



# Tree Fruit Aphid Biology & Management

Diane Alston  
Entomologist  
Utah State University

Northern Utah Fruit Growers Meeting  
Brigham City, UT  
January 28, 2016

# Common Tree Fruit Aphids in Utah

- Apple
  - Rosy Apple Aphid
  - Green Apple Aphid
  - Woolly Apple Aphid
- Cherry
  - Black Cherry Aphid
- Peach
  - Green Peach Aphid
- Plum
  - Mealy Plum Aphid
  - Leaf Curl Plum Aphid



How to identify aphids:

- green, black, pink, purple
- small, soft pear-shaped bodies
- slow moving
- pair of “tailpipes” – cornicles  
exude defensive fluid
- adults with & without wings

We'll look at their biology in two ways:

1. phenology in relation to tree development
2. life cycle & host plants

# Phenology: Rosy Apple Aphid & Green Apple Aphid

## Apple



Monitor

eggs on limbs



Monitor

nymphs & adults on new growth



eggs on limbs



Stages of Development											
											Post-Harvest
Dormant	Green Tip	Half-inch Green	Tight Cluster	Pink	Full Bloom	Post Bloom	June	July	August	Sept.	

# Rosy Apple Aphid

- Can be a severe pest of apple
- Early-season pest
- Severe leaf curling
- Fruit distortion
  - Inject a toxin when feeding
  - Affected fruit unmarketable



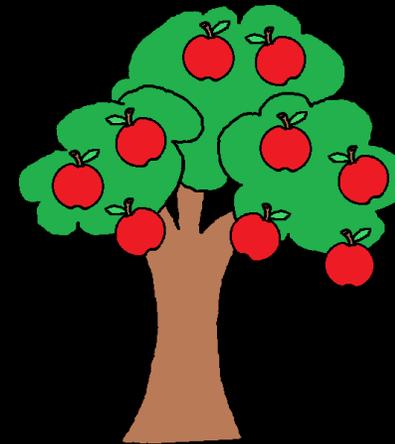
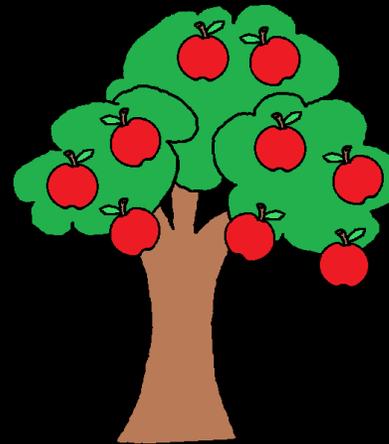
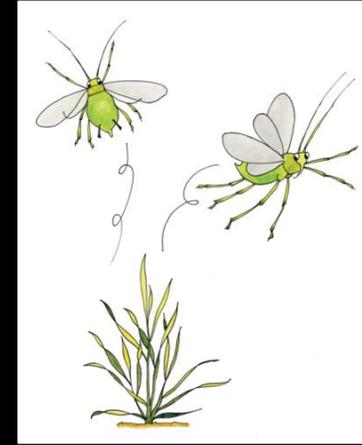
RAA are purplish with a waxy coating



Severe leaf curling & misshapen fruits

# Rosy Apple Aphid

- Winged adults form in late spring
- Migrate to summer host
  - Plantain
    - Buckhorn plantain or ribgrass
    - Broadleaf plantain
- Winged adults form in fall
- Migrate back to apple trees
  - Lay eggs on fruit spurs and twigs
  - Shiny black “small grains of rice”



# Green Apple Aphid

- Most common aphid in apple
- Other hosts:
  - pear
  - hawthorn
  - pyracantha
  - quince
- Infest succulent shoots
- Can feed on fruits
- Remain on apple throughout season



Yellow-green body with black cornicles



Feed on new growth

# Management of Rosy & Green Apple Aphids

## • Green Tip to Half-Inch Green

- 2% Dormant Oil +
- Lorsban 4E
- Diazinon 50W



## • Post-Bloom

- Assail
- Closer SC
- Sivanto 200SL
- Ultor
- Calypso 4F (RAA)
- Admire Pro (GAA)
- Belay (GAA)
- Lannate (GAA)
- Insecticidal Soap
- Neemix
- 1% Horticultural Oil

# Aphid Biological Control



Convergent Lady Beetle



Syrphid or Hover Fly

Brown Lacewing



Green Lacewing



# Phenology: Woolly Apple Aphid

## Apple



Monitor → Monitor

overwinter on roots & in bark crevices

feed on limbs & fruits

twig & root galls

Stages of Development											
											Post-Harvest
Dormant	Green Tip	Half-inch Green	Tight Cluster	Pink	Full Bloom	Post Bloom	June	July	August	Sept.	

