# Attracting Beneficial Insects to the Garden with Beneficial Flowers

## by Richard Merrill

When gardeners requested more information on beneficial insects, we asked expert Richard Merrill to write this guide. Richard is Professor Emeritus and former Director of the Horticulture Department at Cabrillo Community College in Santa Cruz, California. He has done extensive research on beneficials and their relationship to garden ecology.

"Beneficial" insects eat mites and other insects that attack plants. They provide considerable help in the control of many garden pests. We usually take this tiny clash of the eaters and eaten for granted and we don't realize how useful beneficial insects can be until there is a pest problem.

The average organic garden is naturally teaming with beneficials such as lady beetles, predatory bugs, syrphid flies, parasitic wasps and lacewings. These native helpers are an ideal method of pest control, both environmentally safe and free of cost. Beneficial insects, like any animal, need a favorable habitat to thrive. For insect predators and parasites, this is a garden with plants and flowers that provide moisture, shelter, alternative prey and immediate nutrition from nectar (carbohydrates) and pollen (protein). We call these plants "beneficial" plants because they foster beneficial insects.

Many beneficial plants are common garden varieties of cut flowers, herbs, vegetables and ornamentals. They can be easily grown to create a favorable habitat for natural insect enemies. It is not a straight-forward practice and there are no simple designs. Beneficial plants are not a magic bullet or quick fix. They are, in fact, quite subtle about what they do, and how they do it. It takes a patient eye to observe and identify insects crawling and fluttering about flowers in the garden. Nature is seldom predictable; a flower may attract a beneficial in one location, but not in another. Since each garden has its own ecology, this makes decisions about which beneficial plants to grow unique and challenging.



There is a special reward in figuring out how your local insects interact with various types of flowers and plants. With experience, it is actually possible to shape the insect ecology of your yard and garden by the types of flowering plants you grow. In a sense, you become a steward of garden bio-diversity, by growing those flowers that fuel beneficial insects' instincts to search out and eat pests. After all, we design our gardens for beauty, drought-tolerance, shade tolerance — why not the ability to nurture beneficial insects? Managing garden bio-diversity in this way is a fascinating and relatively new aspect of pest control.

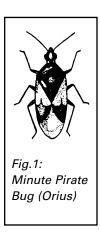
This guide describes the major beneficial insects that are especially attracted to flowers and the types of plants and flowers that they favor. We have also included a table listing the major beneficial herbaceous garden plants. There are undoubtedly others to be discovered. Hopefully these plants will help you get started with this exciting approach to gardening.

# Types of Beneficial Insects Associated with Garden Flowers

#### Predators and Parasitoids

There are two kinds of beneficial insects: predators and parasitoids. Predators either chew pests with their mandibles, or they pierce them with tube-like mouth parts and ingest the body liquids. Parasitoids are insects that lay their eggs in or on other insects. When the parasitoid eggs hatch, the larvae become predators and eat the insect from the inside out or outside in—depending on where the eggs are laid. A few true flies and many species of tiny wasps are the only parasitoids.

Some predators and many parasitoids are quite fussy about what they eat, maybe just one or two insects. They are "specialists." Other beneficials aren't so particular and feed on all sorts of insects and mites. These "generalists" are important in the home garden because they can survive even when pests are rare; there is always something to eat. When there is a pest flare-up, the "generalists" are usually the first to respond and help provide some control. Specialists, on the other hand, can react faster to specific types of pests, especially when they are numerous. In nature, both the generalists and specialists are important to long-term pest control and provide an example of the true "balance of nature".

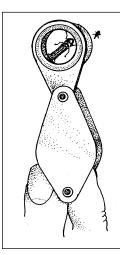


# **Predators**

Most insect predators are poor fliers and are not too particular about what they eat. Some ambush their prey, some hunt them down, some trap them. An effective predator must be able to find pests without spending too much energy. Some of the best insect predators (syrphid flies, lacewings and true bugs) lay eggs near the pests so that the young don't have to work very hard looking for their meals.

