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2013

Sunflower Insect Monitoring Projects

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During the 2013 growing season, UVM Extension's Northwest Crops & Soils Program conducted studies to document the prevalence and impact of sunflower insect pests. Understanding the pest pressures unique to this region is crucial in producing a viable crop. Surveys of sunflower fields in the Northeast have shown that though plant populations are similar to the national averages, estimated yields are lower, primarily due to pest issues. Entire sunflower fields have been lost to pest pressures such as birds, weeds, insects, and disease, but Integrated Pest Management (IPM) strategies can help sunflower growers mitigate these problems.

To determine when problematic insects emerge in Vermont, and how prevalent they are across the state, traps were installed and monitored across the state for banded sunflower moth and sunflower maggot species. While other sunflower insect pests have been identified in Vermont, these two have been the most damaging to the sunflower crop in past years.

Banded Sunflower Moth

Banded sunflower moth (BSM) (*Cochylis hospes*) (Figure 1) overwinters in Vermont and has been known to reduce yields considerably in sunflowers grown in the Northeast. This seed-boring insect, in its larval stage, burrows into the maturing seed of sunflower plants, feeds on the meal inside, and leaves tell-tale "exit holes" in the seed, reducing yields and test weight. Often, growers don't notice the presence of BSM until they harvest their crop. Field evaluations for the 2012 National Sunflower Survey showed that BSM damage was present in the majority of Vermont fields, with up to 31.0% of seeds in an individual field hollowed out or showing signs of BSM entry.

Figure 1. BSM adult.

Figure 2. Locations of BSM traps, 2013.

In six locations across the state, UVM Extension installed traps to verify and monitor the presence of BSM adults (Figure 2). Adult moths generally appear in the early reproductive stages of sunflower plants, laying eggs around R3 or R4 stage of sunflower, when the immature bud of the plant begins to elongate above the nearest leaf and open slightly. The six BSM traps were set up in early June and monitored/replaced every two weeks through the beginning of August, at which point the plants flower and begin to form mature seed, and BSM larvae drop to the ground and pupate. BSM pheromone lures work primarily to determine when the adult moths are present, and can also give observers a rough sense of how large or damaging their population may be. The wing-type traps used in this study were baited with pheromones which can lure adult male BSMs across large distances, and have replaceable bottom components (Figure 3), so researchers were able to swap out the bottoms of the trap biweekly and identify BSMs in the lab.

Interestingly, results from 2013 trap monitoring varied greatly across the state, and were also much different from the results observed in 2012 (Figure 4). Perhaps due to the cooler spring weather and above-average rainfall of the early summer, BSM adults appeared across the state much later than expected. In 2012, traps were installed in mid-June and BSM specimens were immediately identified.

Figure 3. A BSM wing trap design with removable components.

