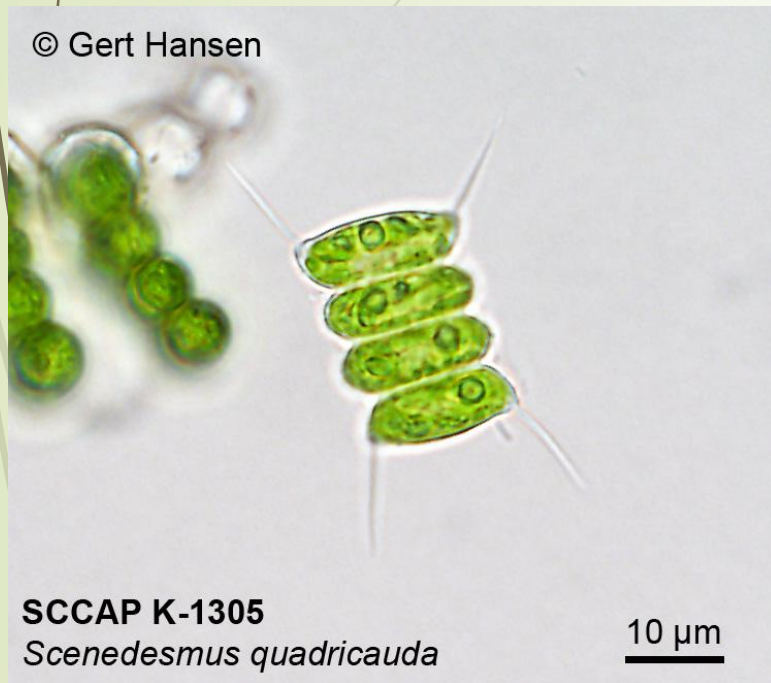




Role of Iron in Blue Green Algae

Patrick Lind, Andy Dzialowski, & Puni Jeyasingh

Algae



Rice university



Robert Horshaw

Blue Green Algae (BGA)

- Cyanobacteria
- Prokaryote organisms
- May have lead to rise in oxygen levels during the Precambrian



© Dwight Kuhn

Roger Denegar, Visuals Unlimited

Lower Murry Water Basin

Harmful Effects

- BGA create a variety of problems
 - Harm humans
 - Hurt fisheries
 - Damage economies



