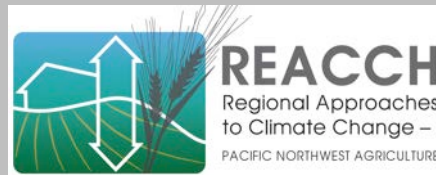


Aphid Community Diversity Across the REACCH Region

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REACCH summer intern 2012
Final Presentation

Advisor: Dr. Sanford Eigenbrode



University of Idaho

Aphids

- Insects found in temperate environments worldwide
- Crop pests
 - Direct - due to phloem feeding
 - Indirect - as vectors of viruses

Importance of Understanding Aphid Communities

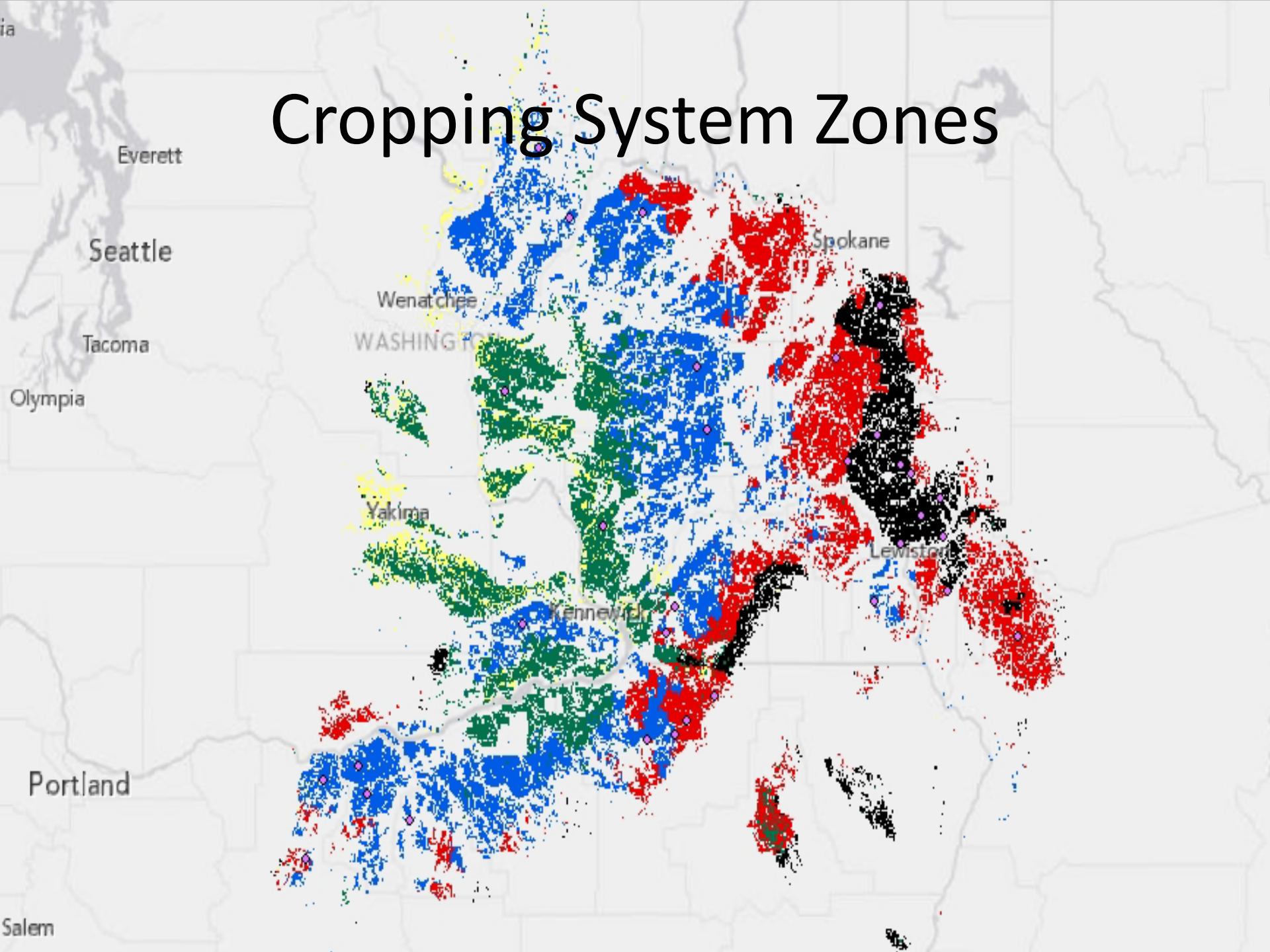
- Aphids are easily affected by changes in temperature and precipitation and as such are useful to research when looking at the ecological impacts of climate change (Clement et al., 2010)
- Documenting current communities provides a foundation for climate based projections of changing aphid pressure
- Better understanding of community structure
- Helps to anticipate the threats to crops and therefore the possible economic impacts

Hypothesis

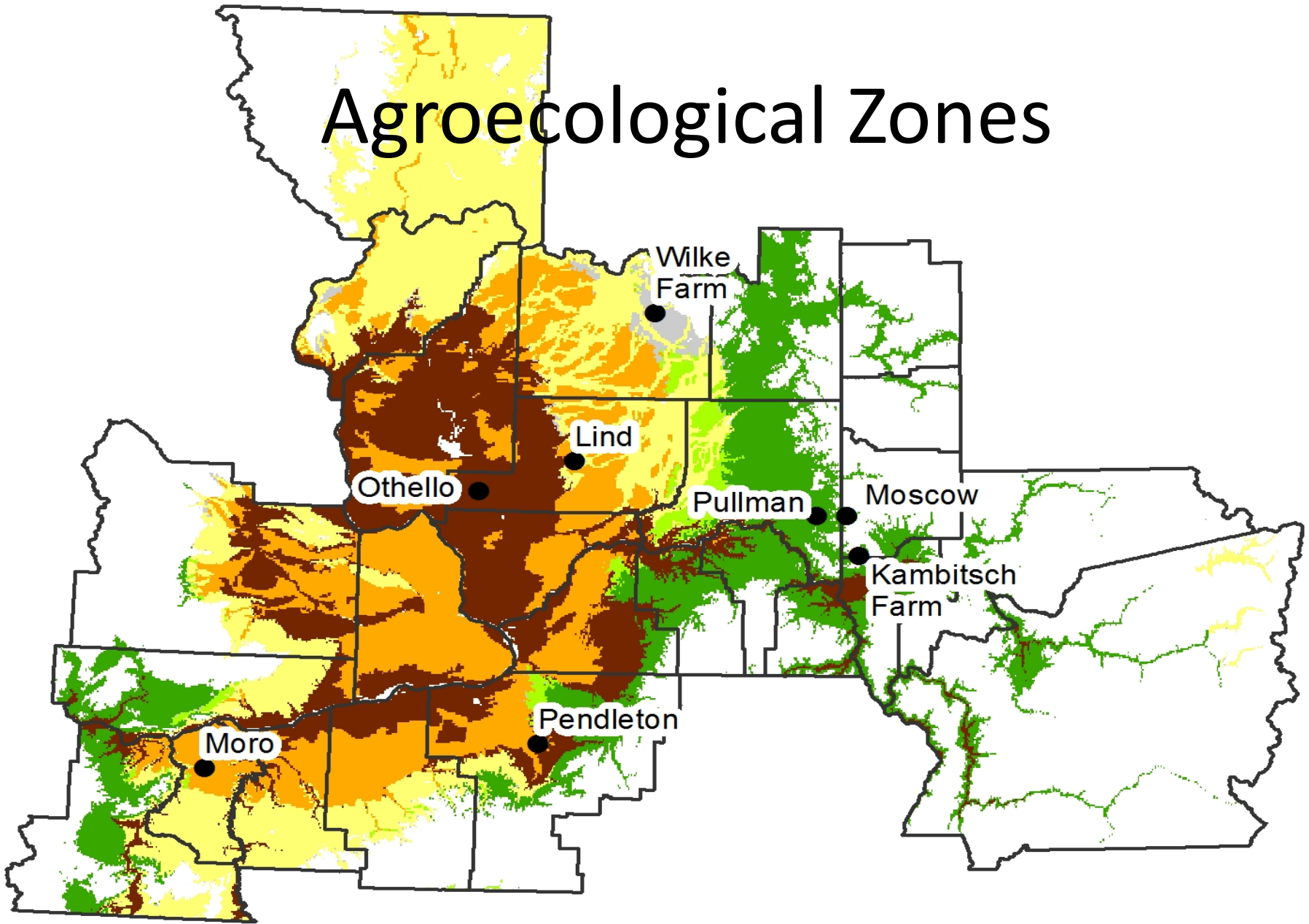
Aphid community structure differs among production zones within the REACCH region. Three systems for defining zones are directly or indirectly determined by climate,

