

Pollinator Garden of Merit By Linda and Rich Silverman, Penn State Master Gardeners

Our third 'Garden of Merit' for pollinators is the garden of Carol Glasgow in Mechanicsburg, PA. Her suburban home is on a .19 acre lot with different microclimates around the property. The front is full sun. The back is almost equally divided by sun and shade and is dry with some wet spots using downspout run-off.

She has lived here for 20 years and it was a typical central PA landscape with mature trees, yews, rhododendrons, spireas, forsythia, and holly with truly awful soil. She started in the back with two 4x4 raised beds and a small entry bed leading to the house around 1997. That was followed by a mixed perennial border and the beginning of the shade area. She removed more turf grass and added plants.

In 2011, the front yard was transformed into all gardens with paths and plantings. In the fall of 2013, the sidewalk to curb strip was sheet mulched and planted the following spring. It is a great storm water management technique for keeping water out of the sewer and on your property. It has a mix of natives, herbs, and sedums.



Carol Glasgow in her pollinator friendly garden

Carol answered the following questions about why her garden is pollinator-certified.

1. How many species of native plants do you have?

I have a diverse collection of plants. My front gardens have about 28 native species and 30 pollinator friendly plants. In the back yard, there are 38 native species and other perennials, trees, and shrubs. I also keep a small vegetable garden, herb bed, and annuals in the ground and pots.

I became a Master Gardener in 2008 and my training led to a deeper understanding of the plant world. I use some of my plants in horticultural therapy programs and activities at long-term care facilities and adult day-care centers in Cumberland and Perry County. I harvest and use them for artwork and other crafts. I'm fascinated by the meanings of flowers and am up to 65 plants representing characteristics and traits. The latest is a Carolina Allspice *Calycanthus floridus*, meaning benevolence, which has a beautiful fall color.

Continued on next page

2. What have you done to increase pollinator diversity?

This is an old suburban development featuring front yards mowed short and boring foundation beds. I feel like my gardens are a pollinator oasis in a barren desert of turf grass. I'm seeing more bee species than I can name and numerous butterflies. I need to work on identifying the pollinators beyond the recognizable swallowtails and monarchs and bumblebees. I've added natives to both host larvae and provide pollen and nectar. Much of the garden cleanup waits until spring. I've incorporated tree stumps, rocks, birdbaths, and bare ground into landscape. I don't have a real insect problem because of the diversity. I do have my hemlocks professionally treated for the hemlock wooly adelgid, which is the only pesticide I need.

3. How did you get into gardening? How did you get into natives?

I still recall when my Dad helped me make a little childhood flower bed. There was a magical thrill when little zinnias and marigold seeds emerged, grew and turned into beautiful flowers. He was not a gardener, but he was supportive. I continue to learn new things. I recall a presentation on how people fight nature instead of working with it. I've been making a deliberate effort to get more natives in the ground ever since.

4. What are your future plans to increase pollinators in your garden?

I've been focusing on educating myself on what different pollinators need. As budget and time allow, I'm removing less desirable species. It is a process and the garden is always evolving. I want to increase the spring pollinator plants and add more natives to my shade area.

5. What have you observed this year in regard to the number of bees and other pollinators?

This year, the bees were out early and looking for food. As the season progressed, I've seen a tremendous amount of bees. The swallowtail butterflies are showing up now but no monarchs yet. (Date of interview was 8/11/16) Last year was great for them so I'm hopeful that they're just running late. Hummingbirds are busy and feeding well on quite a few plants.



Diverse plantings attract a wide array of pollinators

We are recognizing Carol's garden for a great pollinator friendly property in the midst of the usual 'non-friendly to pollinators' suburban landscaping. Also, her desire to learn more about which plants support our pollinators best is why she is receiving the 'Gardens of Merit' designation.

Picky eaters: Bumble bees prefer plants with nutrient-rich pollen By Sara LaJeunesse

Bumble bees have discriminating palates when it comes to their pollen meals, according to researchers at Penn State. The researchers found that bumble bees can detect the nutritional quality of pollen, and that this ability helps them selectively forage among plant species to optimize their diets.

