Microbial Communities in Cogongrass (*Imperata cylindrica*) Invaded and Non-Invaded Commercial Loblolly Pine (*Pinus taeda*) Stands

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Agenda

- Background
- Methods
- Results
- Questions

Cogongrass in Southeastern U.S.

- The 7th worst weed in the world
- Introduced from Japan in 1912 and 1920
- Produces vast rhizome networks
- Exudates limit growth of plants and symbiotic fungi

Cogongrass in Southeastern U.S.

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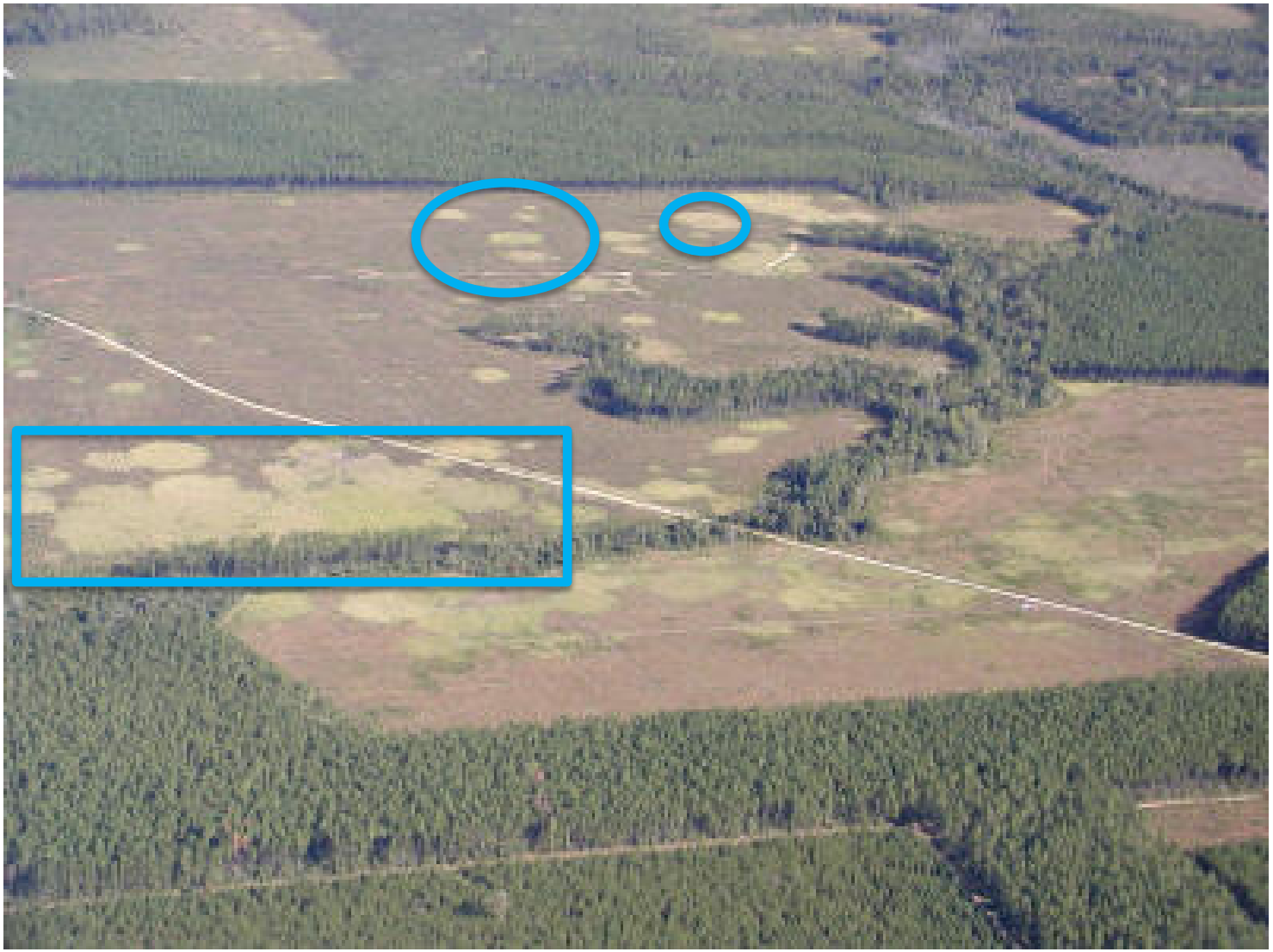


Mycorrhizae Role in Plant Development

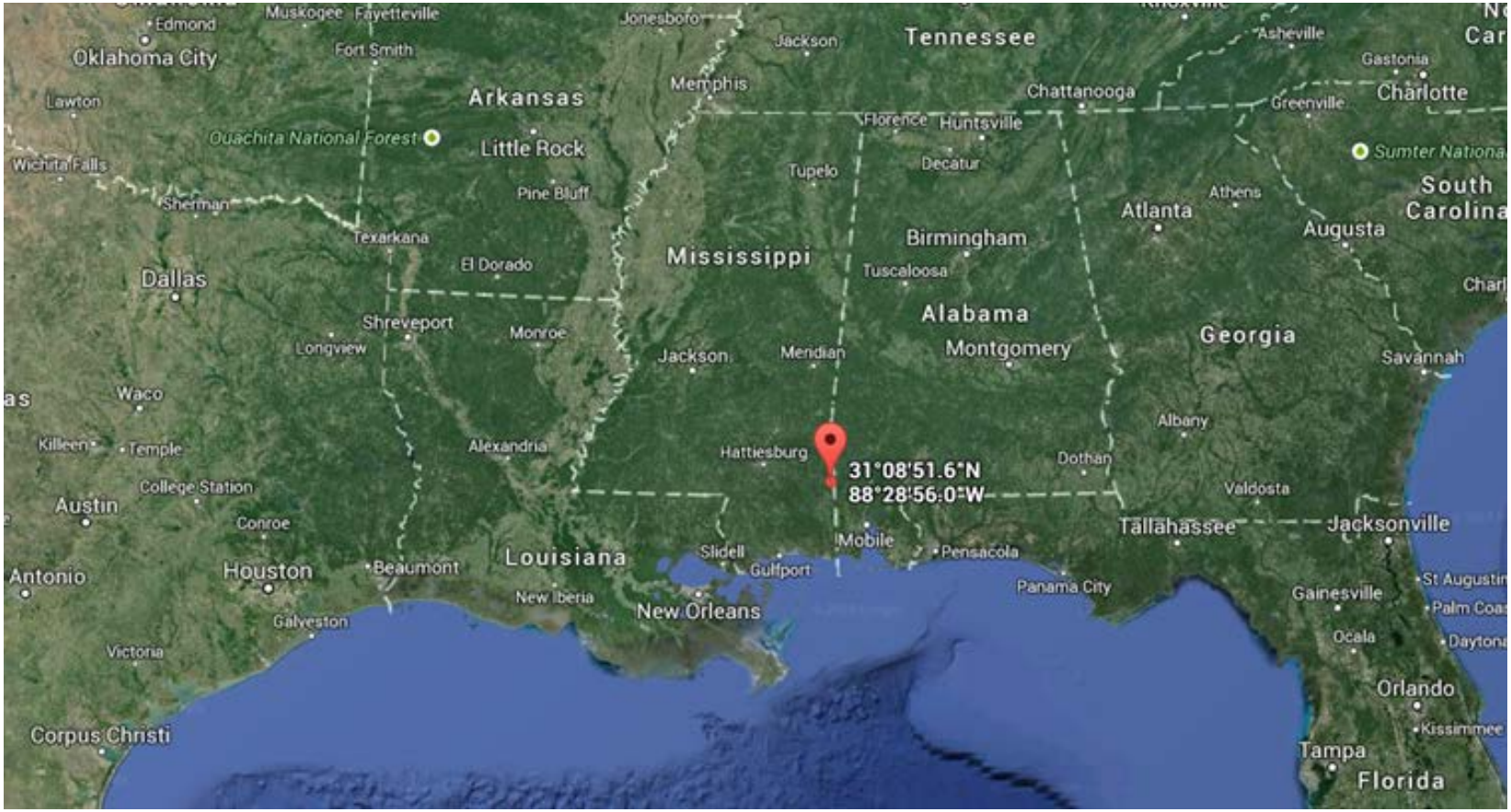
- Ubiquitous group of organisms
- *Pinus* is predominantly ectomycorrhizal
- Are credited with increased nutrient absorption, disease resistance, and decreased predation

Source: http://abioticdesignstudio.blogspot.com/2011/04/mycorrhizae-as-farming-fungi.html