- Cropping System Zones
- Agroecological Zones
- Douglas Zones

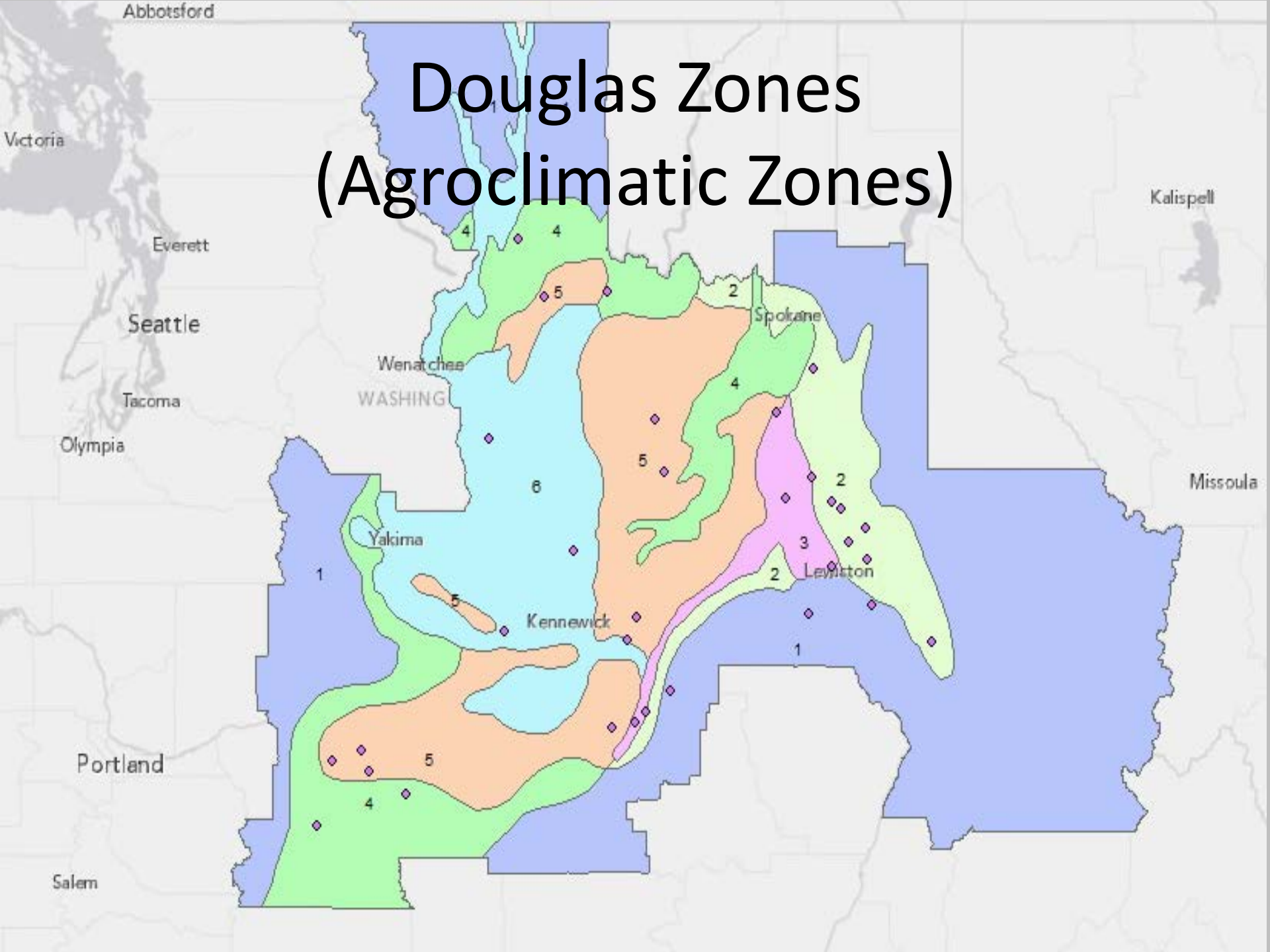
Cropping System Zones



Agroecological Zones



Douglas Zones (Agroclimatic Zones)



Zones

Cropping System Zones:

- **Zone 1** : Annual Cropping
- **Zone 2** : Intermediate Cropping Area
- **Zone 3** : Grain/Fallow
- **Zone 4** : Irrigated
- **Zone 5** : Orchards