# Woolly Apple Aphid

- Can be a severe pest of apple
- Mid- & late-season pest
- Forms galls on roots & twigs
  - reduced tree vigor
  - stunted roots & trees
- Contaminate stem bowl of fruit



Root galls



Aphids covered in white woolly wax



Twig galls disrupt transport of nutrients & water



# Woolly Apple Aphid Biological Control



Aphid mummies

*Aphelinus mali*  
parasitoid wasp of WAA



Aphid Predators:

ladybeetles

lacewings

syrphid flies



Alyssum planted to attract  
Syrphid flies to nectar & pollen

# Management of Woolly Apple Aphid

- Petal Fall

- Ultor

- 1 or 2 applications (14 d)



- Post-Bloom when WAA first observed

- Diazinon 50W
  - Assail 70WP
  - 1 to 1.5% Horticultural Oil



# Phenology: Black Cherry Aphid Sweet Cherry



Monitor → Monitor

eggs on limbs



nymphs & adults on new leaves



adults fly to  
mustard weeds



fly to cherry trees  
eggs on limbs

## Stages of Fruit Tree Development

										Post-Harvest
Dormant	Green Tip	Tight Cluster	White Bud	First Bloom	Full Bloom	Petal Fall	June	July	August	

# Black Cherry Aphid

- Large shiny metallic black aphid
- Spring pest
- Severe leaf curling
- Distortion of leaves
- Red discoloration of leaves
- Excessive honeydew gums up fruit
- Growth of black sooty mold



# Black Cherry Aphid

- Winged adults form in late spring
- Migrate to summer host
  - Mustard family plants
    - Shepherd's purse
    - Hoary cress
    - Dyer's woad
- Winged adults form in fall
- Migrate back to cherry trees
  - Lay eggs on limbs
  - Shiny black "small grains of rice"



Mustard family  
weeds



Shepherd's purse  
Hoary cress  
Dyer's woad

# Management of Black Cherry Aphid

## • Bud Swell to First White

- 2% Dormant Oil +
- Diazinon 50W
- Beleaf 50 SG



## • Petal Fall to Early Summer

- Admire Pro
- Assail
- Actara
- Aza-Direct
- Beleaf
- Insecticidal Soap

Aphid Predators:  
lady beetle, lacewing,  
syrphid fly



# Phenology: Green Peach Aphid Peach & Nectarine



Monitor Monitor

eggs on limbs

nymphs & adults on new leaves

adults fly to  
summer hosts

fly to peach trees  
eggs on limbs

Stages of Development											
Dormant	Swollen Bud	1/4-inch Green	Pink	First Bloom	Full Bloom	Petal Fall	June	July	August	Sept.	

# Green Peach Aphid

- Yellow-green body with 3 dark green stripes on back
- Winged adult has black head & thorax, yellow-green body
- Severe leaf curling & honeydew
- Flowers & fruits abort
- Feed on nectarine fruits
  - Fruit bumpy & unmarketable
- Reduce shoot vigor, retard growth



Wingless & Winged GPA



Severe leaf distortion Damaged nectarine fruit

# Management of Green Peach Aphid

## • Swollen Bud to First Pink

- 2% Dormant Oil +
- Asana XL
- Diazinon



## • Shuck Split

- Admire Pro
- Assail
- Closer SC
- Actara
- 1% Horticultural Oil
- Insecticidal Soap



Biological Control!



