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Rockbridge Extension Master Gardeners

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Entomology

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This module was originally developed by Jim Revell, Extension Master Gardener and Scott Baker, Senior Extension Agent, Virginia Cooperative Extension.

Updated August 2026.

Welcome to Insects

In this module you will learn to identify insects by their characteristics and the type of injury they cause. You will learn the recommended management of the most common insects in the geographic area

- Read Chapter 3, in your Master Gardener Handbook before viewing these slides. These slides are NOT comprehensive of the information on insects
- Browse the Suggested Readings at the end of these slides. They contain online sources that will be helpful for your learning
- The Test Your Knowledge section is for fun and review

What I Will Learn in This Module (Objectives)

- Insect characteristics: number of body regions, pairs of legs, pairs of antennae, and pairs of wings
- "ptera" – definition and its use in nomenclature
- Definition of metamorphosis
- Benefits and value of insects
- Description of types of insect injury
- Identification and recommended management of the most common insects in the area
- Identification of the most common beneficial insects

Continued…..

What I Will Become Familiar With

- Standard classification system
- Descriptive characteristics of insect orders that are important to the gardener
- Descriptive characteristics of common, non-insect pests in the area

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Insect Trivia

- Estimated 5.5 million species
- Scientists have described and given scientific names to +1 million insects
- Represents ±85% of all known animal species
- Over 1/3 of named species are in one Order: Coleoptera (Beetles)
- +100,000 species named in U.S. and Canada
- In one PA research project, on average, >9,700 Anthropods were counted in a 1 SF x 3” deep section of forest leaf litter
  - At this rate, it could be calculated 425M soil and leaf Anthropods per acre

- **Reproductive Power** – Cabbage Aphid averages 41 offspring per female; 16 generations April-to-October; if all lived, you’d have “1,560 + 21 zeros” by the end of season
- **Consumption Power** – Caterpillar of the Polyphemus Moth can eat 86,000 times its weight within two months of birth



Photo Credit: ufl.edu
Accessed 11/19/21

- **Smallest Insect** – Fairyfly, a parasitic wasp, is small enough to fly through the eye of a needle



Photo credit: Wikipedia
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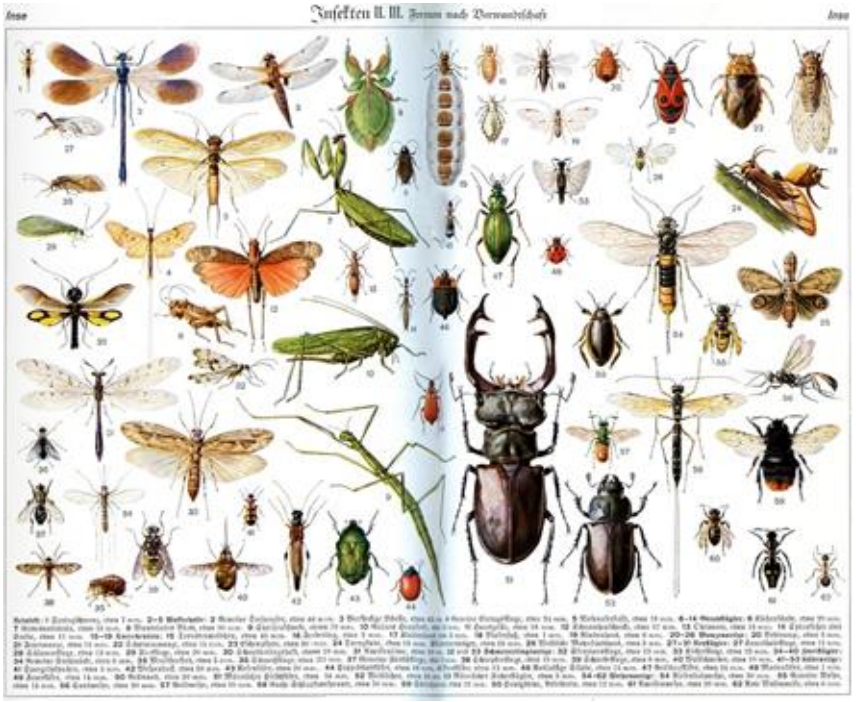
Glossary of Terms

The links below take you to a glossary of technical terms and words related to entomology

A few Entomological Terms Defined



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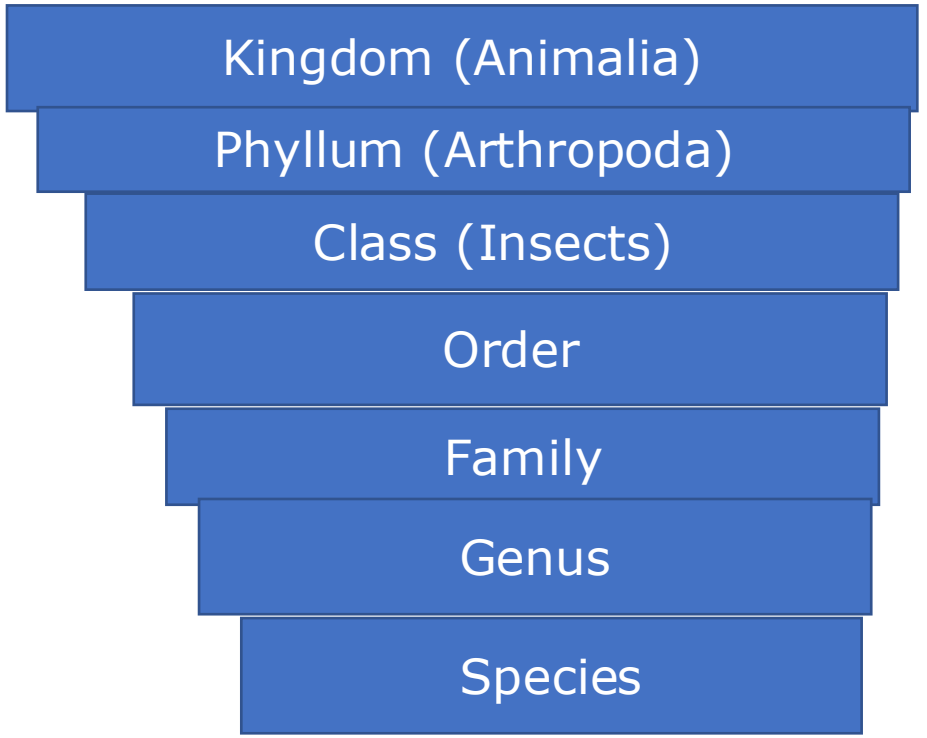
Classification of Insects

Insects are in the Animal Kingdom, in the division (or phyla) known as Arthropod, in the class known as Insecta (insects)

The class Insecta is further divided into orders.

Easy way to remember the order:

Kings
Play
Chess
On
Funny
Green
Stools



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Identification by Order

The ability to classify an insect to the order level gives the gardener access to much valuable information such as type of mouthparts (how it feeds gives clues towards methods of control), its life cycle (proper timing for best control), and type of habitation. Most Order names end in “ptera” which means wing. However, there are exceptions, e.g. Odonata (dragonflies and damselflies), Phasmida (walking sticks), Blattodea (cockroaches and termites), and Psocodea (barklice, booklice and parasitic lice).

Below are several examples of insect orders

Order	Common Name	Mouthparts	Other
Hemiptera	True bugs, stink bugs, squash bug (Note: aphids, scale, whiteflies, cicadas, and leafhoppers, formerly in an order called Homoptera, are now classified under Hemiptera	Piercing, sucking	Gradual metamorphosis; Two pair wings
Coleoptera	Beetles, Weevils, White grub, borers	Chewing	Two pairs wings; complete metamorphosis
Lepidoptera	Butterflies, Moths	Chewing or siphoning	
Diptera	Flies, Mosquitos, gnats	Sponging or piercing; larvae chewing	One pair wings; complete metamorphosis
Hymenoptera	Sawflies, wasps, bees, ants	Chewing	Complete metamorphosis

Identifying Insects

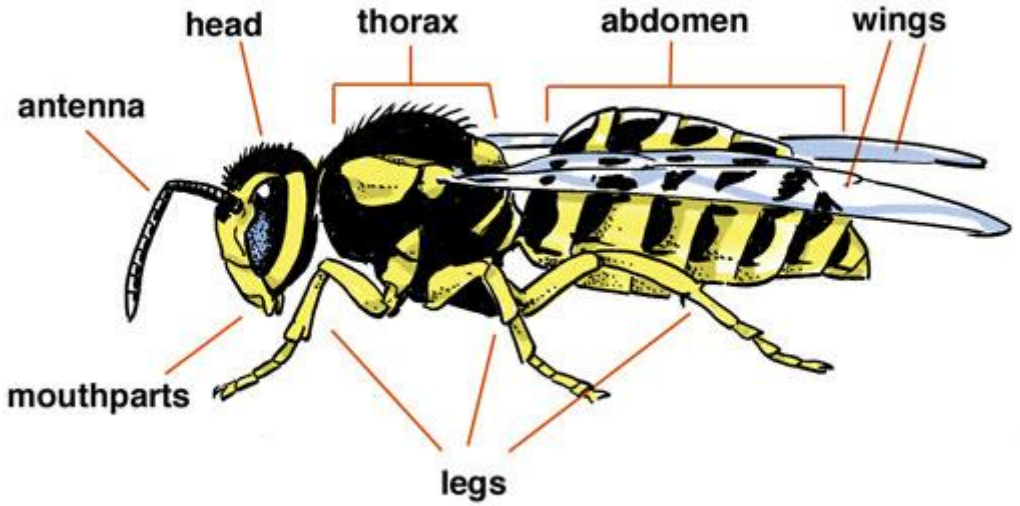
Dichotomous keys are useful in identifying insects (paired statements to lead you to a conclusion). To use these keys, you may need a magnifying glass to see parts of the insect.

The link below is to dichotomous keys useful for insect identification

Dichotomous Key to Insect Orders

What is an Insect?

- 3 body regions
- 6 legs (3 pairs)
- A pair of compound eyes (with few exceptions)
- Usually a pair of Antenna (segmented; used for smell)
- Wings (usually two pair on adults; no wings on immature stages; ants have wings in reproductive stage)
- Wings absent in many insects such as lice and fleas
- Flies have only one pair of wings



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What is Not an Insect?



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Mites (8 legs) (Phylum: Arthropoda
Class: Arachnida)



Photo credit: CC SA 3.0
Accessed 11/19/21

Spiders (8 legs) (Phylum: Arthropoda
Class: Arachnida)



Photo credit: Wikimedia Accessed 11/19/21

Snails / Slugs
(Phylum: Mollusca
Class: Gastropoda)



Photo credit: Wikimedia

Sowbugs also called "pillbugs"
(Phylum: Arthropoda Class: Crustaceans)

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Insect Structure (Morphology) Characteristics / Sample Insect

MOUTH PARTS

A. Chewing
Colorado Potato Beetle

B. Sponging
Housefly

C. Siphoning
Butterflies

D. Piercing / Sucking
Bugs, Aphids, Thrips

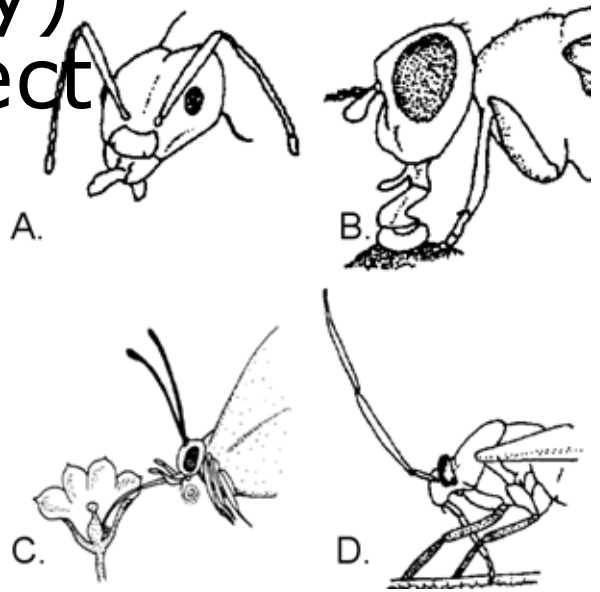
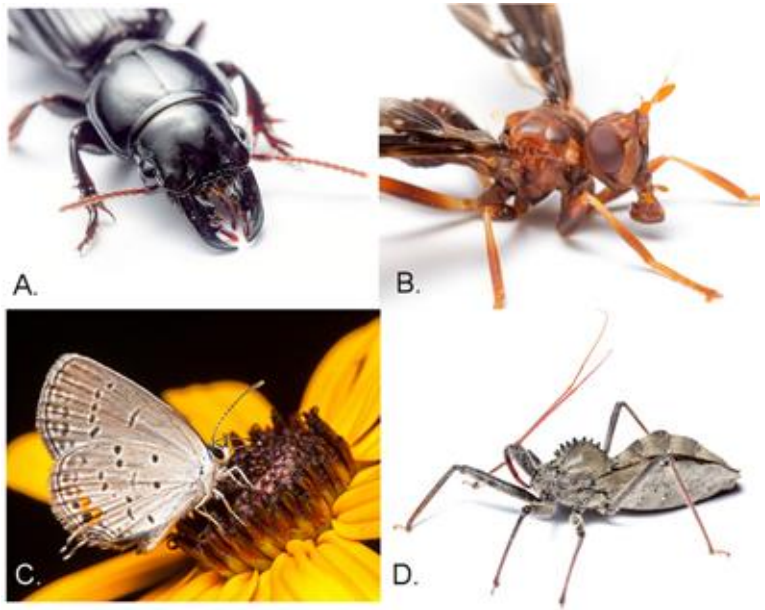


