Bulletin #2009

IPM Tactics to Reduce Pesticide Exposure to Honey and Native Bees

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This fact sheet was created to supplement the NRCS IPM for Pollinators Program. However, it can also be used as a stand-alone reference.

1 Familiarize yourself with bee taxa (groups). Learn to recognize the major groups of bees: honey bees, bumble bees, and digger or sand bees (also called andrenids). Each field has its own mix of bee species and differing abundances (Figure 1, Resources 1A and 1B).

2 Familiarize yourself with bee behavior. Look for bees when you are scouting for pests or applying pesticides and fertilizers. Learn what taxa or group of bee they are, in addition to when and where they are active in your field. Become familiar with the role that field edges play in supporting bees, and learn to recognize the flowering plants along field edges and interiors that bees visit (Resource 2A). This knowledge will provide insight into how best to limit pesticide exposure to bees. Estimate the pollinator abundance in your field and its effectiveness on fruit set (Resource 2B).

Figure 1: Digger bee on willow (*Salix sp.*)
Photo: Frank Drummond

3 Base your decisions to apply pesticides on action thresholds or disease forecasts. This means that monitoring or sampling pest abundance is critical. Using conservative action thresholds, over the long term, will reduce the potential incidence of bee exposures (Resource 3A). It is also important to pay attention to weather conditions on your farm. Pest forecasting tools, such as the mummy berry forecasting model, help you to identify when an infection occurred and therefore the precise window of time that you have to make a pesticide application, saving bees and money (Resource 3B).

4 Use spot treatments or perimeter sprays when possible. If insect pests or weeds are spotty or confined to field edges for part of the season, only treat where the pests or weeds are present. Do not apply pesticides where there are concentrations of flowering plants that bees are visiting (Resource 4A).

If weeds are flowering along field edges before a perimeter treatment, make sure that the spray does not drift onto the flowering edge. To insure this, spray when

the wind is blowing away from the sprayed perimeter to protect bees foraging along the field edges. The flowers along field edges have been linked to the overall number of pollinating bees in the field during bloom (Resource 4B). Another type of avoidance spray tactic is to spray blueberry maggot fly upon emergence in pruned fields that have been mowed to remove flowering plants (Resource 4C).

5 Mow/cut/treat flowering weeds before spray applications. Always focus on weed management in the prune year, if possible. If flowering weeds are in the field interior, cut weeds down to prevent bees from coming into the field. The following weeds/wildflowers have been observed to have bee visitations: goldenrods, cow vetch, St. John's-wort, red sorrel, black chokeberry, purple loosestrife, clovers, raspberry, blackberry, and dew berry (Figure 2, Bushmann and Drummond 2015).

6 Use cultural controls when possible. For insect pests, prophylactic burning (flea beetles and spanworm) or targeted burning (thrips or tip midge) should reduce insecticide exposure to bees. For plant disease agents that overwinter in the field (mummyberry), a prophylactic burn MAY reduce inoculum (Resource 6A). For weeds, sulfur and burning are prophylactic tactics that reduce the need for herbicides. Hand clipping or mowing weeds can reduce their seed production (Resource 6B). Managing isolated fields on a single crop cycle reduces the need for blueberry maggot controls(Resources 6C, 6D, 6E, 6F).

Figure 2: Paying attention to weeds in bloom is an important factor in minimizing risk to pollinators. Purple loosestrife (*Lythrum salicaria*).
Photo: Lily Calderwood

7 Use least toxic insecticides. We are lucky in that there are a multitude of insecticide choices for most pests. Biological controls and biorational insecticides can be considered. Examples include: insect pathogenic fungus, Beauveria bassiana (Botanaguard) against flea beetle, Bt against spanworm, spinosyns (Entrust) against flea beetle and spanworm. Spinosyns and azadirachtin (neem oil or Azasol) can be effective against spotted wing drosophila. Entrust has much lower toxicity to bees after drying on the foliage. The rate of drying depends on the relative humidity in the air, but generally can range from 1 hr to 24 or 48 hrs. Therefore, knowledge of the short-term forecast is an important aspect to minimizing toxic exposure to bees when using this product. We have also found that applications of acetamiprid (Assail) has a low likelihood of harming honey bees and native bees. Refrain from using LONG residual insecticides near bloom or in fields that have flowering weeds in them. Phosmet (Imidan), even if properly applied and bees are exposed, can kill bees for up to 7-10 days.

