

## Landscape Integrated Pest Management<sup>1</sup>

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To combat landscape plant insect pests successfully, something should be known about the manner in which they develop and feed. Insects normally hatch from eggs deposited on or near the food supply, although in some cases, as with aphids, they hatch within the female's body and the active young emerge from the female. Adults usually have fully developed wings, although a few species of insects never develop wings.

Insects pass through several stages during their development (metamorphosis). Plant bugs, leafhoppers, thrips and grasshoppers hatch from the egg in a form known as a nymph. The nymph resembles the full-grown insect, except that it lacks wings and is smaller. It molts periodically as it increases in size (gradual metamorphosis, Figure 1). Moths, beetles and flies, on the other hand, hatch from the eggs in a worm-like form (larva) that is much different in appearance from the adult. The larva of a moth or butterfly is commonly called a caterpillar; the larva of a beetle is called a grub; and the larva of a fly is known as a maggot. Larvae moult periodically and when mature they transform to an inactive form, known as a pupa. The adult moth, beetle or fly emerges from the pupa after a period of

no feeding and little activity (complete metamorphosis, Figure 2).

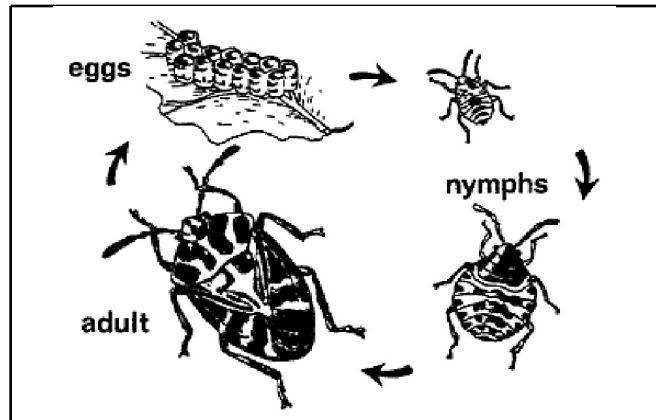


Figure 1. Gradual metamorphosis.

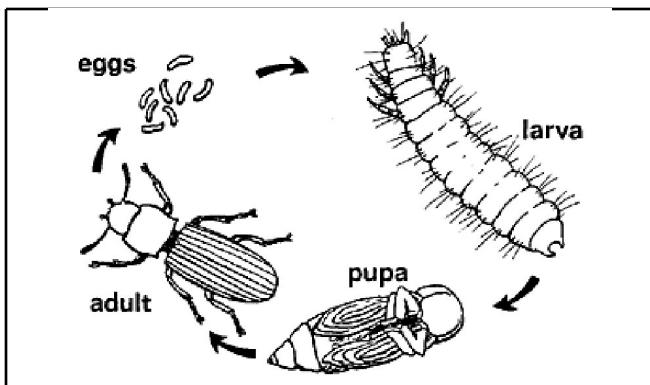
The length of the life cycle varies greatly with many species of insects. Some develop from egg to adult in a few days or weeks, many require a year, and a few take two or more years to reach maturity.

### Identification

Proper identification is very important. When the insect is correctly identified, information regarding its life cycle, food preference, habits and whether it is beneficial or harmful can be looked up in various

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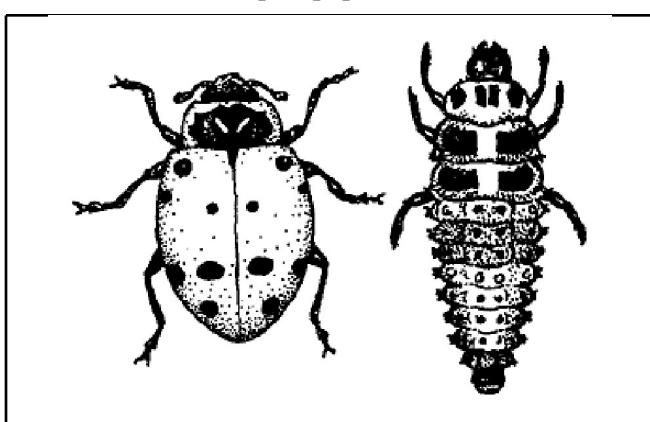


