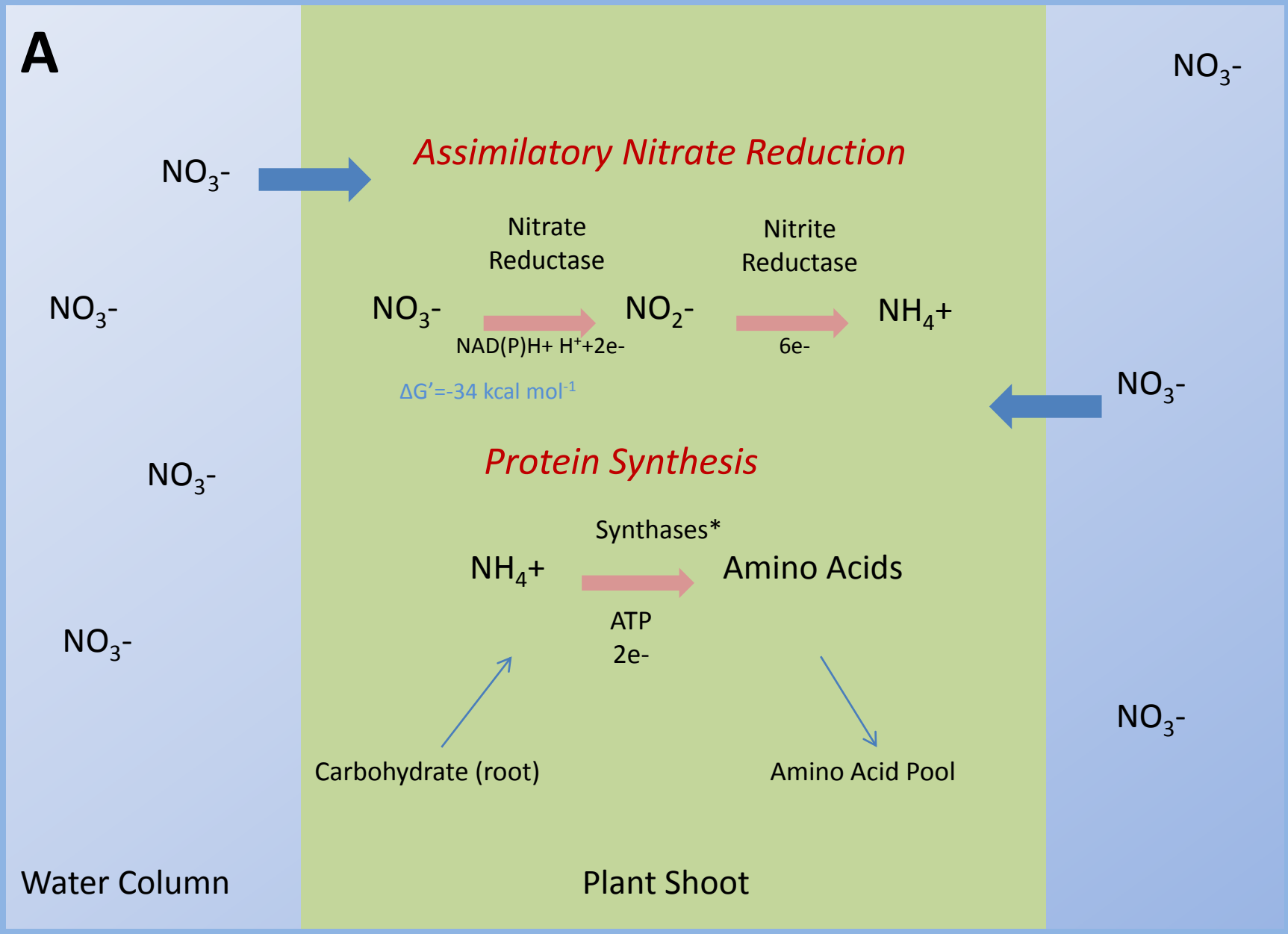
Four Mesocosm Treatments
0.1, 0.5, 1, 5 mg L^{-1} NO_3-N
6 month growth experiment