Photo credit: ncsu
Accessed 11/19/21

Insects: structure, classification

Arthropod Morphology



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Insect Structure (Morphology) Characteristics

THORAX

3 segments; Each has a pair of legs**;** used in ID of insects

WINGS

- 2 pair of wings (attached to 2nd & 3rd segment of thorax)
- Veins in wings characteristic for species, more important for identification to order, family and sometimes genus
- Hemiptera = half winged; Hymenoptera = membrane winged

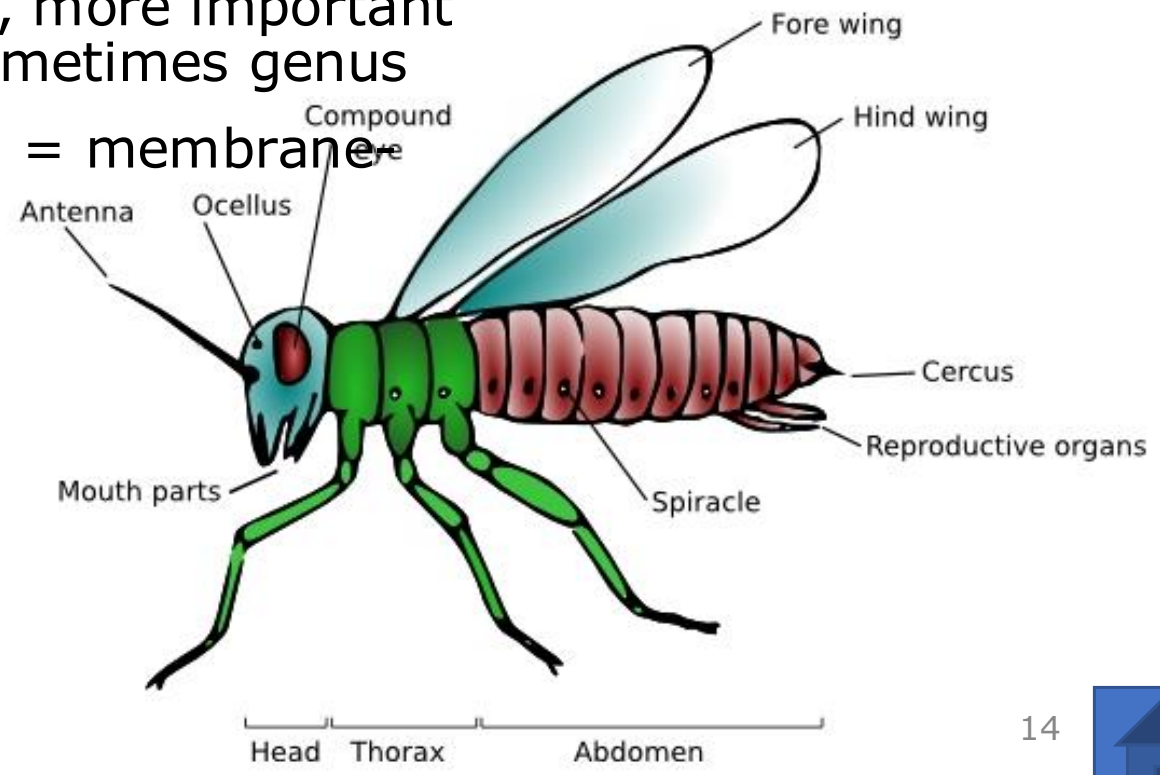
  Diptera = two winged;

  Isoptera = equal wings

ABDOMEN

(shapes and markings on abdomen often used in ID of insects)

Photo credit: Accessed 11/19/21



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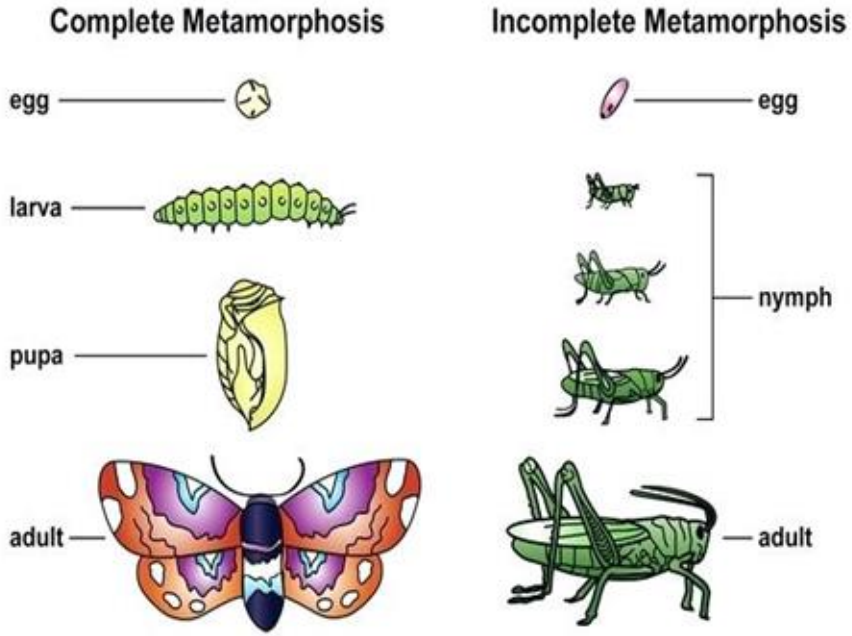
Metamorphosis

Metamorphosis is a biological process by which an insect physically develops after birth or hatching, involving a change in the insect's body structure through cell growth and differentiation. Different scientists classify the types of metamorphosis differently (types & subtypes)

Metamorphosis may be

1. None (ametabolous)
2. Partial / Simple (hemimetabolous)
3. Complete (holometabolous (egg, larva, pupae, adult)

Knowledge of an insects metamorphosis is important to knowing how and when it is susceptible to various types of pest control. For example, scale insects are very susceptible to insecticides when they are in the nymph stage, but not susceptible as adults; nymphs and adults may occupy different habitats and feed on different foods.



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Insect Metamorphosis

Tools for Identifying Insects

- Camera / photo
- Magnification device (hand-held magnifying glass to microscope)
- Dichotomous Key (see handout)
- Reference books
- Ask key questions
  - Where was the insect found? Type of plant, location (leaf, flower, branch, trunk, ground, underground)
  - What was the insect doing? (feeding, resting, mating, swarming)
  - Time of year found? (month, season)
  - What is the insect's physical appearance? (body parts - shape, color, markings; legs – number, shape, color, markings; wings – no/yes and number; adult or immature stage

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Types of Insect Injury

Injury by Chewing Insects:

- Results: holes in leaves; missing leaves
- Insect examples: cabbageworms, armyworms, grasshoppers, Colorado potato beetles, fall webworms

Injury by Piercing-Sucking Insects:

- Results: spotting of white, brown or red on leaves, fruits or twigs; curling or puckering of leaves; deformed fruit and seeds; brown spots on seeds, or nuts; witches' brooming; wilting, browning or dying
- Insect examples: Aphids, scale insects, squash bugs



What does chewing damage look like? Photo credit: tamu.edu Accessed 11/19/21



Sucking pests. Photo credit: tamu.edu Accessed 11/19/21

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Types of Insect Injury



Photo credit: wireworms
Accessed 11/19/21

Injury by subterranean insects:

- Results: reduced health to death of plant
- Insect examples: wireworms, root maggots, pillbugs, strawberry root weevils, grape and corn rootworms

Injury by Laying Eggs:

- Results: destroys critical plant tissue
- Insect examples: periodic cicada, gall insects



Insect and mite galls.
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Insects as Vectors of Plant Disease

More than 200 plant diseases are disseminated by insects (most being viruses)

How do insects spread plant diseases?

1. By feeding, laying eggs or boring into plants they create an entrance point for a disease that is not actually transported by them
2. Carry and disseminate the causative agents of the disease on or in their bodies
3. Carry pathogens on the outside or inside of their bodies and inject plants hypodermically as they feed
4. Serve as host for some part of the pathogen's life cycle

Examples: Fireblight (bacteria) vectored by pollinating insects

Cucumber mosaic (virus) vectored by aphids



Fireblight.
Photo credit: uga.edu
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Damage from Insects



Cabbage Worm. Photo credit
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Leafminer. Photo credit
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Corn Rootworm. Photo credit: purdue.edu
Accessed 11/19/21



Gall Wasp. Photo credit: ufl.edu
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Striped Cucumber Beetle. Photo credit: ufl.edu
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Leaf-cutter Bee. Photo credit: ufl.edu
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Benefits of Insects

Insects are beneficial to the gardener in several ways:

- Pollination. Most common fruits and many ornamental plants are pollinated by insects
- Destroy weeds (although can also injure crop plants)
- Improve physical condition of the soil and promote fertility; also their dead bodies and droppings serve as fertilizer
- Scavengers. Devour bodies of dead animals and plants
- Predators and Parasites of other insects



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Photo credit: Wikipedia
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Integrated Pest Management: Insects



Photo credit: P. Turner EMG



Photo credit: P. Turner EMG

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Management of Insect Pests

Less than 1% of all insect species are considered pests.

Pesticides have many adverse effects:

- Food is less safe to eat
- Handling of plants is dangerous
- May harm or kill beneficial insects, birds, pets
- Users are exposed to chemicals
- Pesticides may leach through soil into groundwater
- May kill fish
- May induce resistance
- Some can remain in the environment for years

Yet, there are efficient and effective non-chemical means of dealing with insect pests.

Each year VCE publishes a new Pest Management Guide: Home Grounds and Animals (PMG). The most recently published PMG can be found on ramga.org > class.

The first few pages provide a table of contents to help you find what you are looking for. For example, if you want to know how to treat aphids on vegetables, go to the PMG; scroll down to the table of contents to Find "Home Vegetables"; scroll down to the 'home vegetables' chapter to find "Organic control of insects", and methods of control for specific insects, and much more information. You may want to download this file to your computer for future use. It is free to download.

