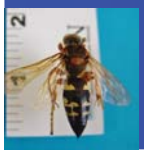
It's a Big-Eat-Bug World

Frank A. Hale, Ph.D.
Professor
Dept. of Entomology & Plant Pathology
and David Cook
Extension Agent III, Davidson County

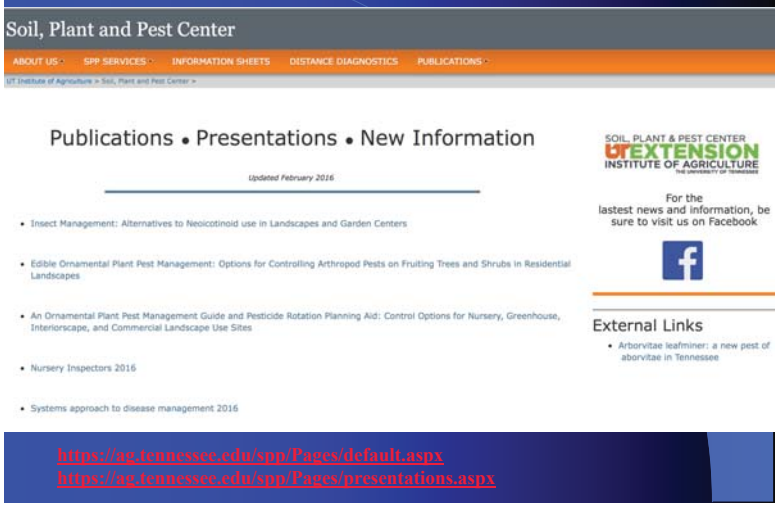


UTEXTENSION INSTITUTE OF AGRICULTURE THE UNIVERSITY OF TENNESSEE

UT Soil, Plant and Pest Center

Ellington Agricultural Center, Nashville, TN

New Presentations, Publication, Information



https://ag.tennessee.edu/spp/Pages/default.aspx
https://ag.tennessee.edu/spp/Pages/presentations.aspx

Follow us on Facebook

Daylily Leafminer

Daylily Leafminer

Image of larva courtesy of Gary J. Steck, Florida Dept. of Ag. & Consumer Services, Div. of Plant Industry

Control with imidacloprid or spinosad insecticides labeled for use on daylilies

Adult fly image courtesy of V. J. Hickey, Louisiana Dept. of Agri. & Forestry

Beneficial Organisms

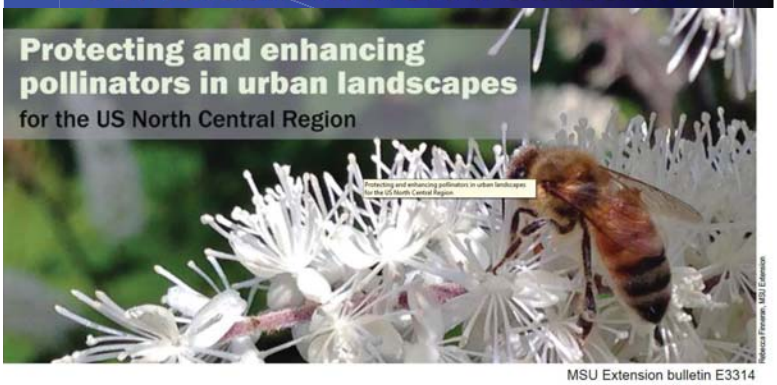
Pollinators: Pollination of flowers, vegetables, and fruits.

Predators: Feed on other insects and kill them.

Parasitoids: Kills host by lay eggs in or on host.

Microorganisms: Infecting host with disease or toxin.

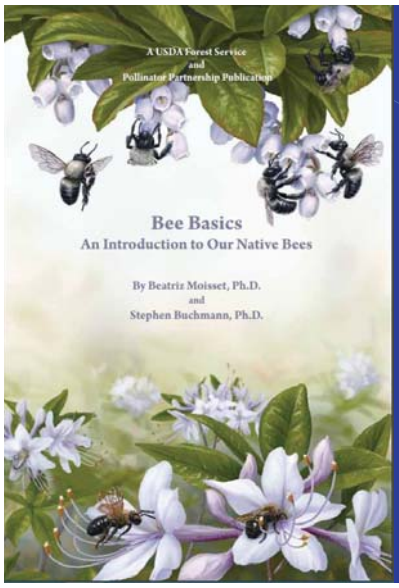
An Excellent New Publication



MSU Extension bulletin E3314

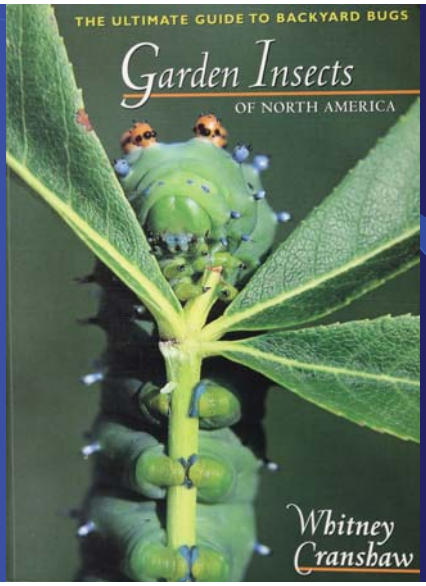
By David Smitley, Michigan State University Department of Entomology; Diane Brown and Erwin Elsner, Michigan State University Extension; Joy N. Landis, Michigan State University IPM; Paula M. Shrewsbury, University of Maryland Department of Entomology; and Daniel A. Herms, The Ohio State University Department of Entomology

http://www.extension.umn.edu/garden/insects/docs/protect-pollinators-in-landscape.pdf



http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5306468.pdf

http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5306468.pdf



Ground Beetles (Predators)

Colors: From Shiny Brown to Black to Iridescent and Metallic

Nocturnal: Mostly Pursue Prey at Night

Food: Caterpillars, Snails, Slugs, and Small Insects. Some species eat weed seeds

Tiger Beetles (Predators)

Colors: Shiny Metallic Bronze, Blue, Green, Purple, or Orange.

