

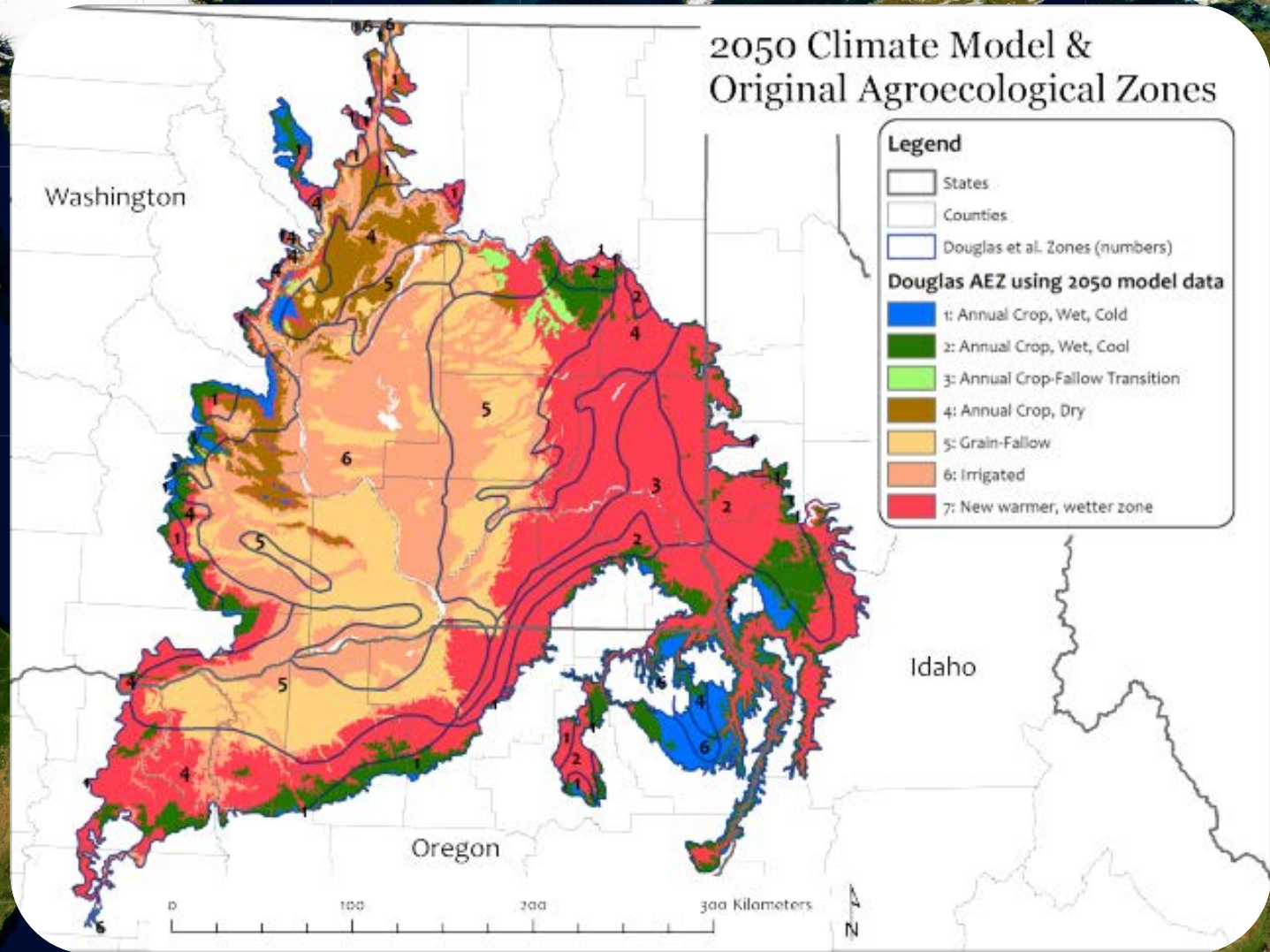
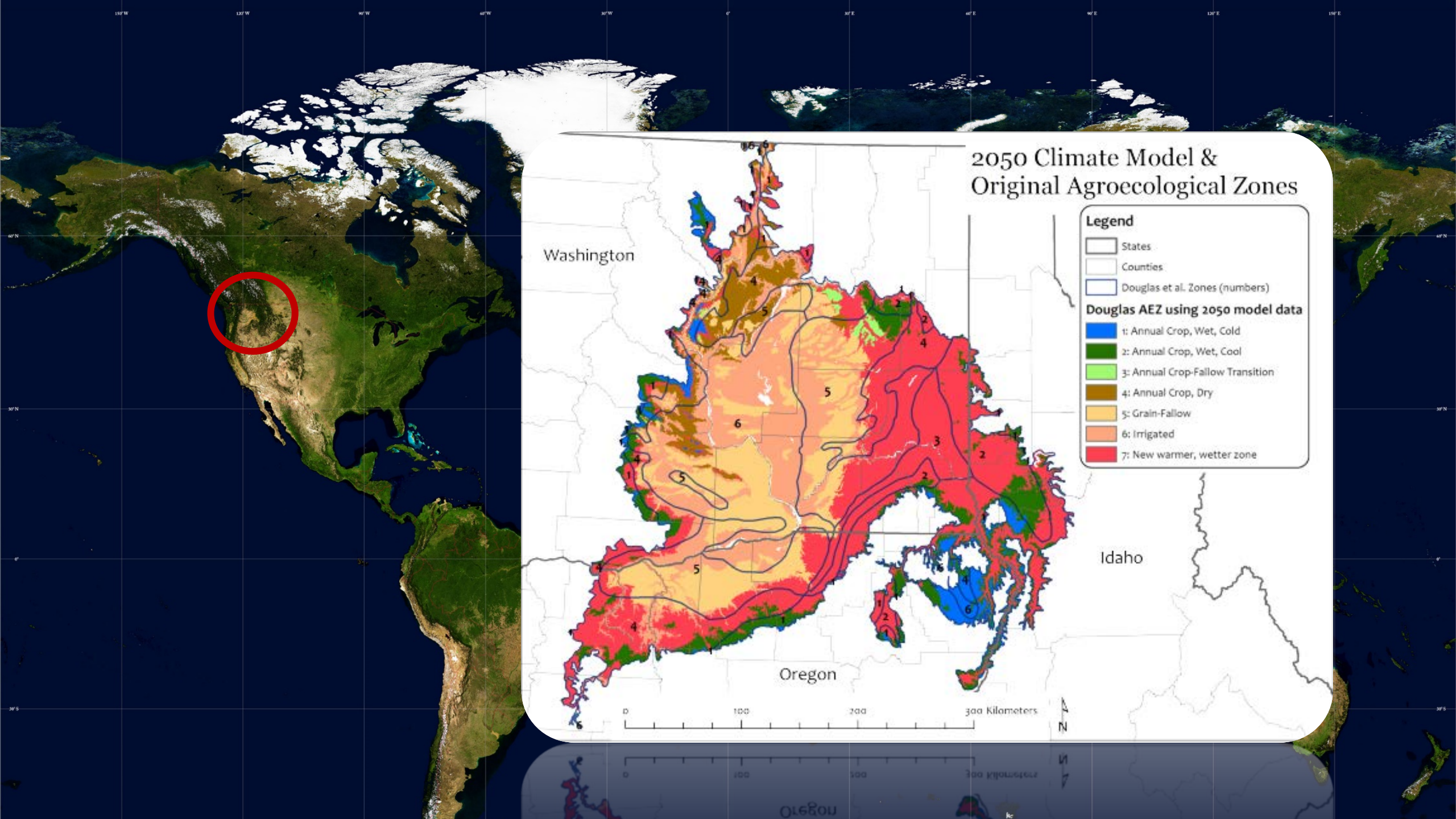
Evaluation of 4R's N management for Canola



WASHINGTON STATE
UNIVERSITY

Justin Alexander Archibald





Best Management Practices for Mitigating and Adapting to Climate Change (cfBMPs)