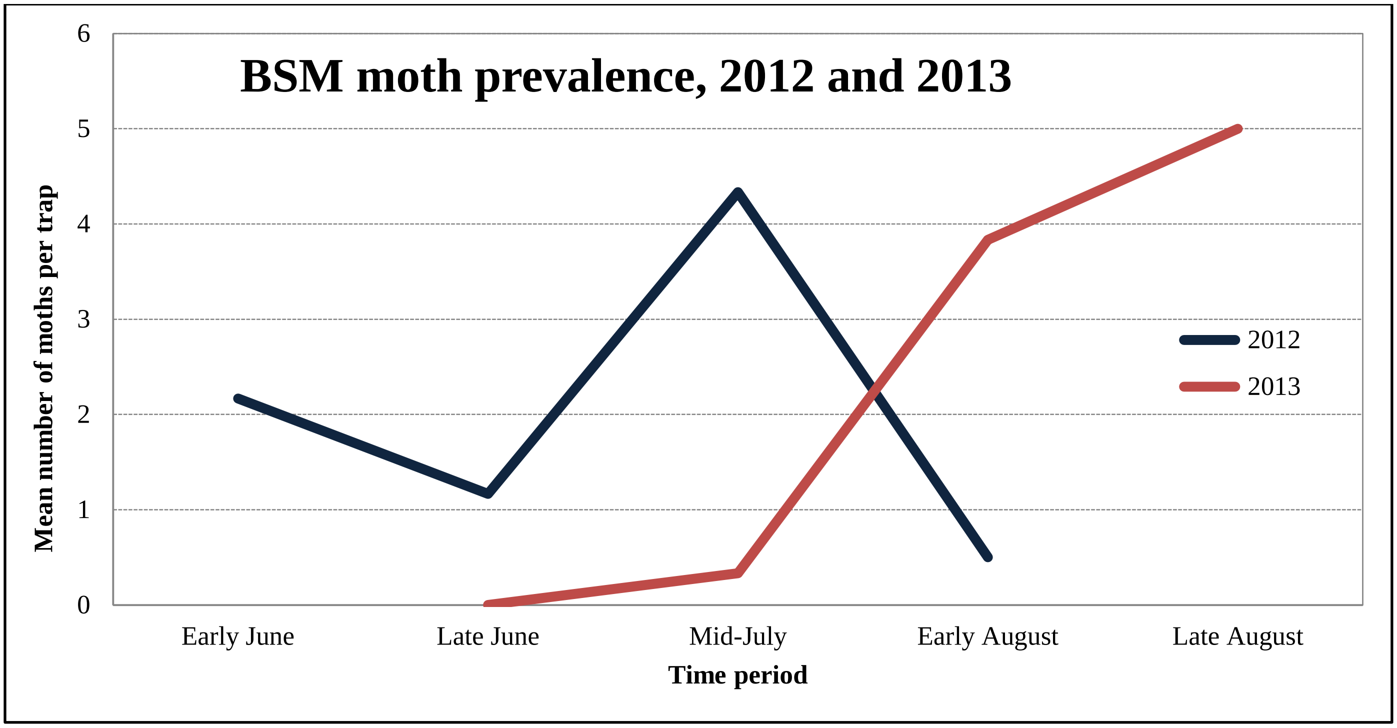


Figure 4. Results of BSM monitoring project across six Vermont locations and two years.

In 2013, it was not until mid-July that the first moths were detected (Figure 5). The late emergence of BSM was surprising, and was almost definitely linked to the cold, wet Vermont spring. The timing of BSM emergence is important to note; if growers can alter planting dates so that their sunflowers are not in vulnerable growth stages (R3/R4), they may be able to avoid having BSM adult moths lay their eggs.

Though BSM specimens were identified in five of the six scouted locations, the greatest BSM populations were in Alburgh and Brandon, VT, with few individuals in North Bennington, Newbury, and North Hardwick, and no BSM specimens identified in North Hero. The close proximity of the North Hero and Alburgh traps might lead one to believe the number of moths found in the two locations would be similar, but the discrepancy in BSM populations at the two sites can be attributed to each farm's crop history. At the farm in Alburgh, sunflowers have been grown for the past eight years, while the farm in North Hero had no history of sunflower production. This underlines the importance of crop rotation where possible, as the moth overwinters and can quickly establish itself as a predominant pest in a crop that is grown year after year. A major barrier to controlling BSM in VT is likely the size of fields and farms. Although adequate rotations are implemented on fields, the sunflower crop is not generally rotated to another field far enough away to keep BSM from migrating from one field to the next.