# **Examples of Predatory Bugs**

Most true bugs, *Hemiptera*, are plant-feeders, but a few are important predators. They prefer animal juices to plant juices. Predatory *Hemiptera* is one of the most important groups of beneficial insects. They are mostly general predators of insects, mites and eggs, but the smaller species tend to be more specialized than the larger ones. So it is helpful to describe predatory *Hemiptera* by size.

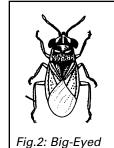


#### **Magnifying Lens**

A 10x hand lens is a necessary tool for identifying most insects. A 15x lens is suitable for mites and eggs. Place the hand lens as close to the eye as possible and move the object to and from the lens until it is in focus. Try viewing the object with sunlight falling on it.

*Orius, the minute pirate bug* (Fig.1), is very small (1/16 inch) and requires a hand lens to see it properly. It feeds on eggs, tiny insects and mites, and it is especially attracted to colonies of thrips. You can often find it in corn silk eating pollen and looking for eggs of the corn earworm. You can also see *Orius* on Cosmos and Sunflowers to name a few common flowers that it favors.

Geocoris, the big-eyed bug (Fig.2) is only a little larger (1/8 inch). It is an important general predator of insect eggs (especially caterpillars), spider mites, thrips, aphids, leafhoppers and other smaller pests. Big-eyed bugs also eat nectar from flowers, which helps sustain them when food is scarce. The flowers of the Daisy family, like Yarrow, Chamomile and Marigolds and many weeds



Bug (Geocoris)

provide nectar and pollen for Geocoris.

Larger predatory bugs (1/4 to 1/2 inches) feed on small pests when they are young, but move to larger soft-bodied insects, especially caterpillars, as they mature. Examples include: the Assassin bug (Fig.3), which is a general predator with a low profile, long legs and a pointed head; the Spined Stink or Soldier bug, *Podisus* (Fig.4), which is sold for the control of the Mexican bean beetle

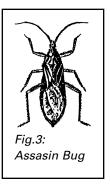




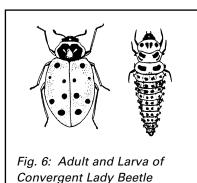
Fig.5: Damsel Bug (Podisus)

Fig.4: Spiny Stink Bug (Podisus,

and is also a major predator of caterpillars, and other insect larvae; and the Damsel bug, Nabis (Fig.5), which is an important native predator of aphids, leafhoppers, plant bugs, thrips and small caterpillars. It over winters well in hedgerows and borders and is often found on the flowers of plants in the Carrot family like Bishops Lace, Dill, Fennel and Chervil.

#### Lady Beetles:

One of the most popular of all beneficials, both larva and adult lady beetles are predators. They are found almost everywhere, and they are regarded by farmers and gardeners as a sign of general well being. The adults are specific and eat mostly aphids;



(Hippodamia Convergens)

the larvae are generalists and eat insect eggs, beetle larvae (root worms and weevils), aphids and other soft-bodied insects. Each larva eats about 25 aphids per day, and each adult about 60. There are several species of lady beetles, but the most popular is probably the convergent lady beetle, Hippodamia convergens (Fig.6). Its common name refers to the converging white markings just behind the head.

Along the west coast, Hippodamia migrates in hordes to foothill areas during the winter where it hibernates and is easily collected and sold. So easy, in fact, that sweeping collection of hibernating swarms may be threatening natural populations of this unique lady beetle. In addition, releases of commercial Hippodamia are often unsuccessful. The hibernating beetles are full of stored body fat, and there is little incentive to search for and eat pests when they are released in a garden. Even when they are active, Hippodamia tends to disperse easily whenever food is scarce.

Hippodamia can be discouraged from dispersing and encouraged to stay in your garden if local nectar sources are adequate. They find this in shallow flower clusters and in the bodies of pests that eat nectar such as aphids and mealy bugs. Lady beetles can also be kept active in the garden by growing beneficial plants that harbor aphids and other alternative prey. Many of the Brassica vegetables (cabbage family) are insectary plants, as are Sunflowers, Tansy, Sweet Alyssum and Angelica.

