



Trees, Bees, and Pollination

**TREE CITY USA®
BULLETIN**

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With today's concerns about so many things negatively impacting our environment, the silent crisis of pollination can easily go unnoticed — and fruit trees and ornamentals are center stage in this important issue. The good news is that at least some of the problem can be addressed by all of us through a few simple but essential actions.

It is not much of an exaggeration when the National Park Service issues a warning that “life, as we know it, depends on pollinators.” But who or what are the pollinators and what’s the problem?

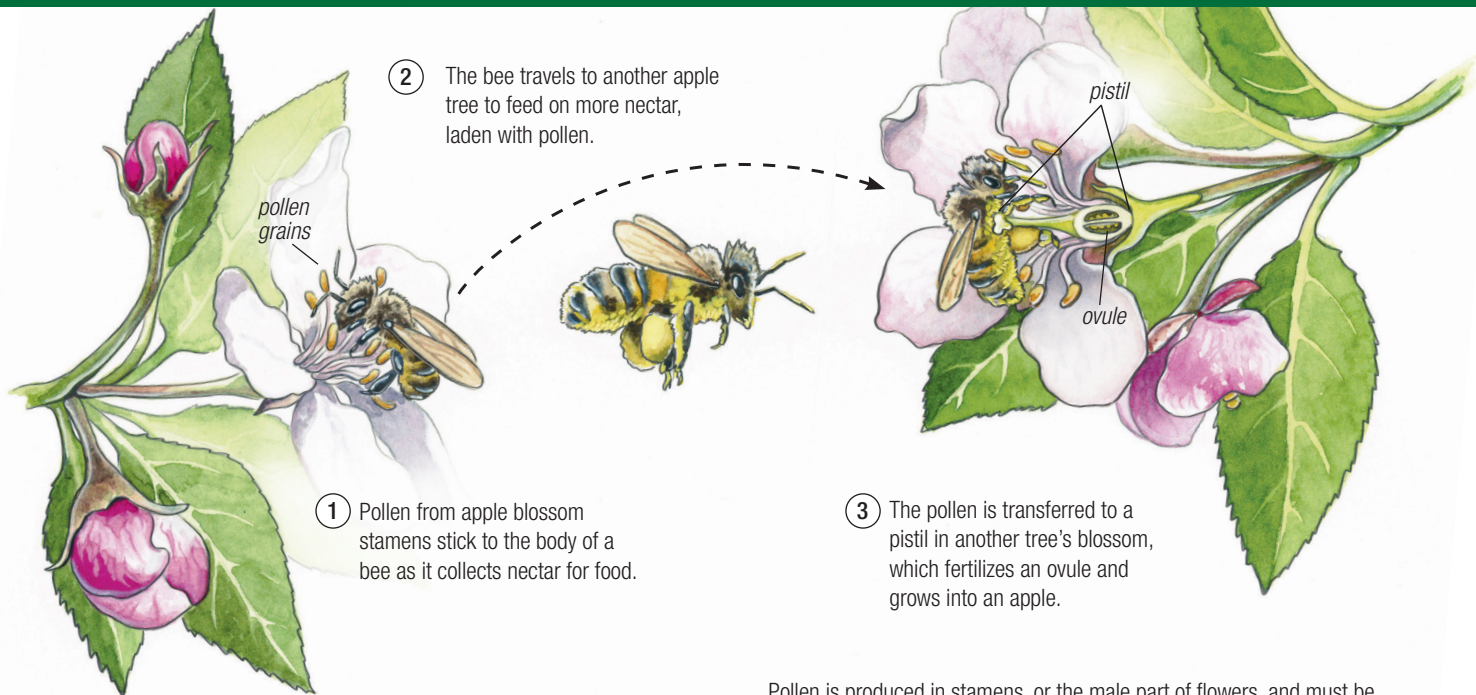
Bees, of course, are the rock stars of the pollination world. However, they are joined by other creatures that, like the bees, go about visiting blossoms, inadvertently transferring pollen from one flower to another. The results are the fruits, vegetables, and ornamental flowers we value and often take for granted. Not to be overlooked as pollinators are bats, butterflies, beetles, and other insects. Even birds, especially hummingbirds, do some pollinating. Wind and splashing raindrops round out the other pollinating agents. Together more than 75% of the Earth’s flowering plants depend on pollination.