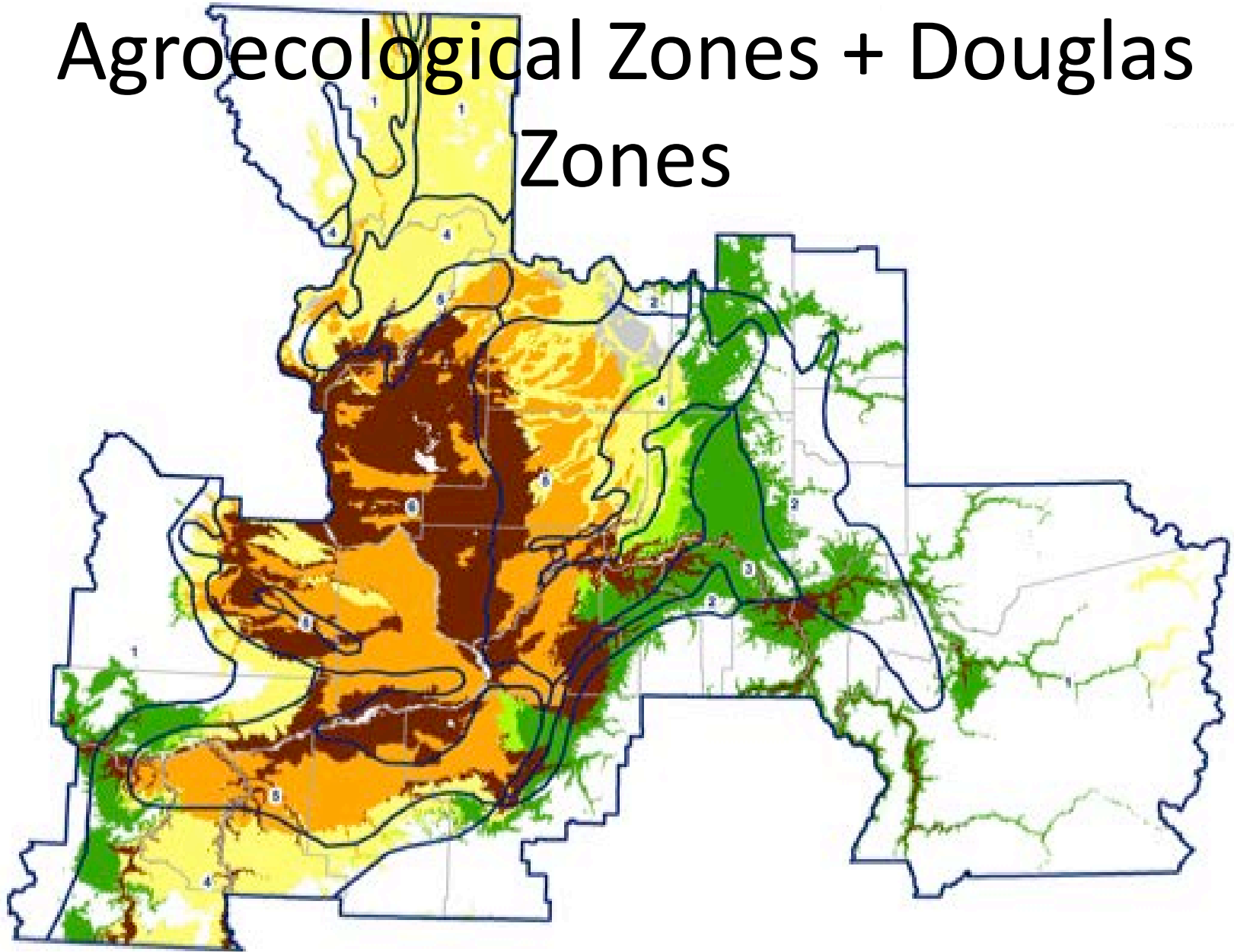
Agroecological Zones:

- **Zone 1** : Annual Dry Crop (Wet-Cold)
- **Zone 2** : Annual Crop (Wet-Cool)
- **Zone 3** : Annual Crop (Fallow-Transition)
- **Zone 4** : Annual Crop (Dry)
- **Zone 5** : Grain-Fallow
- **Zone 6** : Irrigation

Douglas Zones:

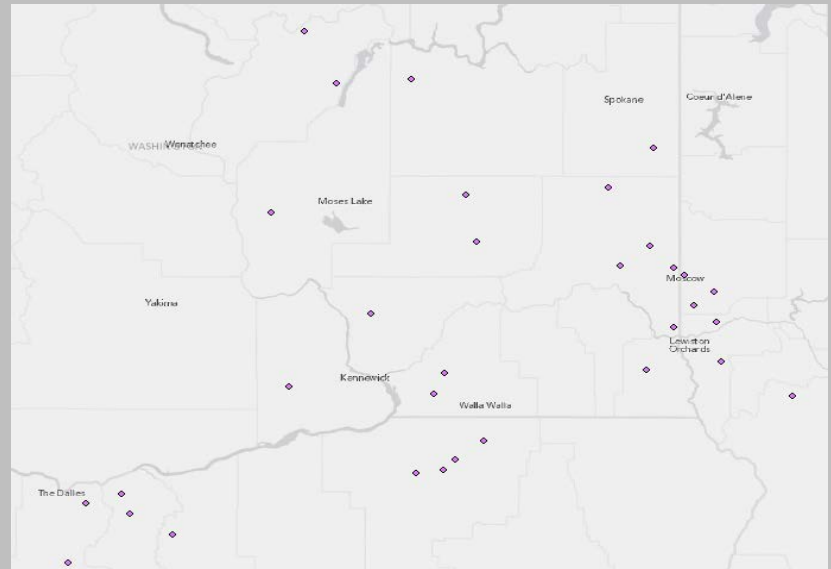
- **Zone 1** : Annual Crop (Wet-Cold)
- **Zone 2** : Annual Crop (Wet-Cool)
- **Zone 3** : Annual Crop (Fallow-Transition)
- **Zone 4** : Annual Crop (Dry)
- **Zone 5** : Grain-Fallow
- **Zone 6** : Irrigated

Agroecological Zones + Douglas Zones



Data Collection

- Sweep nets
 - 150 sweeps per plot
- 32 winter wheat sites on commercial farms or experimental sites
- Assumption:
sweep nets give a complete picture of the aphid community



