

The *PAMS* approach

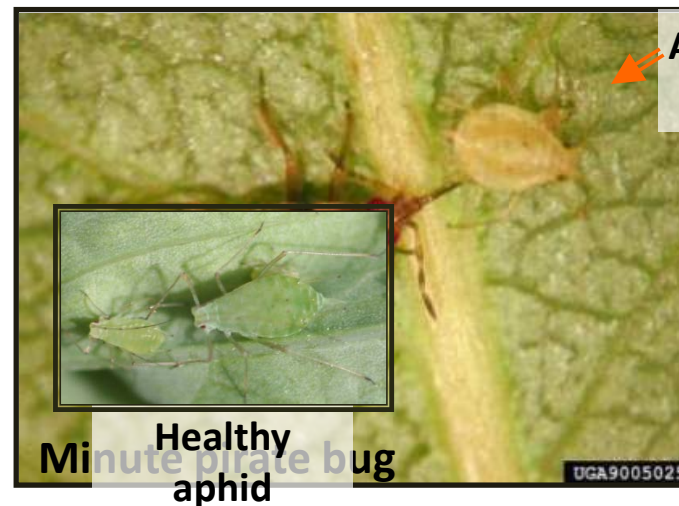
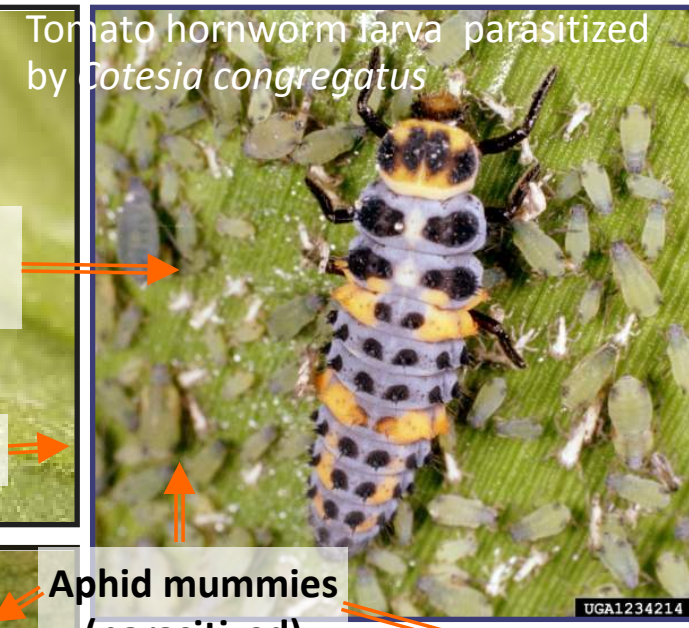
Prevention, Avoidance, Monitoring and Suppression

Meet the Beneficials: Natural Enemies of Insect Pests

- **Predator:** Organisms that attack, kill, and feed on several to many other individuals (prey) in their lifetime.
- **Parasitoids:** Larval stages of insect parasites feed on or inside of other insects, killing their hosts. Adults are free-living wasps or flies.

Natural Enemies

- **Predators** (e.g., beetles & predatory bugs)
- **Parasitoids** (parasitic wasps, some flies)
- **Pathogens** (viruses, bacteria, fungi)



Aphid mummies
(parasitized)

Any activity involving the manipulation of natural enemies to maintain pest populations below damaging levels

- Conserving natural enemies is one aspect of biological control that can effectively reduce pest populations and damage
- Each time a spray is applied, more predators and parasites are killed, and you inherit their work!

Aphids

Pest of most vegetable crops.

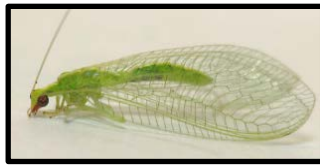


Green Peach Aphid *Myzus persicae*
Others – cotton & potato aphids, etc.

Biol. Control agents



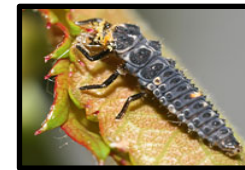
Lacewings
Chrysoperla rufilabris



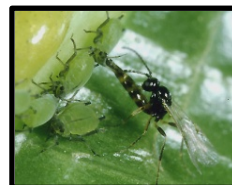
Predatory midge
Aphidoletes aphidimyza



Minute pirate bugs
Orius insidiosus



Ladybeetles
Hippodamia convergens



Parasitic wasps
Aphidius testaceipes



Courtesy of Dr. Tom Coudron
(USDA-ARS)



