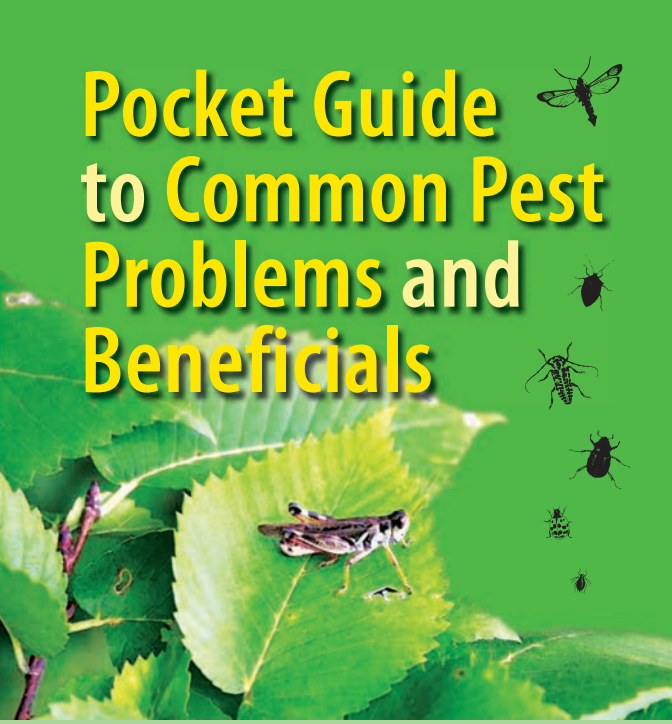
Pocket Guide to Common Pest Problems and Beneficials



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HEALTHY YARDS
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IPM
INTEGRATED PEST MANAGEMENT
& PESTICIDE SAFETY EDUCATION

K-STATE
Research and Extension

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

Table of Contents

Introduction

The purpose of this guide is to help homeowners and gardeners identify common landscape pests and beneficials. Good pest management can only be achieved with proper identification. It is important to recognize insect pests and know when and how they might cause damage before implementing control. This publication features 40 of the most common insect pests and beneficials. Specifically, it contains information on what the insects look like, life stages, damage, and what can be done to control them.

General knowledge of insect orders helps to identify and understand insects. Mouthparts provide clues about how insects damage plants — by chewing leaves or sucking sap. Characteristics of common insect orders are listed in the table on pages 8 and 9.

Understanding the life cycle is important because an insect's appearance, habitat, and damage may be different at each stage of development. Ametabolous insects exhibit no metamorphosis. Adults look the same as immatures. Insects with incomplete or gradual metamorphosis go through three life stages — egg, nymph, and adult. The nymph resembles the adult and does not go through a pupal stage. Nymphs and adults often live in similar environments and feed on similar foods. Insects that undergo complete metamorphosis progress from egg to larva, pupa, and adult. Larvae look different than adults and often consume different foods. A variety of tactics may be needed to target different stages of these pests.

Control measures may not be needed for all insects. Some insects cause cosmetic damage but do not actually harm plants. Good sanitation, such as weed and debris removal, can decrease insect numbers. This publication lists integrated pest management practices that can be followed to help minimize pest damage.

The hope for this guide is that it will serve as a useful resource for the people of Kansas.

Visit the following websites to obtain more information on pest biology, integrated pest management, and control methods.

Kansas Healthy Yards and Communities
www.kansasgreenyards.org

Common Plant Problems in Kansas
www.hfrr.ksu.edu/p.aspx?tabid=586

eXtension
www.eXtension.org
Garden,Lawn, and Landscape Pests

Pesticide Safety and IPM Program
www.ksre.ksu.edu/pesticides-IPM/

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Common Insect Orders Gardeners Should Know

Orders	Examples	Mouthparts	Metamorphosis	Features
Collembola	Springtails	Chewing	Ametabolous	Furcula (for jumping).
Thysanura	Silverfish, Bristletails	Chewing	Ametabolous	"Tail" filaments.
Odonata	Dragonflies, Damselflies	Chewing	Incomplete Metamorphosis	"Toothed." Prey on other insects.
Orthoptera	Grasshoppers, Crickets, Katydids	Chewing	Incomplete Metamorphosis	Leathery wings, jumping hind legs.
Mantodea	Mantids	Chewing	Incomplete Metamorphosis	Front legs folded as if praying.
Hemiptera	True bugs	Piercing-Sucking	Incomplete Metamorphosis	Scutellum. Some can "bite." Membraneous tips on leathery forewings.

Homoptera	Aphids, Scales, Leafhoppers, Planthoppers	Piercing-Sucking	Incomplete Metamorphosis	Plant feeders. Some transmit plant viruses.
Neuroptera	Dobsonflies, Antlions, Lacewings	Chewing	Complete Metamorphosis	"Nerve-winged." Carnivorous.
Coleoptera	Beetles, Weevils	Chewing	Complete Metamorphosis	"Sheath-winged." Elytra. Largest order.
Hymenoptera	Bees, Wasps, Ants, Sawflies, Parasitoids	Chewing/ Lapping	Complete Metamorphosis	Membraneous wings. Many have stingers. Some species are social and build nests.
Lepidoptera	Butterflies, Skippers, Moths	Sucking	Complete Metamorphosis	Scales on wings.
Diptera	Flies, Midges, Mosquitoes	Piercing/Sponging	Complete Metamorphosis	Hindwings are halteres.