Featured Species

R. padi



<http://bugguide.net/node/view/84884>

S. avenae



<http://bugguide.net/node/view/637140>

D. noxia



<http://www.cals.ncsu.edu/course/ent425/text18/exotics.html>

S. graminum



<http://www.aphidweb.com/Aphids%20of%20Karnataka/Schizaphisgraminum.htm>

A. middletonii



<http://eol.org/pages/588008/overview>

R. maidis



http://ipm.illinois.edu/fieldcrops/insects/corn_leaf_aphid/index.html

Characteristics of the Communities

➤ Species Richness

➤ Shannon-Wiener Index

$$H' = -\sum p_i^* (\ln^* p_i)$$

➤ Simpson's Diversity Index

➤ $1 - D$

$$D = \frac{\sum (n^* \{n-1\})}{N(N-1)}$$

➤ Total Species Abundance

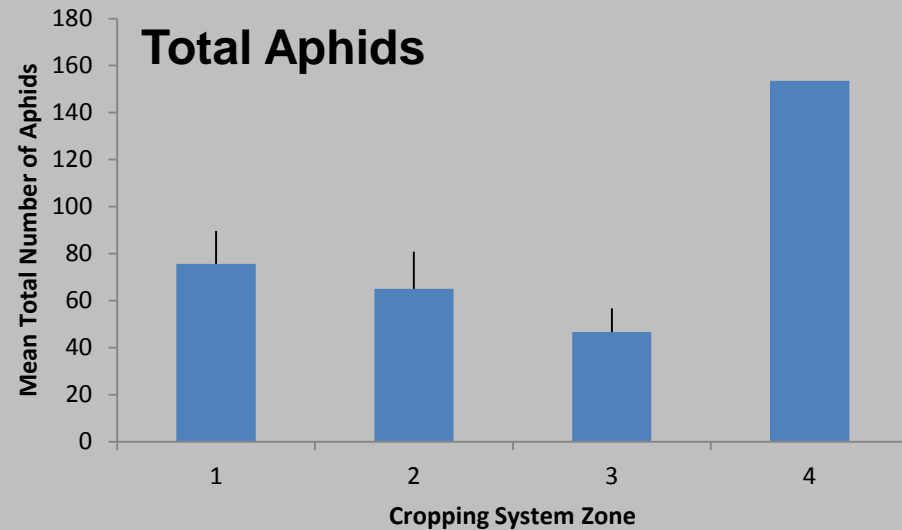
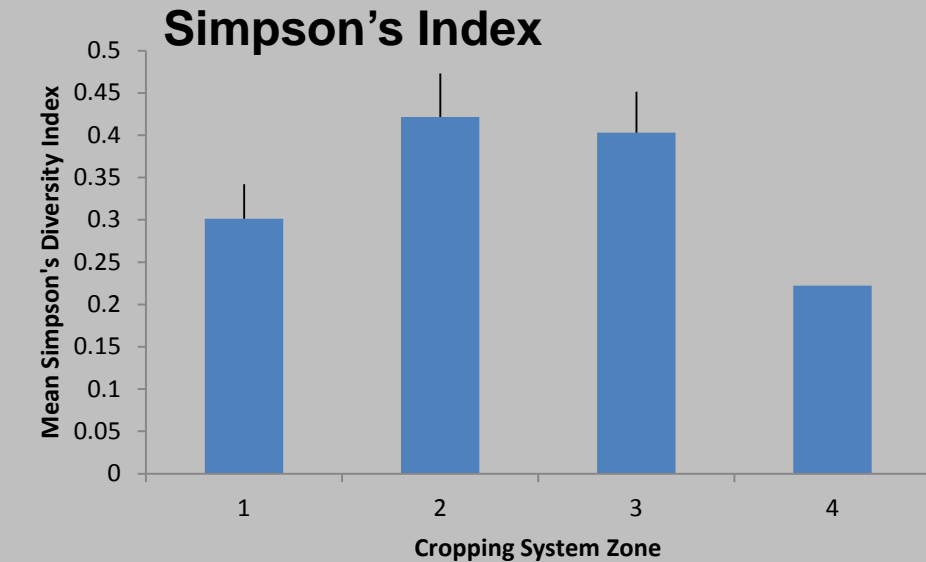
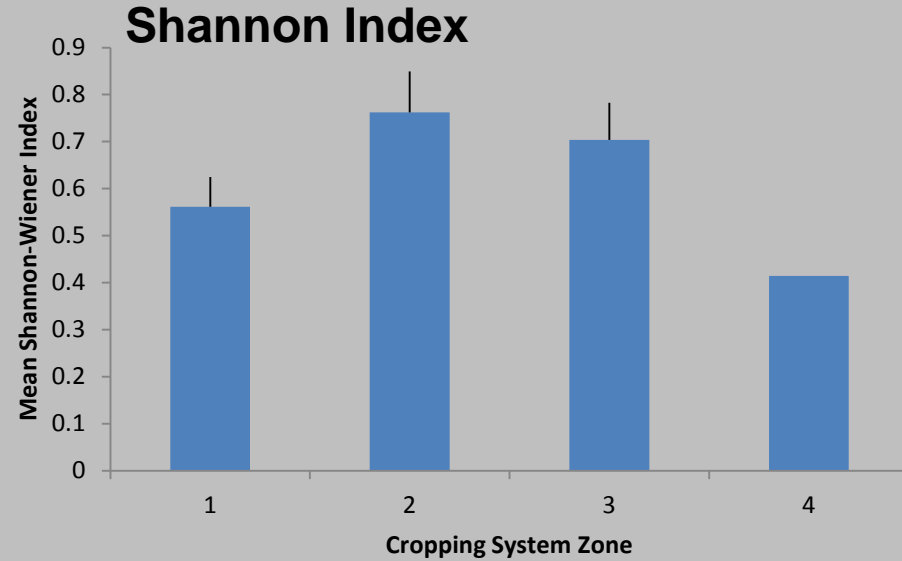
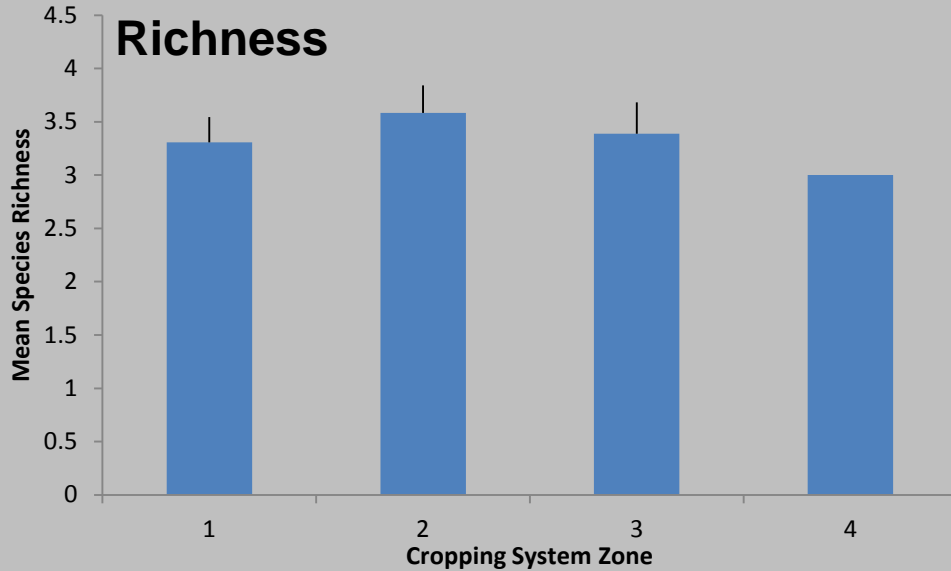
➤ Individual Species Abundance

