

Rock'n in the Garden

Creating Landscapes for Insects - *or not!*

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Basic Premise: Provide (or eliminate) aspects of the environment that are required for optimal growth and development of insects found in/around yards/gardens/homes:

- Food for immature stages;
- Food for adult stages;
- “Special needs” (water, mud, plant resins, plant hairs);
- Shelter (primarily for nesting).

Butterfly Gardening

People garden for many purposes: to provide fresh produce, to make landscapes more attractive, and to attract wildlife. One form of wildlife that is quite easily attracted to a yard are butterflies. In recent years, butterfly gardening has become an increasingly popular form of landscaping in the United States, following a long history in England and other areas of Europe.

At its core, the principles of butterfly gardening are simple - purposeful plantings to attract and retain local species of butterflies to the site. This is done by providing for the basic needs of the insects - foods used by both the adult and caterpillar stages of the butterflies as well as attention to shelter requirements.

Shelter needs are fairly easily provided for in most yards. Garden sites chosen for a butterfly garden should provide some protection from the strong winds common to the region. A hedge or windbreak of some sort is useful for butterfly gardens established in more exposed locations. In residential neighborhoods this is usually provided by the buildings and landscaping already in place.

The most obvious feature of a butterfly garden are nectar-bearing flowering plants. Plants commonly visited by butterflies are those which provide sugary nectar used by many species as an energy source. Types of flowers – and even different cultivars of the same species - vary greatly in this regard and a partial list is provided below.

Table 1. Some nectar-bearing flowering plants commonly visited by butterflies.

Asters	Bee balm (<i>Monarda</i>)
Butterfly bush (<i>Buddleia davidi</i>)	Catmint (<i>Nepeta</i>)
Milkweeds (<i>Asclepias</i> spp.)	Cosmos (<i>Cosmos</i> spp.)
Larkspur	<i>Lantana</i>
<i>Gaillardia</i>	Sages (<i>Salvia</i> spp.)
Sweet pea	Thistles (including globe thistle)
Verbena	Zinnia

Males of some butterflies also visit damp areas, sometimes collecting in large groups. The purpose of these 'mud puddle clubs' is unclear, but it is thought that dissolved minerals are useful nutrients for the butterflies. A small pool or area of moistened soil can provide for the needs of these butterflies.

When designing a butterfly garden, attempt to make mass plantings of butterfly food plants, which are more attractive than are scattered plantings. Also, give consideration to providing a sequence of desirable flowers and plants throughout the season. Although some butterflies may be present during the entire growing season, butterfly visits typically peak during mid to late summer so it is particularly important to provide nectar and other adult food sources at this time of the year.

Also very important in a butterfly garden are food plants used by the caterpillar stage of the butterflies. These plants are actively sought by the female butterflies for egg laying and the presence of caterpillar foods can allow their local establishment. Furthermore, the caterpillar stages are often unusual in form or color and can be particularly interesting to observe. Use of caterpillar food plants can allow one to observe all stages of butterfly development (eggs, caterpillars, chrysalis, adult) increasing enjoyment of the butterfly garden.

The types of butterflies present in an area vary considerably by regions and therefore regional considerations are important in selecting the appropriate plants to support them. Some of the plants that support larval stages of multiple species are included in the CSU fact sheet “Attracting Butterflies to the Garden (<http://extension.colostate.edu/topic-areas/insects/attracting-butterflies-to-the-garden-5-504-2/>).

There *are* some conflicts which arise with butterfly gardening, as with all other landscaping designed to attract wildlife. Most obvious are the caterpillar food habits which involve eating some of the plant leaves. Although caterpillars of most butterflies never occur at levels that would damage plants, there are a few that can be considered 'pests' in some settings. Most obvious is the cabbage butterfly, the common 'cabbageworm' of home gardens. Unfortunately the caterpillars of this insect all too often may spoil a head of cabbage or broccoli and need to be controlled on these plants.

