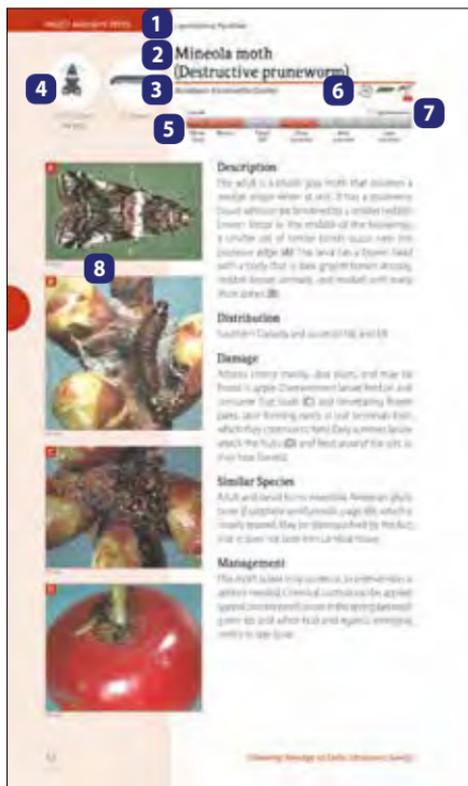


How to Use This Guide

This guide is a compilation of fact sheets separated into three sections, with each fact sheet covering a specific species or group of similar species. The first section (red) offers material on arthropod pests (insects and mites). The second section (green) describes beneficial insects, spiders, and mites. The third section (brown) lists tree fruit diseases. Information presented in the heading on each fact sheet is described below.

1. For arthropods, taxonomic classification:
 - Order (plus Suborder, for Hemiptera):
 - Family

2. Common name
3. Scientific name and authority
4. For arthropods, silhouettes of life stages and lengths in mm (see inside back cover for quadrille grids in mm and inches)
 - A: adult (in Lepidoptera, wingspan)
 - L or N: last/largest larval/nymphal stage
5. For arthropods, principal period of activity in the crop (in red or blue, for indicated stages)
6. Feeding habits or site of attack (see page 2 for a key to icons)
7. For arthropods, number of generations per year
8. Photos of life stages and damage



Key to Icons

The following icons represent the feeding habits of the species. They illustrate which prey or part of the fruit tree is preferentially consumed or attacked (representing more than 90% of the species' total diet).

 : Mites (eggs and motile forms)

 : Insect eggs

 : Larvae

 : Leafhoppers

 : Scales

 : Aphids

 : Multiple insects and mites

 : Nectar, pollen (pollinators)

 : Shoots

 : Blossoms

 : Apples

 : Cherries

 : Peaches

 : Pears

 : Plums

 : Trunk and branches

 : Roots and crown

 : Foliage

Impact: Repetition of an icon indicates the importance (either in frequency or significance of economic impact) of each pest or beneficial:

 *One icon* – Light; minor pest or beneficial

 *Two icons* – Moderate; secondary pest or beneficial

 *Three icons* – Important; major pest or beneficial

Insect and Mite Pests

In the first section, which deals with arthropod pests, the following information is given (not all sections are included for every species):

Description: Major traits used to identify the insect or mite. Note that younger nymphs or larvae may not have well-developed characteristic markings. These traits are not always unique to a particular species, but are used to distinguish it from other species presented in this guide.

Distribution: General geographic range of occurrence (in eastern North America only, even if species is more widely distributed).

Key:

CT - Connecticut

FL - Florida

IL - Illinois

MA - Massachusetts

MD - Maryland

ME - Maine

MI - Michigan

NB - New Brunswick

NH - New Hampshire

NJ - New Jersey

NS - Nova Scotia

NY - New York

OH - Ohio

ON - Ontario

PA - Pennsylvania

QC - Québec

RI - Rhode Island

SC - South Carolina

VA - Virginia

VT - Vermont

WV - West Virginia

Damage: Damage to the fruit or tree caused by the pest. In the interest of conserving space, life history details not directly related to species identification or pest activity on the crop (e.g., overwintering stage, mating or oviposition behavior, etc.) are not included in this guide.

Insect and Mite Diagnostic Keys

The following keys are a means of identifying the most likely causes of specific types of insect damage, according to the symptoms of injury evident in the field. Pests are listed approximately in decreasing order of severity and frequency of occurrence. Greatest accuracy in species identification will be ensured by collecting and examining actual insect specimens associated with the damage.

