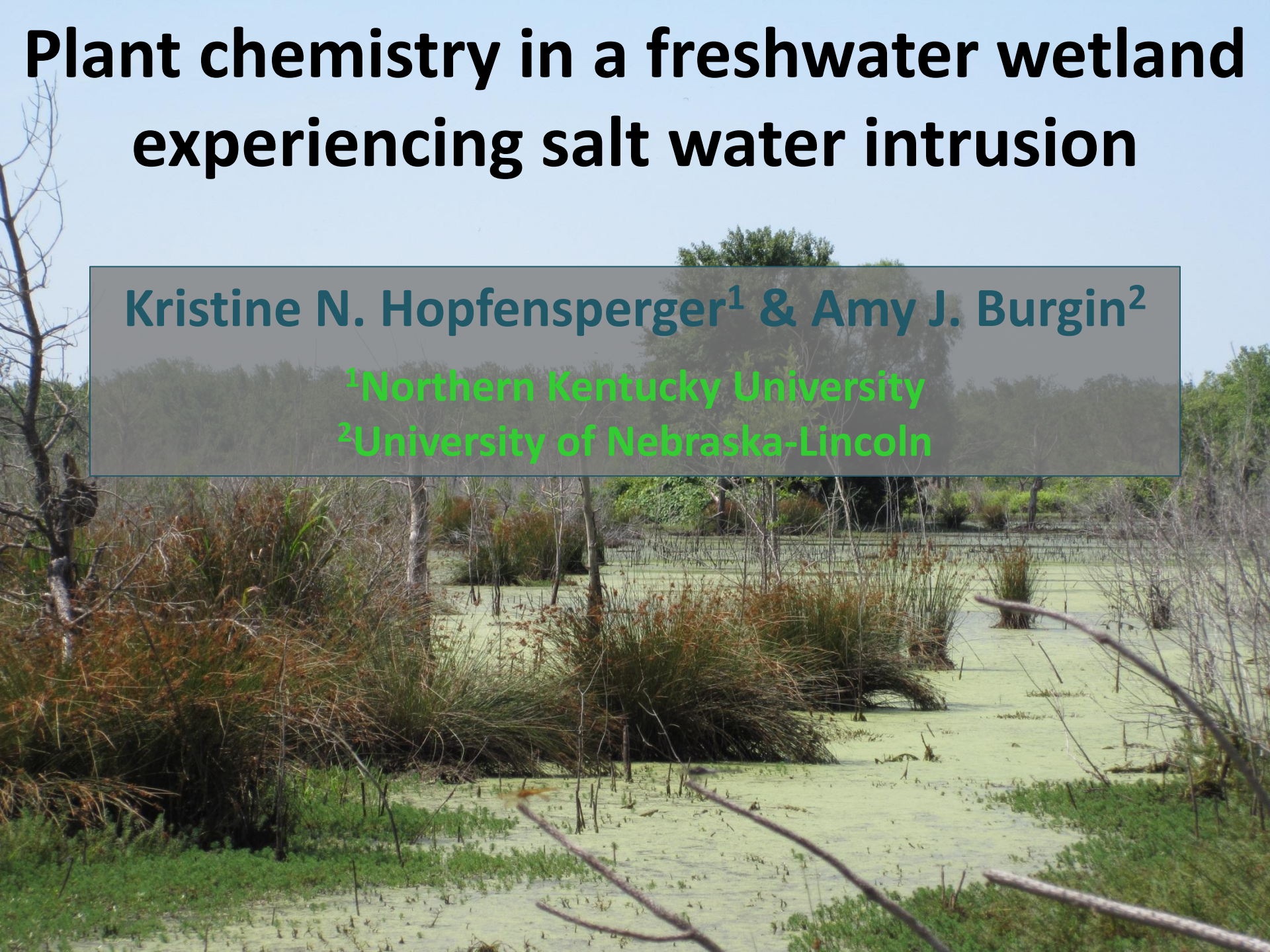
Plant chemistry in a freshwater wetland experiencing salt water intrusion

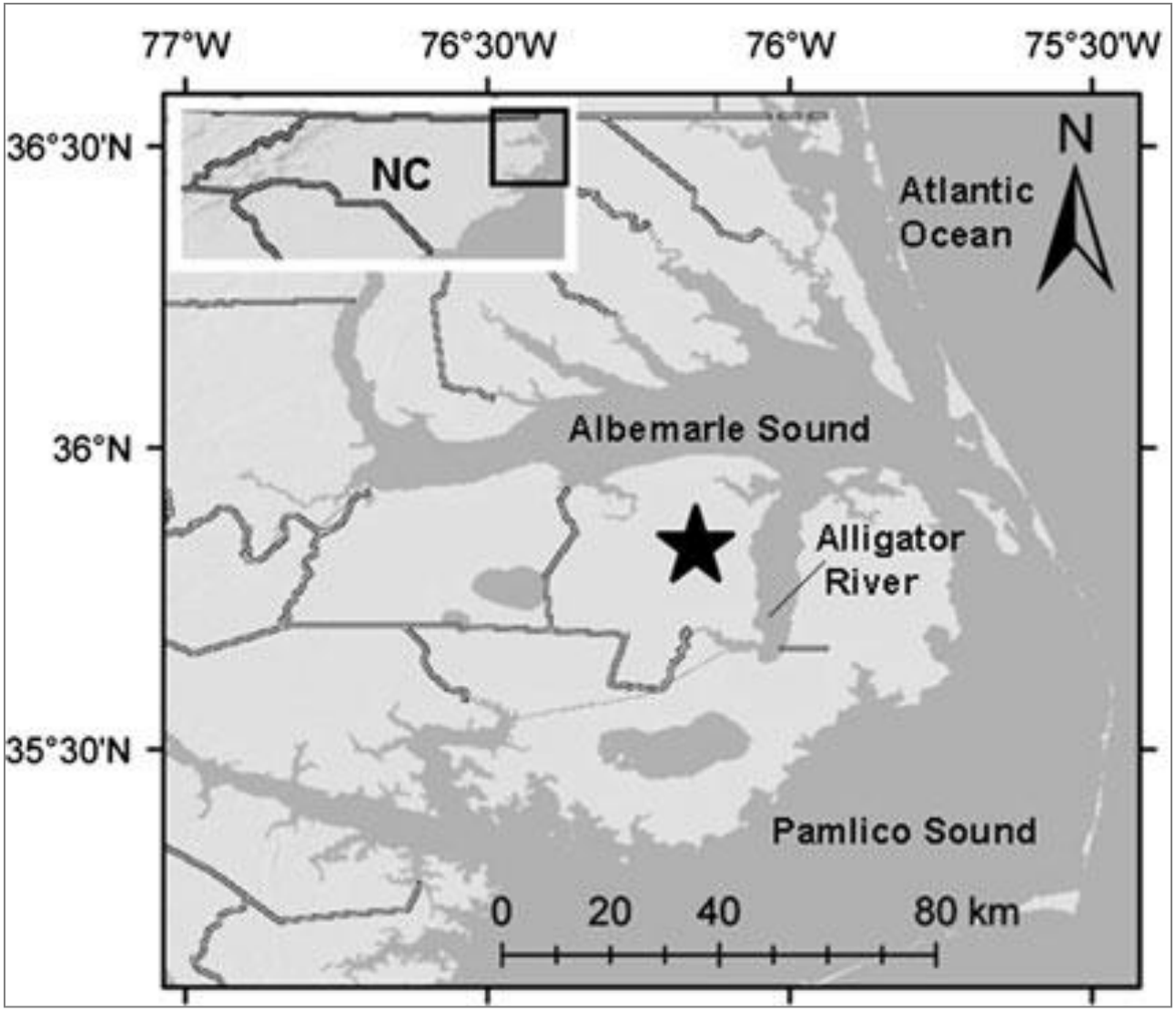
Kristine N. Hopfensperger[1] & Amy J. Burgin[2]