Nitrogen
Management

Crop
Diversification
and
Intensification

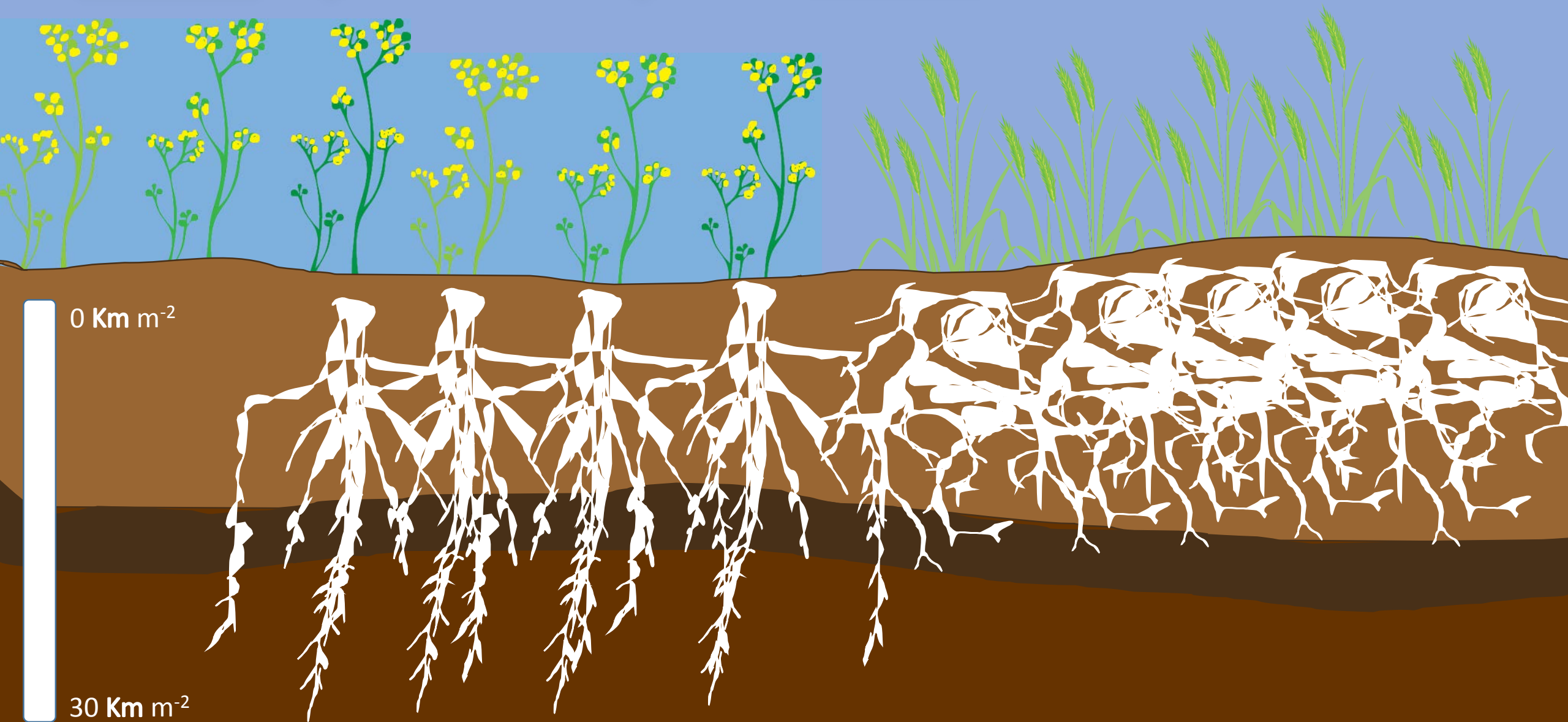


“Canola is not you’r
father’s wheat”



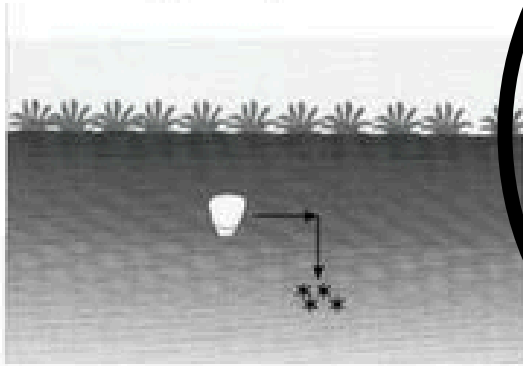
Canola: Tap Rooted Crop

Wheat: Fibrous Rooted Crop

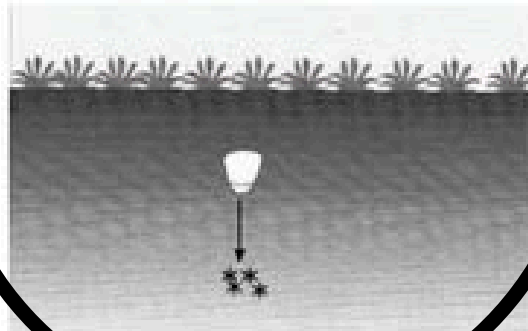


Starter Fertilizer

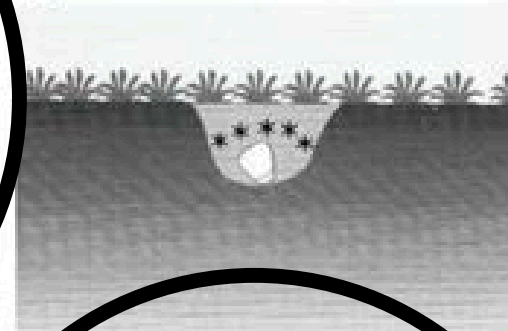
A. Two-by-two placement.



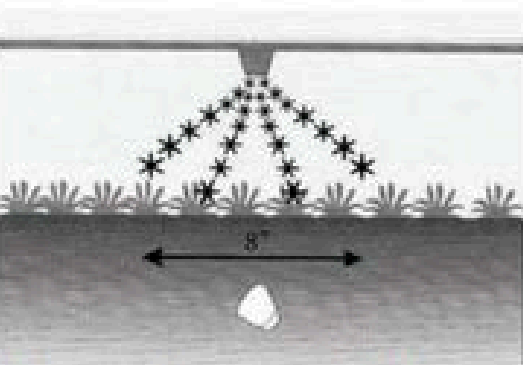
B. Below-seed placement.



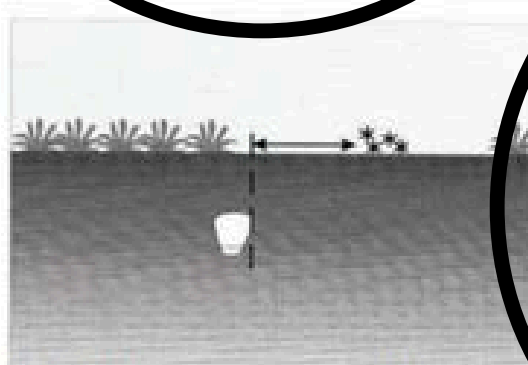
C. In-row or "pop-up" placement.



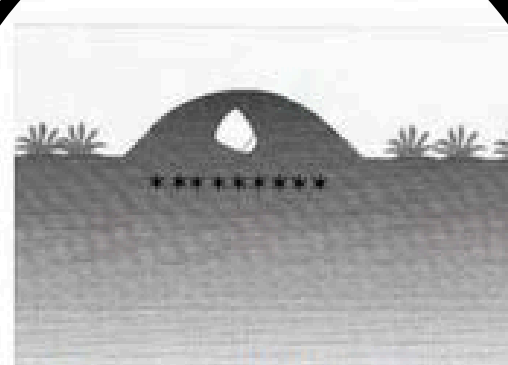
D. Over-the-row banding.



E. Surface-dribble placement.



F. Banding under the row.



Previous Research



Root Urea Interactions

Pan, William L., Isaac J. Madsen, Ronald P. Bolton, Lisa Graves, and Tara Sistrunk. "Ammonia/Ammonium Toxicity Root Symptoms Induced by Inorganic and Organic Fertilizers and Placement." *Agronomy Journal*, 0, no. 0 (2016): 2485-2492.

