



Pennsylvania Apple Pollination



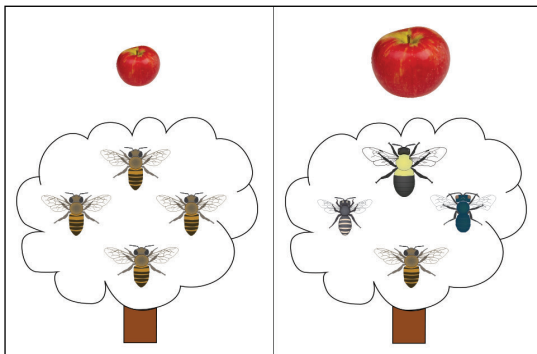
Nancy Adamson

Apples Need Pollination



Apples require cross-pollination between different apple cultivars or crabapples to set fruit. **Pollination is essential for producing large, well-formed apples.** However, only 2-5% of all apple blossoms need to set fruit to produce a commercial crop; additional fruit are hand- or chemically thinned. Pennsylvania apples are visited by managed honey bees and over 50 species of wild bees. A few growers also use the Japanese Orchard Bee (JOB), a managed mason bee. The JOB was introduced into PA 25 years ago by the USDA and has since naturalized in the area. All of these bees visit apple flowers to collect pollen and nectar to feed their young.

Integrated Crop Pollination: combining strategies to improve pollination



Apples visited by many different kinds of bees (see tree on right) have higher seed and fruit set, and produce larger, better-formed fruit. (Blitzer et al. 2015).

Many PA apple growers no longer rent honey bees for apple pollination, but instead rely on wild pollinators. Wild bees are abundant and active pollinators in most PA orchards, which are typically small (<10 acres) and surrounded by woodlots and fencerows that support many species of wild bees.

Apple growers that rent honey bees benefit from having wild bees in the orchard too; orchards visited by many different kinds of bees have higher fruit set than those visited by one kind of bee. Different species of bees tend to visit flowers at different times of the day and may be active at different times through the bloom season. Having a diverse set of pollinators active in your orchard can ensure consistent pollination from the beginning to the end of crop bloom.

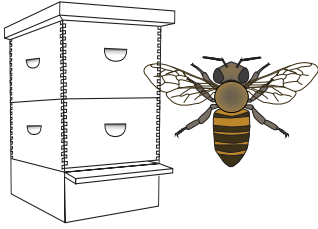
In addition, cool, rainy, and windy spring weather can lead to poor pollination. A number of wild bees are tolerant of temperatures of 5-10 F lower than the honey bee. **These bees can help pollinate the crop under variable spring weather.**

Maintaining woodlots and wild flowering plantings around the orchard supports wild and managed pollinators by providing extra pollen and nectar sources for bees in addition to nesting resources and refuge from pesticides.



Kelly Gill

Meet the Pollinators

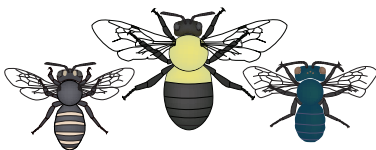
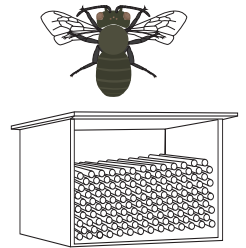


Honey Bees (*Apis mellifera*) can be managed or rented for apple pollination. Honey bees are less efficient apple pollinators per visit than some wild species, but are easy to manage and transport, and provide many active pollinators per hive. Honey bees are social insects; on any given day, a 6-8 frame colony will have roughly 14,000 – 19,000 pollinating bees. Hives are typically placed at a rate of two hives/acre when the crop reaches 5-10% bloom, and are usually removed from fields at petal fall.

Japanese Orchard Bees (JOBs)

(*Osmia cornifrons*, also called hornfaced bees) are managed bees used by some apple growers.

These solitary bees nest in drilled wood or cardboard tunnels that mimic their natural nests in beetle bore holes, and fly under cooler and cloudier conditions than honey bees. A single JOB can set up to 2,450 apple blossoms in a day compared to 50 blossoms by a honey bee! About 600 JOB (250 females) are typically released into orchards about 7-10 days before apple bloom and removed from orchards about 2 weeks after bloom finishes. Nests can be stored in barns until the fall, when cocoons are removed and cleaned of parasitic mites, then refrigerated for the winter. This is a new industry and management practices are still being developed to scale up to commercial orchards.



Wild Bees and flies visit apple flowers in many orchards, especially those near woodlots or other natural habitat. Researchers found more than 50 different species of wild bees visiting Pennsylvania apple flowers. Some of the most common species include mason bees (*Osmia* spp.) and mining bees (*Andrena* spp.). Many wild bees, including mining bees, nest in the ground and prefer areas with well-drained bare soil. The more different kinds of wild bees an orchard has, the better the fruit set.

Three Practices to Support Bees

1 Protect natural habitat around orchards and add additional flowering plants

Natural areas provide flowering resources and nesting sites that support wild bee pollinators. Flowering plants provide pollen and nectar for bees and their offspring. In the early season, flowering trees such as willows, maples, and red buds are especially important. More diverse nutrition helps bees stay active and healthy.

2 Minimize pesticide risks to pollinators

Use integrated pest management (IPM) to make targeted pest management decisions. Avoid spraying during bloom. If sprays are needed, spray after dusk or before dawn when bees are not active in the orchard, and avoid tank mixes. Whenever possible, select pesticides that are less toxic to bees.

3 Communicate with your beekeeper

Set up a contract to define the expectations of both parties and notify your beekeeper if spraying the orchard.

Additional Resources

Integrated Crop Pollination
<http://projecticp.org>

Center for Pollinator Research
<http://bit.do/pa-poll-research>

Native Pollinator Videos
<http://bit.do/poll-videos>

Mason Bees
<http://bit.do/mason-bees>

Cover Crops for Bees
<http://bit.do/pa-cover-crops>

**Wild Pollinators of Eastern
Apple Orchards**
<http://bit.do/wild-bees-apples>

**How to Reduce Bee
Poisoning from Pesticides**
<http://bit.do/reduce-bee-risk>

**Integrated Pest & Pollinator
Management for Apples**
<http://bit.do/ippm-apples>

**Wildflower Meadows for
Pollinators in PA**
<http://bit.do/pa-cons-cover>