Bees and other pollinators can also collect contaminated pollen or nectar from the treated plants and bring it back to their colony, creating high risk of harm to the colony. Research studies have demonstrated native and honey bees can be harmed by small amounts of pesticides in nectar and pollen. When a neonicotinoid is applied as a soil drench (a dilute solution poured around the plant base), it may persist for a year or more, especially in woody plants, and can also move into weeds or flowers growing over the drenched soil. If some of the insecticide moves into pollen or nectar it may not kill bees directly, but it can act as a stressor to affect larval growth, susceptibility to diseases, navigation or winter survival.

How we manage ornamental landscapes has an impact on two of the most important factors affecting pollinators: habitat quality and pesticide exposure. The following two sections explain the best ways to **create and maintain good habitat for pollinators**, and how to **minimize pollinator exposure to pesticides**.

Creating and maintaining pollinator-friendly habitat

Many types of insects feed on pollen and nectar, although two types of pollinators have received the most attention: bees and butterflies. The best way to encourage bees and butterflies is to grow lots of different types of flowering plants that produce nectar and pollen. Consider how much lawn you maintain and whether any of it could be planted or managed to support more flowers. Consider allowing clover, ground ivy, black medic, vetch, dandelions and other flowering weeds to grow in your lawn, educating others about the benefit of flowering weeds, and helping change local ordinances that prohibit these "weeds" from growing in your area. Incorporate more flowering annuals, perennials, shrubs and trees into your yard and garden so there is always something blooming throughout the season from early spring through autumn.

For natural areas of the yard and garden, or border areas, see the list of native plants below or find a region-specific list of pollinator-friendly plants, like one available at the Michigan State University Native Plants and Beneficial Insects website: www.native-plants.msu.edu. Native plants are strongly recommended, but there are also many non-native ornamental plants that are excellent food plants for bees and butterflies. Below are lists of plants that provide pollen and nectar for bees and butterflies.

Ohio State Weed Lab, The Ohio State Univ., Bugwood.org

Do you call it butterfly milkweed or butterfly weed? Both are common names. The scientific name is always *Asclepias tuberosa.*

There are several reasons why it is important to use the genus/species name (scientific name) when you investigate and buy your plants, trees and shrubs. Common names may be regional and could refer to a different type of flower depending upon local tradition. Also, be sure to find the exact species listed below because other species in the same genus may not be attractive to bees. *Salvia*, for example, is a popular annual bedding plant, but red salvia, which is a popular annual in the north central region, is not attractive to bees while blue salvia, *Salvia farinacea*, and several types of perennial salvia (*Salvia nemorosa*) are. Also, some cultivars of flowers may be more attractive than others.

Better habitat for bees

Annuals attractive to bees

In general, herbs and garden perennials are good for bees while annual bedding plants are not as attractive to them. Annual flowers like petunias are readily available at the garden center, but most have been bred for showy flowers or vigorous growth and do not produce enough pollen and nectar to be good food plants for bees or butterflies. Below are some annuals that may be more difficult to find, but are good food plants for pollinators. Please note that some of these, like garden heliotrope, lantana and pentas, are considered annuals in northern states but are perennials in more southern states.

Annuals attractive to bees table

Common name	Genus species (scientific name)
Ageratum	*Ageratum houstonianum*
Anise-scented sage	*Salvia guaranitica*
Aster	*Callistephus chinensis*
Black-eyed susan or gloriosa daisy	*Rudbeckia hirta*

Annuals attractive to bees table (continued)

Common name	Genus species (scientific name)
Blue salvia (mealycup sage)	*Salvia farinacea*
Borage or starflower	*Borago officinalis*
Calendula	*Calendula officinalis*
Clary sage	*Salvia sclarea* (biennial)
Common lantana	*Lantana camara*
Common sunflower	*Helianthus annuus*
Cornflower	*Centaurea cyanus*
Cosmos	*Cosmos bipinnatus*
Dahlia (open types)	*Dahlia* cv.
Garden heliotrope	*Heliotrope arborescens*
Mignonette	*Resedaodorata*
Pentas	*Pentas* spp.
Pineapple sage	*Salvia elegans*
Popcorn plant	*Cassia didymobotrya*
Snapdragon	*Antirrhinum majus*
Spider flower	*Cleome* spp.
Sweet William (biennial in southern parts of north central region)	*Dianthus barbatus*
Sweet alyssum	*Lobularia maritime*
Tithonia	*Tithonia rotundifolia*
Vervain	*Verbena bonariensis*
Zinnia	*Zinnia elegans*

