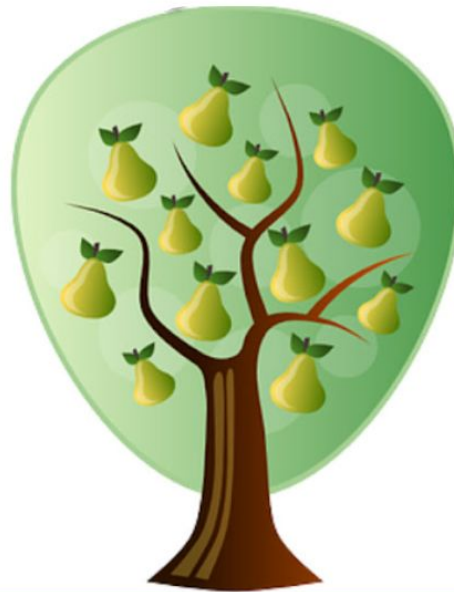
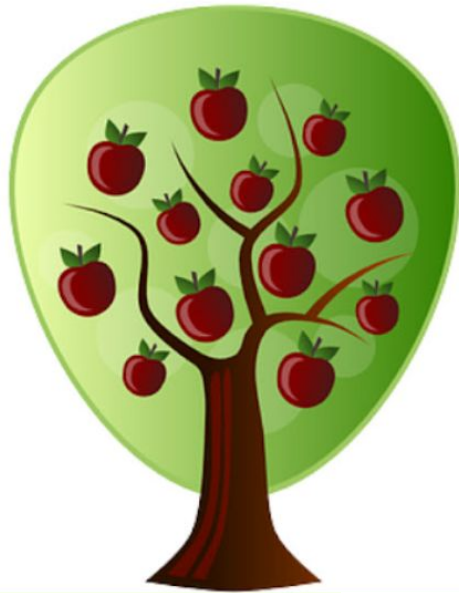


# Fruit tree care in SW Washington

Growing healthy fruit trees  
Managing diseases and pests



WSU EXTENSION  
**Cowlitz County**



# What went wrong with your fruit trees last year?

What fruit trees are you growing?

What went wrong with your fruit trees last year?

<https://photos.app.goo.gl/FgroXcHktBdVxbuk6>

## **My goal:**

Give common-sense, guidelines for an organic approach for reducing pests and plant diseases on homegrown tree fruit.

# Table of contents

- [5 steps approach to plant problems](#)
- [Selecting the right tree, right place](#)
- [Soil fertility](#)
- [Tree problems not caused by insects or disease](#)
- [Managing insect and disease problems](#)
  - Spray schedules
  - Organic solutions
- [Explanation of “bud” terminology with images](#)
- [Diagnosing apple blemishes](#)
- [Guide to nutrient deficiencies in apples](#)
- [Resources](#)

# Primary Apple and Pear Pests in SW Washington

- Anthracnose
- [Bitterpit\\*](#)
- [Apple Scab](#)
- [Codling moth](#)
- [Apple Maggot](#)
- [Powdery Mildew](#)
- [Birds](#)
- [BMSB](#)
- [Tent Caterpillars and other caterpillars](#)
- [Rust](#)
- [Pearleaf blister mite](#)
- [Earwigs](#)

# Stone fruits

- Cherries
  - Sweet
  - Tart (Pie)
- Plums-
  - European
  - Asian
- Peaches-Nectarines
- Apricots

## Common Problems

- Peach leaf curl
- Bacterial canker
- Brown rot
- Coryneum blight
- Scale Insects
- Bark splitting
- Walnut husk fly
- Fruit cracking
- Pollination problems occur when bad weather at bloom time.
- Cold damage for early bloomers
- Spotted Wing Drosophila

# Common sense approach to plant problems

1. **Monitor** your plants for pests and diseases and adjust methods over time.
2. ID the insect pest or plant disease



**PLANT AND INSECT CLINIC**  
360-577-3014 ext 1  
colwitzmastergardener@g  
mail.com)

# Common sense approach to plant problems

3. Use a **variety of common-sense methods** to control problems in the garden, not just using pesticides!
4. **Tolerate** harmless pests.
5. **Set** a threshold to decide when it's time to act. Not every problem needs to be “treated.” **LEAST TOXIC CHOICES!!**



# Common sense approach to plant problems

6. **REPEAT** steps 1-5 all growing season long!