➤ *R. padi*

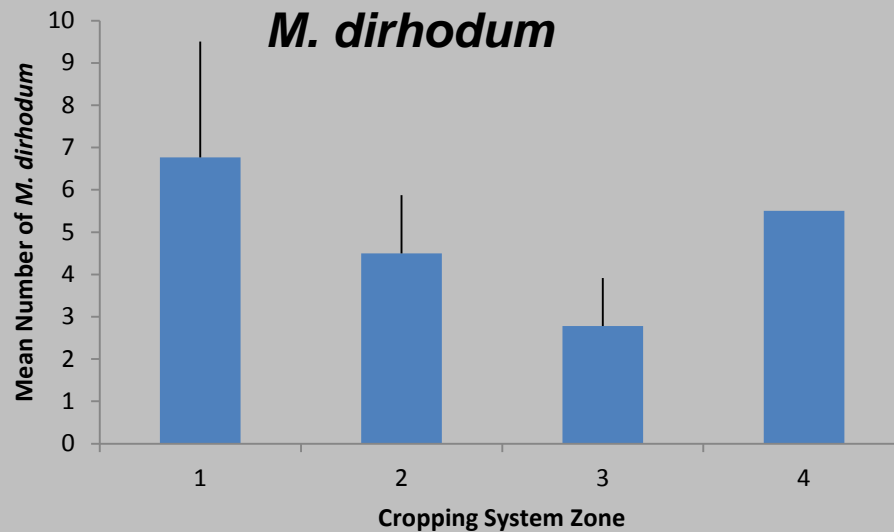
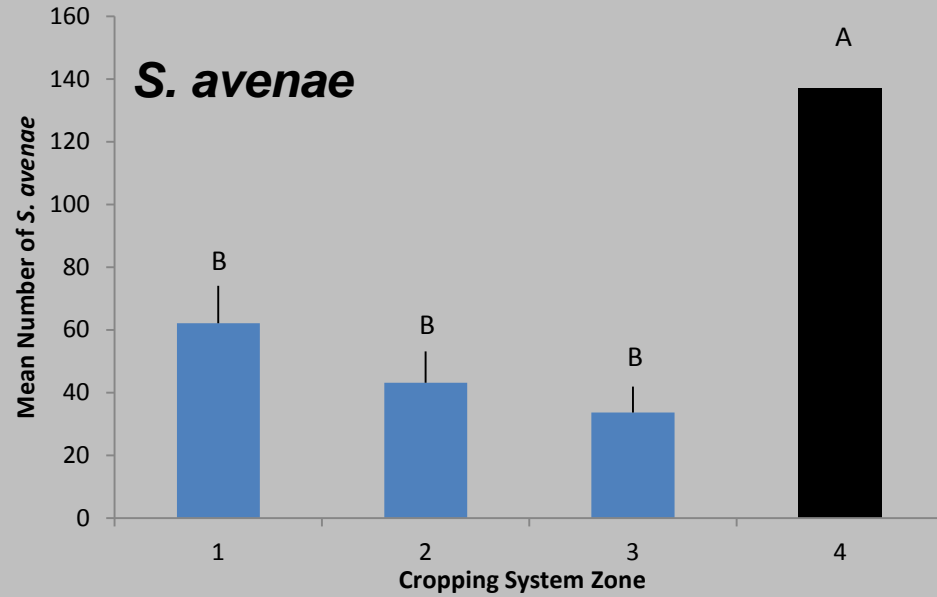
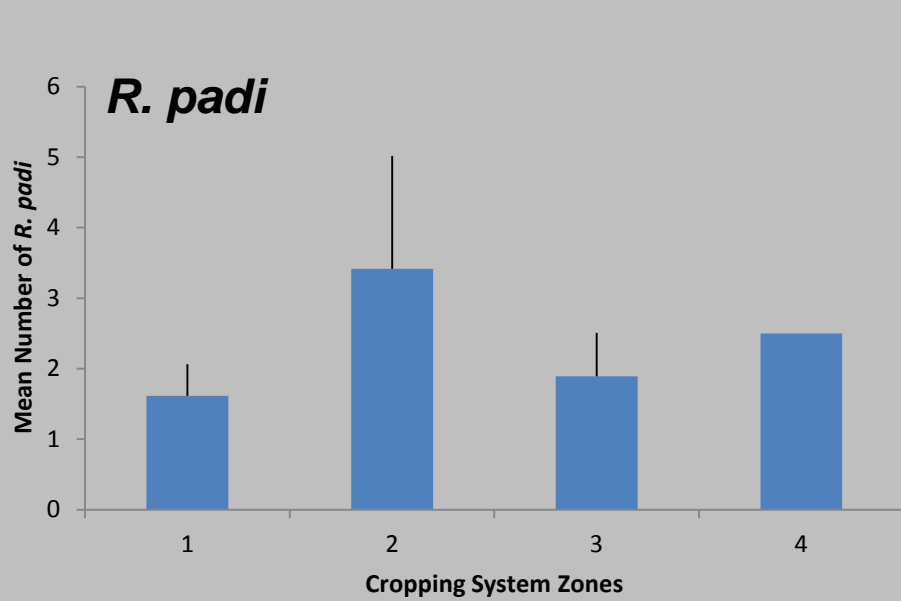
➤ *S. avenae*