Wheat

Canola

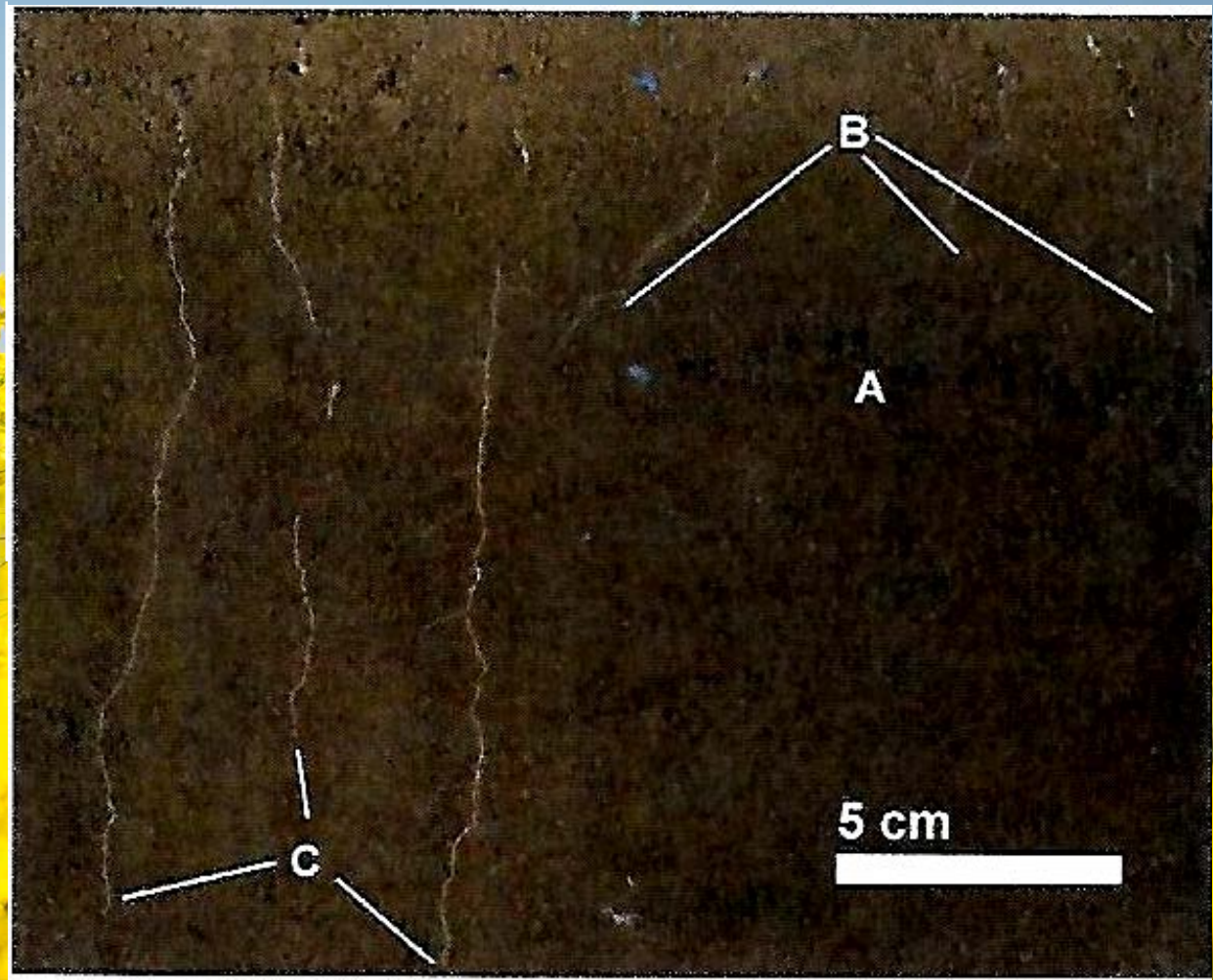
1DAP



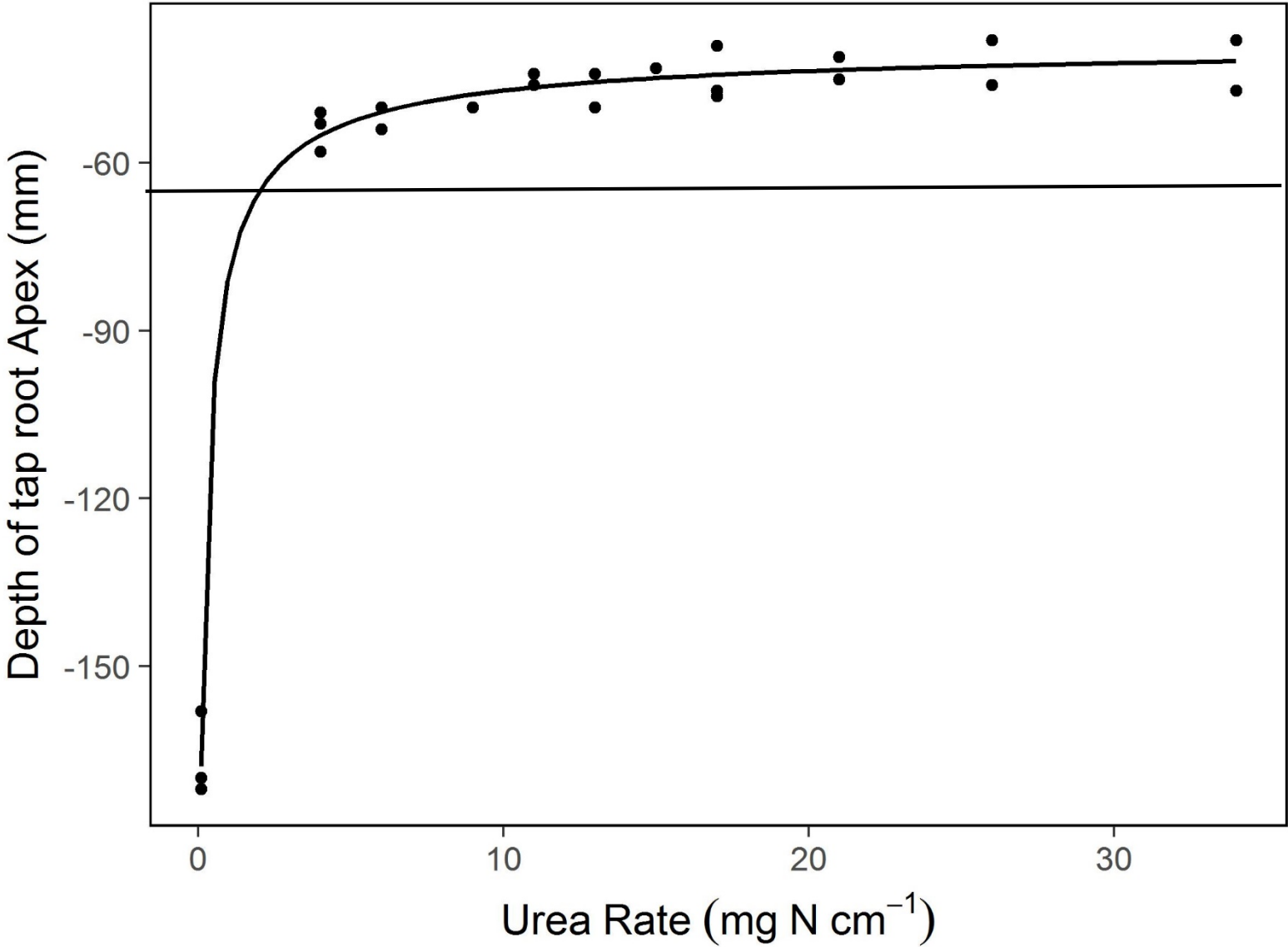
4DAP



5DAP



Root Depth Response To Increased Urea



