

Pests and Plants

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2/22/2018

Good or Bad?

- Most (95%) are neutral or good, but the pests are emphasized here
- Some are both good and bad for plants – needed for pollenization, but also eat the plants, for example. Or eat both bad and good insects.
- Some of the most beneficial are listed at the end
 - Ladybugs
 - Parasitic wasps
 - Green lacewings
 - Centipedes

Cucumber Beetle

- Crops Infected
 - Both feed on
 - Cucurbit: Cucumber, cantaloupe, squash, gourd, pumpkin, and watermelon
 - Pea, corn
 - Striped: bean, and flowers
 - Spotted: potato, beet, tomato, eggplant, and cabbage
- Life Cycle
 - Damaging Stage: adult and larvae
 - Overwintering: adult winters in leaf litter and hedgerows
- Control Measures
 - Resistant or less-tasty-to-beetle varieties
 - Traps
 - Chemical: carbaryl, rotenone, sabadilla, pyrethrum, and methoxychlor



Flea Beetles

- Crops Infected
 - Eggplant, potato, tomato, cabbage, spinach, and corn depending on specific type of flea beetle
- Life Cycle
 - Damaging Stage: adult and larvae, but most damage to young plants or when large number of beetles
 - Overwintering: weeds or leaf litter as adults
- Control Measures
 - Remove crop residues
 - Cover young plants or start indoors
 - Chemical: Sevin, methoxychlor, rotenone, insecticidal soap, and pyrethrum



Colorado Potato Beetle

- Crops Infected
 - Potatoes, eggplant, tomatoes, ground cherries, and peppers
- Life Cycle
 - Damaging Stage: adult and larvae feed on leaves
 - Overwintering: adults under plant debris and in soil
- Control Measures
 - Bacterium: Novodor, Foil, and Trident (*Bacillus thuringiensis* var. *tenebrionis* a.k.a Bt San Diego) on young larvae
 - Physical: ditches with steep side lined with plastic, crop rotation, or flame throwers
 - Chemical: Sevin, rotenone, and pyrethrum, neem (but beetles are known to form resistance, rotate with bacterium)



Mexican Bean Beetle

- Crops Infected
 - Beans (legumes)
- Life Cycle
 - Damaging Stage: Adult and larvae feed on leaves
 - Overwintering: Adult under leaf litter and in weedy hedgerows
- Control Measures
 - Parasitic wasp, *Pediobius foveolatus*
 - Pick beans early, handpick beetles and kill them, cover rows
 - Chemical: Sevin, methoxychlor, rotenone, and pyrethrum particularly on underside of leaves



Squash Beetle

- Crops Infected
 - Cucurbits: squash, pumpkins, cucumbers, melons, gourds
 - Lima beans
- Life Cycle
 - Damaging Stage: Adults and larvae
 - Overwintering: Adults under loose tree bark or leaf litter
- Control Measures
 - Crop rotation
 - Hand picking and row covers
 - Chemical: Endosulfan (Thionex), lambda-cyhalothrin (Warrior), pyrethrins, spinosad (Radiant or Entrust)



Imported Cabbage Worm

- Crops Infected

- Cabbage Family: Cabbage, broccoli, cauliflower, collards, kale, Chinese cabbage, and Brussels sprouts
- Larvae occasionally eat turnips, radish, mustard, and lettuce

- Life Cycle

- Damaging Stage: larvae
- Overwintering: pupa attached to a stem, branch, fencepost or other hard surface area

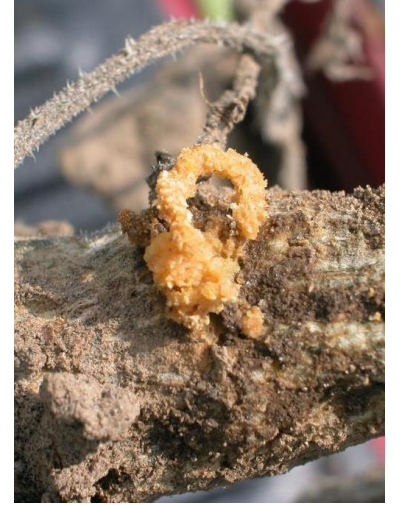
- Control Measures

- Resistant varieties: red cabbages, savoy cabbage, and glossy collards
- *Bacillus thuringiensis* (Dipel, Thurcide, Bt, etc.) on small larvae
- Row covers or nylon stockings
- Sevin, methoxychlor, rotenone, and pyrethrum



