Straw Management and Crop Rotation
Alternatives to Stubble Burning:
Assessing Crop Rotation and Weed Management Options

Co-Principle Investigators
Dave Huggins, Soil Scientist
Drew Lyon, Weed Scientist
Kate Painter, Ag. Economist
New Project Objectives

- Identify and economically assess crop rotations and sequences that benefit from retaining winter wheat residues in direct-seed systems;
- Document effects of wheat straw management on several troublesome grass weeds; and
- Convey project findings through electronic and print media, field days, conferences and research site tours.
Weed Management
Conservation Farming and Herbicide Resistance

- Direct seed and reduced tillage systems dependent on herbicides for weed control
- Herbicide resistance a growing problem worldwide and in the Pacific Northwest
- Last new herbicide mode of action introduced 20 years ago, nothing new expected for another 20 years
Weed Life Cycle

Seedling → Reproduction, Seed Set

Soil Seed Bank ← Seed Shatter
Interrupting Weed Life Cycle, Herbicides

Seedling → Reproduction, Seed Set

Seed Bank → Seed Shatter
Weed Seed in Chaff Fraction

Rewarding the Survivors!!
Interrupting Weed Life Cycle, Harvest Weed Seed Control

Seedling → Reproduction, Seed Set

Seed Bank → Shatter

Seed

Interrupting Weed Life Cycle, Harvest Weed Seed Control

Seedling → Reproduction, Seed Set

Seed Bank → Shatter

Seed
Harvest Weed Seed Control

- Biological attribute needed for system to work: mature seed do not shatter before grain harvest, held above cutting bar height
Seed Retention at Harvest

<table>
<thead>
<tr>
<th></th>
<th>Downy brome</th>
<th>Italian ryegrass</th>
<th>Jointed goatgrass</th>
<th>Rattle fescue</th>
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<tbody>
<tr>
<td>Seed above 6 inches (% of total)</td>
<td>80</td>
<td>60</td>
<td>60</td>
<td>40</td>
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</tbody>
</table>
Narrow Windrow Burning

Concentrate residues at harvest

Burn residues in autumn
Narrow Windrow Burning

99% control of *Lolium* and *Raphanus*

Most Western Australian growers use this technique
Pullman Study
Windrows to be Burned
Burning Windrows
Burning All Crop Residue
Three Weeks After Burning
Collecting Crop Residues
Crop Residue after Burning

- Control: a
- Spread: b
- Windrow: b

Crop residue dry weight (lb/A)
Germinating Italian Ryegrass After Burning
Italian Ryegrass Survival

* Seconds above 100° C
Alternatives to Field Burning
Chaff Collection

Up to 85% of *Lolium* and *Raphanus* seed collected and removed
Glenvar Bale Direct System

Up to 95% of *Lolium* seed collected and removed in baled harvest residues
Harrington Seed Destructor
Future Work

• Investigate potential for non-burning harvest weed seed control

• Repeat seed harvest, burning trials in 2014

• Possible field scale demonstration plots, grower outreach
Crop Rotation
Crop Rotation
Crop Rotation

- Pairs of burned and non-burned plots established Oct 2013 in ww stubble
- Will be planted to garbanzo beans, spring barley, spring wheat, and spring canola for 2014
- Data collection spring-fall 2014 – pathogens and yield
- Completes 2 years of previous data
Questions?