The sad part is that the number of pollinators is falling drastically. Domestic beekeepers report as much as 42% annual losses. Populations of wild bumblebees are also falling, and several wild bee species in the U.S. are at risk of extinction.

The perils for pollinators include disease, parasites, shrinking habitat, indiscriminate use of pesticides, climate change, and lack of a diverse food supply. Of these causes, at least four can be directly addressed by tree boards and individuals who work with trees and gardens.

The welfare of pollinators should be an important consideration in land stewardship ranging from individual backyards to municipal strategies for sustainable urban forestry.

Pollination: How it Works



PERTINENT FLOWER PARTS

Pollination is the transfer of pollen grains from the male anther to the female stigma. If the flowers are compatible and all conditions are right, the pollen grain germinates and extends a tube into the ovary. Fertilization occurs and a seed begins to grow.

Depending on plant species, the flower may have one or both reproductive parts (perfect flowers), separate male and female flowers on the same tree (monoecious), or male and female flowers on separate trees (dioecious).

Pollen is produced in stamens, or the male part of flowers, and must be transported to the pistils, or female part. After fertilization, the ovary begins to ripen into fruit. For successful pollination, blossoms on compatible tree varieties must appear at the same time. Wind and insects then transfer the pollen, with bees being the most effective courier.

SELF- AND CROSS-FERTILIZATION

In some species, self-fertilization can occur on the same flower or other flowers on the same tree, but this does not allow genetic variation. (Nonetheless, there are some successful self-fertilizing fruit trees on the market.) In some cases, a flower's biochemistry recognizes its own pollen and will reject it, as it does with pollen from species other than its own.

Cross-fertilization occurs when the pollen from a different tree of the same species makes a successful transfer. This ensures genetic variety and usually produces fruits of higher quality.

AN AMAZING RELATIONSHIP

Who would guess that there is a relationship between bees and grizzly bears? From research in Glacier National Park, the U.S. Geological Survey found six species of bumblebees pollinating huckleberry bushes. Grizzly bears get about 15% of their diet from these plants, so fewer bees means fewer berries, which can affect bear range and behavior.



Bees in the Orchard

There is probably no place where the importance of bees is as clear as in an orchard. In economic terms, orchard pollination by bees is estimated at more than \$6 billion annually in the United States. In terms of food security and enjoyment, the results are priceless.

The bumper sticker that reads “Thank a farmer” should be expanded to add “and bees.” Without cross-pollination, most fruits would be undersized or abnormally shaped, if they were produced at all. Therefore, orchardists do all they can to encourage bees to work among their trees. The techniques include:

- Keeping or renting honeybee hives. Timing is essential so that the hives are in place when blossoms are in the “popcorn” stage of being about 10% open. Ideal weather helps, too — temperatures in the mid-60s, wind under 15 mph, and no rain.
- Having two hives per acre is usually adequate, distributed throughout the orchard.
- Creating garden spaces and/or providing more nesting sites for wild bees.
- Providing water (free of farm chemicals) near the bee habitat for native and honeybees. Pans, refreshed every few days, work nicely. Burlap draped over the edge prevents bees from drowning.

Effective cross-fertilization also involves making sure there are compatible trees present. This may mean mixing rows of two different marketable varieties or in some other way making sure pollinator trees are within 100 feet of the trees bearing the marketable fruit. Two key considerations are they must be of the same species and must flower at the same time.



The lack of enough bees in an orchard is blamed for the quality of the pear on the left side of this photo.

BACKYARD FRUIT TREES

The same principles hold true for tree owners in urban areas. For example, a pollination-compatible flowering crabapple might be planted within 100 feet of an edible apple tree. Or a Red Delicious apple and a Lodi apple might be planted next to each other. County extension offices and reputable tree nurseries can provide information about what trees should be planted together to ensure cross pollination.

Planting two different fruit tree cultivars of the same species near each other is as important as selecting trees that are suitable for the area's hardiness zone.



Bees and Landscape Trees

All trees play a role in helping to attract and sustain healthy populations of bees and other pollinators. But some work better than others.

One of the many benefits of planting for tree diversity in the community, or even the backyard, is that landscape trees blossom at different times throughout the season. This provides pollinators with a broad spectrum of time in which to gather pollen and nectar. Landscape trees also provide excellent resting and hiding places for insect and bird pollinators.

