

Prepping for a Healthy Fruit Harvest

Marion Murray
USU IPM Program

EXTENSION 
UtahStateUniversity



Pest Advisories: pestadvisories.usu.edu



Timely Integrated Pest Management Alerts for Fruits, Vegetables, Landscape Ornamentals, Turf, and Urban Areas

Fruit



FRUIT IPM ADVISORY • 2018- FRUIT

Backyard: Prepping for a Healthy Fruit Harvest

🕒 March 12, 2018



FRUIT IPM ADVISORY • 2017- FRUIT

Fall Orchard Chores

🕒 October 12, 2017

Vegetable



VEGETABLE IPM ADVISORY • 2017- VEG

Post-Harvest Cleanup, Tomato Russet Mites, and Diseases

🕒 September 26, 2017



VEGETABLE IPM ADVISORY • 2017- VEG

Sunburn/Sunscald, Squash Diseases, and Spider Mites

🕒 August 31, 2017

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APPLE, PEAR

green apple aphid
rosy apple aphid
blister mites
San Jose scale
iron chlorosis

fire blight

codling moth
woolly apple aphid
powdery mildew

spider mites
flatheaded borers
stink bugs
leafhopper
leafroller
pear slug

PEACH, NECTARINE, PLUM, APRICOT

green peach aphid
leafcurl plum aphid
peach twig borer
cytospora canker
iron chlorosis

greater peachtree borer
coryneum blight

peach powdery mildew
apple powdery mildew

CHERRY

black cherry aphid
iron chlorosis

western cherry fruit fly

bacterial canker
powdery mildew
shothole borer
spider mite
leafhopper
coryneum blight

Dormant – Delayed Dormant

March 2018						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

April 2018						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

Dormant Timing – Buds Tightly Closed

APPLE, PEAR – Prune 15-20% last year's growth to let light in

- also remove dead and diseased branches

TART CHERRY – Prune crossing, dead, and over-extended limbs



“Delayed Dormant” Timing – What is This?

Apples: swollen bud - 1/2”

Pears: swollen bud – green cluster



Silver Tip

Green Tip

Half-Inch Green



Swollen Bud
(Scale
Separation)

Bud Burst
(Blossom Buds
Exposed)

Green Cluster
(Tight Cluster)

Delayed Dormant – What is This?

Peaches and Nectarines: swollen bud – first pink

			
Swollen Bud (First Swell)	Calyx Green	Quarter-Inch Green (Calyx Red)	Pink (First Pink)

Delayed Dormant – What is This?

Cherries: swollen bud – tight cluster



Swollen Bud
(First Swell)

Bud Burst
(Green Tip)

Tight Cluster

Apricot: swollen bud



First Swell
(Bud Swell)

Tip Separation (Swollen Bud)

Delayed Dormant – What is This?

Plum: swollen bud – green cluster



Swollen Bud



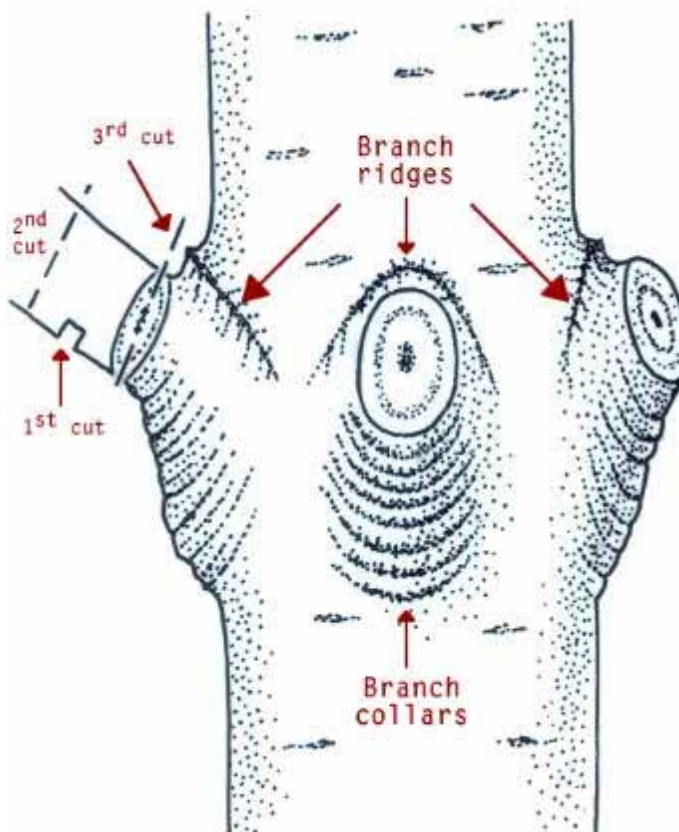
Bud Burst



Green Cluster

Delayed Dormant Timing - Bud Swell and Beyond

- ➔ 1. PEACH, NECTARINE, APRICOT, PLUM, SWEET CHERRY: prune for light and fruit production



Delayed Dormant Timing – Bud Swell and Beyond

Pruning Stone Fruit Trees

To PREVENT - Cytospora Canker that causes gumming





Prune 4
inches
beyond
dead tissue



Delayed Dormant Timing – Bud Swell and Beyond

1. PEACH, NECTARINE, APRICOT, PLUM, SWEET CHERRY:
prune for light and fruit production

➔ 2. **ALL FRUIT TREES:** Spray application to target certain insects and diseases (if they were present the prior year)