Insect Pest Control

An integrated approach to insect control includes:

- Soil preparation
- Plant Selection
- Cultural Practices
- Mechanical Control
- Biological Controls
- Pesticides

Source for this and the following slides on pest control: The Virginia Master Gardener Handbook

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Insect Pest Control: Soil Preparation

- Maintain the pH that is appropriate for the plants being grown. This allows the plants to have access to all the necessary soil nutrients and provides a suitable environment for earthworms and microorganisms
- Feed the soil, not just the plants; providing an appropriate environment for all soil life will result in healthy plants which can resist pests
- Till the soil in the fall to expose those stages of pests which live near the surface to natural enemies and weather

Insect Pest Control: Plant Selection

- Plant crops suited for your soil and climate
- Plant disease-free, insect-free, certified seed; disease/insect resistant or tolerant species and varieties
- Select plants that are sturdy and have well developed root systems
- Buy from a reputable grower

Insect Pest Control: Cultural Practices

- Observe what is going on in your garden; find problems early
- Crop rotation. Do not grow the same thing in the same spot each year
- Interplanting. Avoid planting all plants of one kind together
- Thinning. Overcrowding causes weak growth and susceptibility to insect attack
- Watering. Water in the morning to decrease possibility of fungus; stay out of the garden when the plants are wet to prevent spread of disease; diseased plants are more susceptible to insect attack
- Time planting to avoid peak of insect infestations. (Example: plant squash as late as possible, after June 15, to avoid the egg laying stage of the squash vine borer)
- Sanitation. Crop debris are good sites for harboring insects, especially over winter
- Avoid injury to plants. Injured weak plants are more susceptible to insect attack
- Weed control. Weeds often harbor pests and compete for nutrients and water; they also provide cover for cut worms and slugs

Insect Pest Control: Mechanical Controls

•Handpicking. Inspect frequently, you may be able to keep the numbers small
•Traps. Milk jugs with a solution appropriate for the insect you want to trap (e.g. Japanese beetle bait sold in stores); blacklight, bluelight bug zappers attract both beneficial and harmful insects, so aren't much help to the gardener; Upturned flower-pots, and boards will trap earwigs, sowbugs and slugs – be sure to check them every morning
•Baits. Often used home remedy for slug control: Beer in a shallow dish sunk to ground level
•Repellents. Reflective mulch can repel aphids; crushed eggshells or hydrated lime spread around plants may discourage slugs
•Exclusion or Barriers. Wood ash, cardboard tubes around seedlings; paper bags over ears of corn; Netting over young seedlings; Cheesecloth screens for cold frames to prevent insect egg-laying; sticky barriers on trees to prevent crawling insects; floating row covers

Insect Pest Control: Biological Controls

Predators, Parasites, Pathogens

Encourage natural predators such as praying mantids, ladybugs, lacewings, ground beetles

Purchased natural predators are often effective for only a short period of time

Learn to recognize the eggs and larvae of the beneficial insects and avoid harming them

Pesticides: Non-synthetic

Botanicals or natural pesticidal products

May have the same toxic effects as synthetic pesticides; Break down readily in soil and are not stored in plant or animal tissue; Their effect may not be as long lasting as synthetic pesticides

Pyrethrum: made from powdered flower heads of *T. coccineum* and *C. cinerariifolium* and attacks the nervous systems of all insects

Spinosad: a natural substance made by a soil bacterium that can be toxic to all insects which eat, or touch it by affecting the nervous system

Bacillus thuringiensis (BT) is a biological product, a bacterium whose spores when consumed by the insect, cause death by destruction of gut cells.

Pesticides: Synthetic

Chemical control

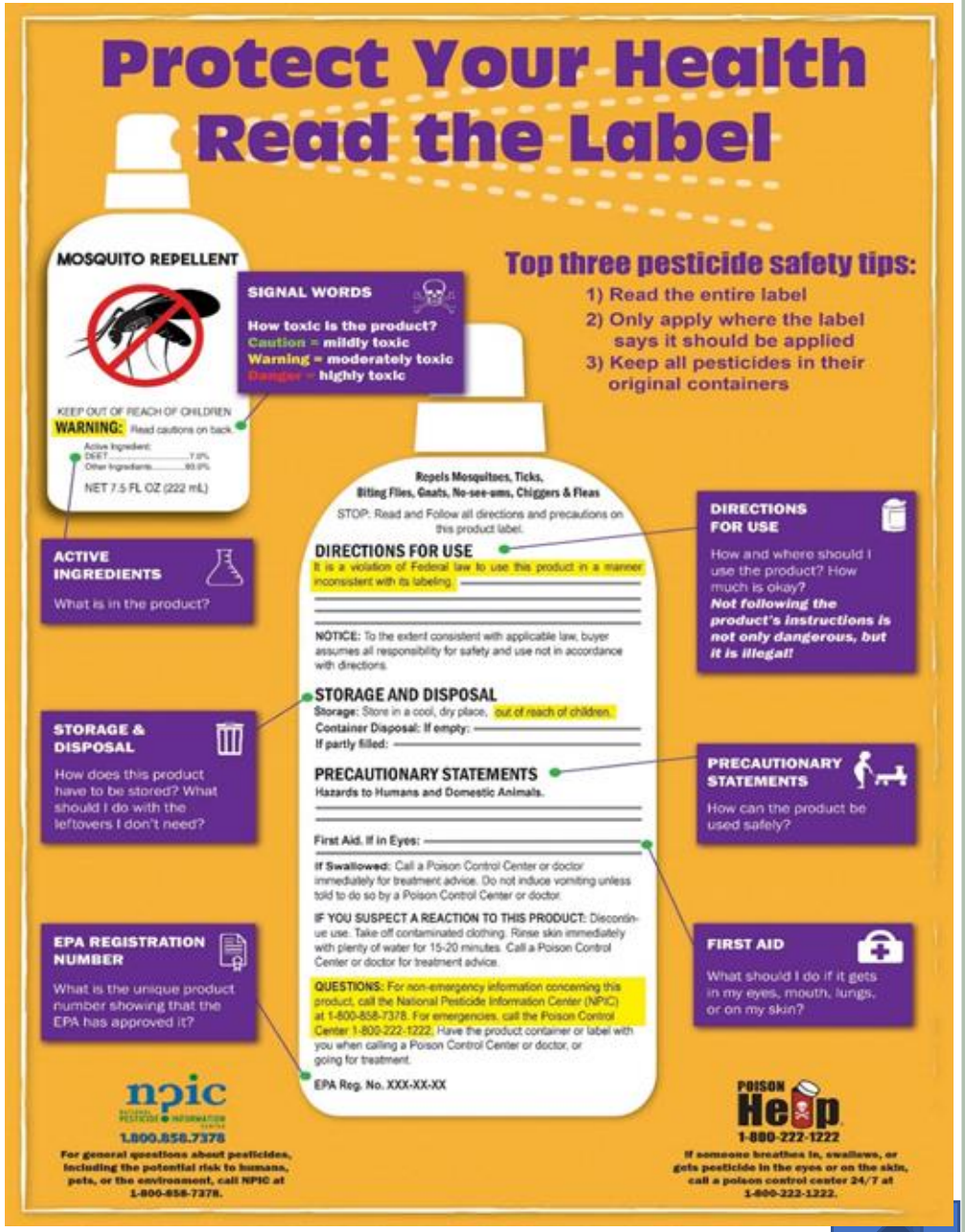
Man-made chemicals used according to the label can provide a safe and effective control for many pests

Examples of synthetic pesticides include: Permethrin, Carbaryl, Imidacloprid

Choose the Right Pesticide

- Identify the insect
- Use the least toxic pesticide for control
- Make sure the pesticide is registered to be used on the insect
- Consider toxicity level on pollinators
- Read and follow all safety labels carefully*

*Remember: All pesticides are designed to kill regardless of whether they are synthetic or non-synthetic classification



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Selecting a Management Practice

How do you know which management practice is best for which pest?

One source for this information is the Pest Management Guide (PMG) produced by Virginia Tech. The most recently published PMG can be found on ramga.org > class.

- Another source of management information for pests is the Virginia Cooperative Extension website http://www.ext.vt.edu/
  You can use the search bar to find information

- Go to this website and type a keyword question in the search site. For example type in “Blueberry pests”. Several references will come up, sometimes including the PMG

ID Before Management

Before you can manage insects, you must be able to identify them. Some beneficial insects look very similar to pests. For example, the Brown Marmorated Stink Bug looks very similar to the Spined Soldier Bug, but one is a pest and the other is a beneficial insect.

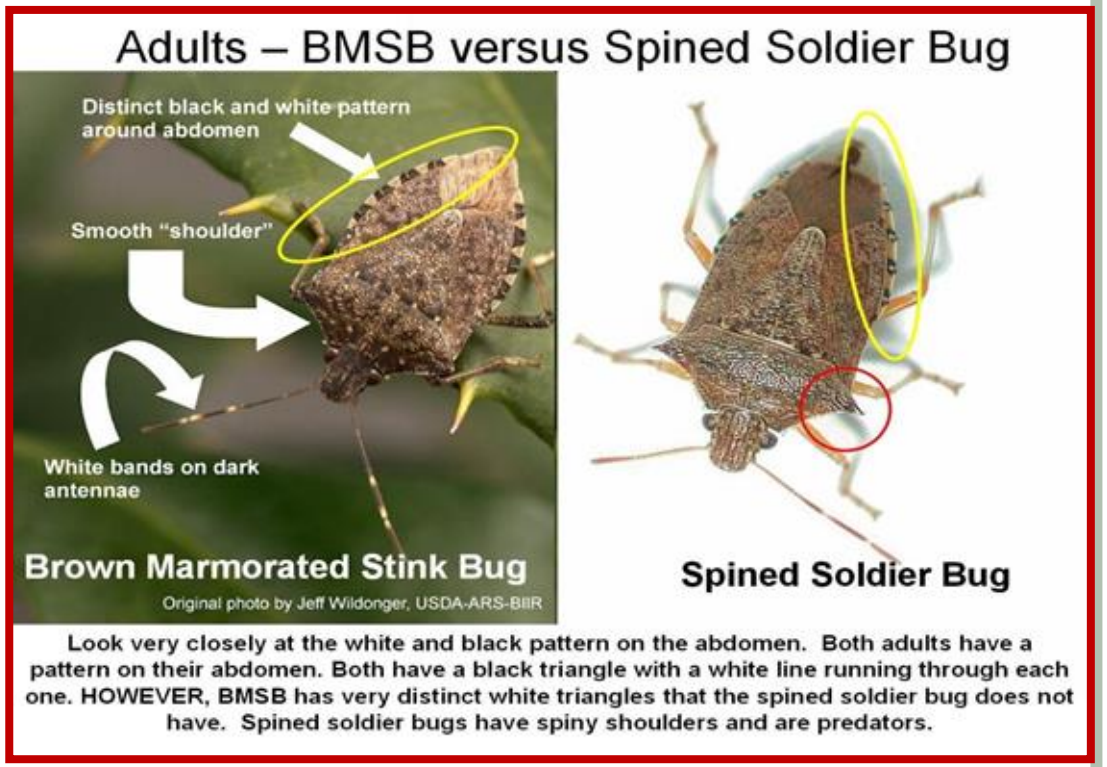

Photo credit: Field crop news
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Before Deciding to Eliminate ALL Bugs Consider

Good……..Bad



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- Not all insecticides are specific
- Is it a good bug or bad bug?
- If a bad bug, know its life cycle
- Know your plant:
  - Growth rate
  - Food: nutrients needed (Excess nitrogen may cause rapid growth attracting aphids)
  - Harvest time: Harvest regularly to reduce insect damage

Good …….Bad

Photo credit:
misstate.edu
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- Are there alternative measures?
  - Hand-picking
  - Row covers
  - Trap cropping (flea beetles, squash bugs)
  - Repellants (hot pepper, garlic spray)
  - Barriers (cardboard tubes, popsicle sticks, wood ash, mesh screening)
  - Baits (shallow dish with beer, yellow plastic strips/cards)
  - Attract beneficial insects
  - Companion planting

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This module will review a few of the insects more common to Virginia.

Your Master Gardener Handbook provides more information that will serve as a helpful reference to you in the future.

