# APPLE INSECT PESTS

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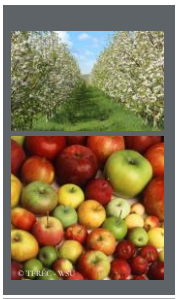

## Apple insect pests

- Codling moth
- Oriental fruit moth
- Plum curculio
- Apple maggot
- Stink bugs
- Periodical cicada
- Rosy apple aphid
- Woolly apple aphid
- European red mite
- Japanese beetle
- San Jose scale
- Dogwood borer
- Black stem borer
- Spotted lanternfly

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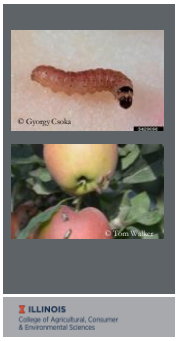

## Codling moth

- Most damaging pest of apple and pear
- Two generations per year at least
- Once the caterpillar is in the fruit, it becomes a cull

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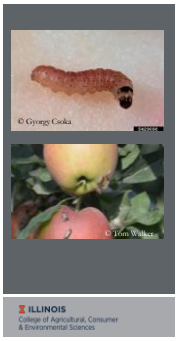
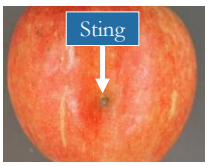
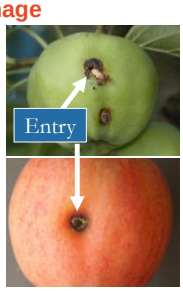


## Codling moth damage

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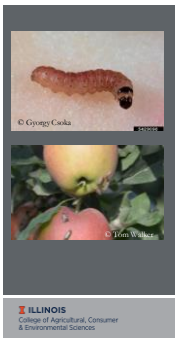

## Codling moth

- Overwinters as caterpillars
- Adult flight in late April or early May
- Moth numbers increase four-fold with each generation

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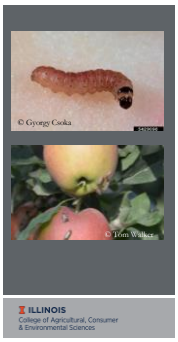

## Codling moth control

- Target the first generation
- Pest control toolbox
  - Mating disruption
  - Ovicides
  - Larvicides

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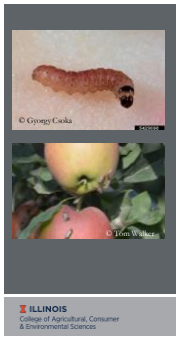


## Mating disruption

- First line of defense
- Delays and prevents egg laying
- Before earliest moth emergence
  - At bloom or 100 degree days
- Hand applied dispensers
  - Upper third of the tree canopy
  - 200-400 per acre depending on label rate

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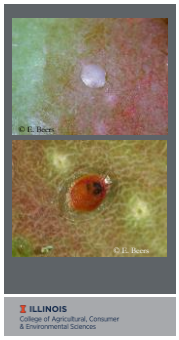


## Ovicides

- Second line of defense
- Prevents egg hatch by suffocating eggs
- Superior oil
  - Easier on natural enemies than other pesticides because of short residue time, about 1 day
  - Delayed first cover strategy
    - 375 degree days

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## Larvicides

- Third line of defense
- Target newly hatched caterpillars before they enter fruit
- Conventional pesticides
- Granulosis virus
- Very precise timing is required
  - Once caterpillar enters the fruit, it is too late
- Delayed first cover strategy
  - 525 degree days
  - Repeat every 5-7 days

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## Conventional ovicides and larvicides

- Degree day targets for some insecticides
  - 50 to 150 DD – Rimon
  - 100-200 DD – Assail, Esteem, Intrepid
  - 250 DD – Altacor, Danitol, Delegate, pyrethroids
    - Second spray in 10 days for high numbers
    - More than 10 moths/trap/week
  - 1050 DD 1st generation flight, biofix for 2nd generation
  - 1300 DD 2nd generation egg hatch

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## Monitoring and sanitation

- First generation treatment is essential
- Subsequent treatment is not always essential
  - Pheromone traps
    - 1 per 10 acres
    - 5 male moths per trap per week
  - Sanitation

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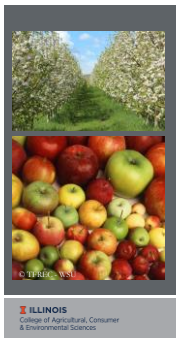