Delayed Dormant Timing - Targeted Pests

APPLE, PEAR

green apple aphid

rosy apple aphid

blister mites

San Jose scale

fire blight

PEACH, NECTARINE, PLUM, APRICOT

green peach aphid

leafcurl plum aphid

peach twig borer

CHERRY

black cherry aphid

ALL FRUITS - Aphids

Green apple aphid



Rosy apple aphid



Mealy plum aphid



Green peach aphid



Black Cherry Aphid





ALL FRUITS - Aphids

Overwinter as eggs

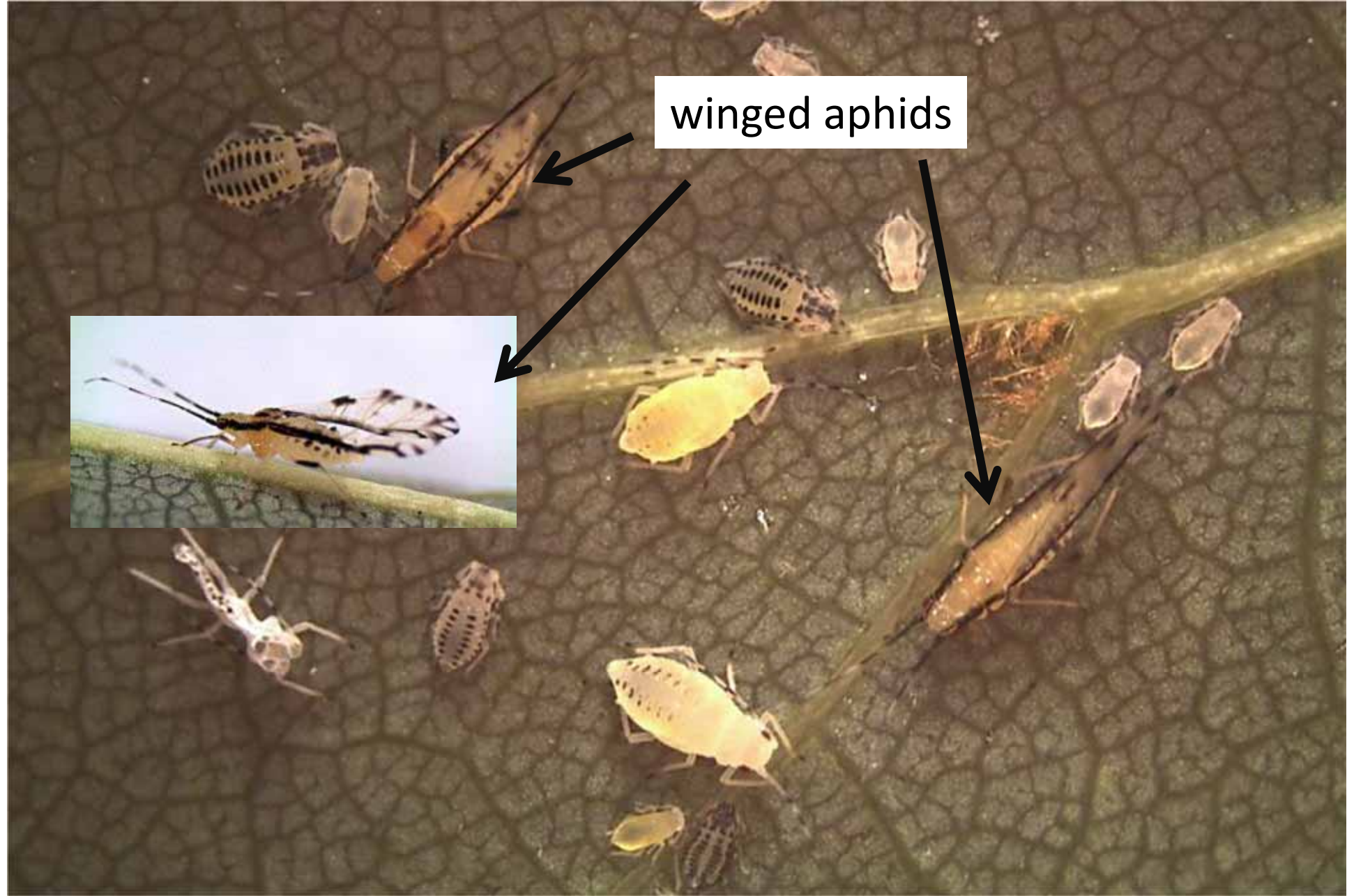


ALL FRUITS - Aphids

Eggs hatch in spring



ALL FRUITS - Aphids



ALL FRUITS - Aphids

Most aphids leave fruit trees by early June for weeds and vegetable hosts for the summer