# 70% of plant problems are due to non-disease, non-insect problems!

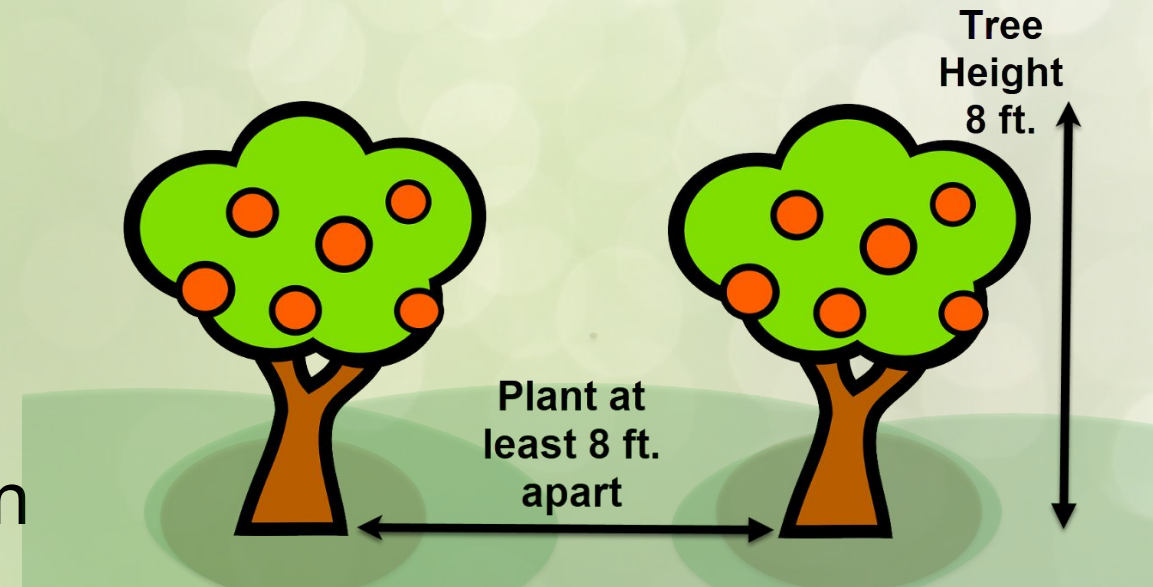
- What are some of these causes?
- Compacted soil, pavement, or weed barrier fabric that inhibit normal plant growth.
- Mowing or using string trimmers too close to the trunk of fruit trees
- Herbicide drift, soil contamination, soil salinity
- Extreme temperatures—high heat in summer, very low temps in winter

## **Environmental, chemical, or physical causes that are not insect or disease problems**

- Spring frost injury
- Too much water in the winter—poor soil drainage
- Too little water in the summer.
- Too much shade, not enough sun
- Too much fertilizer or not enough
- Poor pruning or fruit thinning

# Site Selection

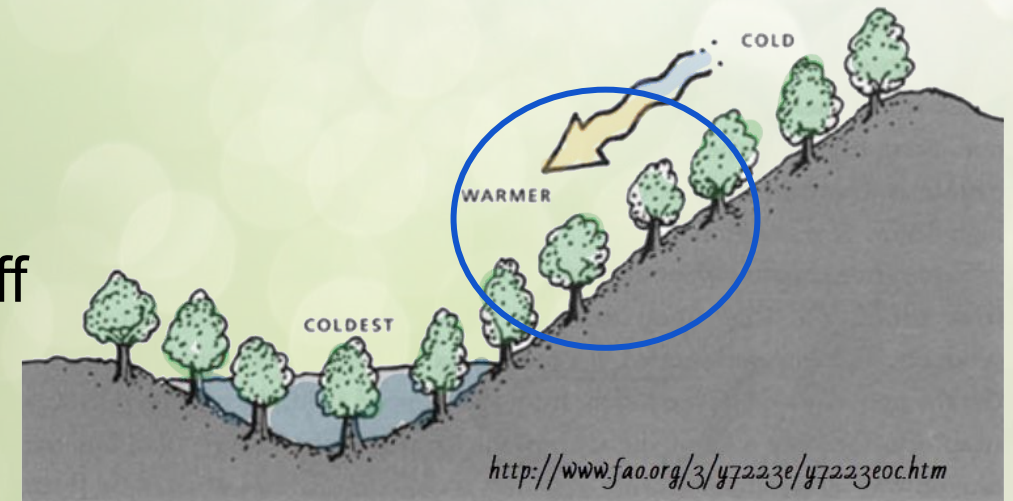
- Sun- $\geq$  8 hours
- Soil pH (between 6-7)
- Soil drainage-well drained!
- Must have at least 3 feet deep soil for tree roots.
- Tree spacing--match space between trees with expected tree height.
  - Standard trees: 20-25 feet
  - Semi-dwarf trees: 12-15 feet
  - Dwarf trees: 6-8 feet