➤ *M. dirhodum*

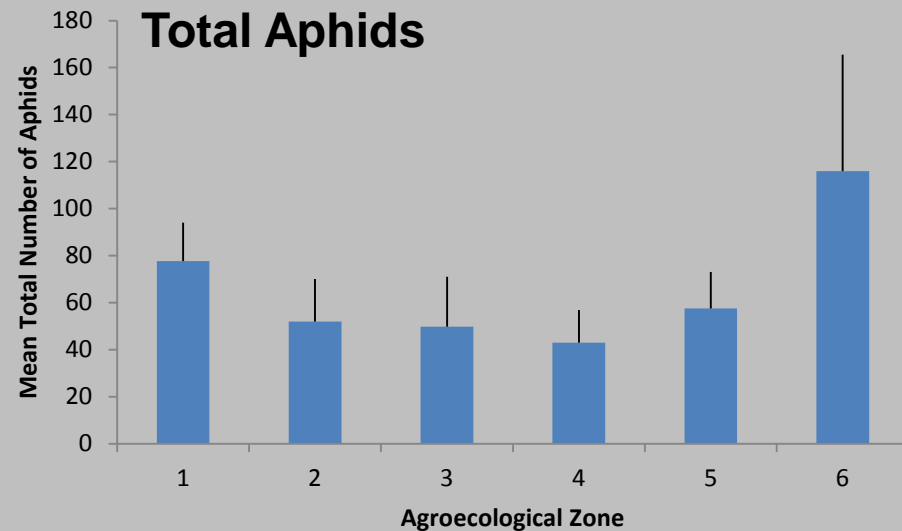
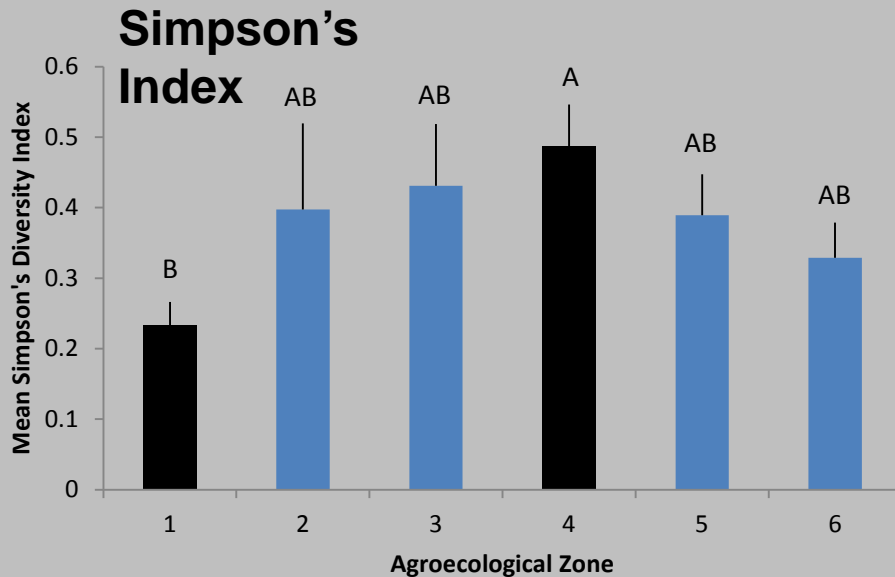
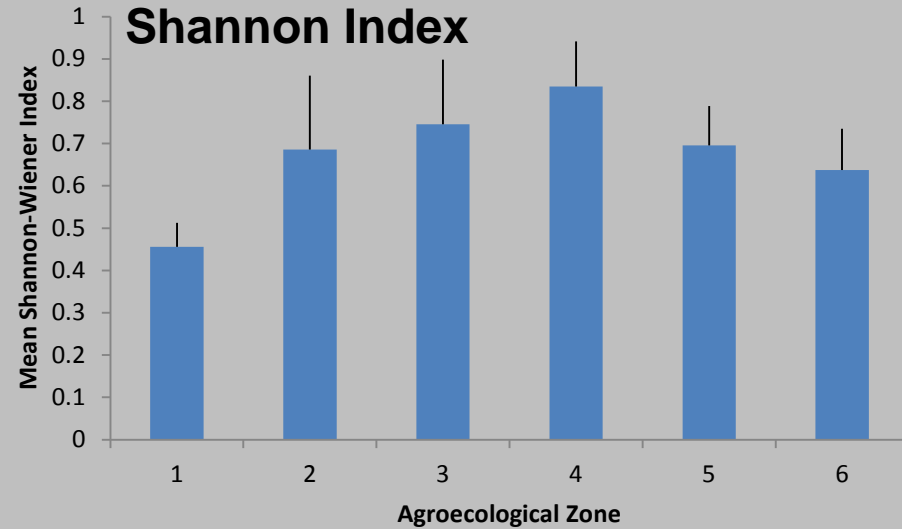
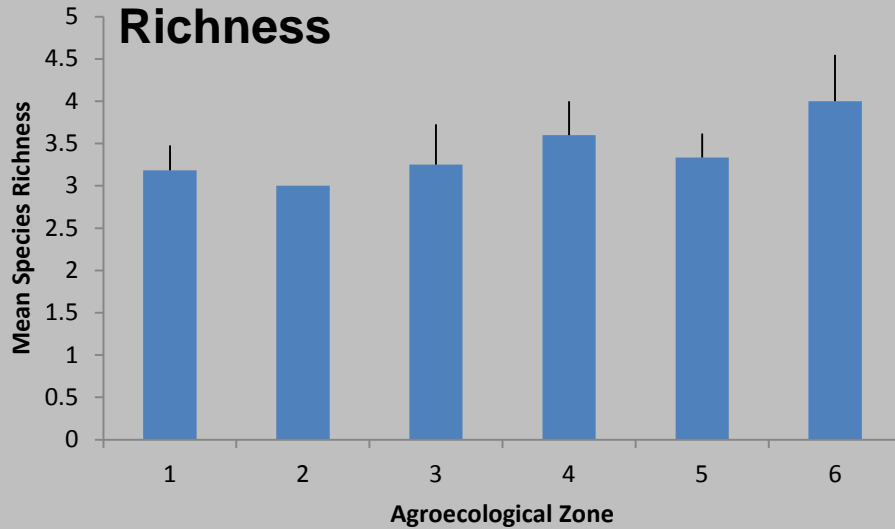
Cropping System Zones



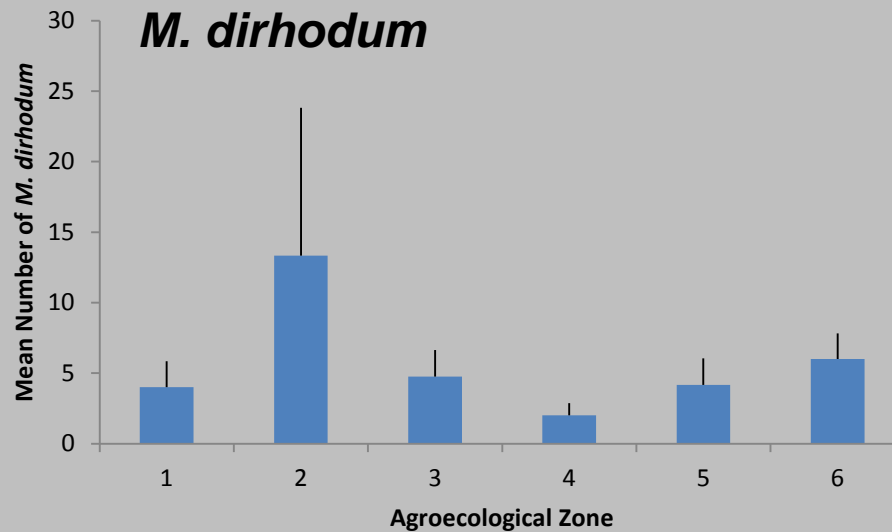
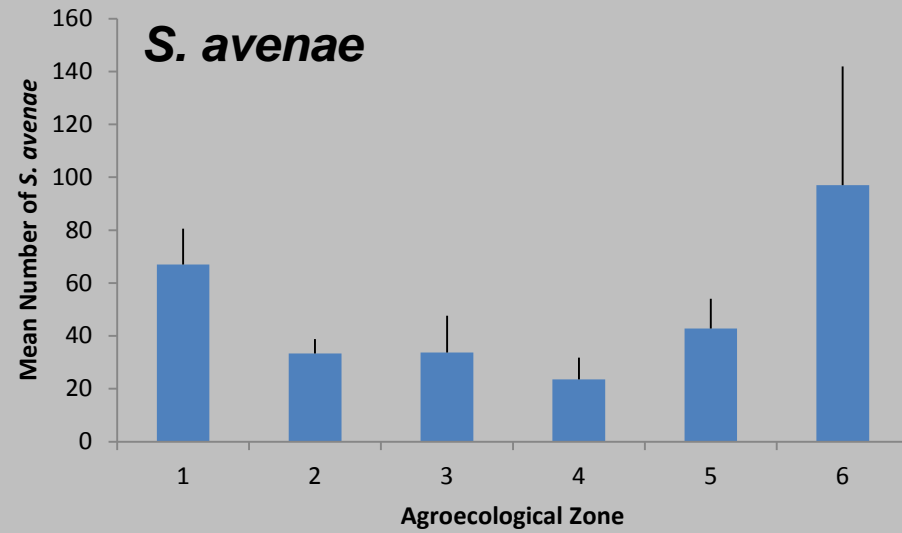
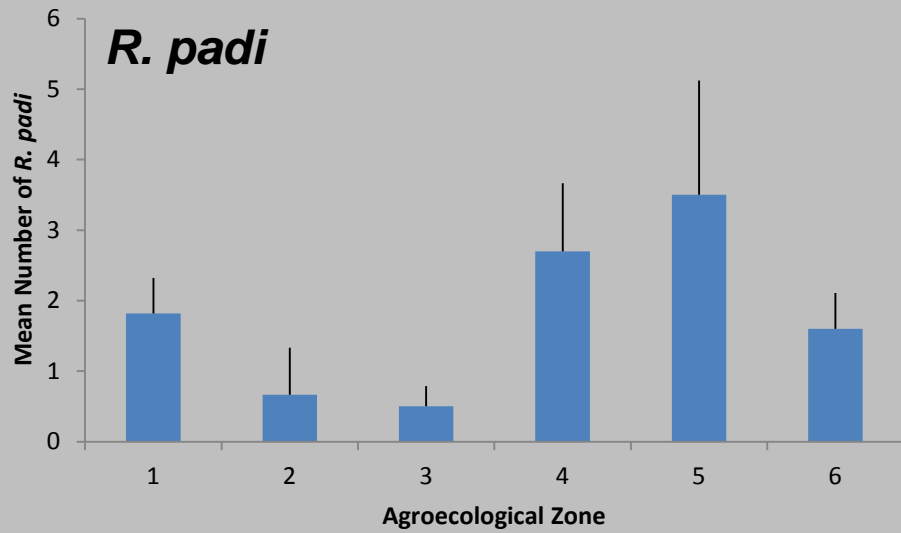
Cropping System Zones