General Pests

Aphids

Many genera and species

Order: Homoptera

Description: Aphids vary in color from green to yellow, black, gray, or red. They are soft-bodied, pear-shaped insects with long legs and antennae. Usually less than ⅛ inch in size, they possess a pair of cornicles or "tailpipes."

Life stages: Egg, nymph, and adult. In spring and throughout summer, all aphids are females that reproduce via parthenogenesis. Nymphs rapidly develop into adults. They produce numerous generations per year.

Plants attacked: Garden and landscape plants.

Damage: Aphids suck plant juices, which reduces plant vigor and stunts growth. Leaves may curl and turn yellow because of aphid feeding. They excrete honeydew, which can cause black sooty mold to grow on leaves.

IPM recommendations: A forceful stream of water can be used to dislodge aphids from the plant. Natural predators and parasites will help control the aphid population. Prune off the infested growth and carefully remove infested plants. Insecticide applications may be needed if there are not enough predators or other methods do not work.

Cutworms

Many genera and species

Order: Lepidoptera

Description: Cutworms are the caterpillars of several species of night-flying moths. They can be greenish, brownish, grayish or have striped bodies, which are plump, smooth and often greasy in appearance. Cutworms curl up tightly when disturbed.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Many garden and field crops.

Damage: Caterpillars feed on grass blades and cut plants near the soil surface.

IPM recommendations: Prevent the pest by removing weeds in and around the garden. Cutworm moths like weeds for egg-laying, and larvae like them for food. Place a physical barrier such as a paper collar or aluminum foil around the base of each plant. Inspect for damage daily and handpick the cutworms.

Grasshoppers

Many genera and species

Order: Orthoptera

Description: Enlarged hind leg femurs enable grasshoppers to jump. Most grasshoppers are reddish brown or yellow with various colored markings. Nymphs resemble adults, except they are wingless and smaller.

Life stages: Egg, nymph, adult.

Plants attacked: Vegetable crops favored include lettuce, carrots, beans, sweet corn, and onions. They feed on grasses, sedges, and other broad-leaved plants.

Damage: Defoliation is the primary injury to plants, but fruit and ripening grain may also be a food source. Adults move into yards and gardens in July and August or when agricultural crops, grasses, and forage crops are harvested.

IPM recommendations: A trap crop of attractive plants (zinnias or some other lush flower) can be planted around the edge of the garden to attract and hold grasshoppers. Leaving border areas unmowed will delay movement into the yard and garden. Row covers and screens can help protect valuable plants. A severe outbreak may require the use of insecticidal sprays or baits.

Scales

Many genera and species

Order: Homoptera

Description: Scales derive their name from the shell-like, protective covering that they possess. They are small, immobile insects with no visible legs and antennae. Immature scales are soft-bodied, mobile and referred to as crawlers.

Life stages: Egg, nymph (crawlers), adult.

Plants attacked: A wide variety of woody and herbaceous plant species.

Damage: Scale insects feed on plant sap, which causes low plant vigor and poor growth in heavily infested plants. Potential twig and branch dieback.

IPM recommendations: Scale insects are usually controlled by natural enemies.These include parasitic wasps and predators, such as ladybugs. Dormant oil treatments can be applied in early spring before bud break. Summer oils also can be effective against most scales, but some plants are sensitive to these treatments.

Spider Mites

Many genera and species

Order: Acari

Description: Spider mites range in color from red/brown to yellow/green. They have eight legs and no antennae.

Life stages: Egg, larva, nymph, adult. An entire generation may take only eight days to complete under ideal conditions, so populations can grow quickly.

Plants attacked: All landscape and garden plants. Favorites include evergreens such as spruce and juniper, tomatoes, cucumbers, and flowers like marigold and roses.

Damage: Spider mites feed on the lower leaf surface by piercing plant cells. Feeding causes the leaf to turn chlorotic or yellow and have a brown stippled appearance. Severely damaged leaves can die and whole plants can be killed. The underside of leaves may exhibit a fine webbing.

IPM recommendations: Natural enemies are the best control for spider mites. Do not use broad-spectrum pesticides such as carbaryl (Sevin) because they will destroy beneficial insects and increase mite populations. A strong jet of water can be used to dislodge the mites from the plant. Insecticidal soap, neem oil, and other chemicals can be used to reduce the mite population, but repeat applications are necessary.

Leafhoppers

Many genera and species

Order: Homoptera

Description: Leafhopper adults range in size from ⅛ to ½ inch depending on species. They also have a characteristic elongated, wedge shape and can be colored yellow, green, gray or have colored patterns. They jump and fly off readily when disturbed. The nymphs resemble wingless adults.

Life stages: Egg, nymph, adult.

Plants attacked: Grasses, flowers, vegetables, fruit trees, shrubs, and weeds.

Damage: Leafhoppers can injure plants by sucking the juices from the leaves. They also can transmit plant diseases. Chlorosis (yellowing) and necrosis (browning) can be indications of "hopperburn."