Squash Vine Borer

- Crops Infected
 - Cucurbits: primarily squashes, pumpkins
 - Less susceptible: melons, and cucumbers
- Life Cycle
 - Damaging Stage: larvae within stems or vines
 - Overwintering: pupae in soil near plants
- Control Measures
 - Resistant cucurbits, floating row covers, crop rotation
 - Stem barriers, adult traps, late planting
 - Beneficial nematodes (*Steinernema carpocapsae*)
 - Kaolin clay on larvae just after hatching



Tomato Hornworm

- Crops Infected
 - Solanaceous plants (nightshade family): tomato
 - Have been found on potato, eggplant, and pepper
 - Weed hosts: horsenettle, jimsonweed, and nightshade
- Life Cycle
 - Damaging Stage: caterpillars
 - Overwintering: pupae in soil
- Control Measures
 - Check twice per week, remove weed hosts
 - Remove and kill, throw in soapy water
 - Ladybugs, green lacewings, and paper wasps, *Polistes* spp. are predators
 - Insecticidal soap, Bt subsp. *kurstaki*, carbaryl, spinosad, permethrin, and bifenthrin



Squash Bug

- Crops Infected
 - Squash and pumpkins
 - Other cucurbits, such as cucumbers
- Life Cycle
 - Damaging Stage: adults
 - Overwintering: adults in sheltered places, under plant debris, around building, under rocks
- Control Measures
 - Remove and kill nymphs and adults into soapy water
 - Crush eggs and/or trap bugs under boards and destroy
 - Remove plant debris
 - Minimal bee activity under leaves with chemicals: carbaryl, permethrin, bifenthrin, esfenvalerate



Cutworm

- Crops Infected
 - Nearly all
- Life Cycle
 - Damaging Stage: caterpillar (larvae) at night
 - Overwintering: caterpillar stage
- Control Measures
 - Beneficial nematodes
 - Stiff (cardboard, plastic, or metal) buried protective collars (2-in below and 2-in above) or band of diatomaceous earth
 - Eliminate tall grass and weeds
 - Carbaryl bait in late afternoon



Adult cutworms are dark night-flying moths

Codling Moth

- Crops Infected
 - Apples, pears, apricots, quinces
 - Caterpillars bore small holes in the fruit, usually at or near the blossom end. Inside, the pinkish-white worms with brown heads feed on the flesh, leaving tunnels full of sawdustlike frass (droppings). Infested fruit often drops prematurely from trees.
- Life Cycle
 - Codling moth larvae overwinter in cocoons under loose bark on the trunk or under debris on the ground.
 - The females lay eggs on leaves, twigs, and fruits. The larvae feed briefly on the leaves before tunneling into the fruits.
 - After feeding for 3 to 5 weeks, they emerge and crawl down the trunk in search of a spot to pupate. There can be up to three generations per year.
- Control Measures
 - Spray with the bioinsecticide *Bacillus thuringiensis* (Bt). You will need to apply Bt at least three times, and timing is critical. Make the first spray 15 days after petal fall begins, and subsequently at 5-day intervals. Note when petal fall begins and mark the spray days on a calendar. Orchardists use sticky traps baited with codling moth pheromone in order to time sprays exactly.
 - Parasitic wasps will attack the caterpillars as they hatch, and are commercially available if there's no natural population.
 - Rake leaves and dropped fruit through the growing season and in autumn after all leaves have fallen.



Cabbage Looper

- Crops Infected
 - Chews ragged holes in the leaves of cabbages, broccoli, Brussels sprouts, and cauliflower.
- Life Cycle
 - The larvae of a gray, night-flying moth
 - There may be several generations per year
- Control Measures
 - Use a lightweight row cover in early spring as a barrier to egg-laying moths.
 - Spray with *Bacillus thuringiensis* (Bt), which is most effective when caterpillars are small. Be sure to spray the undersides of leaves where young caterpillars prefer to feed.



Corn Earworm

- Crops Infected
 - Corn
 - Also a variety of plants and hence has many common names: tomato fruitworm, cotton bollworm, geranium budworm.
 - Also is know to feed on beans, peas, peppers, potatoes, and squash.
- Life Cycle
 - The adult is an inch-long tan moth that lays yellow eggs on leaf undersides in the spring. The caterpillar larva has alternating light and dark stripes that may be green, pink, or brown.
 - This first generation of caterpillars feeds on the leaves. Eggs of later generations are laid on corn silk; the emerging caterpillars feed on the silk and the kernels at the tip of the ear just inside the husk.
- Control Measures
 - Squirt half a medicine dropper of mineral oil into the tip of each ear of corn after the silks have wilted and have begun turn brown (applying oil earlier may interfere with pollination).
 - Plow the garden in fall to kill overwintering pupae.
 - Apply *Bacillus thuringiensis* (Bt) before caterpillars enter ears or fruits.
 - Cultivate the soil between crops to destroy pupae.



