Twenty-five Pests You Don't Want in Your Garden

Prepared by
the PA IPM Program

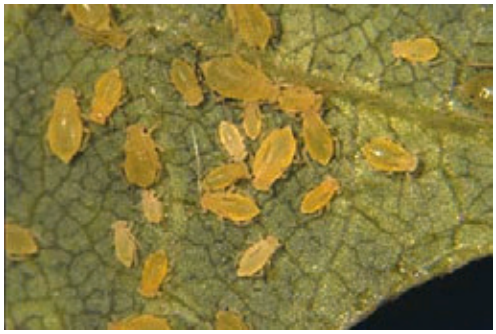
J. Kenneth Long, Jr.
PA IPM Program Assistant
(717) 772-5227
c-klong@state.pa.us

Pest	Pest Sheet
Aphid	1
Asparagus Beetle	2
Bean Leaf Beetle	3
Cabbage Looper	4
Cabbage Maggot	5
Colorado Potato Beetle	6
Corn Earworm (Tomato Fruitworm)	7
Cutworm	8
Diamondback Moth	9
European Corn Borer	10
Flea Beetle	11
Imported Cabbageworm	12
Japanese Beetle	13
Mexican Bean Beetle	14
Northern Corn Rootworm	15
Potato Leafhopper	16
Slug	17
Spotted Cucumber Beetle (Southern Corn Rootworm)	18
Squash Bug	19
Squash Vine Borer	20
Stink Bug	21
Striped Cucumber Beetle	22
Tarnished Plant Bug	23
Tomato Hornworm	24
Wireworm	25

Aphids

Many species (Homoptera: Aphididae)

(Origin: Native)



Soybean Aphids

Primary Host: **Many vegetable crops.**

Damage: **Adults and immatures suck sap from plants, reducing vigor and growth of plant. Produce "honeydew" (sticky liquid) on which a black fungus can grow.**

Management: **Hide under leaves. Because of small size, hidden behavior and rapid reproduction, populations can become very large before they are noticed.**

Biocontrols: **Several natural enemies such as lady beetles and lacewings feed on them. Several parasitoids lay eggs within aphids, killing them as the nymphs develop.**

Cultural Controls: **Avoid high nitrogen levels in plants (enhances aphid reproduction) by using less soluble forms of nitrogen.**

Physical Controls: **Proper pruning and washing aphids off with a strong stream of water can help.**

Chemical Controls: **Contact your local Penn State County Extension Agent for more information**
http://www.extension.psu.edu/extmap.html

Insect Description:
Adults: **About $^{1}/_{8}$" long; soft-bodied; light to dark green; may be winged or wingless. Cornicles, paired tubular structures on abdomen, are helpful in identification.**

Nymph: **Daughters are born alive containing partly formed daughters inside their bodies. (See life history below).**

Eggs: **Laid in protected places only near the end of the growing season.**

Life History: **Females lay eggs near the end of the growing season in protected places on host plants. In spring, plump "stem mothers" emerge from these eggs, and give live birth to daughters, and they give birth to more daughters, all without mating. At the end of the growing season, males are produced, and females born at the same time have eggs rather than live young in them. Mating occurs, the eggs are fertilized and overwintering eggs are again laid in protected areas on the plants.**

Asian Lady Beetle feeding on Aphids

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Soybean aphids: David W. Ragsdale, U of Minn, www.insectimages.org; Asian Lady Beetle feeding on aphids: Marlin E. Rice, Iowa State University, www.ent.iastate.edu.

Asparagus Beetle

Crioceris asparagi (L.) (Coleoptera: Chrysomelidae)

(Origin: European)

Adult Asparagus Beetle

Primary Host: **Asparagus**

Damage: **Adults feed on tips of shoots as soon as they push through the ground, causing scars and browning of tips. Adults and larvae feed on stem and leaf surfaces. Larvae excrete black fluid that stains plants.**

Management: **Regular cutting helps reduce damage.**

Biocontrols: **A tiny (1/8") metallic green wasp, *Tetrastichus asparagi*, parasitizes asparagus beetle eggs.**

Cultural Controls: **Control volunteer plants to help reduce damage. Destroying crop residue eliminates overwintering sites for the adults.**

Physical Controls: **Hand picking is best in small patches. In summer, brushing the plants with a broom to knock off the larvae will help. Control during summer and fall may eliminate the problem for the next year.**

Chemical Controls: **Contact your local Penn State County Extension Agent for more info. http://www.extension.psu.edu/extmap.html**

Insect Description:

Adults: **¼" long; with bluish head, reddish neck, and creamy yellow spots with red borders on the wings. (Adult spotted asparagus beetles are larger, reddish orange with black antennae, eyes and undersides and 6 black spots on each wing.)**

Pupae: **Located in the soil below the asparagus plants.**

Larvae: **3/8" long; soft-bodied, gray with black heads.**

Eggs: **Black (Spotted asparagus beetle's are yellowish-green.)**

Life History: **Overwinter as adults in any suitable shelter like loose tree bark or hollow stems of old asparagus plants. About the time of first asparagus cutting, they make their way to the young shoots and lay eggs on them. The larvae feed about 2 weeks before dropping to the soil to pupate. There are 2 generations each year. The active beetles often drop to the ground if disturbed.**

Asparagus Beetle Larva

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Asparagus Beetle Adult: Clemson University – USDA Cooperative Extension Slide Series, www.insectimages.org; Asparagus Beetle Larva: Clemson University – USDA Cooperative Extension Slide Series, www.insectimages.org.