Also, they provide food for beneficial insects



By June, curled leaves will be empty of aphids

Delayed Dormant – Pest Management

APPLE, PEAR - Blister mites

Tiny eriophyid mites that feed within leaf blisters all season long



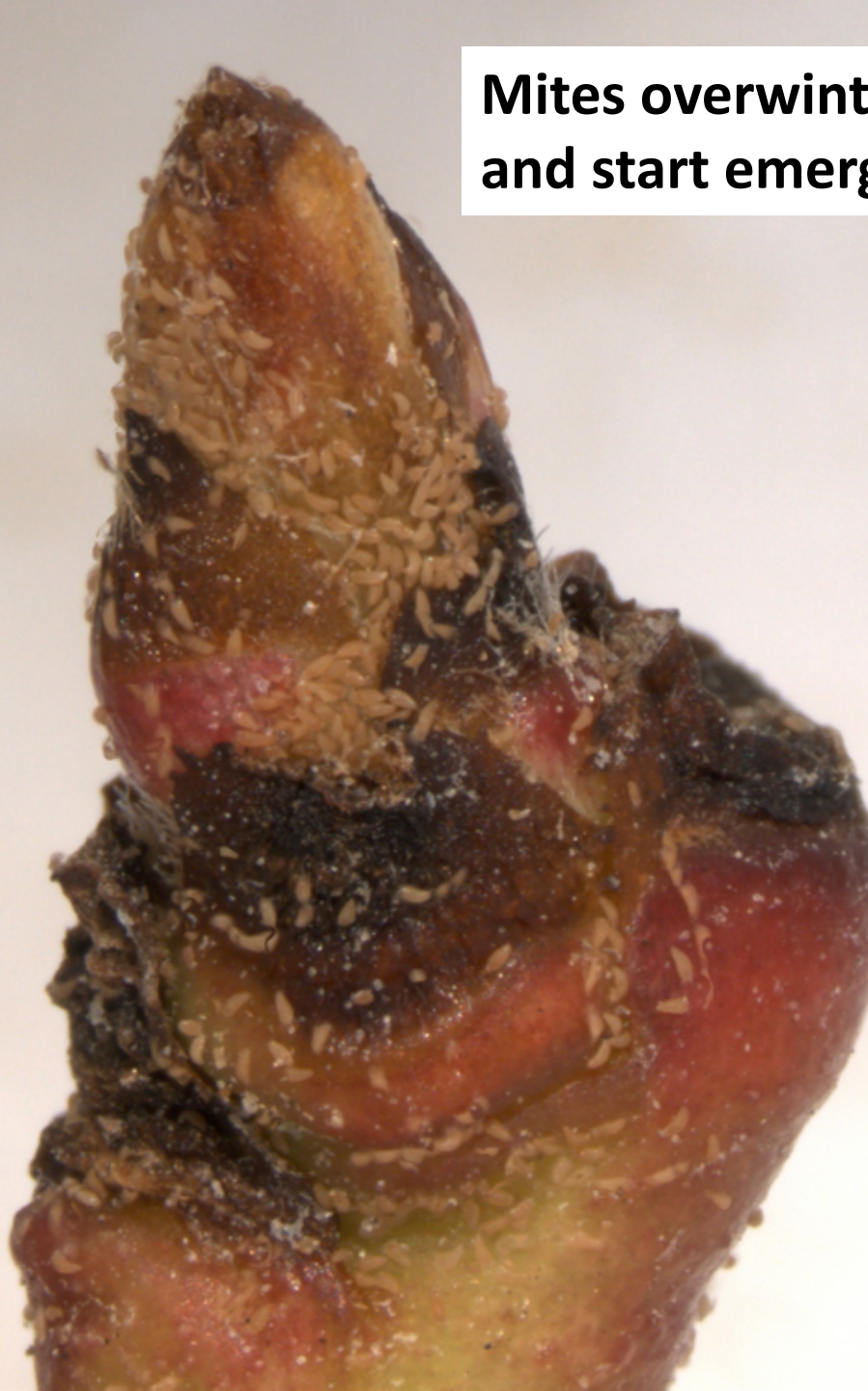
Blister mite symptoms on apple early season (top) and late season (bottom)



Blister mite symptoms on pear



**Mites overwinter in bud scales
and start emerging at bud swell**



Delayed Dormant – Pest Management APPLE, PEAR - San Jose Scale

Immobile insect that feeds on twigs, limbs, and fruit

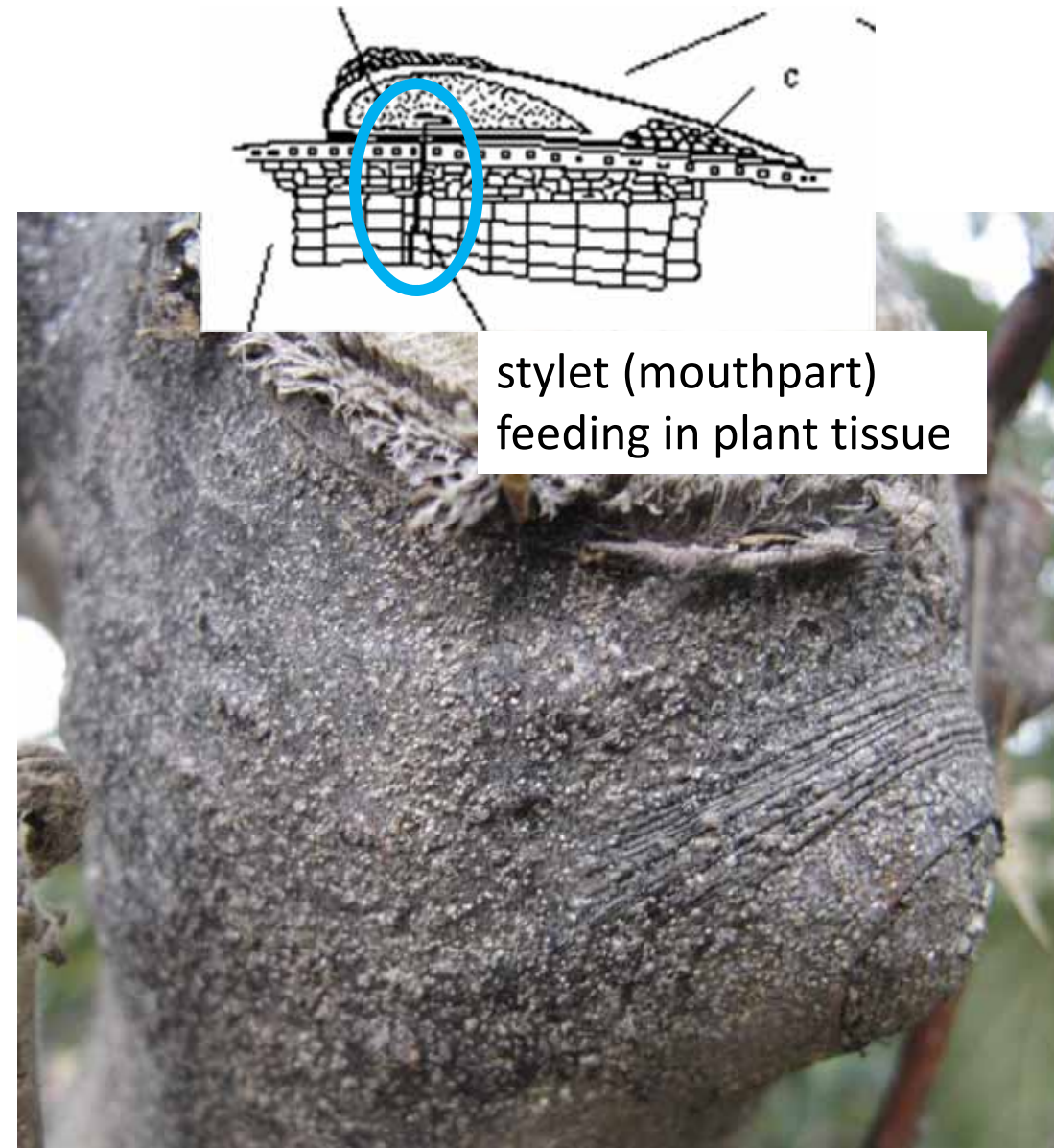
Large infestations weaken trees and kill limbs



