

# Attracting Beneficial Natural Predators to Control Insect Pests

## Definitions:

- **Pest**: an insect that causes damage to a desirable plant through ravenous eating or through the transmission of a destructive virus, bacteria, or fungi.
- **Beneficial Predator**: includes birds, spiders, insects, and bugs that eat and keep the pest population in check.

## Key Concepts

- **More insects make for healthy plants** (huh?)
  - Of the nearly 900,000 species of insects in the world (about 90,000 in the US), only 1 to 2 percent are considered to be destructive. The vast majority of damage to crops and our beloved garden plants is carried out by a relatively small number of pests. That means that 98 to 99 percent of all insects are in some way beneficial, or at least not harmful to plants. Because non-harmful insects will compete with pests, increasing the total number of insects in your yard will help keep the number of pests to a relatively low and acceptable level.
- **Some insects are more beneficial than others . . .**
  - Though most insects are benevolent, some are especially good at seeking out and destroying pests. These are generally known as Beneficial Predators. This project highlights some of the most effective general predators – predators which eat many types of insects. There are also very specific predators, which feed primarily on one particular pest, and can be imported to help with a specific problem, but that is beyond the scope of this project.

# Some of Your Friends and Allies



## **Birds**

*Feed on a variety of insects*



## **Spiders**

*Feed on a variety of insects.*



## **Bats**

*A single little brown bat can catch and eat 1200 insects in one hour!*



## **Lacewings**

*Feeds on soft bodied insects including aphids, mealybugs, thrips, small caterpillars, mites, moth eggs, some scales*



## **Ladybugs**

*Feeds on aphids, mealybugs, soft scales, spider mites*



## **Hover-fly**

*Feeds on many species of aphids*



**Braconid Mini-Wasp**

*Feeds on aphids, armyworms, codling moths, European corn borer, flies, gypsy moths, cabbageworms, many caterpillars and insects*



**Tachnid fly**

*Feeds on many species of caterpillars, Japanese beetles, May beetles, sawflies, squash bugs*



**Pirate Bug**

*Feeds on small caterpillars, leaf hopper nymph, spider mites, thrips, insect eggs*



**Assassin Bug**

*Feeds on many insects – especially caterpillars and flies*



**Big Eyed Bug**

*Feeds on aphids, small caterpillars, leafhoppers, spider mites, tarnished plant bugs*



**Damsel Bug**

*Feeds on aphids, small caterpillars, leafhoppers, plant bugs, thrips, treehoppers*



**Spined Soldier Bug**

*Feeds on fall armyworms, hairless caterpillars (eg. tent caterpillars), sawfly larvae, beetle larvae*



**Praying Mantis**

*Feeds on any insect they can find, including other beneficial insects*

## Principals of Attracting Beneficial Predators

- **Provide Suitable Habitat**
  - Birds, spiders, and insects all need a place to live, as well as shelter from the rain and wind, and sun.
  - A diversity of habitats will encourage a diversity of insects
  - Create a Full Canopy
    - High, Medium, and Low Trees
    - Shrubs & Bushes
    - Tall, Medium, and Short Perennials and Annuals
    - Groundcovers
  - Keep a brush pile
    - A collection of sticks, branches, twigs, and debris in an out-of-the-way corner or inconspicuous place. A great “bug-house” and favorite hangout for ground-dwelling birds like sparrows and toehees. Use logs or rocks to create open spaces in the pile, and leave entrance holes.
  - Leave the debris!
    - Leaf litter provides important habitat for beneficial insects and spiders. Consider leaving some leaves over the garden in the fall or even letting your plants grow up through the litter in the spring. Shredding your leaves and returning the mulch to the garden is another attractive alternative.
  - Hang some Bird Houses and Bat Houses too.
  - Consider a hedge-row of bushes around the outside of the yard
  - Consider an area of native meadow wildflowers
  
- **Provide a Source of Water**
  - Important not only for attracting birds, but for beneficial insects as well.
  - Options include: Pond or Stream, Bird Bath, Fountain, Water Barrel with water plants, or even just a Dish of Water. Add fish to control mosquitoes.
  