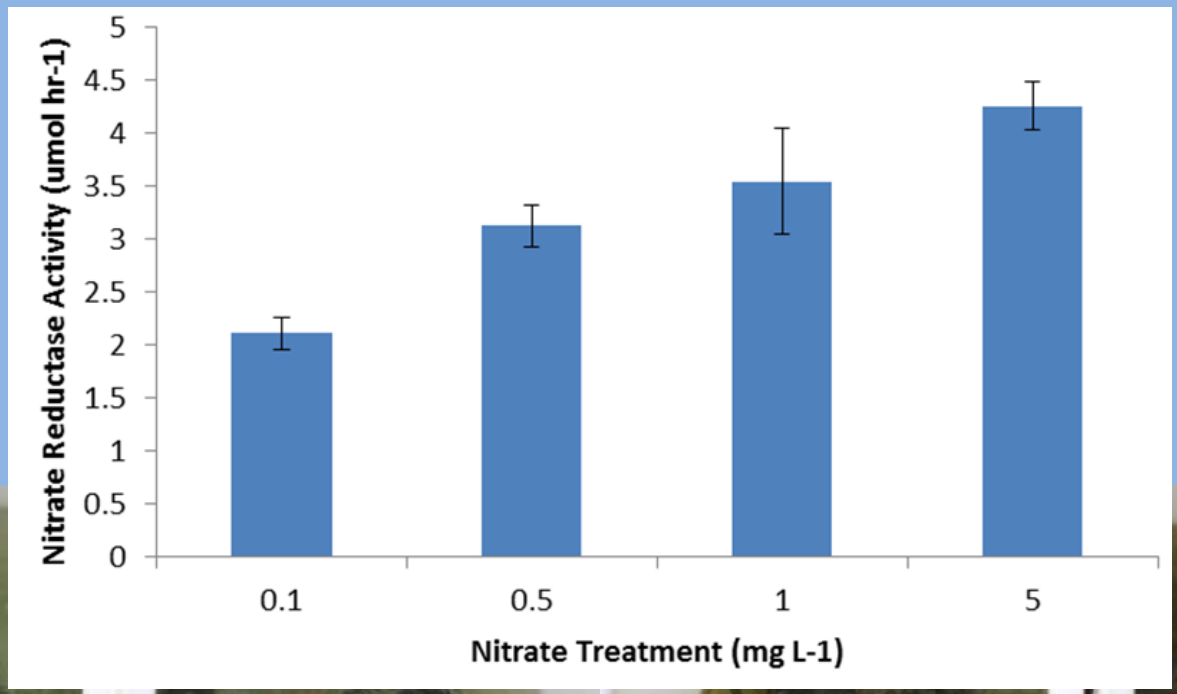
3 replicate tanks with 10 individuals of both *V.americana* and *S.kurziana*
n=30 indiv. per treatment

Analyses:
-Nitrate reductase activity
-Amino-acid concentration
-Biometrics (length, width)
-Root/shoot ratios (mass)
-tissue NH_4+
-aerenchyma structure
-cellular starch storage