[1]Northern Kentucky University

[2]University of Nebraska-Lincoln



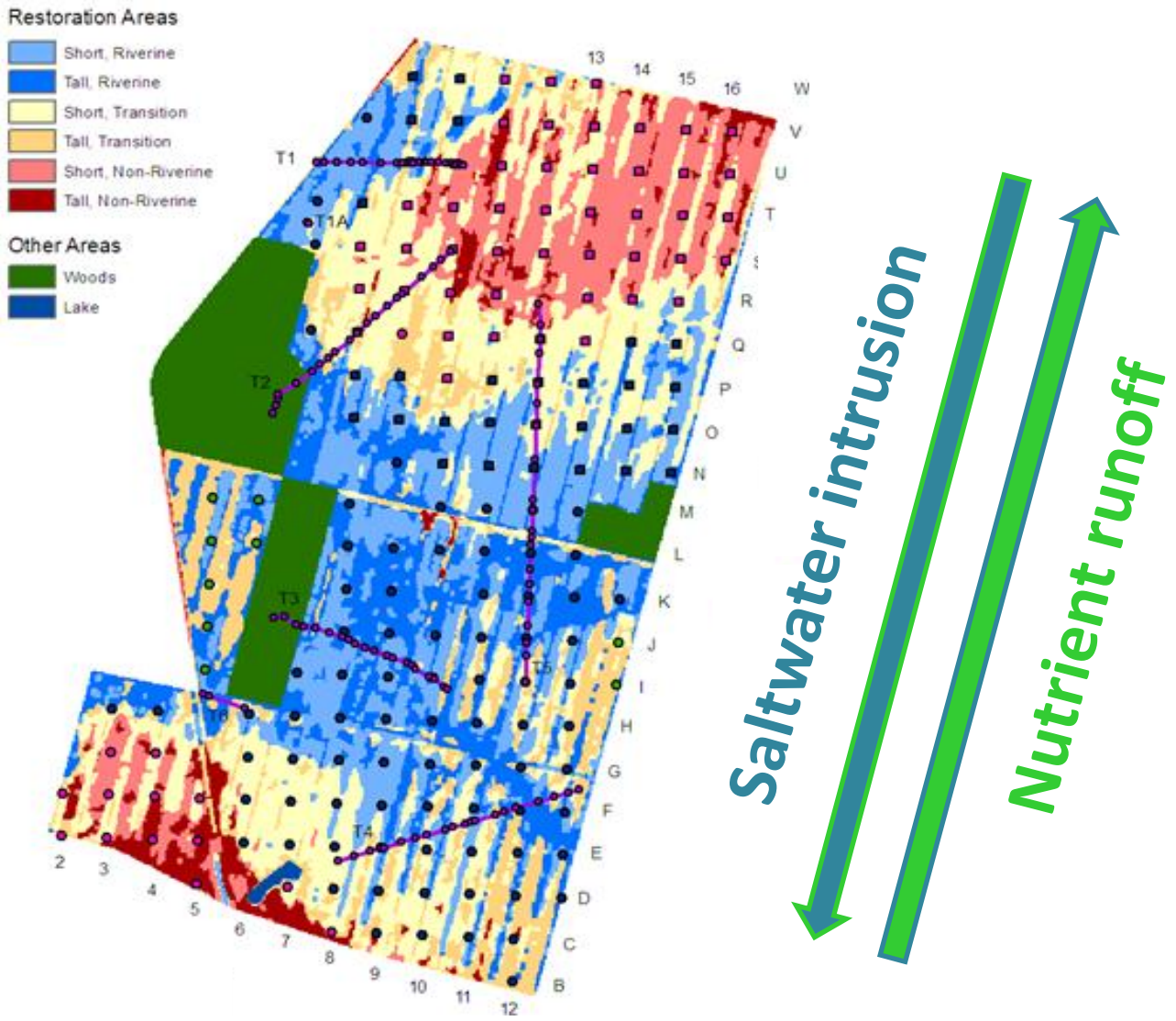
Introduction to Timberlake



My Introduction to Timberlake

http://www.flickr.com/photos/jacek_kaim/2812004523/

Introduction to Timberlake



Timberlake Vegetation

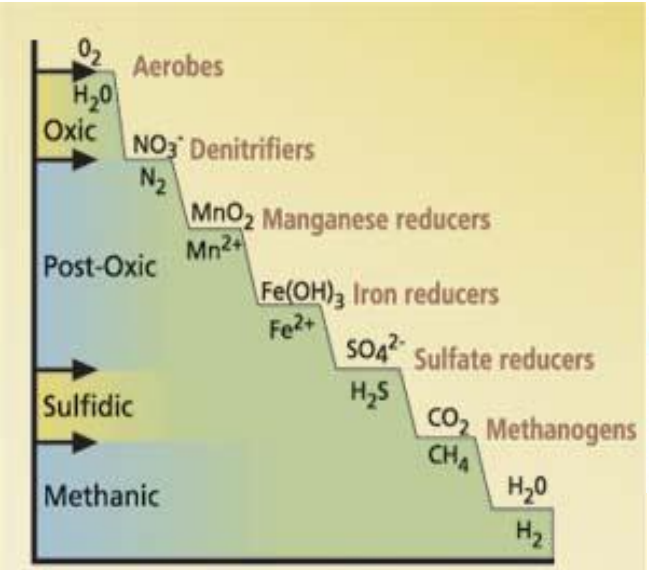
Variety of wetland habitats

Stunted cypress growth

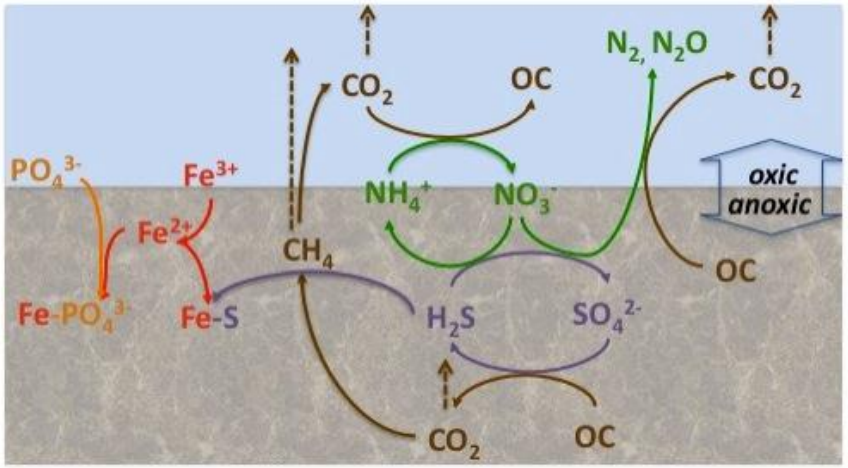
Study Questions