**Figure 2.** Complete metamorphosis.

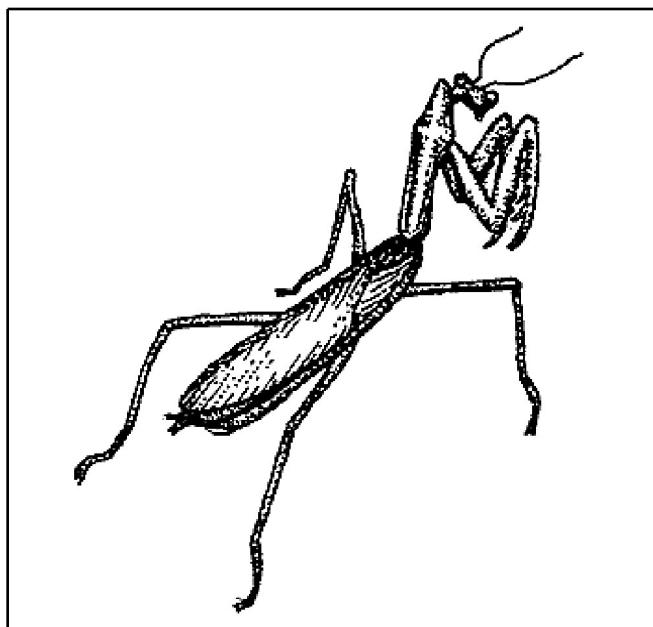
leaflets or books available at the local Cooperative Extension Service or library.

### Beneficials

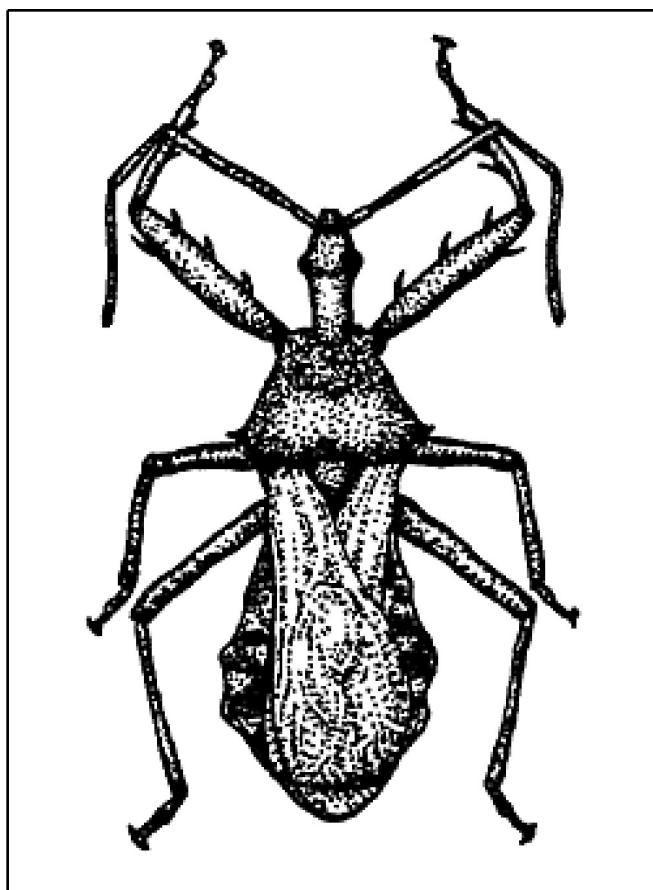
Less than one percent of all insects are pests on plants. Many beneficial insects feed upon harmful ones. Common examples of predators are lady beetles (Figure 3), praying mantids (Figure 4), assassin bugs (Figure 5), ambush bugs, and aphid lions. Spiders also prey on numerous insect pests. Several species of mites do not damage plants but instead feed upon other plant-feeding mites. Also, many harmful insects are destroyed by tiny wasp-like parasites. It is important to learn to identify these beneficials and to recognize when they are holding pests in check. If such pests as aphids, scales, or whitefly nymphs have a small hole, as if stuck by a straight pin, it is evidence that they have been parasitized by tiny wasps. If predators are present or the pests show signs of parasitism, every effort should be made to preserve the beneficial insects. Delay applying a pesticide and allow the beneficials a chance to control the pest population.



