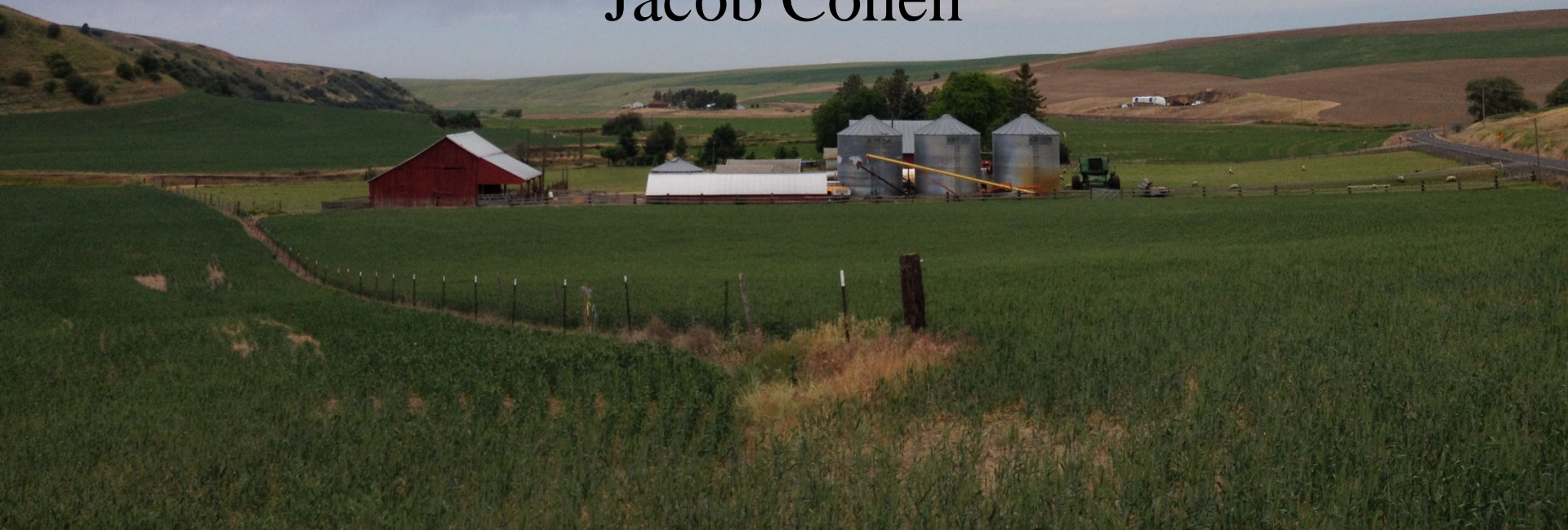


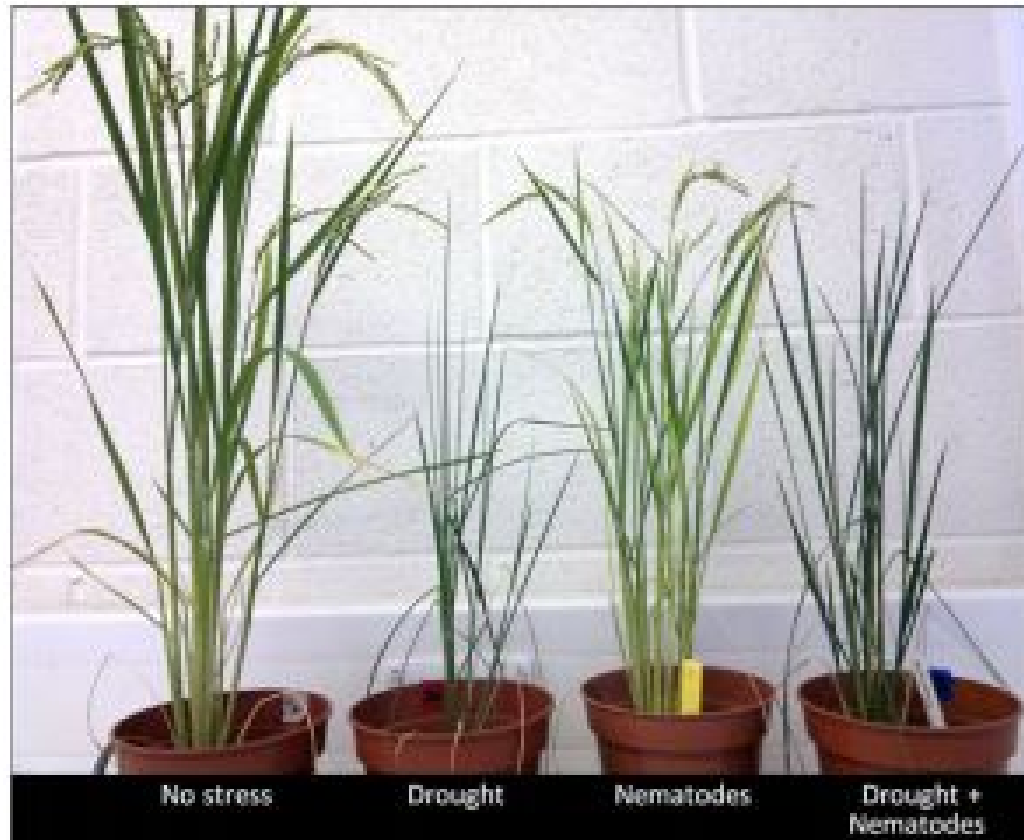
# Exploring the ecological interactions of plants, viruses, insects, and the environment

Jacob Cohen



# Background

- Plant responses to abiotic and biotic stresses
  - N.J. Atkinson and P.E. Urwin



# Background

- Herbivory (above and below ground)
  - F.L. Wackers and T.M. Bezemer
  - P. Anderson, M.M. Sadek, and F.L. Wackers
  - M. Wang, A. Biere, W.H. Van der Putten and T.M. Bezemer



*Gossypium  
herbaceum*



*Agriotes lineatus*



*Spodoptera exigua*



*Plantago  
lanceolata*

# Background

- Virus – herbivore interactions
  - M.F. Kersch-Becker and J.S. Thaler

Potato Virus Y