A CHECKLIST OF RECOMMENDED TREES

Here are a few of the many trees that have special qualities that benefit pollinators:

- Black Cherry
- Black Locust
- Tupelo
- Willow
- Fruit Trees
- Linden (Basswood)
- Magnolias
- Oaks
- Sourwood
- Sweetgum
- Yellow Poplar (Tuliptree)

The Yellow Poplar (Tuliptree), is an abundant source of nectar and pollen for honey bees, native bees, and hummingbirds.



Philadelphia's Orchard Project (POP) was started in 2007 by economic development pioneer Paul Glover. The program uses residents and other volunteers for labor in low-income neighborhoods. It reclaims vacant lots to make neighborhoods safer, cleaner and more livable, and teaches marketable skills to participants.

FRUIT TREES IN THE CITY

Fruit trees and the benefits they provide need not be limited to rural or suburban orchards. Increasingly, they are viewed as a way to increase the availability of fresh food in underserved areas of large cities. Here urban orchards can be used to make good use of vacant parcels as well as to provide

wholesome, healthful food. They are also a way to build community pride and bring together diverse individuals to plant and care for the trees. Anywhere in the community, fruit trees can be considered to offer an alternative to shade trees or other ornamentals.

A SWEET BYPRODUCT

Arguably the best honey is not made from the common clover flowers, but rather from trees. What can compare with orange blossom honey or the famous sourwood honey? But from whatever source, the work that bees put into it is truly astounding. Here's why.

One honeybee visits 50–100 flowers during a collection trip and may make 12 or more round trips in a day. Still, the busy bee can make only about one-twelfth of a teaspoon in its lifetime of about 6 weeks. It takes about 556 worker bees to gather one pound of honey and requires approximately 55,000 flight miles to make a gallon. Fortunately, there are often 50,000 or more bees in a colony to share the work. Together, a colony can produce about 60-100 pounds of honey in a year.

The bees, of course, aren't thinking of us when they make honey. They use pollen as a protein source and nectar is transformed into honey for long-term food to get them through winter. So, are we stealing their food when we harvest honey? Fortunately, the bees make an excess of honey and removing a portion of it does no harm. And the pollen that gets transferred from one flower to another in the process of pollination is just an accident from excess grains brushing off the bee (or other pollinator).

Sourwood trees are among the landscape trees that offer a multitude of benefits. They include not only nectar for fine honey but beauty in summer and fall.



WHAT ABOUT MALE AND FEMALE TREES?

“Too many males always spells trouble!”

That is a quote from an interesting book that points out a quandary for urban forestry. The book has the eye-catching title, *Safe Sex in the Garden*. In it, author Thomas Leo Ogren points out that among dioecious trees (male and female flowers on separate trees), female trees are being planted less than males because they (the females) produce seeds and fruits that are often considered “messy” in urban landscapes. The quandary is that male trees produce the pollen that affects an increasing number of people today who suffer from pollen allergies. Ogren writes, “Between specifically planting large numbers of male clones and the systematic removal of female trees, we have created quite a situation. As is so often the case,

when we manipulate large ecosystems and don't consider the consequences, we create a host of new problems.”

Female trees not only provide us with the fruit we love (except when it falls on sidewalks and patios) and attract more birds, bees, and butterflies, but their millions of sticky stigmas act as nature's pollen traps, or what Ogren calls “our natural air cleaners.”

Ogren notes that four of the five top-selling street tree cultivars are male clones. If there is a message here, it is that when considering trees to plant, gender is yet another characteristic to add to the selection matrix. Balance, diversity, and moderation are always good principles to follow.

Gardens to Invite Pollinators

A pollinator garden is a good way to give a boost to bees, butterflies, and other pollinators.

Some communities create special gardens and education sites to help provide food and habitat to our beleaguered pollinators and raise public awareness about this need. This is something that can be done by tree boards, schools, civic organizations — or individual property owners. Here are some basic steps to consider, with more information at the website mentioned on page 8. You can also visit existing pollinator gardens and get advice from county extension offices and native plant societies in your area.

THE SITE

Almost any parcel of property can provide enough space to help pollinators. Even window or balcony boxes outside an apartment can help, or a narrow strip of little-used land, or within a row of widely spaced trees. The key is plenty of sunlight, no nearby use of insecticides, and soil cultivated thoroughly to loosen it and be rid of weeds. If space allows, a muddy spot provides insects access to water and soil minerals. Consider replacing an area of turf to save on mowing and watering.