Mesocosm water source:
Silver Springs c/o SJRWMD

Proposed Mechanism of Inhibition



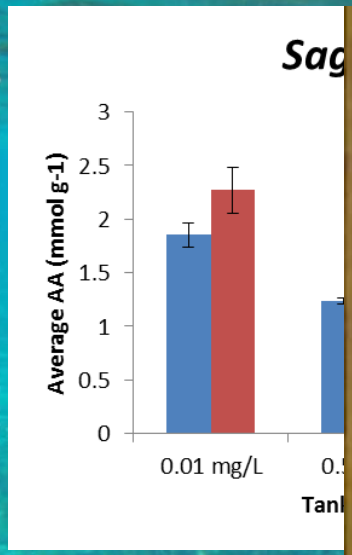


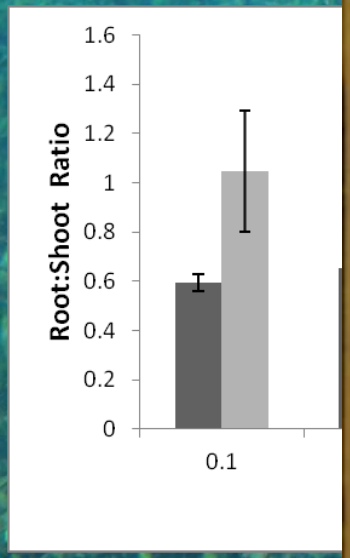
0.1 mg L^{-1} NO_3-N

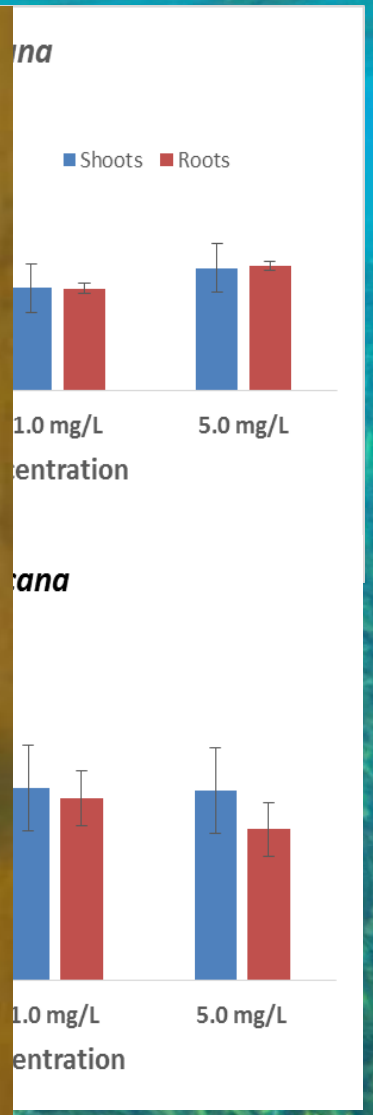
0.5 mg L^{-1} NO_3-N

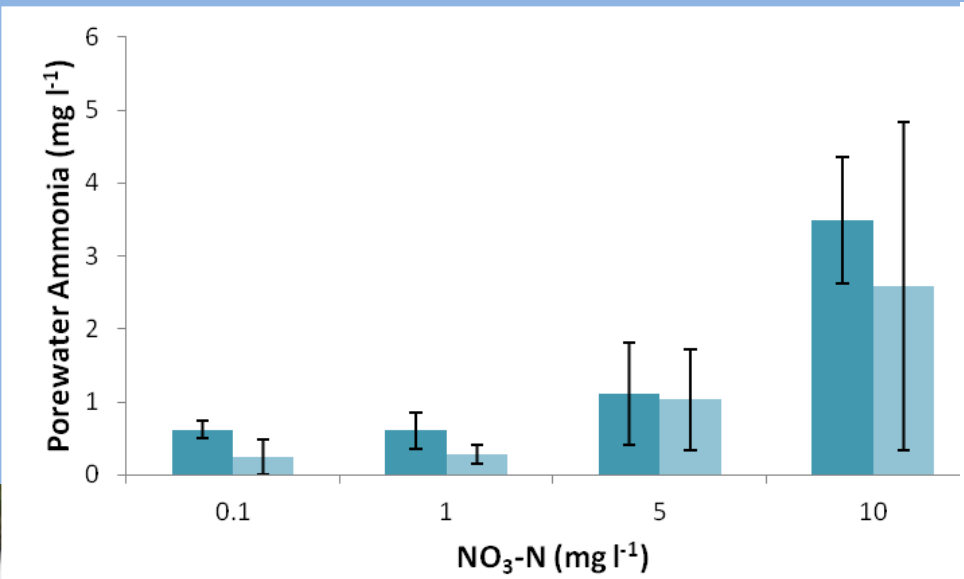
1.0 mg L^{-1} NO_3-N

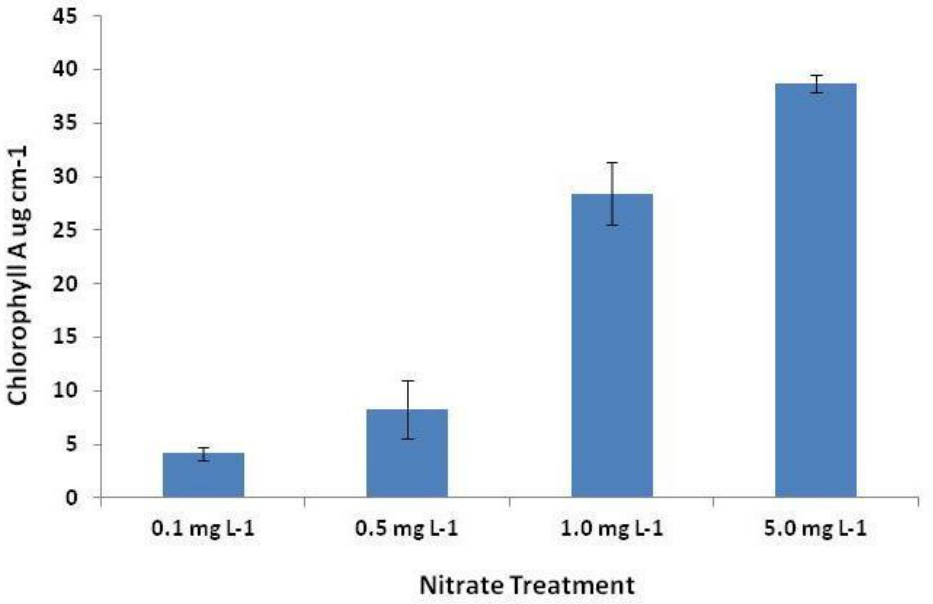
5.0 mg L^{-1} NO_3-N


Sag
Average AA (mmol g-1)
3
2.5
2
1.5
1
0.5
0
0.01 mg/L
0.1


Root:Shoot Ratio
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0.1


Shoots
Roots
1.0 mg/L
5.0 mg/L
1.0 mg/L
5.0 mg/L





0.1 mg L^{-1} NO_3-N

0.5 mg L^{-1} NO_3-N

1.0 mg L^{-1} NO_3-N

5.0 mg L^{-1} NO_3-N

Conclusions

Conclude: Increased NO_3-N does not appear to directly inhibit SAV growth

Significant Observation:

Epiphytic algae did respond positively to increased NO_3-N

Next Steps:

Mesocosms experiments

DO, sediment type, and micro-nutrients

Minor setbacks…..

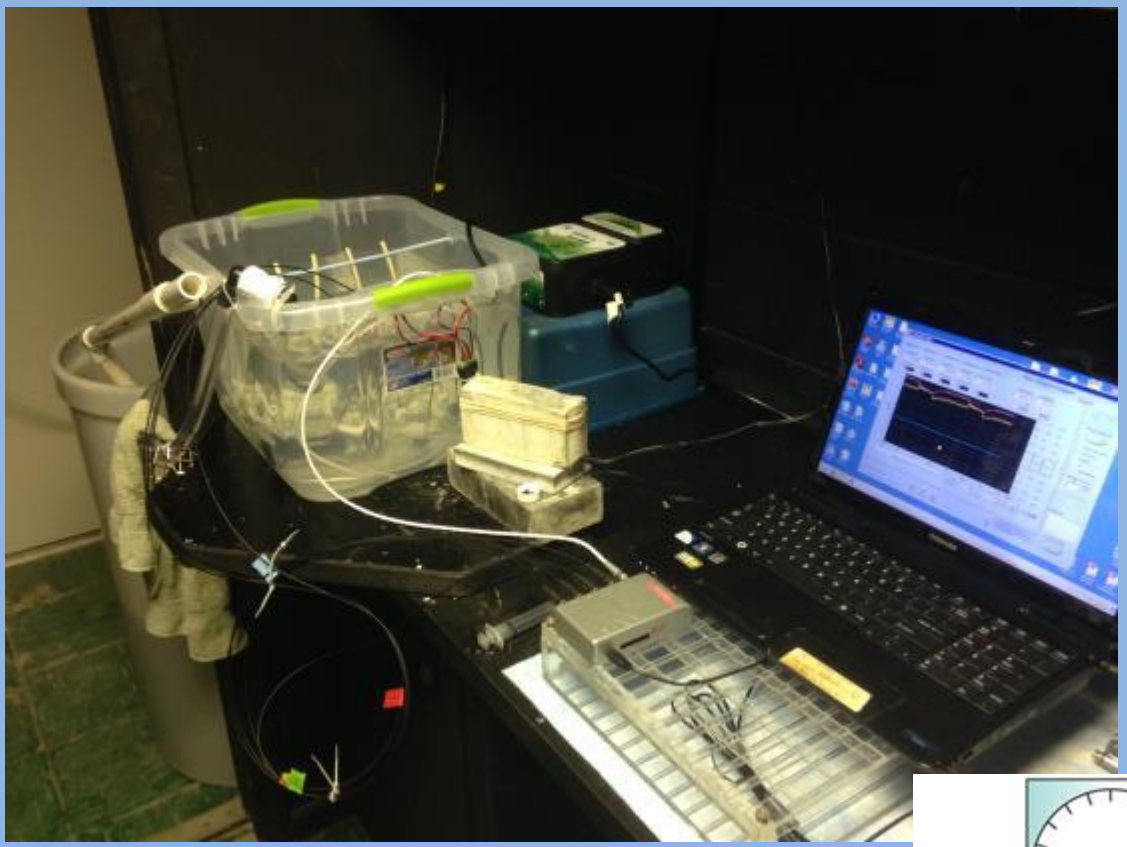
Observation: algal biomass inversely proportional to water velocity

0-5 cm s^{-1}

20-35 cm s^{-1}


Algal Biomass (g DW m-2)
Velocity (m S-1)
y = 4.8353e-8.316x
R² = 0.7137
0
1
2
3
4
5
6
7
8
9
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