Diurnal: Prefer Open Sunny Locations.

Facts: Long Legs, Long Antennae, Large Eyes, Large Mandibles.

Food: Small Insects and Spiders.

Six spotted tiger beetle image courtesy of D. Cook

Soldier Beetles (Predaceous Larvae)

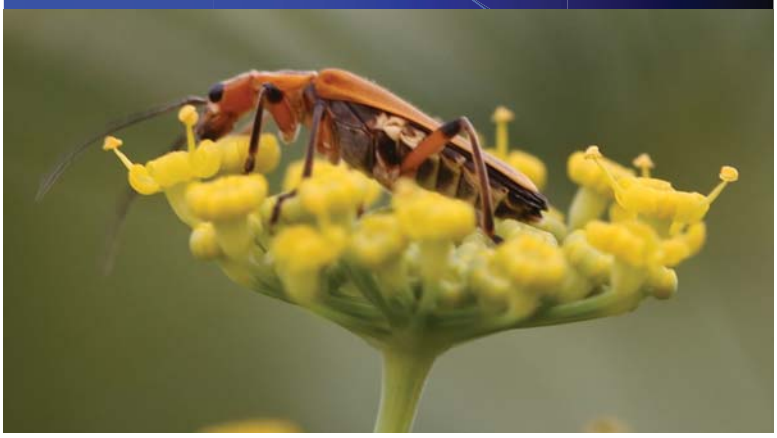
Color: Mostly Dark Gray, Brown, or Yellow. Body Parts may be Red, Orange, or Yellow.

Diurnal: Active During the Day. Only larvae are predaceous. Adults feed on pollen and nectar.

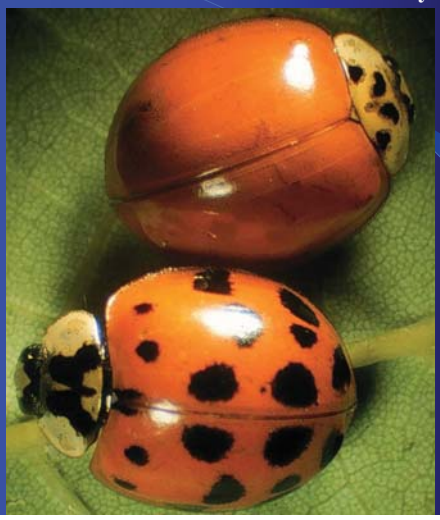
Food: Beetle Larvae, Caterpillars, Grasshopper Eggs, Aphids, Corn Rootworms, and Other Insects.

Courtesy of A. Windham, UT Extension

Soldier Beetle

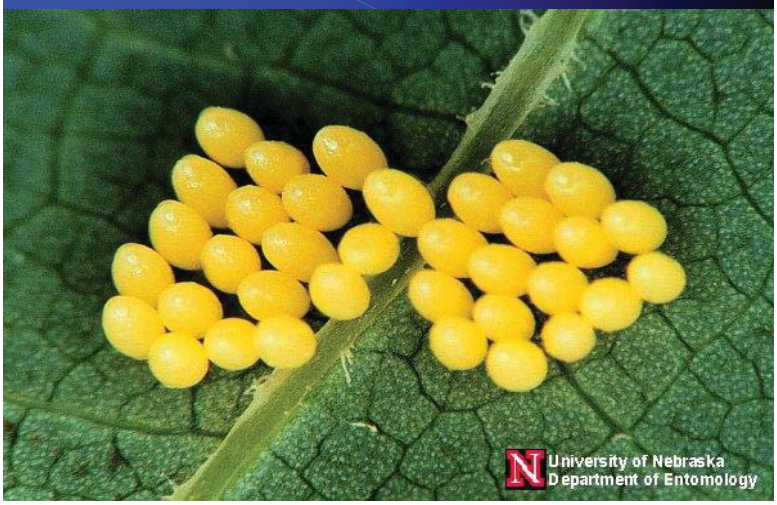


Asian Multicolored Lady Beetles (Predators)

