Prepping for a Healthy Fruit Harvest

Marion Murray
USU IPM Program

Fruit Production Questions

- Pruning
- Fertilization
- Thinning
- Irrigation
- Fruit Varieties
- Harvesting

Contact:
- County Extension Office
- Dr. Teryl Roper (Fruit Extension Specialist, Logan, UT) – teryl.roper@usu.edu

Pest Advisories: pestadvisories.usu.edu

APPLE, PEAR
- green apple aphid
- rosy apple aphid
- blister mite
- San Jose scale
- iron chlorosis
- fire blight
- codling moth
- woolly apple aphid
- powdery mildew
- spider mites
- flatheaded borers
- stink bugs
- leafhopper
- 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
- leafroller
- pear slug

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Choose which pest advisory you want to receive:

March 2018

April 2018

Dormant - Delayed Dormant
**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

**Delayed Dormant – What is This?**

- **Peaches and Nectarines**: swollen bud – first pink

**Delayed Dormant – What is This?**

- **Cherries**: swollen bud – tight cluster
- **Apricot**: swollen bud

**Delayed Dormant – What is This?**

- **Plum**: swollen bud – 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

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

Delayed Dormant Timing – Pest Management

ALL FRUITS - Aphids

- Green apple aphid
- Rosy apple aphid
- Black Cherry Aphid
- Green peach aphid
- Mealy plum aphid
- Black Cherry Aphid
ALL FRUITS - Aphids

Overwinter as eggs

Eggs hatch in spring

ALL FRUITS - Aphids

winged 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.

Mites overwinter in bud scales and start emerging at bud swell.
APPLE, PEAR - San Jose Scale

Immobile insect that feeds on twigs, limbs, and fruit

Large infestations weaken trees and kill limbs

Overwinter on tree bark

Over 200 crawlers hatch from each female in June

PEACH, NECTARINE, APRICOT - Peach Twig Borer

Larvae feed inside ripening fruit

Overwinters as a larva in protected sites in the tree

APPLE, PEAR - Fire Blight

Caused by a bacterium – Erwinia amylovora

Bacteria overwinter in old infections

Bacteria becomes active in early spring

ALL FRUIT TREES - Oil Spray

Horticultural oil 2% mixture 5 TBS oil per gal water

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

Only use when temps > 40F

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 - 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)

Summary: Dormant – Delayed Dormant

DORMANT

APPLES, PEARS - prune

DELAYED DORMANT

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

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

ALL FRUITS: Apply chelated iron (if necessary)

Determine fertilizer needs

Spring

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

2. Pest management
**Spring - Fruit Thinning**

APPLE at bloom: hand-removal of all flowers except king bloom

APPLE, PEAR (some) at ½ - 1-inch diameter: space clusters to 6 inches apart; thin remaining clusters to a single large fruit

PEACH, NECTARINE, APRICOT, PLUM when fruits are ¾ - 1-inch diameter: space fruit 6-8”

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**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

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**Spring - Pest Management**

**APPLE: Apple Powdery Mildew**

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

Overwinters in terminal buds and on twigs

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**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**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Brand</th>
<th>Residual (days)</th>
<th>Type</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>myclobutanil</td>
<td>Spectracide Immunox</td>
<td>14</td>
<td>conventional</td>
<td></td>
</tr>
<tr>
<td>potassium bicarbonate</td>
<td>Monterey Bi-Carb</td>
<td>5-7</td>
<td>organic</td>
<td></td>
</tr>
<tr>
<td>sulfur + insecticidal soap</td>
<td>Safer 3-in-1</td>
<td>?</td>
<td>organic</td>
<td></td>
</tr>
<tr>
<td>sulfur + pyrethrin</td>
<td>Bonide Citrus, Fruit and Nut Orchard Spray, Nature’s Care 3-in-1</td>
<td>?</td>
<td>organic</td>
<td></td>
</tr>
<tr>
<td>neem oil</td>
<td>many products</td>
<td>5</td>
<td>organic</td>
<td></td>
</tr>
</tbody>
</table>

Do not use in temps above 85F
Highly susceptible varieties:
- Fuji, Gala, Gingergold, Granny Smith, Honeycrisp, Jonathon, Jonagold, Idared
- Asian pears, Bosc, D’Anjou

Primary infections occur through open blossoms.