The Good Guys
These are beneficial insects

Photo credit: Assassin beetle. ncsu.edu Accessed 11/19/21



Photo credit: Syrphid fly ncsu.edu Accessed 11/19/21



Photo credit: lacewing. uky.edu Accessed 11/19/21



Photo credit: Ground beetle. uky.edu Accessed 11/19/21



Photo credit: Braconid wasp Accessed 11/19/21



Photo credit: Adult Predatory stink bug Accessed 11/19/21



Photo credit: Lady beetle. ufl.edu Accessed 11/19/21



Photo credit: Praying mantid, UM Ext Accessed 12/15/2022



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Assassin Bugs

Hemiptera



Photo credit: ncsu.edu
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- Predatory on insect eggs, larvae and adults
- Capable of biting
- Piercing and sucking mouthparts
- Dark-colored, with combinations of gray, green, and black; have long, narrow heads
- Use their front legs to capture prey
- Simple metamorphosis with egg, nymph, and adult stages
- May be eaten by birds, rodents, and large predatory arthropods, such as spiders, praying mantids, and even other assassin and ambush bugs

Assassin Bugs and Ambush Bugs
Assassin Bugs





Photo credit: uky.edu
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Lacewings

- 2 pairs of wings and chewing mouthparts
- Eat aphids, insect eggs, and other arthropod prey
- May be eaten by other creatures, such as spiders, lady beetles, and larger lacewings
- Green and brown lacewing adults are also predators and feed on the same prey as the larvae
- Common all summer long



Photo credit: ufl.edu
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Ground Beetle



Ground beetles
Accessed 12/15/2022

- This group of beetles varies in size (1/8 to 1 inch), shape and color
- Found under stones, bark, logs and other debris laying on the ground
- They feed on other insects both as larvae and adults
- Active at night

Syrphid Fly



Photo credit: ncsu.edu
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- Syrphid flies, also known as hover flies for their ability to hover in flight, are common predators of aphids and other soft bodied insects. Adults are usually bee mimics

- May be 5-7 generations per year



How do you tell the difference between a fly and a bee? Here are a few differences:

- Wings: Flies have 2; bees have 4
- Antennae: Flies have stubby antennae; bees have long one
- Eyes: Flies have big compound eyes; bees have simple eyes

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Lady Beetles: aka Ladybirds, Ladybugs
A family of beetles



Photo credit: ufl.edu Accessed 11/19/21

- Worldwide there are nearly 6,000 species
- The majority are considered useful
- Some are "good guys" feeding on fungal growths
- Some are "bad guys" (pests) feeding on plants
- Some are predators: feeding on mites; whiteflies; scale; mealybugs; or aphids

Ladybeetles

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Predatory Stinkbug

- Predatory species feed on more than 100 species of insect pests
- Both adults and nymphs will attack larger insects
- Have shorter stouter beak than the long thin beak of plant-feeding stink bugs
- Important species found in our area: Spined Soldier Bug, Two-spotted Stink Bug, Florida Predatory Stink bug

Photo credit:
Accessed 11/19/21



Field Guide to Stinkbugs
You may want to download this file for future use

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Spined Soldier Bug

The spined soldier bug, *Podisus maculiventris*, is a medium-sized predatory stink bug. The adult has a prominent spine on each "shoulder." This stink bug is the most common predatory stink bug in North America



Photo credit: ufl.edu
Accessed 11/19/21



Photo credit: ufl.edu
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[Spined Soldier Bug (nymph and adult)]

Praying Mantid

- 'Mantis' refers to the genus Mantis. Only some praying mantids belong to the genus Mantis
- Mantid refers to the entire group
- Mantids eat a wide variety of insects and other small prey
- When hunting, mantids assume a "praying" position, folding the legs under their head. They use the front legs to strike out and capture their prey
- Selective insecticides, such as those containing *Bacillus thuringiensis* (for caterpillar control) and insecticidal soap (to control soft-bodied insect pests) have little impact on mantids as compared to broad-spectrum insecticides
- The Carolina mantis is native to VA, while the European and Chinese mantis are naturalized species



Photo credit: WI Ext
Accessed 12/15/2022

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Praying Mantids

Pests: The Bad Guys

- Aphids
- Bagworm
- Brown Marmorated Stink Bug
- Cabbage Looper
- Carpenter Bee
- Colorado Potato Beetle
- Corn Earworm
- Cross-striped Cabbage Worm
- Cutworms
- Eastern Tent Caterpillar
- Emerald Ash Borer
- European Imported Cabbage Worm
- Gypsy Moth
- Harlequin Bug
- Hemlock Woolly Adelgid
- Japanese Beetle
- Leaf Beetles
- Leaffooted Bug
- Long-horned Beetle
- Metallic Wood Borers / Flatheaded Wood Borers
- Mexican Bean Beetle
- Scale Insects (Armored, Soft Scale, Mealy Bugs)
- Spotted Lantern Fly
- Spotted / Striped Cucumber Beetle
- Squash Bug
- Squash Vine Borer
- Stink Bugs
- Thrips
- Tomato Hornworm
- Yellow-necked Caterpillar

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Aphids: Order Hemiptera

- **ID:** Small pear shape; tubelike structures called cornicles projecting backwards out of the hind end of their bodies; See symptoms (i.e. damage) before insect
- **Host plants**: Most veggies, fruits and ornamentals
- **Habits**: Piercing / sucking mouth parts
- **Plant Symptoms**: distorts leaves, buds and shoots; wilt; curl; slow growth; yellowing; distortion; some species excrete sweet, sticky honeydew (which may lead to sooty mold); Can transmit plant viruses
- **Prevention**: promote vigorous growth but not too much nitrogen; monitor plants
- **Cultural Controls**: Strong stream of water; careful use of fertilizers; 3” x 5” yellow card sticky traps
- **Chemical Controls**: Malathion, Permethrin
- **Organic Controls:** Neem oil, Pyrethrin, Insecticidal soap
- **Insect Predators**: Lady Beetles, Lacewings, Braconid Wasps, Hoverflies

Aphids

Adults & nymphs
Potato aphid



Wooly apple aphid adults



Cabbage aphid



Photo credit: ucanr.edu

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Spotted Lantern Fly (SLF): Order: Hemiptera

- Discovered in US in 2014 and traced to Chinese pallets of landscape stones which were delivered to Burks Co. PA and Winchester, VA
- Adults have wings, can fly, but predominantly hop/jump great distances
- Piercing, sucking mouth parts which suck the sap and cause extensive damage to crops, ornamentals and trees. Vineyards have been greatly impacted.
- Ailanthus (tree of heaven) is preferred host, but black walnut, maple, willow and fruit trees, grapes, more than 170 plants worldwide can be targeted.
- Nymphs prefer tender new growth of trees, shrubs and herbaceous plants
- Adults feed on woodier plant species and can choose favorite trees on which to gather and feed in large numbers for several weeks. High levels of feeding may increase tree stress and damage may be apparent if plant is already stressed
- In addition to feeding damage, honeydew (tar-like, sugary waste liquid) can be problem. It promotes sooty mold which impedes photosynthesis of plants below. Outdoor furniture, cars, playgrounds, etc. can be covered and cleaning is difficult. In heavy feeding concentrations, honeydew resembles light rain.
- SLF spread can be by catching a ride on rail, or highway vehicles, and egg masses on transported items. In VA, spread has been detected along I-81 corridor.
- Insecticides work well, even oils and soaps. However, practical treatment depends on infestation levels and locations. Always read labels carefully and use only EPA registered insecticides approved for SLF and the application site.

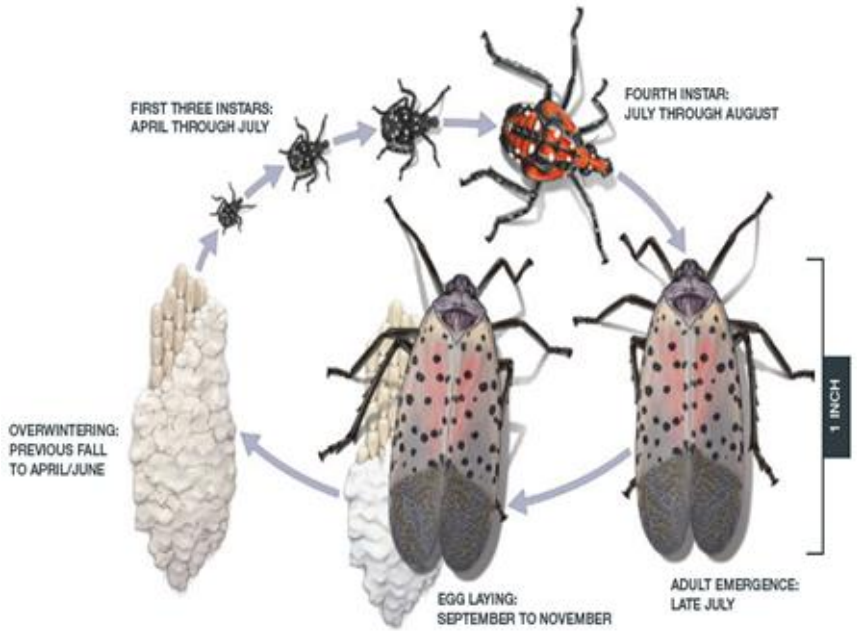

Photo credit: SLF life cycle

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Spotted Lantern Fly

Thrips: Order: Thysanoptera

•**ID:** May see damage before insect (leaves will appear speckled or streaked with silver; flowers are blotched or streaked with brown or white); Bright yellow in color; Adults 1/25 inch long; immature stage wingless but look like adults; lay eggs on buds & leaves

- **Host plants**: Cabbage, cucumbers, onions, most garden plants & trees; citrus/other fruit trees; greenhouse insect
- **Feeding habits**: Thrips have a sucking tube and feed on plant juices; some species spread Tomato-spotted Wilt virus Note, thrips will bite
- **Cultural Controls**: yellow sticky tape traps; row covers; reflective/silver mulch; avoid excess fertilization; use dormant horticultural oils
- **Chemical Controls**: Carbaryl (Seven), Malathion
- **Organic / Biological Controls:** Pyrethrin, insecticidal soap, Spinosad

- **Insect Predators:** Lacewings, Lady Beetles, Minute Pirate Bugs, predatory mites (*Amblyseius cucumeris*)



Black feces & white feeding scars from thrips



Photo credit: ucanr.edu Accessed 11/19/21

An adult, egg, and two larvae of thrips

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Thrips

Hemlock Woolly Adelgid: Order: Hemiptera



Photo credit: umass.edu
Accessed 11/19/21

- **ID:** <1/16 inch long; Wax producer; Color varies from dark reddish-brown to purplish-black in color; when mature covering of wool-like wax filaments
- **Host plants**: Canadian and Carolina Hemlock most affected
- **Feeding habits**: Piercing mouth parts; feeds on sap from twigs, introducing saliva that is toxic to the plant; foliage yellows, needles drop; die-back is common and trees are often killed
- **Controls**: Difficult to control due to white waxy secretion; mid Oct to early Nov best time to treat
- **Chemical Controls**: Imidacloprid in April or May
- **Organic Controls**: dormant oil, horticultural oil

- **Insect predators**: Several Lady Beetles

Photo credit: ny.gov
Accessed 11/19/21



Hemlock Woolly Adelgid

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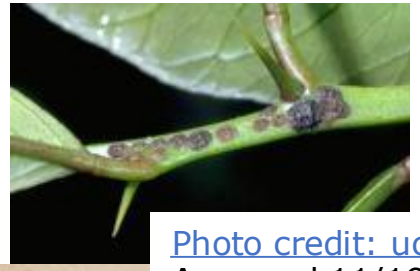
Scale Insects: Order: Hemiptera
Three divisions: Armored Scale, Soft Scale and Mealy Bugs

- 150 species in Virginia
- **ID**: Small (1/16th to 1/8th inch); Soft Scales Larger (1/8th to 1/4 inch); Excrete honeydew which may grow sooty mold
- **Host plants**: Woody plants
- **Feeding habits**: Thread-like mouth parts (stylets) feed on plant sap from leaf veins, stems, twigs; causes leaves and twigs/branches to die
- **Controls**: Insecticides effective only in the crawler (mobile) stage
- **Cultural controls:** grow pollen/nectar plants to attract beneficials
- **Chemical controls:** Permethrin, Carbaryl (Sevin)
- **Organic controls:** Dormant oil (winter, early spring), mineral or paraffin oil (summer, early Fall), Pyrethrin, Neem oil, insecticidal soap

- **Insect predators**: Lady Beetles, parasitic wasps (Encyrtid wasp and Metaphycus helvolus)

Black scale



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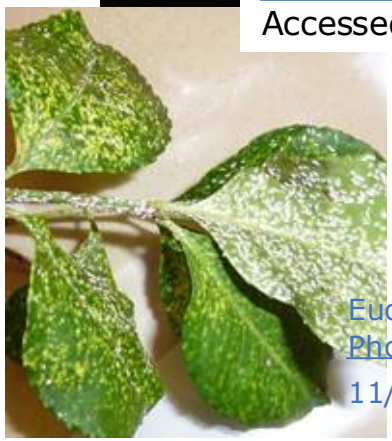

Euonymus scale
Photo credit: Accessed 11/19/21

Scale Insects

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Scale Insects: Armored Scale: Order: Hemiptera
One of three divisions of Scale insects