Delayed Dormant – Pest Management APPLE, PEAR - San Jose Scale

Overwinter on tree bark

Over 200 crawlers hatch from each female in
June



Delayed Dormant – Pest Management

PEACH, NECTARINE, APRICOT - Peach Twig Borer

Larvae feed inside ripening fruit



Delayed Dormant – Pest Management

PEACH, NECTARINE, APRICOT - Peach Twig Borer

Overwinters as a larva in protected sites in the tree



Delayed Dormant – Pest Management

ALL FRUIT TREES - Oil Spray

Horticultural oil: 2% mixture

Spray entire tree (full coverage of buds, etc.)

Only use when temps > 45F

Do not use not within 24 hr of frost

Do not use within 24 hr of rain

Paraffinic oil

Mineral oil

Canola oil



Delayed Dormant – Pest Management

APPLE, PEAR - Fire Blight

Caused by a bacterium – *Erwinia amylovora*

Bacteria overwinter in old infections

Bacteria becomes active in early spring



Delayed Dormant – Pest Management

APPLE, PEAR - Copper Spray

Works by preventing fire blight bacteria from multiplying

Thorough coverage of bark and areas of infection

Can be mixed with oil spray



Delayed Dormant Timing - Bud Swell and Beyond

1. PEACH, NECTARINE, APRICOT, PLUM, SWEET CHERRY:
prune for light and fruit production

2. ALL FRUIT TREES: Spray application to target some
insects and diseases (if they were present the prior year)

➔ 3. ALL FRUIT TREES: Soil application of chelated iron to
prevent iron chlorosis (at bud swell)



Delayed Dormant Timing – Bud Swell and Beyond

1. PEACH, NECTARINE, APRICOT, PLUM, SWEET CHERRY:
prune for light and fruit production

2. ALL FRUIT TREES: Spray application to target some
insects and diseases (if they were present the prior
year)

3. ALL FRUIT TREES: Soil application of chelated iron to
prevent iron chlorosis

➔ 4. **APPLE and new fruit trees:** Apply nitrogen fertilizer
Yearly or every other year

Collect soil for nutrient analysis from Utah State
University Analytical Lab (usual.usu.edu)

Summary: Dormant – Delayed Dormant

DORMANT

APPLES, PEARS - prune

DELAYED DORMANT

PEACH, NECTARINE, APRICOT, PLUM, SWEET
CHERRY: prune

ALL FRUITS: oil spray (if insects present last year)

APPLE, PEAR: oil spray plus copper (if fire
blight present last year)

ALL FRUITS:

Apply chelated iron (if necessary)

Determine fertilizer needs

Spring

May 2018						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

June 2018						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Spring

1. APPLE, PEAR (some), PEACH, NECTARINE, APRICOT, PLUM: **thin fruit**
2. **Pest management**

Spring - Fruit Thinning

APPLE at bloom:

hand-remove all flowers except king bloom

APPLE, PEAR (some) at $\frac{1}{2}$ - 1-inch diameter:

space clusters to 6 inches apart

thin remaining clusters to a single large fruit

PEACH, NECTARINE, APRICOT, PLUM when
fruits are $\frac{3}{4}$ - 1-inch diameter:

space fruit 6-8"



Spring

1. APPLE, PEAR (some), PEACH, NECTARINE, APRICOT,
PLUM: thin fruit

2. **Pest management**

APPLE, PEAR: powdery mildew, fire blight, codling moth,
woolly apple aphid

PEACH, NECTARINE, APRICOT: peach twig borer,
coryneum blight

CHERRY: western cherry fruit fly

APPLE: Apple Powdery Mildew

Caused by a fungus: each host tree has its own species

Overwinters in terminal buds and on twigs





APPLE - Powdery Mildew Management

Monitor by looking for fuzzy whitish patches.