My Research Objective

Urea

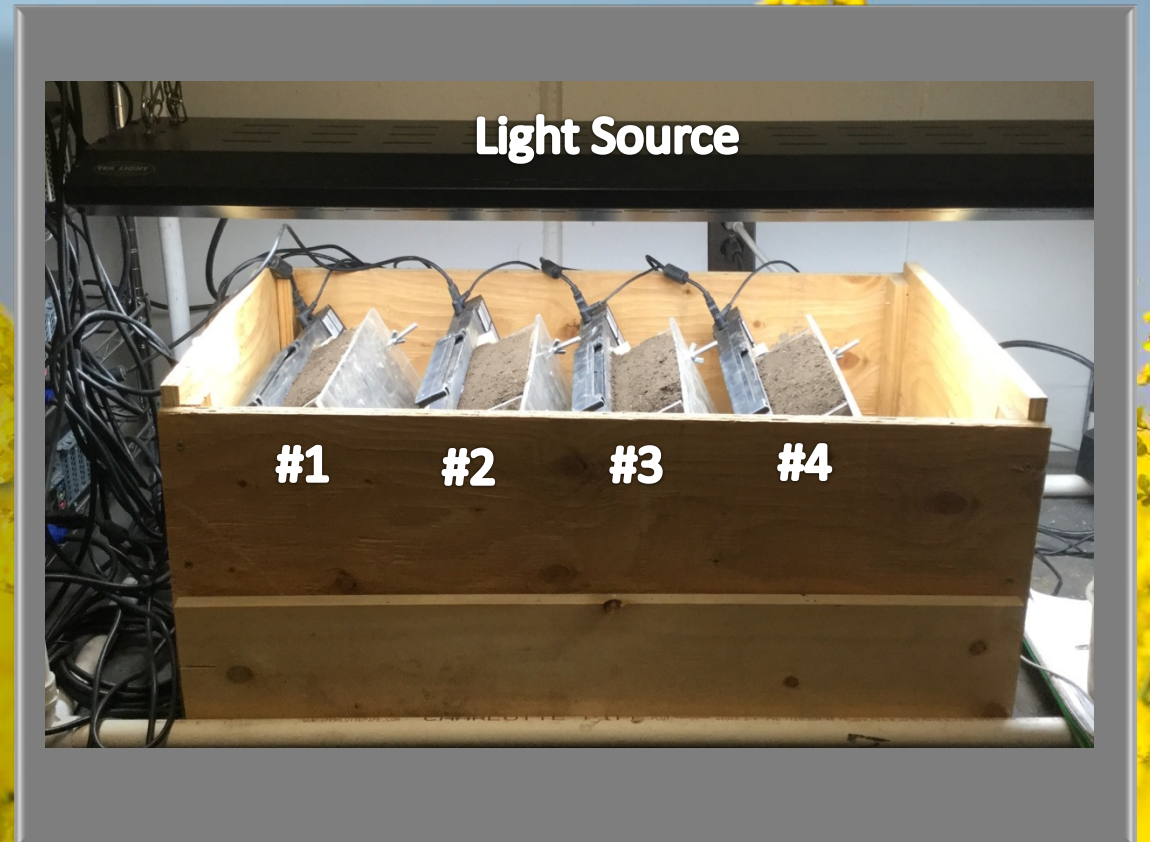
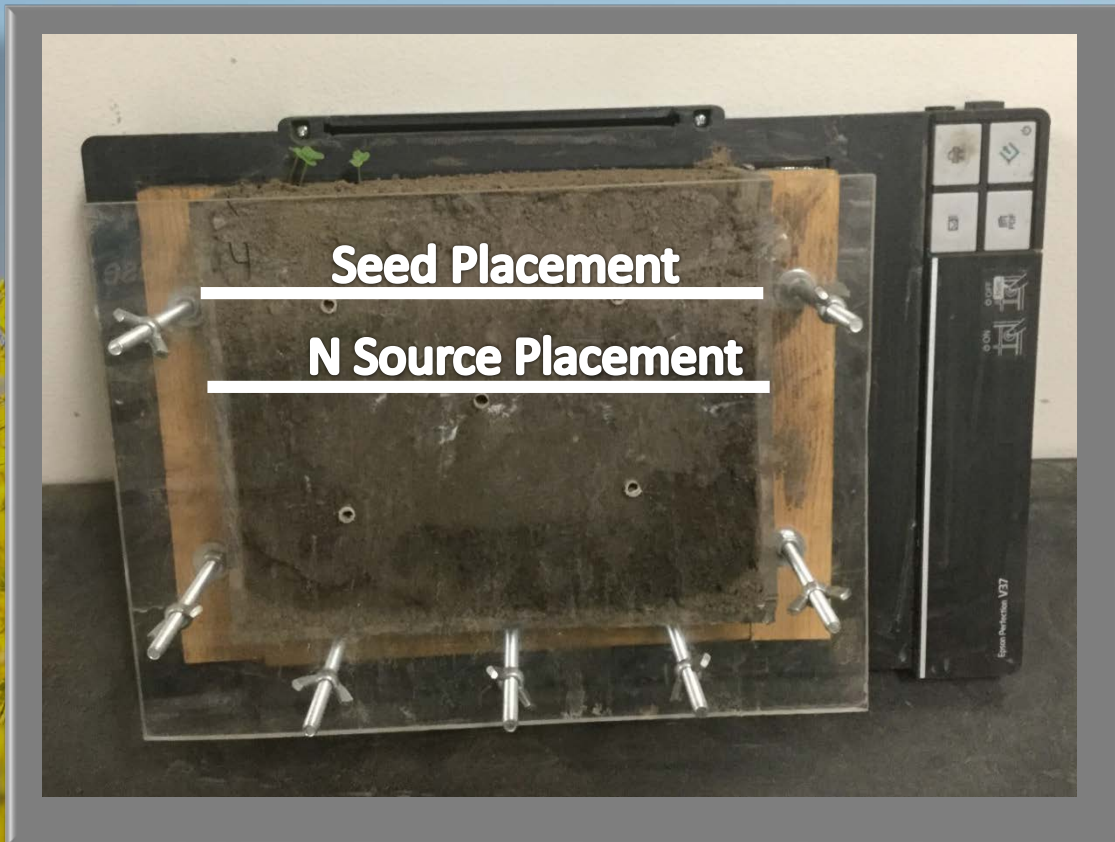
Ammonium
Sulfate