DESIGN

An aesthetic benefit of pollinator gardens is that they provide a beautiful but informal appearance. Plant in same-

plant clumps of four or five, with tall species at the center of the garden or in back (coneflowers, black-eyed susans, asters, etc.), then mediums such as catmint, and short plants in front.

PLANT SELECTION

This is key, and a mix of numerous species will help ensure the availability of specific flowers needed by wild bees. When possible, select native plants, grown chemical-free, and — for bees — bright blue, white, or yellow flowers. At least some should be tubular and aromatic, with landing platforms (such as snapdragons). For monarch butterflies, milkweeds should be among the mix; hummingbirds prefer red blossoms. Select plants that bloom at different times throughout the season.

TAKE CARE OF THEM

Don't let the informal look of a successful pollinator garden fool you. The plants still need adequate water, especially during the first year, and the removal of weeds. Leave the stalks and seed heads in autumn and then cut back the old vegetation in late spring. Use compost and organic mulch when necessary and avoid fertilizers.

Gardens for pollinator food and shelter can be any size.



Taking Action for Pollinators

Many organizations throughout the country help insect pollinators by integrating their habitat and food sources into our built environment. Here are four examples.

DAVEY RESOURCE GROUP, a division of The Davey Tree Expert Company, has a long history of installing pollinator gardens at corporate and community sites. The company has also worked with the Ohio Turnpike Commission and Keep Ohio Beautiful to create educational pollinator gardens at two of the Ohio Turnpike's busiest rest stops. In partnership with the Ohio Department of Transportation, Davey is also mapping suitable habitat sites throughout the state.

UTILITY ARBORIST ASSOCIATION and member companies are including pollination habitat in the "integrated vegetation management" of power line rights-of-way. This includes favoring pollinator-friendly vegetation during clearance operations and timing mowing with the end of butterfly migration periods.

POLLINATE NEW ENGLAND is a program of the Native Plant Trust supported by a grant from the Institute of Museum and Library Services. The purpose is to work with partners to create a network of model pollinator gardens throughout six states. Interpretive signs and educational programs are part of the effort to equip homeowners with the knowledge they need to create gardens and landscapes that benefit pollinators.

PENN STATE CENTER FOR POLLINATION RESEARCH, the Xerces Society, and a host of other universities, government agencies, and nonprofit organizations are working to help pollinators survive and thrive.



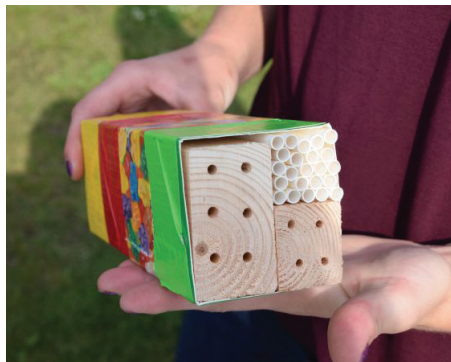
Make a Bee Hotel



There are more than 4,000 native bee species in the United States and some, like mason bees, make great pollinators. Mason bees are solitary and called the “gentle bees” because there is little danger of being stung by them. They are also easy to attract and anyone can provide a place for their nests and overwintering cocoons.

Mason bees use tunnels as their nests, often those found in dead trees. Commercial bee houses are available that use tubes that are easily cleaned or replaced. Homemade bee hotels can be made by simply drilling a series of tunnels in the end of a short log or untreated lumber. Here are some other considerations:

- The tunnels should be about 5/16" in diameter and 6" in depth. (A few other diameter sizes can be used to attract different species of wild bees).
- A roof or building overhang should be used to shelter the entrance holes so rain does not soften the mud used to seal egg cells and the entrance. New bees then emerge in the spring.
- Place the hotel out of the wind and facing east or south to catch the morning sun, but in a location that is shaded on hot afternoons.
- A height of 6–7' above the ground is recommended.
- During the winter months, store in a dry, cool place.



(Above left) Bee hotels can be constructed or purchased. This one has multiple-size tubes and they are cleanable.

(Below left) Making bee hotels is a good youth project. Straws or drilled holes both work well and are easy to construct.

(Below) A homemade bee hotel made from part of a firewood log and scrap material.



FOR MORE INFORMATION

For quick links to sources for more information about topics covered in this bulletin, please visit arborday.org/bulletins.

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