Herbaceous perennials attractive to bees

Researchers have identified that perennial flowers tend to be far more attractive to bees than annuals. Many different types of perennials are good for bees, from showy flowers to herbs. Herb gardens are an excellent resource for bees because they flower over a long period of time, and herbs grow fairly large and produce lots of flowers. The perennials and herbs listed below can be purchased from nurseries and garden centers in the North Central United States.

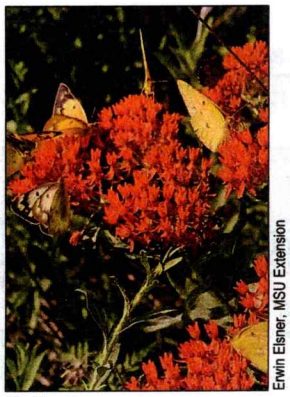
Because species and cultivars vary in cold-hardiness, be sure to check the acceptable hardiness zones listed on the plant label and match it to the USDA Plant Hardiness Zone where you live (http://planthardiness.ars.usda.gov/PHZMWeb/).

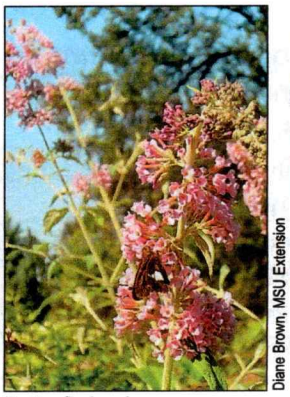
Some of the plants listed below are also available as seeds in commercial "wildflower" mixes. If you are looking for native wildflower seed, a good source of information is the Xerces Society, which gives a list of plants and a supplier for each region (http://www.xerces.org/pollinator-seed/).

Herbaceous perennials attractive to bees

Common name	Genus species (scientific name)
Anise hyssop	*Agastache foeniculum*
Aromatic aster	*Symphyotrichum oblongifolium*
Aster	*Symphyotrichum novae-angliae* – 'Purple Done'
Astilbe, false spirea	*Astilbe* spp.
Basil, sweet basil (annual)	*Ocimum basilicum*
Bee balm	*Monarda* spp.
Bellflower	*Campanula* spp.
Betony	*Stachys monieri*
Bigleaf ligularia	*Ligularia dentate*
Black-eyed Susan, coneflower	*Rudbeckia* spp.
Blanket flower	*Gaillardia*
Blazing star	*Liatris spicata*
Butterfly bush	*Buddleja* or *Buddleia* spp.
Butterfly weed	*Asclepias tuberosa*
Calamint	*Calamintha nepeta*
Carolina lupine	*Thermopsis villosa*
Catmint	*Nepeta* spp.
Chrysanthemum (open types)	*Chrysanthemum*


Diane Brown, MSU Extension
Anise hyssop


Erwin Elsner, MSU Extension
Butterfly weed


Diane Brown, MSU Extension
Butterfly bush


Erwin Elsner, MSU Extension
Bee balm

Herbaceous perennials attractive to bees (continued)