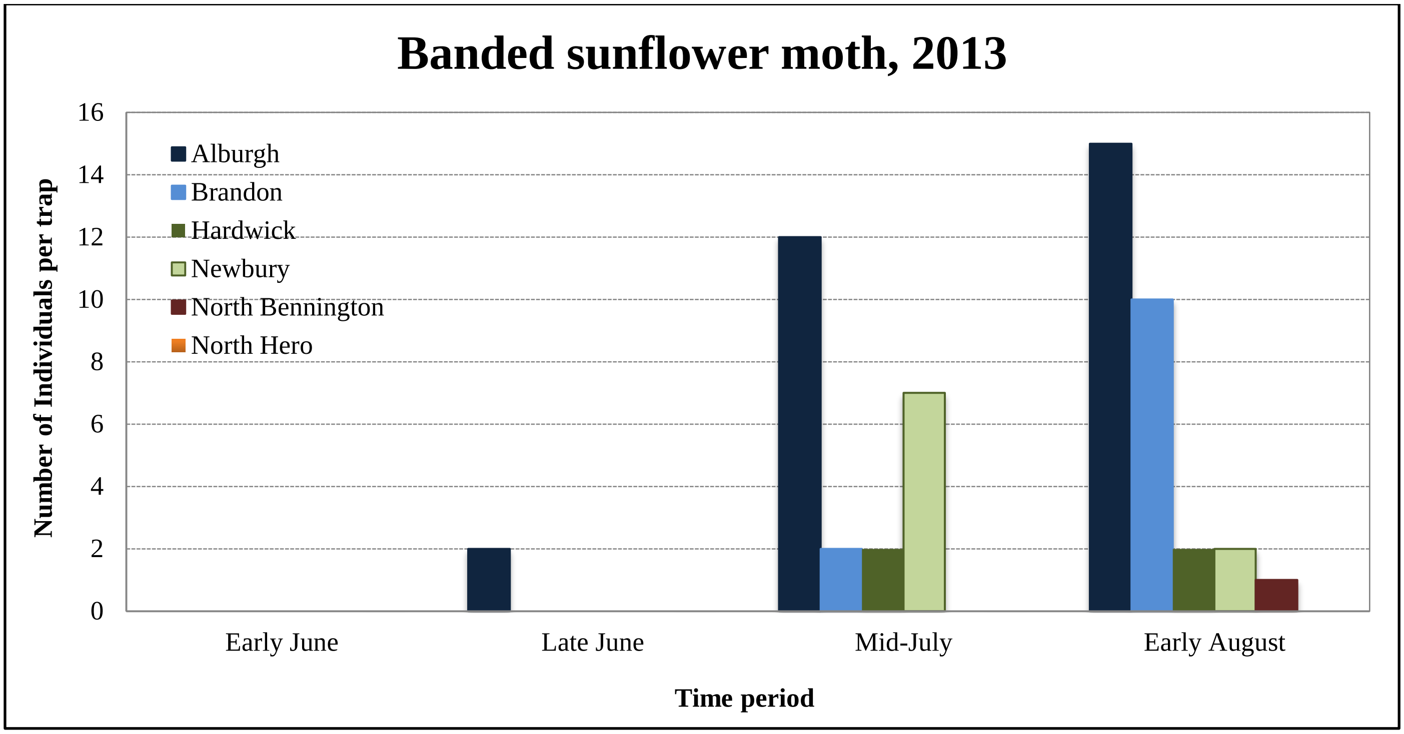


Figure 5. Results of pheromone trapping for banded sunflower moth in six locations from early June to early August 2013.

Sunflower Maggot

There are three types of sunflower maggots that are typically of concern to sunflower growers: sunflower maggot (*Strauzia longipennis*) (Figure 6), sunflower seed maggot (*Neophetritis finalis*) (Figure 7), and sunflower receptacle maggot (*Gymnocarena diffusa*). Sunflower maggot adults generally emerge in mid- to late June and burrow into the stems of the sunflower plant, feeding on pith. The majority of sunflower fields in Vermont have some sunflower maggots present, but stems are not often weakened to the point of lodging or other damage, unless the infestation is very high. In some cases, where prevalence is high, maggots can be found soon after sunflower emergence.

Figure 6. Sunflower maggot fly.

Sunflower seed maggots can cause deformation of the sunflower head and sometimes florets. This species has been seen in its adult stage in Vermont during sunflower scouting activities, but was not detected on any of the traps placed in fields in 2013. There are no signs of sunflower receptacle maggot, which has a yellow head and wings, in Vermont as of yet.

Figure 7. Sunflower seed maggot fly.

A second type of insect trap was used to monitor the arrival and prevalence of sunflower maggot species. Yellow cards coated with sticky "tanglefoot" and baited with an ammonium carbonate "supercharger" designed to attract flies like the targeted species were used for monitoring (Figure 8). These sticky traps are helpful in determining a relative density of certain insects, and can alert growers or researchers to the arrival of an insect pest, as well as identifying areas of concern within a studied area. Sticky traps were moved up a wooden stake during the season to remain close to the plant canopy as sunflowers developed.

At each of two locations in Vermont, five traps were installed in an "X" pattern in a field, with approximately 30 feet between each trap (Figure 9). In North Hardwick, the traps were set up in an eight-acre field with two different oilseed varieties. The traps in Alburgh were staked in among research plots of 18 different sunflower varieties. Beginning on 2-May, each of the five traps was baited and replaced biweekly for 14 weeks of the growing season. This allowed researchers to determine when the adult maggot flies arrived at the sunflower fields. Traps were removed, labeled, and stored in plastic bags for careful species identification in the lab.

Figure 8. Sunflower maggot sticky trap.