**Figure 3.** Lady beetle.



**Figure 4.** Praying mantid.



**Figure 5.** Assassin bug.

### Inspecting Plants

Examine your plants weekly during the spring, summer and fall. Look at the undersides of a few

leaves on each plant and observe the stems for pests. While many plants are relatively pest free, others are commonly infested with key pests (e.g. mites on roses, oleander caterpillars (Figure 6) on oleanders, aphids on crepe myrtles.) Concentrate your scouting efforts on the plants that are likely to have problems. The use of a 10 to 15 power magnifying glass aids in detecting and identifying insects and related organisms. Many insects merely rest on the plant and are neither pests nor beneficial. Learn to determine when a pest is present in damaging numbers and to evaluate the potential of the predator or parasite population. Watch for sooty mold on leaves. This fungus grows on the "honeydew" excreted by insects such as whiteflies, aphids and soft scales. Because ants also feed on this honeydew excrement, their presence on plants often indicates an insect infestation. To aid in locating small insects such as thrips or mites, a sheet of white paper or cloth may be held beneath the leaves and the foliage struck sharply. The insects or mites will fall onto the paper and can be more easily observed and identified than on the green foliage. Most plants in the urban landscape are over-sprayed, resulting in unnecessary environmental contamination and often upsetting the natural predator/parasite-pest balance. Don't apply a control measure until a pest population is present and damage is beginning to occur. If you must treat, use the least toxic remedy possible (such as soap, oil, *Bacillus thuringiensis*) and exercise great care to avoid contaminating yourself and other living creatures.

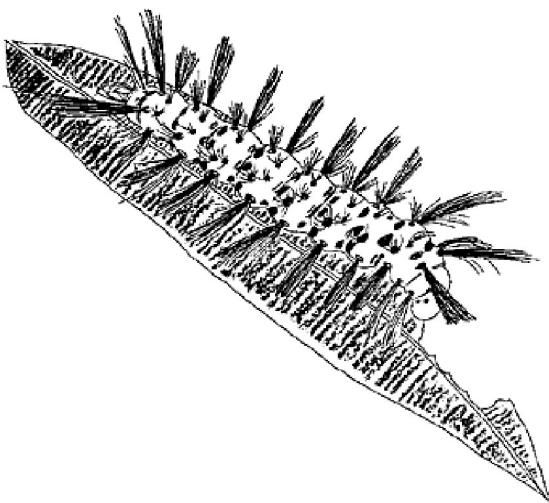


Figure 6. Oleander caterpillar.

## Groups Of Pests

Pests of ornamentals may be divided into five groups according to the way they damage plants.

### Insects with Piercing-Sucking Mouthparts.

(Figure 7) These insects have beak-like mouthparts which are used for piercing the plant tissue and sucking the plant juices.

Examples: Scales, aphids, whiteflies, mealybugs, thrips, lace bugs.