Urea
Ammonium
Nitrate

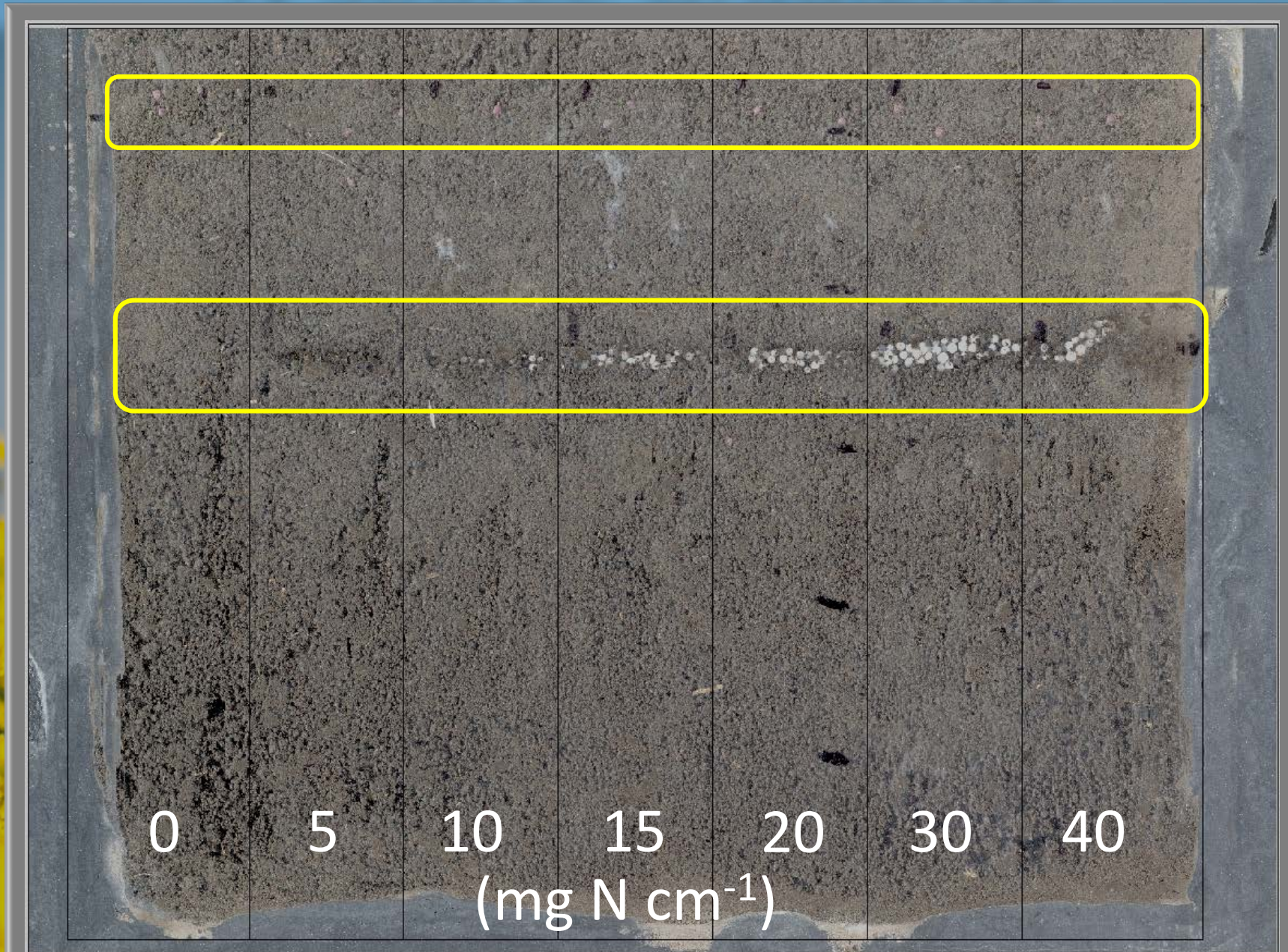
Ammonium
Polyphosphate
11-37-0

Methods

Experiment Setup



N Source Gradients



Results



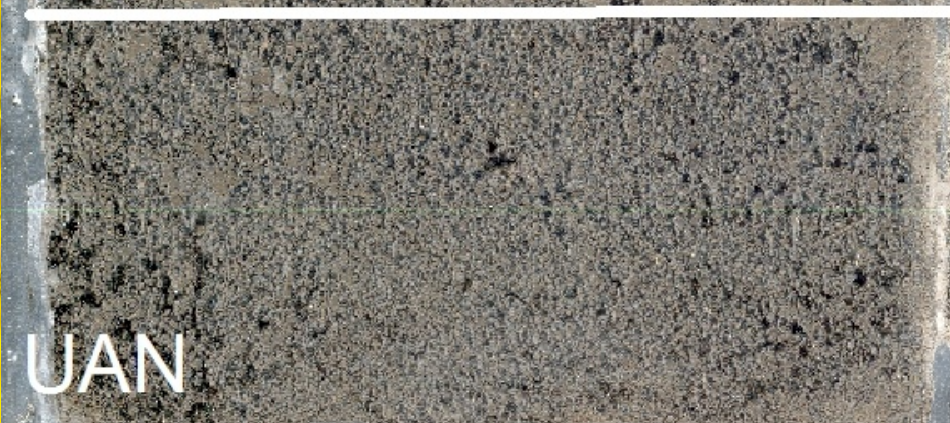
2
DAP