Pickleworm

- Crops Infected
 - Blossoms, stems, and developing fruits of summer squash
 - Occasionally cucumbers and muskmelons
- Life Cycle
 - The adult moths emerge in spring after overwintering as pupae in semitropical areas such as southern Florida. They migrate northward to lay eggs on leaves, buds, stems, and fruits of susceptible plants.
 - There may be four or more generations per year depending on the climate.
- Control Measures
 - After harvest, pull up and destroy vines, leftover fruits, and nearby weeds, all of which serve as overwintering sites for the insect.
 - Plant as early as possible in order to harvest crops before late summer when damage is usually greatest.
 - Spray with *Bacillus thuringiensis* (Bt) in late spring.



Curculio Beetle or Plum Curculio

- Crops Infected
 - Apples, peaches, cherries, apricots, pears, and plums
- Life Cycle
 - Initially they make small, circular scars in the skins of developing apples and pears under which they lay eggs.
 - After hatching, the larvae tunnel into the fruits leaving browned and misshapen fruits.
 - Adult beetles overwinter hiding among fallen leaves and garden debris. They become active just about the time apples bloom, and that's the most important time to take preventative action.
 - Trees often drop the damaged fruit prematurely
- Control Measures
 - There is no trap or botanical insecticide that will control curculio.
 - You can take advantage of the insect's habit of playing dead when surprised. Each morning for three weeks after petal fall, spread sheets under your fruit trees. Shake or jar the tree, and the beetles will fall onto the sheets where you can collect and dispose of them.
 - Pick up and destroy all fruit that falls to the ground. This step alone will diminish a curculio population substantially.



Japanese Beetle

- Crops Infected
 - Adults eat just about every kind of ornamental and edible crop
 - Grubs are often a problem in lawns
- Life Cycle
 - Prior to pupating, the 1-inch-long, white, c-shaped grubs live in the soil and feed on the roots of many plants.
- Control Measures
 - Japanese beetles are easy to see and are fairly easy to knock into a can of soapy water.
 - Yellow target traps baited with a pheromone attractant work, but sometimes too well. Don't place one near your garden or you'll be pulling beetles in from all over town.
 - Deter feeding by adult beetles by spraying plants with neem oil. Use parasitic nematodes in lawns and garden beds for grub control.



Asparagus Beetle

- Crops Infected
 - Asparagus
- Life Cycle
 - Larvae are greenish-gray hump-backed grubs with dark heads. Adult beetles emerge in early spring to lay numerous shiny black eggs on asparagus shoots; eggs hatch in about a week.
 - Early in the season both adults and larvae feed on developing spears, and later move on to the ferny foliage.
 - There are two to five generations per year, depending on the climate.
- Control Measures
 - Handpick adults or knock them into a container of soapy water.
 - Spray an insecticide containing neem oil at the first sign of infestation and again in early fall as directed by the product label.
 - Birds feed on beetles and ladybug larvae prey on larvae and eggs.
 - Remove plant debris from the garden to reduce overwintering sites.



Corn Rootworm

- Crops Infected

- Corn
- Others include cantaloupe, cucumber, muskmelon, and squash.
- Spotted cucumber beetles prefer roses and dahlias, among other garden plants.

- Life Cycle

- Larvae of these beetles are 1/2- to 3/4-inch-long, white wormlike grubs that tunnel into and feed on corn roots, making them stunted, yellow, and unstable.
- Adult beetles lay orange eggs at the base of corn plants, then feed on corn silks, pollen, tassels, and occasionally leaves.

- Control Measures

- Grow corn in a different location every year, and reduce surrounding weeds where adults hide.
- Encourage natural enemies such as birds and tachinid flies with habitat improvements.



Sweet Potato Weevil

- Crops Infected
 - Sweet Potato
- Life Cycle
 - The larvae are 1/3-inch-long, legless white grubs with dark heads
 - The adult weevil is 1/4-inch-long with a pronounced snout.
 - Adults feed on the tops of the plant, but usually do little damage. They lay eggs in cavities in the potato or on the vine near the soil surface.
 - Weevils overwinter in stored sweet potatoes or on nearby weeds such as wild morning glory.
 - There can be as many as eight generations per year.
- Control Measures
 - When buying slips or seed potatoes, make sure they are certified weevil-free.
 - Mound soil around the base of stems to make it difficult for larvae to enter roots.
 - Clean up all weeds and leftover sweet potatoes at the end of the season.
 - Rotate crops



Grasshoppers

- Crops Infected
 - Many
- Life Cycle
 - All species and life stages of grasshoppers look essentially the same: Long narrow bodies, with long angled back legs suited to jumping, and a head featuring large eyes and chewing mouthparts. Adult grasshoppers are winged and can fly a good distance, but juveniles are wingless.
 - Most overwinter as eggs in untilled soil.
 - There are usually 1 or 2 generations per year.
- Control Measures
 - Cover plants with fabric row covers.
 - The protozoan disease, *Nosema locustae*, is available commercially in a bait formulation, and is best applied early in the season.