A few other caterpillars may feed on some garden plants. The strikingly colored caterpillar of the black swallowtail butterfly, also known as the parsleyworm, is a caterpillar familiar to gardeners who make plantings of parsley, fennel, or dill. The painted lady may munch on a few hollyhock leaves when it is not on dining on thistles and the caterpillar of the variegated fritillary often resides in a patch of pansies. However, in larger plantings designed for ornamental purposes the feeding by these insects will rarely be noticeable.

Butterfly gardens also tend to look a little more 'wild' than formal garden designs. Some of the best plants useful for attracting butterflies do not have a compact growth habit and some of the plants used by caterpillars and butterflies are even considered weeds in some settings. Careful landscape design can minimize this problem.

Finally, most insecticide use is incompatible with a butterfly garden. Caterpillars are very susceptible to most insecticides, including *Bacillus thuringiensis* (Dipel, Thuricide). Adult butterflies are less sensitive to insecticides, but also can be killed or repelled by some ingredients. Furthermore, most fungicides, selective miticides and insecticidal soaps *can* be safely used on plants visited by butterflies or caterpillars. A conscious decision must be made try not to treat the butterfly garden plantings, something that is made easier by selecting plants prone to few other pest problems.

Sphinx moths and “Hummingbird Moths”

Sphinx moths (hawk moths) are adults of insects in the family Sphingidae. Larvae of most are known as “hornworms”, as most possess a stout spine on the hind end of the body.

Day flying species are popularly known as “hummingbird moths”

(<http://extension.colostate.edu/topic-areas/insects/hornworms-and-hummingbird-moths-5-517/>)

(The most common species of “hummingbird moth” in the western U.S. is the **whitelined sphinx** (*Hyles lineata*) that flies during dusky and cloudy periods as well as at night <http://bspm.agsci.colostate.edu/files/2013/03/Whitelined-sphinx.pdf>. A strictly day-flying group are the “bumble bee clearwings (*Hemaris* spp.) that somewhat resemble large bumble bees <http://bspm.agsci.colostate.edu/files/2013/03/Bumble-Bee-Clearwing-Moths.pdf>). Species present in Colorado include the **hummingbird clearwing** (*H. thysbe*), **snowberry clearwing** (*H. diffinis*), and **slender clearwing** (*H. gracilis*). (Note: The two hornworms that are damaging to garden tomatoes, the tomato hornworm and the tobacco hornworm, do not fly during the day; thus, these would not be considered "hummingbird moths".)

Although hummingbird moths will visit many flowers, the types of plants they will most often visit have long flowers, with rich nectar sources that may be beyond the reach of many other flower visitors with shorter mouthparts. Some good plants to consider planting in order to increase visitation by “hummingbird moths” (and other sphinx moths) include:

- Evening primrose (*Oenothera*)
- Four o’clocks (*Mirabilis*)
- Gentian (*Delphinium*)
- Honeysuckle (*Lonicera*)
- Larkspurs (*Delphinium*)
- Wild bergamot (*Monarda fistula*)
- Many *Agastache* spp.
- Catmints (*Nepeta* spp.)
- Datura*
- Winecup (*Callirhoe*)

The Use of Flowering Plants by Natural Enemies of Insects

Many insects important in the biological control of plant pests have special food needs during their adult stage. For example, syrphid (flower/hover) flies are important predators of aphids in their larval stage but adults must feed on nectar to mature eggs. Many other insects use pollen and/or nectar (as well as honeydew) to sustain them, often allowing them to survive longer, produce more progeny and provide an overall higher level of biological control. Lady beetles, green lacewings, tachinid flies and parasitic wasps are among the natural insect enemies that utilize nectar and pollen in this manner.

As the mouthparts of these insects are not greatly enlarged to access deep sources of nectar shallow flowers are those used by these insects. Also, flowers that are broad and allow the insects to easily perch are also favored. Many plants in the families Apiaceae (carrot family) and Lamiaceae (mint family) are particularly meet these criteria and are commonly utilized by natural enemies of insects. A list of these and some other plants to consider for gardens to promote the activity of these insects is in Table 3.