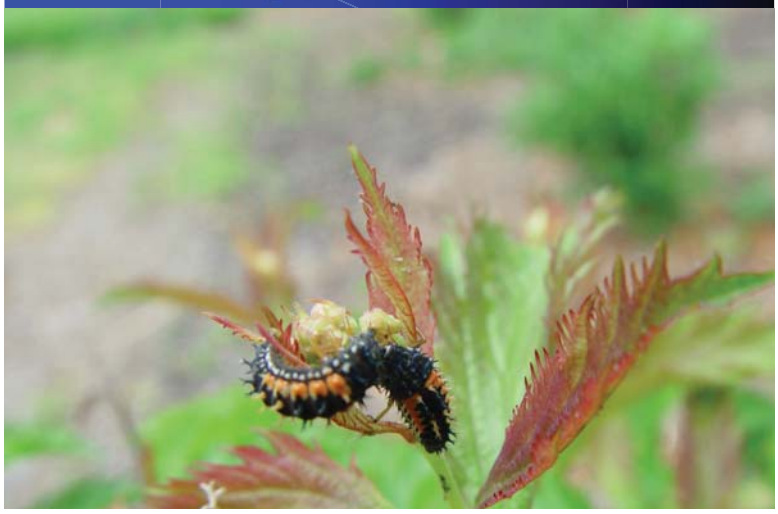


Multicolored Asian Lady Beetle Feeding on Aphids

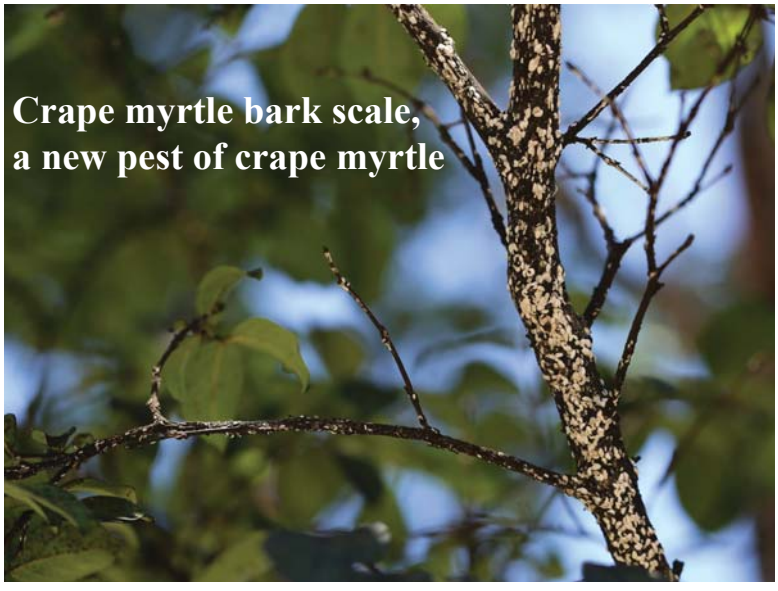
Lady Beetle Egg Cluster



Lady Beetle Larvae

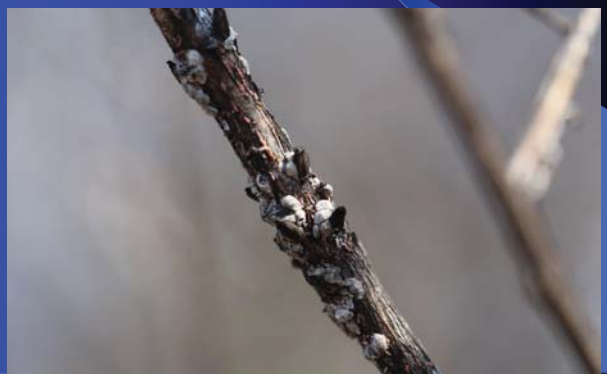


Scymnus sp. Lady Beetle Larvae



An IPM Approach to Crape Myrtle Bark Scale Control Using Beneficial Insects

- Apply a dormant application of horticultural oil which is less disruptive to beneficial insects & spiders



Washing to remove crape myrtle bark scale and improve plant appearance

- Some landscape professionals are using a JD9-C spray gun at 125 – 150 psi with insecticidal soap solution or pressure washing to physically remove scale and black peeling bark

Pressure washing

- **Cultural practices for removal of wax scales and sooty mold from ornamentals,** D. W. Held, C. Wheeler, and W. McLaurin, SNA Research Conference Vol. 51 2006, pp141-144.
- Pressure washing with 15 degree tip on wand removed less than or equal to 20% of the sooty mold from crape myrtle leaves
- Removed >80% of the Florida wax scale on holly leaves at 870, 1160, 1450 & 1740 psi

Pressure washing crape myrtle

Image by Janet Creech of a brave and dedicated employee of Don Williams Landscaping LLC, Shreveport, LA