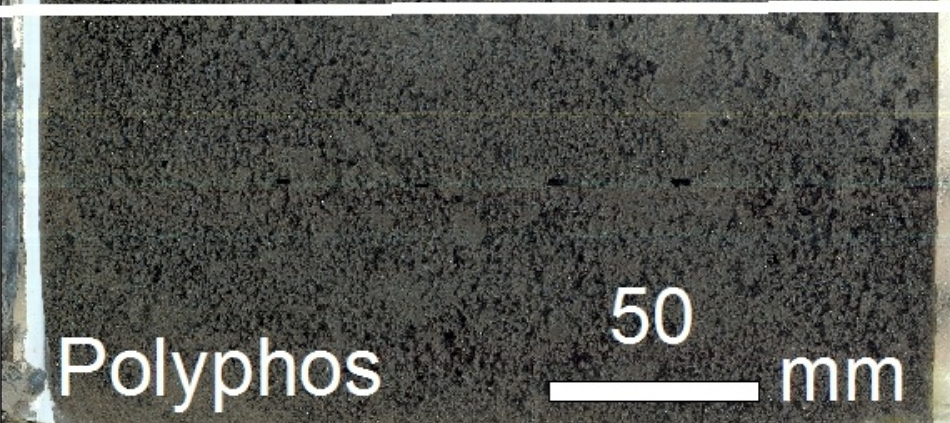
Urea



AS



UAN

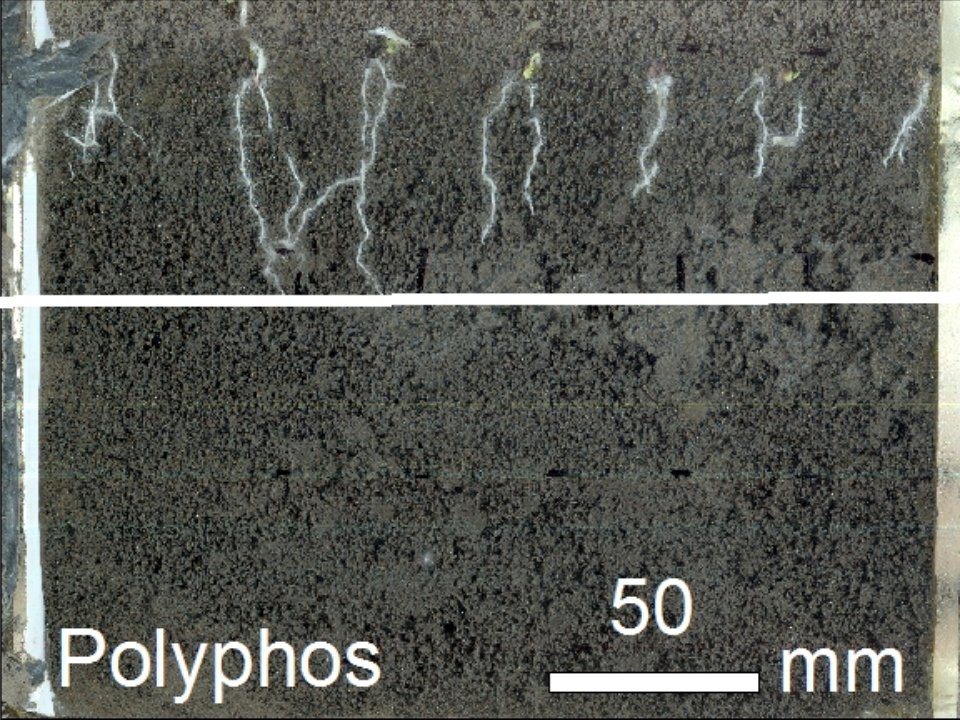
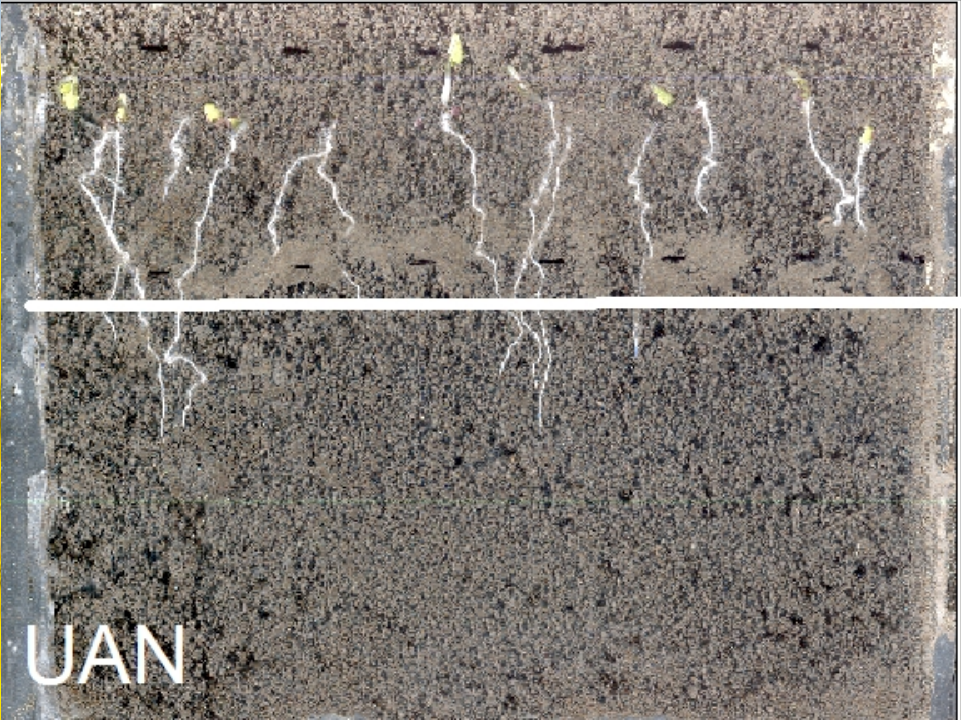
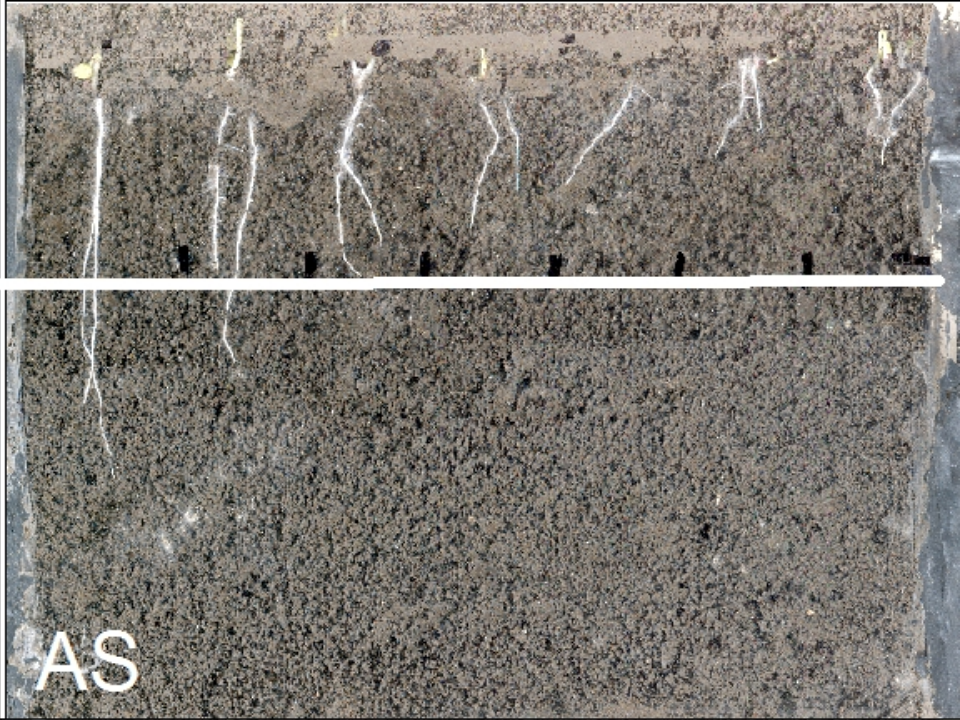
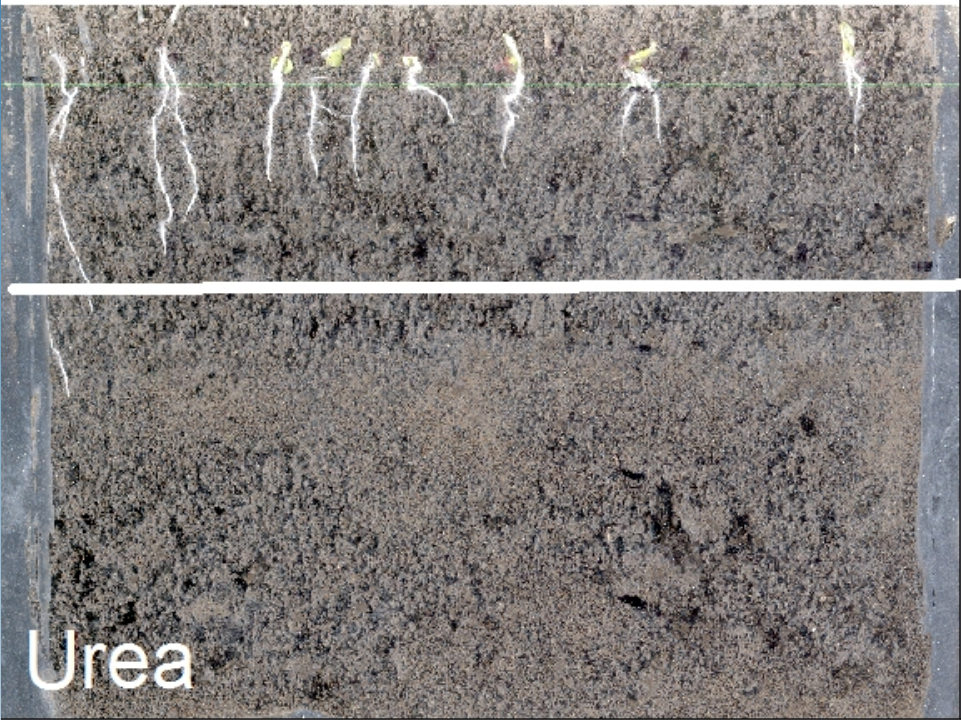