Jennifer Graham



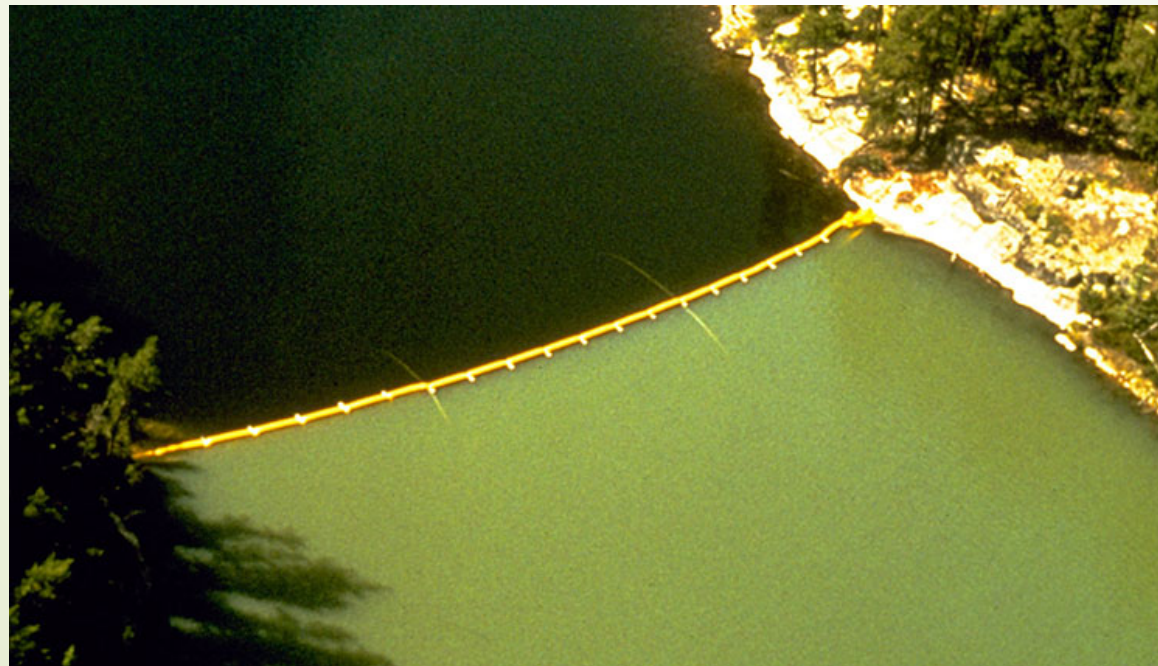
ESA ESRIN



Murray Darling Basin Authority

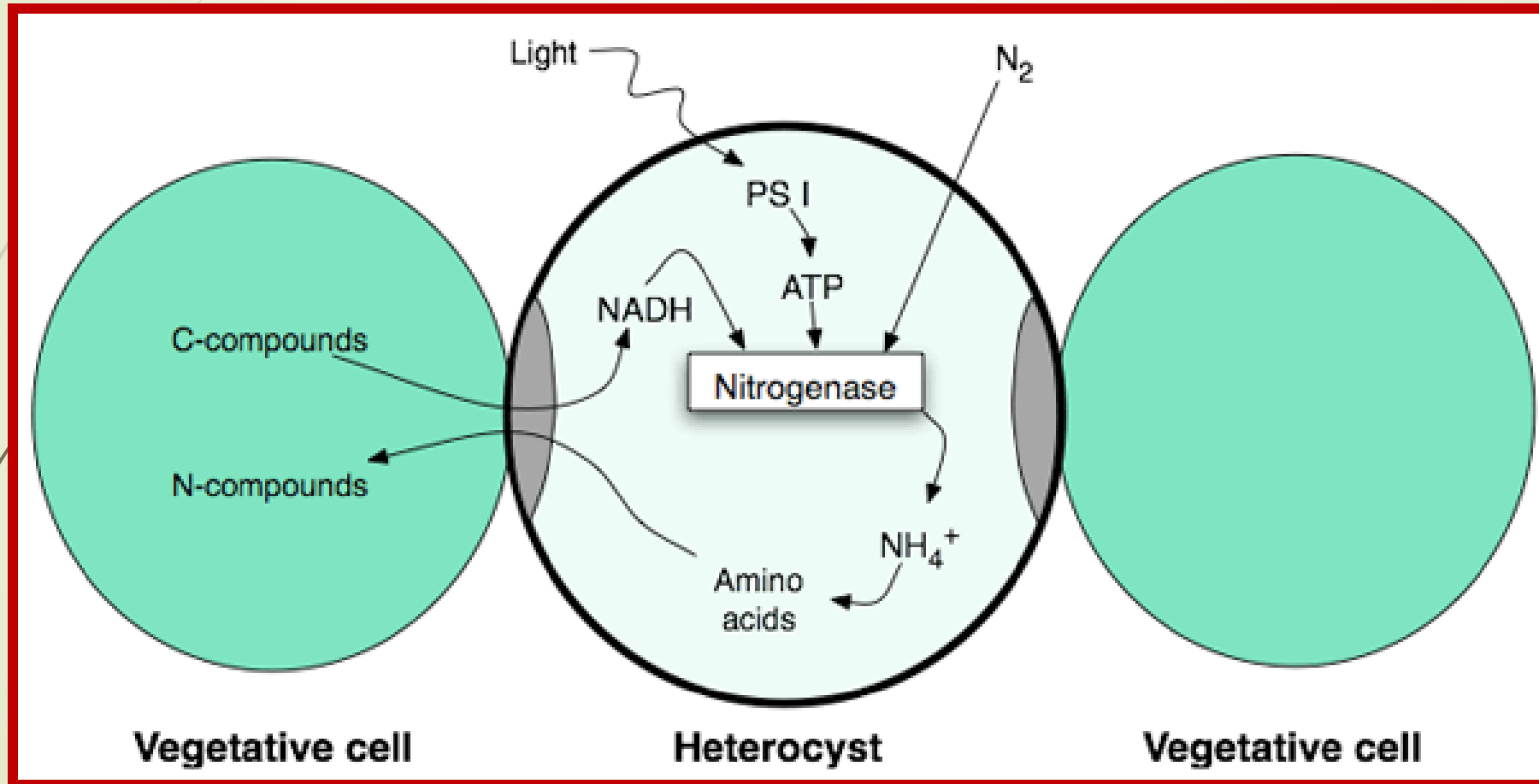
Nutrients that affect growth

- Most work on algae focused on N and P
- Considered most limiting nutrients in freshwater



Lake 226. Schindler

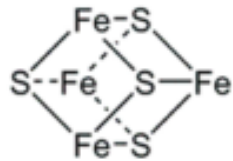
Nitrogen Fixation



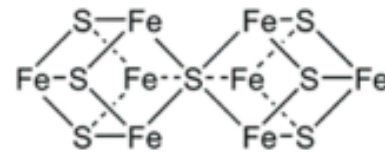
The Role of Iron (Fe)

- Nitrogenase is the enzyme of N fixation
- ~ 59% Fe by mass

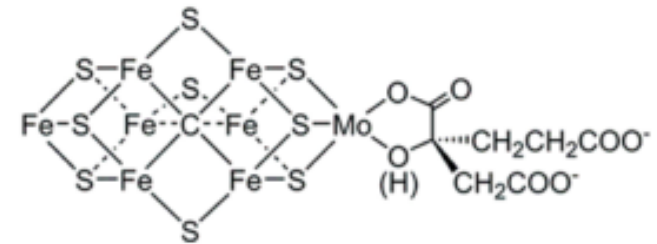
F cluster



P cluster

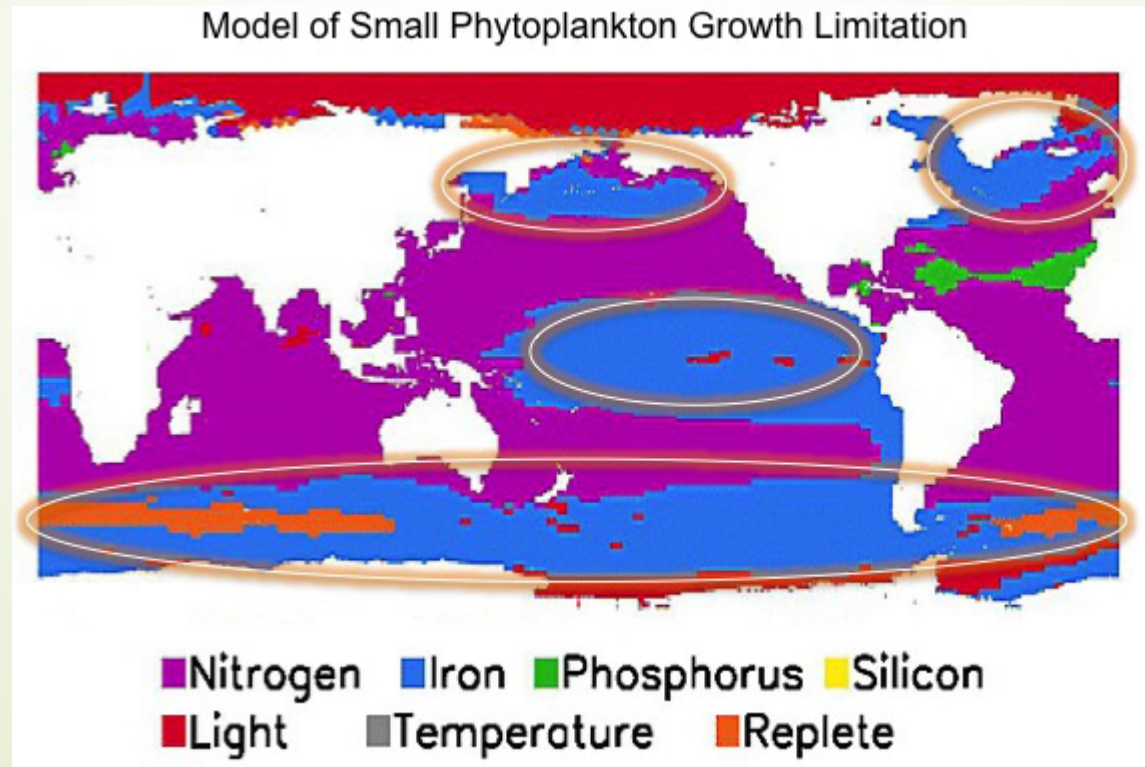


M cluster



Important for Freshwater?

