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Supporting Biodiversity in the Garden

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Sustainable sites support biodiversity, defined as the variety of life forms within a given ecosystem, biome, or the entire earth. In your backyard, you can provide a diversity of vegetation that serves as food and habitat to attract and support a variety of local wildlife.

Why is it important to support biodiversity in your garden?

There are few other places for biodiversity to go. Of the entire United States, only 5% remains in natural lands, with the rest devoted to agriculture and other development. The vast majority of these natural lands are considered ecological islands—unconnected fragments of habitat that don't provide sufficient space for diverse ecosystems to operate and survive. The role of home landscapes in providing food and habitat for wildlife is becoming increasingly essential to the continued existence of biodiversity in our country and even our planet.

Biodiversity provides essential ecosystem services for all humans: clean air, clean water, nutrient-rich topsoil for growing food, pollination, weather buffers, carbon sequestration, and waste recycling. The complex relationships between diverse species in an ecosystem generate tangible benefits to humans. Encouraging biodiversity in the home landscape can help prevent the breakdown of these natural and essential processes.

Backyard wildlife connects humans to the natural environment. Inviting a wide variety of plants and animals into your landscape offers unparalleled opportunities for observing the workings of the natural world.

What does wildlife need, and how can you provide it?

Food. The plants in your garden are the basis of animal diversity, converting carbon dioxide, sunlight and water into food energy on which all animals depend. At the base of the food web are insects, most of which depend on certain species of plants for survival. Providing the right types of plants to attract a diverse community of insects will also attract their predators, promoting a balanced ecosystem. Research has shown that native plants support local insects better than plants that evolved in different places.

Water. All living things depend on water in some form to survive, whether drawing it from the ground, the air, a surface water source, or from food plants. In your garden, providing a reliable source of water such as a small pond, container water garden, or a simple bird bath will support a wide range of plants and animals.

Shelter. Provide habitat for a diverse array of wildlife by supplying three levels of protection – a canopy of trees, a middle layer of shrubs, and a ground layer of herbaceous perennials. Stones, brush piles and hollow logs also provide good cover for wildlife.

Safety. Making your backyard fit for a variety of plants and animals means limiting the use of pesticides and herbicides, whose effects are multiplied as they travel up the food web.

Supporting Specific Types of Wildlife in Your Garden

Bees Humans are undeniably reliant on bees: Over 1/3 of the food we eat depends on their pollination services. With the drastic reduction in bee populations in recent years, it has become increasingly important to incorporate bee forage and habit into our landscapes.

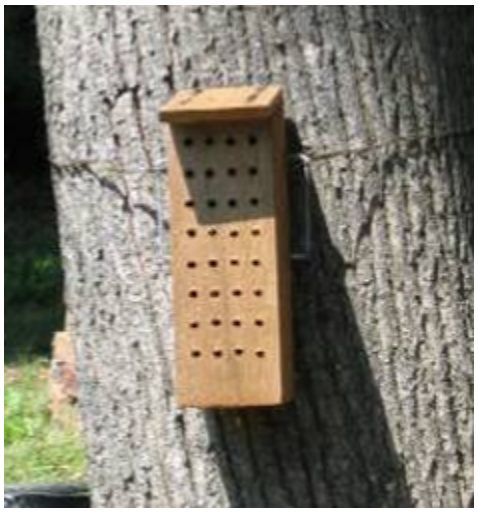
Native bee feasting on common milkweed (Asclepias syriaca)

Though bees, in general, have a bad rap due to the barbed stingers of European honeybees, the majority of backyard bees are non-aggressive native bees with rarely employed, very mild stingers. Over 4000 species of native bees exist across the United States, ranging from tiny fly look-alikes to the familiarly large bumblebee. Reduction in habitat and widespread pesticide use has caused the decline of these essential pollinators.

Avoiding pesticides is the first step to welcoming bees and their beneficial services. If pesticide use cannot be avoided, it is best to spray during the evening hours when bees are lodged in their nesting place.

Bees are guided to flowers by perfume and color, most significantly by ultraviolet colors not visible to humans. In your garden, you can attract these busy pollinators by providing yellow and purple/blue flowers, especially those with a sweet scent. (Red flowers, on the other hand, provide little attraction because bees cannot see red.) Attract a variety of bee species with a plant collection that always offers a flower in bloom.

Unlike European honeybees, the majority of native bees are solitary, nesting in sunny spots on bare ground or in vacant holes in dead trees and old logs. You can provide artificial nesting boxes for the latter by taking a 4" x 4" x 8" block of wood and drilling holes of varying widths (3/32 – 3/8") about 3" deep and 3/4" apart. Alternatively, you can tie together a small bundle of hollow reeds, closed at one end and cut to varying lengths. Hang your bee nest on a tree, wall, or fence facing east or southeast to absorb warmth from the morning sunlight.