Some plants that are utilized as nectar/pollen sources for natural enemies of insect pests.

Moon carrot (<i>Seseli gummiferum</i>)	Coriander (<i>Coriandrum sativum</i>)
Fennel (<i>Foeniculum vulgare</i>)	Dill (<i>Anethum geraveolens</i>)
Sweet alyssum (<i>Lobularia maritima</i>)	Basket-of-gold (<i>Aurinia saxatilis</i>)
Yarrow (<i>Achillea</i>)	Carpet bugleweed (<i>Ajuga reptans</i>)

Lavender globe lily (*Allium tanguticum*)
Master wort (*Astrantia major*)
Four-wing saltbush (*Atriplex canescens*)
English lavender (*Lavandula angustifolia*)
Edging lobelia (*Lobelia erinus*)
Monarda fistulosa
Sulfur cinquefoil (*Potentilla recta*)
Solidago virgaurea
Spike speedwell (*Veronica spicata*)

Dyers' camomile (*Cota tinctoria*)
Dwarf alpine aster (*Aster alpinus*)
Purple poppy mallow (*Callirhoe involucrata*)
Sea lavender (*Limonium latifolium*)
Mentha x piperite
Penstemon strictus
Sedum
Crimson thyme (*Thymus serpyllum coccineus*)
Lanceleaf coreopsis (*Coreopsis lanceolata*)

Hunting wasps (Crabronidae, Sphecidae families) may also benefit from provision of nest sites. These are solitary wasps that create nest sites that they subsequently provision with live, paralyzed prey they collect to feed their young. Hunting wasps do not make colonies; each mother develops and sustains a nest site for rearing young. All are non-aggressive and the sting of most is very mild and only employed if the insect is pressed against the skin.

Many hunting wasps will nest in soil, and soil type, slope, and drainage may be very important in meeting nest site requirements. Others are cavity nesters that will utilize existing holes or excavate plants that have a pithy center. Provision of drilled wood, pruned branches of pithy plants (e.g., caneberries, rose, butterfly bush) or bundled canes (e.g., bamboo) can be used to construct nest sites for these types of hunting wasps.

The **black-and-yellow mud dauber**, *Sceliphron caementarium*, is different in habit, wholly constructing their nest from mud. This hunting wasp seeks certain spider prey – particularly crab spider or orb-weaver spiders that they provide as food for their larvae

The paper wasps of the genus *Polistes* are also predators of many insects. These are one of the social wasps of the Vespidae family, which also includes yellowjackets (*Vespula* spp.) and the baldfaced hornet (*Dolichovespula maculata*). These differ in habit from the hunting wasps in several ways, most notably in being social species that create colonies with dozens of individuals with one dominant egg laying queen. Their nests are made of paper, usually gathered from weathered wood, and they create a single layer paper comb for rearing young, which are fed chewed up insects that the adults collect. Also, in contrast to the hunting wasps, *Polistes* paper wasps can sting in defense of the hive and have a sting that is painful.

Additional Resource: The recently published book, *Farming with Native Beneficial Insects*, produced by the Xerces Society (<http://www.xerces.org/>), provides a thorough treatment on how habitat can be managed to increase the abundance and activity of insect natural enemies.

Honey Bee

The issue of honey bees (*Apis mellifera*) is more complex than with some other insects found in gardens. These insects are well recognized for their highly beneficial activities as pollinators and as producers of highly valued products such as honey and bees wax. In this regard one may wish to provide plantings that are utilized by honey bees.