- Many studies have linked Fe in oceans -> algal blooms
- Little work in freshwater



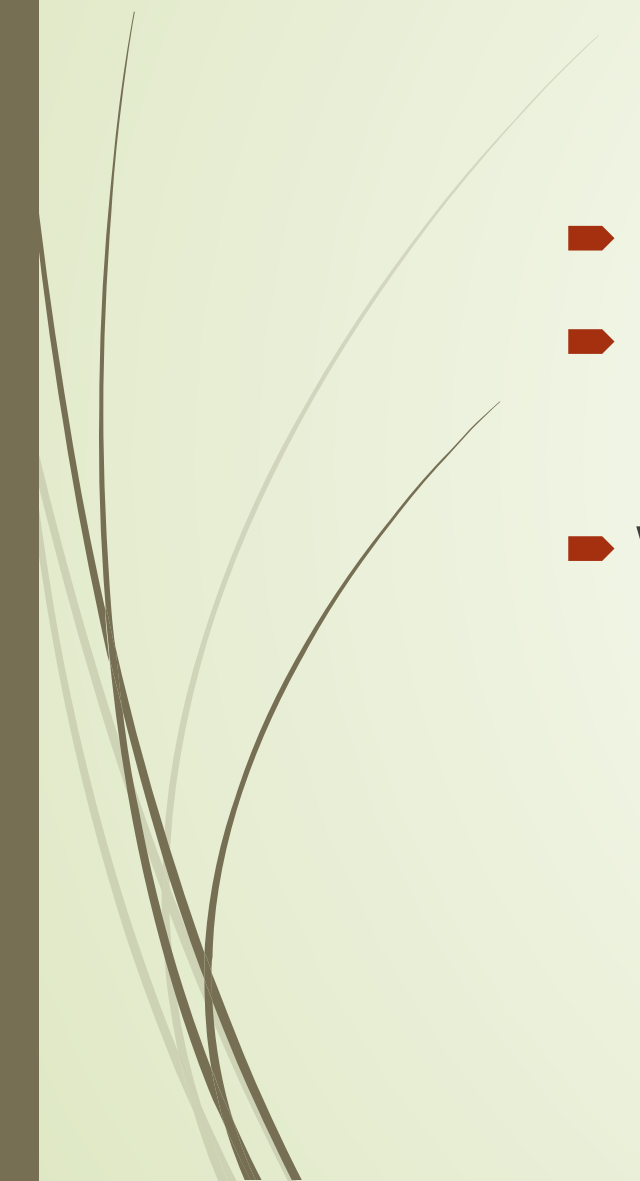
Iron in freshwater

- ▶ Extensive variation in Fe concentration among lakes
- ▶ Variation in Fe use within and between species unstudied

	Lake Nriagu	Lake Sherrell	Scandinavian Lakes
Fe (nmol L ⁻¹)	0.6-27	1.1-100	200-860