IPM recommendations: Remove weeds and debris from the garden in the fall to reduce the number of overwintering leafhoppers. Leafhoppers can be dislodged from the plant using a steady stream of water. Encourage the presence of predatory flies and parasitic wasps that prey on leafhoppers. Leafhoppers probably will not require chemical treatment because plants can tolerate fairly high populations without harm.

Ornamental Pests

Bagworms

Thyridopteryx ephemeraeformis

Order: Lepidoptera

Description: Bagworms are most commonly recognized by their brown or dark gray cone-shaped bags. The bags contain bits and pieces of foliage. The male moth is black with clear wings, while the female moth is grub-like and never leaves the bag.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Deciduous and evergreen trees and shrubs.

Damage: Heavy feeding can defoliate the host.

IPM recommendations: Remove bags by handpicking by late April or early May before larvae begin hatching from the eggs. An insecticide application is required to eliminate bagworm larvae when the population has reached epidemic levels. Control is most effective when larvae are in early developmental stages. Thorough spray coverage is important to achieve good control.

Cottonwood Borer

Plectrodera scalator

Order: Coleoptera

Description: Beetles are about 1 to 1 ¼ inches long with characteristic black and white coloration. They also have long black antennae. Larvae are cream-colored and reach 1 ¼ to 1 ½ inches long.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Cottonwood, willow, and poplar.

Damage: Adult feeding will cause shoots to turn black, shrivel up, die, and fall from the tree. Larvae bore into the base of susceptible trees. Nursery trees that are girdled may have a broken, scrawny, and defoliated appearance.

IPM recommendations: Proper site selection, irrigation and fertilization are important to keep trees healthy and make them less susceptible to attack. In early September, small larva can be removed from the base of a tree using a pocket knife. In late June or early July and again in late July, spray the lower trunk and saturate the soil around the base of the tree with permethrin to prevent adults from laying eggs.

Euonymus Scale

Unaspis euonymi

Order: Homoptera

Description: Males are elongated and white, while females are oval-shaped and brown. The rear end is rounded and wide. The head end is pointed. Large numbers congregate on the underside of leaves, twigs, and stems, giving the appearance of small cottony spots.

Life stages: Egg, nymph (crawler), adult. There are two or three generations per year.

Plants attacked: Euonymus, camellia, boxwood, bittersweet, daphne, eugenia, English ivy, hibiscus, holly jasmine, privet, honeysuckle, olive, pachysandra, and stone fruits (*Prunus* sp.).

Damage: The scales' feeding extracts juices from the lower surface of the leaves causing upper leaf surfaces to turn yellow. Discoloration progresses until leaves die and drop. Heavy infestations can cause death of whole branches or the entire plant.

IPM recommendations: Prune heavily infested branches to the soil surface. The scale population can be reduced by applying a dormant spray in early spring before the buds have started to open, but this may defoliate the plant. In late May or early June when the catalpa trees are in early bloom, treat crawlers with a labeled insecticide. Reapply to control second generation crawlers in late August or early September. Heavily infested plants should be completely removed and destroyed, including the roots.

Elm Leaf Beetle

Xanthogaleruca luteola

Order: Coleoptera

Description: Beetles are ⅛ to ½ inch long and yellowish in color. They have fairly broad black stripes down the outer edges of the wings, and a thin stripe down the middle. Newly emerged larvae are black with a hairy-looking appearance. Larger larvae may have a striped appearance with a dull yellow to olive color.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Siberian elm is the preferred host, but all elm species can be attacked.

Damage: The majority of elm leaf beetle damage is caused by the larvae feeding on the epidermal tissues of the lower leaf surface, which causes leaves to dry out and turn brown. Entire trees may take on a burnt or brown appearance if populations are high enough.

IPM recommendations: Treatments should be applied after larvae are hatched and while they are small and have not caused extensive feeding damage. Egg hatch usually occurs around mid-May for the first generation and early to mid-July for the second generation. Routine close-up inspections are important to ensure correct timing of foliar sprays. Products with imidacloprid can be used to drench the soil around the base of the tree. The product will be consumed by foraging larvae after it enters the root system and moves into the leaf tissue. Prevent adult beetles from invading the home by inspecting screens and caulking around windows and siding. Eliminate beetles found inside by vacuuming.

Fall Webworm

Hyphantria cunea

Order: Lepidoptera

Description: Moths of the blackheaded race have white wings, which are lightly to heavily mottled with black, gray, or brown spots, while moths of the redheaded race have snowy white wings without spots. Fall webworm larvae always remain in the confines of their web mass during development. Larvae of the blackheaded race have black head capsules, while the redheaded race have reddish to orange head capsules.

Life stages: Egg, larva, pupa, adult. Fall webworms produce four generations per year (two for each race).

Plants attacked: Fruit, shade, and ornamental trees, except for conifers.

Damage: High populations can completely defoliate host plants, but do not pose a threat to the overall health of the tree. On pecan trees, nut production and quality can suffer if webworms are not controlled.