# Site Selection

## Slope – exposure & air drainage

- plant on a slope so cold air can drain off
- Avoid south-facing slopes
  - Warm up earlier in spring
  - Promoting early flowering
  - Potential frost damage to flowers
- Avoid exposed hilltops
  - Desiccation & structural damage from high winds



Cold air is denser than warm air, so it flows downhill and accumulates in low spots much like water

# Variety Selection



- Choose size that will be easy to care for—able to pick fruit, prune, manage diseases/pests without a ladder--MINI-DWARF ROOTSTOCK!
- Buy from local nursery—can give advice based on local experience
- Do your research—do your trees need a pollinator tree?

*Growing Trees and Fruits in the Home Orchard:*

<https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/ec819.pdf>

**Seattle Fruit Society top 24 varieties--**

<https://www.seattletreefruitsociety.com/apples/24-best-apples> 13

# Variety Selection



- Choose variety best suited to our area--Examples
  - Apples--scab resistant varieties—Chehalis, Prima, Liberty
  - Peaches—resistant to peach leaf curl—Frost, Rosydawn
  - Plums—European plums bloom later than Japanese varieties—sets fruit better in cold springs <https://nwfruit.org/recommended-fruit-trees/> and [https://s3.wp.wsu.edu/uploads/sites/2109/2019/12/fruit\\_handbook\\_western\\_wa.pdf](https://s3.wp.wsu.edu/uploads/sites/2109/2019/12/fruit_handbook_western_wa.pdf)
- Think “bare root!”-cheaper, better selection, faster growth, healthier