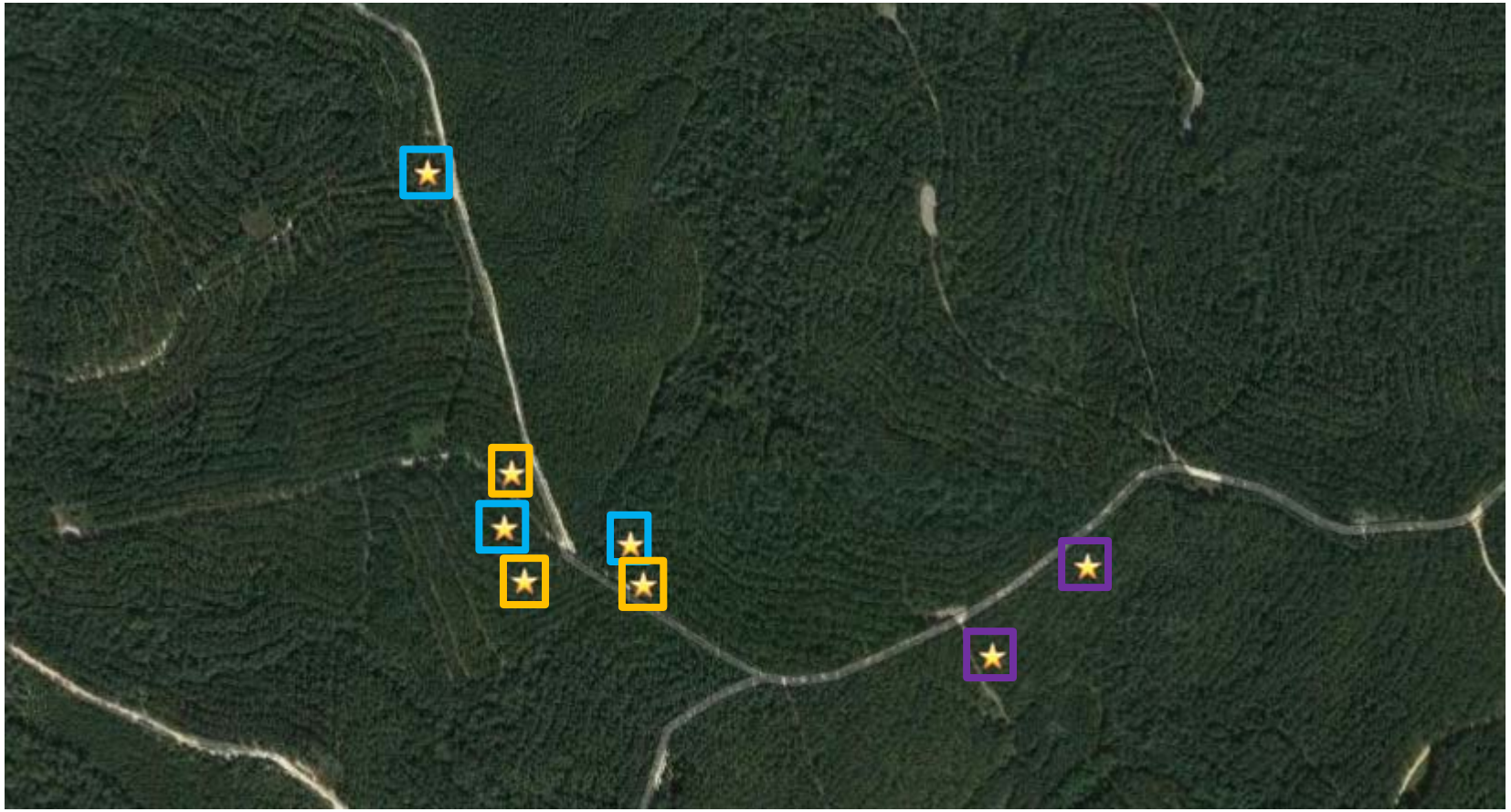
Hypotheses

- Percent colonization of mycorrhizal fungi will be lower in cogongrass invaded stands
- Vegetation will be less diverse in cogongrass invaded areas
- Nitrogen, phosphorus and potassium will be found at lower abundances in cogongrass invaded plots
- Base cations will be found at lower abundances in cogongrass invaded plots
- Soil moisture will be lower in plots invaded by cogongrass
- Microbial biomass (C:N) will be lower in plots invaded by cogongrass

The Westervelt Company



The Westervelt Company



Site Conditions

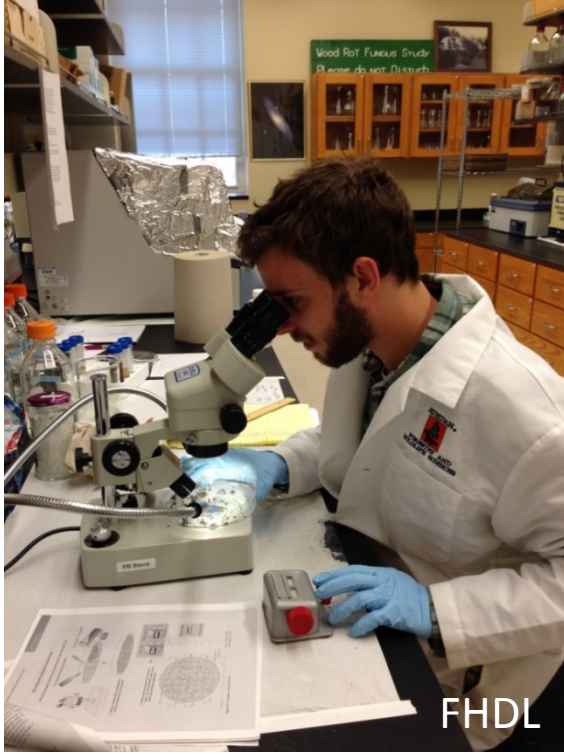
	Cogongrass absent			Cogongrass present				
Plot	N1	N2	N3	P1	P2	C1	C2	C3
Cogongrass cover 2011	0	0	0	0	86	94	97	64
Cogongrass cover 2014	0	0	0	22	12	92	97	53
Age	16	16	22	21	21	16	16	22
Basal Area ($m^2.Ha^{-1}$)	20.9	21.6	24.8	25.3	25.3	21.6	20.9	24.8
Trees Per Acre	227	244	266	243	243	244	227	266
Stocking Percentage	70		80		80	70		80
Annual Precipitation (mm)	1677							
Urea	2010		2007		2010		2007	
Diammonium phosphate application	2006							
Thinned	2009		Prior to 2006		2009		Prior to 2006	
Burned	X		Cool season, 2009		X		Cool season, 2009	

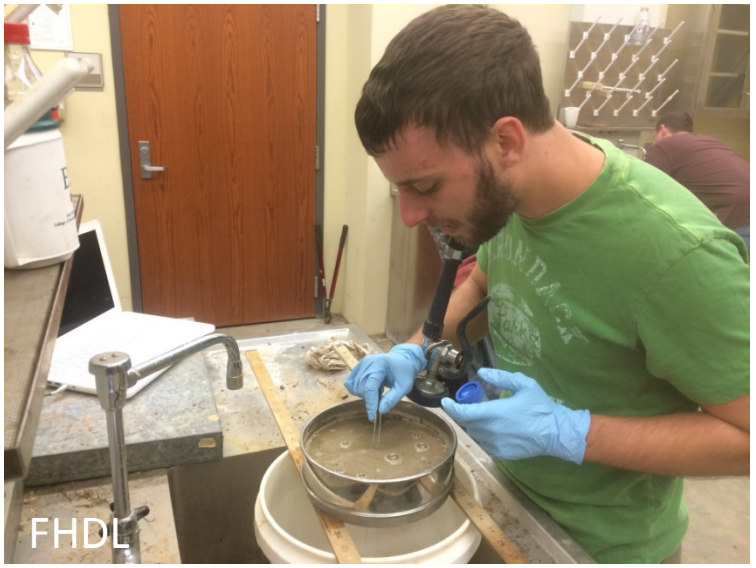
Materials and Methods

- Mycorrhizal roots were collected with 72- 5 cm x 60 cm soil cores (November 2013 and May 2014)
- Microbial biomass was collected by taking four soil samples from each site with a shovel (April, July and October 2014 and January 2015)
- Soil nutrients were collected with 4- 5 cm x 60 cm soil cores (November 2011)