lady beetles, lacewings,  
syrphid flies, predaceous bugs



# Orchard Leafroller Survey 2014 & 2015

Collaboration with Marion Murray, USU  
Utah Specialty Crop Block Grant



# Leafroller Species Present in Utah Orchards



**Obliquebanded leafroller**  
Primary species in N. UT  
Commercial orchards  
2 gens./yr  
June & August/early Sep

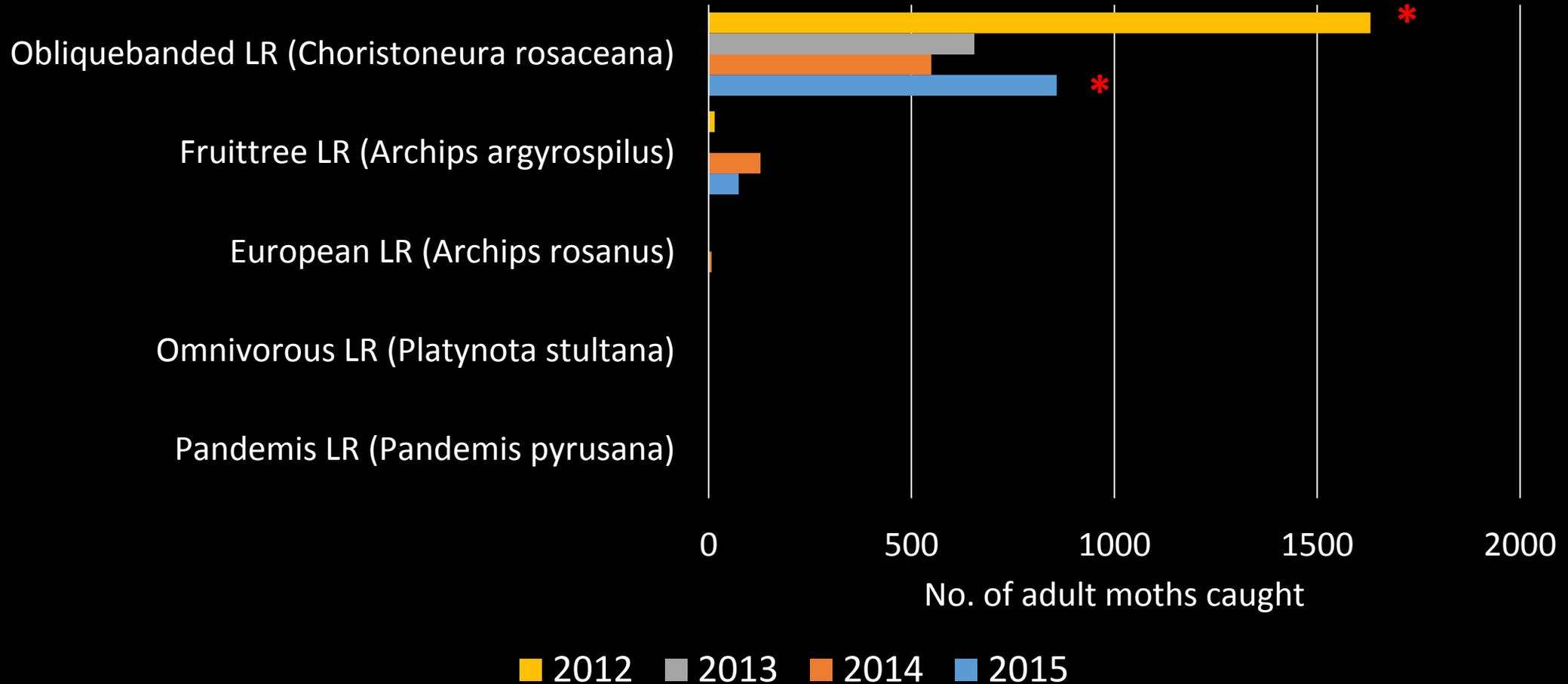


**Fruittree Leafroller**  
Secondary species  
Un- & low-managed orchards  
1 gen./yr  
Late June/early July



**European Leafroller**  
Invasive species  
Very few

## Utah Orchard Leafroller Survey, 2012-2015



2012 & 2013: 6-8 orchards

2014: 10 managed and 11 un- or low-managed apple & cherry: Cache, Box Elder, Davis, Weber & Utah counties

2015: 20 managed apple & cherry: Box Elder, Weber & Utah counties.