Common name	Genus species (scientific name)
Chocolate flower	*Berlandiera lyrata*
Clematis	*Clematis* spp.
Common poppy, red poppy	*Papaver rhoeas*
Common yarrow	*Achillea millefolium*
Coral bells	*Heuchera* spp.
Cornflower	*Centaurea* spp.
Crown vetch (ground cover)	*Securigera* (= *Coronilla*) *varia*
Cut-leaf mallow	*Malva alcea*
(various names)	*Eryngium* spp.
Fennel	*Foeniculum vulgare*
Foxglove or beardtongues	*Penstemon* spp.
Garden speedwell	*Veronica longifolia*
Globe thistle	*Echinops ritro*
Hardy geranium, blue cranesbill	*Geranium ibericum* x (*Geranium himalayense*)
Hosta	*Hosta* spp.
Hyssop (naturalized in North America)	*Hyssopus officinalis*
Inula, Himalayan elecampane	*Inula royleana*
Japanese anemone	*Anemone hupehensis 'Robutissima'*
Large-leaved aster	*Eurybia macrophylla*
Lavender	*Lavandula*
Lemon balm	*Melissa officinalis*
Leucanthemella	*Leucanthemella serotine*
Lupine	*Lupinus* spp.
Mints	*Mentha* spp.
Narrow-leaved foxtail lily	*Eremurus stenophyllus*
New England aster	*Symphyotrichum novae-angliae*
Ornamental onion, garlic, chives, leek, scallion	*Allium* spp., including *Allium* 'mellenium' and 'christophii'

Erwin Elsner, MSU Extension

Lupine

Diane Brown, MSU Extension

Sunflower

Herbaceous perennials attractive to bees (continued)

Common name	Genus species (scientific name)
Oregano	*Origanum vulgare*
Pachysandra	*Pachysandra terminalis*
Parasol whitetop	*Doellingeria umbellate*
Pentas	*Pentas* spp.
Peony	*Paeonia* spp.
Pincushion flower	*Scabiosa caucasica*
Purple burkheya	*Berkheya purpurea*
Purple coneflower	*Echinacea purpurea*
Rosemary	*Rosmarinus officinalis*
Russian sage	*Perovskia atriplicifolia*
Salvia	*Salvia* 'Victoria blue', *Salvia nemorosa* 'Black and Blue', others
Sea holly	*Eryngium maritimum*
Sedum	*Sedum* spp.
Sedum, stonecrop	*Hylotelephium spectabile* and *telephium* and cvs.
Snakeroot	*Cimicifuga famose*
Sneezeweed	*Helenium*
Stiff-leaved aster	*Ionactus linariifolius*
Stokes aster	*Stokesia laevis*
Sunflower	*Helianthus*
Swamp milkweed	*Asclepias incarnata*
Sweet alyssum	*Lobularia maritima*
Thyme	*Thymus* spp.
White wood aster	*Eurybia divarcata*

Shrubs attractive to bees

Flowering shrubs can be an excellent food source for bees because they tend to grow larger than herbaceous perennials, and therefore produce a larger number of flowers. Some species, like *Rosa rugosa*, bloom all summer.

Shrubs attractive to bees (Mach and Potter 2016)

Common name	Genus species (scientific name)
Black chokeberry	*Aronia melanocarpa*
Bottlebrush buckeye	*Aesculus parviflora*
Buttonbush	*Cephalanthus occidentalis*
Common witch-hazel	*Hamamelis virginiana*
Cotoneaster	*Cotoneaster*
Dwarf fothergilla	*Fothergilla gardenia*
Eastern ninebark	*Physocarpos opulifolius*
Elderberry	*Sambucus* spp.

Shrubs attractive to bees (Mach and Potter 2016) (continued)

Common name	Genus species (scientific name)
Holly: American, box-leaved, Merserve hybrid, winterberry	*Ilex* spp.
Mockorange	*Philadelphus coronarius*
Potentilla (bush cinquefoil)	*Potentilla fruiticosa*
Privet	*Ligustrum vulgare*
Raspberry, blackberries	*Rubus* spp.
Silky, gray, redosier dogwoods	*Cornus* spp.
Spicebush	*Lindera benzoin*
Spirea	*Spiraea* spp.
Sumacs	*Rhus* spp.
Summersweet, sweet pepperbush	*Clethra alnifolia*
Viburnums	*Viburnum* spp.
Wild prairie rose	*Rosa arkansana*

John D. Byrd, Mississippi State Univ., Bugwood.org

Buttonbush

Diane Brown, MSU Extension

Elderberry

Jerry A. Payne, USDA Agric. Research Service, Bugwood.org

A bee visits fragrant sumac, *Rhus Aromatica*.