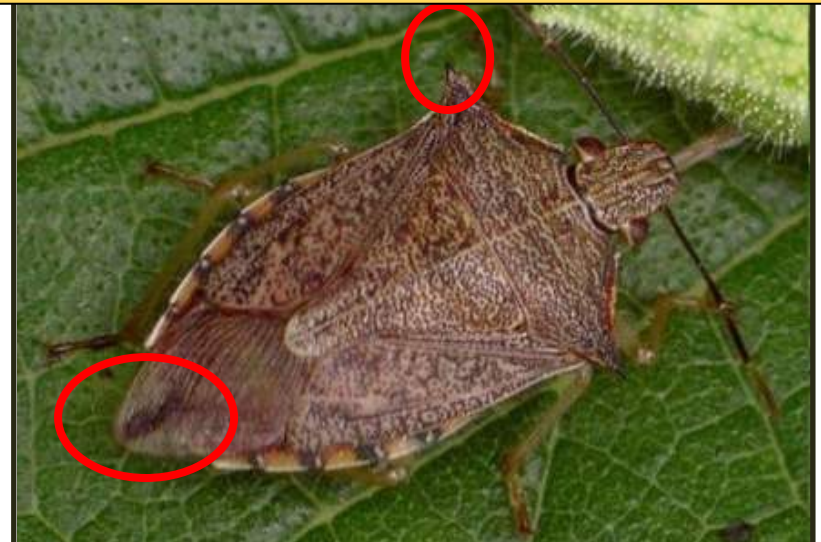
UC Statewide IPM Project



Plant-feeding stink bugs (*below, left*) have a slender beak that is used to pierce plant tissue
 Predatory bugs (*below, right*) have prominent spurs on the "shoulders" (thorax).