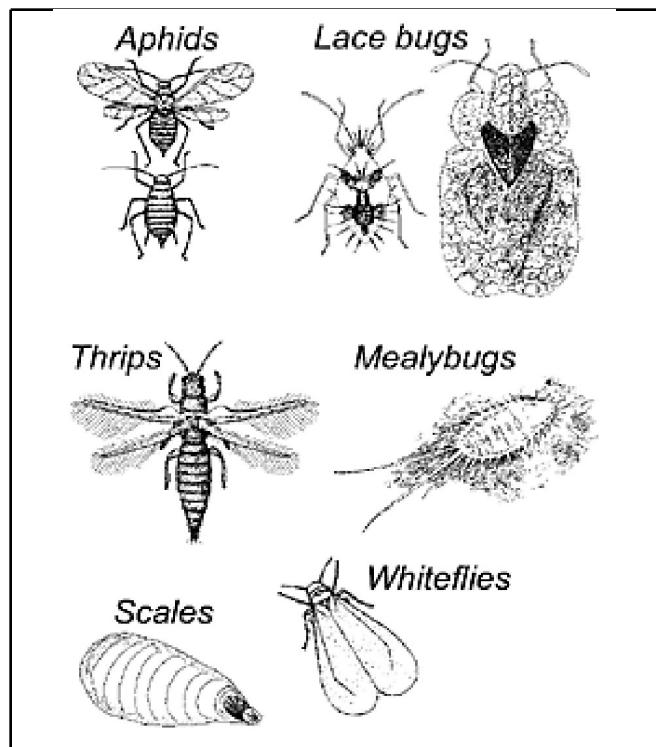


Figure 7. Insects with piercing-sucking mouthparts.

**Foliage-Feeding Insects.** (Figure 8) They may feed on the leaves, flowers or attack the roots.

Examples: Caterpillars, beetles, grasshoppers, katydids.

**Spider Mites.** (Figure 9) These pests are not insects but closely related to spiders and scorpions. They suck plant juices with their piercing-sucking mouthparts.

**Leafminers.** These are very small larvae of flies, beetles, or moths that tunnel between the upper and lower leaf surfaces.

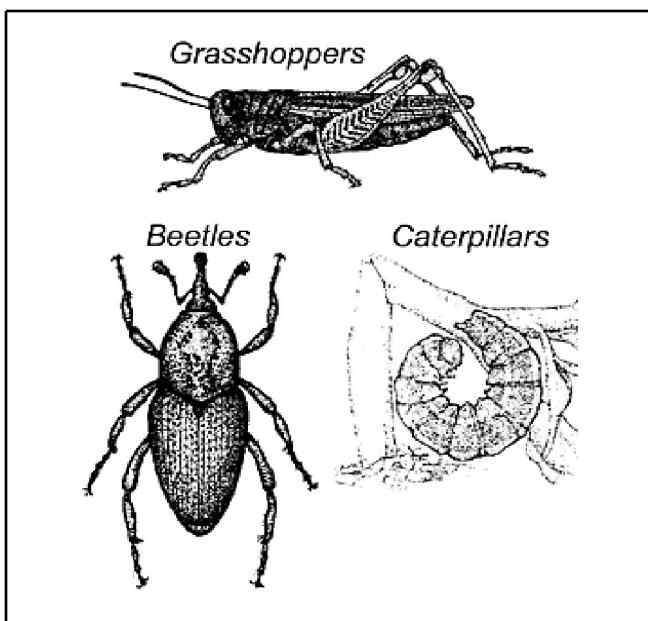


Figure 8. Foliage-feeding insects.

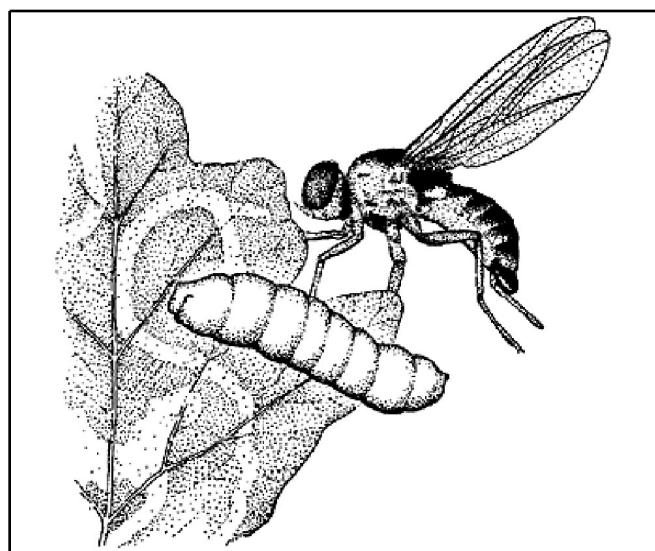


Figure 10. Serpentine leafminer.