- **Provide a Source of Food**
  - This means a variety of plants, *especially flowering plants*.
  - Choose a combination of spring, summer and fall flowering plants.
  - Favor native flowers.
  - Choose plants that will thrive in your specific yard habitat (consider sun & shade, soil type, soil pH, wind exposure, moisture levels)
  - Choose flowers that are known to attract beneficial insects (see next page).

- **Many known host flowers are of the “weedy” or “wild” type, or small-flowered herbs that are not normally allowed to flower. Consider a separate area where some of the wild native flowers and flowering herbs could be allowed to stay, or interplant among your other flowers.**
- Create a Beneficial Pot, packed with beneficial flowers – place in the garden or greenhouse
- **How flowers are used by beneficial insects**
  - Sugar in nectar: used for food – fuel for hunting prey, mating, egg-laying
  - Protein & Fats in Pollen: supports egg development
  - Used as a mating location
  - Small prey that live in flowers (eg. thrips) are a food source for immature stages.
- **Augment Predator Populations**
  - All of the predators listed here can be purchased and shipped from a number of breeding labs, easily found on the internet, for a reasonable price.
  - Beneficial Insects can also be collected in the field if you do the research on where and when to find them.
  - One key to success is introducing the predators early, so that they help check the pest population BEFORE its grows too large to control effectively (but not so early that it is too cold for them to survive, or they have no food source)
- **Minimal use of Pesticides & an Acceptable level of plant damage**
  - Most pesticides will kill beneficial predators, as well as the pests you are trying to eradicate.
  - Use of pesticides can create a “rebound” effect, in that once the pest finds his way into your garden again, it can breed very quickly because there are no beneficial insects left to keep it in check.
  - Pesticides should be used as a last resort, when other measures have failed, and in as specific and limited a scope as is possible and effective. Despite the best intentions and practices, there will be times when pests get out of control, and you will have to decide between losing a plant or group of plants, and using a pesticide.
  - Dormant oil sprays are very effective in killing some of the soft-bodied pests, while not being fatal to the hard shelled predators.
  - Maintaining a diversity of insects will naturally mean that some foliage in your garden will get eaten. It is important to be able to live with some degree of damage, and also to decide how much damage is cosmetically acceptable to you before more drastic measures need to be taken.