Trees attractive to bees

Flowering trees are critical to providing an ample food source for bees because of their large size and thousands of flowers. A blooming linden or black locust produces so much pollen and nectar that it dwarfs the amount provided by most garden flowers in comparison. However, most trees only bloom for two to three weeks, so a succession of trees that bloom from early spring through summer is very helpful to bees. Trees in the North Central United States that are frequently mentioned as good food plants for bees are listed in the following table.

T. Davis Sydnor, The Ohio State University, Bugwood.org

Catalpa

Trees attractive to bees

Source: Lovell 1926, Pellet 1947, Oertel 1980, Tew 2006, Mader et al. 2011, Mach and Potter 2016

Common name	Genus species (scientific name)	Bloom
Eastern redbud	*Cercis canadensis*	April
Red maple	*Acer rubrum*	April
Alternate-leaved, pagoda or green osier dogwood	*Cornus alternifolia*	May
Black tupelo, blackgum	*Nyssa sylvatica*	May
Cherry, peach, plum, almond	*Prunus* spp. (many)	May
Crabapple, apple	*Malus* spp. (many)	May
Hawthorn	*Crataegus* spp. (many)	May
Serviceberry	*Amelanchier* spp.	May
Willow	*Salix* spp.	May

Diane Brown, MSU Extension

Serviceberry

Trees attractive to bees (continued)
Source: Lovell 1926, Pellet 1947, Oertel 1980, Tew 2006, Mader et al. 2011, Mach and Potter 2016

Common name	Genus species (scientific name)	Bloom
Black locust	*Robinia pseudoacacia*	Late May-early June
Catalpa	*Catalpa speciosa*	June
Linden, basswood	*Tilia* spp.	June
Tulip-tree	*Liriodendron tulipifera*	June
Amur maackia	*Maackia amurensis*	July-August
Bee-bee tree	*Tetradium (Evodia) daniellii*	July-August
Japanese sophora, Japanese pagoda	*Sophora japonica*	July-September
Seven sons tree	*Heptacodium miconioides*	August-September


Diane Brown, MSU Extension
Basswood

Wind-pollinated trees attractive to bees

Wind-pollinated trees do not produce nectar, but bees may take advantage of them as an abundant source of pollen. Pines, spruces and nearly all gymnosperms are not usually visited by bees unless it is to gather sap used for propolis, a sticky substance used to fill crevices and seal hives. However, several genera of wind-pollinated angiosperms are routinely visited by bees to collect pollen. The most frequently visited wind-pollinated trees are listed below. Red maple and willow are listed in both tables because they are wind-pollinated trees that are also considered important pollen or nectar sources for bees. Pollen from the wind-pollinated trees may be collected by bees because of a favorable nutritional value, the large amount of pollen produced, or because it is available at times when other food sources are scarce.

Wind-pollinated trees attractive to bees
Source: Kraemer and Favi. 2005, MacIvor et al. 2014, Oertel 1980

Common name	Genus species (scientific name)	Attractiveness to bees[1]
Ash	*Fraxinus* spp.	Somewhat attractive
Birch	*Betula* spp.	Somewhat attractive
Elm	*Ulmus* spp.	Very attractive
Hickory	*Carya* spp.	Somewhat attractive
Oak	*Quercus* spp.	Very attractive
Poplar	*Populus* spp.	Very attractive
Maple	*Acer* spp.	Highly attractive
Willow	*Salix* spp.	Highly attractive

[1]Level of attractiveness in this table is rated by number of reports of bees using pollen, level of bee activity, diversity of bee species observed and amount of pollen found in hives or nests.

Wildflowers attractive to bees

Wildflower mixes often contain seed of several of the attractive perennials listed above. A good source for native wildflower seed is the Xerces Society, which gives a list of plants and a supplier for each region (http://www.xerces.org/pollinator-seed/). Another list of native plants and wildflowers available from nurseries and seed companies is maintained by the American Horticultural Society, and is organized by state (http://www.ahs.org/gardening-resources/societies-clubs-organizations/native-plant-societies). MSU Extension publication E2973, "Attracting Beneficial Insects with Native Flowering Plants," provides photos and bloom time for many of the native flowers listed below. This publication is available for purchase at www.shop.msu.edu. Wildflowers described in E2973 are marked with an asterisk (*) in the following table.