An important consideration with lady beetles is ant control. Ants eat the honeydew produced by aphids, and they will protect them by attacking Hippodamia as well as other lady beetle like the Ash-Gray Lady beetle Olla, used in tree crops, and the Mealy bug Destroyer Cryptolaemus. Cryptolaemus prefers mealy bugs, but both the larva and adult will also eat other soft scales and aphids. With proper beneficial plants, a few releases of commercial Cryptolaemus can naturalize in just a few years.

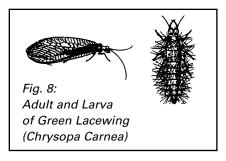
Soldier Beetles: Adult soldier beetles (Fig.7) are common predators of aphids and other insects. They are long, narrow, mid-sized beetles and often orange or red with black or brown wing covers. The velvety larvae live around damp ground and are mostly predators of soil insects like grubs, caterpillars, maggots and grasshopper eggs. Many soldier beetles are especially fond of Goldenrod and other plants in the Daisy family (Asteraceae) like Sunflowers or Cosmos.



#### **Examples of Lacewings**

There are many species of lacewings (Neuroptera). The adults of some are predators (e.g.,the California Brown Lacewing) while most others eat nectar and pollen (e.g.,the Green Lacewing). Adult lacewings are delicate, slender, light green to brown insects ready to lay eggs. With their transparent fore wings and hind wings, they look as fragile as a piece of delicate glass (Fig.8). Females lay eggs on top of tall stalks near patches of aphids and other soft-bodied insects. They are strongly attracted to the smell of aphids and even eat the honeydew secreted

by the aphids.



Lacewing larvae are one of the most important general predators in the garden. They are so voracious they are called "aphid lions." When they are small, they eat

insect eggs, mites and thrips. As they grow, then turn to larger soft-bodied pests like aphids, mealy bugs, whiteflies and small caterpillars.

Lacewing larvae can be difficult to see because they camouflage themselves with the cast-off skins of their victims. To locate them, look with the aid of a hand lens around aphids on plant leaves for a small 1/8 inch or so alligator-shaped larvae, with a tapered hind end and a pair of ice-pick like mandibles at the head foraging for food (Fig.8).

Like many beneficials, lacewings need a suitable habitat or they will disperse when they mature. They need good supplies of nectar, honeydew and pollen for reproduction. For this reason, Lacewings are commonly found on the flowers of plants in the Carrot Family like Bishops Lace, Coriander/Cilantro, Fennel and Dill.

## Example of a Predatory Fly

Syrphid Fly Larvae: The larvae of syrphid flies (Diptera) are general predators of leaf pests like aphids, scales, mealy bugs and small caterpillars. Adult syrphid flies (Fig.9) are called "hover flies" because they buzz around flowers in search of pollen, nectar and the honeydew from aphids. Hovering requires a lot of energy that is supplied by a steady diet of nectar. Being around flowers, syrphid flies tend to have the markings and appearance of bees, blotched as they are with stripes and splashes of yellow and black. Syrphids come in all sizes and shapes, from stout and hairy to smooth and slender.

Not all syrphids are predators. Most of them lay their eggs in moist places like heaps of sodden plant debris, rot

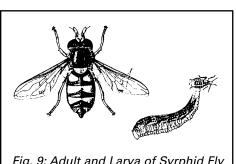


Fig. 9: Adult and Larva of Syrphid Fly

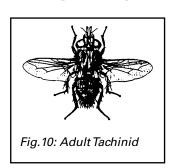
holes, manure, fallen trees, etc. But some lay eggs in or near colonies of aphids, which are an abundant and stationary source of food for the emerging larvae. The larvae are true

maggots, only 1/8 to 1/4 inch long with their pointed heads and legless bodies (Fig.9). As they get larger, their color changes from white to tan to green to gray. They are major predators of aphids, consuming over 60 a day. They also eat other soft-bodied insects and small caterpillars. Syrphids are not available commercially, however, they are found everywhere and they are easily attracted to gardens with beneficial flowers.

Parasitoids are insects that lay eggs in or on other insects. These eggs hatch and become predatory larvae that eat the host. Put another way, a parasitoid is a predator, which lays its eggs as close to the prey as it can get. Parasitoids are found in two groups of insects; the flies (Diptera) and the wasps (Hymenoptera).

