CREC Pollinator Project: 2018 Update

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Most are aware that insect pollinators, like bees, have a positive effect in agriculture. Yet, there is so much we don't know about their behaviors and preferences.

In 2018 a major research effort was initiated to understand the impact of insect pollinators on agriculture from three perspectives; 1) honeybee visitation and honey production, 2) native pollinator habitat and visitation to crops, and 3) the effect of honeybees and native pollinators on crop yields. These efforts will be ongoing for the next several years, but there are a few things we've learned in the first year alone.

Honeybee honey production. Four beehives were equipped at the CREC with specialized equipment this season. Two hives were equipped with a scale to record honey production and two were equipped with a pollen trap. The pollen trap will enable us to identify which crops the bees are visiting throughout the season. We will do that through analyzing the DNA found in the pollen, in conjunction with the USGS Northern Prairie Wildlife Research Center in Jamestown, ND. The goal of this analysis is to determine what the bees are foraging during the growing season. At the CREC, we grow numerous flowering crops including field peas, lentils, chickpeas, soybeans, dry edible beans, flax, buckwheat, sunflowers, canola, cover crops, and a number of others. If we can align our flowering period with positive or negative pollen hits on some of these crops, we will know what the bees prefer, or whether they forage on some of these crops period. Those results will be available in spring 2019. Figure 1 represents the daily weight changes of one of the bee hives at the CREC. Not surprisingly, late July and early August saw the most rapid increase in honey production, with one July day surpassing a 5 lb increase. That's a lot of honey!

Hive scales and pollen traps being installed at the CREC.

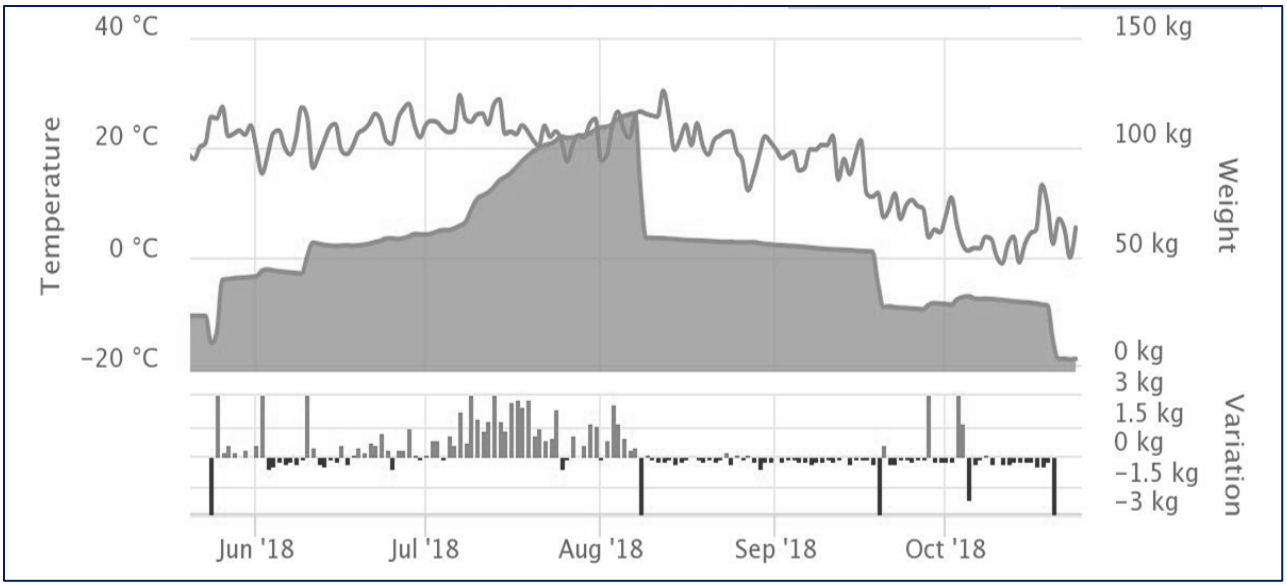

Figure 1. Daily honey production during the 2018 growing season. Large dips indicate box removal from the hive (honey harvest).

Native pollinator visitation. One conservation practice that is gaining a lot of attention is pollinator habitat planting. In theory this sounds like a good synergy between production agriculture and wildlife preservation. Our main objective is to identify if and how pollinator plantings can be integrated into farming operations. For large scale adoption, a pollinator planting must be easy to establish and easy to maintain. We have started exploring some of these aspects through our own experiences. We are trying to identify a mix of plant species that will emerge the first time it's planted, be competitive with weeds, and be attractive to wildlife. These are lofty goals, but failure to meet these goals means failure of broad appeal.

Precision agriculture plays a key role in the success of future pollinator plantings. Through field mapping (UAV images, yield maps, etc.), low/no productivity areas can be delineated. These areas could instead be repurposed for conservation plantings which may include pollinator habitats. While honeybees can be strategically located to maximize their effectiveness, some native pollinators may only travel a few hundred feet to forage, making placement of habitat extremely important. If native pollinators were found to increase crop yields, this strategy could provide a boost to net yields, even while decreasing farmed acres.

The effect of honeybees and native pollinators on crop yields. It is recognized that honeybees increase productivity in many agricultural crops. It is also recognized that bees of all types visit many of our agricultural fields, even in self-pollinated crops like soybeans and wheat. The related questions we are investigating include 1) which species are present and visiting our fields and 2) can pollinators increase crop yields if we managed for them. In 2018 we had one field trial established to begin addressing this. The first crop chosen was flax. Flax flowers profusely but there is mixed evidence about whether bees can increase yield or quality. Our study consisted of three flax varieties with plots being covered with bee exclusion netting or not. The study was conducted in Carrington and Fargo. To identify the visiting insects, traps were set in the flax for one day per week for three weeks during bloom.

Flax yield and test weight were not affected by including insect pollinators in 2018 (Table 1). The only yield differences were between specific varieties. Flax is largely self-pollinated so it is not too surprising to find no yield differences between insect treatments. The study was still able to uncover useful information. For instance, at the Fargo location no bees were observed in the traps, but butterflies were present. There were a number of pollinating insects observed at the Carrington location, including many

bee types and butterflies. However, no honeybees were identified in the traps, even with beehives located within a mile of the location. Since it is only a single year of observation, we cannot yet say that honeybees don't visit flax, but it is discouraging evidence for beekeepers.

Table 1. Performance of three flax varieties as affected by pollinator exclusion.

Variety	Insect presence	Begin Bloom	PM	Test Weight	Yield
		days	days	lb/bu	bu/ac
Omega	Exclusion	49.8	83.3	52.2	21.5
Carter		50.8	83.5	52.2	20.8
Prairie Thunder		50.5	83.0	52.2	28.5
Omega	Inclusion	49.5	82.0	52.2	20.6
Carter		50.8	84.5	52.1	20.3
Prairie Thunder		50.8	82.8	52.1	26.4
Mean		50.3	83.2	52.2	23.0
LSD (0.05)		0.6	2.3	NS	5.0

Future research with this project will include continued work with flax and dry edible bean yields in relation to pollinators. It will also include more work into the integration of wildlife habitat in production agriculture, and a closer look at honey production.