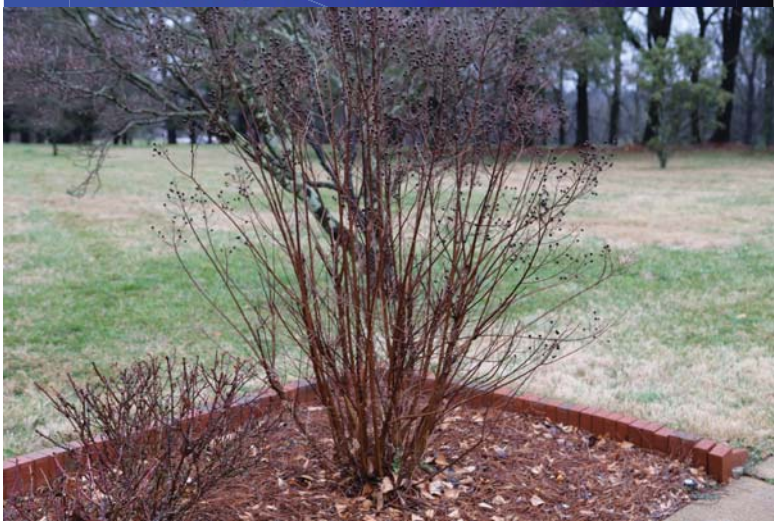
Lady beetle larvae on crape myrtle

Twice-stabbed lady beetle larva

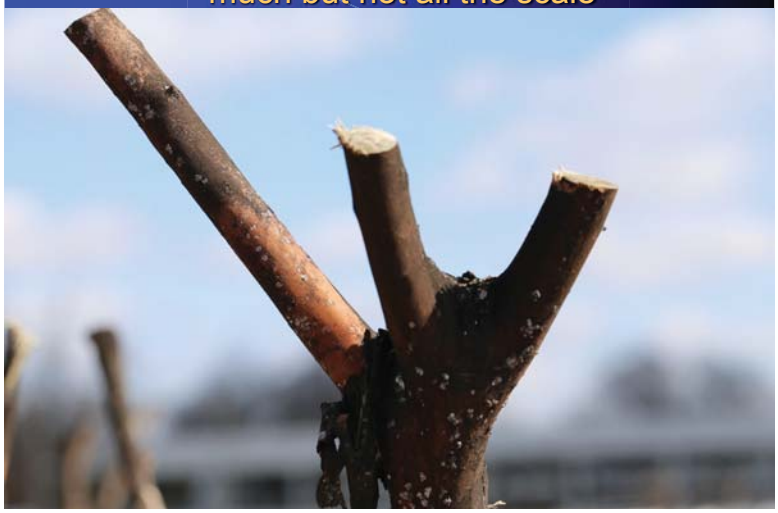
Can pressure washing improve biological control?

- With reduced scale populations, predaceous lady beetles have better predator to prey ratios needed to achieve an acceptable level of biological control

Crape myrtles bloom on new growth



Dormant pruning removes much but not all the scale



Lacewings

Green and brown lacewings have transparent wings

Green lacewing adults feed mainly on pollen and nectar while larvae are predators. Brown lacewings are predaceous as adults & larvae.

Feed on aphids, thrips, mealybugs, scales, moth eggs, mites, small caterpillars, & other soft-bodied insects

(Green lacewing)

(Brown Lacewing)

Green lacewing egg image courtesy of Whitney Cranshaw, Bugwood.org

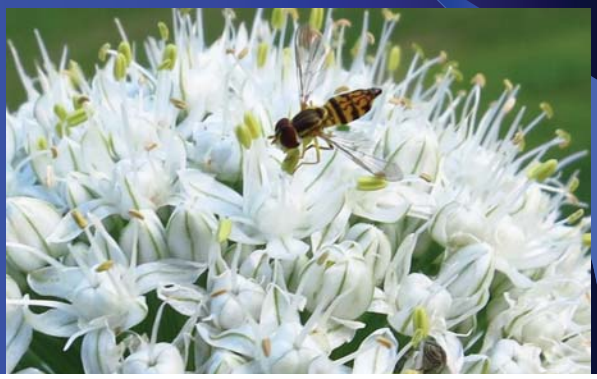
Green lacewing larva image of David Cappaert, Bugwood.org

Syrphid or Hover Flies (Predaceous Larvae)

Color: Shiny, Yellow-and-Black, or White-and-Black Striped

Facts: Have the Ability to Hover Over Flowers

Food: Adults feed on Pollen and Nectar. Larvae Feed on Aphids.

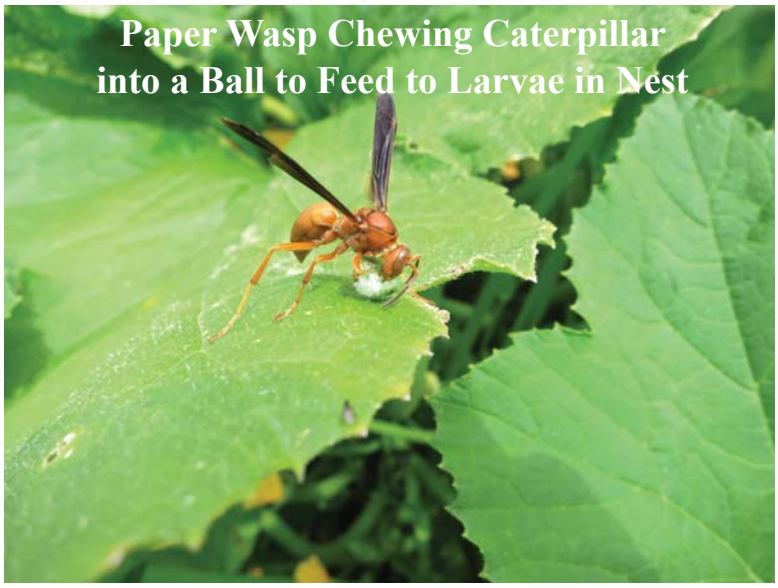


Syrphid Fly Larva Eating Aphids

Image courtesy of Alan Windham, UT


Imported Cabbageworm on Broccoli


Paper Wasp Feeding on
Imported Cabbageworm


Paper Wasp Chewing Caterpillar
into a Ball to Feed to Larvae in Nest


Paper wasp image courtesy of Terrence Godfrey, photojournalist


Paper wasp feeding on emerging
periodical cicada

Praying Mantids (Predators)

Color: Gray or Brownish Green.

Food: Any Insects They Can Capture, Pests and Beneficials.

Facts: Forelegs Used for Grasping Prey, Not for Walking.

(Carolina Mantid)

Image courtesy of Ric Bessin, Univ. of Kentucky (https://entomology.ca.uky.edu/ef418)

Chinese Mantid

Praying Mantis Egg Cases

When: In the Fall, Females Lay Eggs (up to 400).

Facts: Eggs are Laid in a Frothy Liquid that Hardens into a Protective Shell. The Hardened Egg Case is Usually Attached to Stems and Twigs.

Emerge: Nymphs Emerge in Spring or Early Summer.

(European Mantis)

Photo by David Cook

(Chinese Mantis)

Photo by David Cook

Robber Fly (Predators)

Color: Black, Gray, Beige, or Brownish-Yellow.

