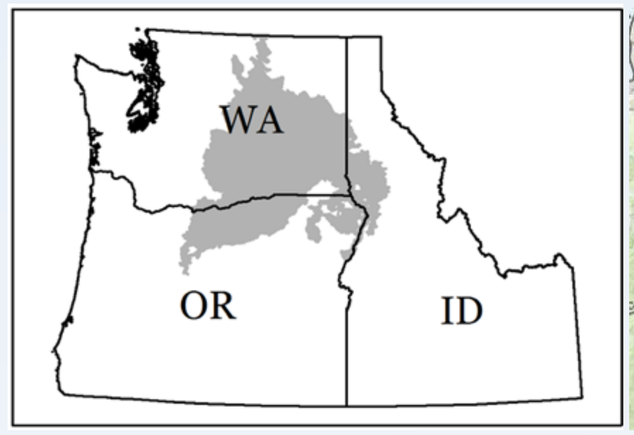
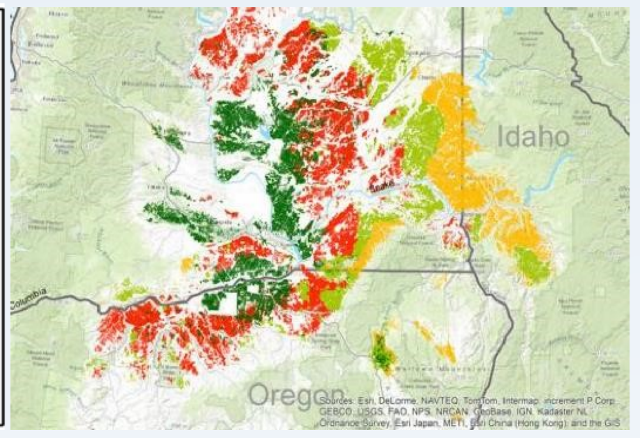
Pacific Northwest Wheat-Based Systems: Landscapes in Transition

Jodi L. Johnson-Maynard[1], Sanford D. Eigenbrode[2], Erin Brooks[1], Ian C. Burke[3], David R. Huggins[4], Brian K. Lamb[5], Rebecca McGee[4], Shelley Pressley[5], Kurtis Schroeder[6], Clark Seavert[7], Claudio O. Stöckle[8]

1. Department of Soil and Water Systems, University of Idaho, Moscow, ID, 2. Department of Entomology, Plant Pathology and Nematology, University of Idaho, Moscow, ID, 3. Crop and Soil Sciences, Washington State University, Pullman, WA, 4. USDA-ARS, Pullman, WA, 5. Civil and Environmental Engineering, Washington State University, Pullman, WA 6. Department of Plant Sciences, University of Idaho, Moscow, ID, 7. Department of Applied Economics, Oregon State, University, Corvallis, OR., 8. Biological Systems Engineering, Washington State University, Pullman, WA.

