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Beneficial insects were used for years until research showed that they, along with unwanted insect pests, were both killed by synthetic pesticides. The pests developed resistance to the pesticides but many of the beneficial insects did not. With the chemicals becoming increasingly ineffective, pest problems increased.

TYPES OF BENEFICIAL INSECTS

There are three major types of beneficial insects present in our gardens. An important one is the pollinator. Without pollinators, fruit, vegetables and the production of seed would be greatly reduced. The best known pollinator is the honey bee, but there are leafcutter bees (a nuisance in the ornamental garden because they cut circles out of the leaves of many plants and use them to line their nests), wasps and alkali bees.

The second type, the predator, feeds on many insects. The predator may be a larvae or adult which feeds on other insects in one more stages of its life. Two very important groups of predators that are not insects include spiders and mites. Spiders are very effective predators and are general feeders. They are often destroyed because of our fear of being bitten. Many of them will bite humans and other animals, but their intent is not for food, but for protection.

Parasitic insects are the third type. The adult lays eggs in or on the host insect and when the eggs hatch, the larvae feed in or on the host insect. The adult parasitic insects feed on pollen, nectar or other food sources, but not on insect pests. Common parasites are small wasps.

Predator and parasitic insects help to keep the insect pest populations down and in many cases can reduce the numbers to a point where other control measures are unnecessary.

We can encourage beneficial insects to stay in our gardens by providing them with the nectar and pollen they need. Both Thomas Jefferson and George Washington maintained insectories and planted various plants to attract beneficial insects for protection of their crops. Some the best plants for attracting and keeping beneficial insects are clovers, alfalfa, Bishops flower, coriander, white sweet alyssum, yarrow, candy tuft, dill, parsley, black-eyed Susan and fennel. It's important to have lots of these plants in bloom to attract and keep the insects around.

The attractant seed mixture works best when planted close to the crop you hope to protect. A perimeter planting is preferred since it lends itself to control throughout your yard and much of the immediate area. Interplanting, particularly in the vegetable garden and flower beds, is also a good planting method. The seed should be sown in February-March in the southern Nevada and April-May in the north. For flowers earlier in the season, many of these can be started inside and transplanted.

In many situations, the plants that you want the beneficial insects to protect don't supply enough pollen and nectar to keep them in the garden. To overcome this, many companies sell a material called "Pred Feed" which is a food supply and attractant for beneficial insects. It contains sugars and other materials that are sprayed on the foliage of the plants.

USING INSECTS FOR HOME GARDEN PROTECTION

Many beneficial insects can be purchased for release in the garden to coincide with the seasonal arrival of a particular insect pest. Before the insects are ordered or purchased, you need to make some important observations. The first is: Do you have any insect pests around? If one purchases lady beetles for the sole purpose of keeping the garden free of bad bugs, you've wasted your money. If there is nothing for them to eat, they will fly off in search of food. At the other extreme, waiting until the pest problem is severe and then releasing the beneficial insects will not result in the expected control, either. The plants could be destroyed before the beneficial insects have a chance to reduce the numbers of the pest. In this case, use the next line of defense – a short-lived, safe pesticide.

The beneficial insects should be released when you observe that the insect pest populations are at low to moderate levels. This makes frequent checks of the garden necessary.

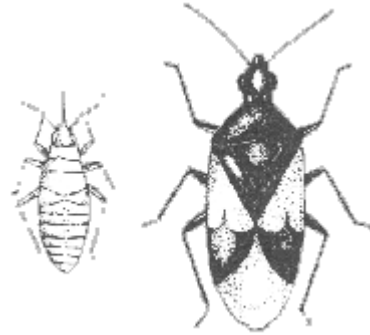
PREDATOR INSECTS

1. Lady beetles. Sometimes called ladybugs (although not a bug), lady beetles love to eat aphids but will feed on mealy bugs, spider mites, larvae of elm-leaf beetle and many other soft-bodied insect pests and their eggs. Both the adult and larvae feed on insect pests. These are often purchased and released, but the problem is they will leave if there isn't enough to eat. Lady beetles are also apt to leave



regardless of the food supply to hibernate and return to where they were originally collected. A pile of pine needles can sometimes convince them to make your garden their home.

2. True bugs. These are very aggressive predators. They stab their prey, piercing the insect to inject digestive enzymes before sucking out the contents. True bugs include assassin bugs, damsel bugs and the minute pirate bug. They prey on spider mites, aphids, thrips, leafhoppers and caterpillars. When they run out of food they often turn to cannibalism. The adults are winged and the nymphs can't fly, although they resemble the adult otherwise. Don't try to pick these up, particularly the assassin bug, which can give you a very painful bite that often has an after-effect.