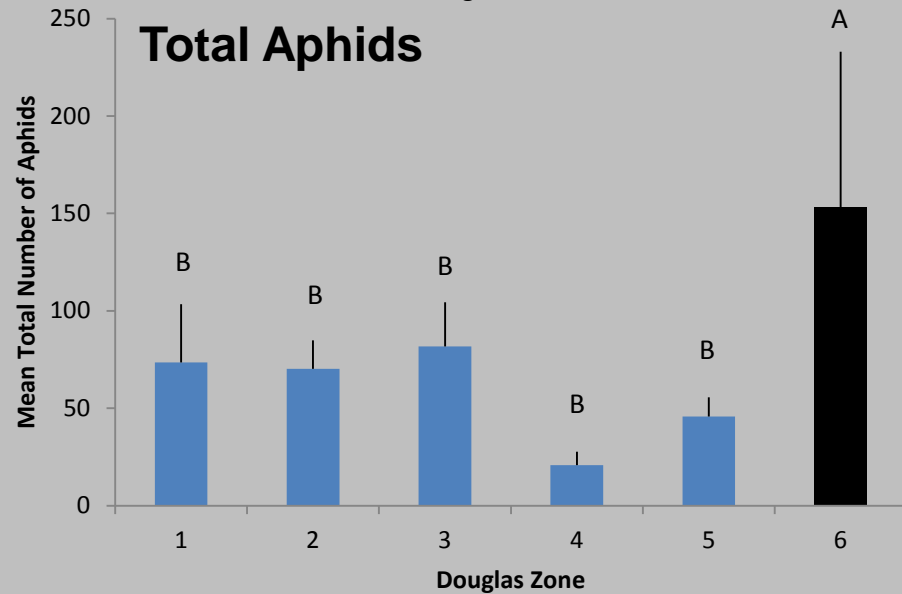
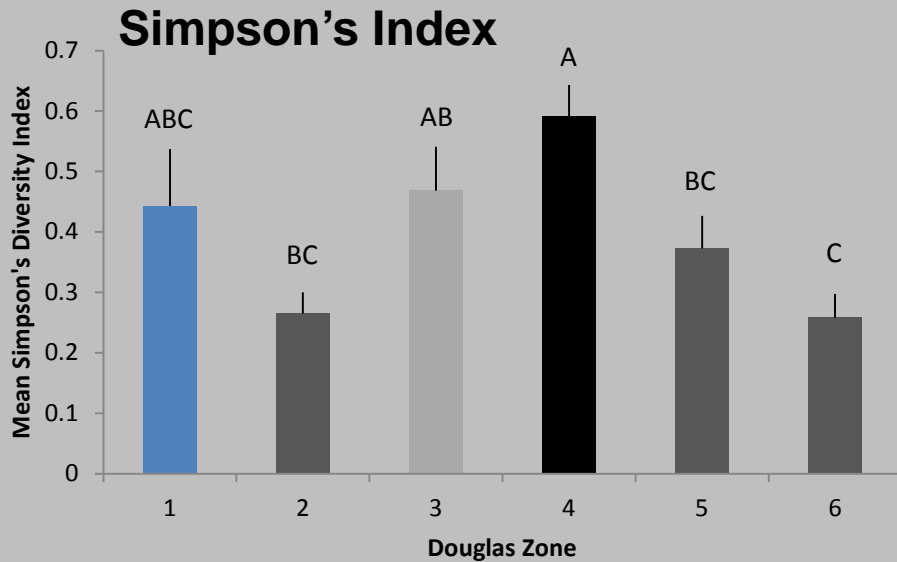
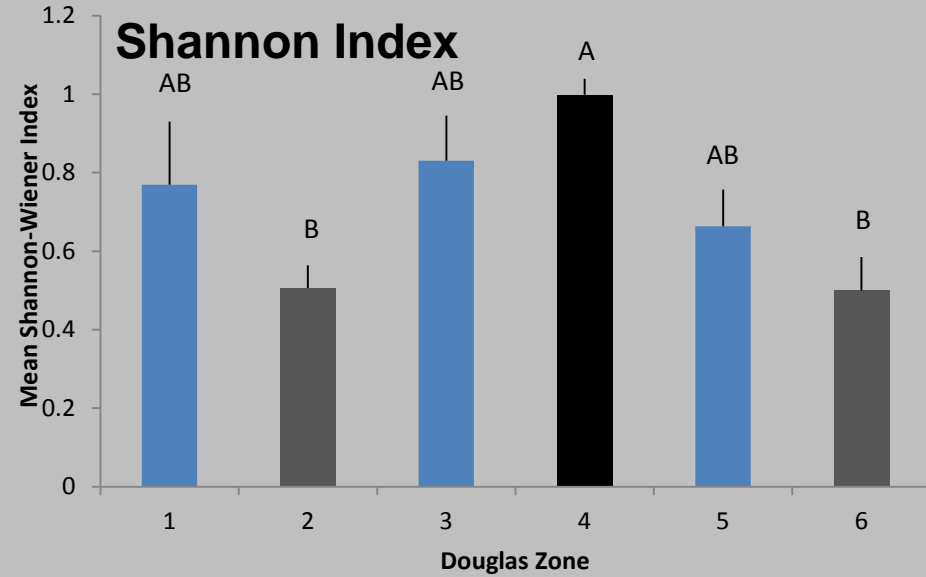
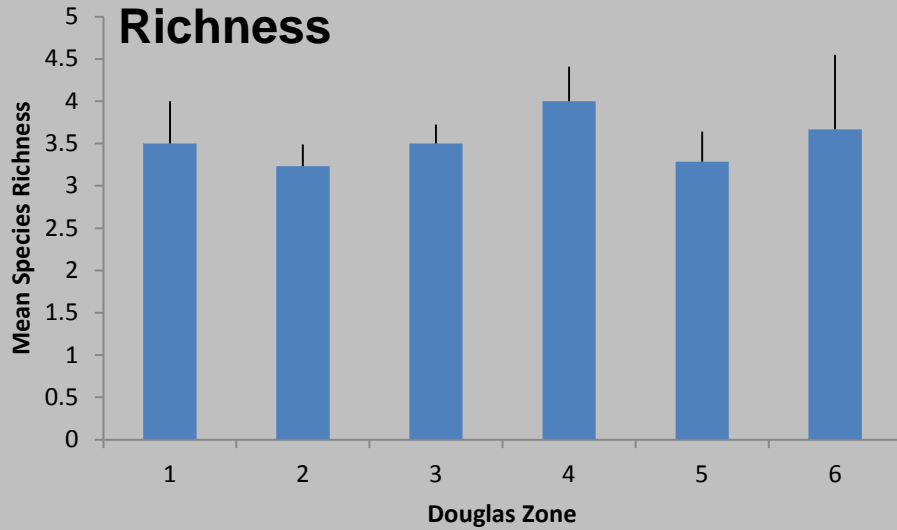
Agroecological Zones