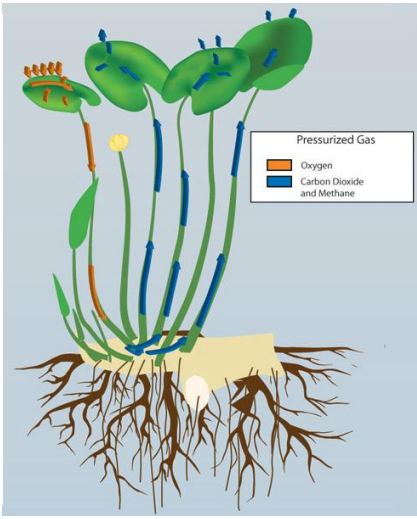
Q1: Do distinct plant community assemblages exist and align along physical gradients?

Q2: Do dominant plant species differ in their influence on oxygen in the rhizosphere?



California Agriculture 57(2):55-59. DOI: 10.3733/ca.v057n02p55. April-June 2003.





Study Questions

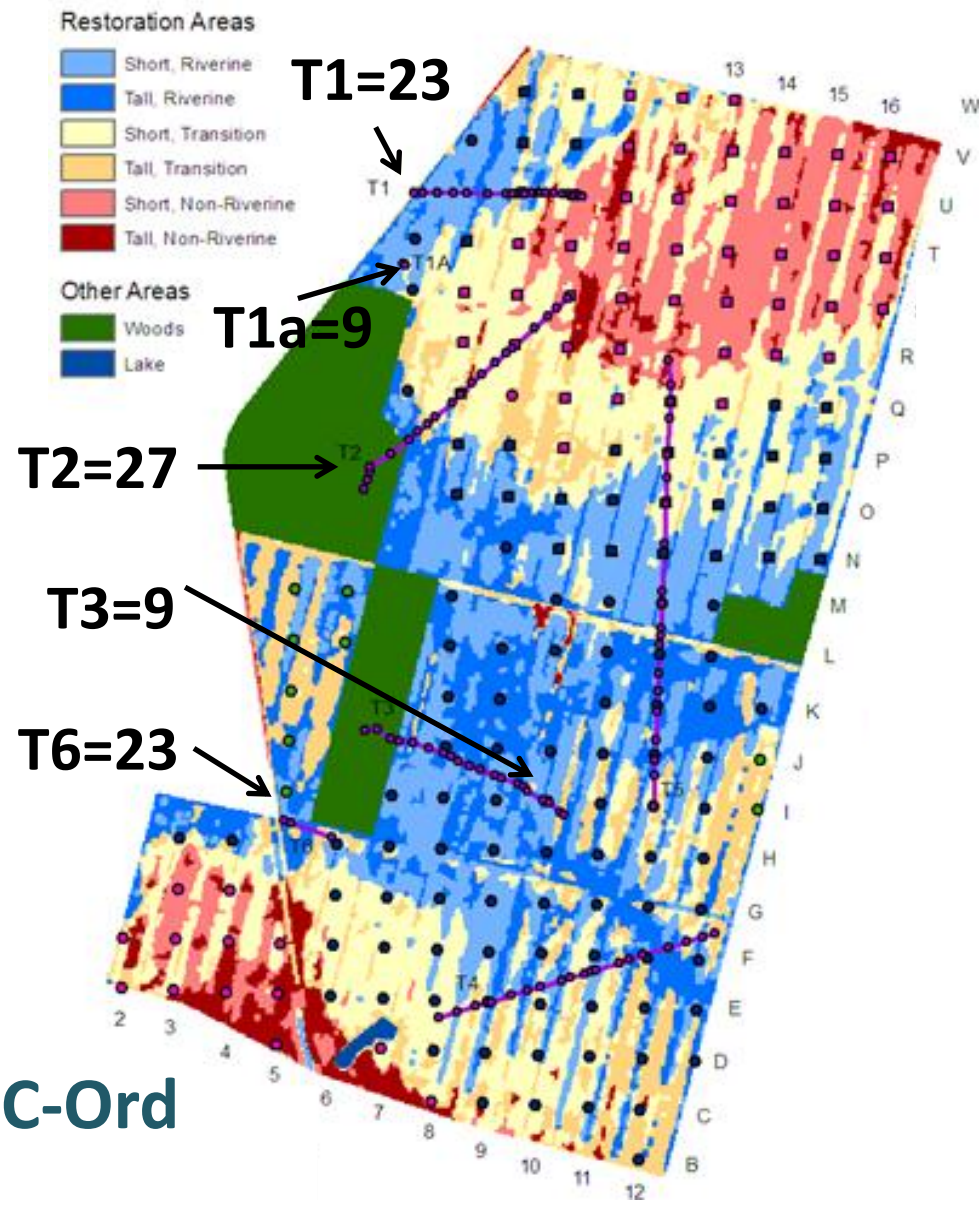
Q1: Do distinct plant community assemblages exist and align along physical gradients?