Peach Tree Borer

- Crops Infected
 - Peach trees
 - Also attacks almond, apricot, flowering cherry, nectarine, and plum trees
- Life Cycle
 - The moths' inch-long caterpillars damage trees by boring into the bark at or near soil level.
 - The first indications of its presence are small piles of sawdust around the base of the tree.
- Control Measures
 - In spring, make frequent checks of tree trunks near the soil line for evidence of borers. If you find a hole, probe inside with a stiff wire to kill the caterpillar.
 - Encourage parasitic wasps by providing habitat.
 - After leaves fall in autumn, spray horticultural oil as directed on the product label.



European Corn Borer

- Crops Infected
 - Corn, tomatoes, potatoes, and peppers
- Life Cycle
 - Caterpillars overwintering in cornstalks and similar hiding places pupate in spring.
 - Adult moths first appear in late spring and deposit clusters of white eggs on the undersides of leaves. The pinkish larvae that emerge feed on leaves and tassels.
 - As caterpillars mature, they bore into main stalks and leave behind sawdust-filled holes.
- Control Measures
 - Remove or plow under old stalks after harvest.
 - If borers have been a problem in the past, treat emerging ears and leaves with *Bacillus thuringiensis* (Bt) when the silk has partially emerged.



Wireworm

- Crops Infected
 - A wide variety of plants, including corn, potatoes, beets, carrots, and sweet potatoes.
- Life Cycle
 - The golden brown hard-shelled worms are the larvae of click beetles that live in the soil and feed on stems, roots, seeds, and tubers
- Control Measures
 - Cultivation and crop rotation are usually all it takes to keep populations low.
 - You can test your soil for the presence of wireworms by spearing pieces of potato on sticks and burying them 2 to 4 inches deep. Dig up the pieces after a week and inspect for wireworms feeding inside.
 - If wireworm populations are very high, use beneficial nematodes to reduce their numbers.



Root Maggots

- Crops Infected

- Onion maggots seek out anything in the onion family, including garlic and leeks
- Cabbage maggots look for any cabbage-family plant, including broccoli or turnips

- Life Cycle

- Root maggots are the larvae of flies that lay their white eggs in the soil at the base of host plants.
- The maggots are most active during the cool weather of spring and fall. Maggots disfigure crops with their tunneling, but the main problem is the entry points they create for rot diseases such as black rot.

- Control Measures

- Check plants that show symptoms and immediately destroy any that are infested.
- Beneficial nematodes can be effective in controlling the larvae
- Adults are attracted to the scent of decaying onions so remove and bury plant debris after harvest.



Earwigs

- Crops Infected

- A variety of plants such as lettuce, corn, celery, tender young seedlings, blossoms and ripening fruits. Daylilies and Butterfly bushes.

- Life Cycle

- These reddish-brown nocturnal creatures feed primarily on decaying organic matter or other insects, hiding in dark, damp places during the day.

- Control Measures

- If earwigs are a problem in your garden, trap and destroy them. One method is to fill a flowerpot with crumpled paper, then place it upside down in the garden with a stick to prop it slightly off the ground. During the day earwigs will crawl into the paper to hide, at which point you can collect them.



Fire Ants

- Crops Infected
 - Like other ants, fire ants nurse aphids on plants, protecting the pests from predators in order to obtain their sweet excrement (honeydew).
 - They also feed on germinating seeds, young shoots, fruits, and saplings.
- Life Cycle
 - These pests make conical nests as large as 18 inches in diameter and 10 inches high. If disturbed they attack aggressively, stinging the intruder. Note all ants bite.
 - Adult fire ants are reddish to dark brown. Winged reproductive forms appear in the spring and early summer. After mating the male dies and the female establishes a new colony. Her first eggs hatch in a week, and the resulting worker ants mature in less than a month. A queen can live several years, producing more than 1,500 eggs per day.
- Control Measures
 - Natural enemies of fire ants have been tested for mass releases that would control the ants in large areas, and progress is being made.
 - Biological control agent, *Beauveria basisanna*, a natural fungus disease that attacks fire ants
 - Beneficial nematodes
 - Pouring boiling water on individual mounds may be effective in small areas.