"Populations of many bee species are in decline across the world, and poor nutrition is thought to be a major factor causing these declines," said Christina Grozinger, director of the Center for Pollinator Research, Penn State. "Our studies can help identify plant species and stocks that provide high-quality nutrition for bumble bees and potentially other bee species, which will help in the development of pollinator friendly gardens and planting strips."

According to Anthony Vaudo, a graduate student in entomology who led the study, scientists previously believed that bees' preferences for flowering plants were driven by floral traits, such as color, scent, morphology or nectar concentration.

"Here we show that bumble bees actually choose a plant for the nutritional quality of its pollen," said Vaudo. "This is important because pollen is bees' primary source of protein and lipids."

The researchers observed and recorded bumble bees as they foraged for pollen among host-plant species in an outdoor arena where the bees were restricted to only those plants. They then determined the carbohydrate, protein and lipid concentrations, as well as protein-to-lipid ratios (P:L), of the pollen from all the plants within the arena. The team analyzed the relationship between the foraging rates and the nutritional quality of the pollen. They report their results in today's (June 27) issue of the Proceedings of the National Academy of Sciences.

Continued on next page

Picky eaters: Bumble bees prefer plants with nutrient-rich pollen (Continued from Page 2)

"We found that bumble bees preferentially visited plants with pollen that had high P:L ratios," Vaudo said. "We did not see a direct relationship between bee visitation and pollen carbohydrate, protein or lipid concentrations."

According to Grozinger, many studies have shown that other animal species regulate their diets to make sure they get enough -- but not too much -- of their key nutrients to stay healthy. "Bees likely get the majority of their carbohydrates from nectar, and then need to selectively feed on different kinds of pollen to get the right amounts of both protein and lipids," she said. The plants with highest visitation by bumble bees in this study included American senna, spiderwort and Culver's root.

The scientists confirmed their finding that bumble bees prefer pollen with higher P:L ratios using a laboratory cage study in which they placed bees in cages in the absence of floral cues. Instead of flowers, they presented the bees with fresh pollen from different plants. The scientists again found that bees preferred pollen with higher P:L ratios.

Finally, to test whether the bumble bees' preferences were due to nutritional quality and not some other chemical signal in the pollen of the different plant species, the researchers homogenized the pollen collected by honey bees into a nutritionally uniform mix. They then added protein and lipids to the pollen to create diets of different P:L ratios, and provided these to the bumble bees. The bees still preferred pollen that had the same P:L ratios as was found in the field studies.

"These nutritional ratios are likely those that most closely match the optimal nutritional needs of the bumble bees," Vaudo said. "The bees seem to optimize their nutritional intake and do not simply try to maximize the amount of protein in their diets."

How do bumble bees know the P:L content of pollen? "It is likely that bumble bee workers sense the protein and lipid content of pollen with two strategies," said Vaudo. "First, there is a chemically complex substance on the outside of pollen called the pollenkitt that includes free amino acids and fatty acids. It is likely that the bees taste pollen quality directly from the pollenkitt with chemotactile receptors on their antennae or mouthparts. Second, after the bees consume pollen, the nutrient concentrations of proteins, lipids and carbohydrates in their bodies change and can cause an increase or decrease in the sensitivity of their taste receptors for those nutrients."

According to Vaudo, extending these methodologies to other bee species could reveal that nutritional needs and preferences of bee species explain their distribution among host-plant species as well. It could also help explain why these distributions may vary year to year and how bees associate other floral cues with rewarding and unrewarding resources.

"Our findings may guide the selection of plant-species for habitat restoration for bee conservation," said Vaudo. "We could select the plant-species that provide the nutritional resources that bees need and prefer so that we can improve bee survival, health, reproduction and the size of bee populations."

The North American Pollinator Protection Campaign Bee Health Improvement Project, the USDA Agriculture and Food Research Initiative National Institute of Food and Agriculture, and an anonymous donor to the Center for Pollinator Research supported this research.



Bumblebee collecting pollen from Culver's root

Protecting Pollinators

Avoiding Invasives:

Euonymus alatus - Burning Bush

By Connie Schmotzer, Penn State Extension

Euonymus alatus, or burning bush, aka firebush, aka winged euonymus, is one of the most widely used landscape plants in yards across America. Grown for its fall color and colorful fruits, it is tough plant that takes on challenging sites.