Q2: Do dominant plant species differ in their influence on oxygen in the rhizosphere?

Q3: Do correlations exist between plant tissue chemistry and the physical and chemical gradients on site?

Sampling – Plant Community

- 91, 1-m^2 plots
- 32 different locations

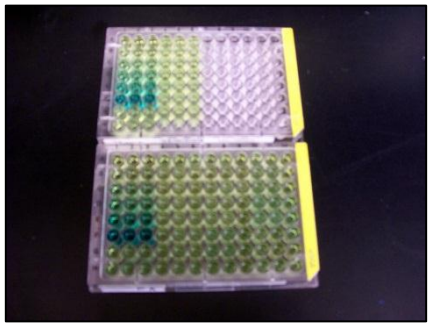


- % cover estimates
- ID genus & species

Data analysis: NMS, CCA; PC-Ord

Soil Sampling & Lab Analyses

- 22 plots (3 no roots)
- Transects 1, 1a, & 6
- 8 wet, 6 intermediate, 5 dry



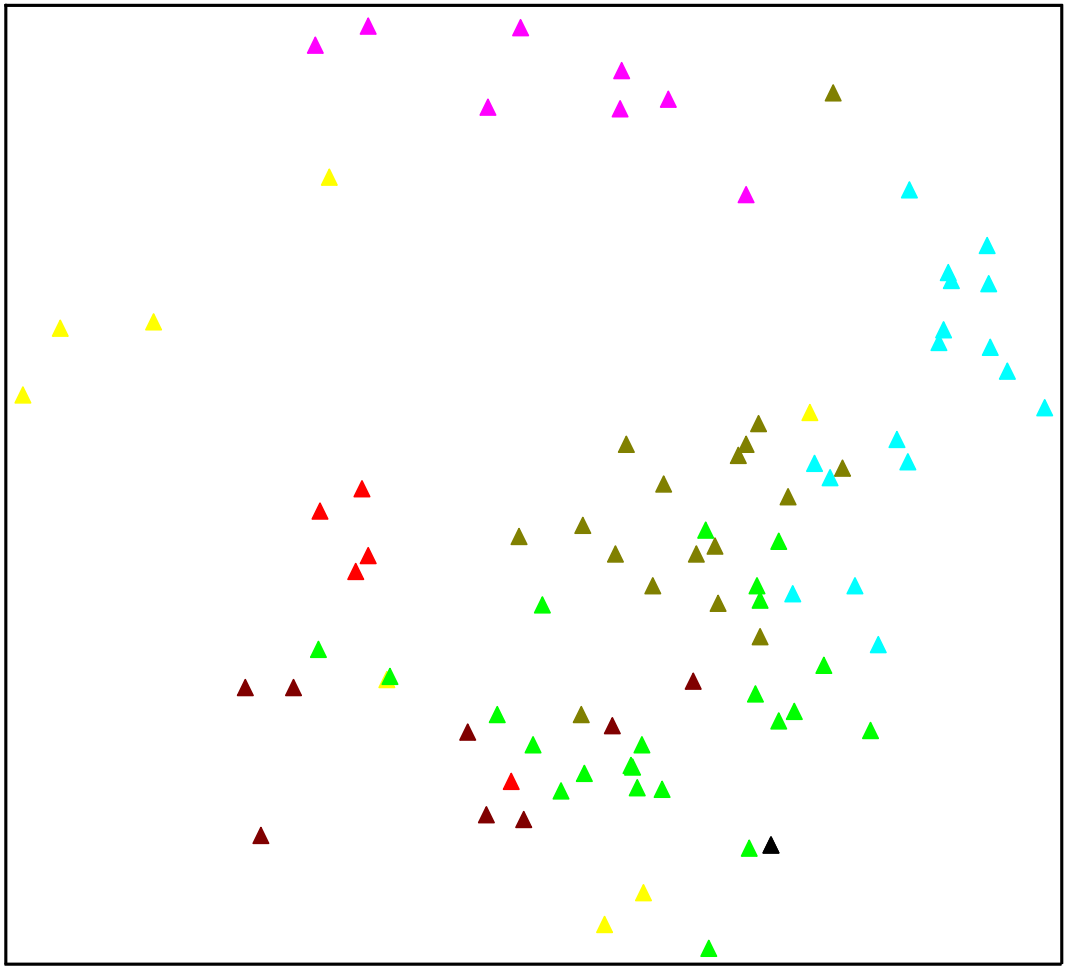
***Data analysis*:**
ANOVAs & Reg;
SPSS

Lab Analyses

- Fe root plaque (Neubauer et al. 2007)
- Dominant spp root & tissue Fe
- Dominant spp tissue C/N

June 2011 Plant Community

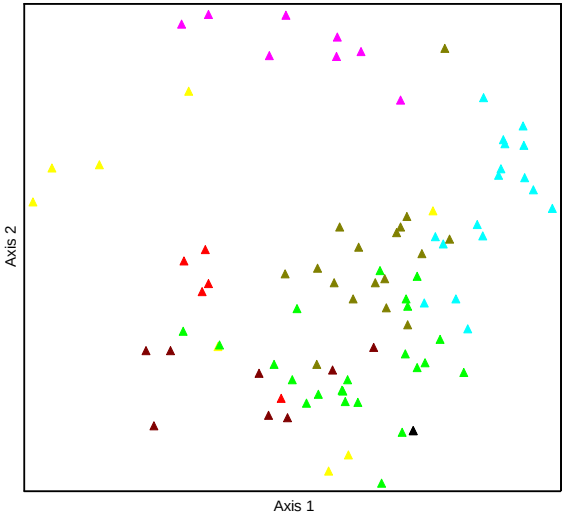
Q1: Do distinct plant community assemblages exist?



- *Typha latifolia* w/ other hydrophilic spp.
- *Juncus effusus* w/ diversity
- *Solidago microcephala*
- *Solidago canadensis*
- *Najas* & SAV
- *J. effusus* & *Typha* (equal)
- *Scirpus cyperinus*
- *Solidago fistulosa* & *J. effusus* (equal)

June 2011 Plant Community

Q1: Do distinct plant community assemblages align along physical gradients?