*Leptinotarsa decemlineata*

*Trichoplusia ni*



*Macrosiphum euphorbiae*

# Background

- Climate Change
  - J.S. Bale, et al.
  - A.E. Huberty, and R.E. Denno
  - W.J. Mattson and R.A. Haack



# Research Questions

- Can a virus encourage non-vector herbivores to feed more? Do aphids without virus have an effect?
- How do herbivores affect plant-virus interactions in different climatic conditions?

# The Ecological System

- Pea (*Pisum sativum*), Pea aphid (*Acyrtosiphon pisum*), Pea Leaf Weevil (*Sitona lineatus*), and Pea Enation Mosaic Virus (PEMV)



# Methodology

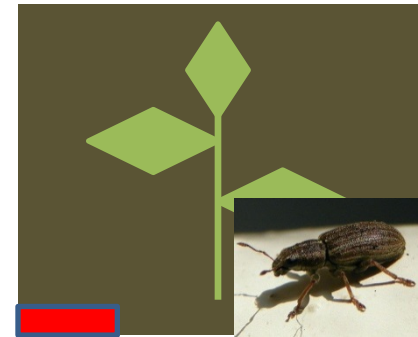
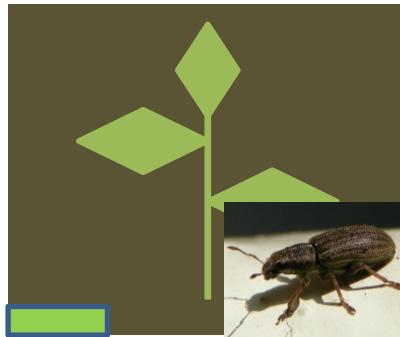
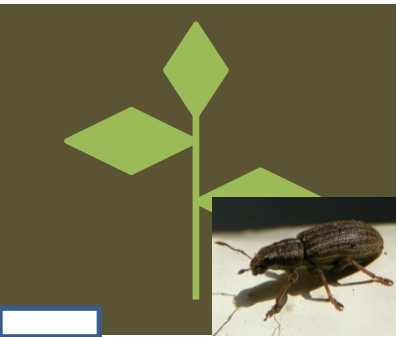