Diane Brown, MSU Extension
Goldenrod


Diane Brown, MSU Extension
Joe-Pye weed

Wildflowers attractive to bees

Common name	Genus species (scientific name)
American vervain, blue vervain	*Verbena hastata**
Aromatic aster	*Symphyotrichum oblongifolium**
Canadian milkvetch	*Astragalus canadensis**
Clover	*Melilotus* spp.
Clover	*Trifolium* spp.
Coneflower	*Ratibida columnifera**
Culver's root	*Veronicastrum virginicum**
Cup plant	*Silphium perfoliatum**
Golden alexanders	*Zizia aurea**
Goldenrod	*Oligoneuron* spp.
Goldenrod	*Solidago speciosa*
Great blue lobelia	*Lobelia siphilitica*
Horsemint, spotted beebalm	*Monarda punctata**
Joe-Pye weed	*Eupatorium fistulosum**
Late figwort	*Scrophularia marilandica**
Meadowsweet (shrub)	*Spirea alba**
Missouri ironweed	*Vernonia missurica**
Mountain mints	*Pycanthemum* spp.*
Native milkweeds	*Asclepias* spp.*
Naturalized asters	*Aster* spp.
Nodding wild onion	*Allium cernuum**
Obedient plant, false dragonhead	*Physostegia virginiana**
Pale Indian plantain	*Cacalia atriplicifolia**
Penstemon, hairy beardtongue	*Penstemon hirsutus**
Prairie blazing star	*Liatris pycnostachya*
Rattlesnake master, eryngo	*Eryngium* spp.
Riddell's goldenrod	*Solidago riddellii**
Rough blazing star	*Liatris aspera*
Rough oxeye, false sunflower	*Heliopsis helianthoides*
Showy milkweed	*Asclepias speciosa*
Smooth aster	*Aster laevis**
Thimbleweed herbaceous perennial	*Anemone cylindrica**
White wild indigo, false indigo	*Baptisia alba*
Wild quinine, American feverfew	*Parthenium integrifolium*
Yellow coneflower	*Ratibida pinnata**
Yellow giant hyssop	*Agastache nepetoides**

*Wildflowers known to attract beneficial insects and described in MSUE publication E2973.

Wildflowers attractive to bees (continued)

Common name	Genus species (scientific name)
Weeds	
Chickweed	*Stellaria media*
Clover	*Trifolium* spp.
Dandelion	*Taraxacum officiniale*
Knapweed (feral)	*Centaurea montana*
Smartweed	*Polygonum* sp.

Landscape plants and wildflowers attractive to butterflies for nectar feeding

Many of the flowering plants attractive to bees will also be visited by butterflies. However, butterflies are attracted to flowers almost entirely for feeding on nectar. They do not intentionally seek or collect pollen for food for their young as do bees. Some pollen may become attached to their mouthparts, legs or bodies as they draw nectar from flowers, but not nearly as much as is found on bees. Because of this, as a group butterflies are not as important as bees for pollinating plants, and flowers that are poor pollen sources can still be very attractive to butterflies for food, if they are a good nectar source.

The immature (caterpillar) stages of almost all butterfly species feed on plant leaves. An adult butterfly might readily take nectar from numerous species of plants, but their host plant range as a caterpillar is often restricted to one or a few closely related plant species. It is very important to carefully select plant species if supporting butterflies is a goal of your gardening or landscaping. The plant lists below are based on published nectar records for over 80 species of common or widespread butterflies found in the North Central United States. Plants that are also hosts for butterfly caterpillars are noted. One of the goals of the President's national plan to protect pollinators is to increase milkweed habitat for monarch butterfly larvae. Planting milkweed in the yard and garden will also help monarchs. The best way to do this is to purchase milkweed seed from a commercial supplier. For more information on gardening for monarchs, see Elsner (2015) in the references of this document.

Diane Brown, MSU Extension

Black-eyed Susan

Erwin Elsner, MSU Extension

Ironweed