Polyphos

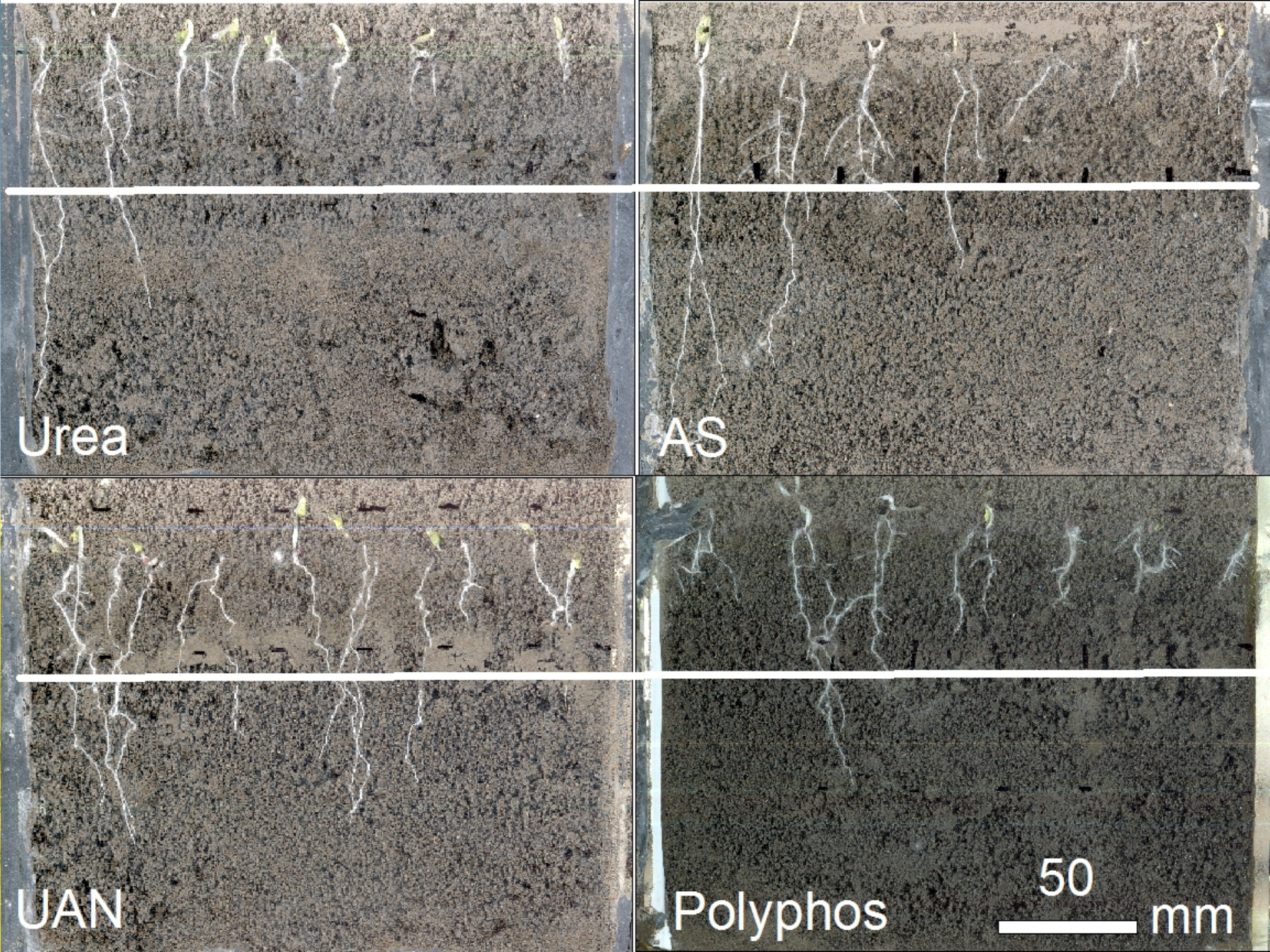
50

mm

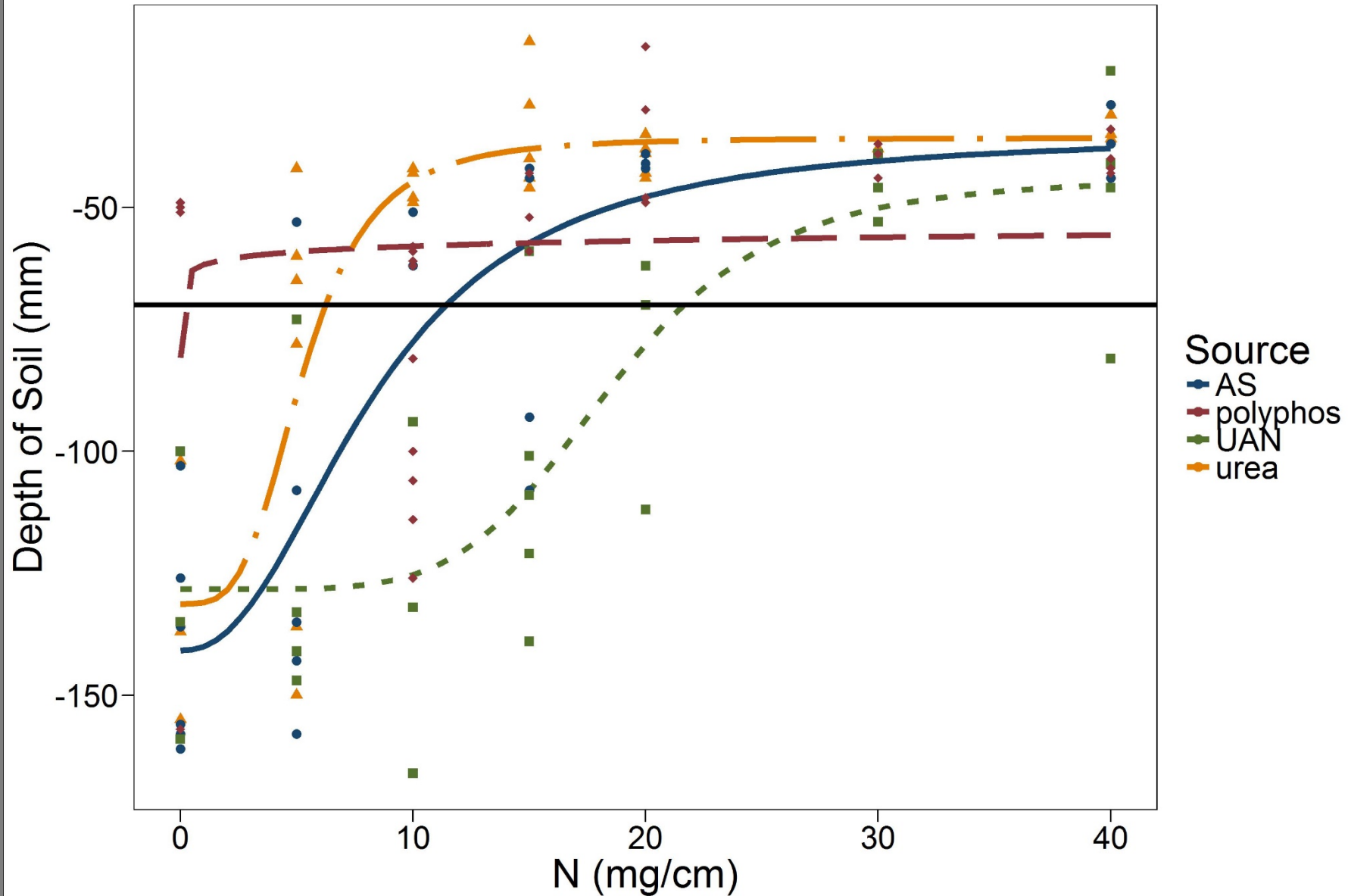
4
DAP



6
DAP



Dose Response



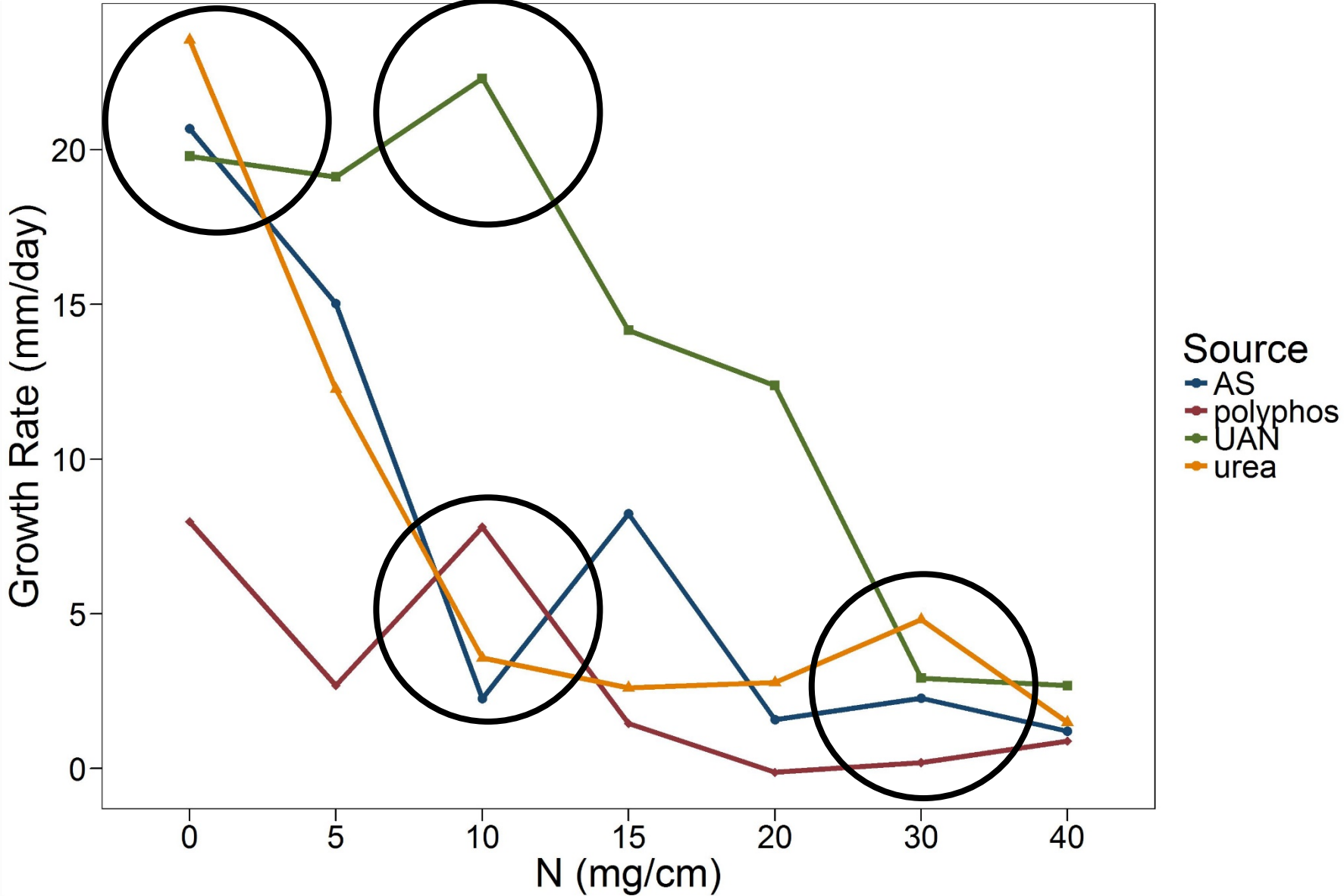
Effective Dose Response

- Percentile = % Root Depth Reduction
- ED = Effective Dose Rate to reach (X)% root depth reduction

Source	Percentile	ED (mg N cm ⁻¹)	Std..Error
Urea	50	5.3	0.8
AS	50	8.4	2.7
UAN	50	18.6	2.7
polyphos (11-37-0)	50	0.1	7.0

Source	Percentile	ED (mg N cm ⁻¹)	Std..Error
Urea	90	9.8	4.6
AS	90	22.0	16.3
UAN	90	28.1	9.4
polyphos (11-37-0)	90	#####	#####

