



**Ebony Murrell, PhD**  
Crop Protection Ecologist

## INTO THE WEEDS

# A Deeper Dive Into Crop Protection Ecology

**M**y science background is in community ecology of pest insects. Before I came to TLI I was studying the effects of crop diversity and organic agricultural practices on soil health, beneficial insects, and pest management in grain crop systems.

One very important lesson I learned from scientists and farmers is that organic agriculture is a system, not just a series of crops. Sustainable organic grain farmers don't simply stop using pesticides or replace synthetic fertilizers with manure. They plant a much greater diversity of crops, use more intricate crop rotations, and alter their tilling practices to build healthier soil, promote beneficial insects, and improve the robustness of their crops to inclement weather and pest outbreaks.

## Silphium Benefits

- Silphium provides **excellent habitat** for beneficial insect predators
- Can be harvested for human consumption as an **oilseeds grain crop**
- **Roots grow over 4 meters deep**, accessing water unavailable to shallow-rooted species.
- Roots **promote beneficial fungi** (mycorrhizae) in the soil.
- Silphium is a **superb pollinator resource**.

## The Program

The goal of my program at The Land Institute is essentially the same as it is for organic farmers: to create a diverse agricultural system, with healthy soils and beneficial insects, that help our crop plants to better defend themselves.



Unlike current grain crop farmers, our grains are all perennial. In most ways, this makes our crops much harder than annual crops, as their perennial roots rapidly build healthy soil communities, their sturdy branches support beneficial insect predators and pollinators, and they are much more tolerant to drought. In other ways, perennial crops can be more challenging. Unlike organic agricultural farmers, we cannot rely on tillage or crop rotations to create diversity in time. We must instead create diversity in space, like the prairie systems we seek to mimic.



## The Challenge:

Silphium has an Achilles heel: a moth pest called *Eucosma giganteana*, or “eucosma” for short.

- Eucosma is a specialist moth, meaning it feeds only on our silphium and a few other species in the *Silphium* genus.
- When silphium flowers and provides oilseeds year after year, it also provides a permanent habitat for the eucosma whose caterpillars feed on those flowers.
- If left unmanaged, the eucosma populations increase over the years and eventually destroy the silphium plants.

## The Solution:

If we learn how to manage eucosma, we can sustainably intercrop our silphium with our other perennial species. This will help us:

- create pollinator resources in our perennial landscapes,
- improve insect predator habitat to naturally manage pests,
- build healthy soil fungi for crop growth,
- increase the seed production and economic viability of our polycultures.

## The Next Step:

**Develop a pheromone trap for eucosma.**

By using eucosma’s unique sex pheromone, we will be able to:

- trap and kill the moths before they lay eggs,
- disrupt their mating in crop fields so that the females only lay sterile eggs,
- reduce the number of eucosma in our fields without harming other insects.



## A New Endeavor

Recently our scientists Tim Crews and Brandon Schlautman have made great progress in intercropping Kernza® with alfalfa. Kernza provides good weed suppression and grain yield, while alfalfa fixes nitrogen, provides habitat for beneficial insects, and can be harvested for forage.

To this biculture, we wish to add a third species: the perennial sunflower *Silphium integrifolium*, or “silphium” for short. **A three-species combination of Kernza, alfalfa, and silphium could provide multiple crops to market and multiple services to our environment.** Additionally, our Crop Protection Ecology technician Edy Cheremond, has identified at least **seven genera of native solitary bees** (not including honeybees or bumblebees) that feed on silphium nectar. In a time when our bee populations are threatened by pesticides, climate change, and habitat loss, this oilseeds crop could provide a much-needed boost to our essential pollinators.

## You Can Help

Our team of scientists are eager to tackle these questions, and help us discover how to manage eucosma sustainably, but we need the funds to do it.

Because silphium is still being developed as an oilseeds crop, and eucosma is a native species that feeds only on silphium, federal and state agricultural agencies have no interest in funding this kind of research. Conservation programs, on the other hand, are not interested in funding research to manage a native insect that feeds on a native species, nor research to help develop a native plant species into a perennial oilseed crop.

**We invite you to be part of our work by providing support for our research.**

To learn more about Crop Ecology Protection and make a donation, visit [landinstitute.org](http://landinstitute.org). Or learn about other giving options by contacting Amy Cole, Director of Development, [cole@landinstitute.org](mailto:cole@landinstitute.org) or (785) 309-6928.



2440 E. Water Well Road Salina, KS 67401

(785) 823-5376 • [info@landinstitute.org](mailto:info@landinstitute.org)

[landinstitute.org](http://landinstitute.org)