- 350 species in U.S.
- Resembles plate of armor
- 1/16th inch to 1/8th inch in size
- Shape may be circular, oval, oblong, thread-like, even pear-shaped
- Secretes waxy covering over their bodies
- Eggs hatch over period of 1-3 weeks
- Females lose their legs and antennae during first molt
- Adult males are tiny two-winged, gnat-like insects
- Does not excrete honeydew

Euonymus Scale

- Crawler 1st gen. May 5- June 10; 2nd gen. July 1-25
- Treatment: May 10-20; July 5-15



Photo link: Euonymus scale Accessed 11/19/21

Obscure Scale

- Primary host of oaks, Pin Oaks
- Crawlers active mid-July (Red oaks), active mid-Aug (White oaks)
- Use soybean oil, mineral oil. Paraffin oil as treatment



Photo link: Obscure scale Accessed 11/19/21

Gloomy Scale

- Silver and Red Maples are primary hosts
- One generation per year; crawlers active June 10-20
- Treat June 20-30

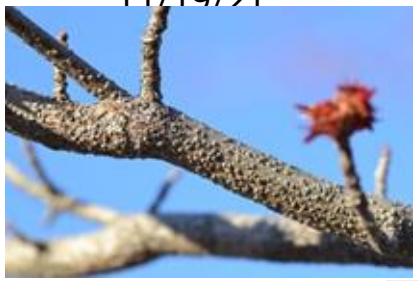

Photo link: Gloomy scale Accessed 11/19/21

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Scale Insects: Soft Scale: Order: Hemiptera
One of three divisions of Scale insects

- 85 species in U.S.
- 1/8th inch to ½ inch in size
- Varies widely in color, size and shape
- Secretes waxy covering that is an integral part of their body
- Females do not lose their legs and antennae during first molt (as do Armored Scale)
- Wax secreted usually forms a sac at rear of body, enclosing eggs
- Some species may require up to one year to mature
- Excretes large amounts of honeydew

Cottony Maple Scale

- Primary host Silver Maple
- Large egg sac (up to 1,000 eggs)
- One generation per year
- Crawlers active June 5-25
- Treat June 10-20



Cottony Maple Scale. Photo credit: ncsu.edu Accessed 11/19/21

Magnolia Scale

- Largest ½ inch in size
- One generation per year
- Crawlers active Sept 1-20
- Treat Sept. 1-20
- Wasps and ants attracted to honeydew



Magnolia Scale. Photo credit: msu.edu Accessed 11/19/21

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Scale Insects: Mealy Bugs: Order: Hemiptera
One of three divisions of Scale insects

- Can be pests of greenhouses, nurseries, landscape and house plants; feeds on most species of ornamental plants
- Up to 1/4 inch in size
- Some species covered with fluffy wax, while others have long tails of fluffy wax
- Females are soft oval insects without wings
- Males are tiny gnat-like, with two wings and long tails of white wax
- Most active in warm, dry weather
- Have thread-like sucking mouth parts
- Secretes honeydew which can result in sooty molds
- Heavy infestations – systemic insecticides may be best control, beware these pesticides can be detrimental to bees
- Chemical controls: Carbaryl (Sevin), Permethrin
- Organic controls: Pyrethrin, Neem oil, insecticidal soap

Longtailed mealybug



Grape mealybug Crawlers



Mealybugs covering stems



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Mealy Bug

Photo cred it: ucanr.edu Accessed 11/19/21

Tomato Hornworm: Order: Lepidoptera

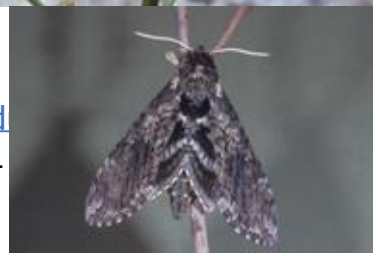


- **ID:** Larvae has 8 V-shaped markings; black horns on back end of larvae; Adult is a large, heavy-bodied moth with narrow front wings, mottled gray-brown color with yellow spots on the sides of the abdomen and a wing spread of 4 to 5 inches
- **Host plants**: Eggplant, tomatoes, peppers, potatoes
- **Feeding habits**: Larvae chew leaves and gnaw holes in fruit
- **Cultural controls**: Attract beneficial insects; hand-pick (leaving any found with white or tan cocoons attached to their backs)
- **Chemical controls**: Carbaryl (Sevin), Malathion
- **Organic / Biological controls**: Bacillus thuringiensis kurstaki, Pyrethrin
- **Insect Predators**: Braconid wasps and other predatory wasps



Tomato Hornworm and moth Photo credit: umn.edu Accessed 11/19/21



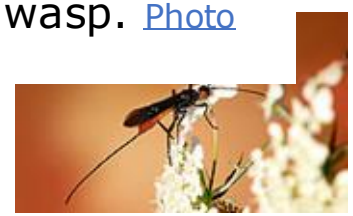


Tobacco Hornworm and moth. Photo credit: ufl.ed Accessed 11/19/21



Parasitized horn. Photo credit: umn.edu Accessed 11/19/21

Braconid wasp. Photo credit



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Leaffooted Bug: Order: Hemiptera

- **ID:** ¾ to 1 inch long, distinguished by the unusual flattening of the hind tibia which resembles a leaf
- **Host plants**: Fruits, vegetables, grains, nuts, ornamentals; major pest in citrus groves, thistle
- **Feeding habits**: Piercing / sucking mouth parts; suck sap from fruit, pods, blossoms, buds, seeds; reduces germination; wounds may permit 2nd pathogens to enter host
- **Symptoms**: immature fruits & pods become deformed; seeds flatten & shrivel & reduce germination; wounds on fruit permit secondary pathogens to enter
- **Cultural controls**: Good cultural practices; hand-picking, soapy water
- **Chemical controls**: Carbaryl (Sevin), Malathion
- **Organic controls**: Pyrethrin
- **Insect Predators**: Some birds, spiders, assassin bugs



Photo credit: vt.edu
Accessed 11/19/21

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Leaffooted Bugs

Stink Bugs: Order: Hemiptera; Family Pentatomidae

- **ID:** Five-sided shield shape; six legs; four wings; antennae; green to brown in color; Long, thick beak
- **Description**: Shield shaped
- **Host plants**: Most garden plants, weeds; ornamental trees; shrubs; vines
- **Feeding habits**: Adults and nymphs – piercing/sucking of sap juices; injured fruit has cat-faced or pitted appearance; some are predatory
- **Cultural controls**: Soapy water; remove egg clusters; control weeds around gardens; clean up debris; attract beneficial insects
- **Chemical controls:** Carbaryl (Sevin)
- **Organic controls:** Pyrethrin
- **Insect Predators:** Parasitic wasps, tachinid flies, spiders

[See the BugGuide website for lots of pictures of stink bugs]

Brown Marmorated Stink Bug: Order: Hemiptera



Photo credit Accessed 11/19/21

- **ID:** Invasive species from Asia; 17 mm (0.66 inches) long; shades of brown on both the upper and lower body surfaces; "shield" shape; almost as wide as they are long; lighter bands on the antennae and darker bands on the membranous, overlapping part at the rear of the front pair of wings; have patches of coppery or bluish-metallic colored punctures (small rounded depressions) on the head and pronotum; two generations per year in Virginia; Adults emerge in late April-early May
- **Host plants**: Fruits (raspberries, apples, peaches), veggies (peppers, tomatoes, lima beans, green peppers), farm crops (feed corn, soy beans)
- **Cultural controls:** seal all cracks and crevices around doors, windows
- **Chemical controls:** Carbaryl (Sevin), Malathion
- **Organic / Biological controls:** Pyrethrin; outside surfaces may be sprayed with insecticides by Licensed Pest Control in early fall



Damage to nectarine and apple

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Brown Marmorated Stink Bug

Harlequin Bug: Order Hemiptera

- **ID:** The adults are red or yellow with black markings; about 5/8 in. long shield-shaped. At rest, the front pair of wings overlap and the insect's back appears to be marked with a distinct "X"
- **Host plants**: Brussels sprouts, cabbage, cauliflower, collards, kohlrabi, mustard, radishes, fruit trees, weeds (wild mustard, pigweed)
- **Feeding habits**: Nymphs and adults suck sap from foliage; severely affected plants will wilt and die
- **Cultural controls**: Row covers; Remove weeds; Hand-pick, mustard or radishes as trap crop
- **Chemical controls:** Carbaryl (Sevin), Malathion
- **Organic controls:** Pyrethrin
- **Insect predators**: Assassin bugs; predatory stink bugs


Eggs and Nymphs



Photo credit: ufl.edu
Accessed 11/19/21

Harlequin Bug

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Squash Bug: Order: Hemiptera

- **ID**: The adults are brownish/gray with orange markings along the edge of their abdomens; ½ to ¾ inch long; have a flat back; produce a foul odor when disturbed; eggs (1/16 inch long); iridescent bronze color; laid in clusters usually found near vein of leaf; nymphs (1/10 to ½ inch long) green when hatch, turn gray-to-whitish with black legs and dark head
- **Host plants**: Serious pest to squash, pumpkins; lesser pest to melons and cucumbers
- **Damage**: Adults and nymphs piercing / sucking on plant sap; leaves wilt and die
- **Cultural controls**: Row cover until flowering; Trap crop (hubbard squash); hand-pick; diatomaceous earth or Kaolin clay (repellant) around base of plant
- **Chemical controls:** Permethrin
- **Organic / Biological controls:** Insecticidal soap, Pyrethrin
- **Insect predators**: Tachinid Fly

Squash bug eggs

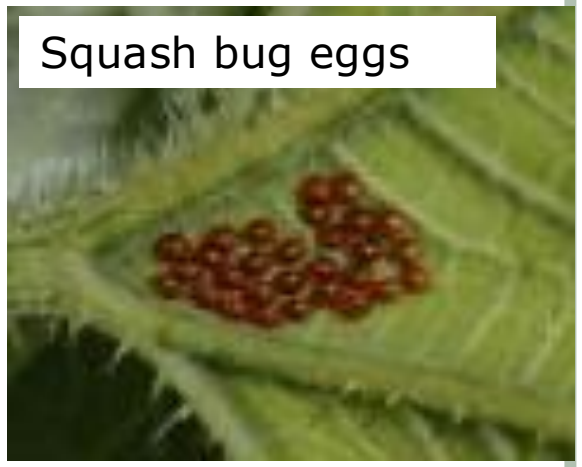

Photo credit: umn.edu
Accessed 11/19/21

Squash bug adult



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Emerald Ash Borer (EAB): Order: Coleoptera

ID: Adults are metallic green, invasive wood-boring beetle, ¼" long and 1/8" wide, non-native. Larvae are 1-1 ¼", white with brown head and pair of brown pincers at end of abdomen.

Habits: Adults emerge from beneath bark May-mid July, feed on leaves. Female adults lay 60-90 eggs, after hatching, larvae burrow thru bark and feed on live tissue in distinctive S-pattern

Host: Ash trees are preferred, however, EAB have been found on other trees

Management: Dependent on if EAB is present and location of trees. Systemic insecticides have been effective if used as preventive measure and if less than 30% dieback. Since damage is tissue, canopy sprays are not recommended. Consult certified arborist.