Aphids

- Crops Infected
 - A wide variety of plants, including most edible and ornamental plants.
- Life Cycle
 - Aphids secrete a sugary fluid called honeydew that attracts ants and may cause the growth of a sooty black fungus on leaves.
 - In small numbers aphids do little damage, but they reproduce rapidly.
 - They can also spread diseases among plants.
- Control Measures
 - Start by rinsing plants with a strong spray of water to reduce the population.
 - If aphids return, spray with insecticidal soap or horticultural oil. When spraying, be sure to cover the undersides of leaves.
 - A variety of natural insect parasites and predators also reduce aphid populations, which is the main reason to not be overly aggressive with sprays.
 - Fertilize judiciously to prevent excess nitrogen aphids love.



Leaf Miners

- Crops Infected
 - Beets, chard, lettuce, peppers, potatoes, and spinach.
- Life Cycle
 - They are the larvae of tiny black flies.
 - They tunnel between the upper and lower layers of leaf tissue creating visible random trails, or mines, in the process.
 - Adult flies lay eggs on the undersides of leaves. After hatching, larvae tunnel into leaves to feed, gaining some protection from predators there.
- Control Measures
 - Protect leafy vegetable crops with a lightweight row cover.
 - Pick off and destroy infested leaves.
 - Encourage natural parasites that attack leaf miners by not spraying pesticides.



Mealybugs

- Crops Infected

- Include citrus, apples, peaches, grapes, potatoes, and a number of tropical plants -- including houseplants and particularly succulents.

- Life Cycle

- In regions without freezing winters, mealybugs are present year-round. In colder climates, there may be 2 to 3 generations per year. The pests overwinter as eggs in cottony egg sacs or as tiny nymphs (the juvenile stage, commonly called crawlers).

- Control Measures

- Kill by hand often
- Controls include insecticidal soap and horticultural oil.
- Natural enemies include the mealybug destroyer (a kind of ladybug), lacewings, and mealybug parasite (a tiny wasp).



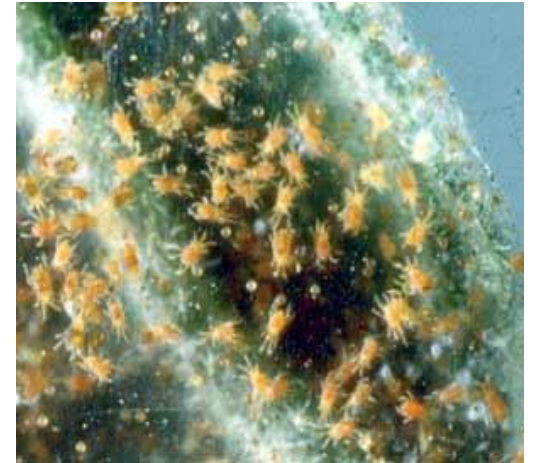
Scale

- Crops Infected
 - Different species attack various kinds of fruits and ornamental plants in all parts of the country.
- Life Cycle
 - Mature females feed, lay eggs, and raise families under their protective shells.
 - Eggs hatch into crawlers that feed by sucking plant juices. As they mature, crawlers produce a shell-like covering and lose their legs.
 - There may be several generations per year.
- Control Measures
 - Remove and kill by hand
 - Spray horticultural oil as directed on the product label



Spider Mites

- Crops Infected
 - Many, including houseplants
- Life Cycle
 - Symptoms of their feeding show up as silvering or a stippled effect on the leaf top, but the precise symptom varies with the plant. Turn over affected leaves and you're likely to find spider mite webbing. They reproduce rapidly and spread to any nearby plants.
- Control Measures
 - Spider mites hate water. Keep plants well watered and wash them off frequently. If you detect an infestation, first spray plants with a forceful stream of water to knock mites from the leaves.
 - If the infestation persists, spray plants with insecticidal soap or horticultural oil, covering the undersides of leaves thoroughly.
 - In orchards, buy and release predatory mites, and encourage any that are already present by not spraying insecticides.



Thrips

- Crops Infected
 - Certain species spread viruses to tomatoes and impatiens.
 - Thrips also attack asparagus, cabbage, lettuce, onions, peas, flowers, and fruit and shade trees.
- Life Cycle
 - Magnification shows thrips to be shiny, elongated blackish or yellowish insects. Adults have feathery, fringed wings, and nymphs lack wings.
 - Thrips prefer to feed on new, rapidly growing plant tissue where it is easy to hide.
 - Most feeding by thrips causes only slight damage, but high populations can be quite destructive.
 - Can prevent rose buds from opening and result in deformed petals.
 - There are many generations per year.
- Control Measures
 - Natural enemies generally keep thrips populations below damaging levels.
 - Conserve natural enemies by reducing or eliminating pesticide use.
 - Locate garden plants away from weedy, grassy borders where thrips live.
 - Keep plants well watered, and fertilize judiciously to prevent overly lush growth.
 - Dormant oil is a useful control on fruit trees.