Unfortunately, many of the same characteristics that make *Euonymus alatus* a successful ornamental also makes it aggressive in natural environments. First introduced into the United States from Asia as an ornamental plant in 1860, burning bush is consistently carried into forests by birds, small mammals and water runoff. In some places, it has displaced the important native pollinator plants that live there (see USDA map below). In Pennsylvania it is an acute problem in the south and along the eastern border, although it has been noted in the Allegheny and Erie region as well.

The invasion problem is most likely made worse by browsing whitetail deer that will bypass the invader for the native species. The detrimental effects of *Euonymus alatus* have caused several eastern states to ban its sale. Much work has been done to produce cultivars that produce less seed, but so far there is little evidence that these cultivars are safe alternatives. (Brand, Lubell, Lehrer, Hort Science). For more information about the problems with burning bush, go to:

<https://www.nps.gov/plants/alien/pubs/midatlantic/eual.htm>

If you feel like you can't do without burning bush's fall color, but would like to protect pollinator habitat, try planting Virginia sweetspire (*Itea virginica*) instead. This gorgeous native will reward you and the pollinators with beautiful spring blossoms, nice summer foliage and tremendous fall color. It's easy to grow in most soils and in sun and shade alike. Or try red chokeberry (*Photinia pyrifolia*). This multi-stemmed shrub grows 6 to 12 ft. tall, and has three-season interest. In spring, pollinators will love the flat-topped clusters of white flowers. Flowers give way to dark green, glossy leaves that turn rich, orange-red in fall along with bright red berries.



Euonymus alatus



Euonymus alatus invading a forest.
Picture by Leslie J. Mehrhoff,
University of Connecticut, Bugwood.org

OUTSTANDING POLLINATOR PLANTS

Agastache foeniculum.- anise hyssop

By Priscilla Waldman, Penn State Master Gardener

Agastache proved to be the most attractive plant for pollinators in the Master Gardener Statewide Pollinator Preferences monitoring project for the monitoring period 2013 - 2015 - we were monitoring for specific species of bees.

The most frequent visitor was the bumble bee followed closely by the European honey bee. The carpenter bees generally were third with the green metallic sweat bee the least frequent visitor. Generally, the straight species had the more pollinator visits than the cultivars except for 'Blue Fortune' and 'Black Adder'.

In addition to bees, pollinators attracted to *Agastache* include hummingbirds and butterflies: I have seen monarchs, tiger swallowtails and spicebush swallowtails nectaring on my straight species *Agastache*. Goldfinches flock to the straight species beginning in August as the seeds begin to provide a feast. NOTE: you will not see goldfinches on the cultivars because the cultivars are sterile and do not produce seed!

Just the FACTS: Common Name: anise hyssop; Type: Herbaceous perennial; Family: Lamiaceae; Native Range: North America; Flowers: Showy, Good cut or dried; Great for borders; Flowers and leaves are edible - for straight species, I have used in tea, sprinkled on salad and heard of the use of seeds in cookies; Leaf: Fragrant - smells of anise; Deer, rabbit and drought tolerant; Require well-drained soil.

Based on garden size and personal aesthetic, gardeners will also want to consider the following specific characteristics and differences:

***Agastache foeniculum* (straight species):** Height: 2 to 4ft. Spread: 1.5 to 3ft; Bloom Time: June thru September; Lavender bloom; Full sun to part shade; Culture: Plants will spread by rhizomes and will easily self-seed in optimum growing conditions.

***Agastache* 'Blue Fortune':** Height: 2 to 3ft; Spread: 1.5 to 3ft; Bloom Time: July thru September; Deep Blue-lavender bloom; Full sun; Culture: Plants do not set seed as flowers are sterile. Removing faded blooms will help to lengthen the flowering time.

***Agastache* 'Black Adder':** Height: 35 to 47in; Spread: 18 to 23in; Bloom Time: Mid-summer to mid-fall; Purple bloom with dark green foliage; Full sun; Culture: Plants do not set seed as flowers are sterile. Appropriate for use in containers.

All three of these species are especially attractive in combination with *Rudbeckia* or purple coneflower. Remember, if you wish to see the goldfinches visiting to feast on the seeds, you will need to plant the straight species as the cultivars are sterile and will not produce seed.



Agastache foeniculum
a pollinator magnet