# Example of a Fly Parasitoid

Fly parasitoids attack an enormous variety of insects and other animals including termites, bees, ants, crickets, caterpillars, slugs and snails. There are several



families of fly parasitoids, but the most common and effective one is the "Tachinid."

Tachinids: Tachinid flies are very common, and they can be seen around the garden quite easily. They resemble large,

robust houseflies with a bristly abdomen (Fig. 10). Tachinids lay eggs on caterpillars, Japanese beetles, crickets and other insects. The adults eat nectar and pollen, and they are often seen on the blossoms of perennial Buckwheats, plus Bishops Lace, Sweet Alyssum and Coriander/Cilantro and other nectar producing beneficial flowers.

## **Examples of Wasp Parasitoids**

Most people are familiar with hornets and yellow jackets because they sting. The adults of stinging wasps are predators of caterpillars and other insects, but they are not parasitoids. Wasp parasitoids are actually several families of tiny, nonstinging, wasps that lay their eggs on or in the eggs, larvae, pupae and adults of other insects. The emerging larvae become predators on their



Fig. 11: Adult Trichogramma on Insect Egg

"hosts." Some wasp parasitoids are generalists but most are very specific about what they eat.

There are hundreds of species of parasitoids. An important example is the tiny egg parasitoid Trichogramma, which preys on pests before they become a problem. There are several species of Trichogramma and together they attack over 200 pests in all types of habitats. They are especially fond of caterpillar eggs.

With adequate pollen and nectar sources Trichogramma, and other wasp parasitoids can be successfully nurtured in the garden.

# Types of Garden Flowers That Attract Beneficial Insects

#### Pollen and Nectar: A Feast for Beneficials

Beneficial insects require enormous amounts of energy to lay eggs and find pests to eat. Pollen (protein) and nectar (carbohydrates) not only provide this energy, but also serve as an alternative food when pests are scarce. Growing flowering plants to provide these food sources will help keep beneficials in your garden.

#### Which Type of Flowers Attract Beneficials

When beneficials are released or move into a new area, flowers are often the first thing they search for. Some flowers are preferred over others. Because most beneficial insects are relatively small, nectar and pollen are taken easiest from clusters of tiny, shallow flowers growing horizontally. Such inflorescences are typical of the Sunflower family, the Carrot family, the Buckwheat family and the Scabiosa family. These flat flower clusters provide accessible landing platforms laden with pollen and nectar.

It is important to know that not every plant within these plant families may be attractive to beneficials. Some Yarrows, for example, are more preferred by *syrphids* than others, and Sunflowers with large disc flowers are better attractors than those with large ray flowers. In ways not yet completely understood, flower color may also be important to beneficial insects looking for nectar and pollen.



Once your flowering plants begin to bloom, don't expect immediate results. Most of the time you are simply feeding the parents of the beneficials. Their progeny will slowly build up in numbers and eventually begin working for you. In the meantime, observe the flowers carefully and see if you can recognize any of the beneficials we have described here.

# The Unique Pollen and Nectar Diet of Syrphid Flies

Syrphid flies eat pollen. This may seem odd since they do not have any piercing or crushing mouth parts. Their mouth is designed for sponging up moist food. A hover fly can pick up pollen grains with its "sponge," but the grains are protected with a tough outer shell. Without "teeth" to break this shell, it seems the syrphid fly is eating something for nothing. Fortunately, this pollen shell is dissolved by the

sugars in plant nectar. This is why syrphid flies are often seen eating pollen grains and then dipping down into the nectar for a little something to drink and mix with their pollen.

# The Garden Plant Guild

# The Plant Guild: Garden As Ecosystem

The term "guild" is derived from the crafts guilds first organized during medieval times to protect trade merchants from unfair competition. The guild became symbolic of a group of people with similar skills, cooperating for common survival.

Botanists use the term "guild" to describe groups of plants dependent on each other for food, light, space and protection from pests.

We can imitate natural plant guilds in the garden. For example, tall or trellised vegetables can shade leaf crops during the summer. Heavy feeders should follow light feeders, or plants that make the soil rich again, such as cover crops or legumes. Plants that cannot stand the competition of weeds and soil diseases should follow those that leave the soil free of weeds and disease.