IPM recommendations: Pruning and destroying infested portions of branches is a common control practice when webs are small. Removal of the web masses will result in removal of most of the larvae. A stick or pole with a nail inserted crosswise can be effective at removing individual webs. Insecticides can also be used to eliminate webworms, but spraying web masses will not kill larvae enclosed in the protective web. A high-pressure sprayer will be needed to penetrate the webs.

Hackberry Nipplegall

Pachypsylla celtidismamma

Order: Homoptera

Description: Adults are referred to as psyllids and resemble miniature cicadas. They are small with hind legs adapted for jumping, and long antennae. They are dark reddish-brown with mottled wings.

Life stages: Egg, nymph, adult.

Plants attacked: Hackberry.

Damage: Nymphs feed on the leaves causing the leaf to respond by forming a nipple-shaped gall. The immature psyllid spends the summer sucking sap from the confines of the gall. Heavily infested leaves may drop prematurely. Psyllids can become a nuisance in the fall when temperatures drop. Adults seek overwintering sites and may invade homes.

IPM recommendations: Most galls cause an unsightly appearance but do not cause serious injury. Control usually is not necessary. Beneficial wasps parasitize nymphs that overwinter in the gall. Eliminate psyllids from homes by vacuuming.

Ash/Lilac Borer

Podosesia syringae

Order: Lepidoptera

Description: The moth has clear wings and resembles the common paper wasp in size, color, shape, and flight habits. Larvae are creamy white with a brown head capsule. When full grown, they are approximately 1 inch long. Newly hatched larvae tunnel into the host where they will develop beneath the bark. Pupal skins and sawdust-like material are characteristic signs of this pest.

Life stages: Egg, larva, pupa, adult. There is one generation per year.

Plants attacked: Lilac, ash, mountain ash, and occasionally privet.

Damage: Borer larvae feed on plant tissues that conduct food, water, and nutrients. Tunnels, 2 inches deep, may exceed 12 inches in length and be ⅓ inch wide. Ash/lilac borers can cause a rapid decline of the host. At other times borers can feed on the tree for several years before decline is noted.

IPM recommendations: Because moths seek out trees that are declining, stressed, or aging, keep trees in good health by watering during drought periods, mulching the root zone, and keeping lawn equipment away from the trunk. Pheromone traps can be used to monitor the onset of moth activity. Spray treatments can then be started 10 days after the first moths are captured. An alternative would be to apply the first spray when Vanhoutte spirea are in full to late bloom. In central Kansas, this often occurs around May 1. A second spray is recommended four weeks after the first. Thoroughly treat the trunk and larger limbs of ash or the lower portions of lilac or privet. Heavily infested ash should be cut and burned during the fall and winter. Infested stems of lilac or privet should be removed as well.

Eastern Tent Caterpillar

Malacosoma americanum

Order: Lepidoptera

Description: The caterpillar larvae produce a small silken "nest" in the crotch of a tree branch. Larvae leave the nest to forage on emerging foliage and return when they are not feeding. Mature larvae spin silken cocoons and pupate into adults. Male moths are smaller than the female with a brown dingy color.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Wild cherry, sandhill plum, chokecherry, and various ornamental shrubs, shade, and forest trees.

Damage: Eastern tent caterpillars are more of a nuisance than a detriment to the overall health of the tree. Caterpillar feeding usually stops in mid-May when the foliage begins to grow rapidly, so the appearance of the tree will be restored.

IPM recommendations: If detected early, tent caterpillars can be eliminated by removing the nest that houses them with a hand or stick. Often the caterpillars go unnoticed until larvae are large and near the end of their feeding. Additional damage is unlikely, so one option is to let the larvae run their course. An approved/registered insecticide can be applied by putting the sprayer nozzle inside the nest or treating the foliage closest to the nest.

European Pine Sawfly

Neodiprion sertifer

Order: Hymenoptera

Description: The caterpillar-like larvae are grayish-green with a light stripe down the back. Mature larvae have shiny black heads. The adults are wasp-like with a brownish-black color.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Feed on two-needle pines, such as mugo, Scotch pine, Austrian, and ponderosa, but can also feed on other pine species.

Damage: Larvae feed on the needle surface causing the needle to turn brown and wilt. Insects tend to feed in groups and can completely defoliate a tree as the feeding becomes more extensive.

IPM recommendations: Colonies of young larvae can be eliminated by removing and destroying branch terminals. Insecticidal soaps and horticultural oils can be effective on small larvae. Insecticidal treatments can be effective when sawfly larvae are small and have not caused much feeding damage.

Pine Sawyer Beetle

Monochamus carolinensis

Order: Coleoptera

Description: These beetles are referred to as longhorned beetles because they possess antennae that are at least half as long as the body. They are cylindrical with a hard shell and a brown mottled appearance. The larvae are white to yellowish in color and have no legs. The larvae are commonly known as sawyers or pine sawyers.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Conifers, such as pines.

Damage: The larvae feed on the inner bark, cambium and sapwood creating galleries or tunnels. Usually these beetles feed on trees that are stressed or dying. The beetles serve as a vector of pinewood nematodes, which causes pine wilt disease.

IPM recommendations: Dead pines can become reservoirs for beetles. Infected trees should be cut promptly and burned, buried, or chipped. The beetles are attracted to stressed trees, so it is important to water during drought periods and to control disease and insect infestations. Consider planting pines that are less susceptible to pine wilt disease.