Bean Leaf Beetle

Cerotoma trifurcata (Förster) (Coleoptera: Chrysomelidae)

(Origin: Native)

Adult Bean Leaf Beetle

Primary Host: **Beans, peas, soybeans.**

Damage: **Larvae feed on roots, nodules, and underground portions of the stem. Adults feed on stems of seedlings and chew round holes in leaves and damage pods.**

Management: **2 or 3 beetles per plant and 30% defoliation usually justifies treatment.**

Biocontrols: **Many different parasitoids and predators attack bean leaf beetles. The most common parasitoid is the tachinid fly, *Calatoria diabroticae*, which attacks the adult beetle.**

Cultural Controls: **An early planting of soybeans may serve as a trap crop if the number of overwintering adults is high.**

Chemical Controls: **Contact your local Penn State County Extension Agent for more information.**
http://www.extension.psu.edu/extmap.html

Insect Description:

Adults: **About ¼" long; varies in color from light yellow to tan to green or even red when mature. Each wing cover may have 4 black spots and there is a black triangle behind the head.**

Pupae: **Whitish in color and about $^{1}/_{6}$" long. Found in small earthen cell in the soil. Adults emerge in about a week.**

Larvae: **Slender and white, about $^{1}/_{3}$" long, with a black head and anal plate and short legs near the head. (Resembles corn rootworm larva). It spends this entire stage feeding underground until pupation.**

Eggs: **Lemon-shaped; reddish-orange in color and less than $^{1}/_{32}$" long. Laid about 1" deep in soil in clusters at the base of plants. Hatch within 2-3 weeks depending on temperature.**

Life History: **Overwinters in wooded areas, leaf litter and weeds. Migrate to bean fields to feed and lay eggs. Eggs hatch in 6-15 days. Larvae feed on soybean root hairs and nodules until pupation. 2nd generation adults emerge and feed on soybean foliage.**

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Bean Leaf Beetle Adult: Marlin E. Rice, Iowa State University, www.ent.iastate.edu.

Cabbage Looper

Trichoplusia ni (Hübner) (Lepidoptera: Noctuidae)

(Origin: ?)

Cabbage Looper Adult

Primary Host: Cabbage, cauliflower, broccoli, Brussels sprouts, radish, mustard, kale, lettuce, celery, spinach, beets, peas, potato, tomato.

Damage: Caterpillars eat large irregular holes in leaves and into heads, causing stunted growth, failure of heads to form, or make produce unmarketable.

Management: Usually more serious in the fall. Should be controlled when small because large loopers are difficult to control.

Biocontrols: The tachinid fly, *Voria ruralis*, is the dominant cause of cabbage looper death.

Cultural Controls: Plant resistant varieties such as Mammoth Red Rock or Chieftan Savoy.

Physical Controls: Hand picking works for small patches. Cover plants with a floating row cover to keep adults from laying eggs on plants.

Chemical Controls: Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html

Insect Description:

Adults: Forewings mottled gray-brown in color with silvery white spots. Hindwings are brown at base and near the edge. Wing-span is about $1^{3}/_{8}$" in extent.

Pupae: White, thin, fragile cocoon on underside of foliage, in plant debris, or in soil clods.

Larvae: Light green. When crawling, make a characteristic loop in the middle of their body.

Eggs: Yellowish white or greenish, usually laid singly on underside of mature leaves.

Life History: Cabbage loopers overwinter as pupae attached to host plants and other nearby objects. The adults emerge in the spring and lay several hundred eggs singly on the upper surfaces of host plant leaves. Larval development may be completed in two weeks if weather is favorable, and the cabbage looper can have three or more generations per year in the northern United States.

Cabbage Looper Larva

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Cabbage Looper Adult: John L. Capinera, University of Florida, http://creatures.ifas.ufl.edu/; Cabbage Looper Larva: R.J. Reynolds Tobacco Company Slide Set, R.J. Reynolds Tobacco Company, www.insectimages.org..

Cabbage Maggot

Delia radicum (L.) (Diptera: Anthomyiidae)

(Origin: Native)

Adult Cabbage Maggot

Primary Host: Crucifers.

Damage: Larvae tunnel into roots of small plants causing plants to appear sickly, off color or stunted, and may cause plant to die. Cabbage maggot injury is favored by cool, wet conditions.

Management: Plowing under crop residues after harvest will destroy many pupae.

Biocontrols: Ground beetles and nematodes may help control maggots.

Cultural Controls: High levels of organic matter may increase the attractiveness of the field to cabbage maggot flies.

Physical Controls: Cover plants with floating row cover to keep adult flies from laying eggs on plants.

Chemical Controls: Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html

Insect Description:

Adults: ¼" long gray body with 3 black longitudinal stripes on thorax and 1 black stripe along top of abdomen. Resemble small house flies.

Pupae: About ¼" long and brown.

Larvae: Small, legless, white maggots, reaching maximum length of about ¼".

Eggs: Oval shaped, bone white and very small. Usually on plant or soil near the stem.

Life History: Overwinter as pupae in the soil. Flies emerge from soil in late April or early May, feed on pollen and nectar, and lay white eggs at bases of newly set plants. Larvae from this generation tunnel in the roots of small plants, causing plants to become stunted. When mature, maggots pupate in roots or surrounding soil. Disk or rototill 2 weeks before planting to destroy the pupae.

Cabbage Maggot Larva

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Cabbage Maggot Adult and Larva: Agriculture and Forestry Information Centre: http://www.gov.pe.ca/af/agweb/library/gallery/search/search_3.php3?category=Cabbage%20maggot.

Colorado Potato Beetle

Leptinotarsa decemlineata (Say) (Coleoptera: Chrysomelidae)

(Origin: Central America, Mexico, Caribbean)

Colorado Potato Beetle Adult

Primary Host: **Potato, tomato, eggplant, pepper.**

Damage: **Adults and larvae feed on leaves and terminals, causing reduced growth or death of plant.**

Management: **Needed primarily during flowering for potatoes.**

Biocontrols: **A lady beetle (*Coleomagilla maculata*), and a predaceous stinkbug feed on the eggs.**

Cultural Controls: **Crop rotation prevents over-wintering beetles from emerging directly in the fields. Till in fall to reduce damage.**

Physical Controls: **Mulches and trenches, and hand picking and row covers are effective.**

Chemical Controls: **Contact your local Penn State County Extension Agent for more information.**
http://www.extension.psu.edu/extmap.html

Insect Description:
Adults: **About $^{3}/_{8}$" in length; oval shaped. Cream colored with 10 black stripes on the back.**

Pupae: **Located in soil.**

Larvae: Early stages are crimson with black legs and 2 rows of black spots on sides of body. Later stages are orange and appear bloated and humpbacked.