Photo credit: Iowa DNR EAB



Photo credit: UMass EAB tree damage

Emerald Ash Borer



EAB larva Photo credit: UMass

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Mexican Bean Beetles: Order: Coleoptera

- **ID**: Called the 16 spotted Ladybird Beetle; yellow to bronze with 16 black spots; adults 1/4 -1/3 inch long and 1/6 -1/4 inch wide (size varies based on diet); yellow or orange eggs (clusters of 40-60) hatch about 7 days; larvae are cylinder shaped, 1/3 inch long, yellow body with black or yellow forked spines covering the body; pupae stage lasts 9 days.
- **Host plants**: Cowpeas, lima beans, snap beans, soy beans, alfalfa, grasses, weeds (Devil's beggar-ticks)
- **Feeding habits**: Both adults and larvae feed on leaves from underside – skeletonize leaves – can completely defoliate plant
- **Cultural controls**: plant early spring, harvesting before July (peak of activity); row covers, handpick, plant pollen/nectar plants to attract parasitic wasps; clean up garden debris after harvest
- **Chemical controls:** Carbaryl (Sevin), Malathion, Permethrin
- **Organic controls:** Pyrethrin
- **Insect predators**: Parasitic wasp (*Pediobius foveolatus*), assassin bugs, predatory stink bugs



Mexican Bean Beetle

Photo credit: Purdue.edu Accessed 11/19/21

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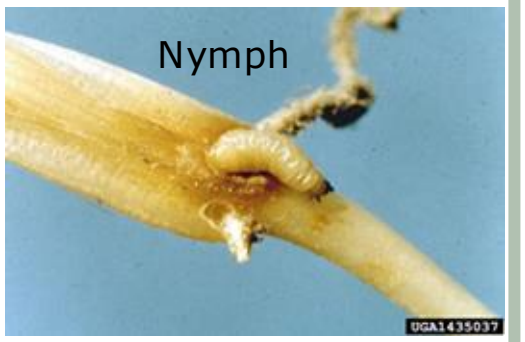
Spotted Cucumber Beetles: Order: Coleoptera

- **ID**: 1st generation adults late June to early July; 2nd generation Sept. to Oct.; yellowish-green adult; (1/4 inch long); 11 black spots and a black head with black antennae; yellowish-white larvae have brown heads and are ¾ inch long when grown; antenna 1/6th inch long
- **Host plants**: Feed on more than 250 plant species including corn, cucumber, peanut, potato, beans, melons, squash, tomato, eggplant, cabbage
- **Damage**: disrupt growth; stunt seedlings; damage fruit; larval stage known as southern corn rootworm) feed on roots and tunnel through stems; may transmit bacterium that causes bacterial wilt
- **Cultural controls**: plant late (after June 15; depending on local conditions); row covers until bloom; plant cucurbits mid June (avoid peak populations; remove crop residue
- **Chemical controls:** Carbaryl (Sevin), Permethrin
- **Organic controls:** Kaolin clay (preventive), Neem oil; Pyrethrin
- **Insect predators**: Pennsylvania Leatherwing Beetles, Tachinid flies, Soldier Beetles





Damage to plant



Spotted Cucumber Beetle. Photo credit: ufl.edu Accessed 11/19/21

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Cucumber Beetle

Striped Cucumber Beetles: Order: Coleoptera



Photo credit: ufl.edu
Accessed 11/19/21

- **ID**: Native to America; oblong, yellowish-green in color, about 1/4 inch long, and marked by three longitudinal black stripes on the top wings; head and antennae are dark colored; Wings are covered with very small punctures clearly seen under magnification. Eggs are light yellow or orange colored, and round to oval shaped. Larvae are worm-like and about 3/8 inch long when full grown, white with a dark head and have three pairs of legs on the thorax. Pupae are whitish-yellow and about 1/4 inch long. 1-3 generations per year
- **Host plants**: Primarily cucumbers and other cucurbits (melon, squash, pumpkin), legumes, okra, eggplant, potatoes, tree and shrub blossoms
- **Damage**: Larvae feed on roots and stems; adults chew on leaves and flowers; can transmit bacterial wilt and cucumber mosaic virus
- **Cultural controls**: Trap crop (Blue Hubbard Squash); Mosaic and wilt – plant resistant varieties of cukes (County Fair), squash and melons (Passmore Muskmelon); grow non-bitter varieties of cukes; row covers until bloom; rotate crops; remove crop residues
- **Chemical controls:** Carbaryl/Sevin, Permethrin
- **Organic controls:** Kaolin clay (preventive); Neem oil, Pyrethrin
- **Insect predators**: Pennsylvania, Leatherwing Beetles, Spined Soldier Bug, Wolf spider and ground beetles



[Managing Cucumber Beetles in Organic Farming Systems]

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Flea Beetles: Order: Coleoptera

- **ID**: About 8,000 species worldwide; metallic blue-black, shiny black, brown or striped and oval shaped; 1/10-1/16 inch long; larvae are tiny white grubs; cabbage and related crops; eggplant, beets, spinach, turnips
- **Host plants**: Tomato, pepper, cabbage
- **Damage:** Adults and larvae chew tiny holes in leaves (young plants and transplants can be severely damaged); adults can transmit viral bacterial disease
- **Cultural controls**: Till weeds and crop debris after harvest, row covers
- **Chemical controls**: Carbaryl (Sevin), Malathion
- **Organic / Biological:** Pyrethrin, Neem oil, Spinosad, Kaolin clay (repellent), diatomaceous earth (dust plants)
- **Insect Predators**: Tachinid flies, parasitic wasps, predatory stink bugs, earwigs, lady beetles; commercially available (*Pediobius foveolatus* – predatory wasp and Spined Solider Bug)



Photo credit: colostate.edu
Accessed 11/19/21

Colorado Potato Beetle: Order: Coleoptera

- **ID**: oval in shape and 3/8-1/4 inch long; have a yellow-orange prothorax (the area behind the head) and yellowish white wing covers with 10 narrow black stripes; yellowish orange oval eggs; larvae first hatch, they are brick red with black heads
- **Host plants**: Feed exclusively on plants of the nightshade family (Solanaceae); major pest of potatoes and eggplant
- **Damage**: Both adults and larvae feed on leaves and stems
- **Cultural controls**: Handpick, row covers, potato cultivars that show resistance (Katahdin, Sequoia), companion planting (coriander and dill to attract beneficial insects), crop rotation
- **Chemical controls:** Permethrin
- **Organic controls:** BT (*Bacillus thuringiensis* var. San Diego or Tenebrionsis), Neem oil, Spinosad, Pyrethrin
- **Insect predators**: Parasitic wasps, predatory stink bugs









Photo credit: ufl.edu
Accessed 11/19/21

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Colorado Potato Beetle Management

Japanese Beetle: Order Coleoptera

- **ID**: brilliant metallic green; generally oval; 3/8 inch long and 1/4 inch wide; coppery color and the abdomen has a row of five tufts of white hairs on each side that are diagnostic; larvae are typical white grubs that are C-shaped when disturbed
- **Host plants**: Wide range of fruits (grapes), ornamentals and vegetables
- **Damage**: Adults skeletonize leaves and devour flowers; can completely defoliate plants; larvae (grubs) chew on roots of grasses
- **Controls:** Apply late June after adults congregate; repeat until August
- **Cultural controls**: Row covers; hand-pick
- **Chemical controls:** Permethrin, Carbaryl (Sevin), Malathion
- **Organic / Biological controls:** Neem oil, Pyrethrin, parasitic nematodes for grub control
- **Insect Predators**: Tachinid flies, parasitic wasps







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[Japanese Beetles]

credit: umn.edu
Accessed 11/19/21

Long-horned Beetle: Order: Coleoptera

- **ID**: Usually elongated, cylindrical to flattened; brown, reddish brown or black in color; some mottled, banded or spotted with white, gray to other colors; few species are red, yellow, orange to bluish or have bold markings; range in size few mm long to 20-50 mm (1-2 inches); distinctive antennae (11 segmented) often longer than insect body; larvae called roundheaded borers
- **Host plants**: Mostly dead or dying trees and shrubs; adults may feed on pollen and leaves of trees
- **Damage**: Larvae (rounded-headed borers) bore into wood, producing tunnels and galleries; may cause structural weakening of tree/shrub; saw dust may be found at/near entry holes
- **Cultural controls**: Prevention, sanitation, prompt action for borers; prune or remove wounded damaged areas of trees/shrubs
- **Chemical controls:** Systemic insecticides (Imidacloprid) depending on species, soil drenches or trunk/branch sprays
- **Predators**: No natural predators









Asian Long-horned Beetle
Photo credit: osu.edu
Accessed 11/19/21

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Metallic Wood Borers / Flatheaded Wood Borers
Order: Coleoptera

- **ID**: Called metallic wood borers due to iridescent or metallic sheen; larvae are white, legless grubs with elongated body; flattened shape of head has been likened to a horseshoe nail; adults range from 6-64 mm long (1/4 to 1 ½ inches) with small antennae, oval shaped body
- **Host plants**: Variety of conifers, hardwoods and shrubs, depending on species of insect
- **Damage**: Attack weakened, dying, recently cut, or killed trees; some species tunnel into sapwood and heartwood; sign of attack is wide, meandering galleries under bark with tightly packed, fine dust; emerging adults leave oval, cleanly cut exit holes
- **Cultural controls**: Preventive – remove / process wood of recently dead / felled trees
- **Chemical controls:** Timing is important. Treat trunk bark / branches in early days of May, June and July; Imidacloprid (check advisory for pollinators); Permethrin; pheromone traps
- **Insect predators**: Woodpeckers, chalcid wasps



Figure 145. Adult metallic wood borer (flatheaded wood borer). Note that antennae are shorter than the body.



Figure 144. Larva of flatheaded wood borer. Note that their flattened heads are usually broader than the body.

Photo credit: TA&M Accessed 12/15/2022



Photo credit: Flathead borer damage Accessed 11/19/21

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Wood Borers

Squash Vine Borer: Order: Lepidoptera

- **ID**: Resembles a wasp but are robust moths; front wings are metallic green and rear wings are transparent with black or brown margins and veins. Wingspan is approximately 32 mm (1 ¼ inch); body is orange and black, often in a ringed pattern surrounding the abdomen; Eggs are flat, brown, and about 1/25 inch long (size of pencil point); larvae are white or cream-colored with brown heads, growing to almost an inch in length; have 8 pairs of appendages from their body.
- **Host plants**: Cucumber, gourds, melons, squash, pumpkin
- **Damage**: Eggs are laid near soil line; larvae hatch 8-10 days and bore into vine at main stem or runner; larvae cause girdling of vascular system causing plant to wilt / die
- **Cultural controls**: Plant as late as possible, cover vines with soil a few feet from base of plant, row covers, hand remove borer
- **Chemical controls:** Permethrin
- **Organic / Biological controls:** Kaolin clay (preventive), Pyrethrin
- **Insect Predators**: Ground beetles; egg stage – Parasitic Wasps

Photo credit: umn.edu
Accessed 11/19/21



Squash Vine Borer Adult



Squash Vine Borer Larva



Wilting plant: from squash vine borer damage

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Squash Vine Borer

Eastern Tent Caterpillar: Order: Lepidoptera

- **ID**: Overall body shape is elongate and cylindrical with a well-developed head; thorax, a three-segmented region each segment containing a pair of (true) legs; The abdomen is typically 10-segmented
- **Host plants**: Rosaceous plants including most fruit trees (apple, cherry, plum, crabapple), hawthorn, poplar, willow, ash and birch
- **Feeding habits**: Chewing mouth parts; can cause defoliation; conspicuous tents in branch crotches; most often feeds at night
- **Cultural controls**: tear web / tent apart when applicable; prune egg masses Nov – March
- **Chemical controls:** Permethrin, Carbaryl (Sevin)
- **Organic / Biological:** Neem oil, BT (*Bacillus thuringiensis*), Spinosad, Pyrethrin
- **Insect predators**: Parasitic wasps, tachinid flies, birds









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[Eastern Tent Caterpillar]
[Photo credit: uky.edu]
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Bagworm: Order: Lepidoptera

- **ID**: recognized by the case or bag that the caterpillar forms; Young larvae are approximately two mm long, glossy black on the back and dull amber on the undersurface of their bodies. Mature larvae are dull, dirty gray and splotched with darker markings toward the head; Fully developed larvae are about 18 to 25 mm long. The adult female is worm-like. The adult female lacks eyes, wings, functional legs and mouthparts. She never leaves the bag; The adult male is sooty black and moth-like with transparent wings that are nearly devoid of scales.
- **Host plants**: Juniper, cedar, false cypress, arborvitae with wide variety of other woody plants like elm, pine, honey locust, sycamore
- **Damage**: Chewing mouth parts; can defoliate plant; feeds, creating bag for shelter; females remain in bag through all life stages; males emerge from bag with clear wings, and fly
- **Cultural controls**: Before eggs hatch in May-June handpick overwintering bags and destroy them
- **Chemical controls:** Carbaryl (Sevin), Permethrin
- **Organic / Biological controls:** Neem oil, BT (apply mid June to mid July as works well only on young bagworms), Spinosyn A (mid June), Pyrethrin
- **Insect Predators**: Parasitic wasps

Adult Male Bagworm





Adult Female Bagworm



Bagworm Eggs

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[Bagworm]
[Photo credit: ufl.edu]
Accessed 11/19/21