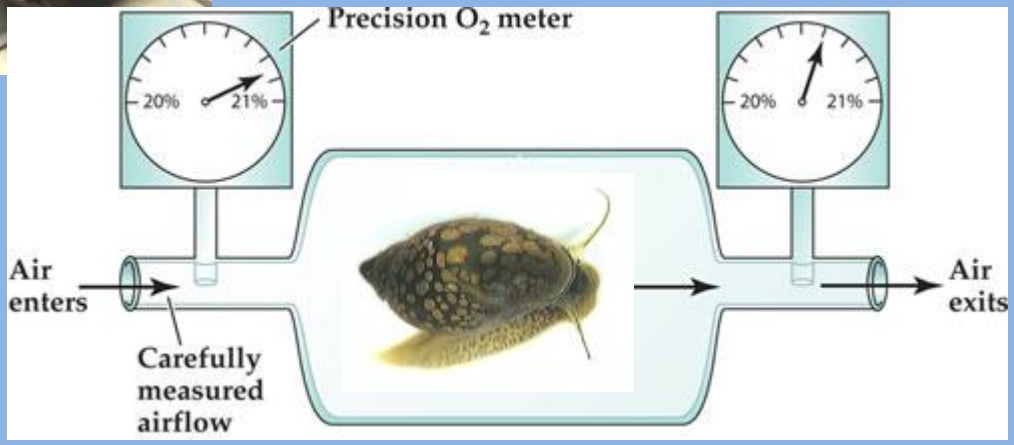
Oxygen Stress on Herbivores



Hypotheses:

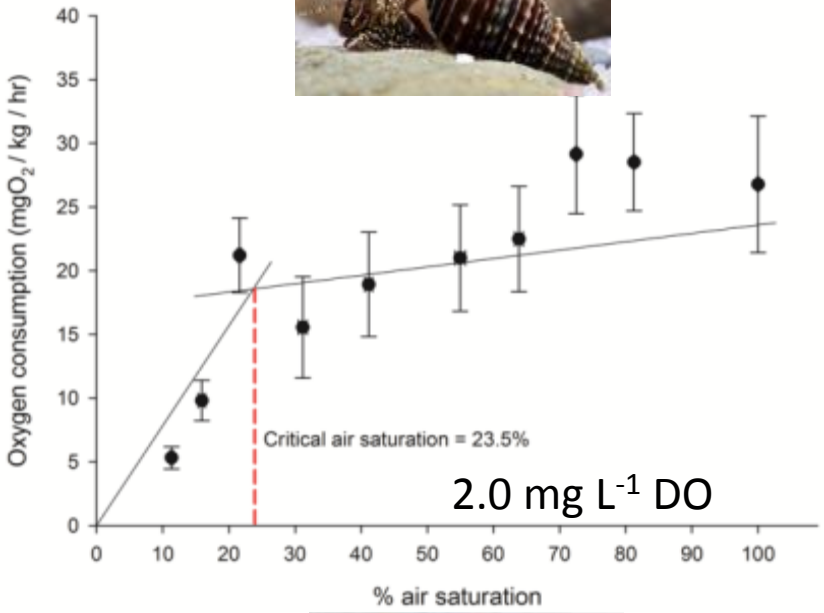
H_1- Reduced DO extirpates grazers (snails)

H_2- Nitrate concentration inhibits grazer communities

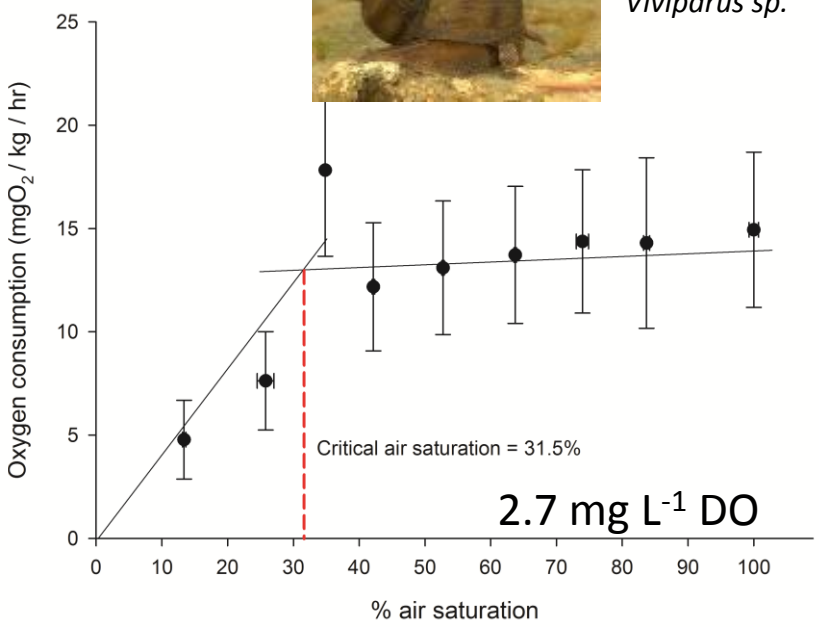


Respirometry experimental rig
(Pyroscience- fiber optic DO)