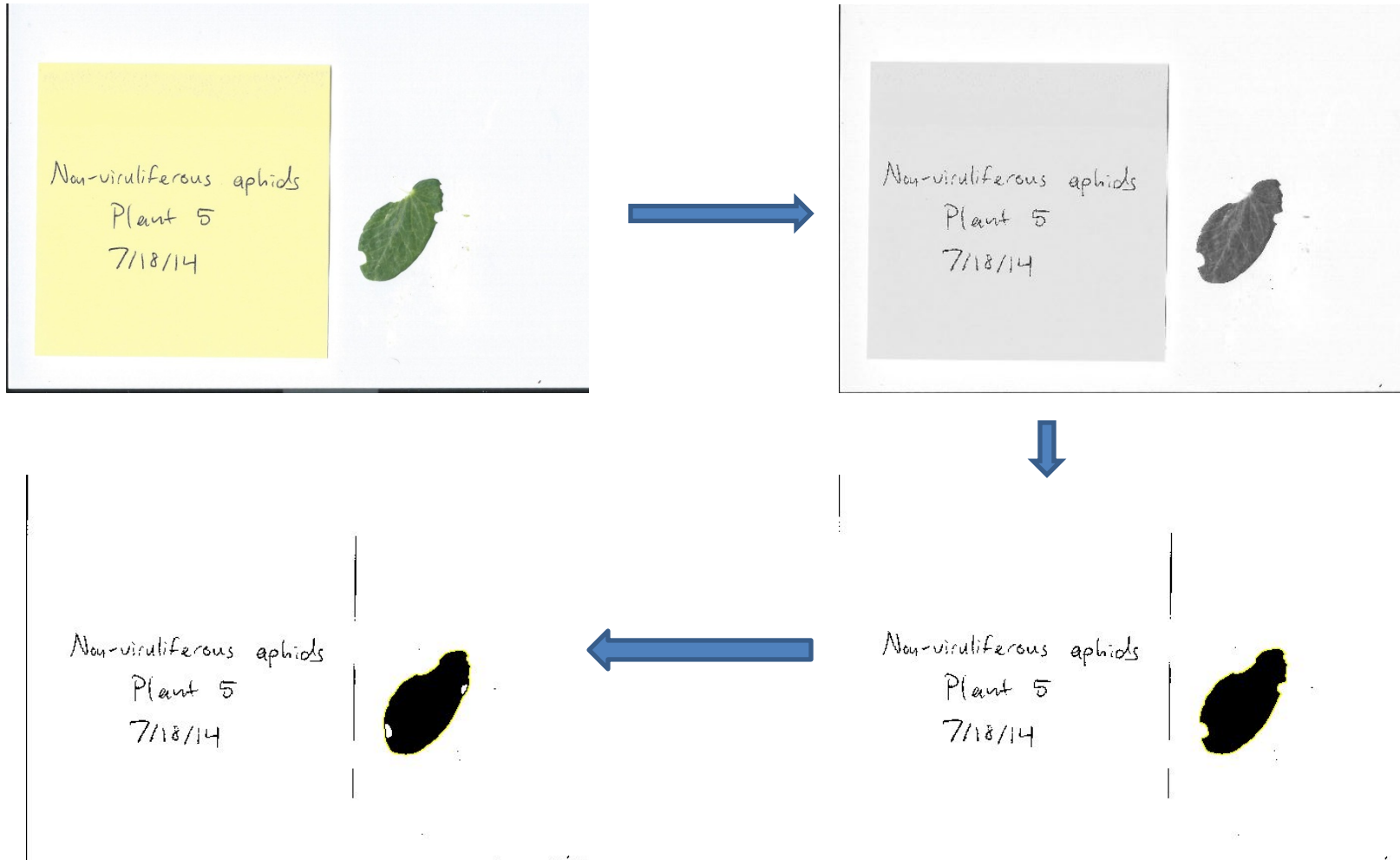
# Methodology