*Growing Trees and Fruits in the Home Orchard:*

<https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/ec819.pdf>

**Seattle Fruit Society top 24 varieties--**

<https://www.seattletreefruitsociety.com/apples/24-best-apples> 14

| Variety Pollinated | Pollen Source | Akane | Braeburn | Cortland | Empire | Fuji | Gala | Golden Delicious | Honey Crisp | Jonagold | Jonamac | Jonathan | Lodi | McIntosh | Paulared | Red Delicious | Red Gravenstein | Spartan | Tydemans's Early | Tydemans's Red | Winter Banana | Yellow |
|--------------------|---------------|-------|----------|----------|--------|------|------|------------------|-------------|----------|---------|----------|------|----------|----------|---------------|-----------------|---------|------------------|----------------|---------------|--------|
| Akane              |               | X     | X        | X        | X      | X    | X    | X                | X           |          | X       | X        | X    | X        | X        | X             |                 | X       | X                | X              | X             | X      |
| Braeburn           | X             |       | X        | X        | X      | X    | X    | X                | X           |          | X       | X        | X    | X        | X        | X             |                 | X       | X                | X              | X             | X      |
| Cortland           | X             | X     |          | X        | X      | X    | X    | X                | X           |          | X       | X        | X    | X        | X        | X             |                 | X       | X                | X              | X             | X      |
| Empire             | X             | X     | X        |          | X      | X    | X    |                  |             |          | X       | X        | X    | X        | X        | X             |                 | X       | X                | X              | X             | X      |
| Fuji               | X             | X     | X        | X        |        |      | X    | X                | X           |          | X       | X        | X    | X        | X        | X             |                 | X       | X                | X              | X             | X      |
| Gala               | X             | X     | X        | X        | X      |      |      |                  | X           |          | X       | X        | X    | X        | X        | X             |                 | X       | X                | X              | X             | X      |
| Golden Delicious   | X             |       | X        | X        |        |      |      | O                | X           |          | X       | X        | X    | X        | X        | X             |                 | X       | X                | X              | X             | X      |
| Honey Crisp        | X             | X     | X        | X        | X      | X    | X    |                  |             |          | X       | X        | X    | X        | X        | X             |                 | X       | X                | X              | X             | X      |
| Jonagold           | X             | X     | X        | X        | X      | X    |      | X                |             |          | X       | X        | X    | X        | X        | X             |                 | X       | X                | X              | X             | X      |
| Jonamac            | X             | X     | X        | X        | X      | X    | X    | X                |             |          |         | X        | X    | X        | X        | X             |                 | X       | X                | X              | X             | X      |
| Jonathan           | X             | X     | X        | X        | X      | X    | X    | X                |             |          | X       |          | X    | X        | X        | X             |                 | X       | X                | X              | X             | X      |
| Lodi               | X             | X     | X        | X        | X      | X    | X    | X                |             |          | X       | X        | O    | X        | X        | X             |                 | X       | X                | X              | X             | X      |
| McIntosh           | X             | X     | X        | X        | X      | X    | X    | X                |             |          | X       | X        | X    |          | X        | X             |                 | X       | X                | X              | X             | X      |
| Paulared           | X             | X     | X        | X        | X      | X    | X    | X                |             |          | X       | X        | X    | X        |          | X             |                 | X       | X                | X              | X             | X      |
| Red Delicious      | X             | X     | X        | X        | X      | X    | X    | X                |             |          | X       | X        | X    | X        | X        |               |                 | X       | X                | X              | X             | X      |
| Red Gravenstein    | X             | X     | X        | X        | X      | X    | X    | X                |             |          | X       | X        | X    | X        | X        | X             |                 | X       | X                | X              | X             | X      |
| Spartan            | X             | X     | X        | X        | X      | X    | X    | X                |             |          | X       | X        | X    | X        | X        | X             |                 |         | X                | X              | X             | X      |
| Tydemans's Early   | X             | X     | X        | X        | X      | X    | X    | X                |             |          | X       | X        | X    | X        | X        | X             |                 | X       | X                | X              | X             | X      |
| Tydemans's Red     | X             | X     | X        | X        | X      | X    | X    | X                |             |          | X       | X        | X    | X        | X        | X             |                 | X       | X                | O              | X             | X      |
| Winter Banana      | X             | X     | X        | X        | X      | X    | X    | X                |             |          | X       | X        | X    | X        | X        | X             |                 | X       | X                | X              |               | X      |
| Yellow Transparent | X             | X     | X        | X        | X      | X    | X    | X                |             |          | X       | X        | X    | X        | X        | X             |                 | X       | X                | X              | X             | O      |

Key to symbols:

X = compatible    O = partially self-compatible, but pollinizer suggested    Blank space = not compatible