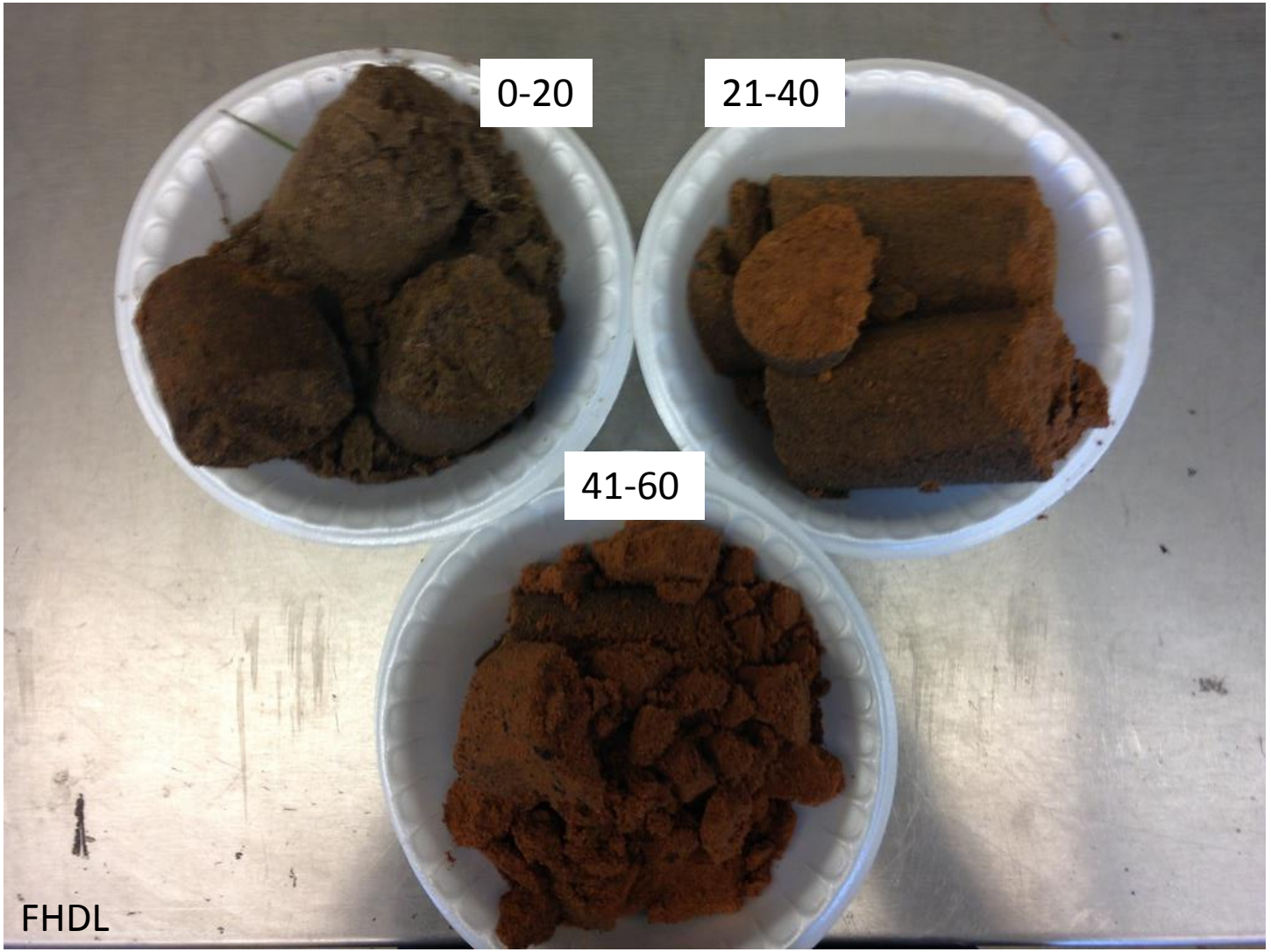
Materials and Methods

- Roots will be separated from soil cores
- Amount of fine root recovered is measured
- Percent colonization of mycorrhizal fungi





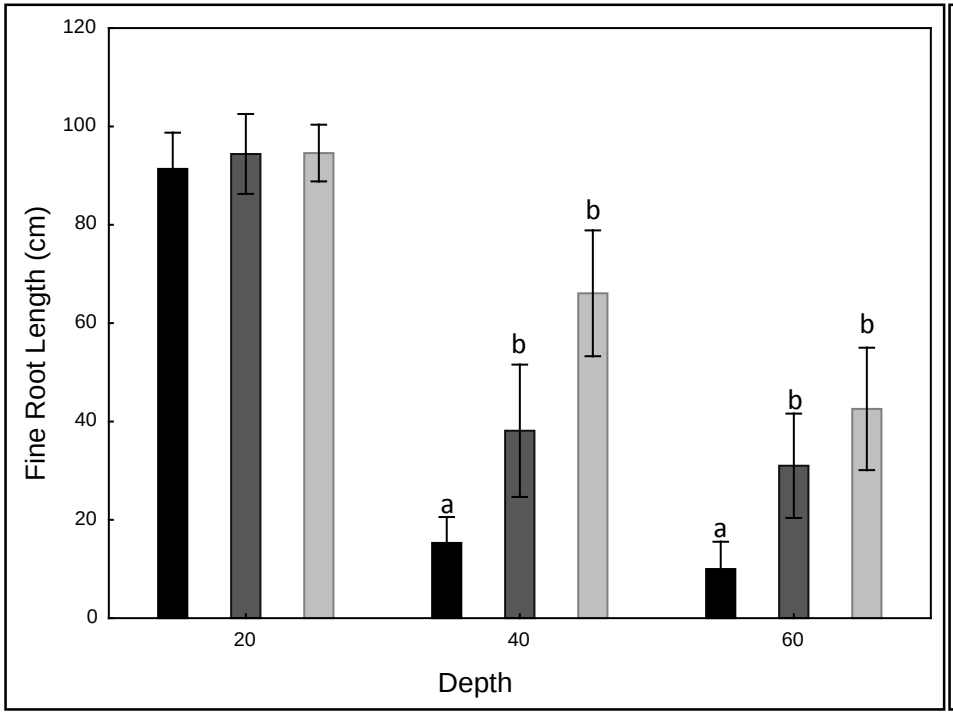
Soil Core In Increments



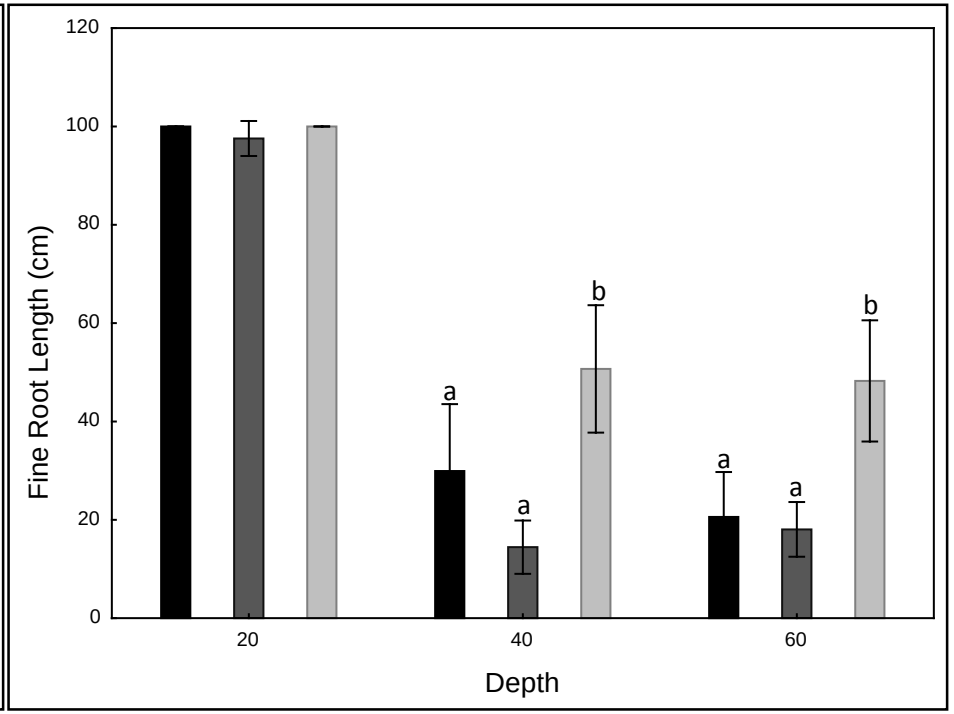
Materials and Methods

- Determine microbial biomass C and N present in each site
- Measure soil moisture