## Oriental fruit moth (OFM)


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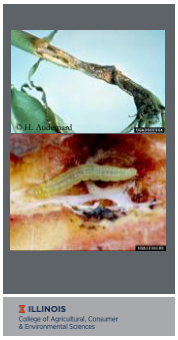

## Oriental fruit moth damage

- Overwinters as caterpillar in a cocoon
- Pupate in late March
- Early season OFM damages succulent terminal growth
- Attacks fruit in mid-summer
  - Caterpillar bore to center of peach and feed around the pit
  - Fruit often drops
- Can be 6-7 generations per year
  - 2nd and 3rd generations are most damaging
  - Serious damage when populations are high

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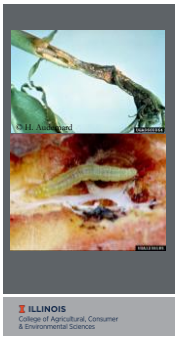

## Oriental fruit moth damage

- Mating disruption at pink (400 twist ties per acre)
  - Determine need for sprays at petal fall
- Monitoring using pheromone traps
  - One trap per 10 acres
- Threshold 7 moths per trap per week
- Superior oil for eggs
- Altacor
- Pyrethroids (Asana, Baythroid, Danitol, Mustang Maxx, Pouce)
- Assail
  - Be very careful with these around bees
- Delegate
- Diamides (Altacor, Exirel, Verdepryn)
- Rimon

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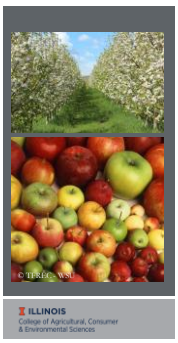

## Plum curculio

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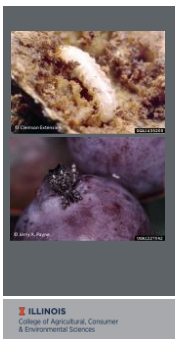

## Plum curculio

- Overwinters as an adult
- Migrate into orchard in spring
- Lays eggs in fruit
- Larvae hatch 5 days
- One generation per year

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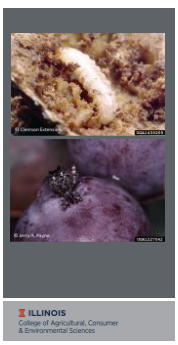

## Plum curculio

- Adults
  - Egg laying causes crescent shaped damage
  - Surface feeding scars
- Larvae
  - Premature drop of fruit

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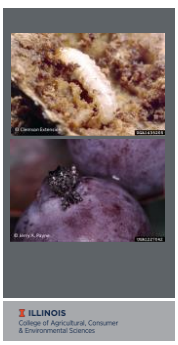

## Plum curculio control

- Shake infested trees
- Clean up fallen fruit
- Insecticides at petal fall, first cover
- Insecticides for adults
  - Pyrethroids (Asana, Baythroid, Danitol, Mustang Maxx, Permethrin, Proaxis, Warrior II)
  - Neonicotinoid (Actara, Assail, Belay)
    - Be very careful with these around bees
  - Apta
  - Avaunt
  - Exirel

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## Apple maggot

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## Apple maggot

- Overwinter as pupa
- Adults emerge around July 1
- Feed outside orchard
- Lay eggs under skin of apples
- Lay hundreds of eggs
- Larvae feed on apples 3 to 4 weeks
- Apples drop, larvae pupate in soil

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## Apple maggot damage

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## Apple maggot control

- Sanitation!
- Red sticky balls
  - Hang in June for determining presence
  - Threshold 1 adult

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## Apple maggot control

- Insecticides at third cover
  - Pyrethroids (Asana, Baythroid, Danitol, Delta Gold, Mustang Maxx, Proaxis)
  - Neonicotinoids (Assail, Belay)
  - Sevin

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## Stink bugs

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## Stink bug damage

- Overwinter as adults
- Emerge in April through June
- Mate multiple times
- Five nymphal stages
- One to two generation per year


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## Stink bug damage

- Damage to fruit
- Corky, pithy areas from feeding


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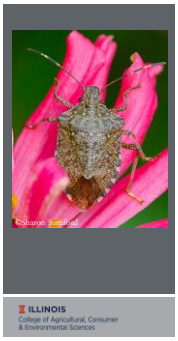


## Stink bug control

- Insecticides
  - Pyrethroids (Azera, Baythroid, Brigade, Danitol, Mustang Maxx, Warrior II)
  - Neonicotinoid (Actara, Venom)
    - Be very careful with these around bees