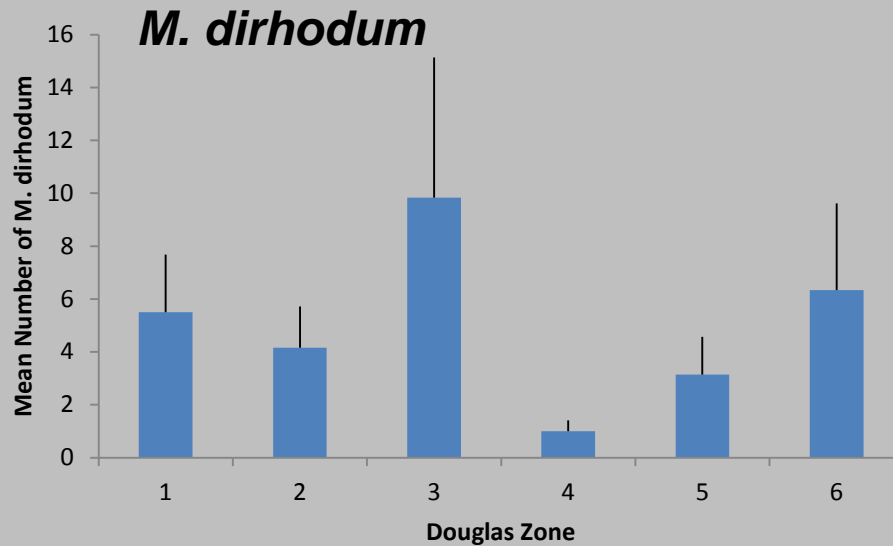
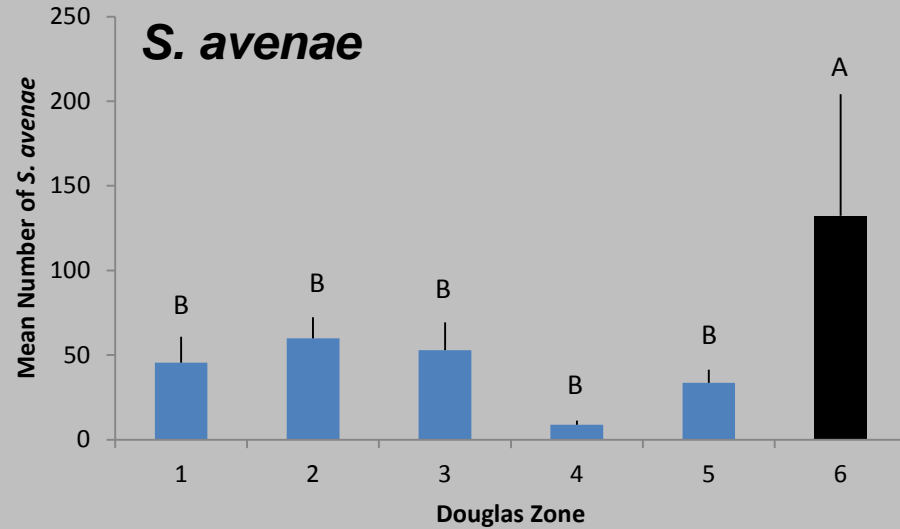
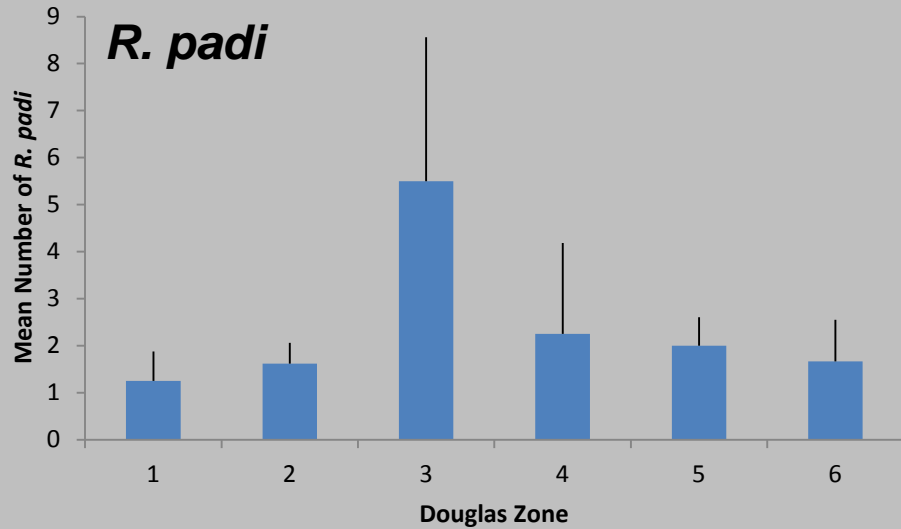
Agroecological Zones



Douglas Zones



Douglas Zones



Summary

	Agroecological Zones	Douglas Zones	Cropping System Zones
Richness	0.7153	0.8491	0.8662
Shannon-Wiener Index	0.1003	0.0296	0.2084
Simpson's Diversity Index	0.0399	0.0124	0.1893
Total Aphids	0.3205	0.0462	0.0979
<i>R. padi</i>	0.5003	0.2816	0.6038
<i>S. avenae</i>	0.0885	0.0165	0.0283
<i>M. dirhodum</i>	0.2411	0.3497	0.4969

Conclusion

- Diversity indices and aphid abundance differs more clearly among Douglas Zones than other zonation systems
 - Why?
- 2012 sweep net data and Berlese funnel samples can help corroborate these findings

Ethical Issues

- Properly representing breadth of the data and results
- Properly representing others involved in data collection and GIS modeling

Acknowledgements

Dr. Sanford Eigenbrode

Ying Wu

Georgia Seyfried

Dr. John Abatzoglou

Erich Seamon

Katie Thomason



References

Articles

Clement, S. L., D. S. Husebye, and S. D. Eigenbrode. 2010. Ecological factors influencing pea aphid outbreaks in the US Pacific Northwest. *In* P. Kindlmann, A. F. G. Dixon, and J. P. Michaud [eds.], *Aphid biodiversity under environmental change*, 107-128. Springer, Netherlands.

Pictures

<http://texaswheat.org/greenbug-management-strategies.html>

Thank you!

Questions?