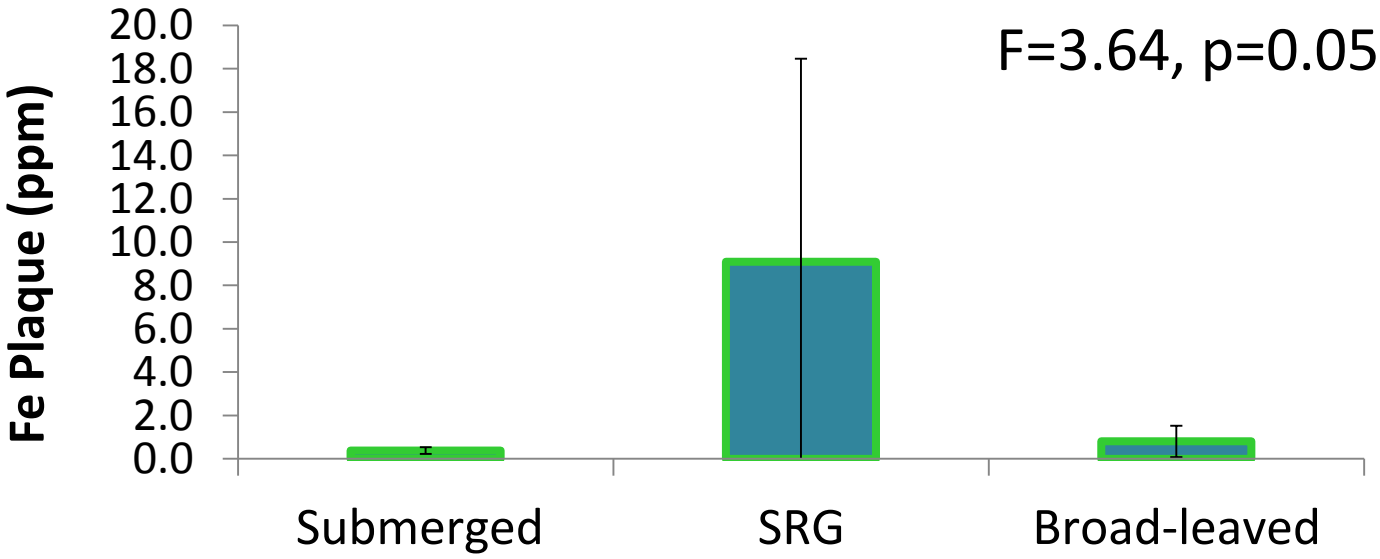
	Community	Moisture	Life Form
▲	*Najas* & SAV	Wet	Submerged
▲	*T. latifolia*, etc.	Wet/ Intermediate	Structural*/ Submerged
▲	*J. effusus* w/ diversity	Intermediate/ Wet	Structural/ Submerged
▲	*J. effusus* & *Typha*	Intermediate	Structural
▲	*Scirpus cyperinus*	Intermediate	Structural
▲	*Sol. fistulosa* & *J. effusus*	Intermediate/ Dry	Broad-leaved/ Structural
▲	*Sol. microcephala*	Dry	Broad-leaved
▲	*Sol. canadensis*	Dry	Broad-leaved

*** Structural = Sedge/Rush/Grass = SRG**

Plant Community Characteristics

Q2: Do dominant plant species differ in their influence on oxygen in the rhizosphere?

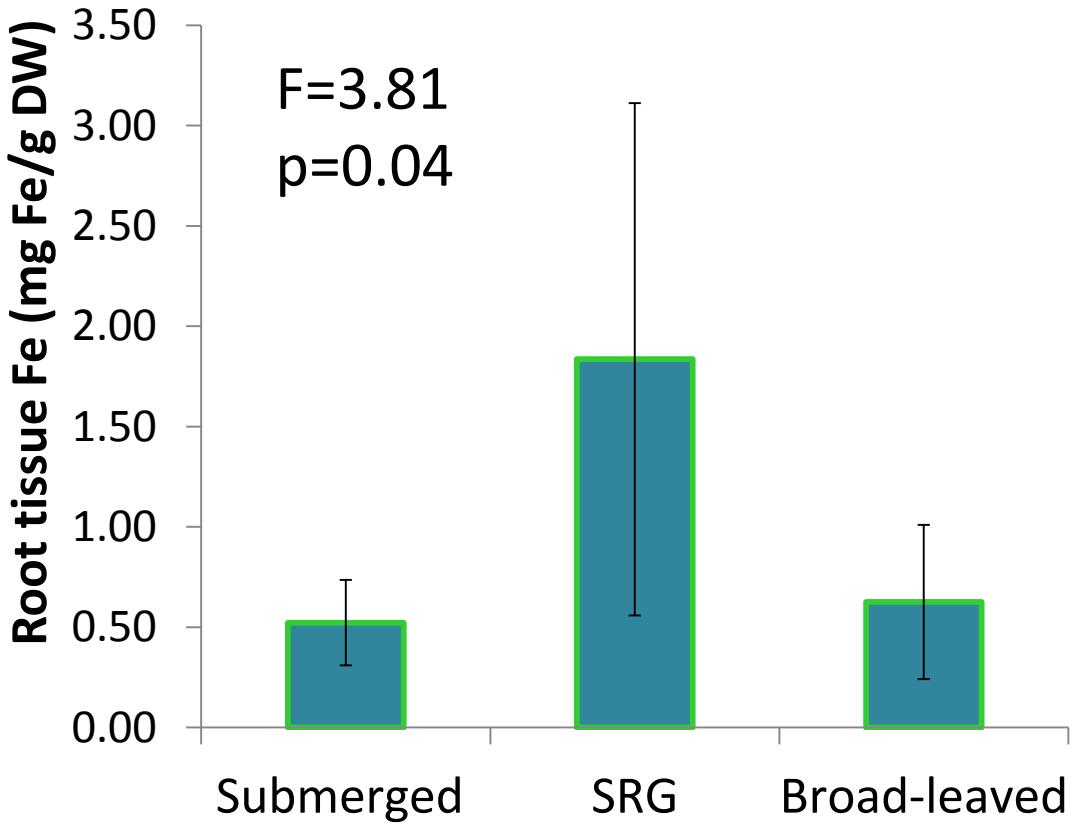
Structural species deliver more oxygen to rhizosphere



Plant Community Characteristics

Q2: Do dominant plant species differ in their influence on oxygen in the rhizosphere?