Recovered Fine Root Length



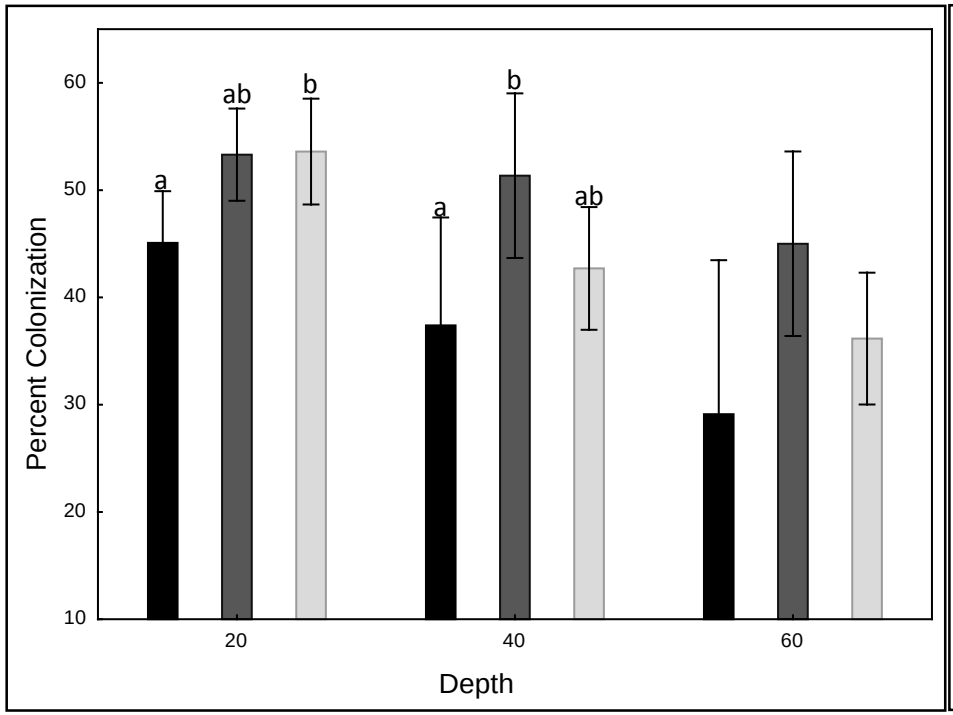
November



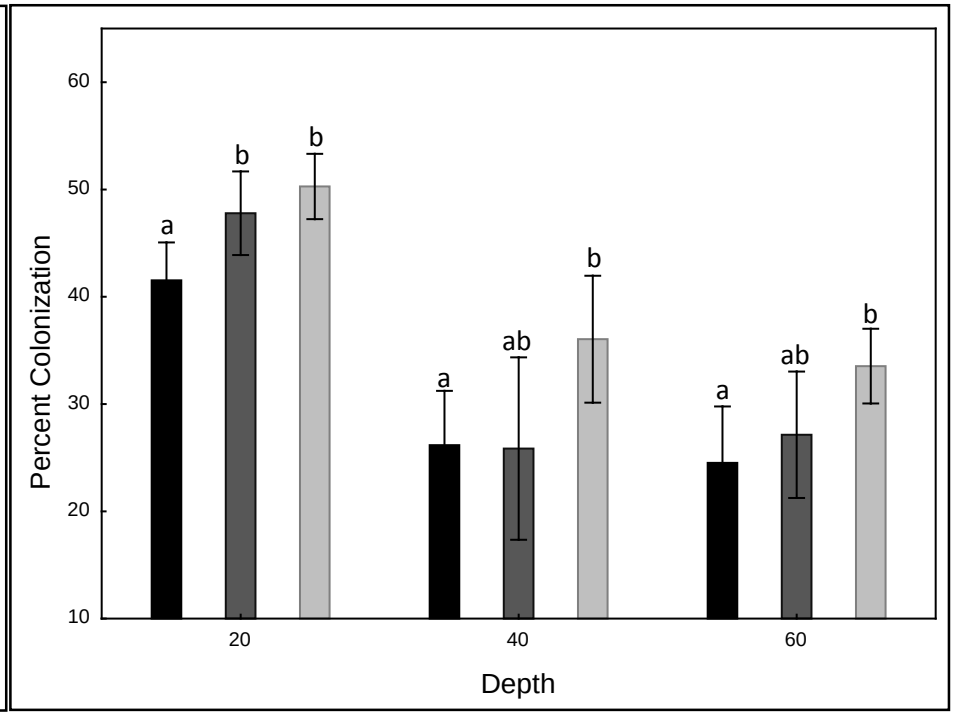
May

Cogongrass present (>50 %)
Cogongrass present (<50 %)
Cogongrass absent

Percent Colonization of Mycorrhizal Fungi



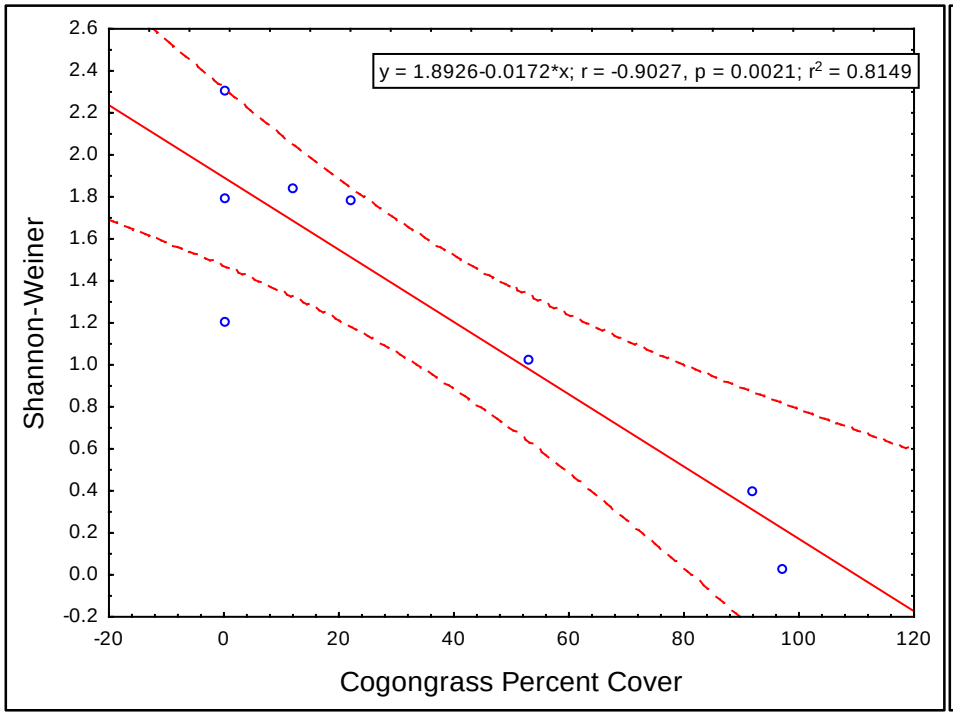
November

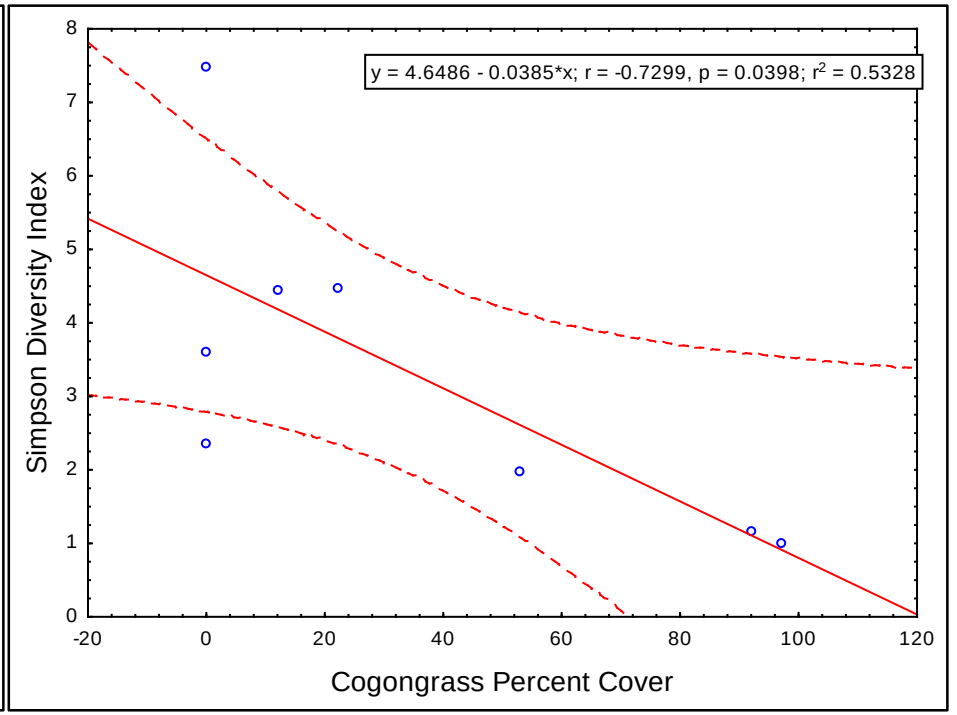


May

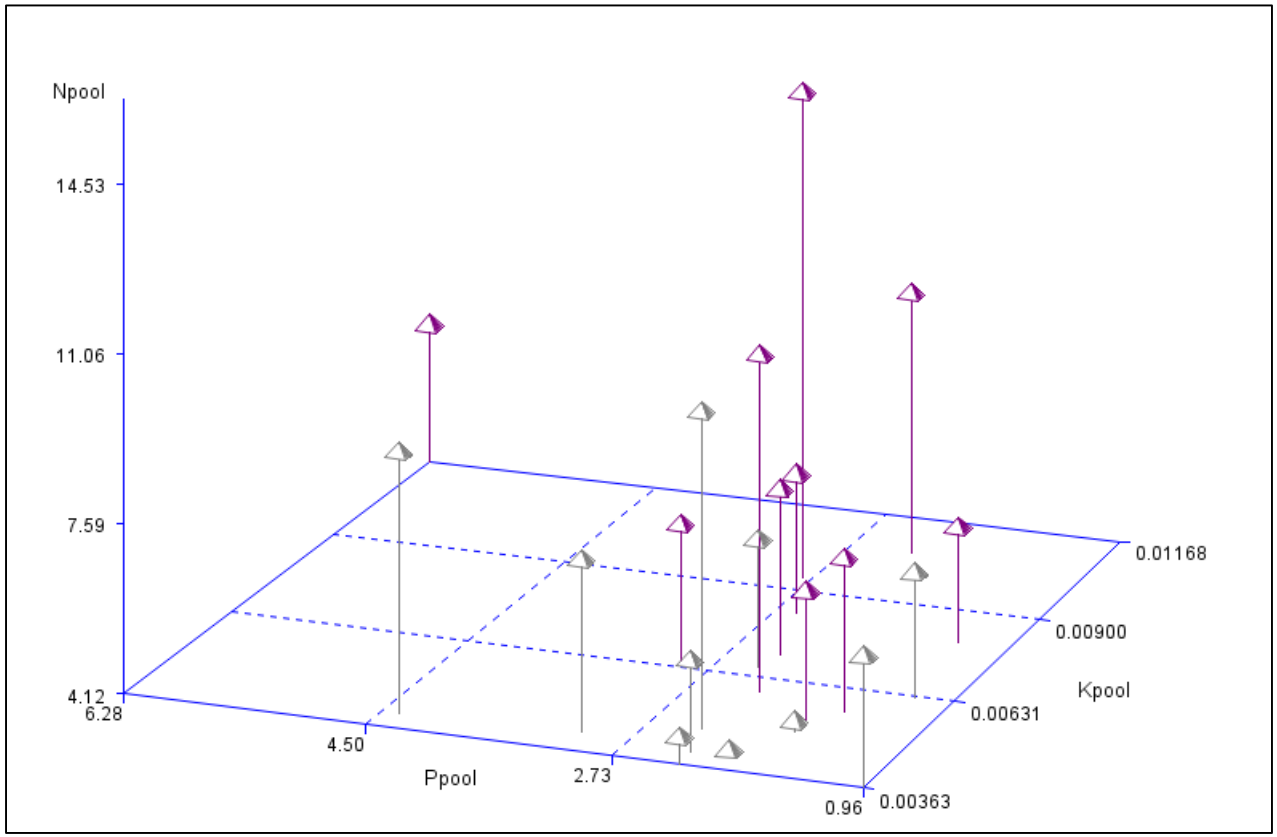
Cogongrass present (>50 %)
Cogongrass present (<50 %)
Cogongrass absent