Field Damage Key for Identifying Insect and Mite Pests of Apple

A - Damage to buds, flowers, fruitlets, or terminals

- 1 • stings, holes, or depressions: tarnished plant bug (page 72), mullein plant bug (page 69), apple seed chalcid (page 92), click beetles (page 48)
- 2 • feeding damage, tunneling: obliquebanded leafroller (page 77), oriental fruit moth (page 90), European apple sawfly (page 86), green fruitworms (page 56), eyespotted bud moth (page 55), winter moth (page 60), pale apple leafroller (page 58), Mineola moth (page 52), green pug (page 51), cigar/pistol casebearers (page 54)
- 3 • parts died back, shriveled, eaten, or dropped: pear thrips (page 49), winter moth (page 60), spring cankerworm (page 66), apple pith moth (page 53), cigar/pistol casebearers (page 54)

B - Feeding or oviposition damage to fruit

- 1 • feeding or oviposition stings, punctures, or scars: apple maggot (page 83), plum curculio (page 82), tarnished plant bug (page 72), mullein plant bug (page 69), stink bugs (page 70), apple red bug (page 68), hawthorn dark bug (page 68), pear plant bug (page 68), apple seed chalcid (page 92)

- 2 • small holes or pitting: codling moth (page 88), obliquebanded leafroller (page 77), tufted apple bud moth (page 80), oriental fruit moth (page 90), lesser appleworm (page 76), variegated leafroller (page 81), winter moth (page 60), Sparganothis fruitworm (page 81), Mineola moth (page 52)
- 3 • surface mining or depressions, or holes less than 6 mm (1/4") deep: plum curculio (page 82), obliquebanded leafroller (page 77), tufted apple bud moth (page 80), redbanded leafroller (page 79), Japanese beetle/rose chafer (page 74), lesser appleworm (page 76), variegated leafroller (page 81), eyespotted bud moth (page 55), cherry fruitworm (page 87), winter moth (page 60), Mineola moth (page 52), European earwig (page 48), snowy tree cricket (page 97)
- 4 • channels, gouges, or large surface excavations or scars less than 6 mm (1/4") deep: obliquebanded leafroller (page 77), tufted apple bud moth (page 80), European apple sawfly (page 86), redbanded leafroller (page 79), green fruitworms (page 56), Japanese beetle/rose chafer (page 74), variegated leafroller (page 81), fruittree leafroller (page 59), fall webworm (page 62), multicolored Asian lady beetle (page 124)
- 5 • holes with tunnels more than 6 mm (1/4") deep, internal burrowing or trails, with or without frass: apple maggot (page 83), codling moth (page 88), oriental fruit moth (page 90), European apple sawfly (page 86), green fruitworms (page 56), lesser appleworm (page 76), European corn borer (page 89), cherry fruitworm (page 87), dock sawfly (page 85)



Leaf weevil
A: 7 mm



European earwig
A: 16 mm



Click beetle
A: 10 mm

Leaf weevils

Coleoptera: Curculionidae

Polydrusus impressifrons Gyllenhal and *Phyllobius* spp. 

European earwig

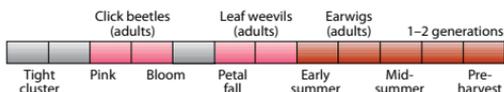
Dermaptera: Forficulidae

Forficula auricularia 

Click beetles

Coleoptera: Elateridae

Tenicera spp., *Agriotes* spp. 



Vincent



Vincent



Vigneault

Description

Leaf weevils are metallic green or brown curculios (A) with antennae borne on the snout. The European earwig is dark brown with an elongated body and pincer-like forceps at the rear of the abdomen (B). The short elytra do not entirely cover the abdomen. The click beetle is dark-colored (C) with a hard, elongated body; a characteristic pair of spurs; and sometimes colorful markings on its thorax. When set on its back, it can bend and suddenly straighten out, propelling itself into the air to right itself and emitting a distinctive "click" sound.

Distribution

P. impressifrons: QC, ON, CT, NY, MI, OH. Numerous earwig and click beetle species are widespread throughout the eastern fruit-producing states and provinces.

Damage

All occur in apple and pear and occasionally other tree fruits. Leaf weevils, which may be especially numerous on plum trees, create feeding holes in the leaves a few millimeters in size. The European earwig occasionally feeds on leaves or damaged fruit but is also a predator of aphids and caterpillars. The adult click beetle sometimes chews on and destroys flower buds, pistils, and stamens and may be found in tunnels made by European apple sawfly (page 86); larvae are found in soil and feed on roots.

Management

These insects cause negligible problems. Tolerance is probably more economical than intervention.