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 75°F AND moisture is present (rain, irrigation water)

AND / OR

Monitor for new infections starting 2 weeks after bloom, and prune them out immediately.
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 in mid spring
3. eggs hatch and bore into fruit
4. mature larvae pupate to adults; begins another generation

Thin fruit to one apple/cluster

Remove unmanaged trees

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

Spring – Pest Management
APPLE, PEAR - Codling Moth Management

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

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

PDF document linked within Fruit IPM Pest Advisory message
**Spring - Pest Management**

**APPLE, PEAR - Codling Moth Management**

**Tree Fruit IPM Advisory**

Codling Moth Spraying Timing Information, First Generation

Decide when to spray for crysalis, not adult moth.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Brand</th>
<th>Residual (days)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>acetamiprid</td>
<td>Ortho Fruit &amp; Veg</td>
<td>14</td>
<td>max 4 applications</td>
</tr>
<tr>
<td>gamma‐cyhalothrin</td>
<td>Spectracide Triazicide</td>
<td>14‐17</td>
<td>wait 21 days to harvest</td>
</tr>
<tr>
<td>carbaryl</td>
<td>Sevin</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>permethrin</td>
<td>Bonde Eight</td>
<td>14</td>
<td>pears only</td>
</tr>
<tr>
<td>malathion</td>
<td>Bonide Malathion</td>
<td>5‐7</td>
<td>max 2 sprays</td>
</tr>
<tr>
<td>malathion</td>
<td>Hi‐Yield 55% Malathion; Ortho Malathion</td>
<td>5‐7</td>
<td>pears only; max 2 sprays</td>
</tr>
</tbody>
</table>

**EFFECTIVENESS**

**APPLE, PEAR - Codling Moth Conventional Products**

**Ingredient**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Brand</th>
<th>Residual (days)</th>
<th>Comments</th>
</tr>
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<tbody>
<tr>
<td>azadirachtin</td>
<td>Safer BioNeem</td>
<td>7‐10</td>
<td></td>
</tr>
<tr>
<td>spinosad</td>
<td>Ferti‐lome / Monterey / Natural Guard</td>
<td>7‐10</td>
<td></td>
</tr>
<tr>
<td>oil</td>
<td>All Seasons Oil; EcoSmart; neem products; Natria Multi‐Insect</td>
<td>3</td>
<td>Use 1% in water; apply at start of each generation</td>
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<tr>
<td>pyrethrin</td>
<td>Ortho Fruit Spray; Fertilome Fruit Tree Spray; Monterey Bug Buster-Q</td>
<td>3‐5</td>
<td></td>
</tr>
<tr>
<td>pyrethrin</td>
<td>Ferti‐lome Fruit Tree Spray; Monterey Take Down; Nature's Care Insect Control</td>
<td>3‐5</td>
<td></td>
</tr>
<tr>
<td>kaolin clay</td>
<td>Surround</td>
<td>7</td>
<td>produces protective barrier</td>
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</table>

**APPAREL - Woolly Apple Aphid**

**Pesticide Pre‐Mixes (Labeled for Insects and Diseases)**

- Products containing non‐organic fungicide + insecticide—Not Recommended
  - applying these products means that you may be using a fungicide when it is not necessary, or vice‐versa
  - if used repeatedly, there is greater risk for resistance

- Products with organic insect and disease control—OK
  - products containing sulfur plus pyrethrin
  - products containing neem oil plus pyrethrin
  - no risk of resistance

- Spring - Pest Management

- Apple, pear - Codling Moth Conventional Products

- Apple, pear - Codling Moth Organic Products

- Apple, pear - Woolly Apple Aphid

- Spring - Pest Management

- Tree Fruit IPM Advisory

- Conventional Products

- Organic Products

- Pesticide Pre‐Mixes (Labeled for Insects and Diseases)
APPLE - Woolly Apple Aphid Management