SRGs contained the most Fe in root tissues

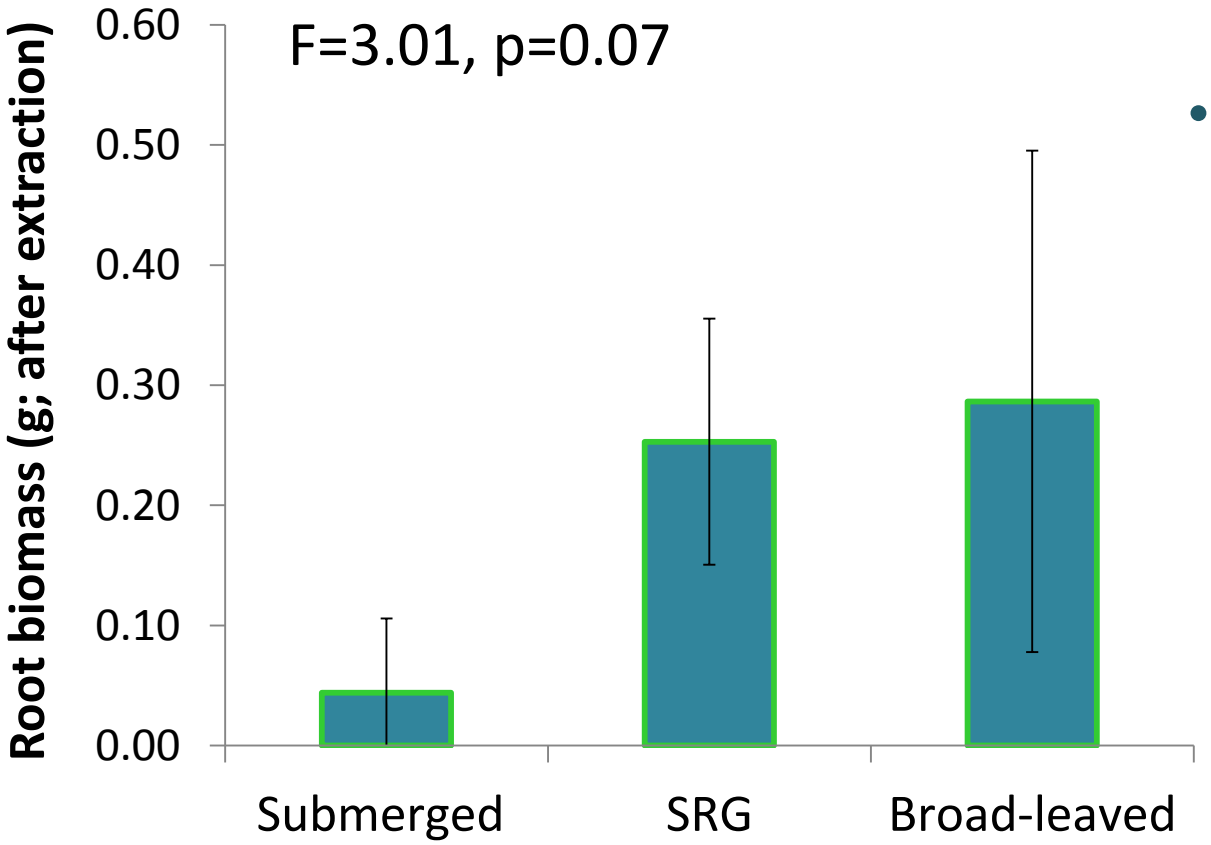


- **Fe content in stem/leaf tissue did not differ among plant life forms**
- **However, only one submerged species was sampled, and contained 10x more Fe in its tissues than the other samples**

Plant Community Characteristics

Q2: Do dominant plant species differ in their influence on oxygen in the rhizosphere?

Submerged species have least root biomass



- **Submerged species contained 10x more Fe in leaf tissues:**

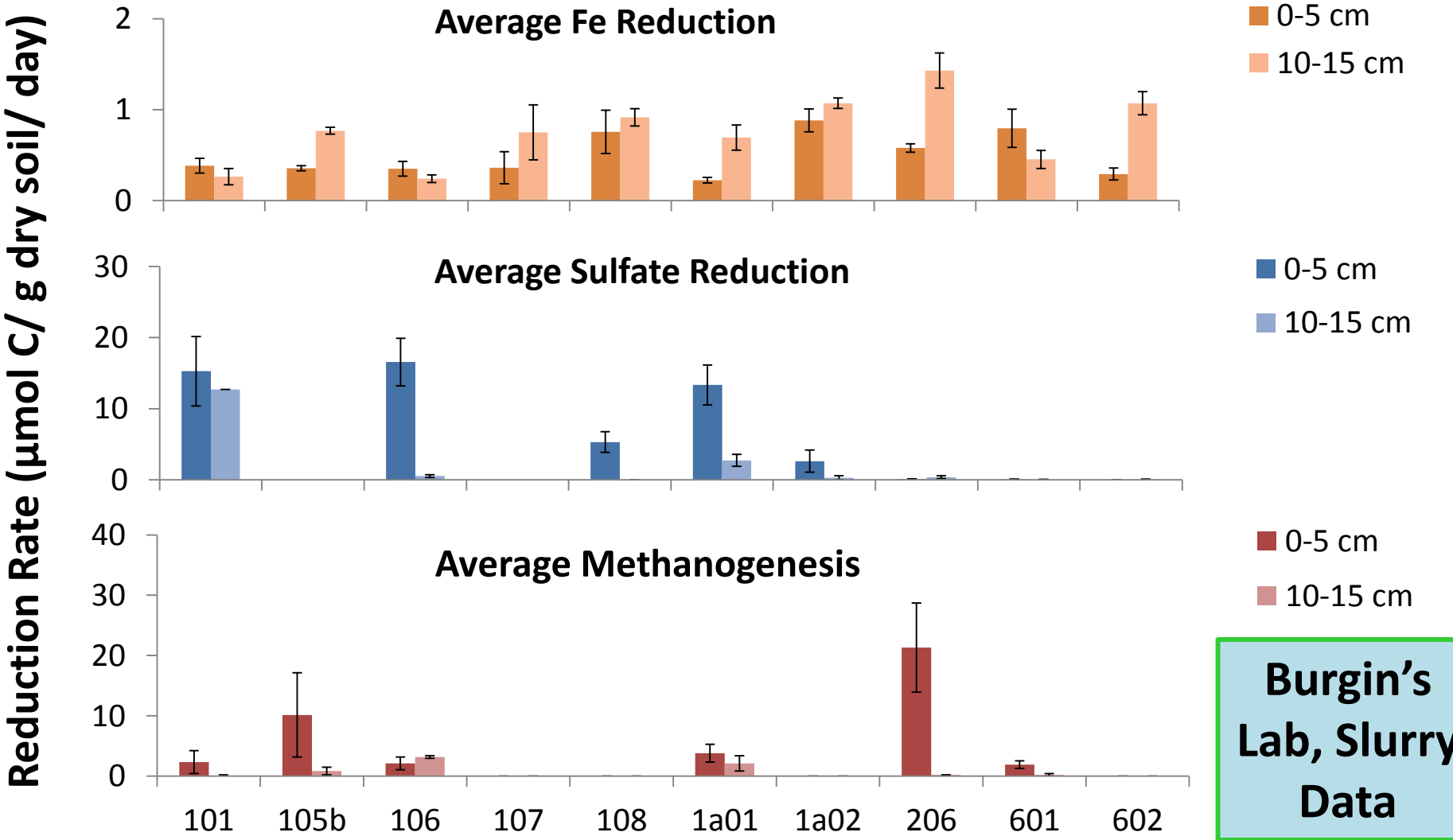
  ***Ceratophyllum demersum* = 11.77 (mg Fe / g dry wt.)**