Systemic insecticides (those absorbed into plant tissue to move throughout the plant) such as imidicloprid, can present problems. It has been documented in sunflower and squash that systemic insecticides can concentrate in the pollen and nectar resulting in high levels of exposure to bees. We have not found this in imidacloprid in wild blueberry when applied either 12 or 22 months prior to bloom, but this could still be a risky tactic to bees as we do not understand in detail what conditions might result in contamination of pollen or nectar. Therefore, we do NOT recommend use of systemic insecticides for any insect pest management tactic when trying to conserve bee communities.

Try not to tank-mix pesticides. Tank mixes can save you time, but what little is known about toxicity of specific pesticides does not include the synergistic effects of toxicity on bees when bees are exposed to multiple pesticides simultaneously. Only use insecticides

recommended by University of Maine Cooperative Extension (Resources 7A and 7B).

8 **Managing bee pastures / forage.** Bee forage plantings and flowering weedy field edges are extremely important food resources for bees. Increasing flowering plant resources for bees in or around your field contributes to higher wild bee densities. Bee pasture or reservoirs can be planted next to wild blueberry fields, but selecting the correct plant species is important. Seeds need to represent plants that are hardy to Maine's climate and tolerant of low pH soils while avoiding aggressive weedy plants or that flower at the same time as wild blueberries. A discussion of how to plant a bee pasture for wild blueberry fields can be found in Resource 8A. Another discussion worth reading is resource 8B, Venturini et al. (2017).

Good weed control within the field interior reduces exposure to all pesticides applied within the field. Bare spots in fields are attractive to soil nesting bees, as are fields that are burned for pruning. Mark these nest sites to protect them. Avoid applying insecticides on top of large bee soil nesting aggregations in fields (Resource 8A).

9 **Avoid Pesticide Drift.** Make sure that no pesticide drift occurs on bee plantings or along field edges that are heavily populated by flowering weeds. Drift is a function of wind speed and droplet size. Generally, drift is lower when winds are less than 5 mph and droplet size is large (select the nozzle and pressure to reduce droplet size). Additionally, nozzle heads close to the top of blueberry canopy reduce drift. There are also drift retardant adjuvants that may reduce drift. NO WIND, however, is not a good recipe for reducing drift. In the early morning, no wind conditions often cause inversion layers of air that can result in off-site movement of insecticide propelled by warm rising air currents or thermals (Resource 8B).

10 **Too early!** Try to persuade honey beekeepers to not bring in honey bees several weeks prior to bloom during mummy berry treatments. Honey bees may pick up fungicides on wet foliage as they forage for water during warm early spring days prior to bloom. Even though we have found that the azole fungicides (Orbit, etc.) are low risk to honeybees, they do have some physiological developmental effects and can reduce worker honey bee longevity by as much as 8%. It is recommended that growers finish spraying fungicide by bloom so that honey bees brought to pollinate, when bloom starts, experience much less exposure to fungicides. At this time, we do not know how these fungicides affect wild bees. Honey bee hive arrival may be out of your control. IF you can discuss the importance of arrival time with your beekeeper it could minimize exposure to fungicides.

11 **Application of short residual insecticides in the evening.** This has not been tested in Maine wild blueberry. However, EPA recommends this practice based on the notion that because bees are not flying at night, targeted insecticide applications at night will lessen the exposure to bees, but still kill insect pests. This tactic is unlikely to work with a long residual insecticide such as Imidan. It is possible that this would work with short residual insecticides such as Entrust and others, especially if the material dries on the foliage by morning. This strategy should also minimize exposure to low bee toxicity insecticides such as Assail. It is hoped that this tactic will reduce exposure substantially, but it has not been tested in many crops.

Unknowns about evening sprays: 1. Bees may spend the night holding onto flowers if a cold front or rain moves in during their foraging bout in the late afternoon. 2. Dew in the morning can re-wet the insecticide and make the bees more vulnerable to toxic exposure. On the FLIP-SIDE, there is no argument that spraying an insecticide during the day when bees are in a blueberry field, foraging on flowers (weeds and/or crop), is deadly for the bees. The essential rules are to minimize exposure by: 1) using pest action thresholds and disease forecasts to determine when to apply pesticides; 2) anticipating where insecticides will be applied for insect pest control, based upon past experience and observations, and reduce bee forage in these areas by cutting or mowing; 3) using least toxic insecticides; 4) spraying in the evening to reduce exposure even more; 5) using short residual insecticides, 6) reducing the likelihood of pesticide drift onto bee nesting and foraging areas; 7) using cultural and biological controls as alternatives to pesticides; and 8) enhancing bee communities by providing bee pasture.