European (imported) Cabbage Worm: Order: Lepidoptera

- **ID:** Adult has black-tipped forewings that span about 1½ inches. Males have 1 black spot on top of each of their forewings and females have 2. The hindwings are all white on the surface except for a black spot on the outer front margin. There is a slight yellowish hue on the underside of the wings; Larvae are velvety green in color with faint yellow stripes running longitudinally on the back and sides.
- **Host plants**: Cole crops, turnips, radish, mustard, nasturtiums
- **Damage**: Larvae feed on first formed outer leaves; as caterpillars mature, they feed on the center of the plant
- **Cultural controls**: Attract beneficial insects, destroy overwintering chrysalises on old plants, handpick, interplant with clover
- **Chemical controls:** Carbaryl (Sevin), Permethrin, Malathion
- **Organic / Biological:** Insecticidal soap, BT (Dipel, Thuricide), Spinosad, Pyrethrin
- **Insect Predators**: Braconid wasps, yellow jackets, other predatory wasps; wrens may eat larva







[Imported Cabbage Worm]

Accessed 11/19/21



Vespid wasp preying on larvae

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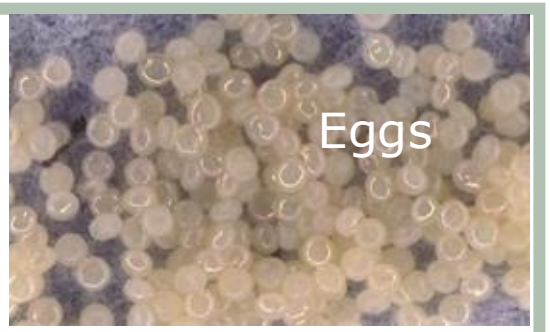
Cabbage Looper: Order: Lepidoptera

- **ID**: eggs are hemispherical shape; yellowish white or greenish in color, and measure about 0.6 mm in diameter; Larvae have three pairs of prolegs, and crawl by arching their back to form a loop; mature larva is predominantly green, usually marked with a distinct white stripe on each side; can be distinguished from other loopers by the presence of small, nipple-like structures (vestigial prolegs) located ventrally on abdominal segments 3 and 4; At pupation, a white, thin, fragile cocoon in formed on the underside of foliage; Adult moth is mottled gray-brown in color; The forewing bears silvery white spots
- **Host plants**: Mainly cabbage family plants (there are some resistant cabbage varieties), beans, beets, celery, lettuce, peas, tomatoes, flowers including Carnations and Nasturtiums
- **Damage**: Chewing mouth parts, feeds up to 4 weeks, may be 3-4 generations; seedlings and small plants may be destroyed
- **Cultural controls**: Plant pollen and nectar plants to attract beneficials, handpick, remove debris after harvest
- **Chemical controls:** Permethrin, Carbaryl (Sevin), Malathion
- **Organic / Biological:** Pyrethrin, Spinosad, BT insecticidal soap
- **Insect predators**: Braconid wasps, yellow jackets, other predatory wasps







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Cabbage Looper
Photo credit: ufl.edu
Accessed 11/19/21

Cutworms: Order: Lepidoptera

- **ID**: Cutworms can be quite distinct from one another, and their coloring can vary from brown or tan to pink, green or gray and black. Some are uniform color, others are spotted or striped. Some larvae are dull and others appear glossy or shiny. Cutworms curl up into a tight "C" when disturbed. Adult moths are moderate sized, brown or black insects showing various splotches, or stripes in shades of gray, brown, black or white; have a body length of about one inch with wingspans up to 1 1/2 inches across. Typically, the front wings are darker than the hind wings and are patterned.
- **Host plants**: All garden vegetables, especially seedlings and transplants
- **Feeding habits**: Chewing mouth parts; larvae of several species attack roots and stems below or just above soil surface; seedlings may disappear entirely; climbing species travel at night, chewing large holes in leaves

- **Cultural controls**: remove weeds; cardboard collar; popsicle sticks (pushed 1" into soil), or tin can around stem; insect parasitic nematodes (*Steinernema carpocapseal*), cultivated soil
- **Chemical controls:** Permethrin, Carbaryl (Sevin), Malathion
- **Organic / Biological controls:** Spinosad, BT
- **Insect Predators**: Parasitic wasps, tachinid flies, ground beetles



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Cutworms



Black cutworm and adult moth

Photo credit: umass.edu
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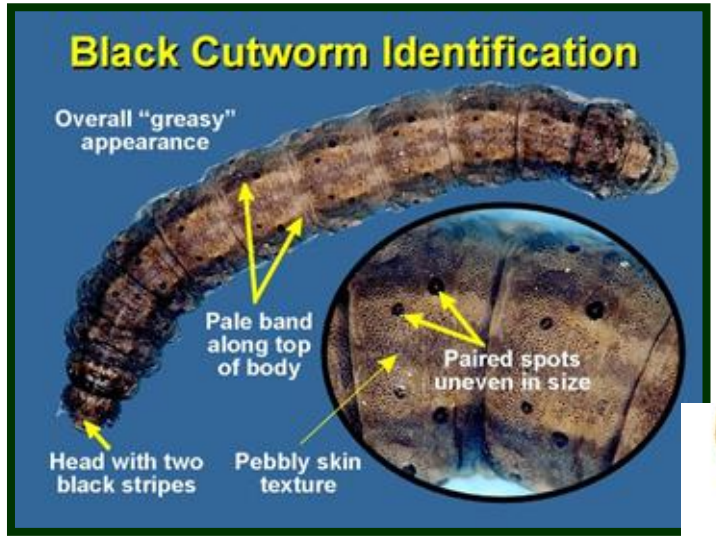
Cutworm Varieties



_Black Cutworm. Photo credit: unl.edu Accessed 11/19/21

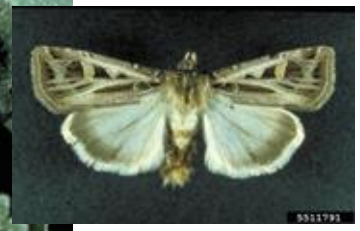


Black Cutworm moth. Photo credit: Missouri.edu Accessed 11/19/21



Sandhill Cutworm & Moth. Photo credit Accessed 11/19/21





_Dingy Cutworm & Moth Accessed 11/19/21



Variegated Cutworm & Moth Accessed 11/19/21

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Corn Earworm (aka Tomato Fruitworm)
Order: Lepidoptera





- **ID**: The larva is variable in color; the head tends to be orange or light brown with a white net-like pattern, the thoracic plates black, and the body brown, green, pink, or sometimes yellow or mostly black. The larva usually bears a broad dark band laterally and a light yellow to white band; A pair of narrow dark stripes often occurs along the center of the back; the body bears numerous black thorn-like microspines.
- **Host plants**: Corn, peppers, tomatoes; also, beans, potatoes, cabbage, okra, peas, squash and other vegetables, field crops
- **Damage**: Larvae chew large holes in leaves and fruit; large cavities in corn; may feed up to four weeks
- **Cultural controls**: Plant as soon as soil temps permit, corn varieties with tight husks show some resistance
- **Chemical controls:** Carbaryl (Sevin), Malathion
- **Organic /Biological controls:** Pyrethrin, Spinosad, BT
- **Insect predators**: Brachonid Wasp, Lacewings, Tachinid flies, Minute Pirate Bugs

Corn Earworm

Adult & larva of corn earworm. Photo credit: ufl.edu Accessed 11/19/21

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Carpenter Bee: Order: Hymenoptera

- **ID**: ¾-1” long; Heavy body; Yellow with black; Hairless abdomen; The thorax is covered with bright yellow, orange, or white hairs, and the upper side of the abdomen is black, glossy, and bare; males do not sting; females will sting if provoked
- **Host plants**: Forests, woodlands, gardens, parks
- **Damage**: Females bore tunnels in dead trees, beams, fence posts, decking, other wood structures, forming cells stocked with an egg and pellet of pollen and nectar
- **Cultural controls**: Make wood surfaces less attractive by painting, pressure treating or varnishing surface (the best preventive control)
- **Chemical controls**: Imidacloprid spray (wait 24-48 hours then seal opening), Pyrethroid sprays (Cyfluthrin or Permethrin
- **Organic controls:** Diatomaceous earth
- **Insect predators**: Woodpeckers







Carpenter Bees

Carpenter bee adult; tunnels; holes. Photo credit: uky.edu Accessed 11/19/21

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Other Garden Pests

These garden pests are often thought of as insects, but are not:

Mites (bad guys)

Slugs and Snails (bad guys)

Spiders (good guys)

Ticks (bad guys)

Photo credit: Wikipedia. Land snail Accessed 11/19/21



Photo credit: Wikipedia. Jumping spider Accessed 11/19/21



Photo credit: long star tick Accessed 11/19/21



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Ticks: Class: Arachnida Order: Acari

- **ID:** All ticks have eight legs in the adult stage, but have six legs as newly hatched larvae (See next slide for diagram and disease vector information on Deer tick (aka blacklegged tick), American Dog tick and Lone Star tick)
- **Hosts**: Varies depending on location – birds, mammals, sometimes reptiles and amphibians
- **Damage**: They satisfy all nutritional requirements on a diet of blood; ticks cut a hole into the epidermis of their host, excreting an anticoagulant; host are found by detecting breath, body odors, or by body heat, moisture and vibration
- **Chemical Controls**: Outdoor areas. Permethrin, Carbaryl, tick repellents containing at least 30% DEET; treat lawns with approved pesticides
- **Predators**: Insect / Chalcid wasps;
  Non-insect / Guinea Fowl

- **Non-chemical Controls:** Avoid tick infested areas (tall grass, dense vegetation); keep grass/underbrush cut and thinned; tuck pant legs into socks; conduct regular "tick" checks on people and pets

Common Ticks in Virginia

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Ticks: Class: Arachnida Order: Acari

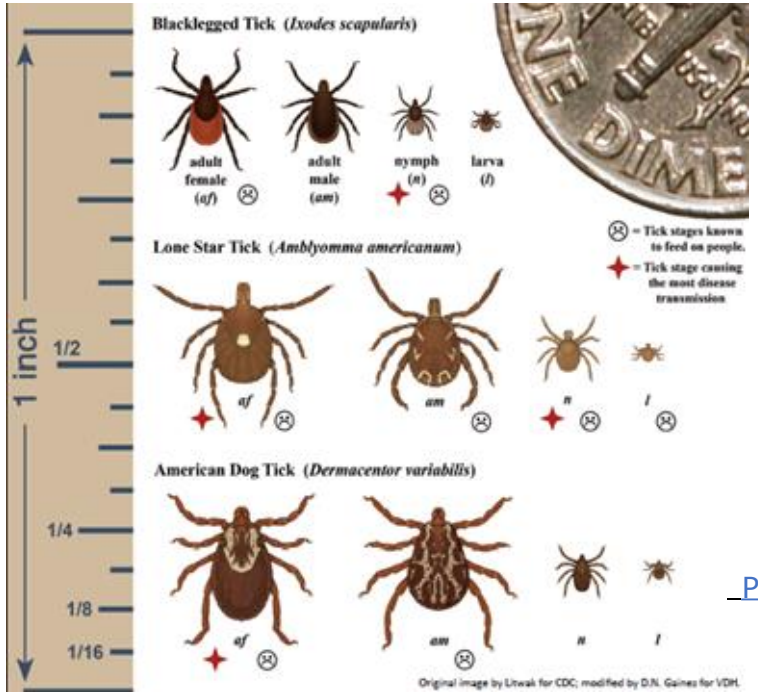

_Photo credit: fairfaxcounty.gov Accessed 11/19/21

Deer Tick: *Primarily northern and eastern VA; becoming more common; vector of Lyme Disease*
Dog Tick: *Primarily west of Blue Ridge Mtns; vector of Rocky Mtn Spotted Fever*
Lone Star Tick: *Predominately east of Blue Ridge Mtns; vector of Rocky Mtn Spotted Fever And Alpha-Gal syndrome*

Spiders: Class: Arachnida Order: Araneae

- **ID:** 4 pairs of legs; No antennae; No wings; 2 body divisions
- **Hosts**: Wide range of arthropods including insects; some large species may feed on birds, lizards, and small mammals
- **Damage**: Many different tactics are used to capture prey (webs, lassoing with a sticky bola, mimicking their prey, running prey down); many have acute vision, but prey is mainly sensed by vibrations; stomachs are too narrow to take solids; prey is liquefied by being flooded with digestive enzymes
- **Controls**: **Indoors**: Insecticide sprays are not recommended; spiders egg sacs and webs best removed with vacuum (dispose of bag immediately); insecticidal dusts if needed