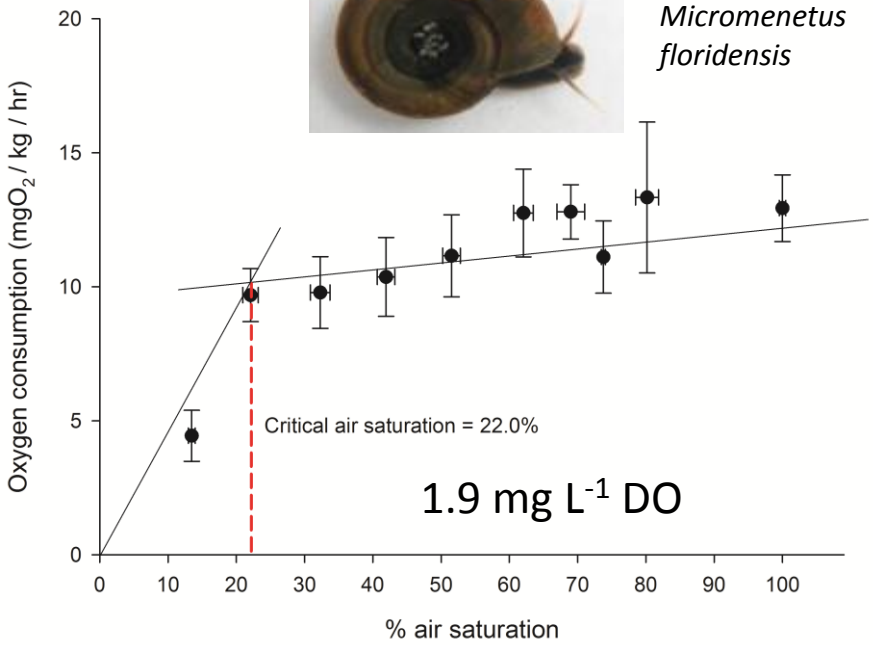
Elimia floridensis



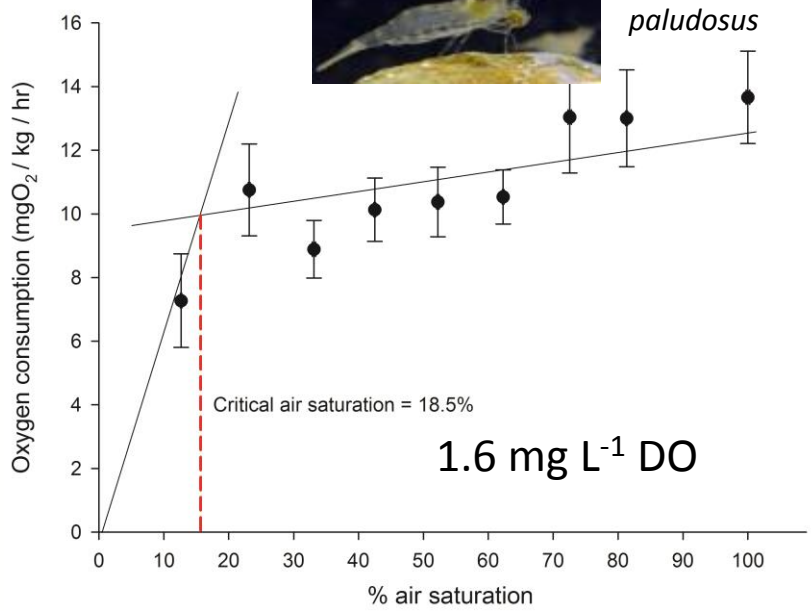
Viviparus sp.