Several plants are heavily visited by honey bees with plants in the families Lamiaceae, Asteraceae and Cleomaceae particularly well represented. Several tree species also can be useful for honey bees, particularly for providing early season sources of pollen and/or nectar. Regional lists of plants that are utilized heavily by honey bees are typically available from state beekeeping and in Colorado the Colorado Beekeepers Association links to several good sites regarding plants that sustain honey bees

by providing nectar and/or pollen <http://coloradobeekeepers.org/farming-for-bees.html> Specific plants that are provided for ornamental plantings that have been accessed in CSU studies can be accessed at

When considering plantings to support local honey bee populations it is also valuable to consider planting pollen/nectar sources that will be available throughout the growing season. For example, some plants that bloom at different periods of the season that can be useful to support honey bees might include the

following: <http://webdoc.agsci.colostate.edu/bspm/Ranking%20Flowering%20Plants%20for%20Honey%20and%20Bumble%20Bees%20APRIL%202015.pdf>

Earliest flowering plants (March-early pril)

Many winter annual Brassicaceae	Dandelion	Gill-over-the-ground
Maples	Willows	Narcissus, crocus, tulips
Alder	Forsythia	Dogwood

Later Spring Flowering Plants (midApril-May)

<i>Prunus</i> spp.	Hawthorns (<i>Crataegus</i> spp.)	Redbud
Catmint (<i>Nepeta</i>)	Caragana	<i>Malus</i> spp. (crabapple, apple)
Pear	<i>Rubus</i> spp.	<i>Syringa</i> spp.
Dandelion	Maples	<i>Rhus</i> spp.
<i>Berberis</i> spp.	Horsechestnut	Catalpa
Black locust	European linden	Privet
Clovers	Sweetclovers	Vetch
Lavender	<i>Allium</i> spp.	<i>Salvia nemorosa</i>

Late Season Flowering Plants (July-September)

New England Aster	Goldenrod (<i>Solidago</i> spp.)	Rabbitbrush
Sage (<i>Salvia</i>)	<i>Monarda</i> spp.	Russian sage
<i>Asclepias</i> spp.	Thistles (<i>Cirsium</i>)	<i>Caryopteris</i>
<i>Epilobium angustifolium</i>	<i>Thymus</i> spp.	<i>Verbena</i> spp.
<i>Ocimum</i> (basil)	<i>Sedum spectabile</i>	

High Honey Bee Use Plants During Summer in 2015 CSU Evaluations

<i>Agastache foeniculum</i>	<i>Bidens ferulifolia</i> 'Giant White'
<i>Calamintha nepeta</i>	<i>Campsis radicans</i>
<i>Caryopteris x incana</i>	<i>Celosia</i> 'Intenz Dark Purple'
<i>Coleus</i> 'Premium Sun Lime Sand'	<i>Dahlia</i> 'Dahlightful Georgia Peach'
<i>Dahlia</i> 'Hypnotica Tropical Breeze'	<i>Dahlia</i> 'Mystic Illusion'
<i>Dahlia</i> 'Hypnotic Lavender'	<i>Diascia</i> 'Flirtation Glacier White'
<i>Digiplexis</i> 'Illumination Raspberry'	<i>Digiplexis</i> 'Illumination Flame'
<i>Digitalis</i> 'Foxlight Ruby Glow'	<i>Euphorbia glamour</i>
<i>Gaillardia</i> 'Arizona Red Shades'	<i>Heptacodium miconioides</i>
<i>Lantana</i> 'Lucky White'	<i>Lantana</i> 'Lucky Lemon Glow'
<i>Lantana</i> 'Lucky Pot of Gold'	<i>Lavatera thuringiaca</i>
<i>Persicaria amplexicaulis</i> 'Taurus'	<i>Salvia slyvestris</i> 'Blue Hill'
<i>Salvia</i> 'Black and Bloom'	<i>Scaevola</i> 'Trix Fairy'
<i>Thymus vulgaris</i>	<i>Verbena bonariensis</i> 'Finesse'
<i>Veronica</i> 'Vernique Blue'	<i>Veronica</i> 'Vernique Rose'

On the other hand honey bees can sting. And, although while foraging they are not aggressive and will not sting unless confined (perhaps accidentally), they do often produce anxiety. Large numbers of honey bees foraging at sites with high human traffic may not be desired in some situations

Several plants are not visited by honey bees. Some plants are not normally pollinated by bees and do not suitably provide nectar or pollen. Other horticulturally modified plants may become non-attractive, such as cultivars with “doubled” blossoms. A list of some plants with very little, if any, observed use by honey bees would include:

<i>Achillea</i>	<i>Aquilegia</i>
<i>Begonia tuberhybrida</i>	<i>Chrysanthemum (most)</i>
<i>Cosmos (doubled)</i>	<i>Dahlia (doubled)</i>
<i>Geranium (ivy)</i>	<i>Hosta</i>
<i>Nicotiana</i>	<i>Nierembergia</i>
<i>Petunia</i>	<i>Phlox</i>
<i>Vinca</i>	<i>Viola</i>

Bumble Bees

Honey bees and bumble bees may both visit many of the same flowers. However, bumble bees can access the nectar/pollen from some plants that honey bees do not. Usually these are somewhat deeper flowers or that have their pollen resources more hidden. For example, bumble bees will visit many nightshade family plants (Solanaceae) that are avoided by honey bees, which the bumble bees will “buzz pollinate” to shake the pollen from the blossoms. Some of the plants often visited by bumble bees include the following:

Plants Noted to be Most Heavily Visited by Bumble Bees

<i>Agastache rupestris</i>	<i>Anemone nemororosa</i>
<i>Cuphea</i>	<i>Echinacea purpurea</i>
<i>Echinops</i>	<i>Hypericum frondosum</i>
<i>Nepeta</i>	<i>Penstemon x. mexicali</i>
<i>Perovskia atriplicifolia</i>	<i>Sesili gummiferum</i>
<i>Solidago</i>	<i>Symphylum officinale</i>
<i>Veronicastrum virginicum</i>	<i>Monarda fistula</i>
<i>Solidago sempervirens</i>	<i>Helenium autumnale</i>
<i>Gentiana andrewsii</i>	Highbush blueberry

High Bumble Bee Use Plants in 2015 CSU Evaluations

<i>Agastache</i> ‘Kudos Silver Blue’	<i>Agastache</i> ‘Desert Solstice’
<i>Agastache</i> ‘Ava’	<i>Agastache foeniculum</i>
<i>Agastache foeniculum</i> ‘Blue Fortune’	<i>Anchusa azurea</i> ‘Dropmore’
<i>Caryopteris x incana</i>	<i>Clematis heracleifolia</i>
<i>Clematis integrifolia</i> ‘Mongolian Bells’	<i>Echinacea</i> ‘Double Decker’
<i>Erigeron algidus</i>	<i>Eupatorium maculatum</i>
<i>Eupatorium rugosum</i> ‘Chocolate’	<i>Hypericum tetrapterum</i>
<i>Liatris spicata</i>	<i>Monarda</i> ‘Pink Supreme’
<i>Nepeta sibirica</i>	<i>Ocimum basilicum</i> ‘Pistou’
<i>Origanum herrenhausen</i>	<i>Oxytropis lambertii</i>
<i>Penstemon x mexicali</i>	<i>Phlomis alpina</i>
<i>Salvia ventricilata</i>	<i>Salvia</i> ‘Evolution White’

Silphium perfoliatum
Veronica 'Baby Doll'
Veronicastrum virginicum

Veronica spicata 'Sunny Border Blue'
Veronica 'Vernique Blue'
Zinnia 'Zahara Cherry Improved'

Additional Resource: If you wish to identify bumble bees, you may do this by participation in "Project Bumble Bee", coordinated by the Xerces Society (<http://www.xerces.org/>). This has a web site where photos can be submitted. These will be identified and entered into a database to help determine the distribution and abundance of various North American bumble bees.

Solitary Bees

The overwhelming number of species of bees that are present in North America – some 4000 species – are solitary bees. These do not establish colonies; instead the female establishes some sort of nest that she subsequently provisions with nectar and pollen to rear her young. Among the more common families of solitary bees include Megachilidae (leafcutter, mason, carder bees), Andrenidae (mining bees), Halictidae (sweat bees), Colletidae (plasterer bees), and the digger bees (subfamily Anthoporinae of the Apidae).

