

Seeking Cooperators!

Insects in Agricultural Landscapes

Background: Agricultural landscapes provide habitat for insects that pollinate crops, control pests, and support biodiversity (e.g. songbirds, monarch butterflies). Increasingly, research is showing the physical arrangement of crop and non-crop habitats in farmlands influences these services. We are investigating how different combinations of crops, forests, and grasslands affect insect biodiversity and associated services, with implications for how farmers can manage landscapes for both productivity and biodiversity.

In past work, we measured predation rates on crop pests in corn and soy fields and found pest suppression improves when landscapes around crop fields have more perennial grassland cover (hay fields, fallow areas, prairie, etc.)¹. There is also growing evidence that not just the contents of agricultural landscapes, but also their spatial arrangement, affects ecosystem services². In this project we are building on previous work to test how the amounts of forest, grassland, and crop fields in the landscape, along with their spatial configuration, affects insect diversity, pest suppression, and pollination services in crop fields.

What we need: We are requesting permission to sample insects during summer 2020 on farms in the southern Lower Peninsula (anywhere South of Clare, MI) that contain all three of the following habitat types:

- Annual crops (corn or soy)
- Woodlots or forests
- Perennial grasses
 - warm season (CRP, Pheasants Forever plantings, switchgrass or restored prairie) or
 - cool season (grass hay fields, fallow or old fields)

What we will do:

- MSU researchers visit the farm two or three times between June and August.
- Passive insect traps (yellow sticky traps and pitfalls) will be set up in each habitat along with small, portable stations to measure pollination and pest suppression.
- In crop fields, the sampling items will be placed to allow normal farm operations.

What you will receive:

- Information on the insect community on your farm, including diversity of pollinators and natural enemies.
- Information on how much pest suppression and pollination occurs on your property compared to others state-wide.
- Three newsletters (spring, summer, fall) with detailed project background, methods and results.

What to do next: If you are interested in participating or have questions (see FAQ's below), please email us at landislab@msu.edu or call the Landis lab at 517-432-5282 and ask for Lizz. We will need the following information:

- Your name and contact info (email or phone)
- Approximate location of farm (address, GPS coordinates, or county and road intersections)

Project Personnel: Dr. Doug Landis, Dr. Nate Haan, Lizz D’Auria (Landis Lab research technician), Michigan State University, Department of Entomology and Great Lakes Bioenergy Research Center.

FAQs:

1. I own property that would work, but one of the habitat types is on my neighbor’s property. Can I still participate?

Yes! Please contact us – we will need your neighbor’s permission as well, so including their contact information would be helpful.

2. The woodlot or grassland on my farm is small – will it still be useful for the study?

Yes. At this point we are interested in any properties that contain all three habitats.

3. I want to participate but am worried the sampling equipment will get in the way.

Equipment in crop fields will be low enough that a tractor can pass overhead and will only be in place for short periods (e.g. 2-3 10-day periods over the course of the summer). If grasslands need to be cut for hay during the study, we simply ask that you avoid the (~2 square yard) area where equipment is set up and let us know when the hay cut occurred so we can include this in our records. We can include tall flags for grassland sampling stations, so they don’t get run over.

4. Where will the sampling stations be located?

We’d like to put two stations in each of the three habitats – one will be near the boundary with other habitats, the other will be on the interior. We’re happy to consult with you about where to place the stations so they are out of your way.

5. What exactly are you going to measure?

- Removal rates of sentinel prey. Common pests (freezer-killed) will be set out on small platforms and checked after two days to see if natural enemies have eaten them.
- Pollination of sentinel flowers. Potted sunflowers, which depend on insect pollinator visits to set seed, will be set out at sampling stations, then we will return them to a greenhouse to measure seed set.
- Insect diversity. We will measure diversity of several important insect groups using passive methods like yellow sticky cards (lady beetles, others), pitfall traps (ground beetles, ants, and spiders), and pan traps (bees). We may also walk transects next to the sampling stations to count butterflies and birds.

1. Werling, B.P., Dickson, T.L., Isaacs, R., et al. 2014. Perennial grasslands enhance diversity and multiple ecosystem services in bioenergy landscapes. *Proceedings of the National Academy of Sciences* 111, 1652-1657. <https://doi.org/10.1073/pnas.1309492111>

2. Haan, N.L., Zhang, Y., and Landis, D.A. 2019. Predicting landscape configuration effects on agricultural pest suppression. *Trends in Ecology and Evolution* 35, 175-186.
<https://doi.org/10.1016/j.tree.2019.10.003>