Whiteflies

- Crops Infected

- Many plants, including tomatoes, cucumbers, lettuce, flowers, trees, and shrubs.

- Life Cycle

- Whiteflies secrete a sticky, sugary substance called honeydew that may cause the growth of a sooty black fungus on leaves.
- Eggs laid on leaf undersides hatch into tiny larvae that look like flat, oval, semitransparent scales.
- The larvae reach adulthood within a about a month of hatching.

- Control Measures

- Spray plants with a stream of water from a garden hose to dislodge the majority of the pests before applying insecticidal soap or other approved product. For effective control, follow instructions on the product label for an appropriate spray schedule.
- Whiteflies cannot survive freezing temperatures. They are reintroduced to northern regions each year on the wind and infested plants.
- Check plants carefully for whiteflies before purchasing.



Tarnished Plant Bug

- Crops Infected
 - All major crops: apples and cotton to flowers and vegetables.
- Life Cycle
 - Nymphs are the more destructive stage. As they feed they inject a toxin into the plant tissue that stunts or otherwise deforms growth.
 - These sleek insects move very quickly, and adults fly when disturbed.
 - Adults and nymphs overwinter in weedy patches and organic debris, emerging in late spring to feed on young weeds and grasses before moving to favored crops.
- Control Measures
 - Keep the garden area free of weeds, and remove organic debris from the garden at the end of the season.
 - Use a lightweight fabric row cover to protect plants, but remove it from fruiting crops during bloom to allow access to pollinating insects.
 - Encourage natural enemies such as ladybugs, spiders, parasitic wasps, birds, and toads.
 - For more specific measures to control serious outbreaks, check with your cooperative extension agent.



Stink Bug

- Crops Infected
 - Feed on okra, squash, beans, tomatoes, and a number of other plants by sucking plant juices.
- Life Cycle
 - Adults overwinter in garden debris and in nearby weedy areas.
 - There are several generations per year.
 - They give off an unpleasant odor when crushed that may attract more stinkbugs
- Control Measures
 - Spray or dust with approved insecticides.
 - Keep weeds around the garden in control.
 - Clean up the garden at the end of the season.
 - Hand-pick stinkbugs in early morning when they are slow moving.



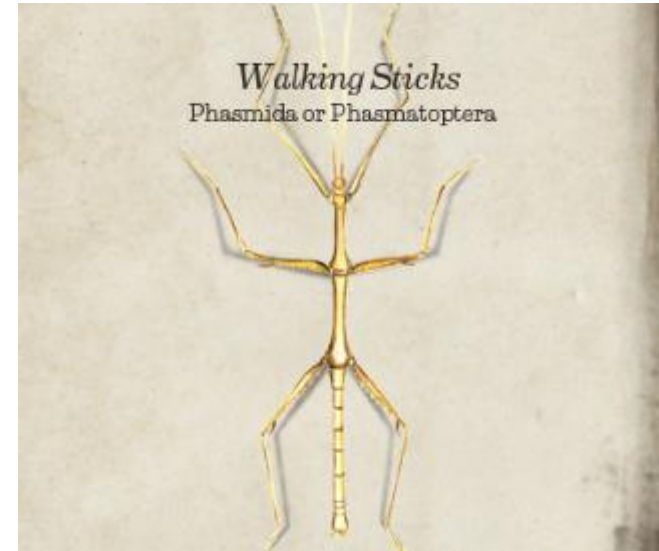
Fungus Gnat

- Crops Infected
 - Are typically harmless to healthy plants - and humans - but larvae can quickly inflict extensive damage to seedlings
- Life Cycle
 - Most fungus gnats are weak fliers, and can often be seen walking rapidly over plants and soil, rather than flying. However when airborne, the gnats may be quite annoying to humans by flying into their faces, eyes, and noses, both indoors and outdoors.-These flies are sometimes confused with drain flies or fruit flies.
 - Some fungus gnats are exceptionally hardy, being able to tolerate cold conditions through their possession of antifreeze proteins. Typically, overwintering organisms can either avoid freezing or tolerate freezing, but *Excechia nugatoria* can do both.
- Control Measures
 - Chemical pesticides are rarely effective and make the infestation worse by killing any natural predators
 - Allowing the soil to dry may reduce their numbers
 - Applying the biological larvicide *Bacillus thuringiensis* (var. israelensis), Gnatrol, to kill gnat larvae
 - The pests are sometimes reduced by placing a layer of sand-or indoor mulch on top of the soil around plants
 - Introducing *Hypoaspis miles* mites or other natural predators, such as centipedes