Plant Diversity Related to Cogongrass Abundance



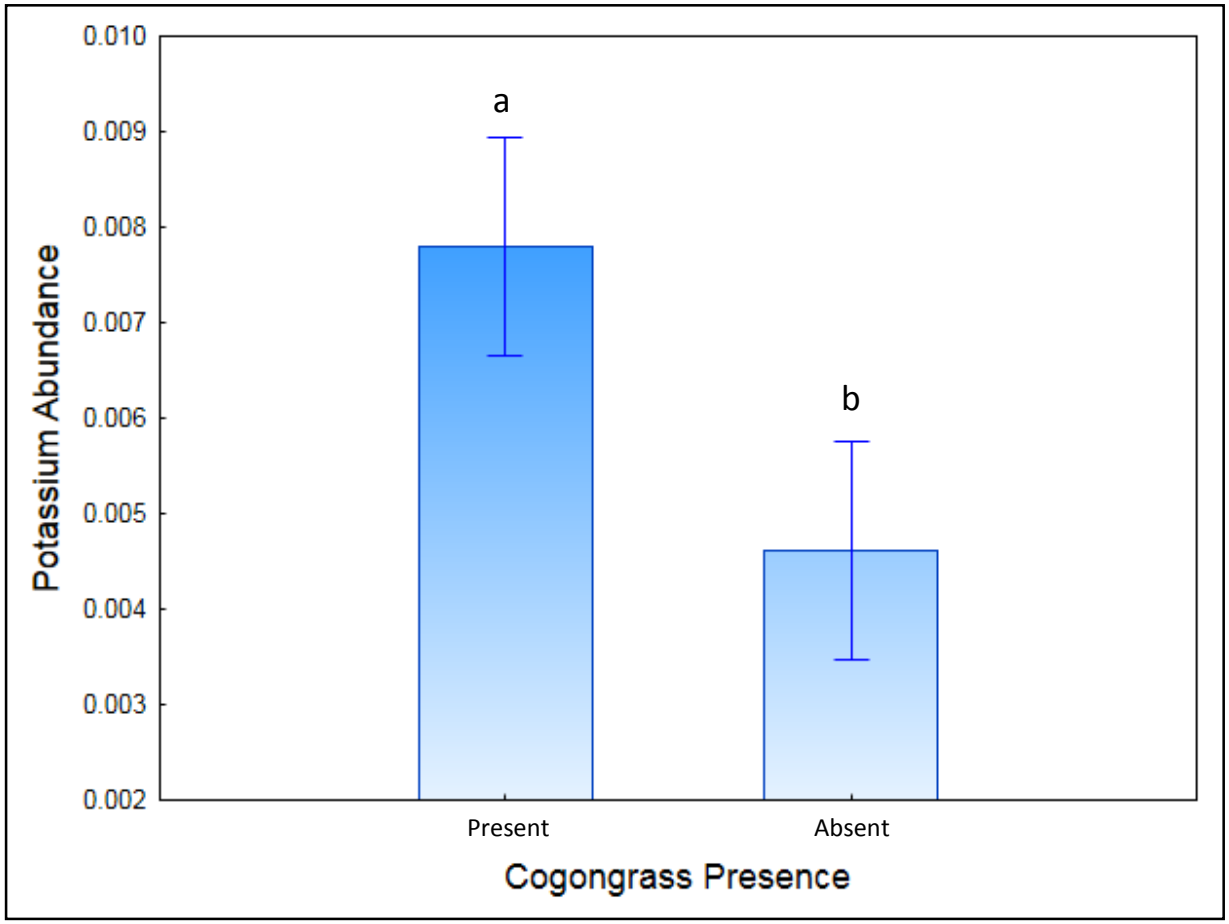


Abundance of N, P and K in the Top 10 cm



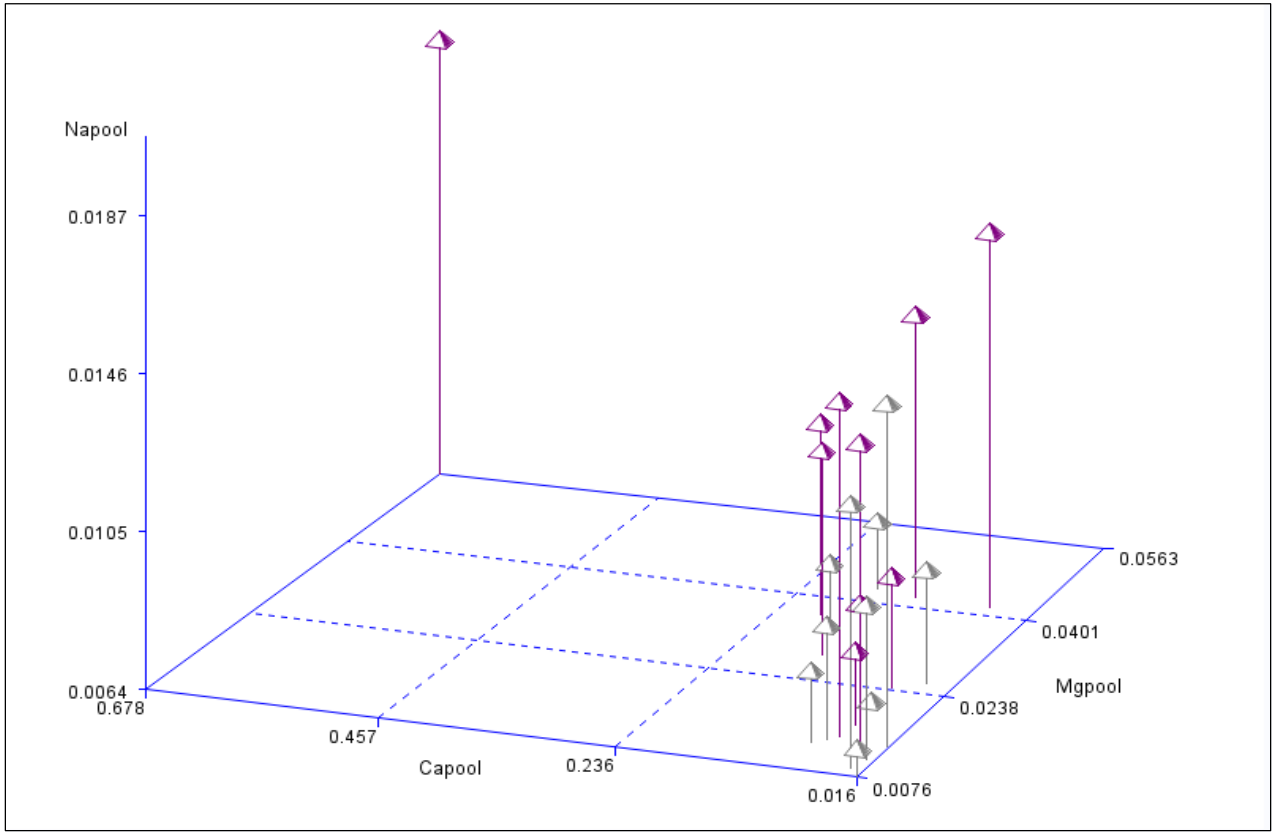
$F_{(3,16)}=6.05$
p=**0.006**

Abundance of Potassium in the Top 10 cm



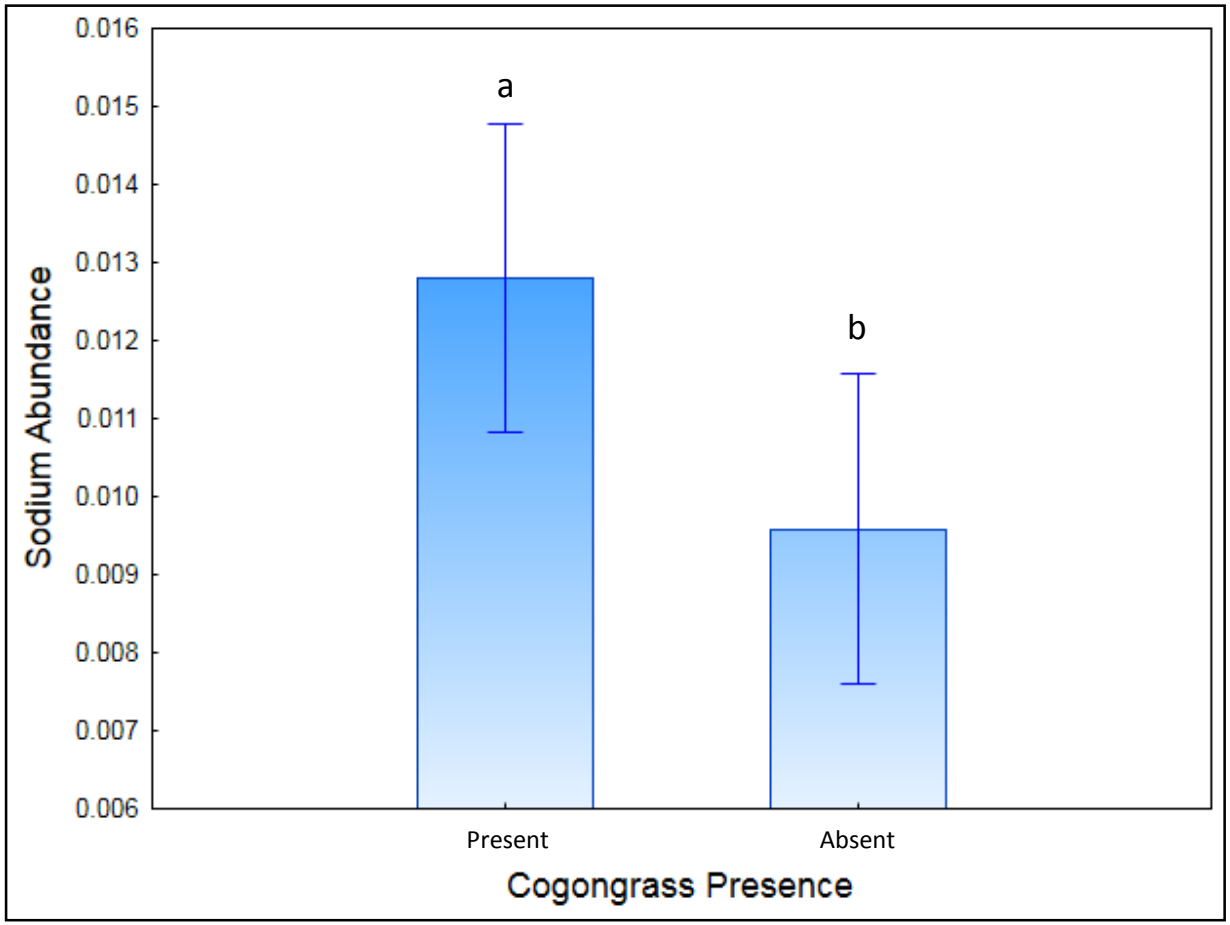
$F_{(1,18)}=17.23$