Eggs: **Deposited in orange clusters of 20-45 oval-shaped eggs under leaves.**

Life History: **Overwintering adults emerge in late May, begin to feed and mate. Eggs laid in June hatching in about 1 week. 2 weeks later, mature larvae drop to ground and pupate. A week later, adults emerge and begin the 2nd generation. New adults in late July or August may feed a few days then begin winter hibernation in the ground.**

Colorado Potato Beetle Larva

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Colorado Potato Beetle adult: USDA Image Gallery, www.ars.usda.gov/is/graphics/photos/; Colorado Potato Beetle larva: Kansas State University, Department of Entomology: www.oznet.ksu.edu/.

Corn Earworm (Tomato Fruitworm)

Helicoverpa zea (Boddie) (Lepidoptera: Noctuidae)

(Origin: Native)

Corn Earworm Adult

Primary Host: **Corn, tomato, beans, peppers, eggplant, tobacco.**

Damage: **Larvae feed on marketable portion of each vegetable crop it attacks, often making them unmarketable. Usually enter corn ears through the tip.**

Management: **Monitor with pheromone traps.**

Biocontrols: **Several predators and parasites, including ladybird beetles, lacewings, predatory bugs, and parasitic flies and wasps attack earworm eggs and larvae**

Cultural Controls: **Cut off the tips of damaged sweet corn ears or plant extra tomatoes or beans.**

Physical Controls: **Mineral oil can be applied to the corn silk to prevent egg laying.**

Chemical Controls: **Contact your local Penn State County Extension Agent for more information.**
http://www.extension.psu.edu/extmap.html

Insect Description:

Adults: **Buff colored; with irregular spots and markings on wings. About 1½" wing-span.**

Pupae: **Initially a shiny reddish brown, it becomes dark brown when adult emergence approaches.**

Larvae: **Light green to tan or other colors, with light and dark stripes running lengthwise on body. Head capsule is light brown.**

Eggs: **Preferred site for laying is fresh corn silks.**

Life History: **Females prefer to lay eggs on corn or tomato plants, usually near flowers or terminal leaflets. After hatching, larvae quickly begin to bore deeply into the fruit, contaminating it with feces. Larvae prefer green fruit and seldom enter ripe fruit.**

Corn Earworm Pupa with Parasite

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Corn Earworm adult: Steve L. Brown, The University of Georgia, www.insectimages.org; Corn Earworm Pupa with parasite: USDA Image Gallery, www.ars.usda.gov/is/graphics/photos/.

Cutworms

Several species (Lepidoptera: Noctuidae)

(Origin: Native or exotic)

Black Cutworm Adult

Primary Host: Many vegetable crops.

Damage: Feed at night and can cut small plants off at the soil surface. On older plants, treatment should not be necessary. Some cutworms climb and feed on all plant parts.

Management: Blacklight or pheromone traps can be used for monitoring. If seedlings are cut off at soil level, cutworms should be suspected.

Biocontrols: Birds, insect predators such as ground beetles, and hymenopteran parasitoids feed on cutworms.

Cultural Controls: Fields with many winter annual weeds should be worked at least 10-14 days before transplanting seedlings. Transplant seedlings when large enough to withstand a little damage.

Physical Controls: Paper collars or other barriers placed around seedlings will protect them from cutworm attack.

Chemical Controls: Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html

Insect Description:

Adults: Large moths (1½" wingspan). Most cutworm moths are brownish with some wing markings.

Larvae: Smooth skinned, dull brownish caterpillars up to 1½" in length, that curl into a C-shape when disturbed. Normally found on or just below the soil surface or on lower parts of plants. Start feeding in early spring. Eat at night.

Pupae: Found in the soil for most species.

Eggs: Laid mostly on broad-leaved weed stems and leaves.

Life History: Many Overwinter as pupae in the soil or as adult moths. Eggs are deposited early in spring. Several cutworms have more than one generation per year. Larvae hide in the soil during the day and move to the soil surface at night where they cut off plants just above the soil surface, causing the plants to die.

Cutworm Larva showing damage

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Black Cutworm adult: Marlin E. Rice, Iowa State University, www.ent.iastate.edu; Cutworm larvae showing damage: University of Georgia Archives, The University of Georgia, www.insectimages.org.

Diamondback Moth

Plutella xylostella (L.) (Lepidoptera: Pyralidae)

(Origin: Europe)

Adult Diamondback Moth

Primary Host: Cabbage, cauliflower, broccoli, Brussels sprouts, radish, mustard, kale.

Damage: Larvae eat many small holes on underside of leaves, giving plant a shot-hole appearance.

Management: Caterpillars are detected by visual observation of the plant. Adults can be detected with pheromone traps.

Biocontrols: Several hymenopterous parasitoids will attack the caterpillars.

Cultural Controls: Plant resistant varieties of crops.

Physical Controls: Moths overwinter in the field, so destroying or plowing under crop debris is recommended.

Chemical Controls: Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html

Insect Description:

Adults: About $^{3}/_{8}$" long; gray or brownish color with 3 pale triangular markings along the inner margin of wings. At rest, the triangles form 3 diamond shapes along the middle of the wings.

Pupae: White silk mesh cocoon formed on surface of leaf or in litter under the plant; about $^{3}/_{8}$" long.