  All others = 0.20

Chemistry of Site

Saltwater intrusion

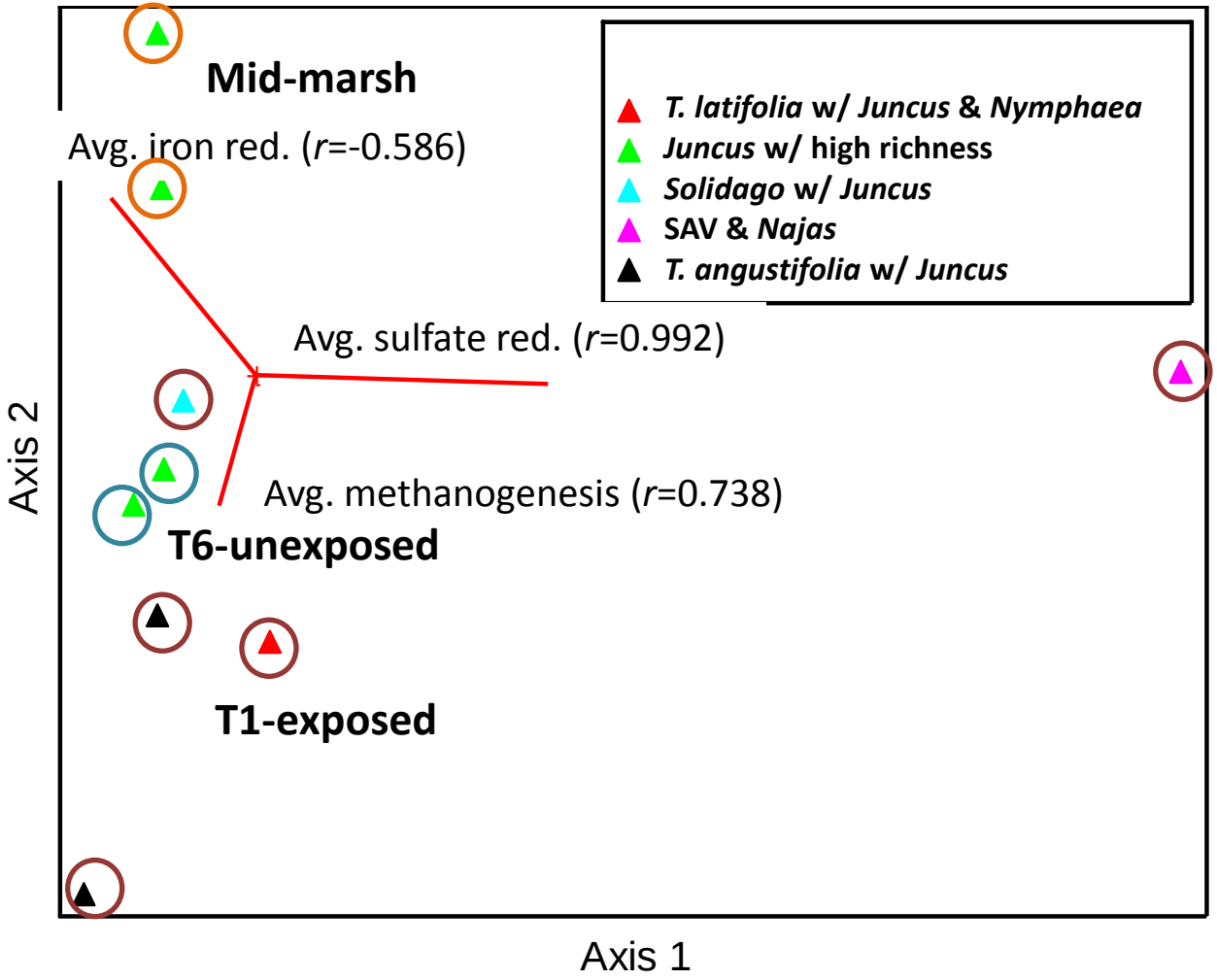
Nutrient runoff



Burgin's Lab, Slurry Data

Plant Communities & Soil Chemistry

Q3: Do correlations exist between plant tissue chemistry and the physical and chemical gradients on site?