Walking Stick Bug

- Crops Infected
 - Herbivores that mainly eat leaves
- Life Cycle
 - Their eggs are oval, dark brown, 2-3 mm long, and have a lighter-colored knob at one end. When they hatch, this knob comes off and the walking stick climbs out. The eggs hatch after 10-12 weeks at room temperature. After they hatch, the egg shell often remains attached. Hatchlings are about 1 cm long.
- Control Measures
 - Native species are usually controlled by natural predators



Neutral for Plants

- The following are not necessarily good or bad for plants
- Note that praying mantis is considered neutral because it readily eats both good and bad insects

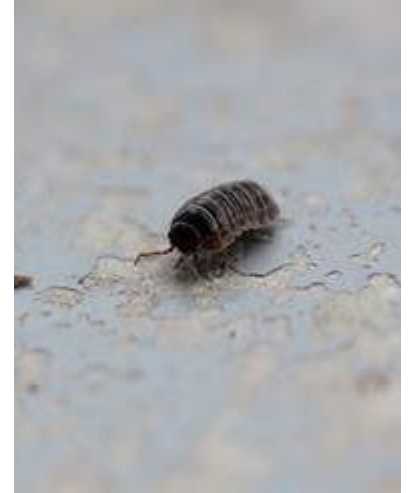
Praying Mantis

- They have triangular heads with bulging eyes supported on flexible necks. Their elongated bodies may or may not have wings, but all Mantodea have forelegs that are greatly enlarged and adapted for catching and gripping prey; their upright posture, while remaining stationary with forearms folded, has led to the common name **praying mantis**.
- Mantises are generalist predators of arthropods. The majority of mantises are ambush predators that only feed upon live prey within their reach. They either camouflage themselves and remain stationary, waiting for prey to approach, or stalk their prey with slow, stealthy movements. Larger mantises sometimes eat smaller individuals of their own species, as well as small vertebrates such as lizards, frogs, and small birds.
- Gardeners who prefer to avoid pesticides may encourage mantises in the hope of controlling insect pests. However, mantises do not have key attributes of good biological pest control agents; they do not specialize in a single pest insect, and do not multiply rapidly in response to an increase in such a prey species, but are general predators. They eat whatever they can catch, including both harmful and beneficial insects.



Pillbugs

- Pillbugs eat decaying vegetable material and are most active at night. They are known for their ability to roll into a ball.
- Pillbugs live in moist locations. They are found under damp objects or under vegetable debris.
- Pillbugs do not spread diseases or invade food products. However, the pillbug is often considered a pest when it gains entry into a home.
- Pillbugs can be avoided by eliminating food sources such as vegetable or plant debris. If pillbugs enter a structure, they will often dry out and die.



Millipedes

- Generally harmless to humans and plants
- They are particularly fond of eating dead and decaying plants.
- Making sure that leaves are not piled up against the house during the fall months and making sure vegetation is kept away from the home as much as possible will also help prevent millipede invasions.



Beneficial for Plants

- This category includes beetles, wasps, and other insects that are predators and parasites of garden pests.
- Some of the most effective are listed here

Lady Beetle or Ladybug

- Adult ladybugs, or ladybird beetles, are typically a brick red or orange with black markings. But some are black, often with red markings. Their larvae look like miniature alligators, and they live up to their appearance by being voracious predators of many garden pests. That's why ladybugs are among the most visible and best known beneficial predatory insects.
- Most North American species are beneficial, with both adults and larvae feeding primarily on aphids. They also feed on mites, small insects, and insect eggs. (There are two pest species in the group: the Mexican bean beetle and the squash beetle. Both adults and larvae of those species feed on plants.)
- Most ladybugs found in gardens are aphid predators. Some species prefer only certain aphids while others will seek out and dine on most any kind of aphid. Some prefer mite or scale species. If aphids are scarce, they'll feed on the eggs of moths, beetles, mites, thrips, and other small insects, as well as pollen and nectar. Not as delicate and refined as they seem, they'll also feed on their own young.
- Because of their ability to survive on other prey when aphids are in short supply, ladybugs are particularly valuable natural enemies of pests.
- Ladybugs overwinter as adults, often in aggregations along hedgerows, beneath leaf litter, under rocks and bark, and in other protected places, including buildings. In spring, the adults disperse in search of prey and suitable egg laying sites. This dispersal trait, especially strong in migratory species such as the commercially available convergent lady beetle, affects the reliability of released adult beetles.
- To encourage these beneficial insects into your garden, supply them with food and moisture. Small and shallow-faced flowers provide adults easy access to nectar and pollen: Plant alyssum, herbs from the dill and mint families, and flowers from the daisy family.