Fact: Ponce on Resting Insects From Above.

Food: Flies, Flying Ants, Small Bees, True Bugs, Grasshoppers, Moths, Butterflies, and Other Insects.

Photo by Drees.

Assassin Bugs (Predators)

Color: Varies From Gray-Brown to Black to Colored Markings.

Facts: Somewhat Flattened, Narrow Head, Stout Curved Beak.

Food: Flies, Mosquitoes, Beetles, Caterpillars, and Other Insects.

Warning: If Handled, Can Inflict a Painful Bite.

Assassin Bug Eggs

Spined Soldier Bugs (Predators)

Color: Grayish-Brown and Covered with Black Flecks.

Facts: Look Like Stink Bug but Have Sharp Spines on Thorax. Sold Commercially

Food: Caterpillars, Including Tent Caterpillars, Fall Armyworms, Cabbage Lopper, Imported Cabbageworm, Sawfly Larvae, Beetle Larvae.

Spined soldier bug nymph feeding on insect eggs courtesy of A. Windham

Spined soldier bug feeding on emerging periodical cicada

Florida predatory stink bug feeding on a kudzu bug

Image courtesy of A. Blalock

Big-Eyed Bugs (Predators)

Color: Usually Black or Pale Yellowish Green with Minute Black Spots on Head and Thorax.

Facts: 1/8 to 1/4 in. Long, Native Predators in Orchards and Field Crops.

Food: Aphids, Leafhoppers, Caterpillars, Plant Bugs, and Mites.

Geocoris punctipes image courtesy of Russ Ottens, University of Georgia, Bugwood.org

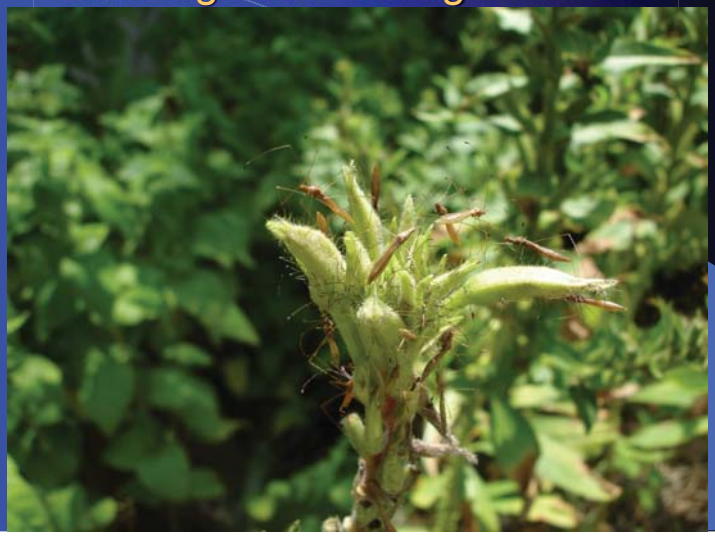
Minute Pirate Bugs (Predators)

Color: Black-and-White Patterned.

Facts: Sold Commercially to Control Greenhouse Pests.

Food: Adults and Nymphs Feed on Spider Mites, Thrips, Small Caterpillars, Leafhopper Nymphs, Small Insects, and Eggs.

Stilt Bugs on Evening Primrose



Damsel Bugs (Predators)

Color: Yellowish, Gray, or Brown.

Facts: Adults Overwinter and Emerge in April and May.

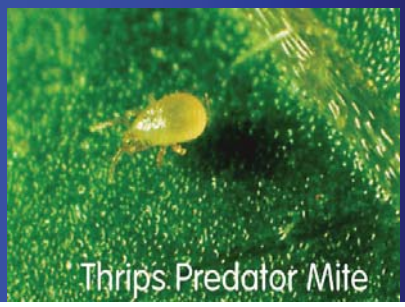
Food: Aphids, Thrips, Plant Bugs, Leafhoppers, Treehoppers, Small Caterpillars, and other Insects.

Predatory Mites

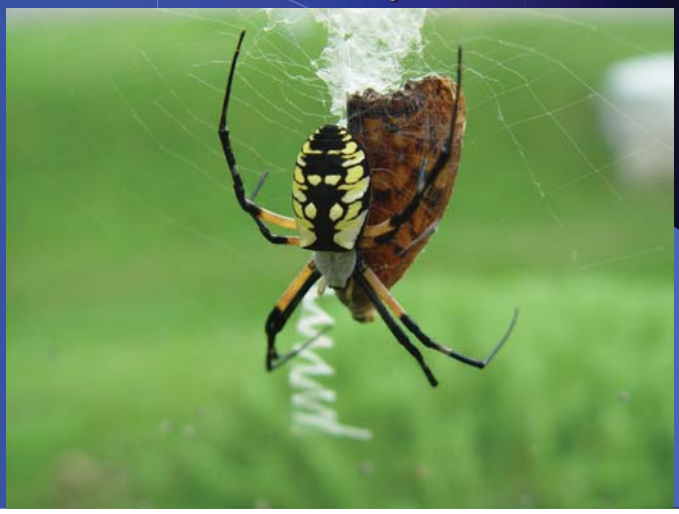
Color: Usually Orange-Red, Tan, or Brown.

Facts: About Same Size as Spider Mites, Usually Teardrop-Shaped, Move Quickly, Can Move Backwards as well as Forwards.

Food: Mites (Adults, Nymphs, Eggs), Thrips, Fungus Gnat Larvae and Eggs, and Other Small Insects.