***p*<0.001**

Abundance of Base Cations in the Top 10 cm



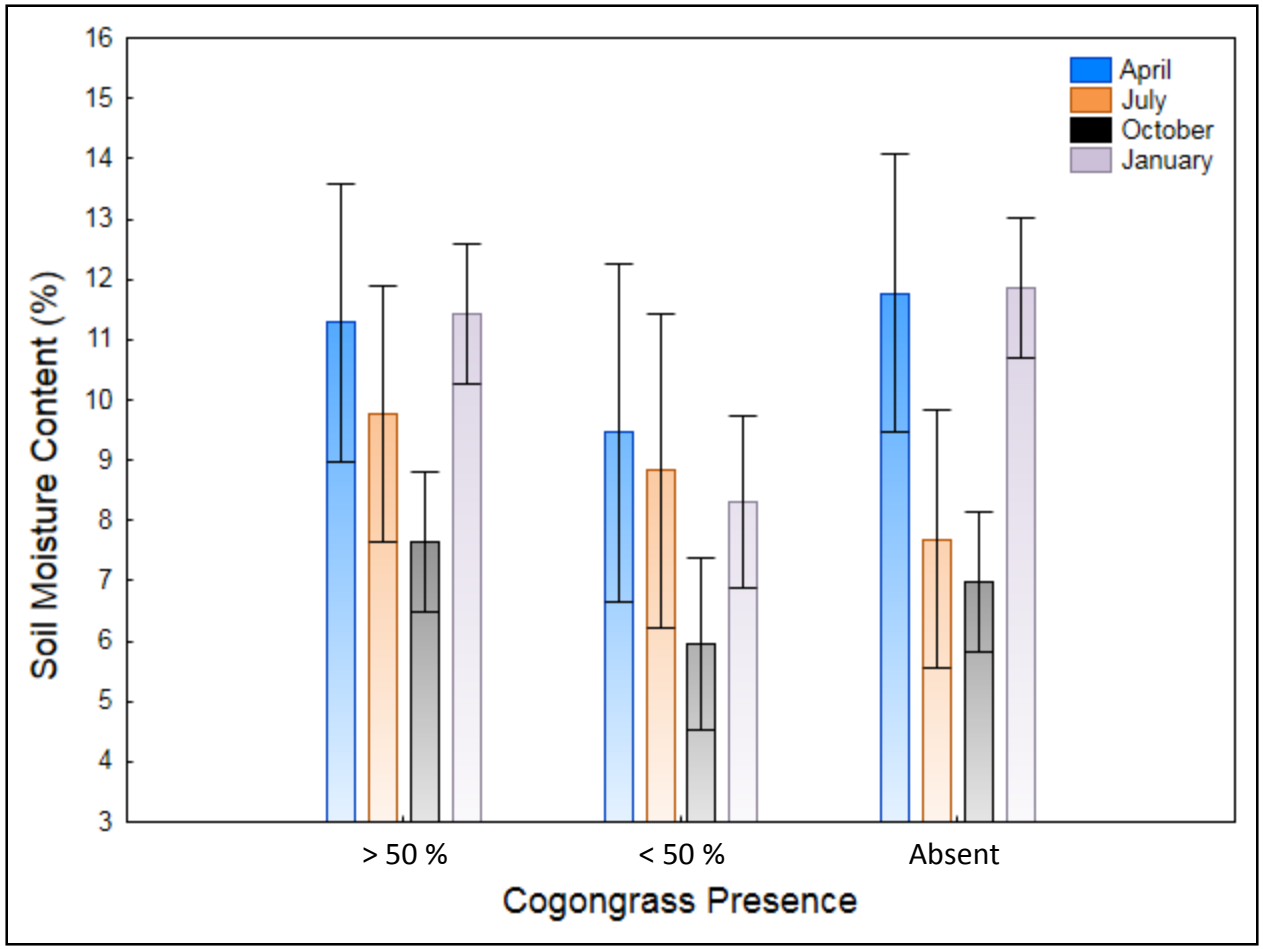
$F_{(3,16)}=2.21$
$p=0.12$

Abundance of Sodium in the Top 10 cm

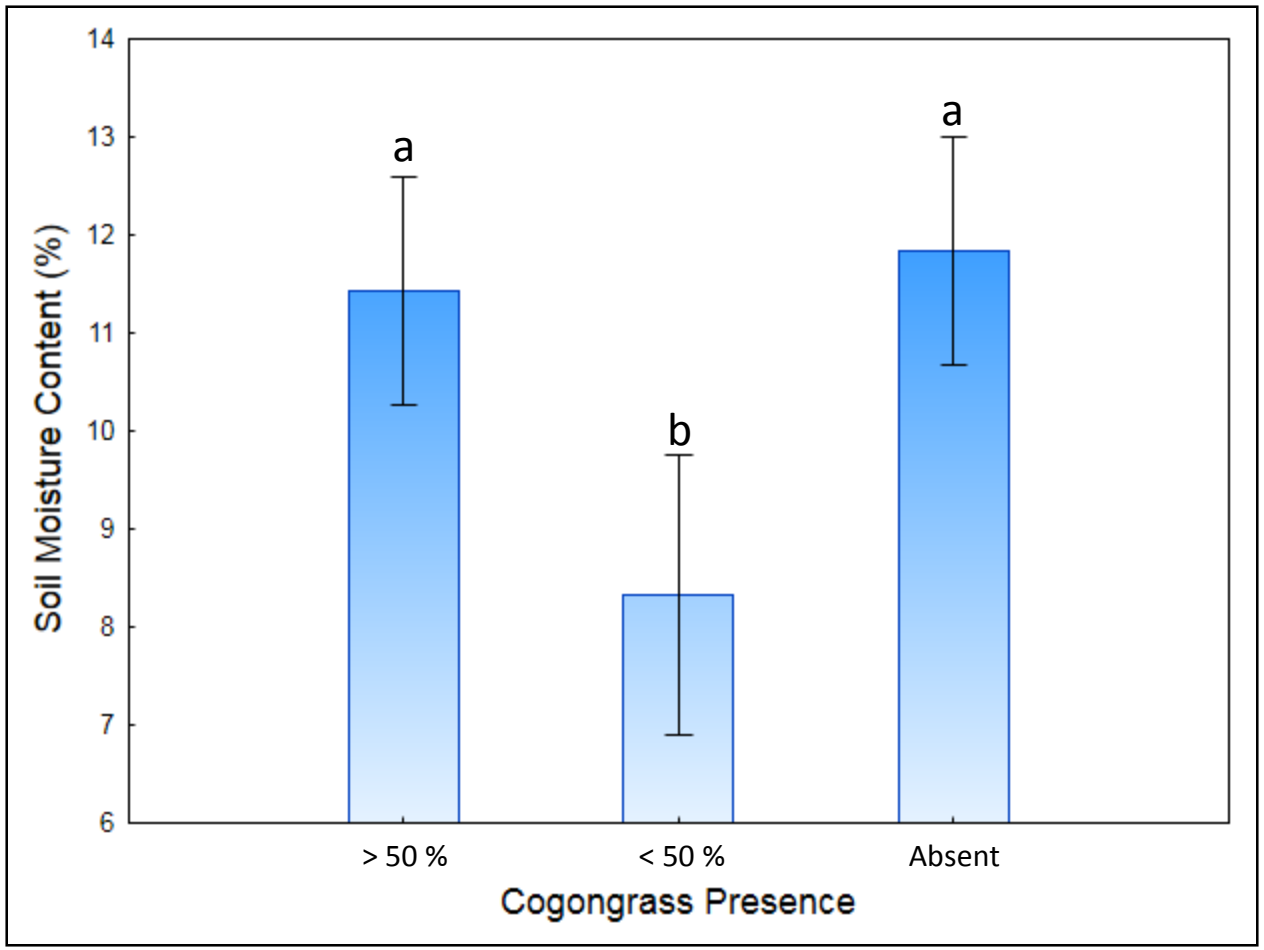


$F_{(1,18)}=5.80$
***p*=0.03**

Soil Moisture in Top 10 cm

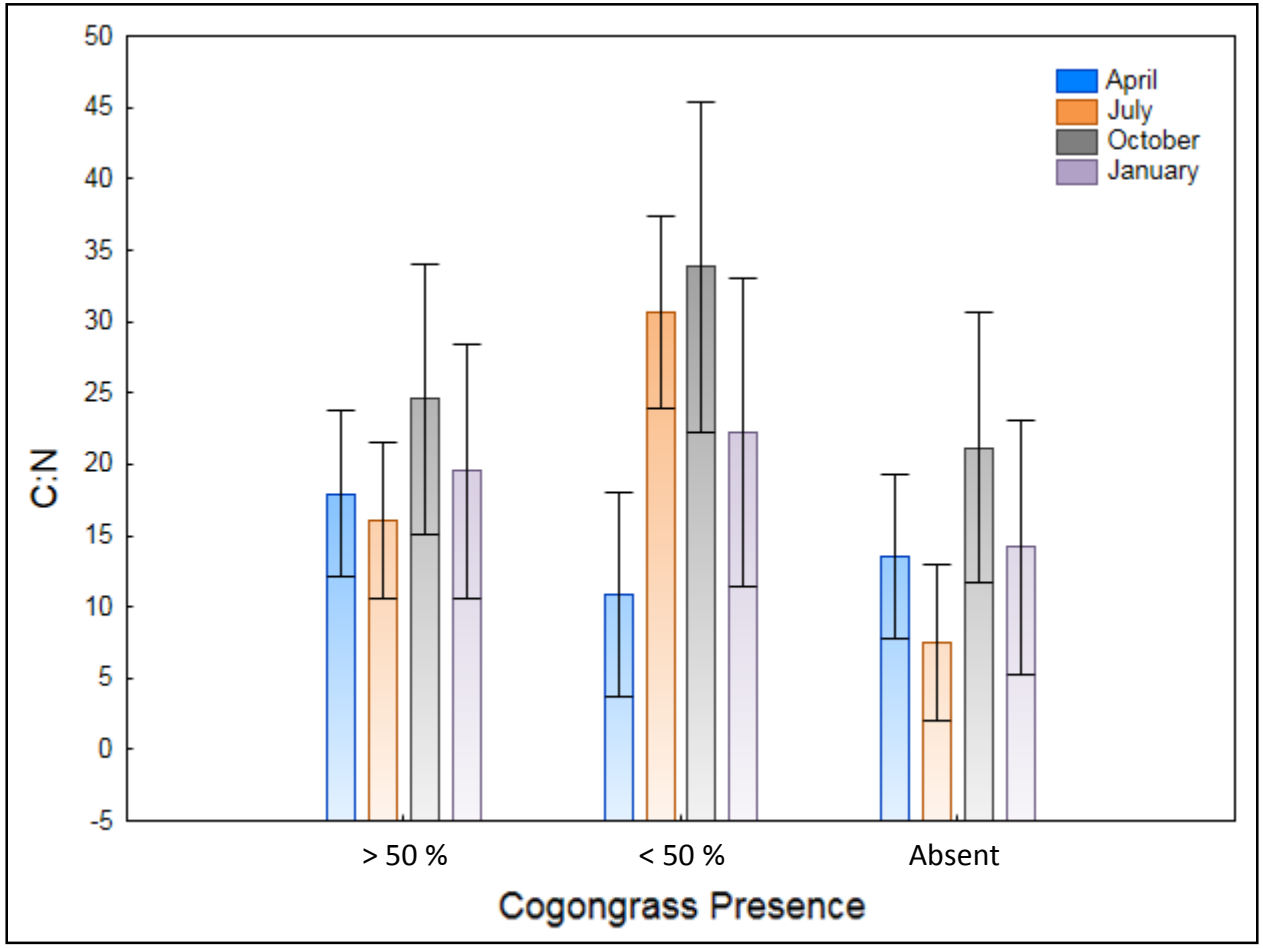


Soil Moisture in Top 10 cm of Soil in January