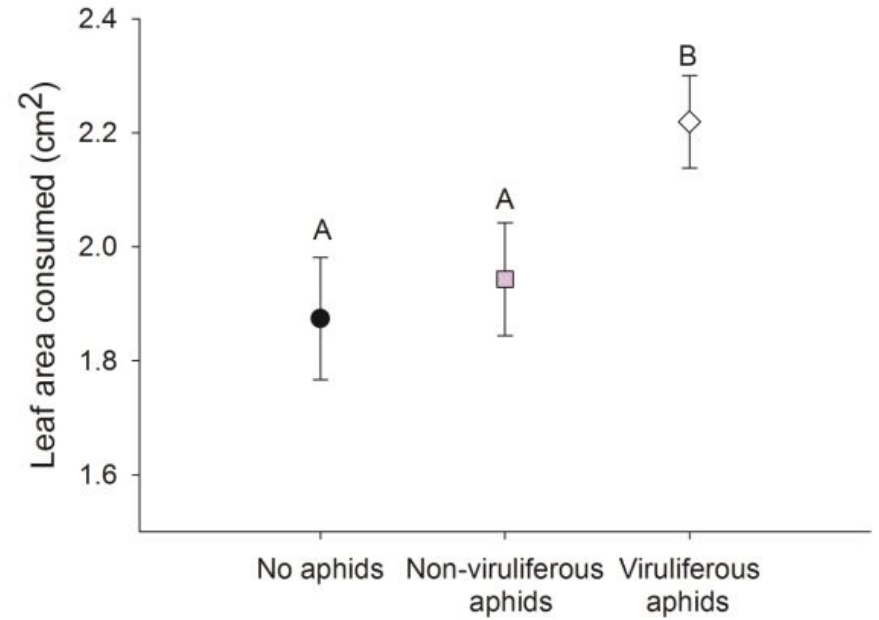
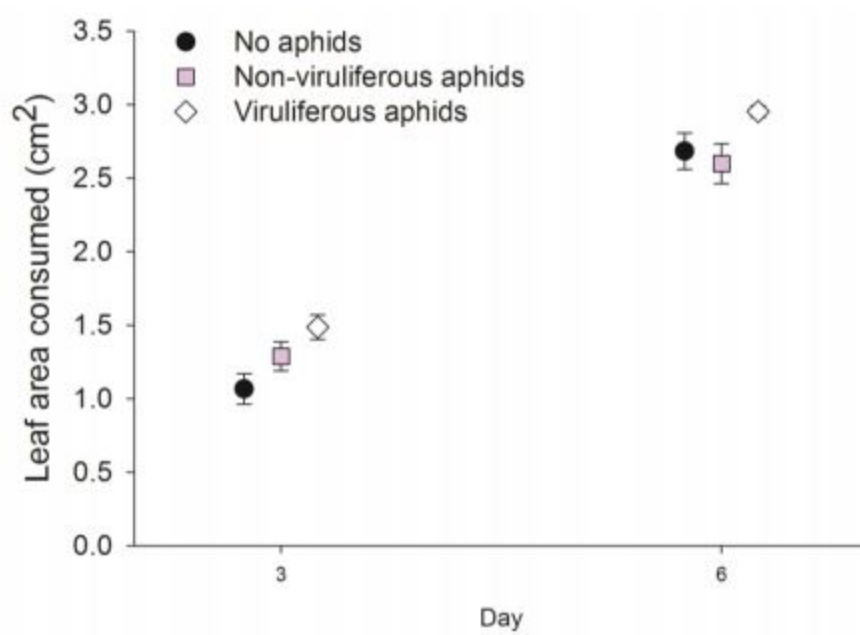
# Methodology