Garden Spider



Orb weaver spider

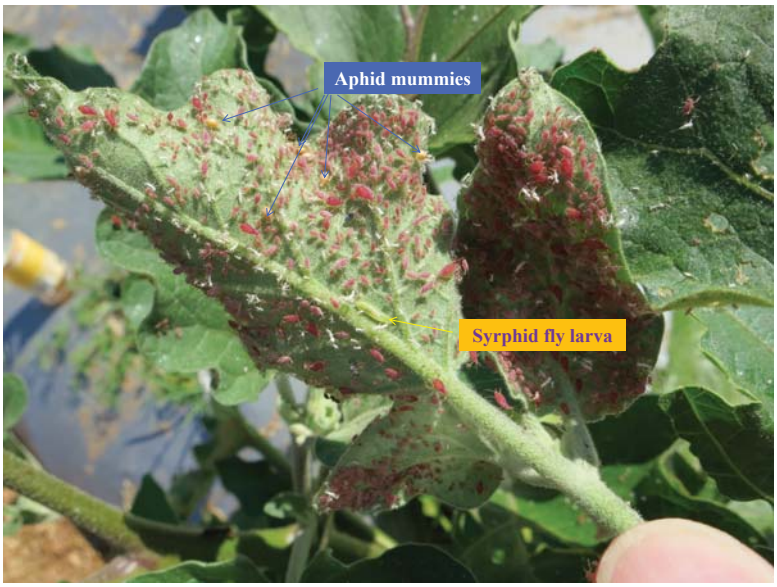
Parasitoid Wasps

'Parasitic Wasps' are not actually parasites, they are parasitoids. A true parasite is something that lives at the expense of its host but doesn't actually kill it. Parasitoids nearly always kill their host.

Trichogramma ostriniae **egg parasitoid image courtesy of Peggy Greb, USDA ARS, Bugwood.org**

Parasitized Tobacco Hornworm

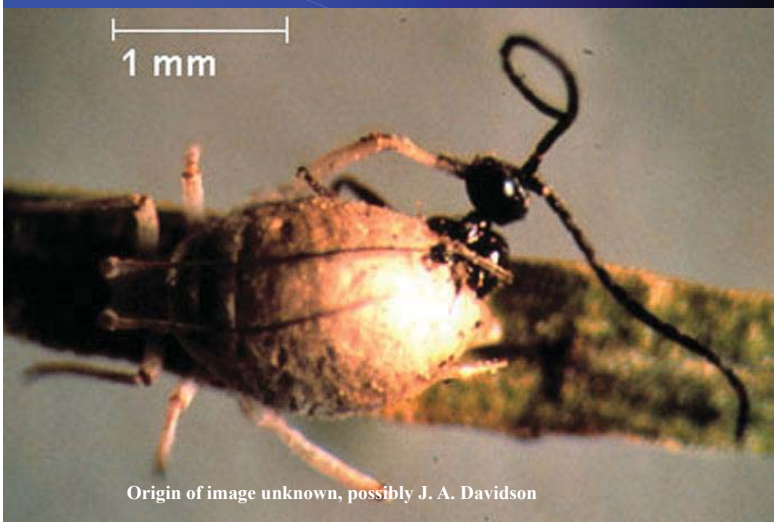
Cotesia congregata (Say) cocoons, a braconid wasp parasitoid



Aphidius colemani, a braconid parasitoid, laying an egg in an aphid

Image courtesy of David Cappaert, Bugwood.org

Braconid Parasitoid Wasp Emerging



Origin of image unknown, possibly J. A. Davidson

Braconid Parasitoid Wasp Emerged From Aphid

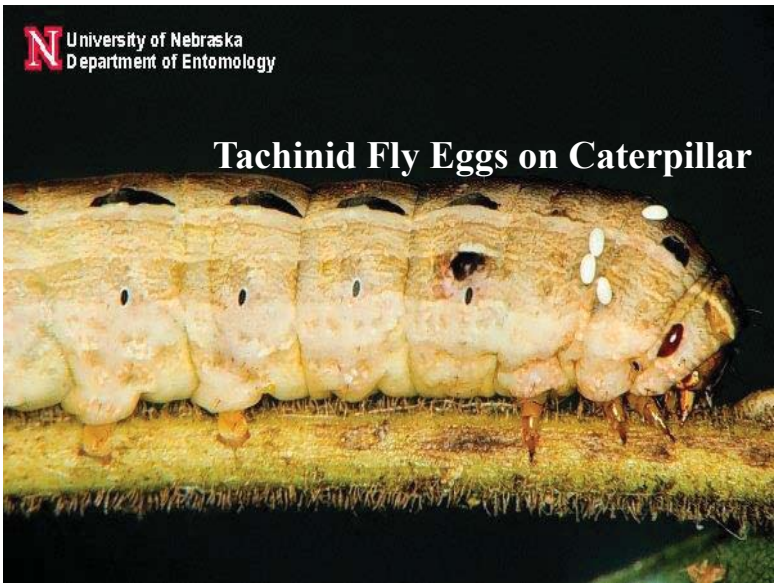
Image courtesy of Alan Windham, UT Extension

Parasitoid Tachinid Flies

Color: Gray, Brown, or Black with Lighter or Colorful Markings.

Facts: Females Lay Eggs or Deposit a Newly Hatched Larva on the Skin of Host. Maggot (larva) will Burrow Into Host to Feed.

Food: Caterpillars, Sawflies, Squash Bugs, Stink Bugs, Grasshoppers.