Larvae: About $^{3}/_{8}$" long; light brown to dark green in color. Usually found on the undersides of leaves.

Eggs: Tiny, yellow, laid under leaves near veins.

Life History: The life cycle can be completed in two weeks to a month depending on temperatures. Upon hatching from the eggs, larvae tunnel into the leaves mining them for about a week. They then exit through the underside and feed externally. When disturbed, the larvae drop on a silken thread, and later climb back onto the leaf.

Diamondback Moth Larva

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Diamondback Moth adult: Archives of the IPM Program at NY State Ag Experiment Station, www.nysaes.cornell.edu; Corn Diamondback Moth larva: USDA Image Gallery, www.ars.usda.gov/is/graphics/photos/.

European Corn Borer

Ostrinia nubilalis (Hübner) (Lepidoptera: Pyralidae)

(Origin: Europe)

European Corn Borer Adults

Primary Host: **Corn, peppers and beans.**

Damage: **Larvae feed on foliage and ears of corn, bore inside pepper fruit, and feed on or bore into bean pods.**

Management: **Monitor with black light or pheromone traps.**

Biocontrols: ***Trichogramma ostriniae*** **parasitize egg masses of the European Corn Borer.**

Cultural Controls: **Choose hybrid with tolerance to corn borers. Shred or bury old stalks to kill over-wintering larvae.**

Physical Controls: **Keep weedy field edges and fence rows clipped to avoid a harbor for the moths.**

Chemical Controls: **Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html**

Insect Description:

Adults: **Yellowish buff to light tan with dark zigzag marks across wings. Wing spread ¾-1".**

Pupae: **Remains inside host plant; smooth, light to dark brown in color; $^{1}/_{3}$-$^{5}/_{8}$" in length.**

Larvae: **Dirty white, smooth skin with many dark spots over sides and top of body; hairless; with dark head.**

Eggs: **Glued to underside of leaves in clusters of 12 or more resembling overlapping fish scales.**

Life History: **1st generation larvae overwinter in stalks of host plant, transform into pupae in late April to early June. Adults emerge and lay eggs mid-May to mid-June. Larvae chew holes in leaves, then into stalk, where they pupate. 2nd generation moths emerge in late July to late August. Larvae complete growth before cold weather and winter in plants.**

European Corn Borer Larva

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: European Corn Borer adult: Marlin E. Rice, Iowa State University, www.ent.iastate.edu/imagegal/; European Corn Borer Larva: Penn State University, www.ento.psu.edu/.

Flea Beetles

Many species (Coleoptera: Chrysomelidae)

(Origin: Native and Exotic)

Adult Flea Beetle

Primary Host: Many vegetable crops. Eggplant is especially vulnerable to attack.

Damage: Chew small holes in leaves, giving the leaf a "shot hole" appearance.

Management: Focus on protecting the youngest plants from attack.

Biocontrols: None known to be effective.

Cultural Controls: Weed control in and around planting sites deprive larvae of food sources; remove crop debris to eliminate overwintering sites; delayed planting may avoid peak populations; rotation of crops.

Physical Controls: Row covers can protect seedlings.

Chemical Controls: Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html

Insect Description:

Adults: Small, shiny beetles with back legs enlarged for jumping like fleas when disturbed.

Corn Flea Beetle: $^{1}/_{16}$", strips the green top layer from leaves, leaving irregular brown or grey lines. Can transmit bacterium of Stewart's wilt.

Potato Flea Beetle: small, $^{1}/_{16}$" long, black.

Striped Flea Beetle: $^{1}/_{12}$", pale stripe on each wing.

Larvae: Usually feed on roots of host plant.

Life History: For most species, adults overwinter underground or beneath plant debris. During April and May, they become active, mate and lay eggs. Eggs typically hatch in 10 days. Larval and pupal development take place during the summer. "New" adults emerge and feed during late summer and fall before seeking overwintering sites.

Flea Beetle Damage

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Flea Beetle adult: Hariet Hinz & Ester Gerber, CABI Biosciences, www.insectimages.org; Flea Beetle damage: Kansas State University, Department of Entomology: www.oznet.ksu.edu/.

Imported Cabbageworm

Pieris rapae (L.) (Lepidoptera: Pieridae)

(Origin: Europe)

Imported Cabbageworm Adult

Primary Host: Cabbage, cauliflower, broccoli, Brussels sprouts, radish, mustard, kale, lettuce.

Damage: Caterpillars eat large irregular holes in leaves and into heads, causing stunted growth, failure of heads to form, or make produce unmarketable.

Management: Masses of wet, greenish-brown excrement deep among leaves is characteristic of this pest.

Biocontrols: Several hymenopterous parasitoids attack the caterpillars as well as virus and bacterial diseases.

Cultural Controls: Resistant cabbage varieties should be planted. Row covers prevent egg laying.

Physical Controls: Handpick larvae and eggs.

Chemical Controls: Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html

Insect Description:

Adults: Common white butterfly with black spots and wing tips. The female has 2 spots on each forewing, while the male has 1.

Pupae: Sharply angled chrysalis is gray, green, or brown, attached to lower leaf surface by silken loop.

Larvae: Velvet-like green larva has a faint yellow stripe down its back, and a row of faint yellow spots on each side.

Eggs: Tiny, pale yellow, bullet-shaped.

Life History: Overwinter as pupae attached to host plant debris. Adults emerge early in spring. Soon after mating, eggs are deposited singly on host plants. Larvae are commonly found on under-sides of leaves, and bore into the center of the head as they grow. When mature, a chrysalis is formed. There may be several generations in a year.

Imported Cabbageworm Larva

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Imported Cabbageworm adult: James Castner, University of Florida/IFAS, March 2000: http://edis.at.ufl.edu/IN283; Imported Cabbageworm larva: USDA Image Gallery, Clemson University – USDA Cooperative Extension Slide Series, www.insectimages.org.