Fungicides

- Apply at “open cluster” stage
- Repeat every 7 – 14 days two to three times



APPLE, PEAR – Powdery Mildew Products

EFFECTIVENESS

Ingredient	Brand	Residual (days)	Type	Comments
myclobutanil	Spectracide Immunox	14	conventional	
potassium bicarbonate	Monterey Bi-Carb	5-7	organic	
sulfur	many products	7	organic	do not use in temps above 85F
sulfur + pyrethrin	Bonide Citrus, Fruit and Nut Orchard Spray; Nature's Care 3-in-1	7	organic	do not use in temps above 85F
sulfur + insecticidal soap	Safer 3-in-1	7	organic	do not use in temps above 85F
neem oil	many products	5	organic	do not use in temps above 85F

Spring – Pest Management

APPLE, PEAR - Fire Blight

Highly susceptible varieties:

- Fuji, Gala, Gingergold, Granny Smith, Honeycrisp, Jonathon, Jonagold, Idared
- Asian pears, Bosc, D 'Anjou

Primary infections occur through **open blossoms**









Spring – Pest Management

APPLE, PEAR - Fire Blight Management

Copper application at delayed dormant timing

Prevent infections with streptomycin fire blight spray
only during bloom

- Use only when temperatures over a 4-day period are above 75F AND moisture is present (rain, irrigation water)

AND / OR

Monitor for new infections starting 2 weeks after bloom, and prune them out immediately

APPLE, PEAR - Fire Blight Management



Spring – Pest Management

APPLE, PEAR - Codling Moth

Larvae burrow into the fruit to feed on seeds

Can infest 100% of the fruit on a tree



Codling Moth Life Cycle

1. overwintering larvae pupate into moths in spring



2. moths lay eggs on fruit mid spring



3. eggs hatch and bore into fruit



4. mature larvae pupate to adults; begins another generation



APPLE, PEAR - Codling Moth Management



Thin fruit to
one apple/
cluster



Clean and mow or
remove all unharvested
or dropped fruit all
season



Remove
unmanaged trees

APPLE, PEAR - Codling Moths: Fruit Bagging

Bag during thinning

Remove any fruit that you don't bag

Options

- Japanese 2-ply apple bags
- waxed paper or clear plastic sandwich bags
- white or tan paper sacks
- clear poly bags with drawstring closures
- disposable nylon foot socks



Spring – Pest Management

APPLE, PEAR - Codling Moth Management

Extension hangs monitoring traps to help determine when to make first spray

First spray of the season is applied by recommended date

Re-apply for each generation



APPLE, PEAR - Codling Moth Management

PDF document linked within Fruit IPM Pest Advisory message



Tree Fruit IPM Advisory

Orchard Pest Update, Utah State University Extension, May 12, 2017



Codling Moth Spray Timing Information, First Generation

Choose either Option A or B when starting your codling moth sprays.

- ➔ • **Option A** is what most people will do. Apply insecticide at the recommended date, and repeat.
- ➔ • **Option B** is an alternative that may help to reduce sprays. Liberally apply horticultural oil (1%) on the first date, and then apply your regular insecticide on the later date. The oil kills eggs that have been laid on fruit up to that point.

Apply treatments, spaced 7-21 days apart (depending on material) to protect fruit up to the end of the first generation egg hatch (dates not yet known). Make sure fruit is protected during the “period of greatest egg hatch.”

County	Location	Option A	Option B		Period of Greatest Egg Hatch
		Apply first spray	Apply oil	Apply first insecticide	
Box Elder	Perry	May 25	May 23	June 5	June 3 - unknown
	Tremonton	May 26	May 24	June 5	June 4 - unknown
Cache	Logan Airport	May 29	May 28	June 10	June 9 - unknown
	River Heights	May 26	May 27	June 6	June 6 - unknown
Carbon	Price Airport	May 26	May 25	not yet known	unknown
Davis	Kaysville	May 18	May 15	May 29	May 28 - unknown
	Farmington	passed	passed	May 23	May 22 - June 12
Grand	Moab	passed	passed	May 12	May 12 - May 29
Iron	Cedar City Airport	May 27	May 25	June 6	June 6 - unknown
Juab	Tintic	May 30	May 28	June 11	June 10 - unknown

APPLE, PEAR - Codling Moth Conventional Products

EFFECTIVENESS

Ingredient	Brand	Residual (days)	Comments
acetamiprid	Ortho Fruit & Veg	14	max 4 applications
gamma-cyhalothrin	Spectracide Triazicide	14-17	wait 21 days to harvest
carbaryl	Sevin	14	
permethrin	Bonide Eight	14	pears only
malathion	Bonide Malathion	5-7	max 2 sprays
malathion	Hi-Yield 55% Malathion; Ortho Malathion	5-7	pears only; max 2 sprays



APPLE, PEAR - Codling Moth Organic Products

EFFECTIVENESS

Ingredient	Brand	Residual (days)	Comments
azadirachtin	Safer BioNeem	7-10	
spinosad	Ferti-lome / Monterey / Natural Guard	7-10	
oil	All Seasons Oil; EcoSmart; neem products; Natria Multi-Insect	3	Use 1% in water; apply at start of each generation
pyrethrin plus soap and neem	Safer End All plus Neem	5-7	
pyrethrin plus neem or canola oil	Ferti-lome Fruit Tree Spray; Monterey Take Down; Nature’s Care Insect Control	3-5	
pyrethrin	Ortho Fruit Spray; Fertilome Fruit Tree Spray; Monterey Bug Buster-O	3-5	
kaolin clay	Surround	7	produces protective barrier

Spring – Pest Management

Pesticide Pre-Mixes (Labeled for Insects and Diseases)

Products containing *non-organic* fungicide + insecticide—**Not Recommended**

- Bonide Fruit Tree Spray: captan plus malathion
- Bonide Fruit Tree and Plant Guard: pyraclostrobin plus lambda-cyhalothrin

Products with organic insect and disease control—**OK**

- Bonide Citrus, Fruit, and Nut: sulfur plus pyrethrin
- Products containing neem oil plus pyrethrin



Spring – Pest Management

APPLE - Woolly Apple Aphid

Feeding causes galls on stems and roots that cause reduced tree vigor or even death of young trees.

Life cycle:

- Overwinter on roots or in the tree.
- Individuals become active in **late spring**.