Monitor starting in mid May for aphid presence

Insecticides
- insecticidal soap
- 1% oil
- Bonide Malathion

must contact insect
apply to dripping
do not apply when temps > 85F

PEACH, NECTARINE, APRICOT – Peach Twig Borer Management

Delayed dormant oil application

One application of Bacillus thuringiensis or spinosad before or after bloom

<table>
<thead>
<tr>
<th>Ingredient</th>
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<tbody>
<tr>
<td>Bacillus thuringiensis</td>
<td>Natural Guard Caterpillar Spray</td>
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<tr>
<td></td>
<td>Bonide Captain Jack's</td>
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<tr>
<td></td>
<td>Monterey Bt</td>
</tr>
<tr>
<td></td>
<td>others</td>
</tr>
<tr>
<td>Spinosad</td>
<td>Ferti-lome Spinosad</td>
</tr>
<tr>
<td></td>
<td>Monterey Spinosad</td>
</tr>
<tr>
<td></td>
<td>Natural Guard Spinosad</td>
</tr>
<tr>
<td></td>
<td>others</td>
</tr>
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CAUGHT, 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 (methylbutanil): 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

Spring – Pest Management
CHERRY - Western Cherry Fruit Fly Management

Add tarp under tree
Remove dropped fruit
Remove all unharvested fruit
Net entire tree

Spring – Pest Management
CHERRY – Western Cherry Fruit Fly Pesticide Products

<table>
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<td>Ortho Fruit &amp; Veg (acetamiprid)</td>
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<td>conventional</td>
<td>max 4 applications</td>
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<tr>
<td>Hi-Yield 55% Malathion; Ortho Malathion; Bonide Malathion</td>
<td>5-7</td>
<td>conventional</td>
<td>max 2 - 4 sprays</td>
</tr>
<tr>
<td>Spectracide Triazicide (gamma-chlorpyrifos)</td>
<td>14-17</td>
<td>conventional</td>
<td>wait 21 days to harvest</td>
</tr>
<tr>
<td>Monterey / Ferti-lome / Natural Guard Spinosad</td>
<td>7</td>
<td>organic</td>
<td></td>
</tr>
<tr>
<td>Sevin (carbaryl)</td>
<td>14</td>
<td>conventional</td>
<td></td>
</tr>
<tr>
<td>Monterey Bug Buster-O</td>
<td>3-5</td>
<td>organic</td>
<td></td>
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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 - 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
- Expose and kill larvae in gum

Nematodes
Steinernema carpocapsae

Summer – Pest Management
PEACH, NECTARINE, PLUM - Greater Peachtree Borer Products

<table>
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<tr>
<td>permethrin</td>
<td>Hi-Yield Lawn, Garden, Pet Bonide Eight</td>
<td>30</td>
<td>peach only</td>
</tr>
<tr>
<td>esfenvalerate</td>
<td>Monterey Bug Buster II</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>spinosad</td>
<td>Monterey / Ferti-lome / Natural Guard Spinosad products</td>
<td>5-7</td>
<td></td>
</tr>
</tbody>
</table>

Effectiveness
Mid June through September
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
   - CHERRY:
     - continue western cherry fruit fly until harvest
     - bird control
   - PEACH, NECTARINE, PLUM:
     - greater peachtree borer – protect lower trunk from late July through September

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Fall

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

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Fall

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

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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

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White Tree Wrap
latex paint and water
1:1 ratio

Fall - Summary

1. Irrigate before ground freezes
2. Pest management
   - PEACH, NECTARINE, PLUM: conyneum blight
3. NEW TREES:
   - Paint trunks with latex paint
   - Apply white tree wrap to trunks from Dec - March

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- Applicator's License Number
- Your Email Address

Marion Murray
IPM Project Leader
Utah State University
Logan, UT
marion.murray@usu.edu
435-797-0776

Other products to use

Insecticidal Soap
- aphids, mites, leafhopper, thrips

Spinosad
- for thrips, apply at petal fall