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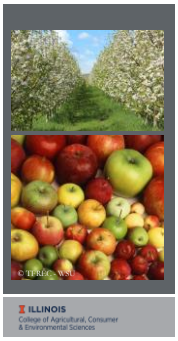


## Periodical cicada



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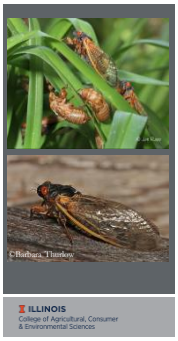


## Periodical cicada

- Late may into June nymphs dig out of ground
- Nymphs climb up and the adults emerge
- 7- 10 days later, female starts laying eggs
- One female can lay up to 400 eggs
- Slice into small branches
- Nymphs in soil for 17 years

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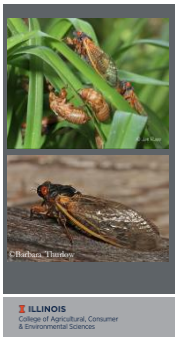


## Periodical cicada damage

- Fruit tree damage
  - Egg laying branch damage
    - Small trees
  - Root feeding
    - Nutrients that would otherwise go to tree and fruit


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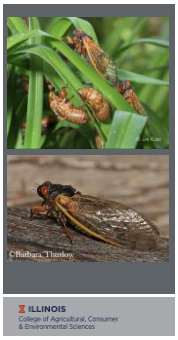


## Periodical cicada control

- When male singing is noted, scout orchards a week later for females
- Cultural control
  - Delayed planting
  - Delayed pruning
  - Netting

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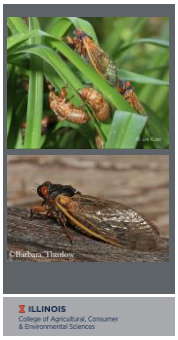


## Periodical cicada control

- Insecticides
  - Excellent or good efficacy
    - **Asana**
    - **Danitol**
    - Sevin
  - Labeled but unknown efficacy
    - **Baythroid, Delta Gold, Proaxis, Warrior II**
    - Neemix

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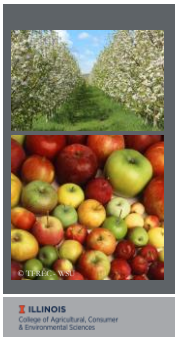


## Rosy apple aphid


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## Rosy apple aphid

- Eggs laid on bark
- Hatch occurs between silver tip and ½ inch green
- Aphids prefer to feed on fruit buds
- Single female averages 185 young
- 4 generations per year

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## Rosy apple aphid damage

- Leaf curl
- Fruit distortion
- Decrease in tree vigor
- Sooty mold



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## Rosy apple aphid control

- Delayed dormant oil
  - Between green-tip and ½ inch green
  - Controls newly hatched aphids
  - Less disruptive to natural enemies
- Economic thresholds
  - Examine 4 leaf terminals on each of 5 scaffold limbs at pink
    - Record number of aphid infestations
    - Treatment when 5% of terminals have aphids

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## Rosy apple aphid control

- Prior to leaf curl
- 1-2% insecticidal soap or summer horticultural oil
- Conventional insecticides
  - Secondary pest outbreaks

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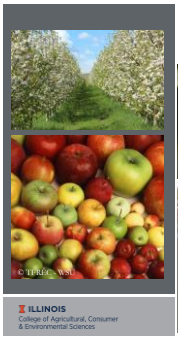

## Wolly apple aphid

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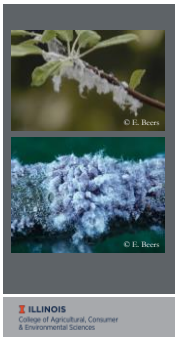

## Wolly apple aphid

- Colonies at wound sites on trunks, limbs, and twigs
- Feed on tender bark
- Larger populations
  - Feeding on roots
    - Where greatest damage occurs
    - Control is very hard here
- Several generations every year
- Overwinter as eggs

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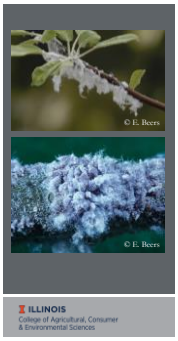

## Wolly apple aphid damage

- Yellowish foliage
- Stunt or kill young trees
- Sooty mold

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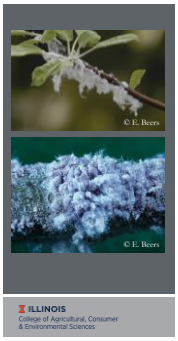