Japanese Beetle

Popilia japonica Newman (Coleoptera: Scarabaeidae)

(Origin: Asia)

Japanese Beetles Adult

Primary Host: Many vegetables, fruits, field crops, ornamentals, turfgrass.

Damage: Larvae (grubs) feed on roots of turfgrass and other plants. Adults feed on leaves, flowers, and fruits of many plants.

Management: Adults are not effectively controlled with scented traps.

Biocontrols: Bacterial Milky Disease is effective given enough time, and a parasitic nematode is effective.

Cultural Controls: Dry soil inhibits development of eggs and 1st stage grubs. Don't irrigate during that time.

Physical Controls: Hand picking. Pheromone traps may attract more beetles than they control, causing increased plant damage.

Chemical Controls: Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html

Insect Description:

Adults: About 3/8" long; metallic green and bronze in color with a row of white tufts on each side of body.

Pupae: First cream-colored, becoming light reddish-brown with age. About ½" long.

Larvae: Common C-shaped white grubs found in lawns, turf or cultivated fields.

Eggs: Tiny white eggs are deposited in the soil where they hatch.

Life History: Grubs overwinter about 8" below the soil surface, moving up when the surface temperature reaches 60°. Pupation begins in June, with adults emerging through July, feeding and mating. The female burrows into the soil to lay eggs about 2-4" deep, where they hatch into grubs which begin feeding on roots and organic material. As winter approaches, the grubs burrow deeper to overwinter.

Japanese Beetle Larva (Grub)

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Japanese Beetle adult and grub: Marlin E. Rice, Iowa State University, www.ent.iastate.edu.

Mexican Bean Beetle

Epilachna varivestris Mulsant (Coleoptera: Coccinellidae)

(Origin: Central America, Mexico, Caribbean)

Mexican Bean Beetle Adult

Primary Host: **Beans, soybeans.**

Damage: **Larvae and adults feed on under-surface of leaves giving them a lacy appearance. May also attack pods when abundant.**

Management: **One beetle per plant or 30% defoliation justify use of pesticide.**

Biocontrols: **Naturally occurring predators may help reduce numbers.**

Cultural Controls: **Delayed planting may reduce beetle populations.**

Physical Controls: **Hand picking works for small plots. Heavy rains help knock off adults and larvae from plants.**

Chemical Controls: **Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html**

Insect Description:

Adults: **Round shaped and copper colored with 16 spots on its back. About $^{5}/_{16}$" long and ¼" wide.**

Pupae: **About ¼" long, yellowish, with traces of spiny larval skin attached.**

Larvae: **Yellow, oval, covered with branched spines. $^{7}/_{16}$" long when full grown.**

Eggs: **Oval, yellow, laid in clusters on underside of bean leaf.**

Life History: **Eggs are laid from late spring through early fall and hatch in 5-14 days. Young larvae feed on underside of leaves and older larvae eat through the leaves leaving only the veins. Pupae are attached to undersides of leaves of beans or nearby weeds and develop in about 10 days. Adults live 4-6 weeks during the active season, and late season adults hibernate in woodland areas or where crops have not been plowed under.**

Spined Soldier Bug feeding on Mexican Bean Beetle Larva

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Mexican Bean Beetle adult: Clemson University – USDA Cooperative Extension Slide Series, www.insectimages.org; Spined Soldier Bug feeding on Mexican Bean Beetle larva: USDA Image Gallery, www.ars.usda.gov/is/graphics/photos/.

Northern Corn Rootworm

Diabrotica barberi Smith & Lawrence
(Coleoptera: Chrysomelidae)
(Origin: Native)

Northern Corn Rootworm Adult

Primary Host: Corn.

Damage: Adults feed on pollen, corn silks, leaves and exposed corn kernels. Larvae tunnel into roots, often pruning them back to the crown, causing stunting and lower yields. Plants with badly damaged roots often topple over during storms.

Management: Monitor about mid-August for adult beetles on tips of corn ears. 200 or more per 100 plants may cause loss in the same field next year.

Biocontrols: No effective ones are commercially available.

Cultural Controls: Plant corn more than 5 days after rootworm egg hatch to prevent larval feeding.

Physical Controls: Crop rotation can effectively prevent infestation. Rootworms are seldom a problem in sandy soils.

Chemical Controls: Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html

Insect Description:
Adults: About ¼" long; solid yellowish-green in color. Good flyers.

Western Corn Rootworm: males are mostly black on the wing covers while females are striped with yellow under the abdomen. (Striped Cucumber Beetles have a black abdomen).

Pupae: In the soil; white, with no protective covering.

Larvae: White and slender; only found underground feeding on corn roots.

Eggs: Deposited in soil near the base of corn plants.

Life History: Overwinter as eggs in the soil. They hatch about mid-June. The tiny rootworms immediately begin searching for corn roots to feed on. Pupae develop about mid-July, with adults emerging in late July. Only 1 generation is produced per year.

Corn Rootworm Larva

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Northern Corn Rootworm adult: Marlin E. Rice, Iowa State University, www.ent.iastate.edu; Corn Rootworm larvae, USDA Image, www.ars.usda.gov/is/graphics/photos/.

Potato Leafhopper

Empoasca fabae (Harris) (Homoptera: Cicadellidae)

(Origin: Native)

Potato Leafhopper Nymph and Adult

Primary Host: Many vegetable crops.

Damage: Characteristic wedge-shaped yellow area at leaf tip ("hopperburn"). Damage may spread over many entire leaves. Stunted plants and reduced yields may result.

Management: Monitor by net sweeping beginning in early June.

Biocontrols: Several predators, parasites and fungal pathogens attack Potato Leafhoppers.

Cultural Controls: Vigorously growing plants more easily withstand feeding damage. Crops near alfalfa fields tend to suffer more damage especially after the alfalfa is cut.