A: 6 mm
N: 4 mm

Tarnished plant bug

Lygus lineolaris (Palisot de Beauvois)



NYSAES



NYSAES



NYSAES



NYSAES

Description

The adult is brown, and the extremities of its wings are translucent with a cream-colored scutellum (triangular plate) on its back (A). The nymph is pale green; from the third nymphal stage, it has five black points on the back (B). This insect usually abandons fruit trees for alternate hosts soon after bloom.

Distribution

Widespread in most fruit-growing states and provinces in eastern North America.

Damage

Attacks most deciduous tree fruits. Prebloom stings on woody tissue or the floral peduncle leave a drop-let of sap and often cause the abortion of flower buds. Stings at the base of the floral receptacle or on the fruit result in funnel-like depressions (C); fruit feeding in stone fruits can cause corky scars (D) or catfacing injury.

Similar Species

The pear plant bug (*L. communis*, page 68) can be present on the trees all season long; it can be distinguished by differences in body coloration.

Management

Watch for the presence of adults on buds. In apple, monitor with sticky white board traps; if necessary, apply broad-spectrum insecticides during the prebloom period. Elimination of alternate host broadleaf weeds—especially legumes, mullein, chickweed, and dandelion, as well as pigweed, lambsquarters, plantain, goldenrod, and aster—in the orchard can contribute to management efforts.



Erythraeidae A: 0.7 mm
(shown at 10X actual size)



Trombididae A: 0.3 mm
(shown at 10X actual size)

Anystidae A: 0.4 mm
(not shown)



Lasnier



Drouin



Lasnier

Red velvet mites

Erythraeidae: *Balaustium* spp.

Trombididae: *Allothrombium* spp.

Anystidae: *Anystis baccharum* (L.)



Description

Balaustium is a large, bright red mite with a tick-like shape and a dense velvet-like covering of dorsal setae; chelicerae are long and retractable (A). It moves very quickly over the plant surface. *Allothrombium* is also a bright red mite but with few hairs and nonretractable chelicerae (B). *Anystis* is a small red mite that can be found moving rapidly along the foliage (C).

⊗ Sensitivity of these species to insecticides is not well known.

Status

Balaustium is an important predator of mites, scales, and moth eggs at the beginning and end of the season. *Allothrombium* feeds on aphids and mites. *Anystis* hatches from eggs in soil litter during early spring; it feeds on leafhoppers and phytophagous mites. Prey searching occurs along apple leaf veins and edges. They may eat up to 40 adult twospotted mites per day.



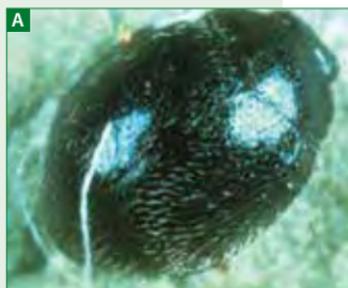
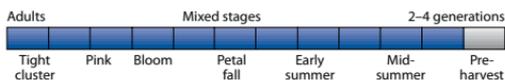
A: 1.5 mm



L: 2 mm

Spider mite destroyer

Stethorus punctum (LeConte)



NYSAES

Description

Adults are oval, convex, uniformly shiny black, and covered with sparse, fine yellowish to white hairs (A). The larva is gray to blackish and has many long-branched hairs and black patches (B). As the larva matures, it becomes reddish, at first on the edges of the body and eventually entirely, just prior to pupation (C).

⊗ This species is sensitive to most broad-spectrum insecticides.



NYSAES

Status

The larvae and adults are important predators of mites. They are normally not found in tree fruits north of PA.

☺ Both forms can consume as much as 100 motile forms per day.



NRAES-75

Armillaria root rot

Armillaria mellea (Vahl:Fr.) P. Kumm.



Burr



Burr



Jones

Host

Apple, Apricot, Cherry, Nectarine, Peach, Pear, Plum

Symptoms

The bark at the crown and roots sloughs off easily, exposing the dense white growth of the fungus (A). The growth extends in a fan-like pattern underneath the bark (B). Black shoestring-like strands (rhizomorphs) may be obvious on the surface of the bark (B). In the fall, yellow/brown mushrooms may appear at the base of the tree, especially if killed trees are left in place (C). Trees in affected orchards will often die in a circular pattern from one or more foci in the orchard.

Distribution

Occurs in all fruit-growing regions in eastern North America, but uncommon.

Similar Diseases and Disorders

Any disease or disorder affecting the root system or rootstock/scion union can produce similar aboveground symptoms. The presence of rhizomorphs distinguishes this disease from similar disorders.