Fruit/Nut Pests

Codling Moth

Cydia pomonella

Order: Lepidoptera

Description: Moths are ¾ inch long with a cinnamon brown spot on the end of each wing tip. Female moths lay eggs on the upper and lower leaf surfaces or on twigs and fruit. Newly hatched larvae immediately seek fruit in which to bore. Larvae are pinkish white with a brown head.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Primarily apples, but also feed on pears, crabapples, walnuts, quince, and other fruits.

Damage: The larvae tunnel into the core of the fruit leaving holes that are filled with excrement, or frass.

IPM recommendations: Homeowners should pick up and destroy fallen fruit. These fruits often harbor codling moth or plum curculio larvae. Cardboard bands also can be placed around tree trunks to serve as a pupation sites. Bands should be placed in August to trap overwintering pupae and removed and destroyed in December. Homeowners can use pheromone traps to help time insecticide applications by identifying when peak flights occur. Insecticides often are needed to achieve complete control. Various active ingredients can be used against these insect pests of fruit.

Peachtree Borer

Synanthedon exitiosa

Order: Lepidoptera

Description: Adults are a type of clearwing moth that resembles a wasp. The female is steel blue with an orange band. The male is smaller with a blue abdomen marked with three or four narrow stripes. Larvae have yellowish-brown to dark-brown heads and white or cream-colored bodies. Look for exudation of gum mixed with the borings of the larvae at the base of the tree.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Peach, cherry, plum, and other stone fruits.

Damage: Larvae feed on the cambium and inner bark of the trunk close to soil level. Trees of any age can be affected. Young trees can be completely girdled and killed. The vitality and production of older trees can be affected, making them susceptible to other pests.

IPM recommendations: Maintain a vigorous, healthy tree. This pest prefers to take the easy route through cankers, wounds, or cracks. Proper watering and pruning, ensuring mowers don't damage bark, and controlling damaging diseases can help prevent this pest. Inspecting closely for borers should be an

annual, late-spring chore. The onset of egg laying and hatch of peachtree borers typically occurs the last week in June. Pheromone traps can be used to determine the precise onset of moth activities and egg laying at the base of the tree. Apply an initial basal spray treatment at that time and again the last week of July.

Plum Curculio

Conotrachelus nenuphar

Order: Coleoptera

Description: The adult plum curculio is a brownish-black to grayish colored snout beetle. Beetles have four humps on their wing covers. Larvae are grayish-white, legless grubs that have brown heads.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Apples, peaches, cherries, nectarines, plums, blueberries and other wild and cultivated fruits.

Damage: Both adult and larval stages injure the fruits. Beetles can be found feeding on buds, blossoms, leaves, and new fruits. Early feeding and egg-laying punctures can cause fruit scarring and malformation. Larvae hatch, feed, and mature inside the fruit.

IPM recommendations: Adult populations can be reduced by removing trash under trees and other sites that adults use to overwinter. Dropped fruit should be picked up in early June.

Apples and pears should be treated at petal fall and twice more at 10-day intervals. Stone fruits, such as peaches, plums, and cherries should be treated at petal fall and 10 days later.

San Jose Scale

Quadraspidiotus perniciosus

Order: Homoptera

Description: Female scales are grayish, flat scale-like creatures. They are nearly circular, whereas males are more elongated. Females also have a characteristic darker nipple-like formation arising from their center. The females give birth to crawlers, which are yellow, flat, and quite small.

Life stages: Egg, nymph (crawler), adult. There are two or more generations per year.

Plants attacked: Apple, peach, pear, pyracantha, quince, and cotoneaster are the most susceptible, but more than 60 plants serve as hosts.

Damage: The insects feed on the fruit, foliage, and bark of the host. They suck the plant juices from the leafy or woody tissue by inserting their stylets into the host, depriving plant tissues of food. Feeding on the fruit decreases fruit quality and feeding on the bark can cause a decline in tree vigor, growth, and productivity. Abundant populations can result in tree death.

IPM recommendations: Prune to remove infested branches and suckers, to open the canopy for better spray coverage. Dormant oils can be applied in the spring. An insecticide may need to be applied in late June against the crawlers in heavy infestations.

Vegetable Pests

Common Asparagus Beetle

Crioceris asparagi

Order: Coleoptera

Description: The common asparagus beetle possesses bluish-black wing covers with a red prothorax (area just behind the head). The wings also have three yellowish square spots. The larva is a soft, greenish grub.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Asparagus.

Damage: Asparagus beetle larvae and adults damage asparagus by chewing on the tips and spear surfaces, which decreases marketability. Larvae also produce an inky black fluid that stains the spears.

IPM recommendations: Spears should be harvested regularly and cut low and cleanly to deprive beetles access to egg-laying sites. Insecticides can be used to protect spears from egg-laying beetles. Protecting the foliar growth of new plantings is important for building root reserves. Deprive beetles of food by removing volunteer plants. Or grow several plants to attract the beetles, which can be sprayed later to eliminate beetle concentrations.