# Data Analysis



# Results



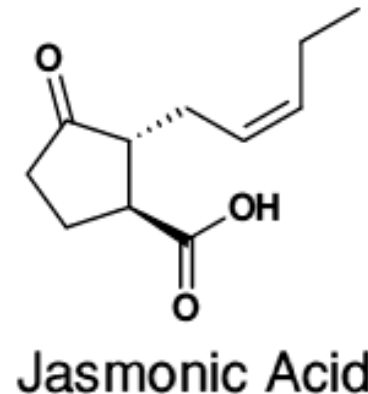
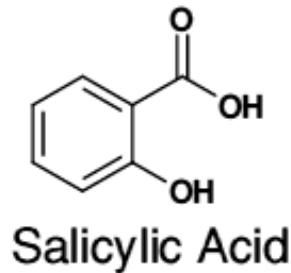
# Conclusions

- PEMV is spatially and temporally variable
- Growers must understand the dangers of PEMV



# Analysis

- M.F. Kersch-Becker and J.S. Thaler ran a similar experiment with tomato plants and Potato Virus Y
- Virus and chewing herbivores are understood to activate different plant pathways that act antagonistically (J.S. Thaler, P.T. Humphrey, and N.K. Whiteman; J.S. Thaler, A.A. Agrawal, and R. Halitschke)



# Research Questions

- Can a virus encourage non-vector herbivores to feed more? Do aphids without virus have an effect?
- How do herbivores affect plant-virus interactions in different climatic conditions?

# The Ecological System

- Wheat (Louise variety, *Triticum aestivum* L.), Wireworms (*Limonius californicus*), Bird Cherry-Oat Aphids (*Rhopalosiphum padi*), and Barley Yellow Dwarf Virus (BYDV)





# Background: Wireworms



# Methodology: Wheat Experiment



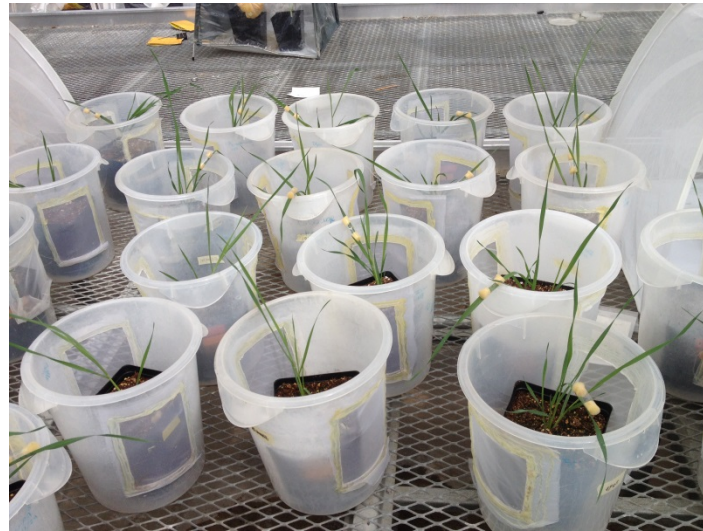
# Methodology: Wheat Experiment



# Methodology: Wheat Experiment



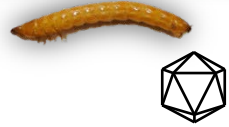
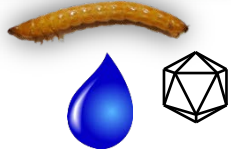
# Methodology: Wheat Experiment



