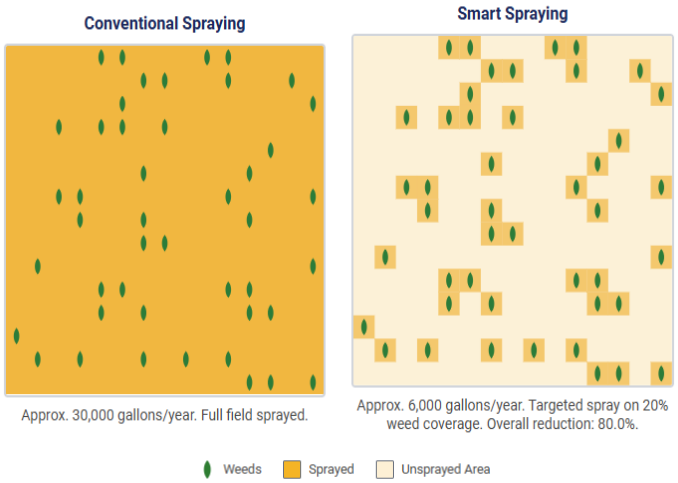
Precision Weed Management in Fallow Systems

Background

- **Precision weed management in Montana**
  - Why?
    - Rapid herbicide resistance in problem weeds (e.g., wild oat, kochia)
    - Rising costs of herbicides and operations
  - Conventional broadcast spraying
    - High cost per acre
    - Over-application of herbicides
    - Environmental concerns
  - Proposed solution: Use of spot spraying systems for targeted, efficient weed control in fallow fields



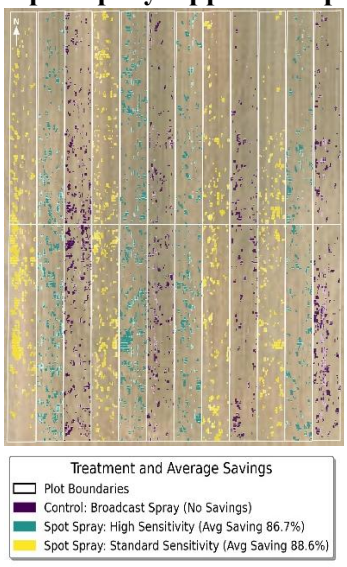
Research Focus

- Quantify the economic benefits of adopting precision weed management technologies
- Evaluate the efficacy of spot spraying systems for weed control in fallow fields
- Assess the mapping accuracy of camera-based systems vs. UAV (drone) based weed detection

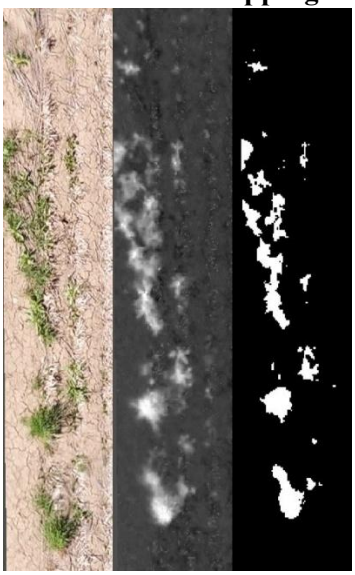
Approach

- **Evaluate spot spraying system efficacy**
  - Sprayer: CarbonBee SmartStriker X with Capstan PinPoint III nozzle control
  - Evaluations**:**
    - Pre-spray weed density assessment (1 day before application)
    - Post-treatment evaluations at 14 and 28 days after treatment
- **Weed mapping in fallow wheat fields**
  - Sensors: RGB, multispectral, and hyperspectral imaging (camera-based and UAV-mounted)
  - UAV Flights: Conducted at 65 ft altitude to generate high-resolution imagery

Spot Spray Applied Map



UAV Weed Mapping



Outcomes

- **Chemical saving:** 75% and 82% in the spot spray with standard and high sensitivity
- **Efficacy results:**
  - Spot spraying equaled broadcast control with significantly less herbicide
  - High-sensitivity spot spraying outperformed other treatments over time
- **Weed mapping:** UAV missed approximately 40% of the weeds compared to the camera-based system

Ricardo Pinto, PhD and Sudhir Payare, MS
Department of Research Centers-Northern Ag Research Center
Contact: ricardo.pinto@montana.edu **– 406-994-6374**