# No Leafroller Larvae or Injury Detected

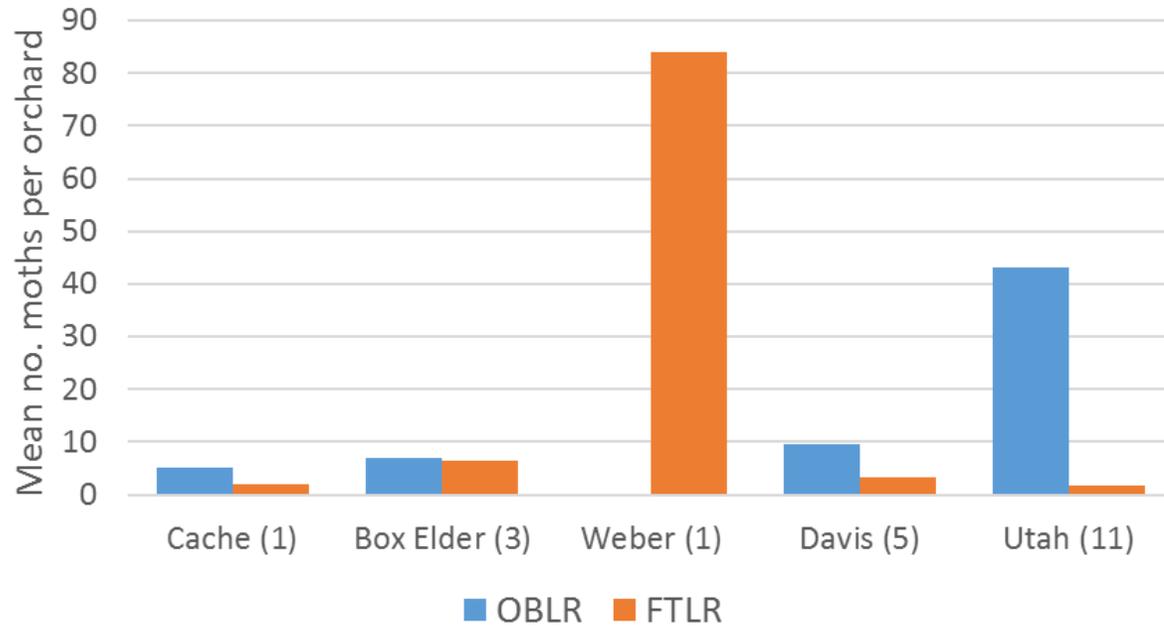
2014 and 2015



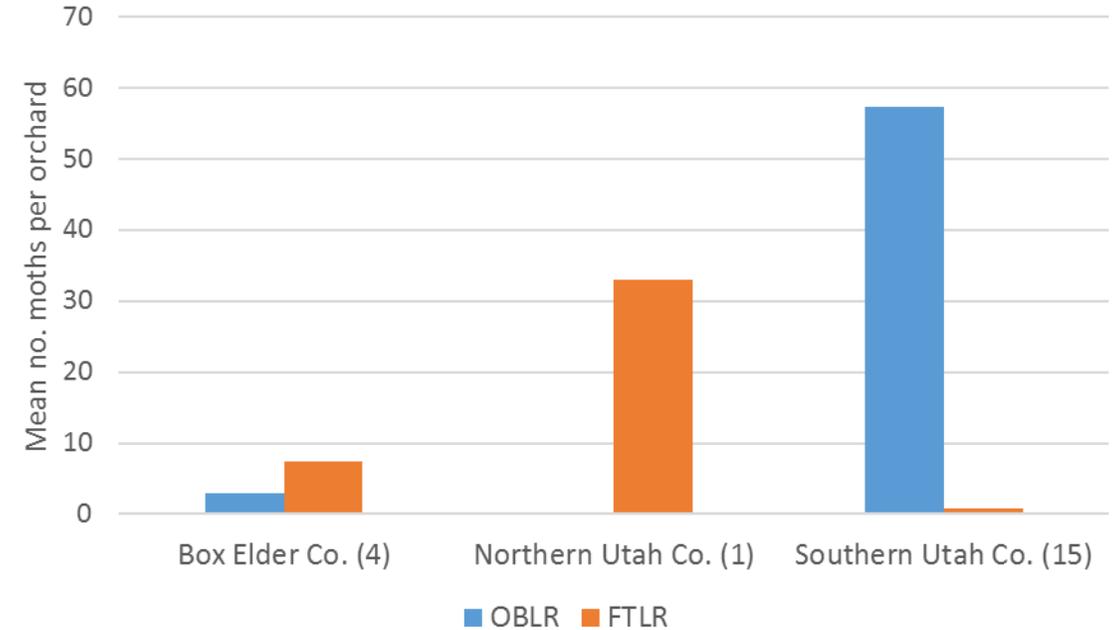
# Orchard Location



Leafroller species capture by county - 2014



Leafroller species capture by county - 2015



# Improving Codling Moth Biofix

New project: funding from UDAF SCBG

- Challenges with setting accurate CM biofix
  - Too few traps
  - Trap checking interval sporadic (daily needed to set biofix)
  - Mating disruption has decreased CM pops.
  - Variable environmental conditions
- WA study (Jones et al. 2013) found biofix predictable using
  - Latitude & elevation formula (WA began using in 2008)
  - No traps
- Validate WA formula
  - Determine first CM larval entry
  - Trap catch, WA formula, temperature, wind speed
- Goal: Improve CM biofix-setting



# Invasive Fruit Pest Guide

Supported by UDAF Specialty Crop Block Grant with C. Nischwitz, L. Spears & C. Burfitt

## • Pests:

1. Brown rot
2. Plum pox virus
3. Brown marmorated stink bug
4. Spotted wing drosophila
5. Plum curculio
6. Japanese beetle
7. Velvet longhorned beetle

## • Go-to guide

- Identification, life history, monitoring, management
- Photos, references, resources

Chapter 1: Japanese Beetle

**Life History of Japanese Beetle in Utah:** There is one generation per year; the majority of the life cycle is spent as a larva (grubs) in the soil feeding on roots of turf grass and other plants. Adapted from drawing by J. Katsuki (University of Minnesota) & Just Floyd (IFRECI).

adults emerge as described. The pupa color varies from creamy white through tan, to the metallic green of adulthood in late pupation. Pupae are about 1/2" wide and 1/2" long (6.5 x 11 mm). Pupation takes place in an inverted cell made by the final instar of the larva. Most of the life cycle is spent underground, only emerging as adults to feed, mate, and lay eggs during the summer (Fig. 1.6).