Woolly Apple Aphid Damage



APPLE - Woolly Apple Aphid Management

Monitor starting in mid May for aphid presence

Insecticides

- insecticidal soap
- 1% oil



must contact insect

apply to dripping

do not apply when
temps > 85F

- Bonide Malathion



Spring – Pest Management

PEACH, NECTARINE, APRICOT – Peach Twig Borer Management

Delayed dormant oil application

One application of *Bacillus thuringiensis* or spinosad before or after bloom

Ingredient	Brand
<i>Bacillus thuringiensis</i>	Natural Guard Caterpillar Spray Bonide Captain Jack's Monterey Bt others
spinosad	Ferti-lome Spinosad Monterey Spinosad Natural Guard Spinosad others



Spring – Pest Management

PEACH, NECTARINE, APRICOT, PLUM - *Coryneum* Blight

Caused by a fungus

Infections occur on new growth in spring

Later, fruit becomes infected



Early infections on peach and apricot

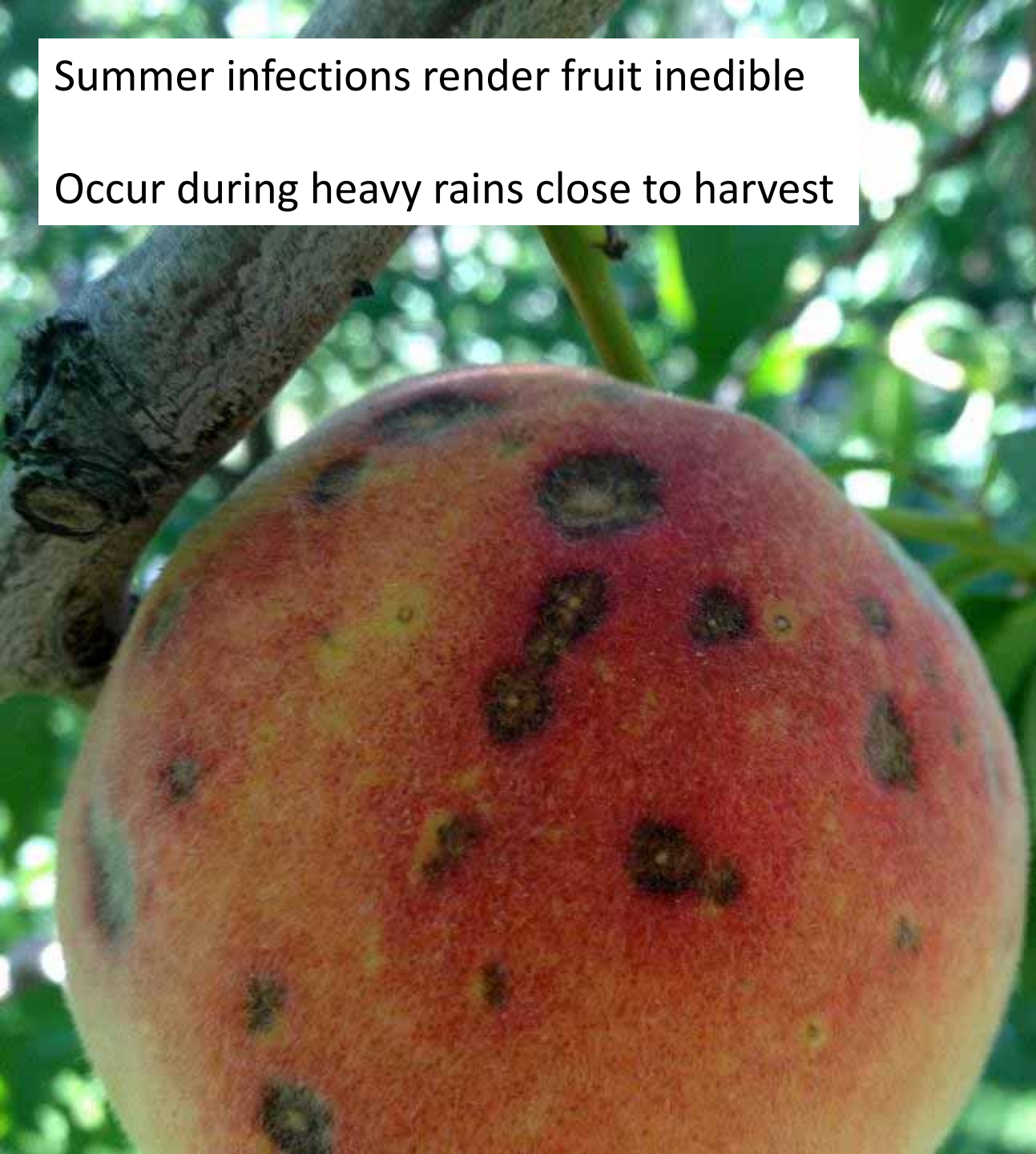


Spring infections later turn scabby



Summer infections render fruit inedible

Occur during heavy rains close to harvest



Spring – Pest Management

PEACH, NECTARINE, APRICOT, PLUM - Coryneum Blight

Prevent wetting of foliage with irrigation

Fungicide at **shuck split**; repeat all season as necessary (after 4+ hour rainfalls)

Conventional:

- **Daconil** (chlorothalonil): don't use after shuck split
- **Spectracide Immunox** (myclobutanil): can be used all season
- **Captan** (captan): can be used all season (not as effective)

Organic:

- Natural Guard Copper Soap



Spring – Pest Management

CHERRY - Western Cherry Fruit Fly

A maggot pest of tart and sweet cherries; one infested cherry can ruin an entire commercial crop