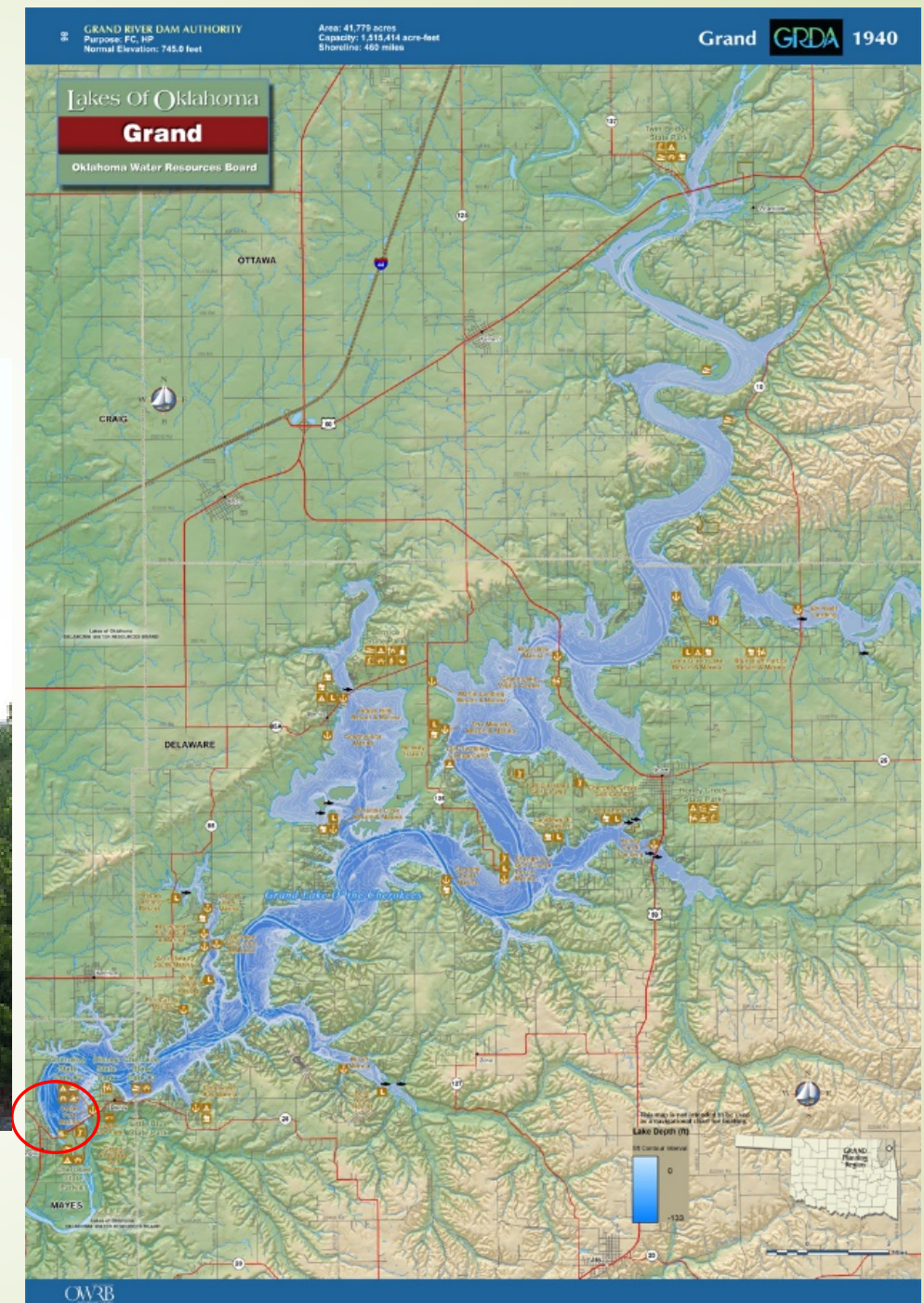


Questions and Predictions

- ▶ Does Fe influence algal growth?
 - ▶ How does it affect BGA in particular?
 - ▶ We expect Fe to have some impact on algal growth, but this growth will be more pronounced in BGA
- 