Native bee nesting box. Photo: Faith Kuehn

For more information about welcoming bees to your garden, visit the Delaware Department of Agriculture's Farming for Native Pollinators page (http://dda.delaware.gov/plantind/pollinator.shtml) and the UD Cooperative Extension Beekeeping page (http://ag.udel.edu/extension/horticulture/beekeeping.htm).

Lepidoptera

(Butterflies, Skippers, Moths & Their Caterpillars) Pollination is an important role played by butterflies, skippers and moths, but perhaps their

more essential role is to serve as a food source for birds, bats, small mammals, and other predators both in their larval (caterpillar) and adult stages. Humans find special interest in the beautiful colors and delicate form of adult Lepidoptera—the collective name for butterflies, skippers and moths.

Caterpillars of the monarch butterfly survive only by eating milkweeds (Asclepias sp.) Photo: John Frett

To encourage adult Lepidoptera to visit your garden, you must provide for their young: caterpillars. While adults are more general about the flowers they seek nectar from, most caterpillar species require specific plants for survival. Providing their host plants in your garden—as well as a variety of nectar plants—is the best recipe for filling your yard with these fascinating flutterers. Many gardeners balk at the idea of providing fodder for leaf munchers, but attracting caterpillars also means attracting their predators, which will prevent the leaf munchers from causing noticeable damage.

Hummingbird clearwing moth Photo: Doug Tallamy

Luna moth, member of the giant silkworm moth family. Photo: Doug Tallamy

Butterflies and skippers require nectar meals to give them the energy to mate and reproduce. They can drink from a variety of flowers; their good vision leads them to red and orange blooms in particular. In general they prefer clusters of flowers for one-stop sipping and daisy shapes whose petals provide a perch.

Butterfly and skipper plants should be located in the sun because the insects require warmth to generate energy for flight. Flat stones placed in the sun provide a morning resting place for drying dewy wings. Mud puddles also benefit certain species of butterflies that use them to obtain mineral salts.

Unlike butterflies, moths hover when they feed, using their long mouthparts to extract nectar from long, tubular flowers. In fact, due to this behavior, some moths are easily mistaken for hummingbirds—especially the hummingbird clearwing moth with its fast-beating wings. Hummingbird clearwing moth Photo: Doug Tallamy

Moths fly in the evening or nighttime hours, and many drink nectar from night-blooming, pale or white flowers that are easiest to see. Due to a keen sense of smell, many moths are drawn to flowers that exude a strong, sweet aroma. However, some moths lack mouthparts and do not feed at all before mating. This includes the giant silkworm moths, a family that contains many of the large colorful moths considered quite attractive by humans. Providing food for their

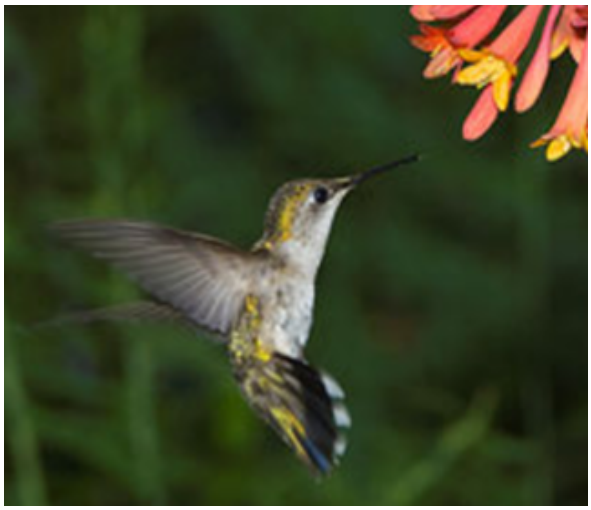
caterpillars is the only way to entice them to the garden.

Butterflies, moths, and skippers all require shelter and protection from inclement weather, which can be achieved in your garden by dense shrub plantings, old logs, or piles of brush. Food plants for all stages of Lepidoptera should also be protected from wind by a hedgerow, fence, or wall.

For a list of the "20 Most Valuable Woody and Perennial Native Plant Genera in Terms of Supporting Biodiversity in the Mid-Atlantic Region" by Doug Tallamy, visit the UD Botanic Gardens' Native Garden page at http://ag.udel.edu/udbg/gardens/native.html

Nectar-feeding Birds

Nectar serves as a food source for both **hummingbirds** and **orioles**, birds that play important roles as pollinators. Hummingbirds use their long, specialized beaks to extract nectar from long, tubular blooms, flocking to red flowers as well as various shades of dark orange and dark pink. Orioles drink nectar from blooming tulip trees (Liriodendron tulipifera) to supplement their diet of fruits, insects, and spiders.