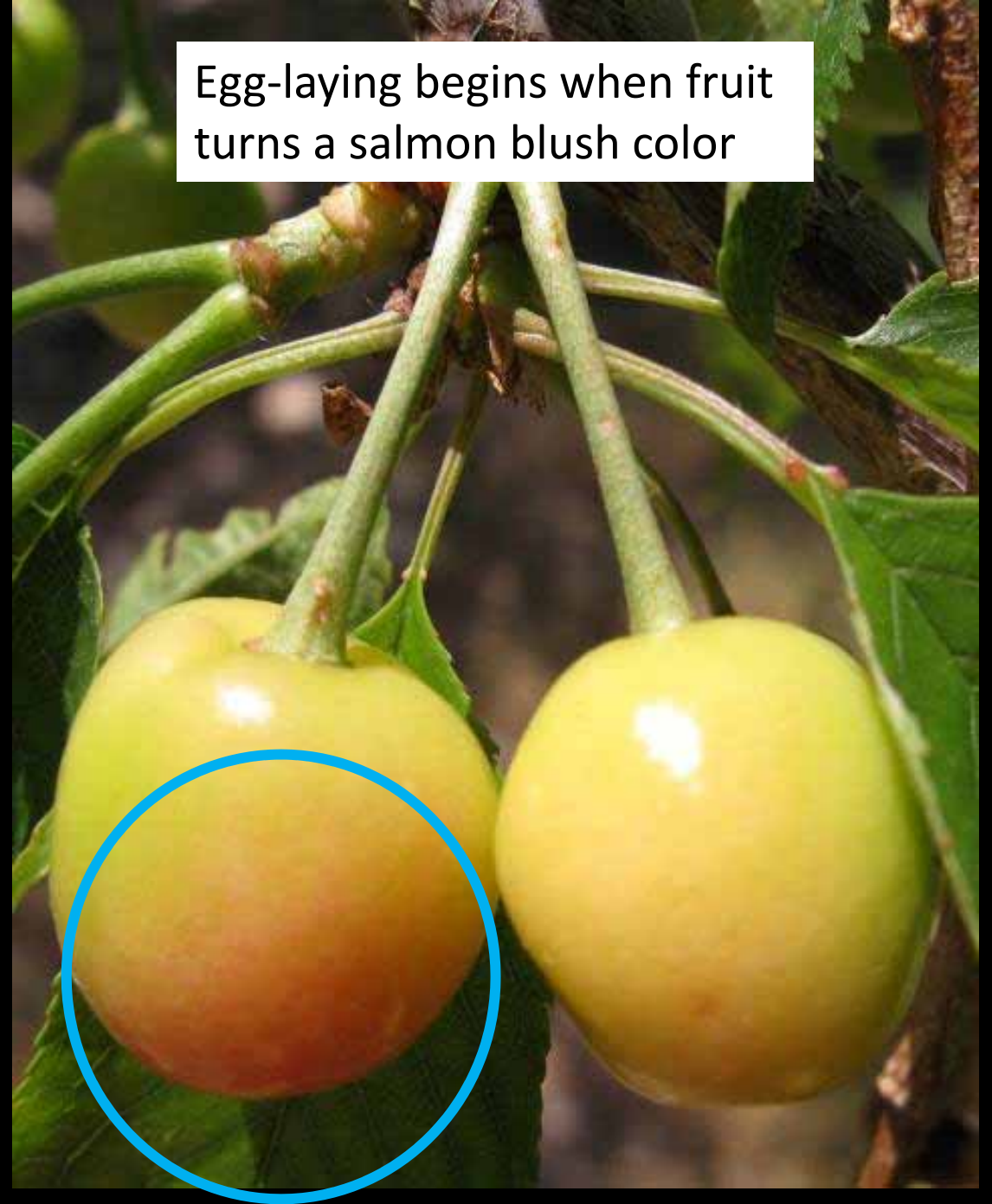
Overwinters as pupa in the soil

Adults begin to emerge in May, and lays up to 200 eggs under the skin of fruit until harvest





Egg-laying begins when fruit turns a salmon blush color



CHERRY - Western Cherry Fruit Fly Management

Add tarp under tree



Remove dropped fruit



Remove all unharvested fruit



Net entire tree



CHERRY – Western Cherry Fruit Fly Pesticide Products

EFFECTIVENESS



Ingredient	Residual (days)	Type	Comments
Ortho Fruit & Veg (acetamiprid)	14	conventional	max 4 applications
Hi-Yield 55% Malathion; Ortho Malathion; Bonide Malathion	5-7	conventional	max 2 - 4 sprays
Spectracide Triazicide (gamma-cyhalothrin)	14-17	conventional	wait 21 days to harvest
Monterey / Ferti-lome / Natural Guard Spinosad	7	organic	
Sevin (carbaryl)	14	conventional	
(pyrethrin) Ortho Fruit Spray; Fertilome Fruit Tree Spray; Monterey Bug Buster-O	3-5	organic	

Spring - Summary

1. APPLE, PEAR (some), PEACH, NECTARINE, APRICOT,
PLUM: **thin fruit**

2. **Pest management**

APPLE, PEAR: powdery mildew, fire blight, codling moth,
woolly apple aphid

PEACH, NECTARINE, APRICOT: peach twig borer,
coryneum blight

CHERRY: western cherry fruit fly

Summer

1. July - Get **foliar nutrition analysis** (if necessary)
Collect foliage for nutrient analysis from Utah State University Analytical Lab (usual.usu.edu)
2. **Proper irrigation**

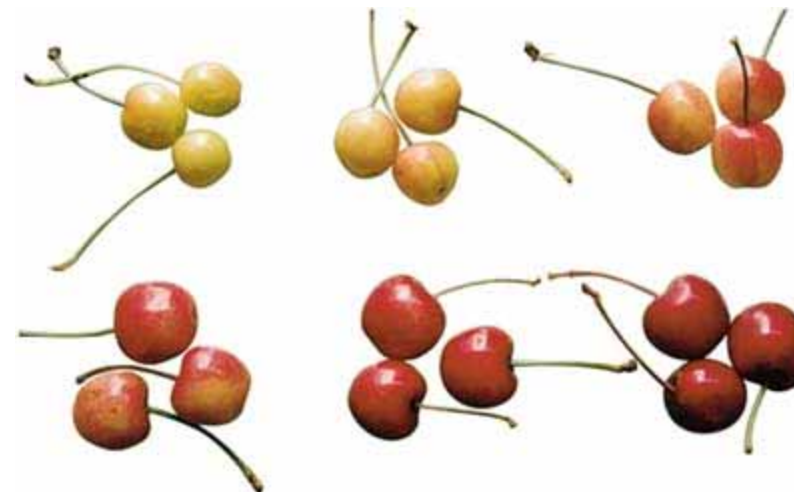


Summer - Irrigation

Especially important during

- fruit maturation
- dry periods in August (flower bud formation)