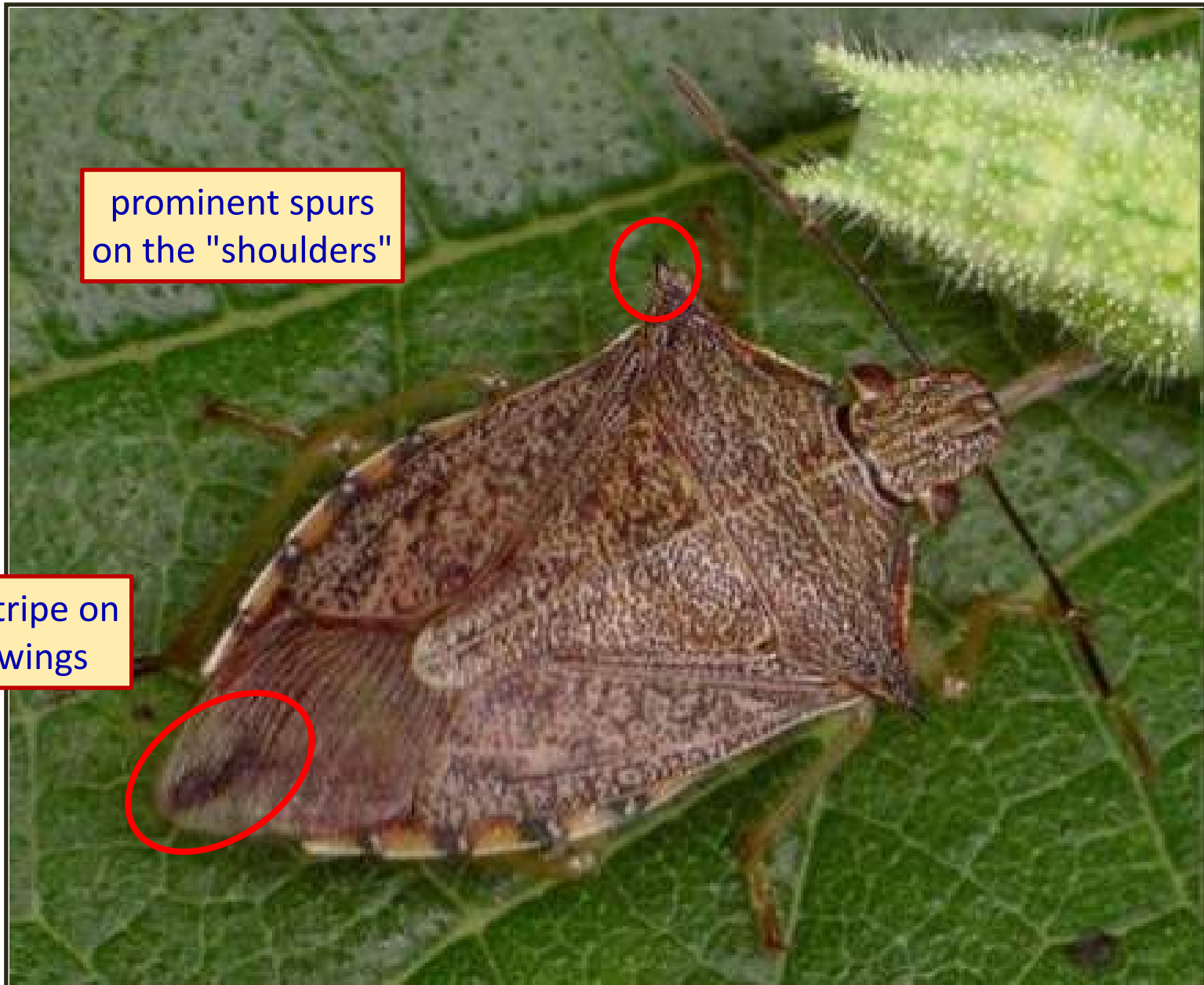


Brown stink bugs cause serious damage to ripening fruits (whitish-yellow spots or rings under the skin of ripening tomatoes).



Spined soldier bug is a beneficial bug. Both nymphs and adults feed on caterpillars and the larvae of pest beetles.

Spined soldier bug: a beneficial bug!



prominent spurs
on the "shoulders"

Black stripe on
hind wings

Promote build-up of natural enemies

By limiting the use of insecticides, populations of beneficials are enhanced, keeping pests in check





UGA1234214



Minute pirate bug

UGA9005025

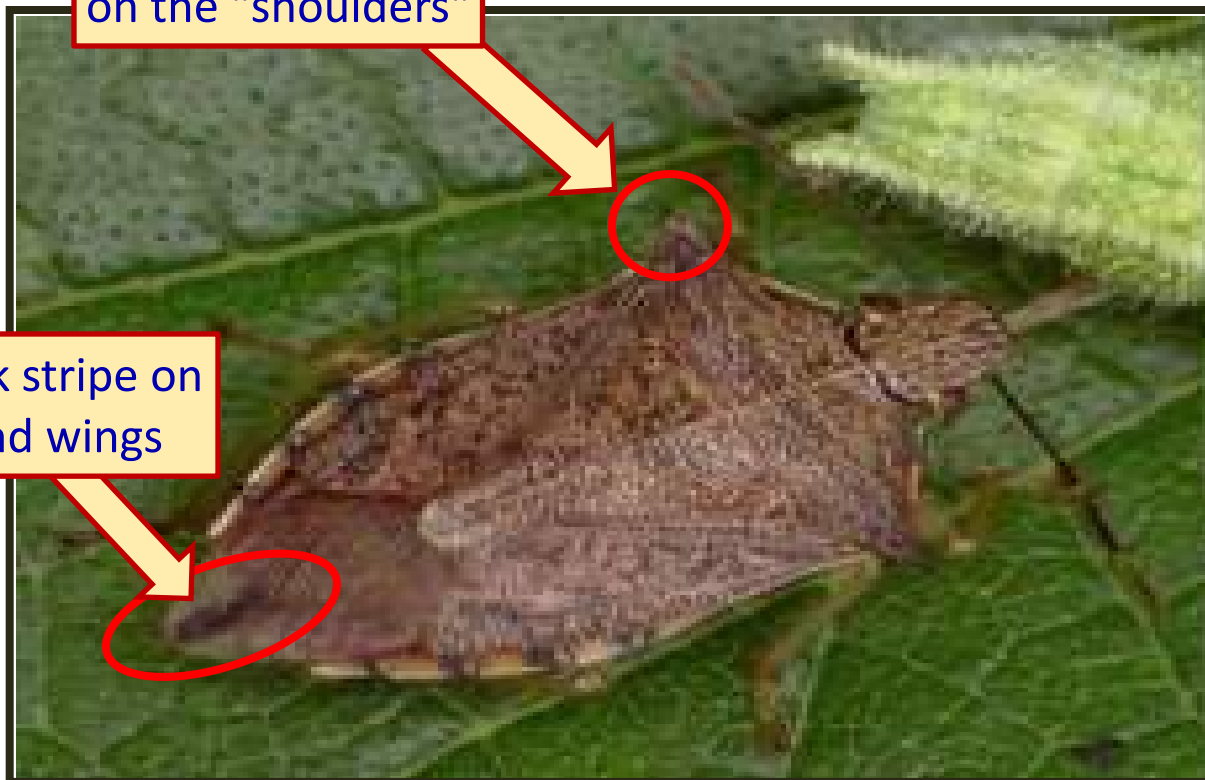


Spined Soldier Bug: A beneficial stink bug!

Both nymphs and adults feed on caterpillars and the larvae of pest insects

prominent spurs on the "shoulders"

Black stripe on hind wings



2nd and 3rd instar nymphs feeding



5th instar nymph

Live insects courtesy of Dr. Tom Coudron (USDA ARS Biological Control of Insects lab, Columbia, MO)



Cilantro



Buckwheat



Collards



Alyssum



Buckwheat