As can be expected there is considerable range of habit among this diverse group of bees including nesting habits, timing of life cycles and types of food plants used as nectar and pollen resources. Many of them are quite small bees and may visit rather small flowers. Others are the size of honey bees or larger and many of the solitary bees may specialize in specific types of flowers (e.g., *Peponapis* and squash blossoms).

High Solitary Bee Use Plants (mostly sweat bees) in 2015 CSU Evaluations

Achillea filipendulina 'Coronation Gold'
Bidens 'Giant White'
Bidens 'Gold Jingle'
Capsium anuum 'Loco'
Euphorbia graminea 'Glitz'
Coreopsis verticillata 'Moonbeam'
Dahlia 'Hypnotica Orange Improved'
Dahlia 'Hypnotica Tequila Sunrise'
Geranium 'Roazanne'
Lobularia maritima 'Giga White'
Lobularia maritima 'Yolo French Vanilla'
Potentilla nevadensis
Zinnia 'Zahara Double Yellow'

Astranita major 'Margery Fish'
Bidens 'Rapid Yellow'
Bidens 'Campfire Fireburst'
Eupatorium maculatum
Helianthus x maximilliani
Coreopsis tripteris
Dahlia 'XXL Veracruz'
Dahlia 'Hypnotica Sangria'
Hibiscus x 'Hardy Hibiscus'
Lobularia maritima 'Yolo White'
Ocimum basilicum 'Pistou'
Salvia 'Fairy Queen'

Availability of nest sites is also important in the success of solitary bees. Most will nest in soil, digging tunnels that may extend a few inches to a foot or more in depth. This is the habit of the digger bees (Anthoporinae subfamily), mining bees (Andrenidae family), sweat bees (Halictidae family) and plasterer bees (Colletidae family). Typically these nests are easily overlooked and may be partially obscured by rocks or plants. Slope, soil texture, and surface debris are all critical in the selection of a nest site by these bees. It is difficult to develop a site that may be acceptable; instead make effort to conserve nesting sites that have been accepted and are being used.

Others nest above ground in cavities such as may occur between rocks, in wood borer tunnels, or plant stems. Among these are:

Small carpenter bees (*Ceratina* spp.). Small carpenter bees similarly nest in the pith of plants, such as caneberries, butterfly bush, ash twigs and other plants. They create cells that are provisioned with plugs of nectar and pollen, separated by wood fibers.

Mason bees (*Osmia* spp.). These are solitary bees in the leafcutter bee family, some of which have been heavily promoted as good, early season alternatives to honey bees for pollination of fruit crops. These bees create separate nesting cells through use of mud partitions. Nests that they use are existing cavities. These can be provided by use of predrilled wood blocks, with a diameter of about 1/4-3/8 inch. Alternately, bundled soda straws are useful for nesting.

Leafcutter bees (*Megachile* spp.). These are the most commonly recognized of the leafcutter bee family as they produce characteristic semicircular leaf cuts when harvesting leaf fragments for nest construction. These will nest in predrilled wood, similar to the mason bees. They will also excavate their own cavities out of rotten, soft wood. Large diameter branches or stems of pithy plants may be used by some species.

Carder bees (*Anthidium* spp.). These leafcutter bees line existing cavities with plant hairs rather than leaf fragments. Lambs'-ear (*Stachys*) is the plant most often noted to be associated with nesting of this species.

Additional Resources: *Attracting Native Pollinators*, produced by the Xerces Society (<http://www.xerces.org/>), provides an excellent introduction to the various types of native bees that occur in North America and gives extensive detail on practices that can be used to assist with their needs for food and nesting resources.

The Bees in Your Backyard (2016, Princeton Press) is, at present, the best single resource one could acquire that would help familiarize oneself with bees that are present in a yard and garden.

The Utah State University Extension publication *Gardening for Native Bees in Utah and Beyond* is an excellent resource that details specific types of flowering plants that are used as nectar/pollen resources by regional bees. <http://extension.usu.edu/files/publications/factsheet/plants-pollinators09.pdf>