Reduce amount by late August



Summer

1. July - Get foliar nutrition analysis (if necessary)
2. Proper irrigation
3. Pest management

APPLE, PEAR:

- continue to prune out fire blight infections
- continue sprays to prevent codling moth until Sept 15

CHERRY:

- continue western cherry fruit fly until harvest
- bird control

PEACH, NECTARINE, PLUM:

- greater peachtree borer



Summer – Pest Management

PEACH, NECTARINE, PLUM - Greater Peachtree Borer

A clearwing moth that attacks the trunk at soil level

Threats:

- kills young trees
- pre-disposes older trees to other injuries



Greater Peachtree Borer Life Cycle

1. overwintering larvae start feeding in spring



2. larvae pupate to adults starting in mid June



3. adults lay eggs on bark from July through September



4. eggs hatch and immediately bore into lower crown and roots





Summer – Pest Management

PEACH, NECTARINE, PLUM - Greater Peachtree Borer Organic Control



Remove all weeds and mulch from touching the bark



Summer – Pest Management

PEACH, NECTARINE, PLUM - Greater Peachtree Borer Organic Control



Expose and kill larvae in gum

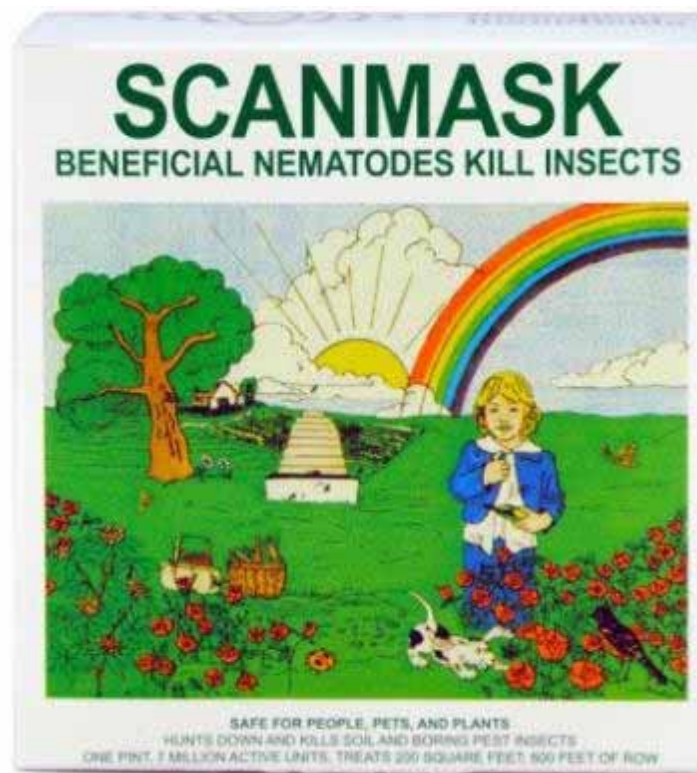


Summer – Pest Management

PEACH, NECTARINE, PLUM - Greater Peachtree Borer Organic Control

Nematodes

Steinernema carpocapsae



PEACH – Greater Peachtree Borer Products

EFFECTIVENESS
↓

Ingredient	Brand	Residual (days)	Comments
permethrin	Hi-Yield Lawn, Garden, Pet Bonide Eight	30	peach only
esfenvalerate	Monterey Bug Buster II	30	
spinosad	Monterey / Ferti-lome / Natural Guard Spinosad products	5-7	



Summer - Summary

1. July - Get foliar nutrition analysis (if necessary)
2. Proper irrigation
3. Pest management

APPLE, PEAR:

- continue to prune out fire blight infections
- continue sprays to prevent codling moth until Sept 15

CHERRY:

- continue western cherry fruit fly until harvest
- bird control

PEACH, NECTARINE, PLUM:

- greater peachtree borer – protect lower trunk from **late July through September**

Fall

September 2018

Mon	Tue	Wed	Thu	Fri	Sat	Sun
17	18	19	20	21	22	23
24	25	26	27	28	29	30

October 2018

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

November 2018

Mon	Tue	Wed	Thu	Fri	Sat	Sun
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

Fall

1. **Irrigate** before ground freezes
2. Pest management
PEACH, NECTARINE, PLUM: coryneum blight



Fall – Pest Management

PEACH, NECTARINE, APRICOT, PLUM - *Coryneum* Blight

Shuck split fungicide and repeat through summer as necessary

Apply Copper Fungicide in fall at 50% leaf drop

good coverage to protect leaf scars



Fall

1. Irrigate before ground freezes
2. Pest management
3. NEW TREES:
Paint trunks with latex paint
OR
Apply white tree wrap to trunks from Dec - March



White Tree Wrap



Flatheaded borers
Cytospora canker



Paint Trunks White



latex paint and water

1:1 ratio

Fall - Summary

1. **Irrigate** before ground freezes

2. Pest management

PEACH, NECTARINE, PLUM: coryneum blight

3. NEW TREES:

Paint trunks with latex paint

OR

Apply white tree wrap to trunks from Dec - March



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EXTENSION 

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