**Trees must be blooming at same time for pollination to occur.**

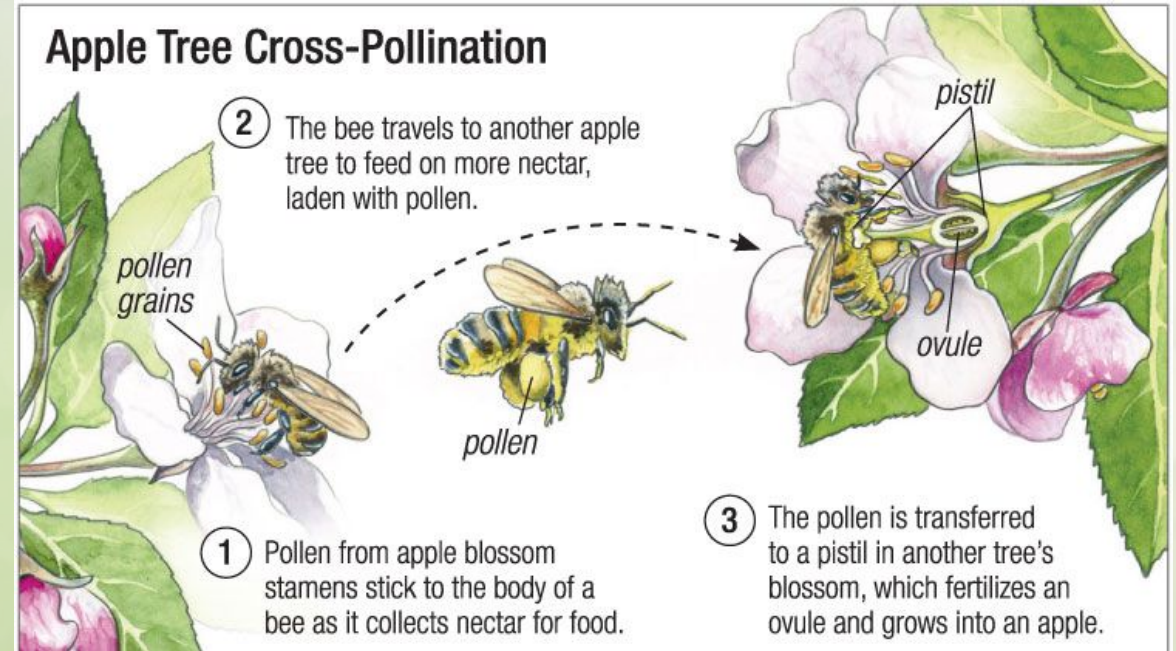
Crabapples are great pollinators.

Popular 'Chehalis' is self-pollinating, but bears more with another nearby pollinator.

[Apple tree pollinator checker](#)

# Pollination

- Need cross pollination
  - Most apples, pears, and many sweet cherries and plums
  - Bloom times must overlap!
- Self-fertile
  - Most peaches, nectarines, apricots, sour cherries and some newer varieties of sweet cherries
- Know your variety some fruit varieties are cross-incompatible
  - Certain sweet cherries won't cross pollinate with others
  - Some apples, plums and pears
  - Pollen-sterile apples (E.g., Jonagold, Liberty, and Gravenstein) need two other pollinators
  - One solution: grafted tree with 3-4 varieties.



<https://shop.arborday.org/images/tree-nursery/cross-pollination.jpg>



# Pollination

- Orchard Mason Bees!!
- IN PERSON “Raising Mason Bees” class Saturday, Feb. 10, 10 am - noon
- Visit our EVENTS CALENDAR for registration details

<https://www.cowlitzcomg.com/public-events>



“Male orchard mason bee.” <https://www.fernandrosemary.com/bee-pics/> Billie Bevers, Master Gardener. Used with permission.

# Small trees allow for better pest control

Protects from BMSB, birds,  
Codling Moth, Apple Maggot,  
SWD



**Homeowners should not make  
foliar applications to trees over  
10 ft tall**

# Small trees allow for better pest control

Protects from BMSB, birds,  
Codling Moth, Apple Maggot,  
SWD



100pcs Fruit Protection  
Bags 6x9  
inch--\$18--re-usable

[https://www.amazon.com/  
Protection-Netting-Drawstri  
ng-Protectors-Tomatoes/d  
p/B0C2YDT1DH?th=1](https://www.amazon.com/Protection-Netting-Drawstring-Protectors-Tomatoes/dp/B0C2YDT1DH?th=1)



**Homeowners should not make  
foliar applications to trees over  
10 ft tall**

# Tree selection --size

## Tree Size

- Mini-Dwarf (5'-8')
- Mini Dwarf (6'-8')
- Dwarf (8'-12')
- Semi-Dwarf (12'-16')
- Semi-Dwarf (14'-22')
- Standard (25'-30')
- Espalier
- Columnar (8'-10')
- Dwarf (12'-16')
- Standard (15'-20')