Micromenetus floridensis



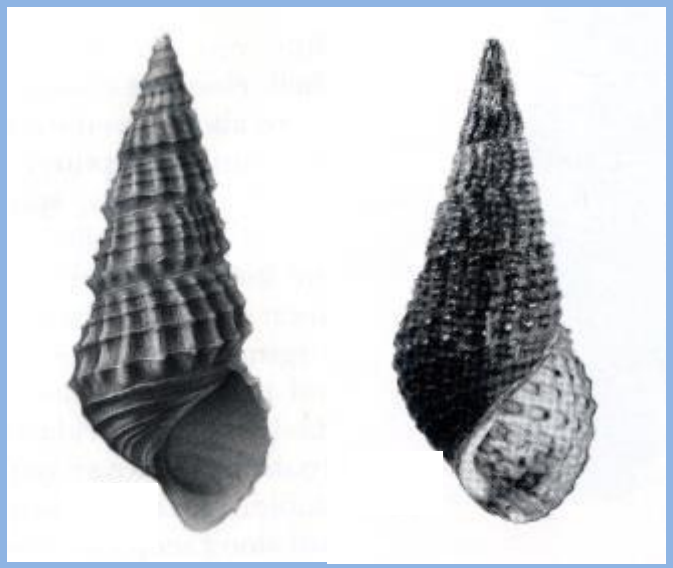
Palaemonetes paludosus



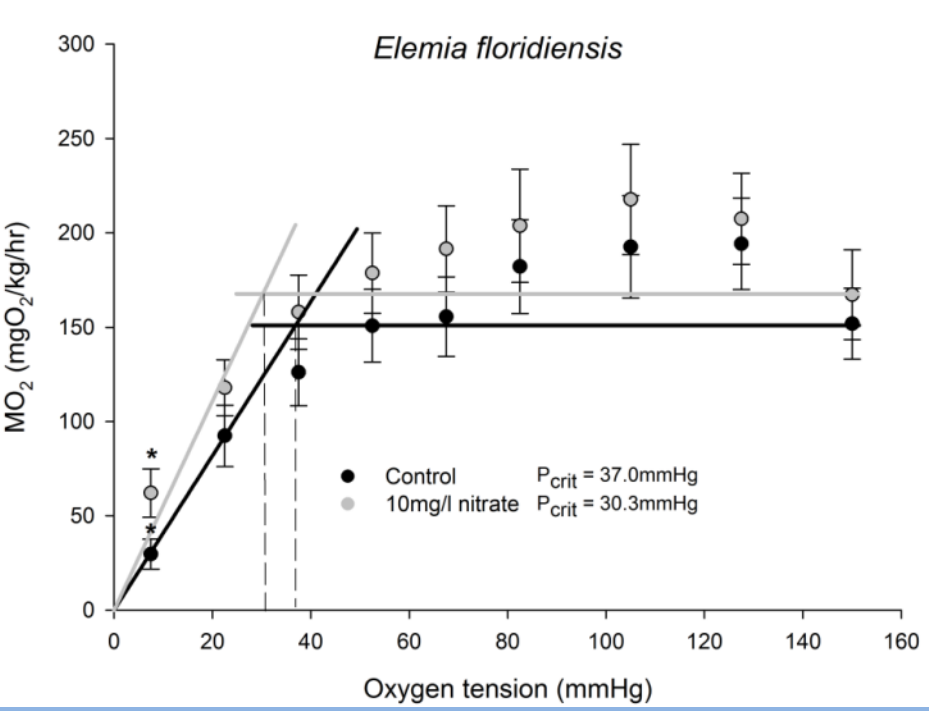
Recent Respirometry Trials

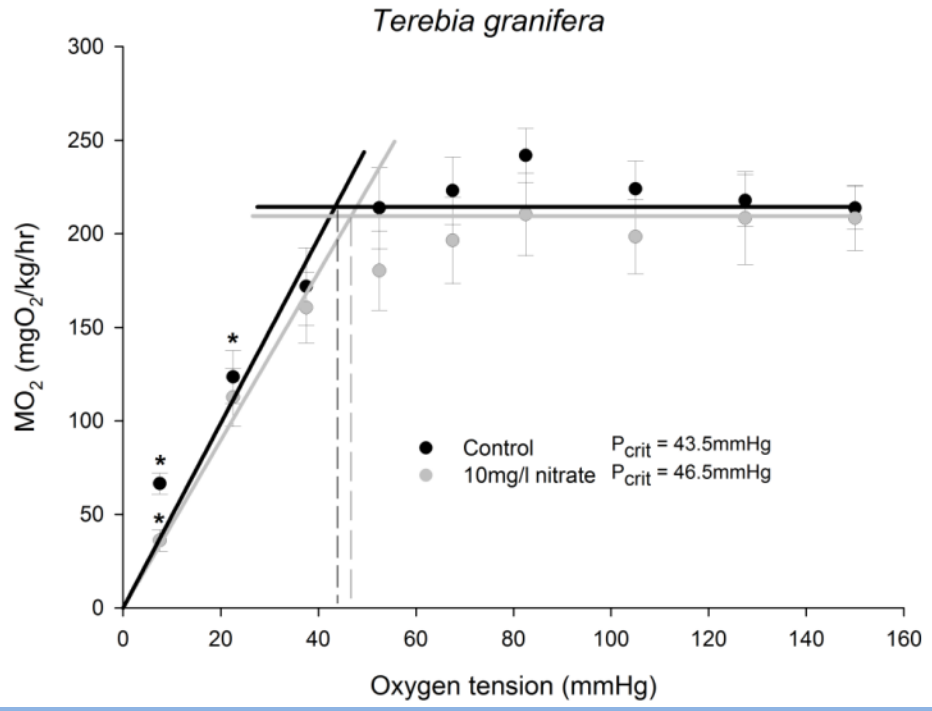
1) NOx influence on Critical Oxygen Levels