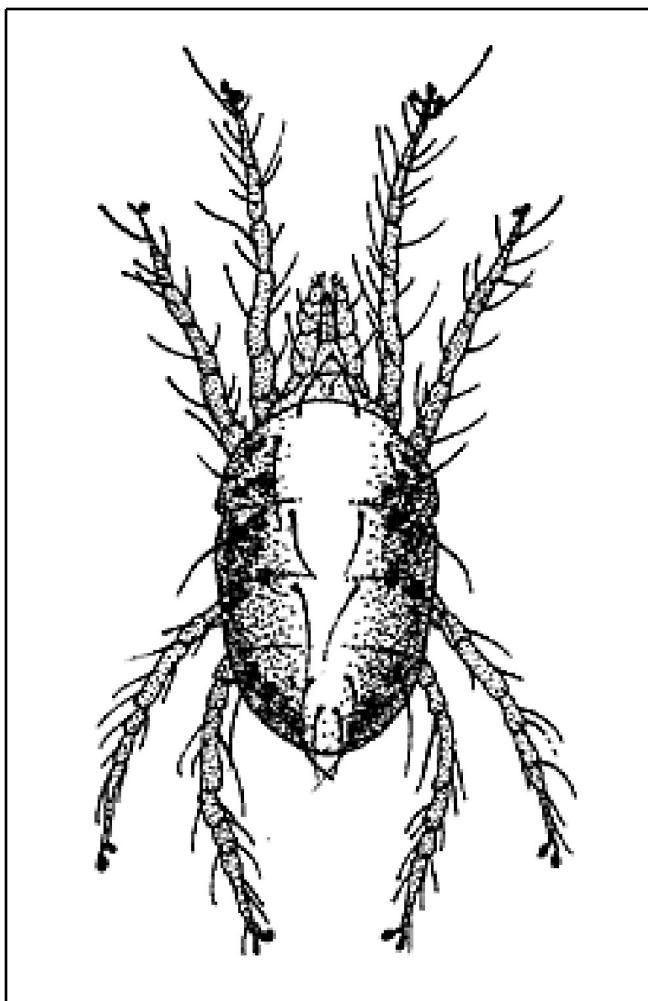


Figure 9. Spider mite.

Examples: Blotch leafminers and serpentine leafminers (Figure 10).

**Borers.** There are many species of insects which bore into the twigs or trunks of plants and trees. These are either the larvae of moths or beetles.

Examples: Pine bark beetles, seagrape borer, carpenter worm.

### Non-Insecticidal Control

Sometimes it is possible to remove pests and keep populations below damaging levels by spraying landscape plants with a forceful stream of water. Use a garden hose with an adjustable nozzle and spray undersides of leaves and stems when such pests as aphids, mealybugs, spider mites, thrips or lace bugs appear.

Insecticidal soaps and horticultural oils are available that are formulated for controlling insects and related pests. An effective, environmentally safe, general purpose spray against insects or mites attacking landscape plants is a soap plus oil mixture. These are commercially available or can be homemade by mixing 2 TBSP vegetable cooking oil (corn, soybean, peanut, or sunflower oil) and 2 TBSP liquid dishwashing detergent per gallon of water. Thorough coverage of the undersides of leaves is very important because the insects must be contacted directly by the soap and oil. Monitor plants and reapply when needed.

Commercial formulations of *Bacillus thuringiensi*, variety *kurstaki*: a bacterium, are

available and provide good control of caterpillars. This bacteria has no effect on other groups of insects, including the predators and parasites.

Mechanical control is sometimes practical for small numbers of the larger insects such as caterpillars, grasshoppers and beetles. Frequently insects can be picked or knocked off the plant and destroyed. Large numbers of newly hatched caterpillars or beetle larvae may be detected by watching for freshly skeletonized leaves and destroyed in this way. After hatching, small caterpillars and beetle larvae remain on the leaf for several days. Damaged leaves can be removed and destroyed before the larvae have dispersed over the plants. Young lubber grasshoppers also feed in aggregates and can be hand picked and destroyed.