- **Controls: Outdoors:** Pesticide sprays proven to have only limited effect; best to use vacuum / broom to remove webs and spiders
- **Insect Predators**: Song birds (wrens), wasps, amphibians and reptiles, lizards, fish, centipedes, each other





Two spiders in Virginia venomous to man: Brown Recluse (Photo credit) and Black Widow (Photo credit) Photos accessed 11/19/21

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Spiders in Virginia: Class: Arachnida Order: Araneae

- American House Spider
- Arrow-shaped Micrathena*
- Barn Spider*
- Black & Yellow Garden Spider*
- Black Widow
- Bowl & Doily Spider
- Brown Recluse
- Crab Spider*
- Grass Spider
- Harvestman
- Jumping Spider*
- Nursery Web Spider
- Wolf Spider*

* Spiders pictured at the right of this slide



Arrow-shaped Micrathena



Barn Spider



Black & Yellow Garden Spider



Wolf Spider



Jumping Spider



Crab Spider

All photos accessed 11/19/21

[Spiders: An undeserved bad reputation]

[Spiders in Virginia]

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Slugs and Snails: Phylum: Mollusca
Class: Gastropoda

- **ID**: Snails have hard coiled outer shells; slugs do not have a shell
- **Host plants**: Most tender succulent plants and shrubs; fruits on or close to ground
- **Damage**: Mainly on decaying organic matter; feed on new shoots, seedlings and other tender plant parts; feed at night, leaving ragged holes
- **Cultural controls:** Physical removal, traps, barriers, habitat modification, drip irrigation
- **Organic / Biological controls:** Metaldehyde (bait), diatomaceous earth



White garden snail



Tawny Garden Slug



Gray Garden Slug



Brown Garden Snail

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[Slugs and Snails]
[Photo credit: ucanr.edu] Accessed 11/19/21

Mites: Class: Arachnida Order: Acari

- **ID**: most go unnoticed due to their small size; General pest: no eyes, 8 legs, piercing mouthparts; < 120th inch
- **Host Plants**: Animals; honeybees; best known mite is the house Dust Mite
- **Damage**: Needle-like piercing / sucking mouth parts; on plants, usually found on underside of leaves; You will see yellowing damage before you see mites

Spider Mites

- **Controls**: Soaps and oils; specific miticides; discard severely infested plants
- **Insect Predators**: Predatory mites



A Varroa destructor mite feeds on a bee. Photo credit Accessed 11/19/21

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Variety of Mites:
Class: Arachnida Order: Acari

Photo credit: ufl.edu
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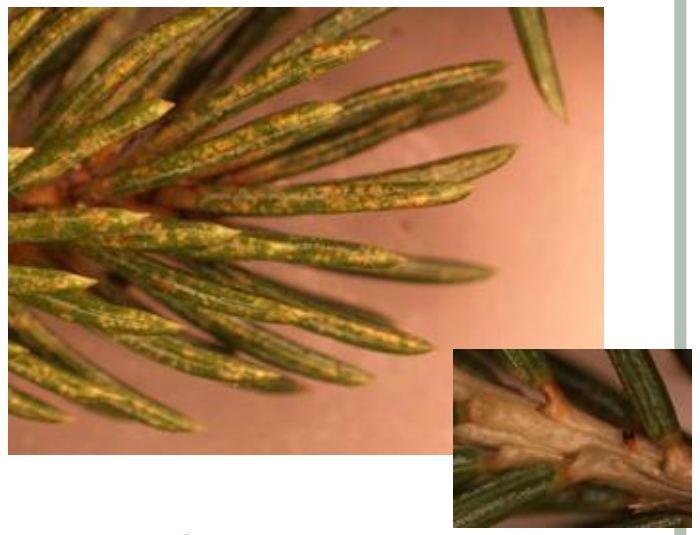
Photo credit: ufl.edu



Photo credit: iastate.edu



Mites & damage: Two-spotted Spider Mite; Southern Red Mite; Spruce Mite

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Mites

- **Range:** N.A.; Southern Red Mite also in S.A.
- **Host plants:**
  - Two-Spotted: Apples, citrus, vegetables, house plants, ornamentals, others
  - Southern Red: American Sycamore, Boxwood, Azaleas, Cotoneaster, cranberry, oak, pear; foliage of woody ornamentals, broadleaf evergreens
  - Spruce Mite: Most conifers; particularly common on spruce, arborvitae, hemlock, juniper and Fraser firs
- **Damage:** Adults and nymphs pierce leaf cells, feeding on juices
- **Cultural controls:** Maintain overall plant health, irrigate in dry conditions, avoid over fertilization, encourage natural predators
- **Chemical controls**: Carbaryl (Sevin) has been shown to increase mite populations
- **Organic controls:** Spinosad, Neem oil, Pyrethrin, insecticidal soap, dormant oil
- **Insect Predators:** Native predatory mites, Lady Beetles, Lacewings, predatory midges, Minute Pirate Bug

Conclusions: A few things to remember

- Conserve beneficial insects when possible by reducing use of broad-spectrum insecticides
- Plant resistant varieties when applicable
- Rotate vegetable crops
- Maintain good cultural practices to reduce plant stress and ward off insect attack
- Healthy soil = healthy plants
- Provide habitat for beneficial insects
- And most important - not ALL insects are bad insects
  A good balance of beneficials and pests can save a landscape.



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End of Slide Set

This is the end of the slides on Insects. You can continue to next slide: 'Suggested Readings'

OR

Click on the house in the lower right corner below to return to the Navigation Page

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Suggested Readings

- Chapters 1, 2, 12 MG Handbook; PMG

Note: : While there are many websites outside of our Virginia Cooperative Extension resources that have good information, that information may not be applicable for your geographic area.. This is especially true regarding the life cycle and treatment times for insects.

- Pests in Gardens and Landscapes
- Leaf Footed Bugs and Scentless Plant Bugs

Continued on next page ….

Suggested Reading

- Whiteflies
- Cucumber Beetles: Organic and Biorational Integrated Pest Management
- Classification: Insect Orders Illustrated

Test Your Knowledge

Insect Questions

Insect Questions Part 2

Use the PMG

Apply What You Have Learned

Help Desk Quiz

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Apply What You Have Learned

1. Name one diptera or hemiptera you have had in your yard / garden in the past
2. Name an insect you have seen in your yard / garden that damages plants by piercing/sucking.
3. List an insect in your yard / garden that is beneficial for a reason other than pollination
4. What type of cultural practices have you used in your garden for pest management?
5. What type of soil preparation have you used that helps prevent or manage pests?

Click to Return to 'Test Your Knowledge'

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Test Your Knowledge of Insects

Answers on next slide

1. Name two “bad” lady beetles
2. How do you distinguish between a Tobacco Hornworm and a Tomato Hornworm?
3. Which sex of the Carpenter Bee does not sting?

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Test Your Knowledge of Insects

Answers

1. Name two "bad" lady beetles.
   Answer: Mexican Bean Beetle; Squash Beetle
2. How do you distinguish between a Tobacco Hornworm and a Tomato Hornworm?
   Answer: Adults - Tobacco Hornworm has 6 spots on each side; Tomato Hornworm has 5 spots on each side; Larva - Tobacco Hornworm has 7 diagonal stripes, horn usually curved and red; Tomato Hornworm has 8 V-shaped markings; horn straight and black
3. Which sex of the Carpenter Bee does not sting?
   Answer: Male

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Test Your Knowledge of Insects

4. Identify these five common insects: Answers on next slide

Photo credit



Photo credit



Photo credit



Photo credit

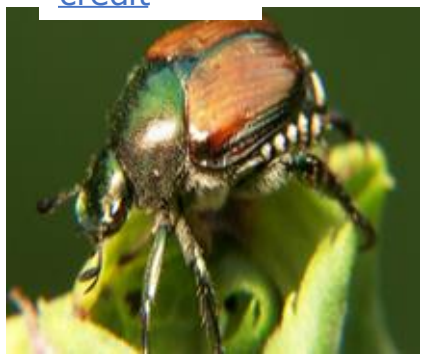

Photo credit



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Test Your Knowledge of Insects

4. Identify these five common insects:

Photo credit



Striped Cucumber Beetle

Photo credit



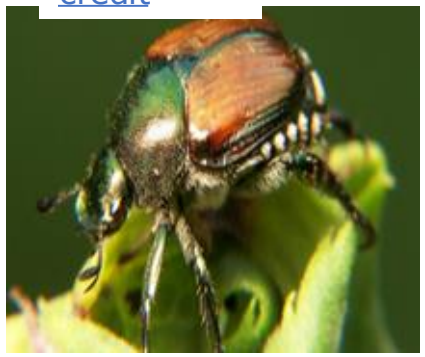
Squash Bug

Photo credit



Cutworm

Photo credit



Japanese Beetle

Photo credit



Harlequin Bug

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Next slide for more insect pictures to ID

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Test Your Knowledge of Insects

5. Which of the following are “true” insects? Answer on next slide

Slug

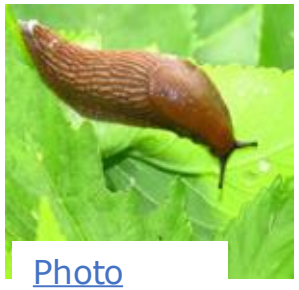

Photo credit

Tick



Photo credit

Tomato Hornworm



Photo credit

Cabbageworm

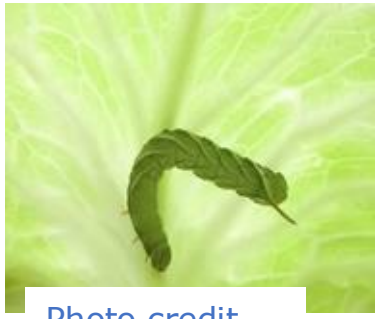

Photo credit

Spotted Cucumber Beetle



Photo credit

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Test Your Knowledge of Insects

5. Which of the following are "true" insects? Click for Answer

Slug

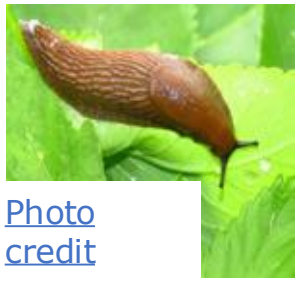

Photo credit

Slug (no)

Tick



Photo credit

Tick (no)

Tomato Hornworm



Photo credit

Tomato Hornworm (Yes)

Cabbageworm



Photo credit

Cabbageworm (Yes)

Spotted Cucumber Beetle



Photo credit

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Spotted Cucumber Beetle (Yes)

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Help Desk Quiz: Answers on next slide

1. Client brought in bug for ID ……



Photo credit:
Accessed 11/19/21

2. Large green flies in basement. Brought plants into basement in fall - flies hatched in spring.

3. My tomato leaves are getting small white lines all over them. What caused this and what do I do about it?

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Help Desk Quiz



1. Client brought in bug for ID ……
   Answer. Assassin Bug (*Arilus cristatus*) or Wheel bug. Client advised not to pick it up as it may bite and the bite can be painful for two weeks. This is a good guy since it eats other insects.
2. Large green flies in basement. Brought plants into basement in fall - flies hatched in spring.
   Answer: Flies came in on plants in fall. Drench plants before bringing into house; soapy water; insecticide.; take plants back outside & drench. If unable to take plants back outside to spray, may need to use an indoor insect "bomb"; told to read labels carefully first.
3. My tomato leaves are getting small white lines all over them. What caused this and what do I do about it?
   The white lines are the tunnels of leaf miners which tunnel between the layers of the leaf. They are not very harmful to the plant; chemicals are rarely needed. If necessary, can use an insecticide labeled for leaf miners.

Use the PMG

Instructions on next slide… however… see how you can do first.

Find information on organic control of aphids on home vegetables

Find Information on organic control of aphids on home vegetables

- Go to the PMG: The most recently published copy can be found on ramga.org > class
- Scroll down to the Chapter on Vegetables, then to the section "Organic Controls for Insects"
- You will find several products used to control aphids on vegetables.

Click to Return to Test Your Knowledge

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