CCA

Spp-Env, Monte Carlo

	r	p
A1	0.999	0.01
A2	0.990	0.47
A3	0.998	0.05

Plant Communities & Soil Chemistry

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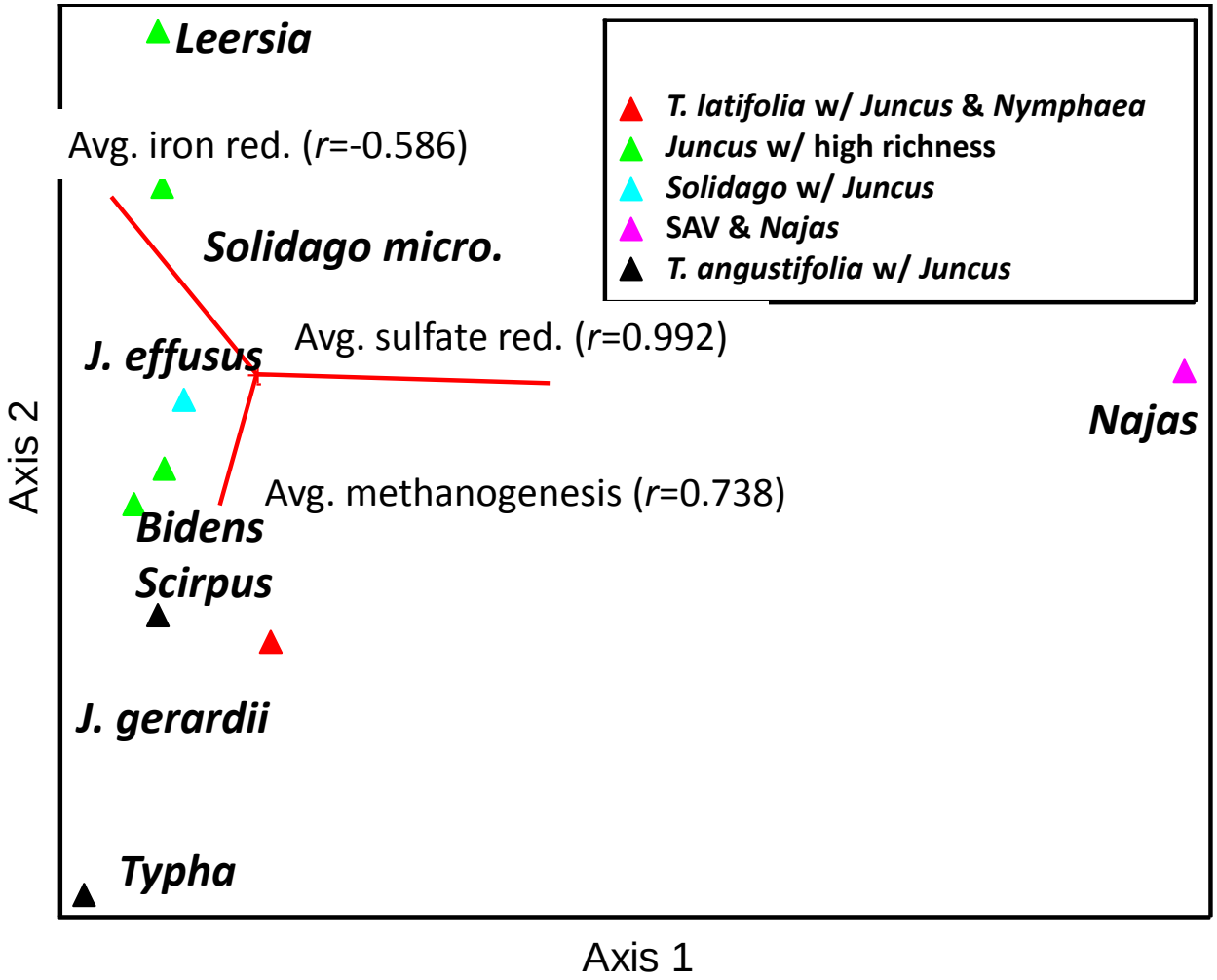

CCA

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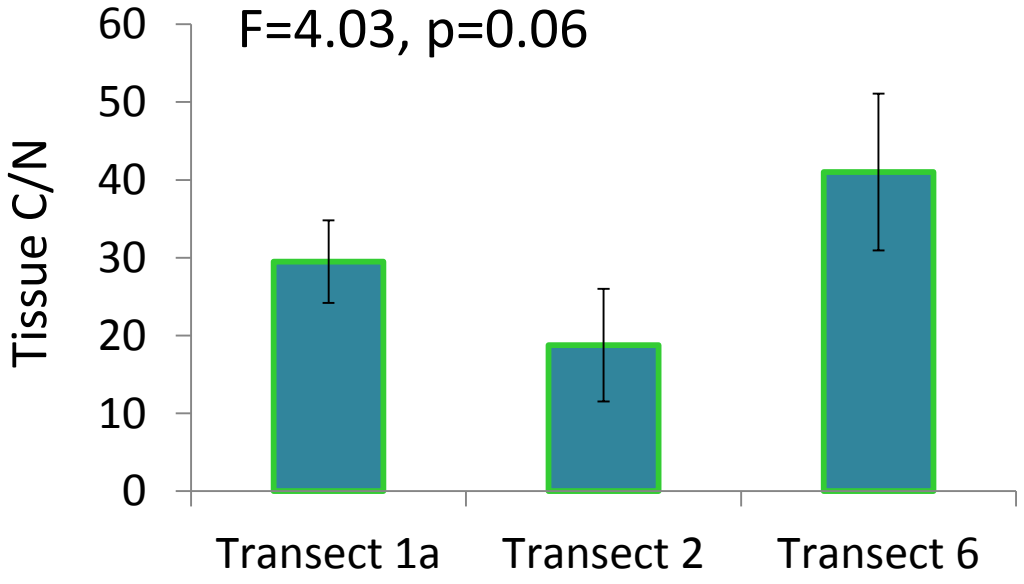
Juncus effusus

Q3: Do correlations exist between plant tissue chemistry and the physical and chemical gradients on site?

Dominant species changes along chemical gradients



Root Fe plaque (ppm) **10.3 ± 2.9 > 4.8 ± 4.7**

Conclusion

Q1: Do distinct plant community assemblages exist & align along physical gradients?

Yes, Timberlake has a variety of plant communities that align along the moisture gradient

Q2: Do dominant plant species differ in their influence on oxygen in the rhizosphere?

Yes, SRGs had higher Fe plaque on roots and Fe in root tissues

Removing Fe from soil may allow for more sulfate reduction

Q3: Do correlations exist between plant tissue chemistry and the physical and chemical gradients on site?

Yes, sulfate and iron reduction were correlated with plant communities & dominant *J. effusus* tissue/root chemistry changed along site gradients

Next Steps

1. Increase sample number for plant chemistry data, specifically dominant species across site
2. Collect more SAV tissue samples throughout the site's saltwater intrusion gradient
3. Reinvestigate Fe plaque on roots with actual moisture treatments (not going from map)
4. Study amount of aerenchymous tissue in dominant species
5. Yearly sampling of plant communities to examine spatial and temporal dynamics of system (interesting findings at DM in VA)

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