Physical Controls: Floating row covers can keep Potato Leafhoppers off plants.

Chemical Controls: Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html

Insect Description:

Adults: Tiny (about $^{1}/_{8}$" long); wedge-shaped, yellow-green insects which fly, jump or run sideways when disturbed. Wings are held roof-like over the body.

Nymph: Smaller versions of the adults, but wingless, and walk sideways.

Eggs: Laid singly within the petioles and veins on undersurfaces of host plants. Hatch in about 10 days.

Life History: Does not overwinter in Pennsylvania. Adults are blown up from the south in late May and early June. Once they arrive, females deposit 1-6 eggs daily in plant stems. The total period from egg to reproductive maturity is about 28 days under favorable conditions. There can be several overlapping generations during the growing season. Both nymphs and adults inject saliva into plants as they feed. They can remain active until killed by fall frosts.

Potato Leafhopper size

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Potato Leafhopper: Marlin E. Rice, Iowa State University, www.ent.iastate.edu/imagegal/, Potato Leafhopper size: Penn State University, http://paipm.cas.psu.edu/CropAlert/IPM_potato.html.

Slugs

Many species (Mollusca: Gastropoda)

(Origin: many European)

Field Slug

Primary Host: Many vegetables.

Damage: Slugs make ragged holes in leaves beginning with lower leaves. Leaves may appear shredded. Silvery slime trails are telltale signs of slugs or snails.

Management: More of a problem in cool, wet weather. Several days of warm, sunny weather may reduce the problem.

Biocontrols: Toads, some beetles and their larvae, parasitic flies and birds are natural enemies of slugs, but are not very dependable.

Cultural Controls: Eliminate hiding places. Remove rotting boards and debris. Keep gardens weeded and grass cut short.

Physical Controls: Small pans or canning lids sunk into the ground and filled with a mixture of yeast and water may attract and drown slugs. Trap them by laying boards between garden rows and collect them in the morning.

Chemical Controls: Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html

Description: Slugs are not insects, but are legless mollusks, like snails without shells.

Adults: Soft-bodied; grayish or mottled slimy mollusks that may reach up to 4" long. Have 2 pairs of retractable tentacles with eye spots on the tips of the longer.

Immatures: Resemble small adult slugs.

Eggs: Colorless, gelatinous appearance, round to oval in shape.

Life History: Overwinter in the egg or adult stage, depending on the species. Juvenile slugs hatch from eggs as soon as soil warms in the spring. Each slug possesses both male and female organs, and produces clumps of 10-20 eggs laid in crevices in the soil, under debris, or other protected locations. Prefer dark, moist areas like under boards, rotting mulches, trash, etc. and feed at night. They feed by rasping the leaf tissue, leaving a ragged shredded appearance to the leaf. Slugs move on their bellies and leave a silver-colored slimy trail wherever they travel.

Slug Eggs

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Field Slug: Marlin E. Rice, Iowa State University, www.ent.iastate.edu/imagegal/, Slug eggs: David J. Shetlar, Ohio State University: http://ohioline.osu.edu/hyg-fact/2000/2010.html.

Spotted Cucumber Beetle (Southern Corn Rootworm)

Diabrotica undecimpunctata howardi Barber
(Coleoptera: Chrysomelidae)

(Origin: Native)

Spotted Cucumber Beetle Adult

Primary Host: Cucurbits (cucumbers, melons, squash, gourds, pumpkins, watermelons), Corn.

Damage: Adults feed on leaves and blossoms. Feeding on young seedlings can result in stunting or death of the plant. Can transmit a bacterium that causes bacterial wilt. Larvae feed on roots.

Management:
Biocontrols: No effective ones are commercially available.

Cultural Controls: Plant corn more than 5 days after rootworm egg hatch to prevent larval feeding.

Physical Controls: Crop rotation can effectively prevent infestation. Floating row covers can protect from the adults.

Chemical Controls: Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html

Insect Description:
Adults: Greenish-yellow with 12 black spots on wing covers. About $^{1}/_{5}$" long.

Pupae: White pupae are in the soil near the base of the plants on which the larvae fed.

Larvae: White larvae that remain in the ground feeding on roots of the host plants.

Eggs: Orange-yellow, laid around the base of host plants, often below the soil surface.

Life History: Overwinter as adults on edges of fields or in woods under litter or other plant debris and appear as plants are set. Feed extensively on leaves and stems in early season. Eggs hatch in 5-8 days into white worm-like larvae that feed on roots. In 14-20 days, they pupate underground. Later, the adults that will overwinter emerge from the ground and feed on cucumbers and melons.

Spotted Cucumber Beetle Larvae

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Spotted Cucumber Beetle adult: Clemson University – USDA Cooperative Extension Slide Series, www.insectimages.org; Spotted Cucumber Beetle larva, USDA Image Gallery, www.ars.usda.gov/is/graphics/photos/.

Squash Bug

Anasa tristis (DeGeer) (Hemiptera: Coreidae)

(Origin: Native?)