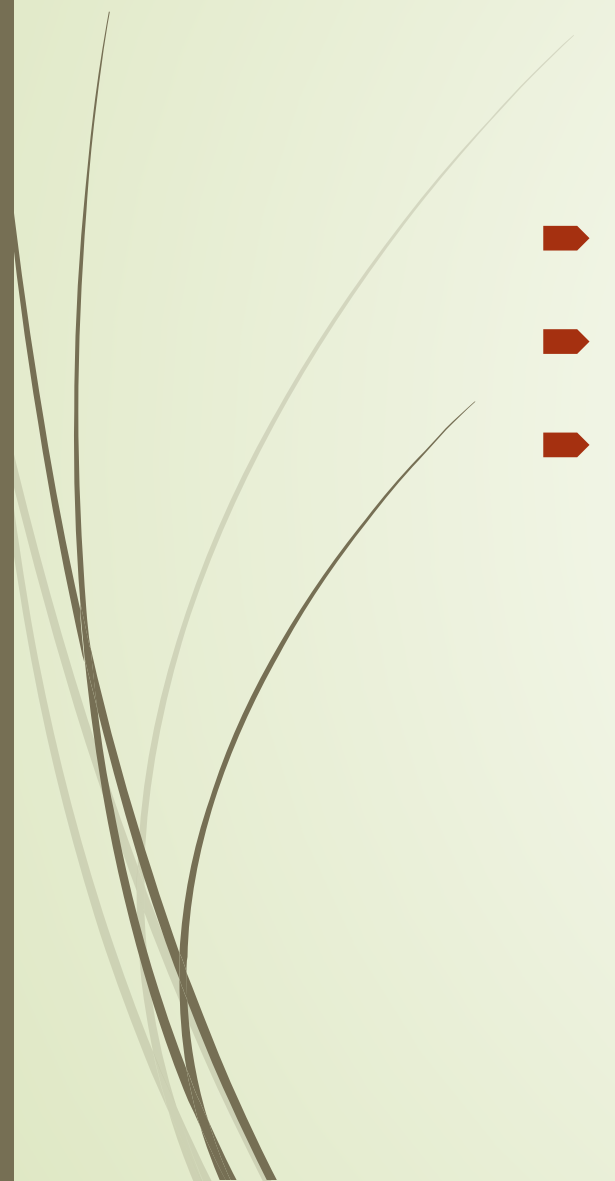
Grand Lake

Ecosystems and Education Center

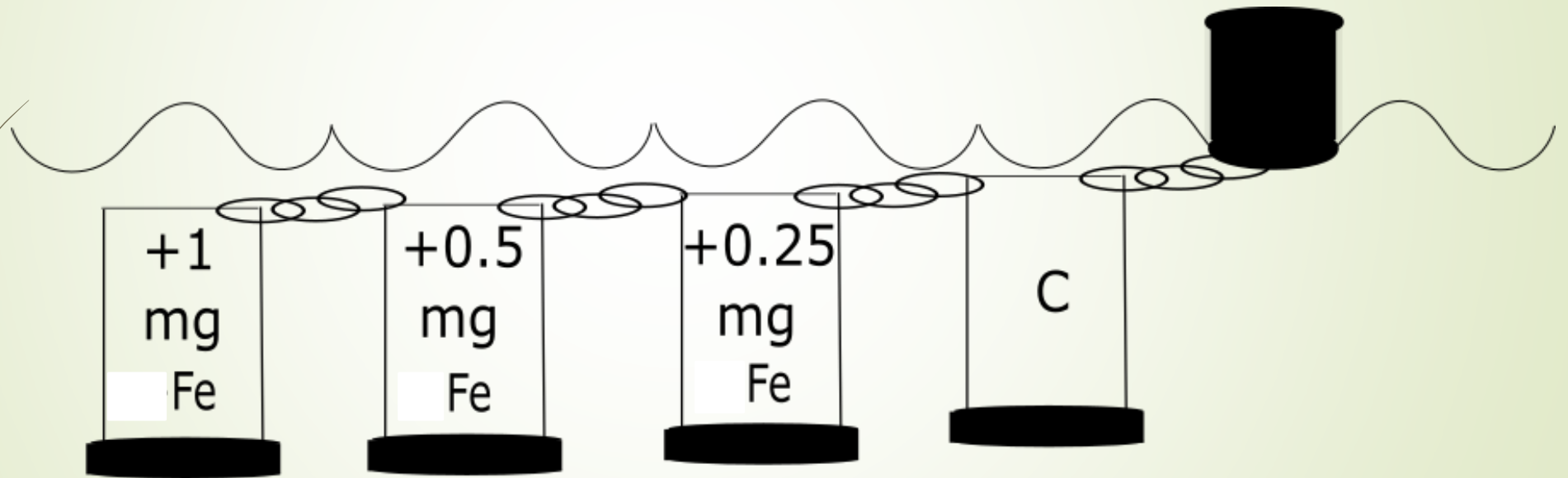




Methods

- Measure seston
 - Measure BGA
 - Measure N & P
- 

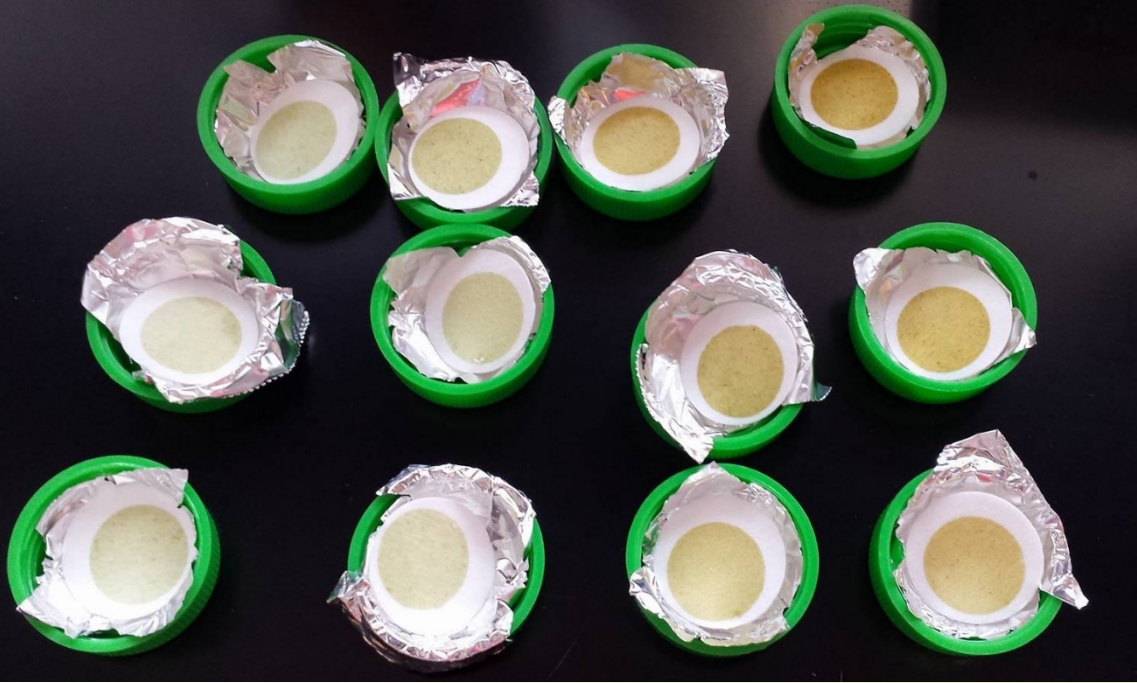