## Wolly apple aphid control

- Monitoring
  - Examine 4 pruning scars on each of 5 scaffold limbs per tree
  - Live aphids
    - Natural enemies
  - Threshold, 10% of pruning scars infested
- Control
  - Diazon, Closer, Beleaf, Movento, Admire Pro
  - Only above ground infestations

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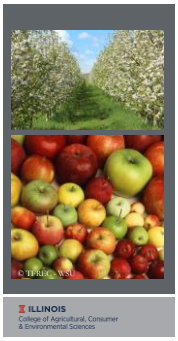
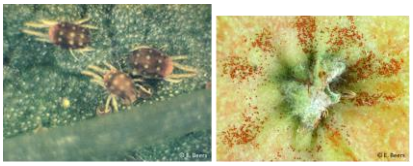


## European red mite

- Overwinter as eggs in bark
- 6-8 generations per year, 14 days
- Can be difficult to control



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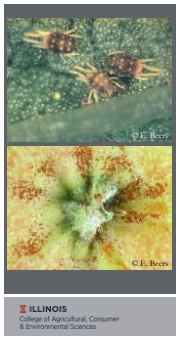

## European red mite

- Infest leaves and damage fruit
- Reduce tree growth, yield
- Bud formation

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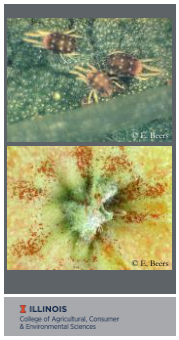

## European red mite

- Conserve and introduce natural enemies
- Commercially available predators
- Avoid broad-spectrum insecticide applications to conserve natural enemies
- Insecticides tend to cause secondary outbreaks
- Use horticultural oil as a delayed/dormant application
- If previous season had heavy outbreaks, apply oil just before bud break

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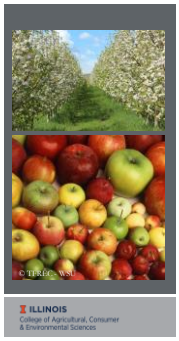

## Japanese beetles

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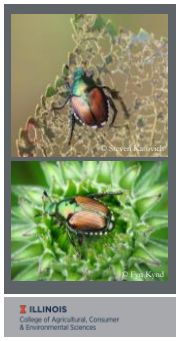

## Japanese beetles

- Overwinter as grub
- Adults emerge in June
- Feeding damage in late June
- Adults lay eggs in soil, 40-60
- Grubs take 10 months to develop

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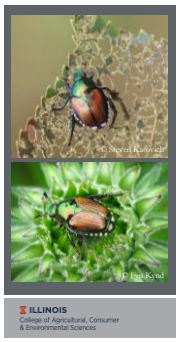

## Japanese beetles

- Feed on leaves, flowers and overripe or wounded fruit
- Skeletonized leaves
- Beetles attract more beetles

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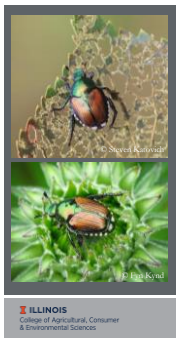

## Japanese beetles

- Japanese beetle traps
- Often attract way more beetles than are caught
- Physical removal
- Shake plants early in the morning
- Insecticides
- Pyrethroids (Danitol, Proaxis, Warrior II)
- Neonicotinoids (Admire Pro, Assail)
- Sevin
- Diamides (Exirel, Verdepryn)

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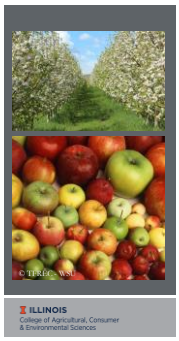

## San Jose scale

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## San Jose scale

- Overwinter as immature scales on tree
- In spring, adults emerge and mate
- Females give birth to crawlers, no egg stage
- Crawlers move around settle down and secrete scale covering
- Two generations per year

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## San Jose scale damage

- Sucking insect
- Injects toxin in plant causing localized discolorations
- Kills limbs or entire tree in a few years

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## San Jose scale control

- Pheromone traps prior to bloom
  - Biofix, male trap catch
- Crawlers are the only stage susceptible to insecticides
- Crawler emergence begins at 380-400 DD
- 600-700 DD best time for spraying
- Insecticides
  - Belay
  - Centaur
  - Esteem
  - Movento
  - Sivanto Prime