Cicada parasite beetle (cedar beetle)

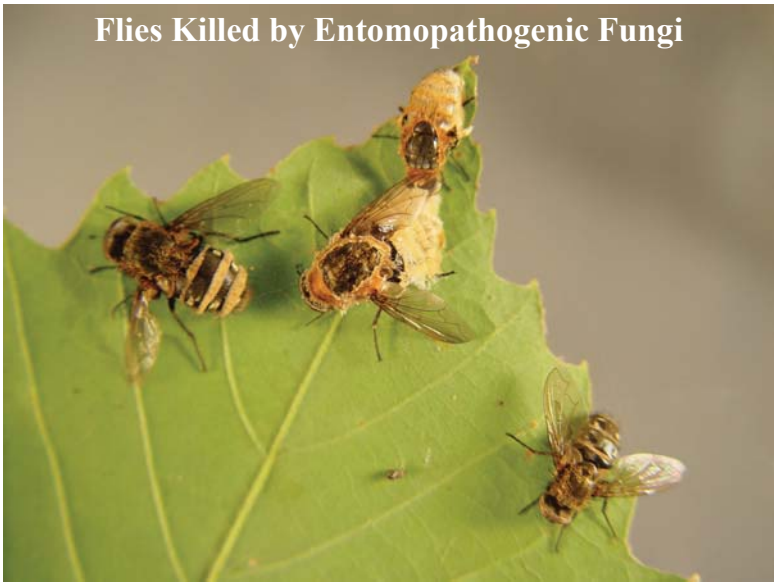
The larvae of cicada parasite beetles attach to periodical cicada nymphs and feed on their hemolymph

White Grub Killed by Cordyceps Fungi

Image courtesy of Ron Johnson, UT Extension

Dog-day Cicada Killed by Cordyceps Fungi

Flies Killed by Entomopathogenic Fungi



Soldier Beetles Killed by Entomopathogenic Fungi

Images courtesy of A. Windham, UT Extension

Advantages of relying on beneficials

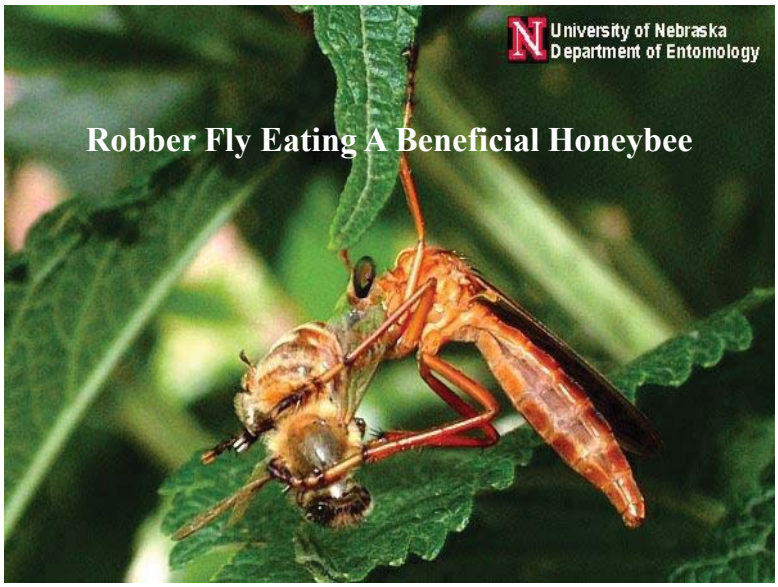
- Requires little work by the gardener.
- Do not have to mess with insecticides.
- Causes no environmental pollution.
- Beneficials may keep pace with pest populations, in some cases.
- Gardener becomes familiar with both pests and beneficials.

Disadvantages of relying on beneficials

- Beneficials may not appear until large pest populations occur.
- Beneficials may leave property when available food is gone.
- Some beneficials may eat other beneficials.
- Gardener must know "good guys" from the "bad guys."
- Must be willing to accept some damage or less-than-perfect plants.

Chinese Mantid Eating Butterfly

Image courtesy of Joe Masabni



Attracting Beneficials

Provide habitat

- Avoid using pesticides which kill beneficial insects in addition to the pests
- Turfgrass is home to ground beetles, tiger beetles, rove beetles, and spiders

Attracting Beneficials

Provide habitat

- Permanent mulched beds are undisturbed homes for centipedes and other beneficial ground-dwellers
- Landscape with rocks or other items that provide insects shelter
- Provide blooming trees, shrubs, perennials, biennials, and annual plants from early spring through the fall provide food and habitat for beneficial organisms

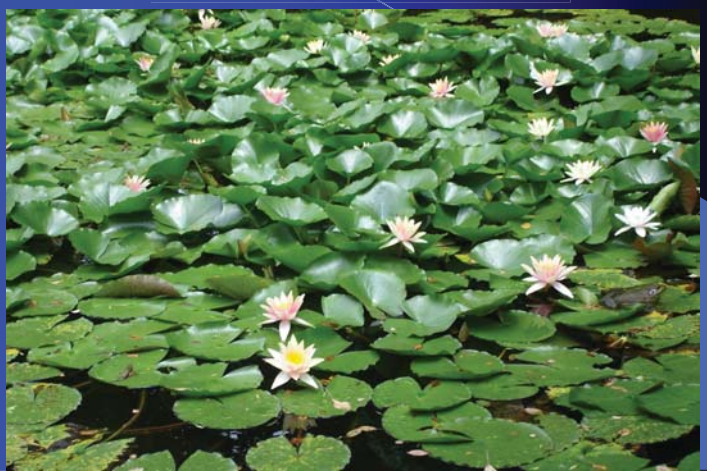
Turfgrass, Trees, Plant Beds, and Water Provide a Diverse Environment