# Methodology: Wheat Experiment



# Methodology: Wheat Experiment

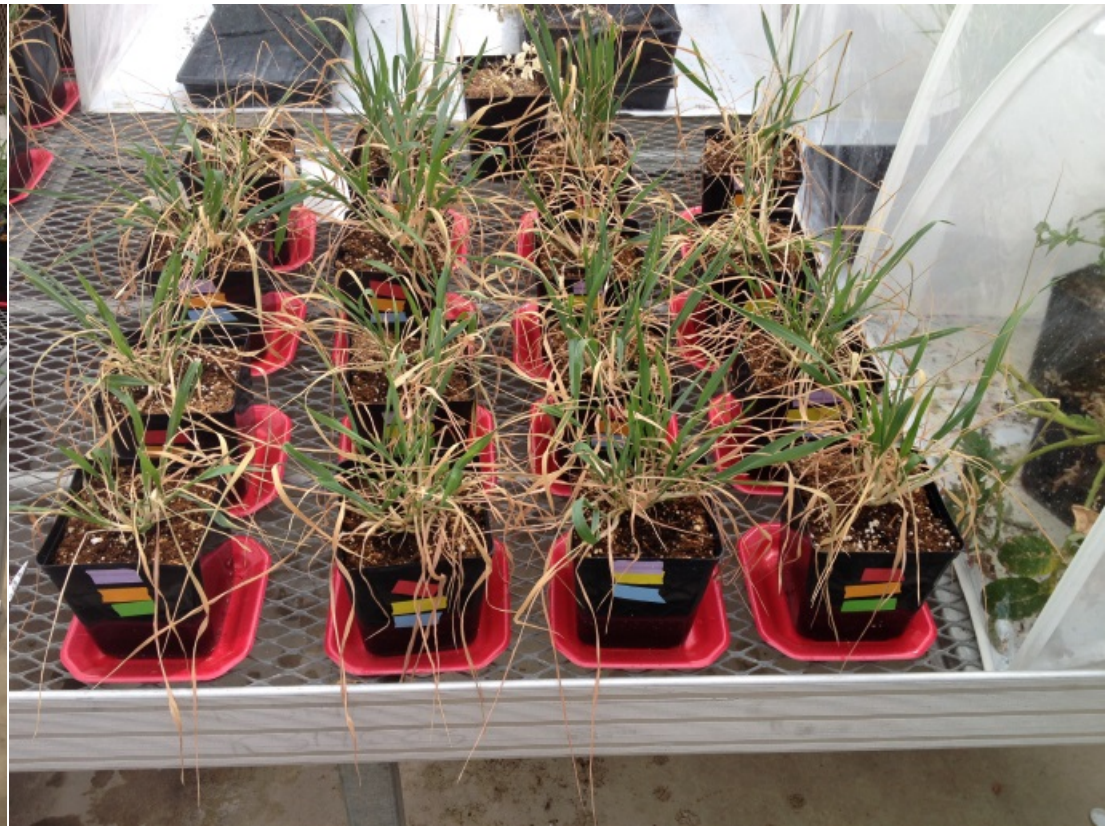


# Data Collection: Wheat Experiment

- Yield
- Plant dry mass
- Root mass
- Virus infection



# Preliminary Results: Wheat Experiment



# Preliminary Results: Wheat Experiment



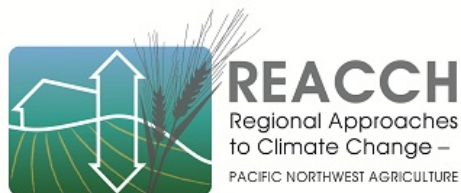
# Future Research

- How wireworms affect aphids in different climatic conditions.
- Use an above ground herbivore on wheat.
- Vary watering regimes to better mimic drought conditions.



# Acknowledgements

- My wonderful lab at WSU: Dave Crowder, Ivan Milosavljevic, Paul Chisholm, Elinor Lichtenberg, Eli Bloom, Liz D'Auria, Isabel Brofsky, and Laura Pearson
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- Nilsa Bosque-Pérez, UI
- Seth Davis, UI
- Lana Unger, UI



# Questions?



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- Some images taken from Google images