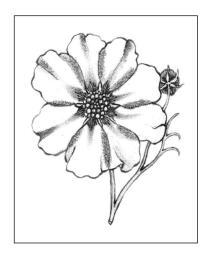
As we have seen, some flowers can provide immediate and alternative food for beneficial insects. There are other ways in which plants can provide a favorable habitat for pest control, and these insect-plant relationships are described below within the context of a "Garden Plant Guild." (See page 8).

# **Insectary Plants**

Some plants are especially good at attracting pests. With careful monitoring, the home gardener can actually use these pest-prone plants to nurture food for beneficial insects — much like a commercial insectary.

One of the easiest pests to "grow" is the aphid. Aphids reproduce rapidly, and they have a wide variety of natural enemies. Most garden plants have aphids, but some plants seem to have more than others. Along the coast of Central California, for example, various cabbage family vegetables are attacked by aphids in the late winter. These aphids are then eaten by beneficial insects. When a second wave of pests begin attacking garden plants in the early spring, the beneficials, having fed on aphids during winter, are able to help control the spring aphids.

It's tricky to deliberately grow pests, but if watched carefully, it can be an interesting and effective way to have a contented group of insect predators positioned for any pest flare-up. Many insectary plants are in the cabbage family including flowering plants such as Sweet Alyssum and wild and cultivated mustards.



# Heavily-Scented Plants as Repellents

Most pests are selective about what they eat, and they are strongly attracted to the smell of their favorite plants. For example, most cabbage pests seek out the mustard oils produced by plants in the cabbage family (*Brassicaceae*). In fact, many plants produce some sort of aromatic oil or resin.

Experiments have shown that odors given off by certain aromatic plants can mask the attracting odor of vulnerable plants, and, in effect, confuse the pest with a mixed signal of different plant odors. Common repellant plants include strongly pungent vegetables (alliums and tomatoes) and many aromatic herbs.

# Hedgerows, Windbreaks and Other Perennial Borders

Perennial stands of plants can be important in providing alternative food and habitat for beneficials insects. Windbreaks, hedgerows, perennial borders and even surrounding areas of weeds can supply valuable nectar and pollen sources as well as alternative prey and permanent refuges from inclimate weather. Perennial stands serve as important over wintering areas for spiders, predatory bugs, syrphid flies and parasitoid wasps, but are less important for lacewings and baby beetles.

The flowers of many shrubs and trees suitable for perennial stands are known to attract beneficials. These include: Blue Elderberry, (Sambucus caerulea), Buckwheats (Eriogonum), Flowering Bottle Tree (Brachychiton), Soapbark Tree (Quillaja saponaria). Other woody plants appear to act more like insectary plants like Black Locust (Robinia), Saltbush (Atriplex) and the California Coffee Berry (Rhamnus). Hedges that include perennial herbs like catnip, mint and thyme are also good choices. Some cover crops also attract beneficials like the annual buckwheat (Fagopyrum), vetches and fava beans (Vicia) and various clovers (Trifolium).

#### 7

# Major Plant Families and Herbaceous Garden Plants That Attract Beneficial Insects

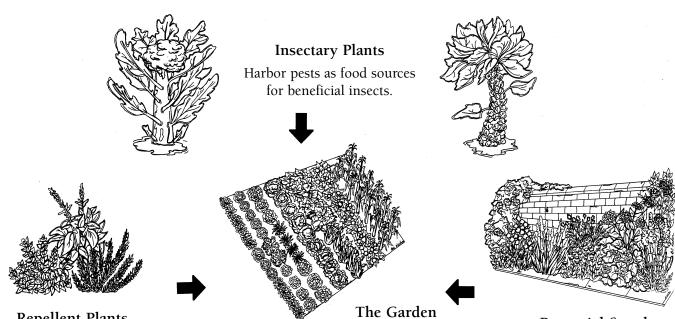
Plants in all four families serve as beneficial flowers primarily by providing accessible pollen and nectar. Plants in the cabbage family often harbor large numbers of aphids which serve as food for many beneficial insects and also serve as insectary plants. This list is limited to families of flowers that are easy to grow from seed in the average home garden and does not include other herbaceous plants and crops known to attract beneficials.