Bean Leaf Beetle

Cerotoma trifurcata

Order: Coleoptera

Description: The bean leaf beetle is a ¼-inch long, oval-shaped beetle that is a red to yellowish-tan. It is marked with a characteristic black triangle at the top of the wing covers and four rectangular black spots on its back. Larvae are whitish with black ends.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Beans, peas, cowpeas, soybeans, and corn.

Damage: Feeding occurs on the underside of the leaves, creating characteristic small oval holes. Extensive feeding can result in poor vigor and reduced yields. Bean leaf beetles are known to carry and transmit plant diseases. Consider planting less susceptible varieties.

IPM recommendations: Monitor the garden for the presence of adult beetles. Look for feeding damage on young, tender plants. Beetles are most active in the afternoon. The risk of bean leaf beetle damage in the spring can be reduced by delaying planting to decrease damage by overwintering adults. Physical removal by handpicking can be used to reduce numbers. Drop beetles into a pail of soapy water to kill them. If enough bean leaf beetles are present to justify treatment, insecticide can be applied to protect plants.

Blister Beetle

Epicauta spp.

Order: Coleoptera

Description: Blister beetles exhibit long, slender bodies with a relatively large head. They can be striped, gray, black, and spotted. Wing covers are usually soft and pliable.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Tomatoes, beans, peas, potatoes, and other vegetables.

Damage: Adults tend to congregate and move in swarms that defoliate plants. Handling beetles can cause painful blisters.

IPM recommendations: Due to their swarming nature, beetles will often move in one day and be gone the next. Adults can be handpicked, but gloves should be worn because these insects can cause blisters and welts on the skin. Contact insecticides can be used to control adults if necessary.

Cabbage Looper

Trichoplusia ni

Order: Lepidoptera

Description: The moth is mottled brown and black with a characteristic white spot and a figure-eight shaped mark on the middle of the front wings. The larva is light green with light stripes along the body. Caterpillars appear to move in a looping motion due to the presence of fleshy false legs (prolegs).

Life stages: Egg, larva, pupa, adult.

Plants attacked: The cabbage looper prefers to feed on members of the cabbage family, such as cabbage, broccoli, and cauliflower but it will also feed on lettuce, spinach, celery, and other vegetables.

Damage: Caterpillars feed on the underside of leaves, creating a tattered appearance with irregular-shaped holes eaten out of the leaves. Plants can be severely stunted and defoliated. Cabbage loopers also may feed on the heads and create problems at harvest.

IPM recommendations: Monitor to determine population levels of loopers and natural enemies. Feeding damage and fecal material can be a good indication of activity, but actual larvae counts are needed to determine infestation level. The use of larvae-free transplants is important. Floating row covers can be used as a physical barrier. A selective insecticide, such as *Bacillus thuringiensis,* can be applied to provide effective control of early instar larvae.

Colorado Potato Beetle

Leptinotarsa decemlineata

Order: Coleoptera

Description: Beetles are about ⅜ inch long with rounded wing covers. They are yellow with 10 black longitudinal stripes. The humpbacked larva is reddish to brick-red in color with black spots on each side.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Potato, tomato, eggplant, pepper, and other solanaceous crops.

Damage: Larvae and adults feed on the foliage of the host plants. They can cause extensive damage if population numbers are high.

IPM recommendations: Remove alternate hosts, such as nightshade and ground cherry, to eliminate them as a possible food source. Planting an early maturing potato variety will help escape damage caused by adults emerging in the summer. Handpicking and dropping adults and larvae in a pail of soapy water, can be effective. Apply *Baccillus thuringiensis* var. *tenebrionis* frequently when egg masses begin to hatch.

Corn Earworm

Helicoverpa zea

Order: Lepidoptera

Description: The head capsule of the corn earworm larva is light brown. The caterpillars vary in color from light green to tan, brown, pink, or nearly black, with light and dark stripes running along the body. The moth is light-grayish brown to green and brown colored with a dark comma shape on the front wings.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Corn, tomato, cotton, peas, and beans.

Damage: Larvae feed on the fruit, stems, and leaves

IPM recommendations: Planting the crop early (especially sweet corn) will allow it to be harvested before the majority of damage occurs. Tolerate some damage by cutting off the tips of damaged sweet corn. Plant sweet corn varieties that contain *Bacillus thuringiensis* (Bt). Insecticides or mineral oil can be applied to provide effective control.

Green Stink Bug

Acrosternum hilare

Order: Hemiptera

Description: Adults have a characteristic shield-shape. The green stink bug is bright green and ½ to ¾ inch long. The nymphs are similar to adults but lack wings and may possess bright markings on the abdomen.

Life stages: Egg, nymph, adult.

Plants attacked: Tomatoes, grapes, peaches, nectarines , beans, peas, okra, and broadleaf weeds.

Damage: The nymphs and adults can injure fruit by using their mouthparts as a probe. Immature fruit will appear dimpled, and mature fruit will have corky areas resulting in a gnarled or mottled appearance.

IPM recommendations: Plant peas, beans, and tomatoes early to avoid high numbers of stink bugs. Handpicking of egg masses, nymphs, and adults can slow population buildup. Insecticide sprays may be used when heavy populations occur. Multiple treatments may be needed to achieve effective control.