2) Exotic vs native snail responses to elevated NOx



Elimia floridensis *Tarebia granifera*





Conclude: NO_3 did not affect overall hypoxia tolerance in tested species, however, hypoxia may be a driver in declining herbivore activity

Whats Next?

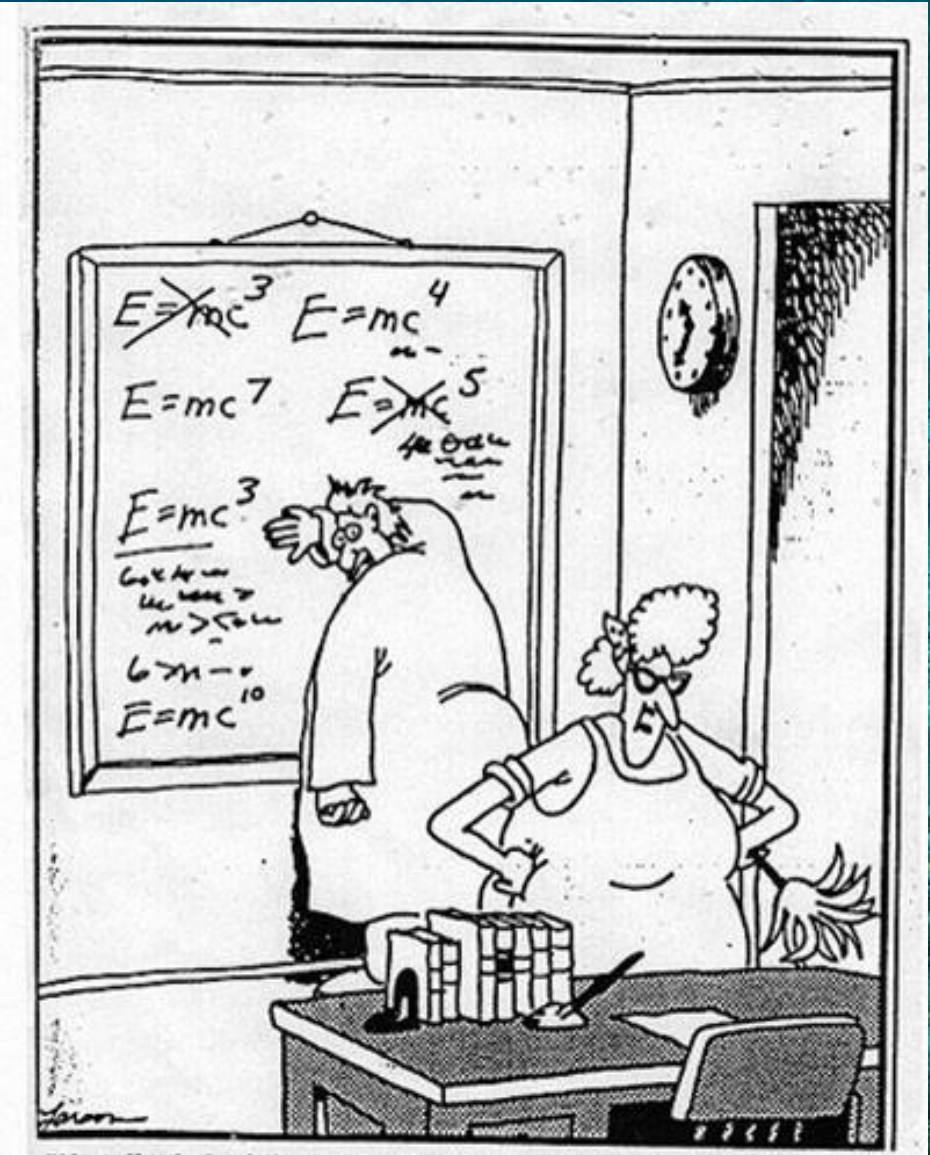
1) round 2 of biomass vs flow velocity

2) velocity and surface shear experiments

3) mesocosm run with DO treatment and Fe, P, Mo additions

4) final species runs in respirometry analysis

Questions?



"Now that desk looks better. Everything's squared away, yessir, squaaaaaared away."