Management

There are no practical control options. Stone fruit tend to be more susceptible to infection than apple and pear; however, susceptibility varies with the choice of rootstock. Of the stone fruit rootstock, Lovell, Mahaleb, Myrobalan, and Nemaguard are considered most susceptible, whereas Marianna and Mazzard are considered moderately resistant.

Anthracnose

Colletotrichum acutatum J. H. Simmonds

Colletotrichum gloeosporioides (Penz.) Penz. & Sacc. in Penz.



Lalancette

Host

Cherry, Peach, Plum

Symptoms

Lesions start as small, circular, tan to brown spots on mature or nearly mature fruit. Lesions expand rapidly with a tendency to form concentric rings that may or may not be sunken. Lesions are firm to the touch but typically develop orange to pink, slimy spore masses in their centers. Individual lesions may reach a diameter of 4–5 cm but may coalesce to form more extensive areas of infection (A).

Distribution

Common to all fruit-growing regions in eastern North America but most serious in warmer production regions.

Similar Diseases and Disorders

Young lesions can be confused with brown rot infections (page 198). Evidence of sporulation is typically needed to differentiate the various fruit rots.

Management

The disease is difficult to manage when disease pressure is high. Fungicides can be used from fruit ripening through harvest; the strobilurin fungicides and captan are the most effective.

Glossary

Abdomen: Posterior segment of the body of insects, spiders, and mites that holds the genital organs (figure 1).

Acerculus (pl., **acervuli**): A compact, conidia-bearing fungal fruiting body.

Anal comb: In some Lepidopteran larvae (e.g., oriental fruit moth), a brown, comb-like, hardened projection adjacent to the anus used to eject feces.

Annulated: With ring-like segments or divisions.

Ascospore: A sexual fungal spore produced in apothecia, perithecia, and pseudothecia.

Basidiocarp: A spore-bearing fungal fruiting body (e.g., many mushrooms).

Bast fibers: The strong fibers of the phloem.

Burr knot: A mass of tender root tissues that develops above soil level on the trunk of young apple trees.

Callus: A mass of undifferentiated cells often formed in response to wounding.

Calyx: A collective term for all the sepals.

Cambium: The tissue that lies between, and is the source of, phloem and xylem.

Canker: Lesion caused by a pathogen that develops in the vegetative tissues of a leaf, peduncle or bud scar, trunk, etc.

Carpel: The female reproductive organ of the flower consisting of the stigma, style, and ovary.

Catfacing: In stone fruits, a deformation of the fruit caused by insect feeding damage, resulting in a fruit shape similar to a cat's face.

Caudal: Pertaining to the tail or the posterior part of the body.

Cephalothorax: In spiders and other arthropods, a body region consisting of head and thoracic segments.

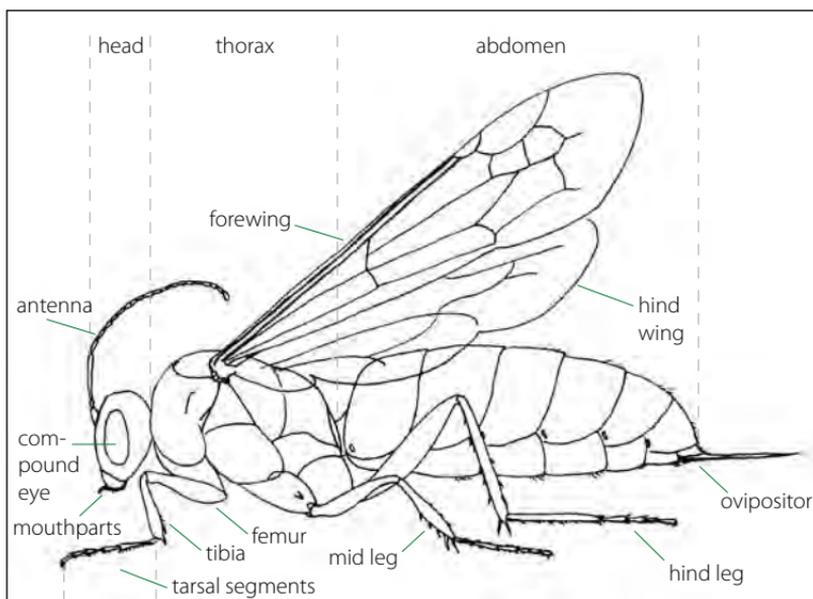


Figure 1. General structure of an insect

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