Squash Bug Adult and Eggs

Primary Host: **Serious pest of squash, melons, pumpkins, and cucumbers.**

Damage: **Nymphs and adults suck plant juices causing leaves to wilt and die. Both will feed on developing fruit.**

Management: **Monitor to prevent population build-up. Wilted plants should be examined for squash bugs.**

Biological Controls: **A parasitoid fly (*Trichopoda pennipes*) lays eggs in the female, feeding on her inner parts.**

Cultural Controls: **Mow field edges and remove debris after harvest from around the field to kill overwintering squash bugs.**

Physical Controls: **Placing old boards in the field before cool nights often attract the bugs. Early the next morning they can be captured and eliminated.**

Chemical Controls: **Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html**

Insect Description:

Adults: **Flat-backed bugs about $^{5}/_{8}$" long. Dark gray-white body with black legs and antennae. When crushed give off an unpleasant odor.**

Nymphs: **5 nymphal stages take about 33 days to develop. Young nymphs have a red head, antennae, thorax and legs, and a green abdomen. With age, they darken and develop black legs and antennae.**

Eggs: **Oval shaped and yellowish-brown. Deposited in clusters of 4-40 eggs in rows.**

Life History: **Overwintering adults emerge in late June, feed and mate and begin laying eggs in about 10 days. Eggs hatch in about 1 –2 weeks and develop into adults in about 4-6 weeks. There is no pupa stage, with each nymphal stage looking more like the adult. There is only one generation a year. Adults overwinter in protected areas.**

Squash Bug Nymph

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Squash Bug adult: Penn State University, www.ento.psu.edu/extension/factsheets/squash_bug.htm; Squash Bug nymph: John Capinera, University of Florida, creatures.ifas.ufl.edu/veg/leaf/squash_bug.htm.

Squash Vine Borer

Melittia cucurbitae (Harris) (Lepidoptera: Sesiidae)

(Origin: Native)

Adult Squash Vine Borer

Primary Host: Squash, zucchini, pumpkins and gourds. Butternut squash is less susceptible to damage.

Damage: Larvae bore into the vine, causing a sudden wilting of a vine or an entire plant.

Management: One of the 1st signs of infestation is yellow pellets of frass on the soil surface near the plant base.

Biocontrols: No commercially effective ones are available.

Cultural Controls: Rotate crops and till to destroy overwintering insects. Vines should always be destroyed following harvest to prevent late caterpillars from completing their development.

Physical Controls: Protect plants with row covers when vines begin to run. Cut open borer entry holes in the stem with a knife; then remove the larva and pack moist earth around the stem.

Chemical Controls: Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html

Insect Description:

Adults: A clear-winged moth that looks like a wasp with metallic olive-brown wings and a red-orange body. Wing spread is 1¼".

Pupae: Cocoons are formed in the soil for overwintering.

Larvae: 1" long white grub-like caterpillar that enters the vine and feeds, pushing out masses of greenish-brown sawdust-like frass.

Eggs: Reddish-brown eggs are laid on the vines when the vines begin to run.

Life History: Overwinter as pupae inside tough silk-lined cocoons in the soil. Adult moths emerge in late June. Moths fly during the warm part of the day and lay eggs on the stems near the soil surface. Eggs hatch in about 10 days and the tiny borers enter the stems, hollowing out the stems. Toward the end of the season when vines become woody and less succulent, the borers may attack the fruit. Borers leave the plant in August and September, when mature and enter the soil to form their overwintering cocoons.

Squash Vine Borer Larva

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Squash Vine Borer adult and larva: Ric Bessin, University of Kentucky, www.uky.edu/Agriculture/.

Stink Bugs

Several species (Hemiptera: Pentatomidae)

(Origin: Native or Exotic)

Adult Green Stink Bug

Primary Hosts: Tomatoes, Soybeans

Damage: Stink bugs damage soybeans by piercing pods and sucking fluid from the developing beans causing the pods to form hardened, knotty spots or to drop from plants, or seeds to be smaller, shriveled, and/or discolored. Tomatoes are damaged by developing hard, white spots just under the skin where stink bugs have fed.

Management: Soybeans can be scouted by sweep net sampling.

Biocontrols: A Tachinid fly attacks stink bugs.

Cultural Controls: Avoid planting near brambles. Stink bug populations build up in berries and migrate to nearby gardens.

Physical Controls: Remove crop debris to eliminate overwintering sites.

Chemical Controls: Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html

Insect Description:

Adults: Flattened, shield-shaped bug with piercing mouthparts. A triangular-shaped plate partially covers its wings. Most species feed on plants, but a few species are predatory.

Nymph: Resemble wingless adults but are frequently marked with different colors and lack the triangular plate.

Eggs: Clusters of barrel-shaped eggs.

Life History: Overwintering adults become active in late spring, laying eggs which hatch into nymphs. As nymphs grow, they increase in size and become more like the adult until wings have developed in the last stage. Both adults and nymphs suck juices from the host plants, causing damage.

Green Stink Bug Nymph

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Adult and nymph stink bugs: Marlin E Rice, Iowa State University, www.ent.iastate.edu/imagegal/.

Striped Cucumber Beetle

Acalymma vittata (F.) (Coleoptera: Chrysomelidae)

(Origin: Native)

Striped Cucumber Beetle Adult

Primary Host: **Cucurbits (cucumbers, melons, squash, gourds, pumpkins, watermelons).**

Damage: **Larvae feed on roots and underground stems. Adults may destroy newly emerged plants. On older plants, they feed on leaves, shoots, stems, flowers and fruits. Adults transmit a bacterium that causes bacterial wilt.**

Management:

Biocontrols: **No effective ones are commercially available.**

Cultural Controls: **Protecting plants with row covers before bloom will prevent beetle feeding and disease transmission.**

Physical Controls: **Yellow sticky traps about 2' above ground level may be useful when used with a bait like *Eugenol*.**

Chemical Controls: **Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html**

Insect Description:

Adults: **About $^1/_3$" long; black head; yellowish body; 3 stripes on back; black abdomen. (Western Corn Rootworm has yellow abdomen).**

Pupae: **White pupae are underground.**

Larvae: **White, worm-like, with a dark head and tip of abdomen, and feed on roots; about $^1/_3$" long.**

Eggs: **Yellow, oval eggs laid in soil around host plants.**

Life History: **Overwinter as adults on edges of fields or in woods under litter or other plant debris and appear as plants are set. Feed extensively on leaves and stems in early season. Eggs hatch in 5-8 days into white worm-like larvae that feed on roots. In 14-20 days, they pupate underground. Adult feeding may transmit the bacterium of bacterial wilt. Cantaloupes are very susceptible to this disease. Once the plant is infected, there is no control and the plant will die.**

Striped Cucumber Beetle Larva

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Striped Cucumber Beetle adult: USDA Image Gallery, http://www.ars.usda.gov/is/graphics/photos/, Striped Cucumber Beetle larva: UFL image: http://gcrec.ifas.ufl.edu/.