Methods



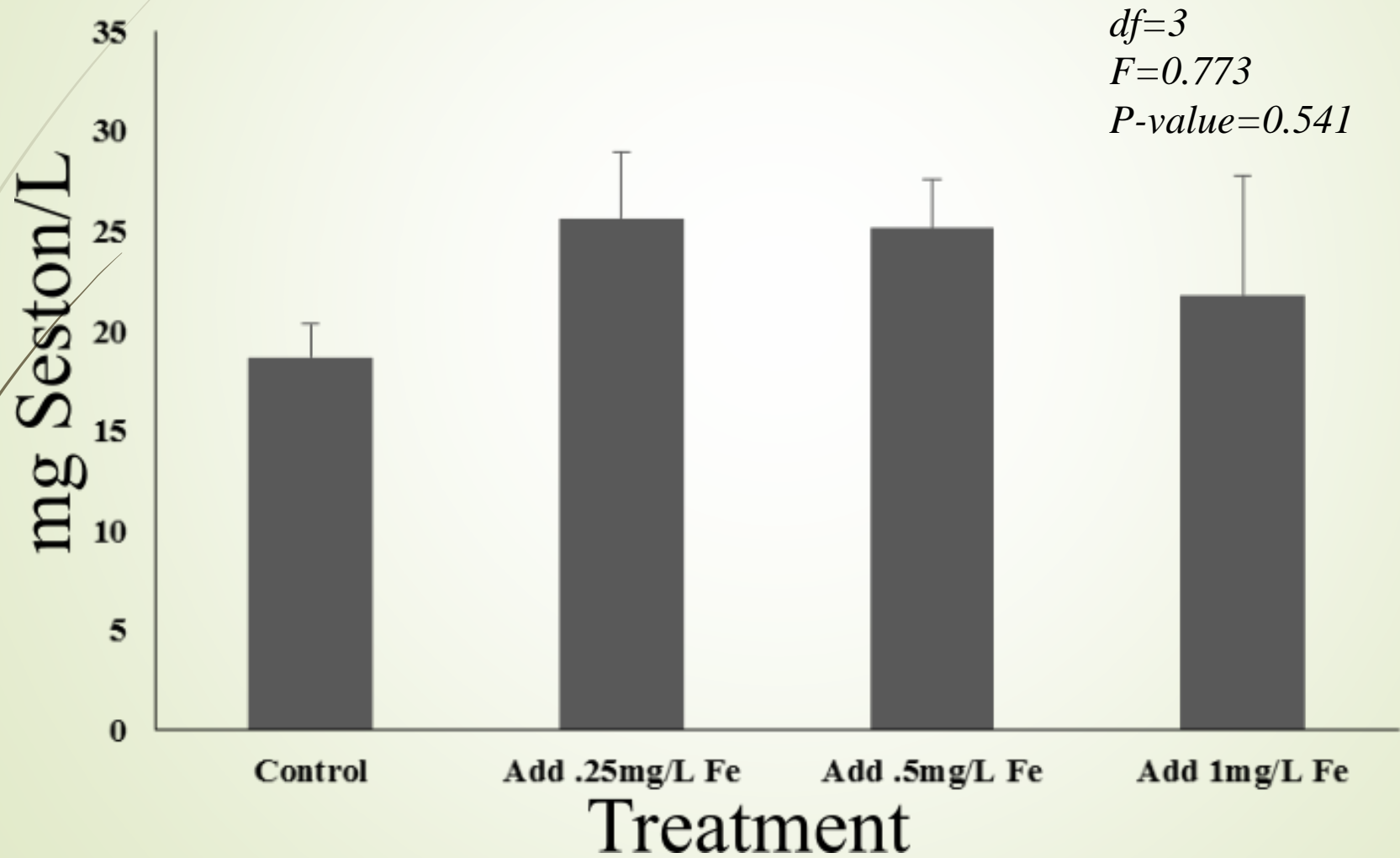


Methods

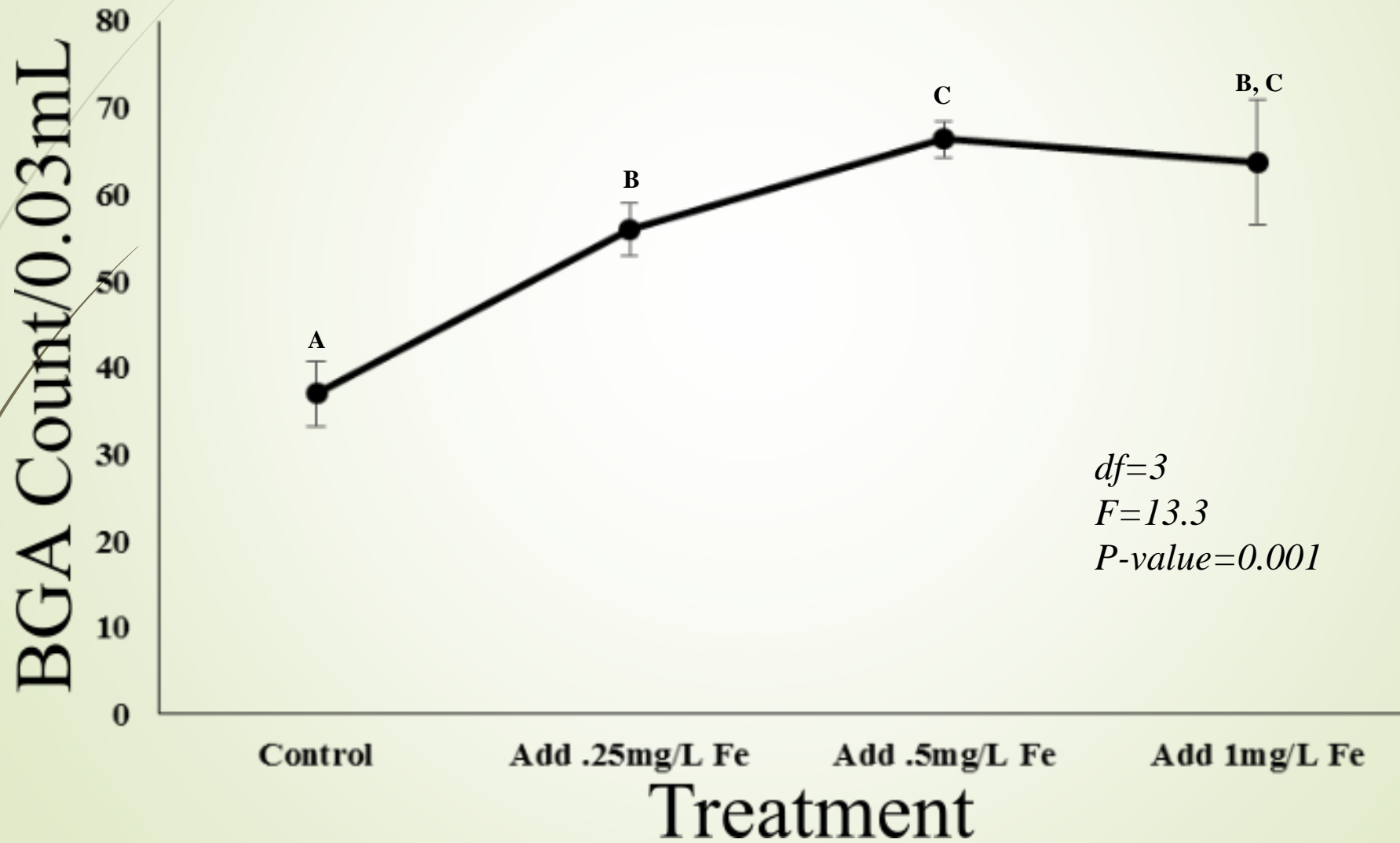
- ▣ Measure seston
 - ▣ Filtering particulate matter
- ▣ Measure BGA
 - ▣ Cell counts
- ▣ Measure N & P
 - ▣ Dissolved N and P