## Chemical Control

Insecticides may be required to control insects and related pests when they reach damaging levels on landscape plants. Most insecticides kill by either direct contact or ingestion. Some also exert a fumigating or vapor action under certain conditions.

Materials should be selected that will be effective in controlling the pests without injuring the plant, or causing buildup of other pests. Before using an insecticide, the following points should be considered:

- Select the right material. Only use an insecticide that has the plant and pest listed on the label.
- Use the right amount. Use the recommended amount. Too little won't control the pest; too much may injure the plant. Read the container label carefully for correct dosage rate.
- Apply it in the right way. Thorough coverage of the leaves (especially the underside), twigs, and branches is essential, but spray only to the point of run-off. The insecticide must reach the area of the plant where the pest is feeding. Most failures to control pests are the fault of incorrect application, not one of the insecticide. The addition of a spreader/sticker to the spray mixture especially with wettable powder formulations is recommended when treating

ornamental plants. Use of a spreader/sticker will aid in the pesticide adhering to the leaves and improve the coverage for better control.

- Cost is not an important factor when it comes to product effectiveness.

## Sprayers

Sprayers of various types and sizes are available, including simple trombone action sprayers, 1 to 3 gallon compressed air sprayers, and 1 to 3 gallon knapsack sprayers. Sprayer type varies with the size and type of planting to be protected. With all sprayers, it is important that relative plant parts be covered to the point of runoff. Sprayers which attach to the end of garden hoses are popular with home gardeners. Such types are less satisfactory, in general, for use on ornamental plants and in particular against pests like scales and spider mites. The spray pattern is usually coarse, and it is difficult to direct the spray to reach and adequately cover the undersides of the leaves, especially those near the ground and on the side of plants close to a building or fence. Considerably more insecticide is used with the hose end attachment and this may lead to greater harm to the environment. If a hose attachment is used, be sure it is one manufactured for use on ornamental plants and not for use on lawns.

## Systemic Insecticides

A systemic insecticide is a chemical compound that is absorbed by the host plant, translocated throughout its tissues and makes the host toxic to certain insect and mite pests. Several systemic insecticides are taken up from the soil by the roots of plants and translocated throughout the plant tissues; others can be absorbed by foliage sprays, or from injections into the plants' stems.

Systemic insecticides have been effective primarily in controlling small sucking pests, including aphids, whiteflies, scales, mealybugs, lace bugs, and spider mites. In general, they have not given satisfactory control of chewing insects.

Systemic insecticides applied to the soil as drenches or granules can remain effective over six weeks. Also, when applied in this manner, they are

relatively harmless to any insect predators and parasites that may be present in the plant foliage.

Systemic insecticides are available in different formulations and concentrations and the amounts may vary for different ornamental plants. Follow the directions and cautions on the manufacturer's container label for the amounts to use on the ornamental plants specified on the label.

## **Phytotoxicity Or Plant Injury**

A pesticide or mixture of pesticides may cause injury to certain plants. The condition under which the injury occurs may vary considerably depending upon temperature, humidity and other environmental factors. In general, it is best to apply pesticides during the cooler part of the day. Plants are less likely to be injured when protected by at least partial shade as opposed to being in direct sun.

It is a good practice to water or irrigate ornamental plants one to two days before applying pesticides. Some materials can injure plants when they are stressed for moisture. Wettable powders are generally safer to use on plants than emulsifiable concentrates because they do not contain emulsifiers and solvents.

## **Precautions**

Insecticides are poisons and should be handled as such. Read the manufacturer's label carefully before opening the container and observe all instructions and precautions. Wear rubber gloves and boots when handling and applying insecticides. Avoid breathing mists or fumes. Do not spill sprays on the skin. Change clothes and wash all exposed parts of the body immediately after using pesticides. Store pesticides in original labeled containers in a locked area out of reach of children. Rinse empty containers three times and put rinsings in spray tank. Dispose of empty containers (one gallon or smaller) by wrapping in newspaper, crush or puncture to prevent reuse, and put in the garbage can for disposal in an approved sanitary land fill.