## Specific Flowers to Attract Specific Beneficial Predators

*Compiled from a variety of sources - highlighted plants are highly recommended*

<i>Achillea filipendulina</i> (Fern leaf Yarrow)	Lacewings, Ladybugs, Hover-flies, Mini-wasps
<i>Achillea millefolium</i> (Common Yarrow)	Ladybugs, Hover-flies, Mini-wasps
<i>Ajuga reptans</i> (Carpet Bugleweed)	Ladybugs, Hover-flies
<i>Allium tanguticum</i> (Lavander Globe Lily)	Hover-flies, Mini-wasps
<i>Alyssum (Aurinia) saxatilis</i> (Basket of Gold)	Ladybugs, Hover-flies
<i>Amaranthus</i> sp. (Amaranth)	Ground Beetles
<i>Anethum graveolens</i> (Dill)	Lacewings, Ladybugs, Mini-wasps
<i>Angelica gigas</i> (Angelica)	Lacewings, (ladybugs), (Mini-wasps)
<i>Anthemis tinctoria</i> (Golden Marguerite)	Lacewings, Ladybugs, Hover-flies, Mini-wasps, Tachinid flies
<i>Anthemum graveolens</i> (Dill)	Hover-flies
<i>Asclepias tuberosa</i> (Butterfly Weed)	Ladybugs
<i>Astrantia major</i> (Masterwort)	Hover-flies, Mini-wasps,
<i>Atriplex canescens</i> (Four-Wing Saltbush)	Lacewings, Ladybugs, Hover-flies
<i>Brassica hirta</i> (White mustard)	Braconid wasps, Ichneumon wasps
<i>Bupleurum fruticosum</i> (Mediterranean umble)	Tachinid Flies, Mini-wasps
<i>Calandula</i> sp. (Pot Marigold)	
<i>Callirhoe involucrate</i> (Purple Poppy Mallow)	Hover-flies, Mini-wasps,
<i>Carum carvi</i> (Caraway)	Lacewings, Hover-flies, Mini-wasps, Pirate/Damsel/Big-Eyed Bugs
<i>Chrysanthemum parthenium</i> (Feverfew)	Hover-flies,
<i>Convalaris minor</i> (Morning Glory)	Hover-flies, Ladybugs
<i>Coriandrum sativum</i> (Coriander)	Lacewings, Ladybugs, Hover-flies, Mini-wasps
<i>Cosmos bipinnatus</i> (Cosmos)	Lacewings, Hover-flies, Mini-wasps, Pirate/Damsel/Big-Eyed Bugs
<i>Daucus carota</i> (Queen Anne's Lace)	Lacewings, Ladybugs, Hover-flies, Mini-wasps, (Pirate/Damsel/Big-eyed Bugs), Assassin Bugs
<i>Fagopyrum esculentum</i> (Buckwheat)	Ladybugs, Hover-flies, Tachinid flies
<i>Foeniculum vulgare</i> (Fennel)	Lacewings, Ladybugs, Hover-flies, Mini-wasps (Ichneumonid), Pirate/Damsel/Big-Eyed Bugs
<i>Hedra</i> sp. (Ivy)	Flower flies, Tachinid flies, Mini-wasps
<i>Helianthus maximiliani</i> (Prairie Sunflower)	Lacewings, Ladybugs
<i>Heterotheca subaxillaris</i> (Camphorweed)	Stink bugs, Assassin Bugs, Ground Beetles, Spiders
<i>Iberis umbellate</i> (Candytuft)	over-flies
<i>Latuca canadensis</i> (Wild Lettuce)	Braconid wasps, Ichneumon wasps
<i>Lavandula angustifolia</i> (English Lavander)	Hover-flies

<i>Limnanthes douglasii</i> (Poached Egg Plant)	Hover-flies
<i>Limonum latifolium</i> (Statice)	Hover-flies, Mini-wasps
<i>Linaria vulgaris</i> (Butter & Eggs)	Hover-flies, Mini-wasps
<i>Lobelia erinus</i> (Edging Lobelia)	Hover-flies, Mini-wasps
<i>Lobularia maritime</i> (white Sweet Alyssum)	Hover-flies, Mini-wasps
<i>Medicago sativa</i> (Alfalfa)	Pirate/Damsel/Big-Eyed Bugs, Assassin bugs, (lady bugs), (mini-wasps)
<i>Melilotus alba</i> (White Sweet Clover)	Tachnid flies, Wasps
<i>Melissa officinalis</i> (Lemon Balm)	Hover-flies, Mini-wasps, Tachinid flies
<i>Mentha pulegium</i> (Pennyroyal)	Hover-flies, Mini-wasps, Tachinid flies
<i>Mentha spicata</i> (Spearmint)	Pirate/Damsel/Big-Eyed Bugs
<i>Monarda fistulosa</i> (Wild Bergamont)	Hover-flies
<i>Nemophila inignis</i> (Baby Blue Eyes)	Hover-flies
<i>Oenothera laciniata</i> & <i>O. biennis</i> (Eve. Primrose)	Ground Beetles
<i>Penstemon strictus</i> (Rocky Mt Penstemon)	Ladybugs, Hover-flies
<i>Petroselinum crispum</i> (Parsley)	Hover-flies, Mini-wasps, Tachinid flies
<i>Phacelia tanacetifolia</i> (Phacelia)	Tachinid flies
<i>Polygonum aubertii</i> (Silver-lace vine)	Tachinid flies, Hover-flies
<i>Potentilla recta</i> 'warrenii' (Sulfur cinquefoil)	Ladybugs, Mini-wasps
<i>Potentilla villosa</i> (Alpine Cinquifol)	Hover-flies, Mini-wasps
<i>Rudbeckia fulgida</i> (Gloriosa daisy)	Hover-flies
<i>Sedum kamtschaticum</i> (Orange Stonecrop)	Hover-flies, Mini-wasps
<i>Sedum Spurium</i> & <i>Album</i> (Stonecrop)	Hover-flies
<i>Solidago virgaurea</i> (Peter Pan Goldenrod)	Hover-flies, Pirate/Damsel/Big-Eyed Bugs
<i>Solidago altissima</i> (Tall Goldenrod)	Predatory Beetles, Big-eyed Bugs, Ladybugs, Spiders, Mini-wasps, Long-legged flies, Assassin bugs
<i>Stachys officinalis</i> (Wood Betony)	Hover-flies
<i>Symphocarpos</i> sp. (Snowberry)	Flower flies, Tachinid flies
<i>Tagetes tenuifolia</i> (lemon gem Marigold)	Ladybugs, Hover-flies, Mini-wasps, Pirate/Damsel/Big-Eyed Bugs
<i>Tanacetum vulgare</i> (Tansy)	Lacewings, Mini-wasps, Tachinid flies
<i>Taraxacum officinale</i> (Dandelion)	Lacewings, Ladybugs
<i>Thymus serpyllum coccineus</i> (Crimson Thyme)	Hover-flies, Mini-wasps, Tachinid flies
<i>Trifolium repens</i> (White clover)	Parasitic wasps of aphids, scales, and whiteflies
<i>Veronica spicata</i> (Spike Speedwell)	Hover-flies
<i>Vicia villosa</i> (Hairy vetch)	Ladybugs
<i>Zinnia elegans</i> (Zinnia or Liliput)	Hover-flies, Mini-wasps



