AGRICULTURAL RESEARCH FOUNDATION
FINAL REPORT
FUNDING CYCLE 2013 – 2015

TITLE: Timing of Pesticide Applications: Determining the Best Time to Spray to Avoid Negative Impacts on Native Pollinators

RESEARCH LEADER: David Wooster, Associate Professor, HAREC

COOPERATORS: Don Horneck, Professor, HAREC, Sandra J. DeBano, Associate Professor, HAREC

SUMMARY:
Over 100 crops in the United States are dependent on insect pollination, including many that occur in the Pacific Northwest. In Oregon, some of the crops pollinated by native pollinators include alfalfa seed, almonds, apples, blueberries, canola, tomatoes, and watermelons. In the past, honey bees and native bees have been able to meet the pollination demands of these crops. However, with the recent decline in the honey bee due to colony collapse disorder, a greater reliance on native bees may be necessary. The potential negative impact of insecticides on native bees has received much attention recently, but little information is available about how to manage the timing of pesticide applications to minimize negative impacts of pesticide applications on this important group of pollinators. One of the best ways to avoid unintended effects on non-target species is to avoid spraying when those species are active. Yet, little is known about the daily activity patterns of native bees. Specifically, no data were available to inform growers in eastern Oregon about optimal times to apply pesticides even though the area is dominated by large production regions that require intensive pest management. This project focused on understanding what native bees are common in agroecosystems in eastern Oregon and determining when these bees are most active. The results of this study are being used to inform management recommendations for agricultural producers in eastern Oregon.

OBJECTIVES:
The objectives of this study were to:
1. determine which native bees are most common in eastern Oregon production areas, and which are likely to play the largest role in crop pollination;
2. quantify the diurnal or daily pattern of these native bee species; and
3. develop management recommendations for the timing of pesticide applications to minimize overlap with peak activity times of significant native bee pollinators.

PROCEDURES:
We used hand-netting, pan traps, and blue vane traps to collect over 8,420 bees at 36 sites in agroecosystems in Umatilla County of eastern Oregon, allowing us to characterize the native bee fauna that may be available as potential pollinators of crops grown in the area. In addition, we quantified the daily activity of native pollinators by sampling at different times of the day,

from early morning to late afternoon. We used this information to develop management recommendations related to the timing of pesticides in our region.

SIGNIFICANT ACCOMPLISHMENTS:

Our study revealed the following results:

1) Most native bees (over 98%) found in agroecosystems in Umatilla County belong to just nine genera of native bees. By far the most common bees belonged to three genera of "sweat bees" (*Lassioglossum*, *Halictus*, and *Agapostemon*), which made up 90% of all bees collected. Other genera common in the study that are known to be important crop pollinators were bumble bees (*Bombus*), mason or orchard bees (*Osmia*), and leafcutter bees (*Megachile*).

2) Studies on diurnal or daily patterns of activity showed that few bees (<1%) were active in early morning (8 -10 AM), a moderate number (~ 15%) were active in mid-morning (10 AM – Noon), the largest percentage (~70%) of bees were active in early afternoon (Noon-2 PM), and a moderate number (~15%) were active in late afternoon (2-4 PM). In addition, our work shows that different types of native bees appear to be active at different times of the day. For example, the most common genera of sweat bees (*Lasioglossum* and *Halictus*) were more than twice as abundant in the morning compared to the afternoon. Other bees, such as *Megachile*, were found to be slightly more active in the afternoon, while other bee genera were essentially equally abundant throughout the day (e.g., *Hylaeus*).

We have presented the results of our research to over 300 growers and fieldmen in eastern Oregon through talks for the Hermiston Farm Fair and at the Oregon Agricultural Chemicals and Fertilizers Association.

BENEFITS & IMPACT:

Pesticide applications are necessary for almost all commercial agriculture, including organic production. Although best practices for pesticide applications are well developed to prevent unwanted mortality in commercial honeybee colonies used to pollinate crops, little information was available with regard to best practices for pesticide applications that reduce unintended negative effects on native bees. Our study has provided growers with information on best times to spray pesticides. Even small changes in the timing of pesticide applications can potentially have large positive effects on increasing the density and pollination activity of native bees. This can decrease the reliance of growers on honeybees and reduce costs of production, contribute to sustainable agricultural practices, and improve the environment by increasing native bees and their contribution to native plants in adjacent uncultivated areas.

ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM:

We applied for a grant from the North American Pollinator Protection Campaign that would have continued to build on this research, but did not receive funding.

FUTURE FUNDING POSSIBILITIES:

We plan on expanding on this work by focusing on species with the greatest potential to pollinate crops grown in eastern Oregon. We plan to submit a USDA NNF proposal this coming year to the "Plant-Associated Insects and Nematodes" Program.