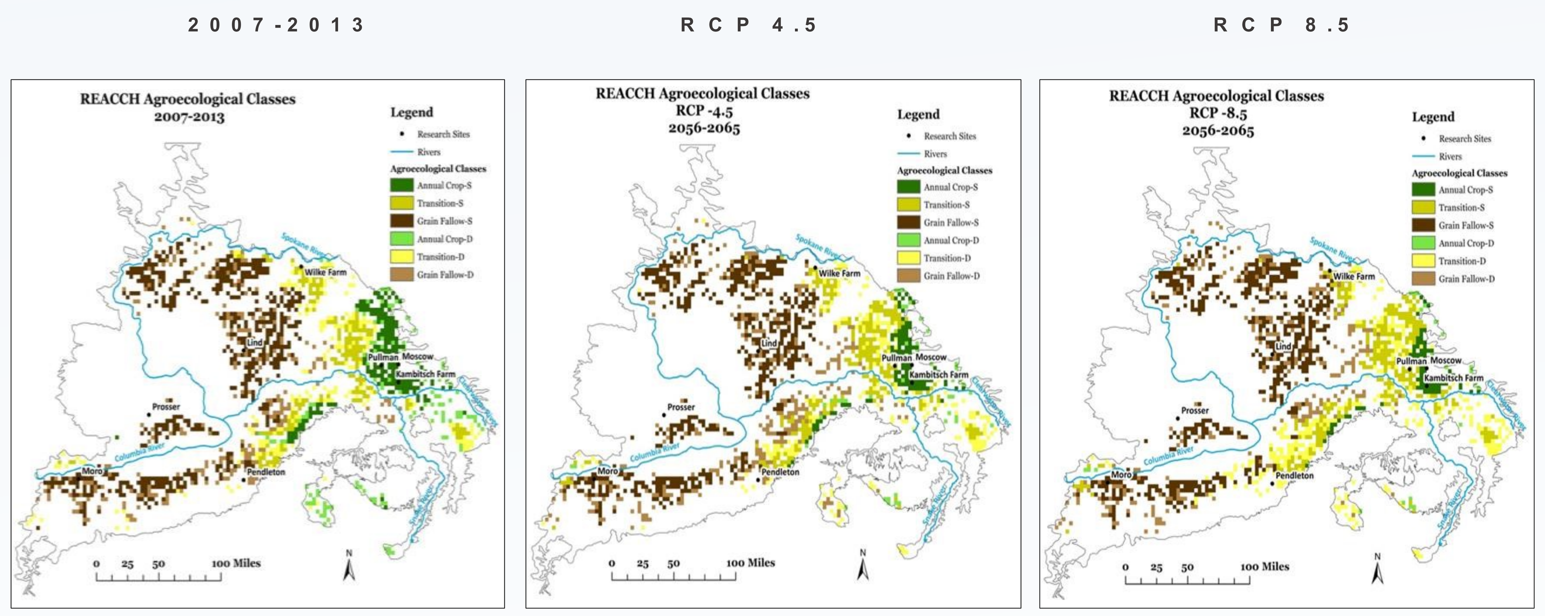
The Challenge





The Inland Pacific Northwest (IPNW) wheat-producing region is characterized by a distinct climatic gradient and four predominant agroecological classes (AECs). AECs: yellow=*Annual Cropping* (limited use of fallow), light green=*Transition Cropping* (rotations with fallow, but not in every year); red=*Crop-Fallow* (fallow used on annual basis); dark green=Irrigated.

Changing Cropping Systems



Assuming that production practices remain unchanged, AECs in late mid-century are expected to shift with a decrease in the area in Annual Cropping and an increase in Crop-Fallow (Kaur et al., 2017). Increased fallow leads to reduced organic matter inputs and increased erosion.

Project Goal

To guide ongoing land use change in the IPNW towards sustainable, resilient agricultural landscapes and food systems through systems-based, interdisciplinary research, extension and education.

Objectives

Research

- Optimize agronomic practices for winter pea and cover crops and determine the impact of diversified rotations on weeds, insects and soil health.
- Quantify the impact of diversified systems on nitrogen and water budgets and GHG emissions at the crop, rotation, farm, and landscape scale.
- Determine the effect of diversified systems on farm-level yields (*intensification*) and profitability.
- Identify the impact of on-farm and surrounding land use on weed and insect populations.

Extension and Education

- Develop a food supply chain vulnerability matrix including all relevant activities and actors for the entire region and identify critical leverage points for adaption and mitigation.
- Disseminate the food chain matrix and provide training for other groups interested in applying a systems-based approach to improving resiliency to climate change.
- Determine the socio-economic and policy-related barriers to the adaptation and mitigation practices identified and develop tools to overcome these barriers.
- Provide a seminar series to assist researchers, graduate students, and stakeholders in developing systems-based and resiliency thinking.

Approach

- Focus on crop diversification and intensification across the climatic gradient
- Multiple spatial scales of study: plot ➔ farm ➔ zone ➔ region
- Systems-based approach that includes supply chains
- Interdisciplinary collaboration involving soil science, entomology, weed science, agronomy, economics, engineering, hydrology, breeding and crop modeling.
- Institutional collaboration among three universities and USDA-ARS
- Stakeholder engagement at throughout the project life cycle

Project activities

Crop modeling

Replicated small plot work

- yields and biomass production
- disease prevalence
- farming practices (planting date, spacing, seeding depth)

Replicated large plots

- yields and biomass
- water and nitrogen dynamics
- long-term rotation performance
- soil health indicators
- insect pests, weeds, and beneficial species

On-farm, field-scale assessments

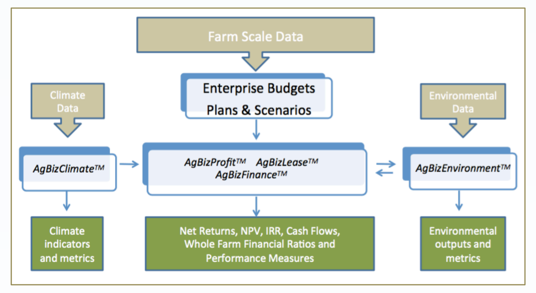
- greenhouse gas fluxes
- water and nitrogen balance

Landscape scale studies

- influence of surrounding land uses on weeds and pests
- feasibility of diversification in different AECs

Economics

- crop, rotation and farm level profitability
- case study development
- integration into *AgBiz Logic* platform



Supply chain vulnerability assessment

- activities and actors in relevant supply chains
- identification of the most vulnerable supply chain components

Engagement

- educational materials to improve adoption of mitigation/adaptation measures

Expected Outcomes

1. Improved resilience of agriculture and supply chains to climate variability
2. diversified and intensified cropping systems with reduced use of fallow
3. improved soil health
4. reduced climate impacts from agriculture
5. tools to aid in decision making at the crop, rotation, and farm level

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