Imported Cabbageworm

Pieris rapae

Order: Lepidoptera

Description: The butterfly is white with black at the tips of the forewings and a black spot on the front edge of each hind wing. The larva is velvety green in appearance and has five pairs of prolegs.

Life stages: Egg, larva, pupa, adult.

Plants attacked: The imported cabbageworm feeds on cabbage, cauliflower, broccoli, Brussels sprouts, turnips, radishes, kale, lettuce, and weeds in the mustard family.

Damage: Cabbageworms feed on foliage creating irregular-shaped holes in the leaves. They can bore into the center of the head, damaging the edible portion of the plant. The greenish, brown excrement contaminates and stains the produce.

IPM recommendations: Controlling weeds around the garden helps decrease pest numbers. Reduce the number of overwintering pupae by destroying and removing the plants in the fall and using fall tillage. The use of resistant varieties may provide some protection. Rotate new plantings to a new planting location. Floating row covers can be used as a physical barrier. A selective insecticide, such as *Bacillus thuringiensis,* can be applied to provide effective control of early instar larvae.

Squash Bug

Anasa tristis

Order: Hemiptera

Description: Adult squash bugs are grayish black to brown and about ¾ inch in size. First instar nymphs can be identified by their small size and light-green abdomens. Nymphs are gray to grayish-white. Wing pads become evident on fifth instar nymphs.

Life stages: Egg, nymph (five nymphal instars), adult.

Plants attacked: All cucurbits, but especially squash and pumpkins.

Damage: Nymphs and adults use their piercing-sucking mouthparts to suck plant sap, causing leaves to brown and wilt. Direct feeding on fruit can result in discoloration and render fruit unmarketable.

IPM recommendations: Maintain healthy plants through proper planting site selection, fertilization, and irrigation. Remove debris from the garden to reduce the number of squash bugs that overwinter. Handpick adults and nymphs, and smash egg clusters on leaves to reduce squash bug populations. Cheesecloth or other netting can be draped over plants to minimize or delay squash bug populations. Insecticides may be effective, but should not be the only management tool. Insecticides must penetrate the plant canopy and cover the top and underside of the leaves, fruit, and vines. Rotate the chemical class or mode of action from application to application to help prevent resistance.

Squash Vine Borer

Melittia cucurbitae

Order: Lepidoptera

Description: The moth is ⅝ of an inch long with a wasp-like appearance. The hind wings are clear, while the front wings are covered with greenish to black scales. The abdomen is covered with orange to reddish hairs.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Vine crops, such as squash, winter squash, and pumpkins.

Damage: Inspection of plants can reveal holes near the base of the plants that are filled with orange sawdust-like material called frass. Affected plants take on a wilted appearance. Larvae tunnel into the vascular system of the plant. Plants can eventually collapse and die.

IPM recommendations: Monitor for the presence of adult borers. Destroy and dispose of infested vines before larvae have completed their development and moved into the soil. Rototilling or deep plowing can physically destroy cocoons and larvae. Summer squash can be used as a trap crop if planted early in the season. Insecticides will only be effective when larvae emerge from the eggs before they tunnel into the plants.

Striped and Spotted Cucumber Beetle

Acalymma vittatum and *Diabrotica undecimpunctata*

Order: Coleoptera

Description: Striped cucumber beetle is oblong, yellowish green with three black stripes down the back. The spotted cucumber beetle is also yellow-green, but has 12 black spots instead of stripes. They are both ¼ inch long.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Cucumbers, squash, pumpkin, melons, and related plants.

Damage: Beetles feed on foliage, stems, pollen, and flowers of host plants. Larvae feed on the roots and stems, but damage is minimal compared to losses from bacterial wilt. The bacterium causing bacterial wilt is spread by striped cucumber beetles.

IPM recommendations: Inspect newly planted cucurbits frequently for the presence of cucumber beetles. Row covers, screens, or cones over small plants can be used to exclude this pest. Prevent transmission of the bacterium by controlling striped cucumber beetle feeding. Various general-use insecticides are labeled for use against cucumber beetles or leaf feeding beetles.

Tomato Hornworm

Manduca quinquemaculata

Order: Lepidoptera

Description: Caterpillars are pale green with v-shaped markings. They possess a horn that is often black and can reach 3 ½ to 4 inches long. The moth is stout bodied with grayish wings that spread 4 to 5 inches. There are five pair of yellow-orange spots on each side of the abdomen.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Primarily tomato, but they will attack eggplant, pepper and potatoes.

Damage: The larva feeds on plant stems and leaves, leaving behind dark green or black droppings.

IPM recommendations: Inspect plants for signs of feeding or missing leaves. Handpicking is an effective control for small gardens. *Bacillus thuringiensis* and other insecticides also may be used to control hornworms.

Turf Pests

Field Chinch Bug and Western Chinch Bug

Blissus leucopterus and *Blissus occiduus*

Order: Hemiptera

Description: Adults are 1/10 of an inch long. They are black with reddish-yellow legs and have shiny white wings that extend back over the abdomen. First instar nymphs are tiny, bright red insects with a distinctive white band. As nymphs mature, their color changes to orange-brown and finally a dark brown.