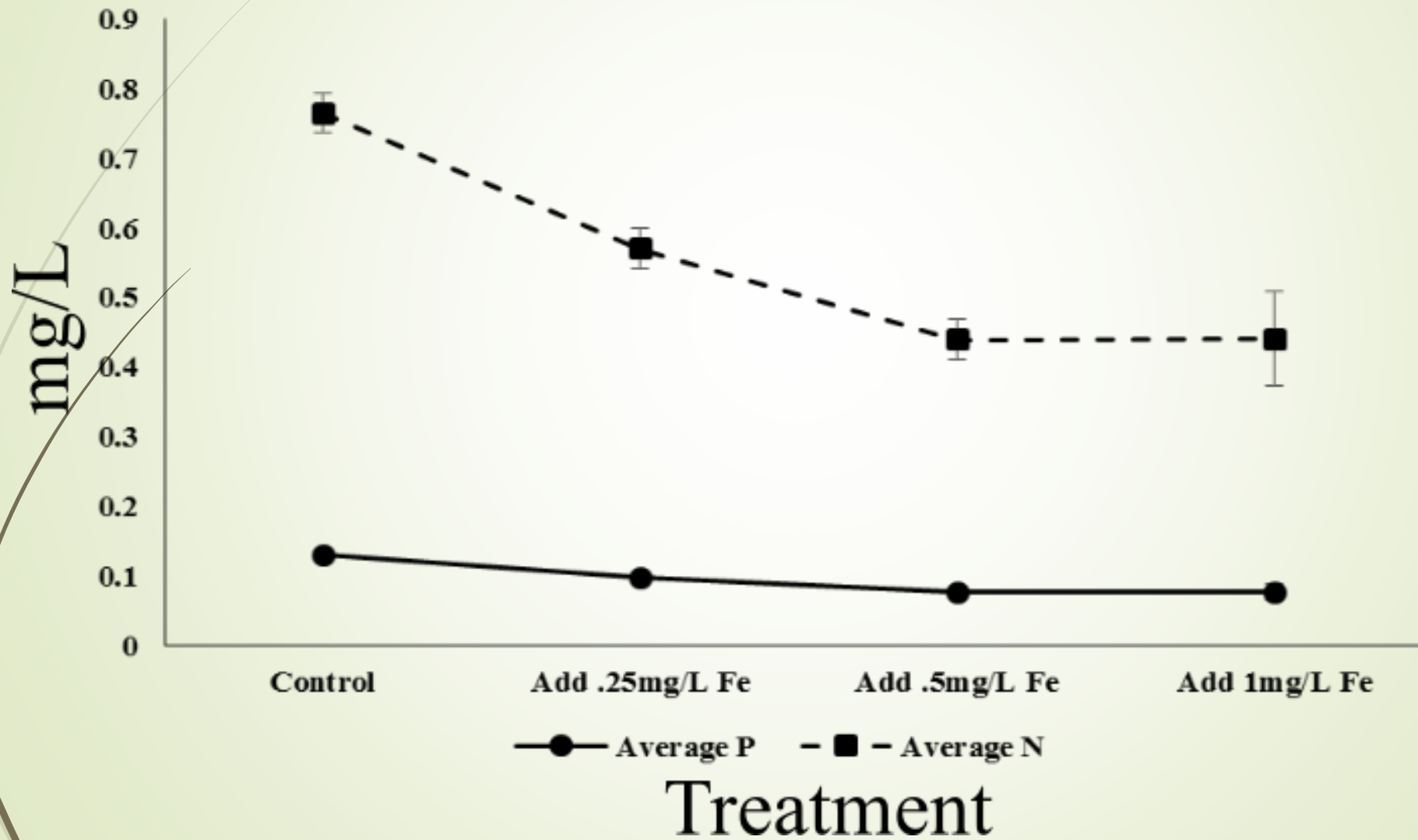
Results



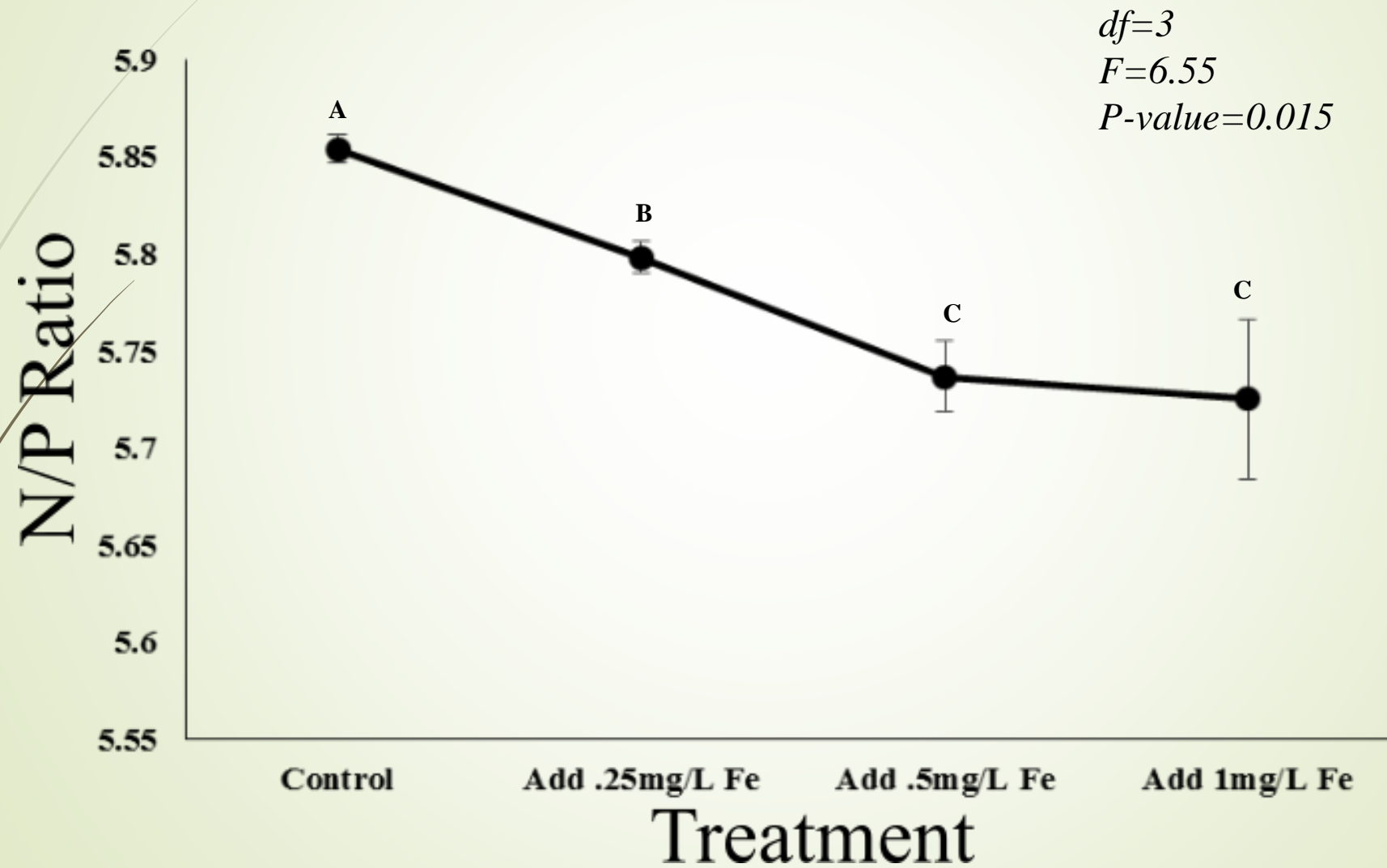
Results



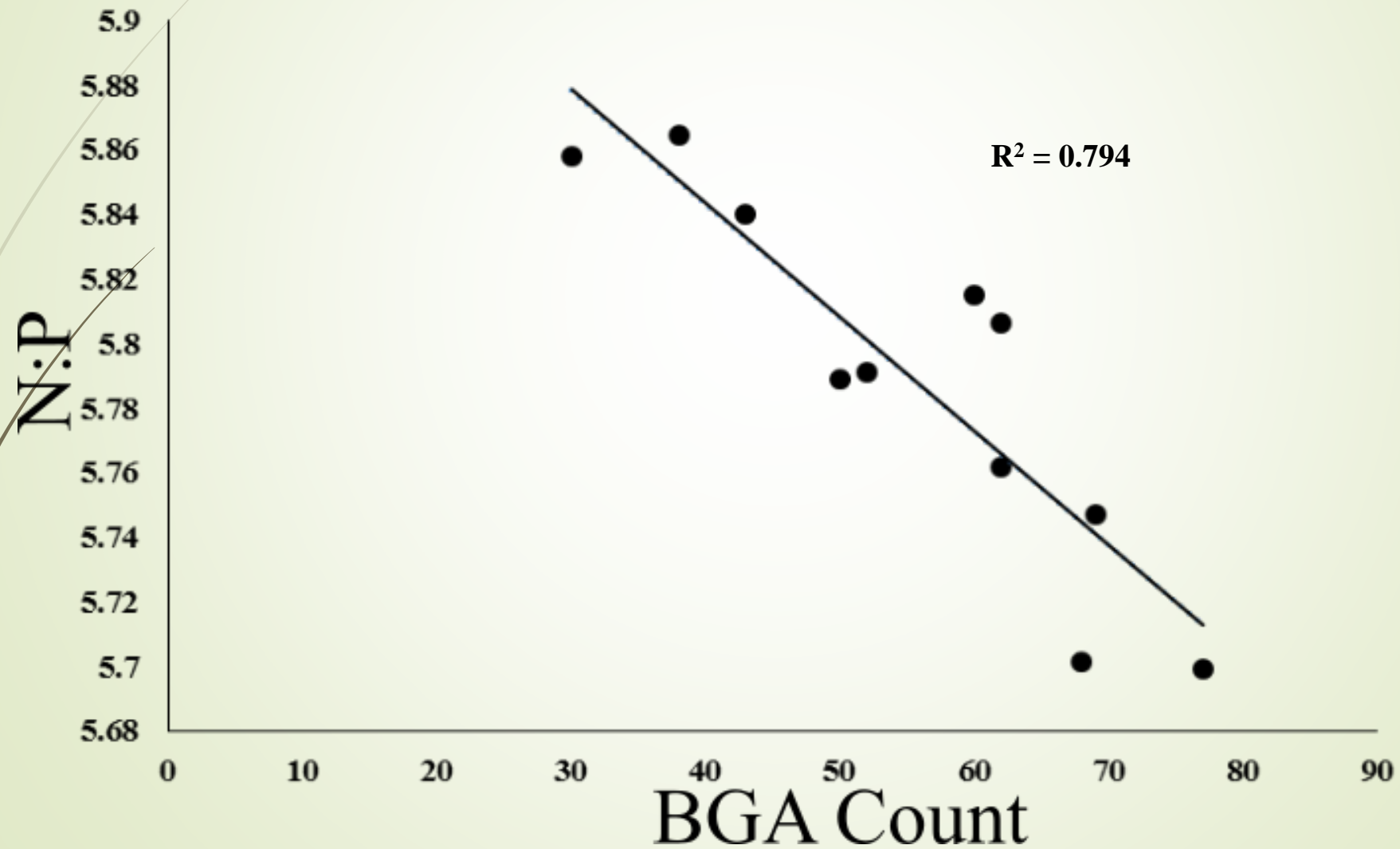
Results



Results

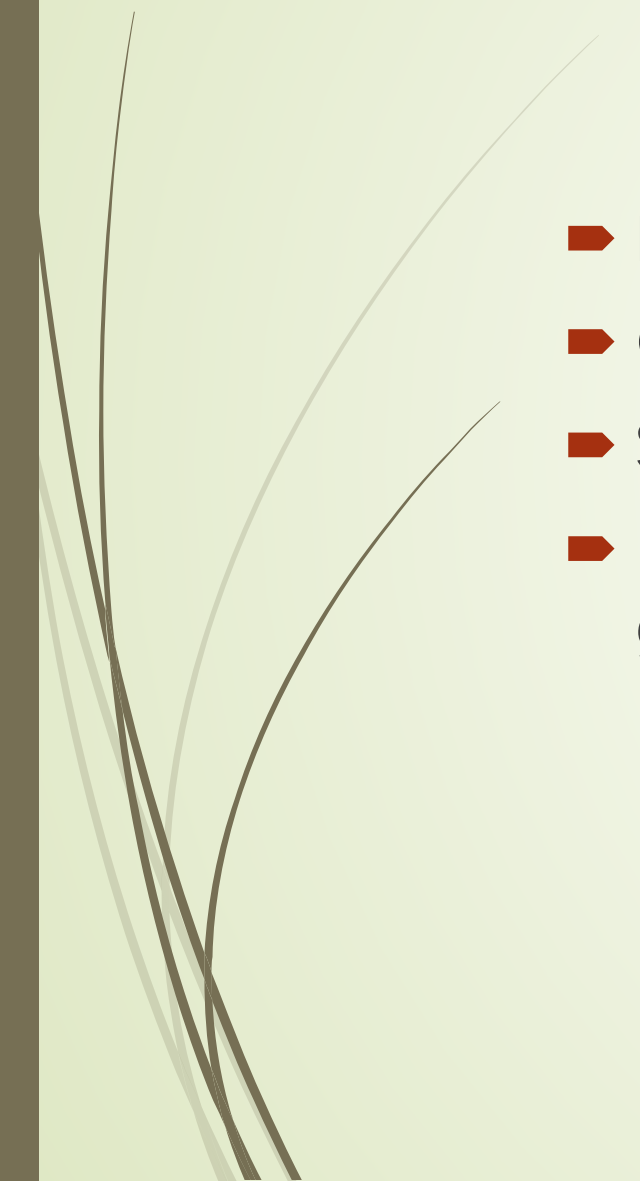


Results





Conclusions

- Fe has little effect on total algal biomass
 - Can drastically increase BGA growth
 - Strongly related to N usage
 - More than 1 or 2 elements (i.e. N &P) are important for growth
- 



Future Directions

- ▶ Multi Elemental Experiments
 - ▶ Observe factorial combinations of N, P, and Fe affect growth
 - ▶ How does the interaction of P and Fe affect growth
- ▶ Nitrogenase Activity
 - ▶ Is the increase in growth in BGA truly because of higher rates of N fixing



Acknowledgments



- OSU
- GRDA OSU Partnership
- Steve Nikolai
- Richard Zamor
- The Jeyasingh Lab