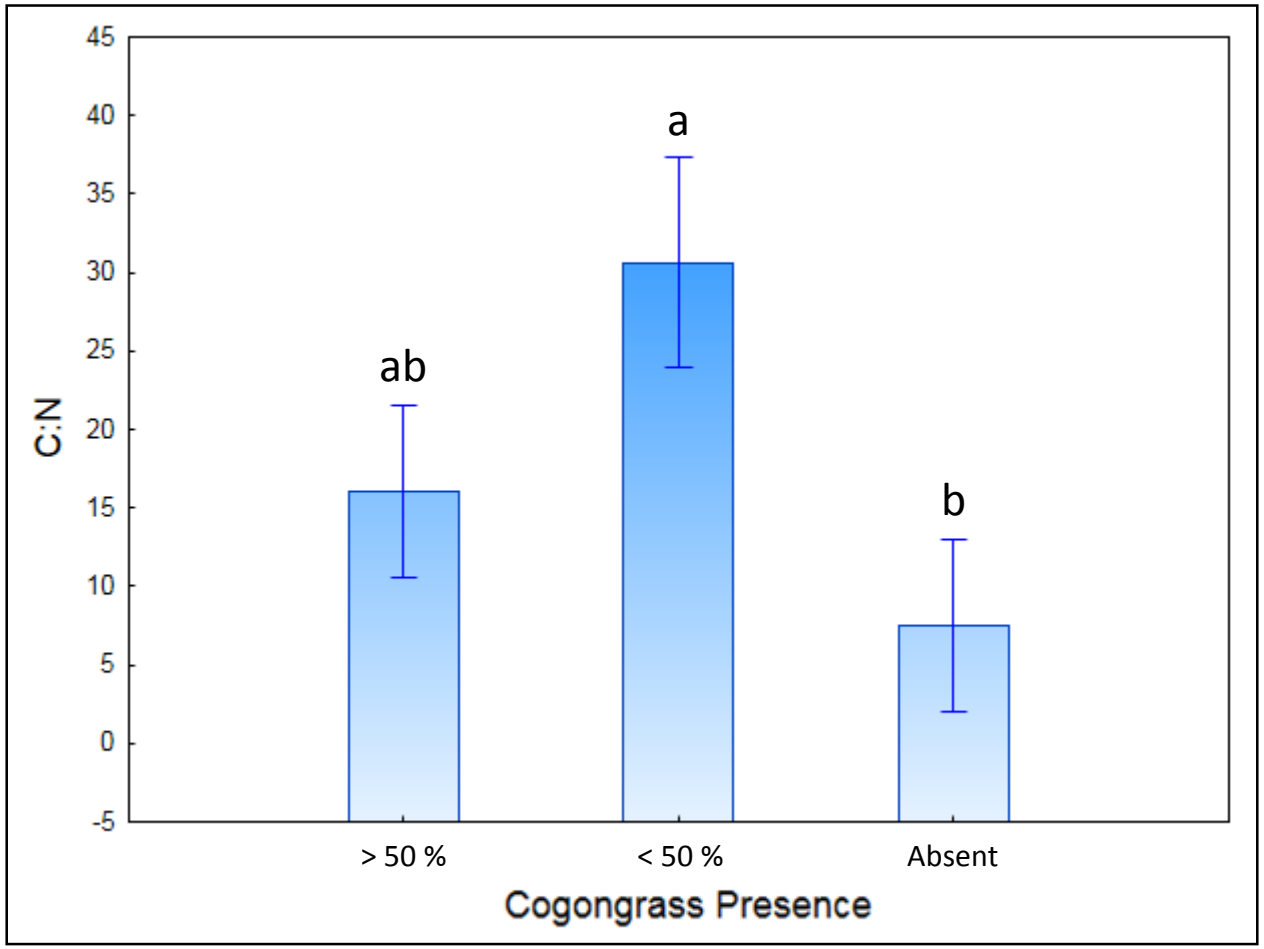


$F_{(2,29)}=8.61$
p=**0.001**

Microbial Biomass C:N ratio in Top 10 cm



Microbial Biomass C:N ratio in Top 10 cm in July



$F_{(2,29)}=14.89$
$p<\mathbf{0.001}$

Conclusion

- Seasonal differences observed in recovered fine root length and percent colonization of mycorrhizae
