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Do You "Know Your 5"?

BLUEBERRY POLLINATION

There are more than 350 species of wild bees in Vermont. It can be daunting to understand them all. This fact-sheet presents an overview of blueberry pollination and the five important bees for and supported by blueberry blossoms. By identifying and understanding the natural history of these bees, you can provide the specific habitat that will help to ensure resilient and abundant pollination and the tasty treats that result from the bee/plant relationship.

The domesticated western honey bee *(Apis melifera)* gets credit for most of the agricultural pollination in North America. However, in many cases, wild bee species are more effective pollinators. And unlike honey bees in the Northeast, wild bees do not need human assistance to survive. They just need a safe place to nest and plenty of flowers to eat from.

Blueberry Pollination Overview

Northern highbush blueberry (Vaccinium corymbosum) is an economically important crop in Vermont. Both northern highbush and lowbush blueberries are widespread in the Northeast and an important food for many wild bees. Blueberry flowers have a tubular corolla, hang downward, and contain anthers and a small opening from where the stigma extends. Bushes can produce berries when there is limited or no pollen transfer by bees; however, those berries will be small, ripening will be delayed, early fruit drop may result, and most berries would not meet market standard quality.

Blueberry pollen is relatively heavy and does not move well by wind, making insect mediated pollination essential. Blueberry pollination should be within 3 days of opening, and fruit set is unlikely after 5 to 6 days. Pollen receptivity changes with high temperatures. When temperatures are in the 70°F and 80°F range, successful pollination may be reduced to 1 to 2 days. At temperatures above 95°F, pollination is further restricted. Indicators of successful pollination are flower drop, leading to a white carpet under bushes. Dull brown flowers on the bush can be an indicator of poor pollination. Managed honey bees are a primary pollinator on large blueberry farms around the world, but are relatively poor pollinators on a per-visit basis. Blueberry pollination studies in Vermont, have shown wild bees are the primary blueberry pollinators in the state and pollination visits by wild bees increased seed set and fruit mass with an estimated production increase of 1 to 6 percent (Nicholson and Ricketts, 2019).

Supporting Pollinators and Limiting Insect Pests

Be careful and conservative with pesticide applications. Insecticides, fungicides and herbicides can all pose risk to crop pollinators in different ways. When pest pressure exceeds an economic threshold, or consumer tolerance level, and the benefit of pest control outweighs the financial cost, avoid spraying during bloom when possible. Always follow an integrated pest and pollinator management plan.

Understanding the dichotomy of plants in the landscape that support pollinator habitat while also supporting potential insect pests of blueberries can be helpful when considering crop pest pressure. For particularly economically damaging fruit flies, like spotted wing drosophila, avoid nearby plantings of other soft-fruiting plants that may host this pest (e.g., elderberry, raspberry) and consider removing select plants in the landscape, such as wild brambles, buckthorn and any of the four invasive shrub honeysuckle cultivars in Vermont.

Other pests of concern, cranberry fruitworm (moth) and blueberry maggot (fruit fly), may be hosted in surrounding landscapes by other native, soft-fruiting plants, such as deerberry, huckleberry species, and wild and cultivated cranberry. Cherry fruitworm (moth) hosts can include a number of other fruit tree species, such as wild and cultivated cherry, pear, peach, apple, and other trees and shrubs like hawthorn and rose.

Support pollinators and limit insect pest pressure by enhancing landscape habitat with pollinator nesting space and season long flower blooms, but non soft-fruit bearing plants. Options for trees include maple, black locust, chestnut, and American linden. Useful shrubs to consider include willows, staghorn sumac and meadowsweet (genus Spiraea). Herbaceous annual and perennial flowering plants such as clovers, self-heal, goldenrod and Joe-pye weed are helpful. Early blooming plants attract wild bees to the landscape, while late blooming ones are valuable for increasing the populations of bumble bees and other long-season bees. Nesting and overwintering habitat can be provided by areas of exposed light textured soils, downed snags or logs in field margins, leaf litter, and dead stems that are hollow or contain soft pith that can be removed by insects to make tunnel nests.

General Recommendations For Supporting Diverse Pollinators

Provide flowers, especially native blooms, for as much of the growing season as possible. Also leave a messy area with leaf litter and dead plant stalks, which provides important nesting and overwintering habitat for many bees. Be careful and conservative with any pesticide applications. Avoid spraying during bloom (whenever possible) and follow an integrated pest and pollinator management plan.

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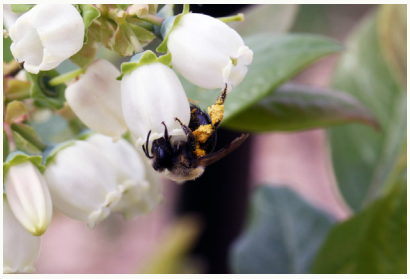
The following five bees are important to blueberry pollination:

Bumble Bees (genus *Bombus)*

These large, charismatic bees are great pollinators of most crops. Queens emerge in early spring and do most of the blueberry pollination. Smaller workers born in early June. Bumble bees are capable of "buzz" pollination, a particularly effective characteristic for blueberry pollination. Early blooming flowers (willows, maples, etc.) and nesting habitat (hedgerows, woodlots) are important to maximize local populations. There are 13 species in Vermont and with practice many can be identified in the field. Having multiple species on a farm adds resilience and increases pollination in inclement weather.

Mining Bees (subgenus *Melandrena)*



This fairly distinctive subgenus of mining bees are among the most abundant pollinators on many blueberry farms around Vermont. They resemble small bumble bees but are more slender and carry pollen on the body, femur and tibia. This is in contrast to bumble bees which just carry pollen on their tibia. They are ground-nesting generalists and are most abundant in May and June.

Carolina Miner *(Andrena carolina)*

Two mining bees in Vermont are specialists on blueberries (and related plants). The Carolina Miner is the more widespread of the two and frequently encountered on blueberry farms. Related shrubs (azaleas, leatherleaf, sheep laurel, etc.) blooming nearby may help to attract and retain the carolina miner and other blueberry-loving bees.

Mason Bees (genus *Osmia)*

These shiny blue bees are efficient pollinators of many spring blooming fruits. The blue orchard bee *(Osmia lignaria)* is a well-known fruit tree pollinator that may be active as early as late March. Females can be identified by the pollen (or pollen collecting hairs) underneath the abdomen. Many species nest above ground in pre-existing cavities (including bee hotels).

Metallic Sweat Bees (genus *Lasioglossum)*

These small, slightly metallic bees are abundant and diverse. They are also capable of "buzz" pollination. Most are generalists that are active through the summer, with at least 27 species recorded from blueberries. Most nest in the ground but several common species nest in rotting logs and stumps, which can be an important habitat feature, especially on wet or heavy soils where ground nesting is limited.

All photos courtesy of Spencer Hardy unless otherwise noted. "Do You Know Your 5?" is a project of the Vermont Pollinator Working Group, with funding from the Gund Institute's Apis Fund (https://www.uvm.edu/gund/apis-fund). For more information about bees, email shardy@vtecosudies.org. For questions about pollinator support practices on farms, email laura.o.johnson@uvm.edu.

Literature Cited: Nicholson, C. N., T. H. Ricketts. 2019. "Wild pollinators improve production, uniformity, and timing of blueberry crops." *Agriculture, Ecosystems & Environment*. 272: 29-37. https://doi.org/10.1016/j.agee.2018.10.018.

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