Parasitic Wasps

- Several tiny wasps are parasites of garden pests. Most common are the *Ichneumon* wasps, *Braconid* wasps (pictured), and *Chalcid* wasps. You're much more likely to see the work of these tiny parasitic wasps than the insects themselves: a tomato hornworm with white rice-like cocoons, or a black or golden aphid mummy with a tiny hole in it.
- These are not the aggressive yellow jackets or ominous looking black paper wasps. Few species of parasitic wasps sting, and then only when they're picked up and mishandled. They're so tiny you're unlikely to be aware of their presence.
- Several species of *Ichneumon* wasps parasitize garden pests such as cutworms, corn earworm, white grubs, and various caterpillars. The largest of the parasitic wasps, the adults range in size from 1/8 to 1-1/2 inches, sporting long antennae, legs, and long, slender bodies. Females have long tail-like egg-laying tubes. Colors range from black to yellowish.
- *Braconid* wasps are tiny, ranging in length from 1/16 to 5/16 inch, with stout bodies. Host pests include various species of aphids, garden webworm, tomato hornworm, armyworms, strawberry leaf roller, and tent caterpillar, among others. Most are dark with some colored markings, but they are so tiny it's hard to see these colors without magnification.
- *Chalcid* wasps range from 1/64 to 5/16 inch in length. They do not fold their wings when at rest like other wasps. This group includes the well-known *Trichogramma* wasp. These are available commercially for pest control purposes because they are effective parasites of pest caterpillars including cabbage worm, tomato hornworm, corn earworm, codling moth, cutworm, armyworm, webworm, cabbage looper, and corn borer. Other *Chalcid* species parasitize aphids, strawberry leaf roller, and other hairy caterpillars.
- To encourage the help of these beneficial insects in your garden, supply them with food and moisture. Adult wasps feed on nectar and pollen. Small and shallow-faced flowers provide easy access to these tiny beneficial insects. Plant alyssum, herbs from the dill family, and flowers from the daisy family. If you have a bird bath or pool in your garden, place stones in the water so wasps have a place to land and drink safely.



Green Lacewings

- They are predators of many garden pests including aphids, thrips, mites, whiteflies, and other small, soft-bodied pests and their eggs. They also attack spider mites (especially red mites), leafhoppers, some beetle larvae, eggs of pest moths, and mealybugs.
- The larvae are yellowish-gray, mottled with brown, and have large mouthparts. They reach 3/8-inch-long before pupation. These are commonly called aphid lions, and they are voracious feeders, eating 200 or more pests or their eggs per week between hatching and pupation.
- Most adult lacewings get their sustenance from pollen, nectar, and the honeydew produced by aphids and scales. Some species also feed upon pests.
- Adults of the most common species are slender and bright green, with delicate veined wings and long antennae. Eggs of lacewings are easy to identify, as they are laid in groups with each egg held aloft on a threadlike stalk. Eggs hatch in 3 to 5 days; the larval stage lasts 2 or three weeks. Pupation lasts about 5 days, and adults live for 4 to 6 weeks. Females lay about 200 eggs in that time. There are 3 to 4 generations per year.
- Attract lacewings to your garden with food and moisture: Small and shallow-faced flowers provide adult lacewings easy access to pollen and nectar. Plant alyssum, herbs from the dill family, and flowers from the daisy family. If you have a bird bath or pool in your garden, place stones in the water so lacewings have a place to land and drink safely.
- Green Lacewing are an exceptional addition to any IPM (Integrated Pest Management) program.



Centipede

- A centipede is an arthropod from the class of Chilopoda. They are elongated insects with lots of legs. "Centi-" is Latin for 100, and "-pede" refers to legs, but centipedes actually have 15-177 legs. Each segment of its body has a pair of these legs. Centipedes are long, narrow, and nearly always flattened. The first pair of legs form claw-like poison fangs, while the last pair merely face backwards. First instars (stages) have only 4 segments, but acquire more with each molt.
- The only way the house centipede is dangerous is if you happen to be another insect such as a bed bug, cockroach, spider, termite, silverfish or other pest. In fact, what you have there is a tiny exterminator that can help get rid of other pests.
- House centipedes are active hunters, since they don't build webs or traps. They seek out their prey and either use those legs to jump on the intended prey or wrap them around it in a technique that experts have come to call "lassoing." Some observers have even noticed house centipedes using their legs to beat prey into submission.
- House Centipedes are nighttime hunters, mostly. As you can see from their head, they have two very well-developed eyes and, for an insect, have pretty decent vision. Despite this, it's those long antenna that they use primarily for hunting. House centipede antenna are so sensitive they can pick up smells as well as vibrations and other tactile sensations.