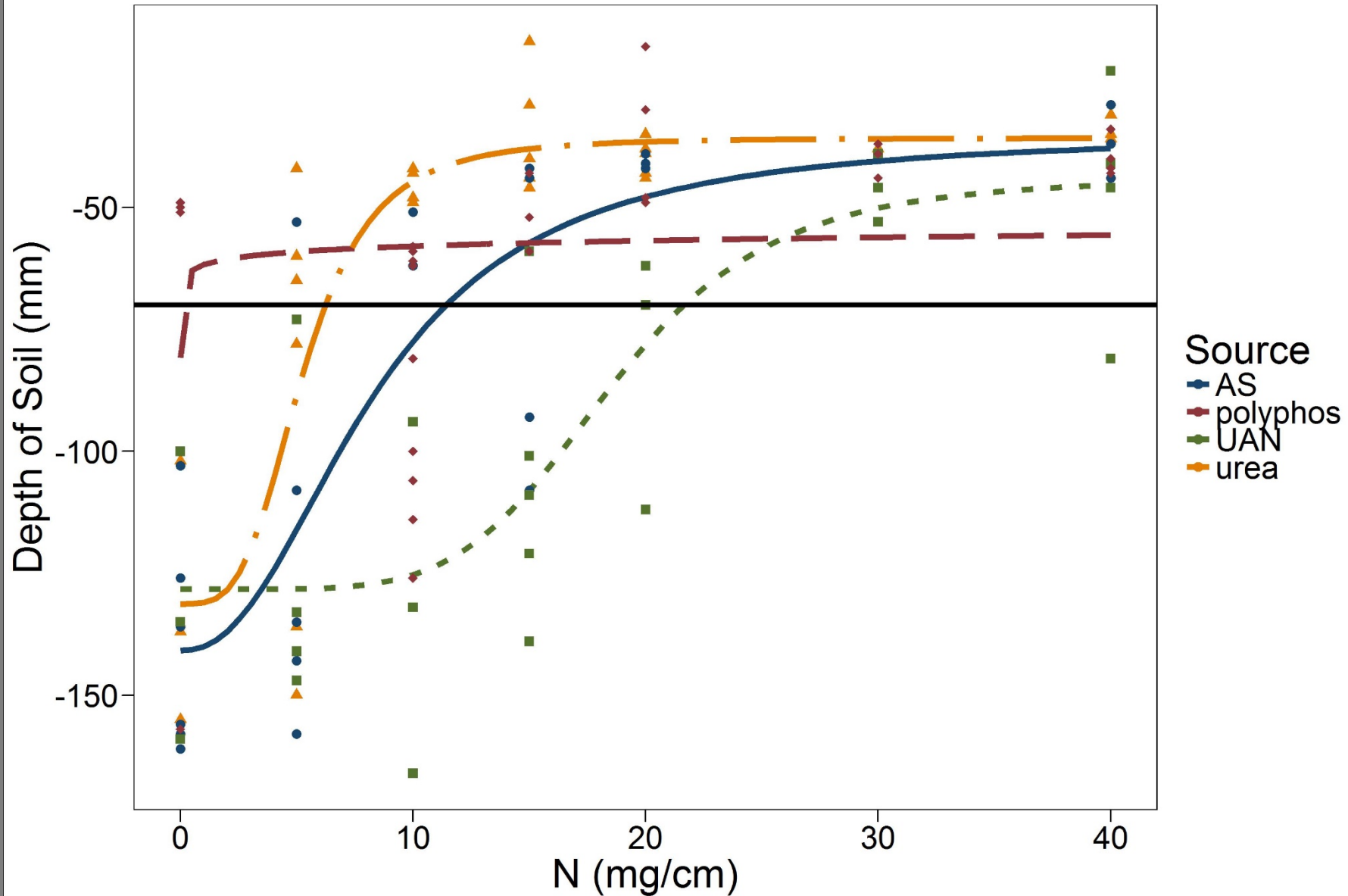
Growth Rate



Discussion

- Was there a difference in ammonium/ammonia toxicity threshold for the various sources
- Which source exhibited the highest toxicity levels
- Which source Exhibited the lowest toxicity levels
- What caused the differences in toxicity levels
- Future Research

Dose Response



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Chemical Composition

Urea
 $\text{CO}(\text{NH}_2)_2$
46-00-00

Urea Ammonium Nitrate
 $\text{AN}(\text{NH}_4\text{NO}_3)$
32-00-00

Ammonium Sulfate
 $(\text{NH}_4)_2\text{SO}_4$
21-00-00

Ammonium Polyphosphate
 $(\text{NH}_4\text{PO}_3)_n$
11-37-0

Discussion

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Conclusion



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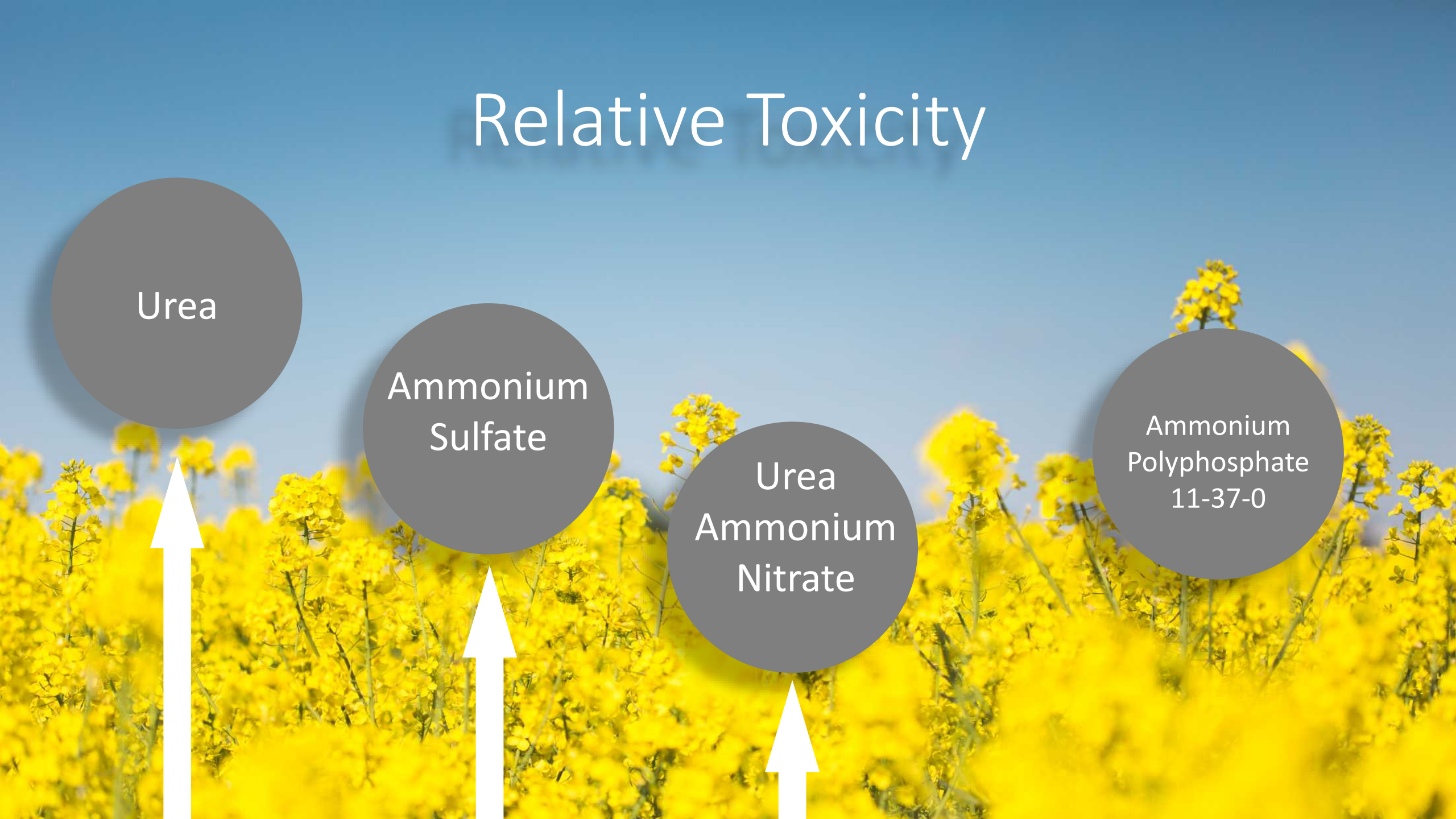
Relative Toxicity

Urea

Ammonium
Sulfate

Urea
Ammonium
Nitrate

Ammonium
Polyphosphate
11-37-0



Right Source

=

Urea
Ammonium
Nitrate

Right Rate

=

(10-15mg N cm⁻¹)

Questions