Ruby-throated hummingbird looking for nectar in a native honeysuckle (Lonicera sempervirens) Photo: Doug Tallamy

Hummingbirds appreciate shrubs with small branches to accommodate their small feet and plants with large leaves to provide protection from inclement weather. They bathe and drink from shallow pools of water and even in water droplets caught on the surface of curved leaves. In times when water is scarce on the landscape, a commercial mister can be used to provide water for hummingbirds.

Though tulip trees provide a sweet snack for orioles, your garden should also include berry-producing plants and support a variety of insects and spiders to make it a desirable environment for these part-time nectar drinkers. Orioles weave basket-like, gourd-shaped nests from plant fibers, which they hang from the ends of tree branches to keep out of predators' reach. You can help them by setting out natural fibers like jute, raffia, yarn, corn husks, and straw, cut to lengths of no more than 6 inches. Providing trees with wide-reaching branches increases the chance of them nesting on your property.

Insects

Insects have traditionally been excluded from the garden rather than welcomed, but wildlife gardeners recognize their enormous potential for supporting biodiversity. Spiders, birds, mammals, amphibians, reptiles and even other insects depend on them for food, and many plants require their pollination services.

Many insects feast on other insects, helping keep garden pests in check. In wet areas, dragonflies are particularly voracious predators.

Beetles especially serve as a fantastic testament to the wonders of biodiversity: More than half of all animal species are insects, and more than half of those are beetles! Though, like caterpillars, the majority of beetles eat leaves, gardeners should not hesitate to welcome them into their garden. Research has shown that plant damage from leaf munchers will be minimal to the human eye in balanced backyard ecosystems that provide habitat for insects and insect predators while avoiding the use of herbicides and pesticides.

Many beetles and other insects eat pollen and nectar from plants with dense clusters of flowers during certain stages of their lifecycle. Flowers in the aster family (daisy shaped blooms) are some of the best types of flowers for attracting beneficial insects in general. Mini-wasps are parasitoids that attack many pest insects, like drinking from tiny flowers with easy-to-reach nectar. This includes members of the carrot family whose upside-down umbrella-shaped blooms provide a flat platform composed of hundreds of miniature flowers.

A low-growing ground cover or a layer of leaf litter in your garden provides needed habitat for beneficial insects as well as many of their predators. Shallow bird baths or stone-lined saucers are great ways to provide water for beneficial insects as well as other wildlife.

For more information about specific beneficial insects, especially in their use as biological pest controls, consult the UD Cooperative Extension facts sheets available at http://ag.udel.edu/extension/horticulture/insects.htm

Songbirds

The twittering and fluttering of birds liven the landscape during all seasons, both for humans as well as their prey and predators. Insects comprise the vast majority of the diet for most backyard songbirds, especially when they are breeding. Providing a diverse cover of plants— especially natives—will do dual duty in attracting not only insects but also the birds that prey on them. Leave a layer of leaf mulch on the ground to aid birds in foraging for the insects, spiders and worms that hide there.

Many birds also enjoy plants replete with fruits, nuts and seeds. For the greatest impact, use a combination of summer- and fall-fruiting plants, as well as plants that hold onto fruits into winter and spring until the cycle of freezing and thawing renders them ripe.

Eastern bluebird with a freshly caught caterpillar. Photo: Doug Tallamy

To provide optimal bird habitat in your landscape, include the various levels of vegetation found in their natural environment. Ground-dwelling birds appreciate shrubs, grasses and perennials for shelter; understory trees and canopy trees serve birds that nest in the middle and top layers of the forest. For many species of birds, evergreens provide important protection during storms and, for non-migratory species, throughout the winter months. Homemade or commercial birdhouses provide additional lodging options for birds that dwell in tree cavities carved out by either a previous inhabitant or natural weathering processes. Finally, the ubiquitous bird bath speaks to another bird need—a shallow water source for drinking and bathing. Shallow puddles generally suffice, as well as homemade or commercially-produced bird baths, with the latter providing the bonus of an attractive landscape feature.

For information about specific bird-attracting plants (including their hardiness zone), consult North

Carolina State University's Attracting Birds website at http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/birds/bird_index.html

Bats

Though seldom seen by daylight-dwelling humans, these flying nocturnal mammals provide an important service in our landscape by consuming vast quantities of insects. Bat Conservation International states that more than 50% of American bat species are endangered or otherwise in severe decline, making it increasingly important to provide food and habitat for bats in our landscapes.