Resources to Help Attain Your Pollinator Protection Plan

1A. Factsheet #630: *Wild Bee Conservation for Wild Blueberry Fields*
https://extension.umaine.edu/blueberries/factsheets/bees/630-wild-bee-conservation-for-wild-blueberry-fields/

1B. *Bees and Their Habitats in Four New England States*
https://umaine.edu/mafes/wp-content/uploads/sites/98/2018/07/Bees-and-Their-Habitats-in-Four-New-England-States.pdf

2A. *BeeMapper* https://umaine.edu/beemapper/ can help you categorize the habitats present on and surrounding your land.

2B. Video: *How to Estimate Bee Abundance in the Field*
https://extension.umaine.edu/blueberries/factsheets/production/wild-blueberry-videos/

3A. Factsheet #209 - *Insect Control Guide for Wild Blueberries*
https://extension.umaine.edu/blueberries/factsheets/insects/209-insect-control-guide-for-wild-blueberries/

3B. *Blueberry Disease Forecasting Blog*
https://extension.umaine.edu/blueberries/factsheets/disease/mummyberry/

4A. *Spot treatments and perimeter treatments:* Factsheet *#201-Monitoring for the Blueberry Maggot*
https://extension.umaine.edu/blueberries/factsheets/insects/201-monitoring-for-the-blueberry-maggot/

4B. *Are They Weeds or a Life Force? Or Sustainability on the Edge* (Drummond et al. 2017)
https://umaine.edu/spire/2017/05/04/drummond-et-al/

4C. Factsheet #193- *Targeting the Prune Year Field for Blueberry maggot management*
https://extension.umaine.edu/blueberries/factsheets/insects/targeting-the-prune-year-field-for-blueberry-maggot-management/

6A. Factsheet #218-*The Influence of Pruning Methods on Disease and Insect Control*
https://extension.umaine.edu/blueberries/factsheets/disease/218-the-influence-of-pruning-methods-on-disease-and-insect-control/

6B. Factsheet #239-*Weed Control Guide for Wild Blueberries*
https://extension.umaine.edu/blueberries/factsheets/weeds/239-weed-control-guide-for-wild-blueberries/

6C. Factsheet #209 - *Insect Control Guide for Wild Blueberries*
https://extension.umaine.edu/blueberries/factsheets/insects/209-insect-control-guide-for-wild-blueberries/

6D. Factsheet #202-*Blueberry Thrips*
https://extension.umaine.edu/blueberries/factsheets/insects/202-blueberry-thrips/

6E. Factsheet #208-*Blueberry Tip Midge*
https://extension.umaine.edu/blueberries/factsheets/insects/208-blueberry-tip-midge/

6F. Additional cultural controls: Factsheet B852- *Organic Wild Blueberry Production*
https://digitalcommons.library.umaine.edu/cgi/viewcontent.cgi?article=1002&context=aes_bulletin/

7A. Factsheet #209 - *Insect Control Guide for Wild Blueberries*
https://extension.umaine.edu/blueberries/factsheets/insects/209-insect-control-guide-for-wild-blueberries/

7B. For annual information on toxicity, REI and PHI periods see Factsheet-2018 *Maine Wild Blueberry Pesticide Chart* – 1 of 3
https://extension.umaine.edu/blueberries/wp-content/uploads/sites/56/2010/05/2018-Insecticide-Pesticide-Chart-PRINT.pdf

8A. Factsheet- *Enhancing Wild Bees for Crop Pollination: Sowing Bee Pasture for New England's Wild Lowbush Blueberry* (PDF)
https://extension.umaine.edu/blueberries/wp-content/uploads/sites/56/2010/05/2015-Bee-Pasture-Fact-Sheet.pdf

8B. Factsheet #303-*Minimizing Off-Target Deposition of Pesticide Applications*
https://extension.umaine.edu/blueberries/factsheets/integrated-crop-management/minimizing-off-target-deposition-of-pesticide-applications/

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