The larvae (grubs) attack plants below ground and feed on the fine roots of grasses and some trees, shrubs, and vegetables. Large clumpings of turf grasses (e.g., lawns and athletic fields) are especially attractive as egg-laying sites. While damage to grasses is initially difficult to detect, it becomes apparent during late summer and early fall when grubs are large. The compromised grass roots are inefficient in uptake of water and nutrients, and eventually turn leaves and stems yellow and brown. Severely injured turf will die. Feeding damage appears in patches of dead and dying plants mixed with healthy, unaffected grass.

chewing away softer tissue, and leaving the veins. They also chew holes in flower buds and petals, soft fruit, and corn silks (Fig. 1.15-1.16). The adult beetles congregate (mass together) and are densest crops in just a few days before moving on. They also wreak havoc on ornamental plants, consuming leaves and flowers.

chewing away softer tissue, and leaving the veins. They also chew holes in flower buds and petals, soft fruit, and corn silks (Fig. 1.15-1.16). The adult beetles congregate (mass together) and are densest crops in just a few days before moving on. They also wreak havoc on ornamental plants, consuming leaves and flowers.

The larvae (grubs) attack plants below ground and feed on the fine roots of grasses and some trees, shrubs, and vegetables. Large clumpings of turf grasses (e.g., lawns and athletic fields) are especially attractive as egg-laying sites. While damage to grasses is initially difficult to detect, it becomes apparent during late summer and early fall when grubs are large. The compromised grass roots are inefficient in uptake of water and nutrients, and eventually turn leaves and stems yellow and brown. Severely injured turf will die. Feeding damage appears in patches of dead and dying plants mixed with healthy, unaffected grass.