<https://brogdaleonline.co.uk/wp-content/uploads/2019/02/Apple-tree-rootstocks.jpg>

size about 8 ft.ft

## APPLES



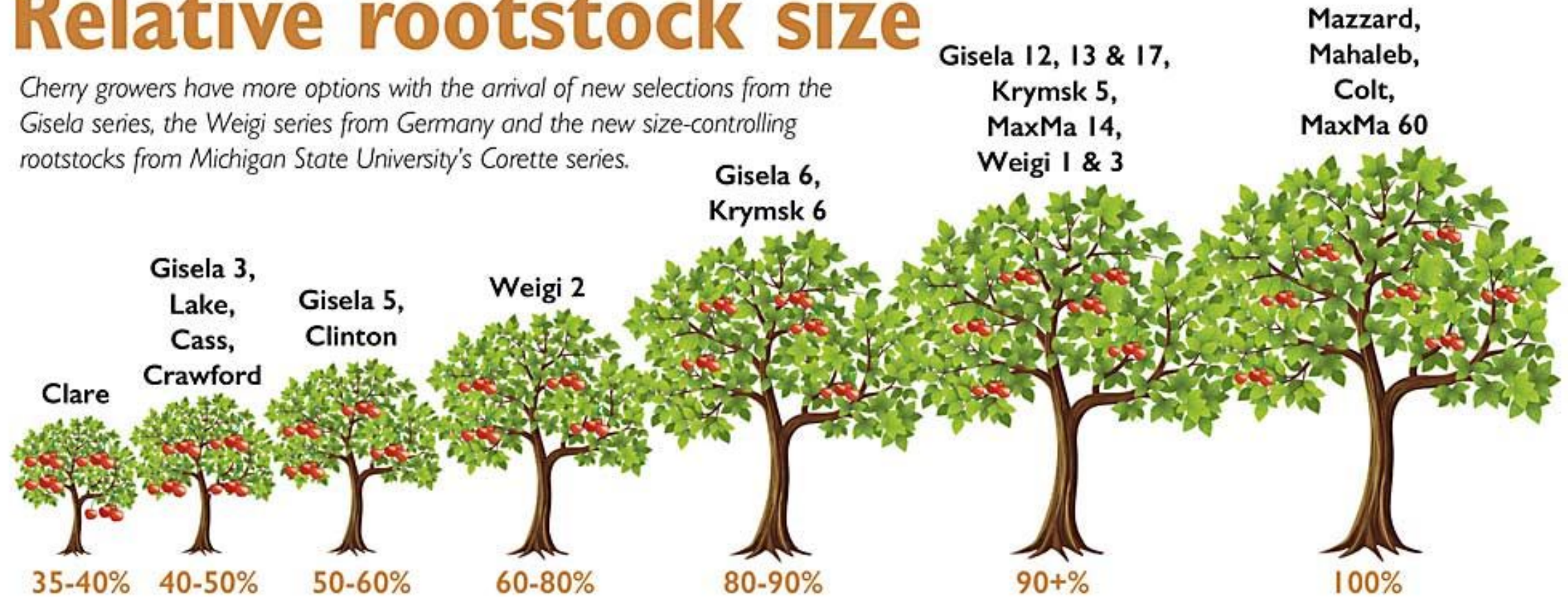
| Rootstock          | M27   | M9   | M26  | MM106   | M25                  |
|--------------------|---|--|--|---|----------------------|
| Ultimate height    | 5-6 feet  | 8-10 feet  | 12-15 feet   | 14-18 feet  | 25-30 feet           |
| Uses               | Vertical cordon*<br>Patio tree<br>Step over<br>Dwarf bush | Oblique cordon<br>Step over<br>Bush<br>Central leader<br>Pyramid | Oblique cordon<br>Step over<br>Bush<br>Central leader<br>Pyramid<br>Small espalier | Double cordon<br>Half standard<br>Espalier<br>Fan<br>Bush<br>Central leader | Standards            |
| Fruiting in        | 2-3 years   | 3-4 years  | 3-4 years  | 3-4 years   | 6-7 years            |
| Cropping potential | 4-5 years<br>15 lbs                                       | 5-6 years<br>44 lbs  | 5-6 years<br>66 lbs  | 7-8 years<br>110 lbs  | 8-9 years<br>265 lbs |
| Planting distance  | 5-6 feet  | 5-6 feet   | 10 feet  | 12 feet   | 25-30 feet           |

\***Cordon:** refers to a single (up to 3) stem with short (2-3 inch) lateral sideshoots (the fruiting spurs), E.g., columnar