## Companion Plants that Repel Specific Pests

*Some plants (especially aromatic herbs) repel pests. Plant these between or near plants with pests.*

- *Allium* sp. (Onions) repels aphids, carrot flies, moles, tree borers, weevils
- *Allium sativum* (Garlic) repels aphids and nematodes
- *Allium schoenoprasum* (Chives) repels aphids, Japanese beetle, rabbits
- *Allium tuberosum* (Garlic Chives) repels aphids, Japanese beetle, rabbits
- *Allium scenscens glaucum* (Corkscrew Chives) repels aphids, Japanese beetle, rabbits
- *Anethum graveolens* (Dill) repels cabbage loopers, imported cabbage worms, Tomato hookworm
- *Artemisia abrotanum* (Southernwood) repels cabbage white butterfly
- *Artemisia absinthium* (Wormwood) repels moths, slugs, carrot fly
- *Borago officinalis* (Borage) repels tomato worm
- *Calendula officinalis* (Pot Marigold) repels tomato hookworm, asparagus beetle, some nematodes
- *Coriandrum sativum* (Coriander) repels aphids
- *Euphorbia lathyris* (Caper Spurge) repels moles and mice
- *Foeniculum vulgare* (Fennel) repels fleas and mosquitoes
- *Hyssopus officinalis* (Hyssop) repels cabbage moth and cabbage loopers
- *Lamium amplexicaule* (Henbit) repels many insects
- *Lavandula angustifolia* (Lavander) repels moths, flies
- *Marrubium vulgare* (Horhound) repels grasshoppers and other chewing insects
- *Matricaria* sp. (Chamomile) repels flies
- *Mentha* sp. (Mint) repels cabbage white butterfly, aphids, flea beetles,
- *Mentha pulegium* (Pennyroyal) repels flies, mosquitoes, fleas
- *Nepeta catania* (Catnip) repels flea beetle and ants
- *Nepeta catania* 'Pool Bank' repels aphids, cucumber beetle, Colorado potato beetle, cabbage moth, squash bug, flea beetle
- *Ocimum basilicum* (Basil) repels flies and mosquitoes, asparagus beetle, aphids
- *Ocimum basilicum minimum* (Bush Basil) repels flies and mosquitoes
- *Ocimum basilicum* 'Spicy Globe' (Mini-Basil) repels flies and mosquitoes
- *Ocimum basilicum* 'Dark Opal' (Purple Basil) repels tomato hookworms
- *Origanum vulgare* (Oregano) repels cabbage white butterfly
- *Pelargonium* sp. (Geranium) repels Japanese beetle, cabbageworm, leaf-hopper