**Plant Hosts and Injury Symptoms**  
A main reason for the quarantine pest status of JB is the number and diversity of plants it attacks (over 300 species of ornamental and crop plants). Preferred hosts include rose, maple, elm, grape, apple, stone fruits (cherry, plum, peach), blackberry, raspberry, apricot, bean, and corn. Adults chew on the leaves, flowers, fruit, and in some cases, stems of plants (Figs. 1.7-1.14). They are voracious feeders. Adults skeletonize leaves,

Chapter 1: Japanese Beetle

**Quick Facts**

- Japanese beetle (JB) is a quarantine insect pest due to its invasive nature, its extensive plant host range and plant damage inflicted by adult and immature life stages.
- JB has been established in the eastern U.S. for nearly 100 years; it was first detected in Utah (Orem) in 2006.
- An intense eradication program directed by the Utah Department of Agriculture and Food was successful in eliminating JB from Utah.
- Monitoring programs continue today to prevent re-establishment of JB in Utah.
- Turf grass is at greatest risk for infestation by JB larvae (white grubs); adult JB attack numerous ornamental, fruit, and vegetable plants.

**Pest Identification and Life History**

JB adults are about 1/2" in wide and 1/2" in long (6.5 x 11 mm). Adults are highly characteristic in color: metallic green head and mid-section (thorax) with copper-brown wing covers (Fig. 1.1-1.2). The adults have five pairs of white hair tufts along the sides of the abdomen and another pair on the last abdominal segment. The legs have prominent spines, and the body underside is metallic green and copper-brown.

Adults emerge from pupae (Fig. 1.3) in the soil during June and July, and feed on a wide range of crop, garden, and ornamental plants over a 6-8 week period. Adults release both sex and aggregation pheromones to congregate males and females for mating and feeding. Plant odors emitted from beetle damaged leaves also cause beetles to aggregate. Mated females will fly to turf grass and burrow 2-3 inches (5-8 cm) underneath the soil to lay their eggs. Each female can lay up to 50 individual eggs.

Eggs are cylindrical when laid and about 1/16 inch (1.5 mm) in diameter (Fig. 1.4). The young larva grows inside the egg, and when it is ready to hatch, the egg is nearly spherical and 1/8 inch (3 mm) in diameter. The body of the newly hatched larva is creamy white with a grayish-brown hind end. The head is yellow-brown with darker mandibles (chewing teeth). The larva grows from just under 1/8 inch (3 mm) in length upon hatching to 1 inch (25 mm) at maturity. The larva (Fig. 1.5), also known as a white grub, has three pairs of underdeveloped legs (one on each of their thoracic segments).

**Background**

The Japanese beetle (JB), *Popillia japonica* Newman (Coleoptera: Scarabaeidae) is a quarantine pest in the U.S. Originally from Japan, JB was first found in the U.S. in 1916 in a New Jersey nursery. It was likely introduced from Japan in shipments of ornamental plants. By the late 1970s, JB had spread throughout the eastern U.S., reaching as far west as Wisconsin. More recently, JB has spread to many western states. In its native environment, JB is not a serious pest due to the natural predators that keep its population in check. Without its natural enemies in the U.S., JB has become established in favorable environments with an abundant food supply and limited