Seeds for plants listed in bold are currently sold by Renee's Garden.

(Check our website, we add new varieties every season!)

Plant Family	Beneficials Attracted	
COMMON NAME / BOTANIC NAME	PREDATORS	PARASITOIDS
CARROT FAMILY (APIACEAE) Angelica (Angelica) Anise (Pimpinella anisum) Blue Lace (Trachymene caerulea) Caraway (Carum caryi) Chervil (Anthrisdcuss cerefolium) Coriander/Cilantro (Coriandrum sativum) Dill (Anethum graveolens) Fennel (Foeniculum vulgare) Lovage (Lovisticum officinale) Bishops Lace (Ammi majus)	lady beetles, lacewings  syrphids, bugs, lacewings  syrphids syrphid flies, ladybeetles Syrphid flies wasps syrphids, bugs, ladybeetles syrphids, bugs, ladybeetles, lacewings	wasps wasps wasps wasps, tachinid flies wasps wasps wasps wasps
Wild Carrot (Daucus carota)  DAISY FAMILY (ASTERACEAE) Blazing Star (Liatrus pycnostachya) Chamomile (Anthemis nobilis) Cosmos (Cosmos binpinnatus) Golden Marguerite (Anthemis tinctoria) Goldenrod (Solidago altissima) Marigold, Signet (Tagetes tenuifolia) Mexican Sunflower (Tithonia tagetifolia) Sunflower (Helianthus annuus & debilis) Tansy (Tanecetum) Yarrow, milfoil (Achillea millefolium) Yarrows (Macrophylla, taygetea etc.)	bugs ladybeetles syrphids, lacewings ladybeetles soldier beetles, bugs ladybeetles wasps syrphids syrphids, ladybeetles syrphids, ladybeetles syrphids, ladybeetle larvae syrphid flies syrphid flies	wasps wasps, tachinid flies wasps wasps wasps wasps wasps wasps wasps wasps
CABBAGE FAMILY (BRASSICACEAE) Broccoli (Brassica oleracea) Sweet Allysum (Lobularia maritime) Candytuft (Iberis umbellata) Mustards (Brassica hirta & juncea)  SCABIOSA FAMILY (DIPSACEAE) Cephalaria (Cephalaria giganitica) Dipsacus (Dipsacus spp.) Pincushion Flower (Scabiosa caucasisca) Scabiosa (Scabiosa atropurpurea)	syrphids syrphids syrphids syrphids, bugs  syrphids syrphids syrphids syrphids syrphids syrphids	wasps wasps, tachinid flies wasps wasps

# THE GARDEN PLANT GUILD Controlling Pests with a Diverse Landscape



## Repellent Plants

Aromatic plants that confuse and deter pests by masking the attracting odor of vegetable crops or garden ornamentals.





#### **Beneficial Flowers**

Pollen and nectar from flowers, shrubs, weeds and covercrops.

### Perennial Stands

Perennial borders. windbreaks and hedgerows provide permanent refuge and food for beneficial insects.

#### References for Insect Drawings

- 1. Metcalf, C. L. & W. P. Flint. 1962. Destructive and Useful Insects. McGraw-Hill Co., New York, NY. (Fig. 9, pg. 67)
- 2. Ross, H. H., C. A. Ross & J. R. Ross, 1982. A Textbook of Entomology. John Wiley & Sons, New York, NY. (Fig. 3, pg. 611, Fig. 7, pg. 609, Fig. 11, pg. 618)
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- 4. Berry, R. E. 1978. Insects and Mites of Economic Importance in the Northwest. Dept. Entomology, Oregon State Univ., OSU Bookstore, Corvallis, OR. (Fig. 2, pg. 7, Fig. 6, pg. 6)
- 5. Borror, D. J. et al. 1976. An Introduction to the Study of Insects, 4th ed. Holt, Rinehart & Winston, New York, NY. (Fig. 4, pg. 282, Fig. 8, pg. 332, Fig. 10, pg. 604)

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