- Some nutrients are found in different abundances
- Significant difference in microbial biomass and soil moisture

Acknowledgements

- Funding: Forest Health Cooperative
- Committee members
- Dr. Ryan Nadel
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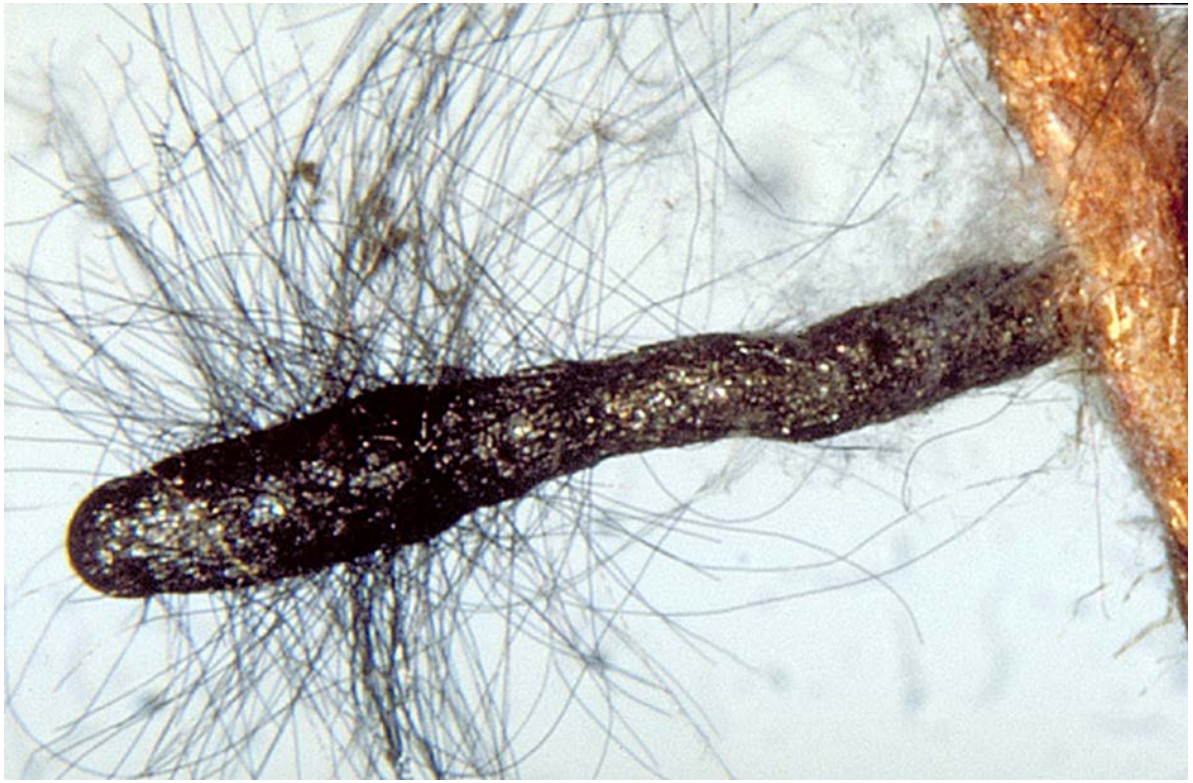
- Robin Governo

Questions?



Source: http://www.deemy.de