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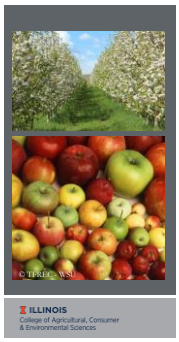

## Dogwood borer

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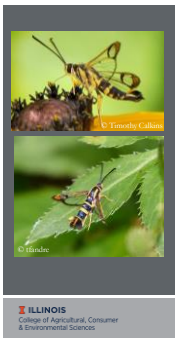

## Dogwood borer

- Adults emerge in spring
- Lay eggs on bark, preferring injured areas, burr knots
- Eggs hatch, 8-9 days
- Larvae enter bark wounds and form feeding galleries
  - 7 instars
- One generation per year

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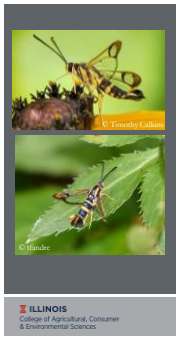

## Dogwood borer damage

- Trunk damage
- Sloughing of bark
- Branch dieback

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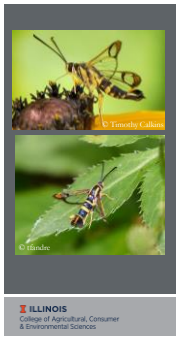

## Dogwood borer control

- Mating disruption – bloom
- Monitoring
  - Sticky traps with lure
  - Hang in tree in early spring
- Insecticides – 1st and 2nd cover
  - 10-14 days after 1st males caught
  - Altacor
  - Assail, Diazinon, Lorsban
    - Highly toxic to bees

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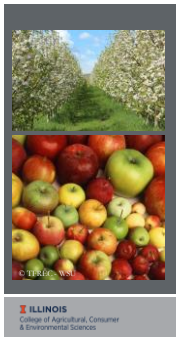
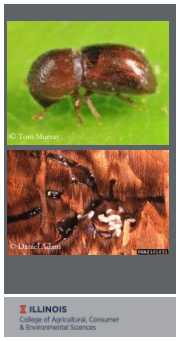


## Black stem borer

57



## Black stem borer

- Adults emerge in spring
- Lay eggs in sapwood
- Cultivate fungal gardens
- Gallery can contain up to 100 larvae
- Up to 2 generations a year

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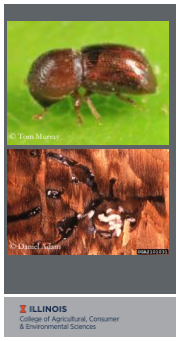

## Black stem borer damage

- Attacks stressed trees
- Prefers young trees
- Scouting
  - Look for holes in wood made by borer
  - Ethanol traps

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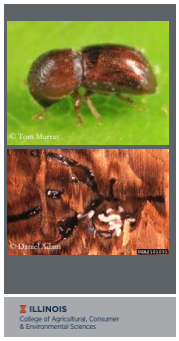
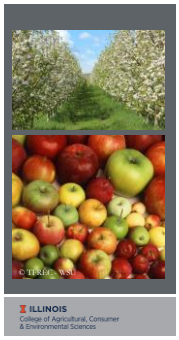


## Black stem borer control

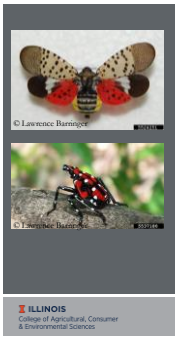
- Truck sprays have very little effect generally
- Female flight
  - Trunk spray of long lasting pyrethroid
  - Generally at 75 degree days
  - Between ½ inch green and pink
- Remove trees with excessive symptoms of decline and burn them

60




## Spotted lanternfly

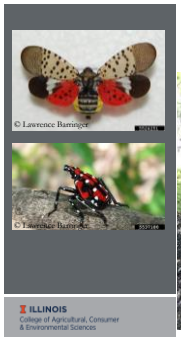

61




## Spotted lanternfly

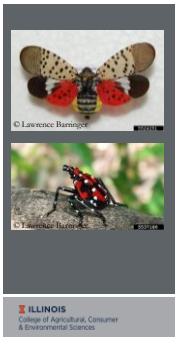


62



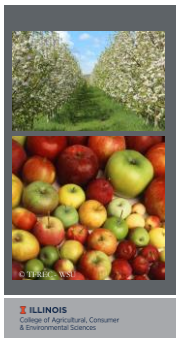

## Spotted lanternfly

63




## Spotted lanternfly


64

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