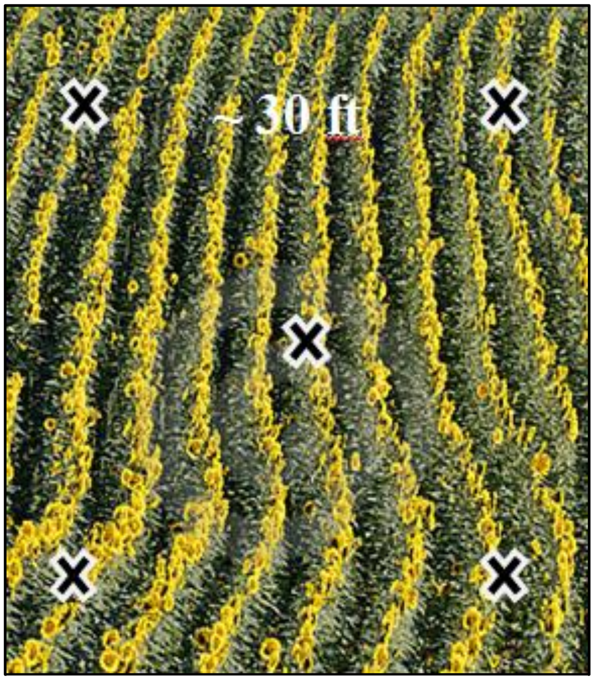
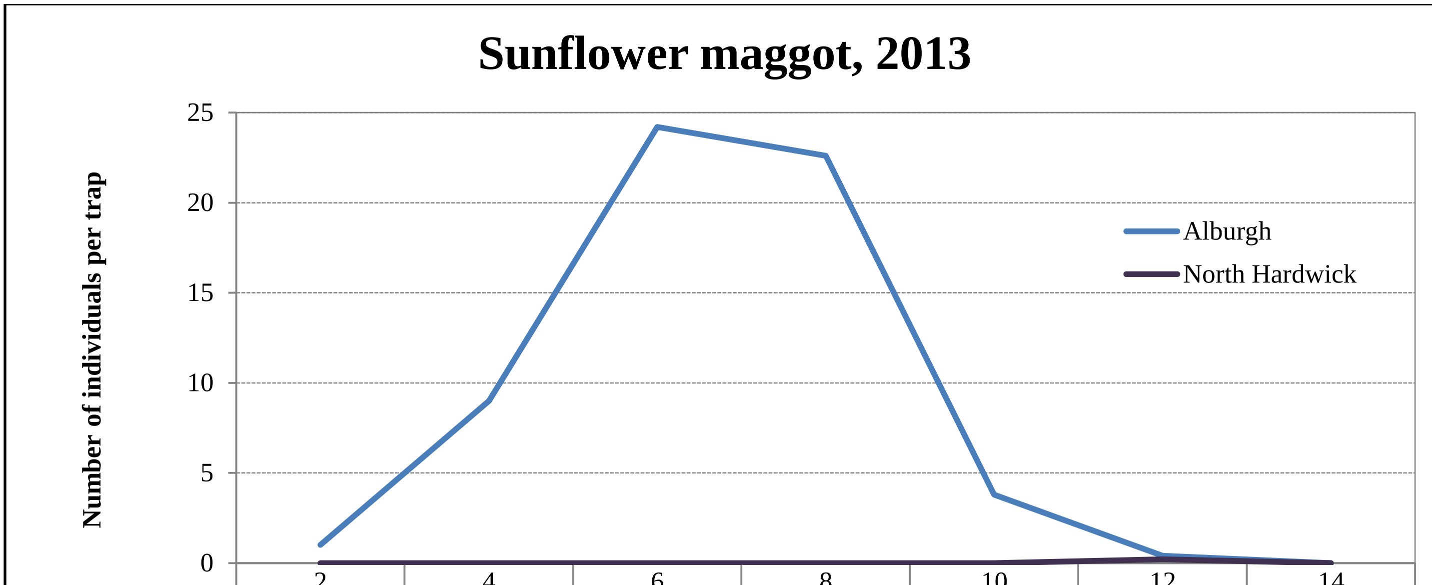


Figure 9. Configuration of five sticky traps.

Only one species of sunflower maggot (*S. longipennis*) was identified on the 2013 sticky traps, and the fly was much more prevalent in Alburgh than in North Hardwick (Figure 10). In fact, there was only one sunflower maggot fly found in North Hardwick all summer—in the 12th week of the study (the last week of August). In contrast, sunflower maggots showed up in Alburgh in the second week of the study (25-Jun), and stayed through the summer, peaking in density in mid-July. This is likely due to each farm's history of sunflower production. The Alburgh farm has grown sunflowers in close proximity to this year's trapping location for many years, while the remote North Hardwick field was a hayfield for years before being turned to sunflower production. North Hardwick also has significantly cooler temperatures and delayed sunflower growth.



	2	4	6	8	10	12	14
Alburgh	1.0	9.0	24.2	22.6	3.8	0.4	0.0
North Hardwick	0.0	0.0	0.0	0.0	0.0	0.2	0.0

Week

Figure 10. Results of sunflower maggot trapping at two locations, 2013.

Conclusions

The results from this insect monitoring project indicate that sunflower insect pests vary in distribution and density across the state, and from year to year. Population size may depend more on previous crop history than on geographical location, and this underscores the importance of careful crop rotation and field planning. Since both banded sunflower moth and sunflower maggot overwinter in the region, their presence in sunflower fields will likely be more and more noticeable if sunflower becomes a popular crop in the area. Deep fall plowing may disturb the insect's overwintering pupae, but crop rotation remains the most effective management tool available.

Growers should scout regularly for insects in their sunflower fields and review information on pest management. Continuous and careful scouting throughout the season at sunflower seed heads, leaves, stems, and flowers will help growers quantify the extent of any emerging pest problems, as well as identify beneficial insects populations (Figure 11). Understanding when insects arrive in relation to the changing season and the lifecycle of sunflower plants will help guide future management decisions such as planting and harvesting dates. For more information on sunflower research, including insect pest identification and control, visit our website at www.uvm.edu/extension/cropsoil/oilseeds.

Figure 11. Scouting sunflowers in mid-summer.

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