Cheekwood Botanical Garden

Attracting Beneficials with Water

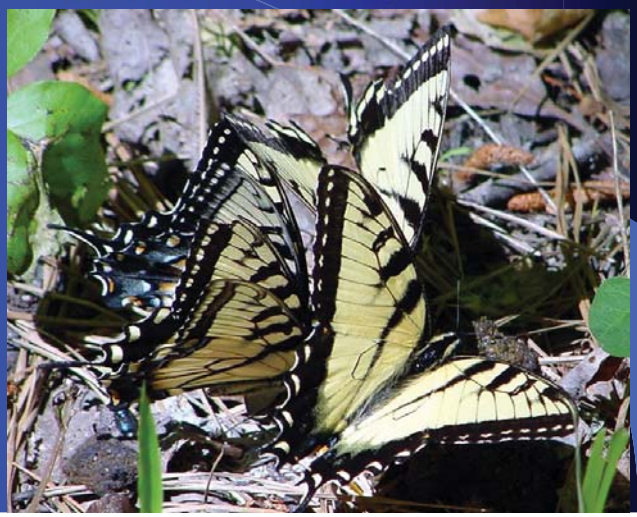
- The use of small ponds with aquatic plants will attract aquatic insects such as dragonflies
- Provide dry areas in water sources for butterflies & other insects to land by placing rocks or gravel in the birdbath or other shallow container.
- Provide mud or wet sand areas on the edge of ponds to attract butterflies, bees and other insects to drink

Cool Cool Water



Dragonfly

Swallowtails obtaining minerals



A Diverse Landscape Attracts Beneficials and Retains Them

UT Garden in Knoxville

Attracting Beneficials

Food

- Provide plants that will provide pollen and nectar as food sources for adult parasitoid insects (parasitoid wasps, tachinid flies etc.)
- Grow berry-producing trees and shrubs as food for birds

Soldier Beetle Feeding on Pollen

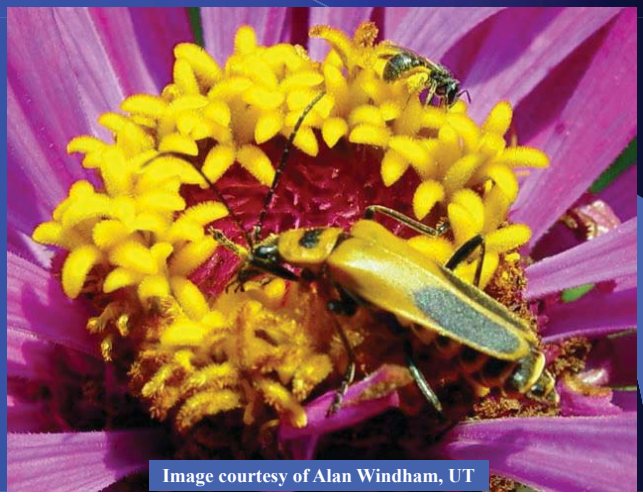


Image courtesy of Alan Windham, UT

Start Early with Flowering Plants

Attracting Beneficial Insects with Native Flowering Plants

- Wild strawberry, angelica, cow parsnip, lanceleaf tickseed, swamp milkweed, horsemint, Missouri ironweed, new England aster, smooth aster, Riddell's goldenrod and others
- Broadleaf flowering weeds (white clover, dandelions) in lawns provide pollen & nectar
- Mow pastures, fields and lots infequently

A. Fiedler, J. Tuell, R. Isaacs, and D. Landis, Dept. of Entomology, Michigan State U.

Flowers, Flowers and More Flowers

Redbud

National Audubon Society Recommended Plants for Beneficial Insects

- Aster
- Buckwheat
- Coneflower
- Coreopsis,
- Goldenrod
- Ironweed
- Joe-pye weed
- Sunflowers

Plant parsley, dill or fennel while alyssum is also great for attracting parasitoid wasps

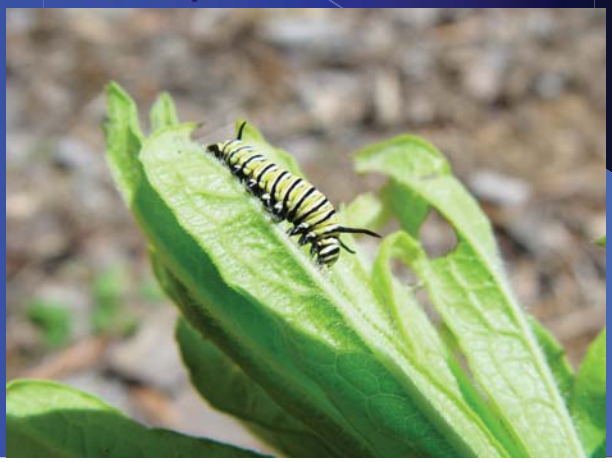
Carrot Family

- Parsley, carrots, fennel, dill, angelica, anise, celery, caraway, coriander (including celantro), cumin, Queen Anne's lace are excellent sources of nectar, especially for green lacewings and wasp parasitoids

Parsley is also a host plant for the parsleyworm (caterpillar of the black swallowtail butterfly)

Pipevine Swallowtail Caterpillars on Pipevine

Monarch Butterfly
Caterpillar on Milkweed



Questions?

SOIL, PLANT & PEST CENTER

UT EXTENSION

INSTITUTE OF AGRICULTURE

THE UNIVERSITY OF TENNESSEE

Real. Life. Solutions.