3. Green lacewings. Lacewing larvae are commonly known as aphid lions. The larvae feed on leafhoppers, nymphs, spider mites, thrips, moth eggs, other eggs and other small larvae. Green lacewing eggs are easy to spot in the garden for they look like tiny eggs held upright on the top of branches by thin strands. The adults require nectar and pollen to feed on or they will leave.

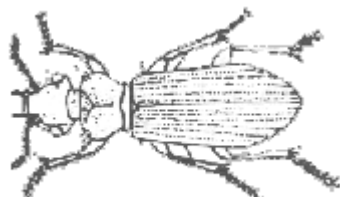


4. Wasps. The common wasps that we notice in our gardens are the hornet and yellow jacket. Others are tiny and very hard to see. The tiny ones are parasites. Some of the large wasps sting caterpillars and feed them to their young. The mud dauber wasp goes after spiders to



feed their young.

5. Ground beetles. These come in many different sizes, shapes and colors. Most ground beetles we see in our gardens are somewhat flattened, darkened and shiny. They have large jaws or mandibles which they use to grab their prey. Most of them hide during the day and feed at night on a variety of insects.

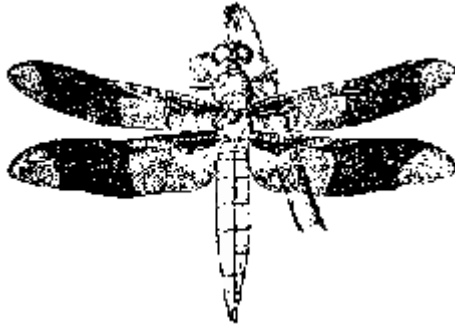


6. Antlions or doodlebugs. Antlions are the larvae of one of large, clear winged insects, and are close cousins of



lacewings. They make funnel-shaped traps in the soil with loose sides and wait for insects to fall in. They have long, sickle-shaped mouth parts for grabbing any unsuspecting insect that falls into its trap.

7. Dragon flies. These are the very large winged insects that fly around ponds or streams. They depend entirely on other insects for their food and eat large quantities of mosquitoes and flies.



8. Syrphid flies. These are also known as flower flies or hover flies. They are often brightly colored and look like small yellow jackets, but because they are flies, they don't sting. The larvae are very voracious and feed on aphids, young termites, ants and bees.



9. Praying mantids. These insects are more interesting than effective because they don't actively search for prey but wait for them instead. They are cannibalistic and the first one to hatch will wait for its brothers and sisters and eat them as they hatch. They eat primarily grasshoppers, bees, wasps, crickets and flies, so aren't all that effective in the garden.

10. Spiders. Spiders are not particular feeders and will feed on any insect they can catch. There are two basic types, those that spin webs and catch flying insects and those like crab spiders which lay in wait to spring on their unsuspecting prey.



11. Predatory mites. These mites feed on most of the pest mites. One of the predatory mites, also feeds on flower and onion thrips.

Commercially Available Beneficial Insects

The following is a list of some of the beneficial insects that are available from nurseries or mail-order catalogs.

Beneficial Insects	Insect Pest Control
White fly predator and parasite	ash white fly, greenhouse white fly
Praying mantids	eggs of most moths and butterflies
Parasitic wasps	eggs of most moths and butterflies

Minute pirate bug	all soft-bodied insects, mites and eggs
Lady beetles	all soft-bodied insects, mites and eggs
Green lacewing	all soft bodied insects, mites and eggs
Golden chalcid	many of the armored scales
Aphid midge	aphids
Thrip predator bug	thrips
Scale parasites	scales
Predatory mites	mites

PARASITES

1. Parasitic flies. Tachinid flies are parasitic flies that lay eggs on caterpillars and tree buds. The fly larvae lives and feeds on immature insect pests. They are about the size of a house fly, covered with heavy bristles and darker.

2. Braconid wasps. These are tiny wasps that you never see unless you happened to notice their little white cocoon on the outside of the insect they have killed. They feed on the body fluids of their host. Most feed on sphinx moth caterpillars like the tomato horn worms.

3. Trichogramma wasps. These wasps lay their eggs in the eggs of other insects. Their main hosts include the eggs of armyworms, fruitworms and cutworms. They parasitize over 60 caterpillars including peach tree borer, cabbage looper and codling moth. These wasps are readily available commercially.