Chapter 1: Japanese Beetle

**1.1. Insecticides recommended for control of JAPANESE BEETLE ADULTS in COMMERCIAL FRUIT production in Utah.**

Common Name	Examples of Brands	Timing of Application	FRP	Protection Interval <sup>1</sup>	Comments
<b>INSECTICIDE CLASS</b>					
<b>Pyrethroid (P)</b>					
bifenthrin	Talstar, Insignif, Captan <sup>®</sup> , Turbon		1-14	7-10	Extremely toxic to fish, aquatic invertebrates, bees and birds; highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds; only may be a problem in aquatic places.
cyfluthrin	Tempo, Baythroid XL <sup>®</sup>		14	7-10	
cypermethrin	Muscyd <sup>®</sup>		1	3	
deltamethrin	DeltaGard	Contact activity and short residual			
ethioniazole	Asana XL <sup>®</sup>	Begin applications when JB adults are first detected, and before populations enter a phase of rapid increase.	14-21	3-5	if flowering plants are present, only apply when pollinating insects are not active, such as in early morning or late evening.
fenprophrin	Danitol <sup>®</sup>		5-21	Max. 2 appl. per yr.	
gamma-cyhalothrin	Decare <sup>®</sup>		21	5	Begin applications to ornamentals before JB numbers increase.
lambda-cyhalothrin	Somitar, Spectracide, Triclosin, Warrior <sup>®</sup> , Karate <sup>®</sup>		1-21	7	Baythroid: not for use on soil forms or golf courses.
<b>Neonicotinoid (N)</b>					
acetamiprid	Assail	Begin application when treatment thresholds have been reached.	7	7	
clothianidin	Bayby	time application before damaging population becomes established; adult beetles will stop feeding after application and mortality will occur within 2-3 days.	7-21	10	
dimethoate	Scorpion		1-21	7	Thorough coverage is important to obtain optimum control; toxic to aquatic invertebrates, bees and other insect pollinators.
imidacloprid	Admire, Merit		14	7	
thiamethoxam	Actara		14-25	7-14	
<b>Other</b>					
kaolin clay	Surround WP <sup>®</sup> , Surround CF	Suppression only; start one week prior to expected infestation and cover with 3-4 applications.	0	5-7 (7-14 in apples)	White coating on the fruit may require removal after harvest to meet marketable. Surround CF: do not use after fruit set.

# Chlorpyrifos Registration Cancellation

- EPA proposed to revoke all crop tolerances for the insecticide chlorpyrifos (Lorsban)
  - Comment period ended January 5, 2016
- Why?
  - Drinking water concerns in small watersheds with intense agriculture
- Orchard uses
  - Dormant/delayed-dormant applications
    - Aphids
    - Scale
    - Campyloomma bug
  - Trunk treatment for greater peachtree (crown) borer

**Specimen Label**

**RESTRICTED USE PESTICIDE**  
For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification.

 **Dow AgroSciences**

**Lorsban<sup>®</sup>-4E**

**INSECTICIDE**

®Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow

**For control of listed insects infesting certain field, fruit, nut, and vegetable crops.**

Group	1B	INSECTICIDE
-------	----	-------------

Active Ingredient:

chlorpyrifos: O,O-diethyl-O-(3,5,6-trichloro-2-pyridinyl)		
phosphorothioate .....		44.9%
Other Ingredients .....		55.1%
Total .....		100.0%

# Acknowledge

- USU Extension Tree Fruit Team & IPM Program
  - Marion Murray
- Student Research Assistants
- Funding:
  - UDAF Specialty Crop Block Grant Program
  - Utah Agricultural Experiment Station
  - USU Extension

Aphids Galore!



Find this slideshow and others at [www.utahpests.usu.edu](http://www.utahpests.usu.edu)



for your attention...



Contact us

USU Links >> USU Home A-Z Index calendars MyUSU directory contact

EXTENSION Utah State University UTAH PESTS

UTAH PESTS Home Utah Plant Pest Diagnostic Lab Integrated Pest Management School IPM Cooperative Agricultural Pest Survey

Google™ Search

Home  
Fact Sheets  
Video Fact Sheets  
Image Galleries  
Slideshows  
Utah Pests News  
Quarterly Newsletter  
Bees and Other  
Pollinators  
In the News  
Contact Us

Utah Plant Pest Diagnostic Lab  
Just \$7 gets your pest problem diagnosed or insect identified.

Integrated Pest Management  
Your source for fruit, vegetable, and landscape pest problems.

School Integrated Pest Management  
Teaching responsible pest management for a healthy learning environment.

Cooperative Agriculture Pest Survey  
CAPS protects Utah agriculture through statewide monitoring of invasive pests.

**In the News**  
Invasive Pests vs. Polar Vortex  
Nov 03, 2014  
Customs Agent in Buffalo Intercepts Invasive Tortricid Moth  
Oct 17, 2014  
New Leafhopper Species  
Oct 07, 2014

UTAH PESTS' is a group of Extension entomologists and plant pathologists that helps to solve the thousands of plant pest issues that concern Utah citizens every day. The UPPDL identifies, the IPM Program educates, and the CAPS Program investigates. Open one of the websites to get answers!

*Slideshows: Fruit Insects*