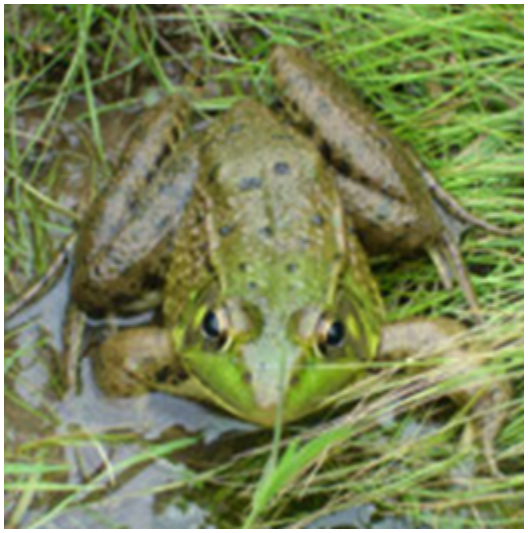
In the southwest United States, nectar-feeding bats enjoy night-blooming agave and cactus flowers. However, bats in the eastern United States feed only on insects—and voraciously at that. For instance, the little brown bat, common in Delaware and throughout the U.S., regularly consumes more than one thousand insects per hour of nighttime flight. Providing native plants for local insects is one of the best ways to ensure a steady food supply for these beneficial predators.

In the wild, bats nest in trees and caves; in the human-altered landscape, they also inhabit bridges, attics, and abandoned buildings. In your landscape, you can provide a safe and hospitable artificial nesting box to simulate a bat's preferred natural environment. Generally, bat boxes are made of untreated wood and feature a variety of chambers with grooved interior walls to provide a gripping surface for roosting bats.

For more information about bats , visit Bat Conservation International's website at http://www.batcon.org . Details about constructing a homemade bat box can be found http://www.batcon.org/pdfs/education/fof_bathouse.pdf

Frogs and toads

Frogs and toads play important ecological roles as insect predators and as prey for larger wildlife. Besides insects, these amphibians also feast on slugs, snails and spiders. To provide habitat for toads and frogs, it is important to incorporate landscape features that offer them shelter as well as foraging ground; for example, log piles, leaf litter, compost heaps, and groundcover plants. A homemade toad shelter is easy to construct from a broken terra cotta pot, turned on its side against the ground to form a snug, toad-sized cave.



American bullfrog Photo: Melinda Zoehrer

Both frogs and toads require a water source for reproduction, and some frogs hibernate over winter in the mud at the bottom of the deeper ponds. The most welcoming backyard ponds provide easy access by way of gently sloping sides, stepping stones, or a wooden plank.

For more information about creating habitat for frogs and toads, visit the Berks, Bucks and Oxon Wildlife Trust's fact sheet "Frogs and Toads," available on the Wildlife Information Service page at t http://www.bbowt.org.uk/content.asp?did=24532

Squirrels, turtles, lizards, spiders, birds of prey, snakes, salamanders, chipmunks, groundhogs, and all other manners of local creatures

If you build a habitat garden that produces biodiversity from the ground up with native plants to

feed local insects—the foundation of the food web—other wildlife will visit too.

Additional Resources

All About Birds
http://www.birds.cornell.edu/AllAboutBirds/

Attracting Birds
http://www.ces.ncsu.edu/depts/hort/consumer/factsheets/birds/bird_index.html

Bat Conservation International
http://www.batcon.org/

Box Turtles in the Garden—Close Encounters of the Reptilian Kind
http://www.bbg.org/gar2/topics/wildlife/2006su_turtle.html

Bringing Nature Home by Douglas W. Tallamy (Timber Press, 2007)

Creating Small Habitats for Wildlife in Your Garden by Josie Briggs (Guild of Master Craftsmen Publications, 2000) The Diversity of Life by E.O Wilson (W.W. Norton, 2000 [Revised Edition])

Frogs and Toads
http://www.bbowt.org.uk/do_download.asp?did=24607

Noah's Garden: Restoring the Ecology of Our Own Back Yards by Sara Stein (Houghton Mifflin Company, 1993)

The Wildlife Gardener's Guide by Janet Marinelli (Brooklyn Botanic Garden All-Region Guides, 2008).

Wildlife in the Garden: How to Live in Harmony with Deer, Raccoons, Rabbits, Crows and Other Pesky Creatures by Gene Logsdon (Indiana University Press, 1999 [expanded edition])

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