- *Petroselinum sp.* (Parsley) repels carrot flies
- *Rosmarinus officinalis* (Rosemary) repels cabbage white butterfly, bean beetle, carrot fly, Mexican bean beetle, slugs, snails, some mosquitoes
- *Ruta graveolens* (Rue) repels Japanese beetle, flies
- *Salvia officinalis* (Sage) repels cabbage moth/looper/maggot, carrot fly, flea beetle, slugs
- *Santolina chameacyparissus* (Cotton Lavander) repels cabbage moth
- *Tagetes sp.* (Marigold) repels aphids, whiteflies, cabbage maggot, corn earworm, Mexican bean beetle, rabbits, some nematodes, plum curculio
- *Tanacetum vulgare* (Tansy) repels flying insects, Japanese beetles, striped cucumber beetle, squash bugs, ants, flies
- *Thymus vulgaris* (Thyme) repels cabbage loopers, whiteflies, cabbageworm
- *Tropaeolum majus* (Nasturtium) repels wooly aphids, squash bugs, striped pumpkin beetle  
Whitefly, cabbage loopers, carrot flies,

## **Trap Plants that Attract Pests**

*These can be planted specifically to draw pests away from other plants, possibly to be collected and disposed of later.*

### **A few examples**

- *Chrysanthemum parthenium* (Feverfew) attracts aphids, thrips
- *Brassica juncea* (Mustard) attracts many pests
- *Lycopersicon esculenta* (Tomato) attracts whitefly
- *Gerbera jamsonii* (Gerbera) attracts whitefly
- *Alstroemeria sp.* (Peruvian Lily) attracts whitefly
- *Rosa sp.* (Rose) attracts whitefly, mites
- *Fuchsia sp.* (Fuchsia) attracts whitefly
- *Raphanus sativa* (Radish) attracts *Pratylenchus* lesion nematodes
- *Helianthus sp.* (Sunflower) attracts thrips
- *Solanum melogena* (Eggplant) attracts whitefly
- *Nicotiana sp.* (Tobacco) attracts whitefly
- *Senecio sp.* (Cineraria) attracts aphids

## **Banker Plants**

*Banker Plants provide a home base for a beneficial predator population by feeding and sustaining a group of insects that the predator feeds upon.*

### Example #1: Aphid control for Sweet Peppers

- Rye (*Secale cereale*) is first purposely infested with corn-leaf aphid (*Rhopalosiphum maidis*), a type of aphid that is not harmful to sweet peppers.
- An aphid-predator (either *Aphidus colemani* Vierick, *Aphidus ervi* Haliday, or *Aphidoletes aphidimyza*) is then introduced to the rye plant, where it happily feeds on the corn-leaf aphids and establishes a colony.
- The rye plant is placed amongst a sweet pepper crop.
- The predators breed and maintain an established colony on the rye, but also jump off into the garden where they devour any aphids that they find.

### Example #2: Whitefly control

- Common mullein (*Verbascum thapsus*) can sustain a colony of the bug *Dicyphus Hesperus* ‘Knight’ throughout its entire lifecycle, so no other (insect) food source is necessary.
- *Dicyphus Hesperus* is introduced to the mullein plant, where it establishes a colony.
- The mullein is then introduced to the greenhouse.
- *Dicyphus Hesperus* maintains a breeding colony on the mullein, but also jumps off into the greenhouse where it readily preys on all stages of greenhouse whitefly (*Trialeurodes vaporariorum*), tobacco whitefly (*Bemesia tabaci*), and Silverleaf whitefly (*Bemesi argentifolii*).