Life stages: Egg, nymph, and adult. Two generations per year. Field chinch bugs overwinter in bunchgrasses, while the western chinch bug overwinters in buffalograss.

Plants attacked: Buffalograss, zoyiagrass, perennial rye, fescue, and Kentucky bluegrass.

Damage: Chinch bugs withdraw sap from the leaves, stems, or stolons when they insert their piercing-sucking mouthparts into the plant. Initial reddish-purple discoloration can progress until plants take on a straw-brown appearance. Damage ranges from minor thinning to extreme cases where the grass is killed.

IPM recommendations: The best defense against chinch bugs is the use of sound cultural practices, which limits thatch accumulation and organic debris. Normally, 20 chinch bugs per square foot warrants treatment. Bifenthrin or carbaryl applied in 3 to 5 gallons of water per 1,000 square feet provide effective control. After applying , water enough (1/8 to 1/4 inch) to move the insecticide into the thatch layer. Follow label directions.

Masked Chafer/ Annual White Grub

Cyclocephala spp.

Order: Coleoptera

Description: Beetles are ½ to ⅝ inch long and reddish brown with a darker brown head mask. The adults may be referred to as May beetles or June bugs. Grubs are white with a characteristic c-shaped body. Grubs have dark stripes on their backs and a brown head capsules and legs.

Life stages: Egg, larva, pupa, adult.

Plants attacked: All turfgrass species, including bentgrass, Kentucky bluegrass, and tall fescue.

Damage: White grubs feed on the roots of turfgrass causing dead spots which show up in lawns during late summer and fall.

IPM recommendations: Aerating the lawn may reduce white grub populations if they are feeding close to the soil surface. Lawns with a history of grub damage can be treated with Merit (imidacolprid) or Mach 2 (halofenozide). Traditional insecticides should be applied when grubs are small. This is normally about the last week in July to the first week in August, or approximately 45 days after beetles appear. Apply the amount of insecticide indicated on the label. Pre- and posttreatment irrigations will enhance product performance.

Beneficials

Honey Bee

Apis mellifera

Order: Hymenoptera

Description: The honey bee is about ½ inch long. The front of the abdomen is yellow, and there is some yellow between the four brown bands on the rest of the abdomen. Honey bees vary in color but are usually some shade of black, brown, or brownish-yellow.

Life stages: Egg, larva, pupa, adult. Three castes of bees are queens, drones, and workers.

Plants attacked: None, but adult honey bees can sting.

Importance: Responsible for the pollination of many fruits, vegetables, and ornamental flowers. They produce honey, beeswax, pollen, and royal jelly.

IPM recommendations: Agricultural pesticides may be toxic to bees. In order to avoid negative impacts to the population, do not treat fields in bloom. Apply insecticides when bees are not foraging, such as late evening or early morning. Choose short residual materials and low-hazard formulations. Avoid spray drift. Read the pesticide label to determine safety precautions.

Green Lacewing

Chrysoperla spp.

Order: Neuroptera

Description: Adults are ½ to ¾ inch long with delicately veined wings. They are light green with long, slender antennae and golden eyes. Larvae have spindle-shaped bodies and pincher-like mouthparts that resemble tiny alligators.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Adults primarily feed on pollen, nectar, and honeydew, but do not harm plants. Some species may be predaceous as adults.

Importance: The larvae referred to as "aphid lions" are predaceous on soft-bodied insects and mites, such as aphids, thrips, mealybugs, immature whiteflies, and small caterpillars.

IPM recommendations: Plantings should include flowering plants, and a low level of aphids should be tolerated. Young larvae are susceptible to desiccation. They may need a source of moisture.

Lady Beetle

Many genera and species

Order: Coleoptera

Description: Lady beetles are commonly referred to as ladybugs. Adult beetles are hemispherical, reddish-orange or yellow with small dark spots on each wing cover. The larva is blackish, soft-bodied with a bumpy or spiny appearance and often has spots or bands of red, black, or yellow.

Life stages: Egg, larva, pupa, adult.

Plants attacked: Adults occasionally feed on nectar, pollen, and honeydew but do not harm plants.

Importance: Larvae and adults feed on aphids, scales, and other soft-bodied insects and mites. Lady beetles play an important role in managing some insect pests in crops and landscapes.

IPM recommendations: Learn to recognize the different stages of these beneficial insects. Add plants that can provide pollen and nectar for lady beetles. Apply insecticide only when necessary and use selective insecticides.

Praying Mantids

Many genera and species

Order: Mantodea

Description: Adults are medium to large, green or brownish slender insects that possess front legs adapted for catching and holding prey. Wings are usually well developed. A styrofoam-like egg case or ootheca protects the eggs and may be noticeable in the garden.

Life stages: Egg, nymph, adult.

Plants attacked: Beneficial insect that does not feed on plants.

Importance: Praying mantids are highly predacious and feed on a variety of insects, including crickets, grasshoppers, and flies. They are good garden predators but do not discriminate between beneficial and harmful garden insects when eating.

IPM recommendations: Attract praying mantids by planting a variety of flowering shrubs and trees. Apply insecticide only when necessary and use selective insecticides.

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