Tarnished Plant Bug

Lygus lineolaris (Palisot de Beauvois) (Hemiptera: Miridae)

(Origin: Native)

Tarnished Plant Bug Adult

Primary Host: Beets, chard, celery, beans, potatoes, cabbage, cauliflower, turnips, salsify, cucumbers.

Damage: Suck plant juices and may inject toxic saliva into plant. Leaves may become deformed, stems and petioles may be scarred and discolored, or the buds and developing fruit may be dwarfed and pitted.

Management: Damage symptoms include leaf ragging, brown, discolored tissue, premature bud drop, cat-facing and other symptoms.

Biocontrols: Several parasites are known, but the egg parasite and nymphal parasites are the most effective.

Cultural Controls: Removal of weed hosts can help reduce damage.

Physical Controls: Destroy favorable over-wintering sites to reduce damage.

Chemical Controls: Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html

Insect Description:

Adults: Less than ¼" long; yellowish-brown head, reddish-brown wings with some black markings.

Nymph: Newly hatched are yellowish-green. As they grow, they develop yellow, green or black spots. Resemble adults without wings.

Eggs: Tiny, laid on plant surfaces, often in leaf petioles. The top of the egg where it meets the plant surface is flattened and has an opening through which the nymph emerges.

Life History: Overwintering adults can be found in dead weeds, leaf litter, under tree bark and other protected places. They become active in spring and feed on newly developing buds and shoots. Eggs are usually deposited singly and hatch in 7-10 days. The nymphs develop into adults in about 3-4 weeks. There are 4 or 5 overlapping broods each year. These are one of the most damaging of the true bugs and are known to transmit plant diseases.

Tarnished Plant Bug Nymph

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Tarnished Plant Bugs: USDA Image Gallery, http://www.ars.usda.gov/is/graphics/photos/.

Tomato Hornworm

Manduca quinquemaculata (Haworth)
(Lepidoptera: Sphingidae)

(Origin: Native)

Tomato Hornworm Adult

Primary Host: **Tomatoes, potatoes, peppers, eggplants.**

Damage: **Tomato hornworm and close relative, the tobacco hornworm eat large amounts of green foliage.**

Management: **Easily detected by presence of droppings resembling those produced by rabbits.**

Biocontrols: **Parasites that pupate on hornworm's body kills many of them. Do not destroy hornworms with small white cocoons on them. These are cocoons of parasites of the hornworms.**

Cultural Controls: **Fall plowing destroys many pupae.**

Physical Controls: **Hand pick larvae from plants.**

Chemical Controls: **Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html**

Insect Description:

Adults: **Brown or gray mottled with white. Hindwings have distinct dark zigzag stripes running diagonally. Wing spread is more than 4".**

Pupae: **Brown, hard-shelled, spindle-shaped and about 2" long. Found in the soil.**

Larvae: **Up to 3-4" in length, usually blue-green, have a " tail" or horn on 2nd to last segment and have 7-8 white stripes running diagonally along side of body.**

Eggs: **Spherical greenish-yellow, laid on leaf undersides.**

Life History: **Overwinters as pupae in the ground. In June or July, adults emerge, mate and lay eggs on the underside of leaves. Within a week, larvae hatch and begin feeding. Toward the end of August, the larvae drop to the ground, burrow in and pupate. There is one generation per year.**

Tomato Hornworm Larva

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Tomato Hornworm adult: R.J. Reynolds Tobacco Company Slide Set, R.J. Reynolds Tobacco Company, www.insectimages.org; Tomato Hornworm larva: Robert L. Anderson, USDA Forest Service, www.insectimages.org.

Wireworms

Many genera and species

(Origin: Native and Exotic)

Wireworm (Click Beetle) Adult

Primary Host: **Many vegetable crops and sod.**

Damage: **Feed on seeds and seedlings of corn, beans and peas causing wilting and often death of the plant. Feed on root crops, reducing marketability.**

Management: **Can be detected with baits (untreated grain or potato) buried underground before planting. Dig up after 10 days and search for wireworms. More than 1 per bait station can result in economic damage and treatment will be necessary.**

Biocontrols: **Predatory ground beetles and a fungus disease may help control them.**

Cultural Controls: **May be a problem if the field had been in sod or fallow the year before. Crop rotation may avoid infestation.**

Physical Controls: **Cultivate at regular intervals to make it hard for larvae to develop and to reduce egg-laying.**

Chemical Controls: **Contact your local Penn State County Extension Agent for more information. http://www.extension.psu.edu/extmap.html**

Insect Description:

Adults: **Called click beetles, usually brown in color with streamlined bodies, tapering toward the rear. The joint between the thorax and abdomen is flexible enabling them to "click," flipping up into the air to flip over when placed on their backs.**

Pupae: **Found in cells in the ground in late summer or fall.**

Larvae: **Slender, smooth, hard-bodied, wire-like; chestnut-brown; ¾-1½" long.**

Eggs: **Females lay them mainly around grass roots.**

Life History: **Overwinter as larval or adult stages in the ground. In early spring the adults become active. Adults can live 10-12 months spending most of the time in the soil. Wireworms can remain in the larval stage 3-7 years, depending on species. These are mainly pests in fields that have been in sod for many years. Serious infestations are usually localized to a single field or portions of a field.**

Wireworm Larva

Page designed by J. Kenneth Long, Jr., PA IPM Program; Photo credits: Click Beetle: Marlin E. Rice, Iowa State University, www.ent.iastate.edu; Wireworm larva: Ric Bessin, University of Kentucky, www.uky.edu/.