# Tree selection-Cherries

## Relative rootstock size

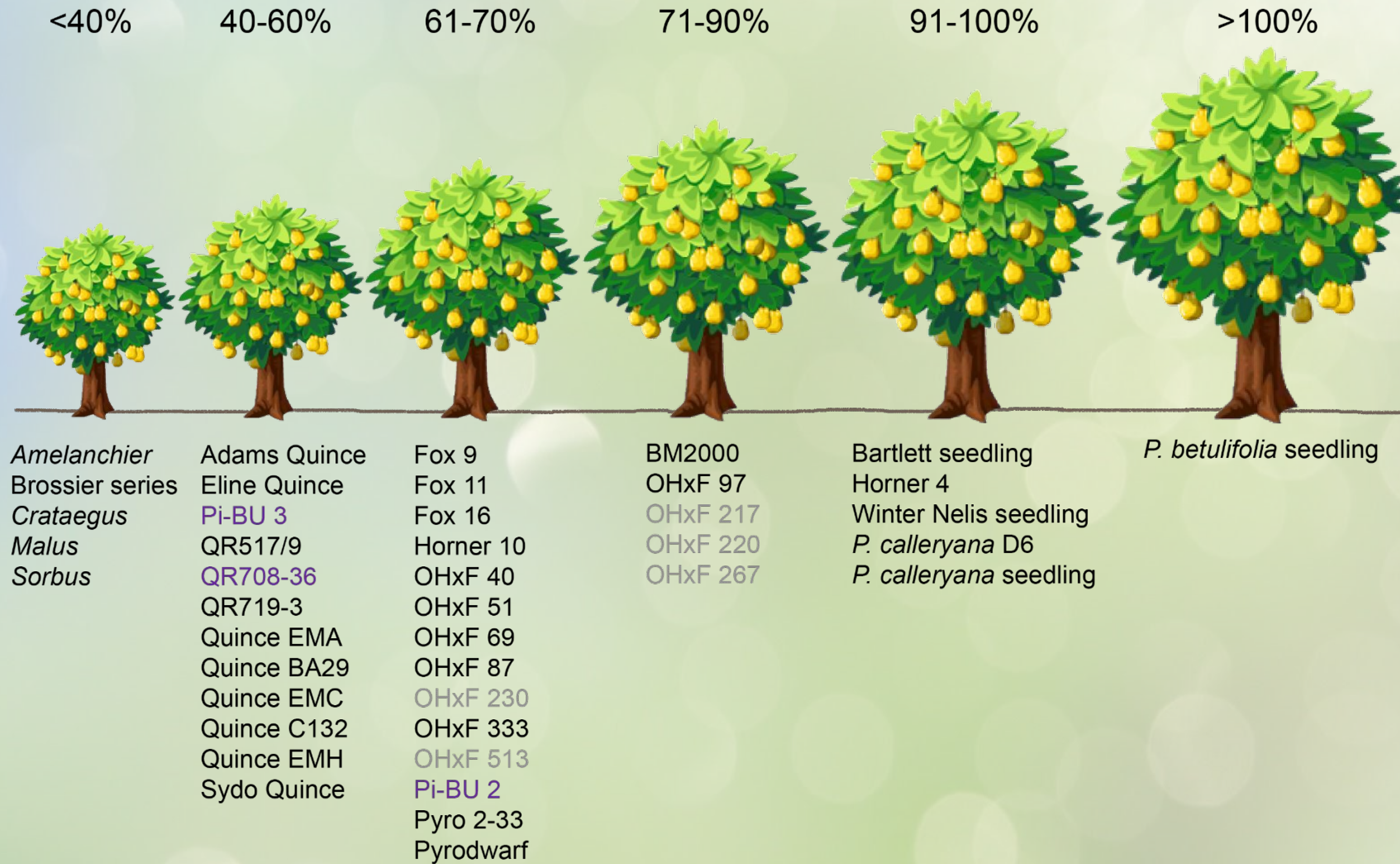
Cherry growers have more options with the arrival of new selections from the Gisela series, the Weigi series from Germany and the new size-controlling rootstocks from Michigan State University's Corette series.



SOURCE: WASHINGTON TREE FRUIT RESEARCH COMMISSION/A. IEZONNI, MSU

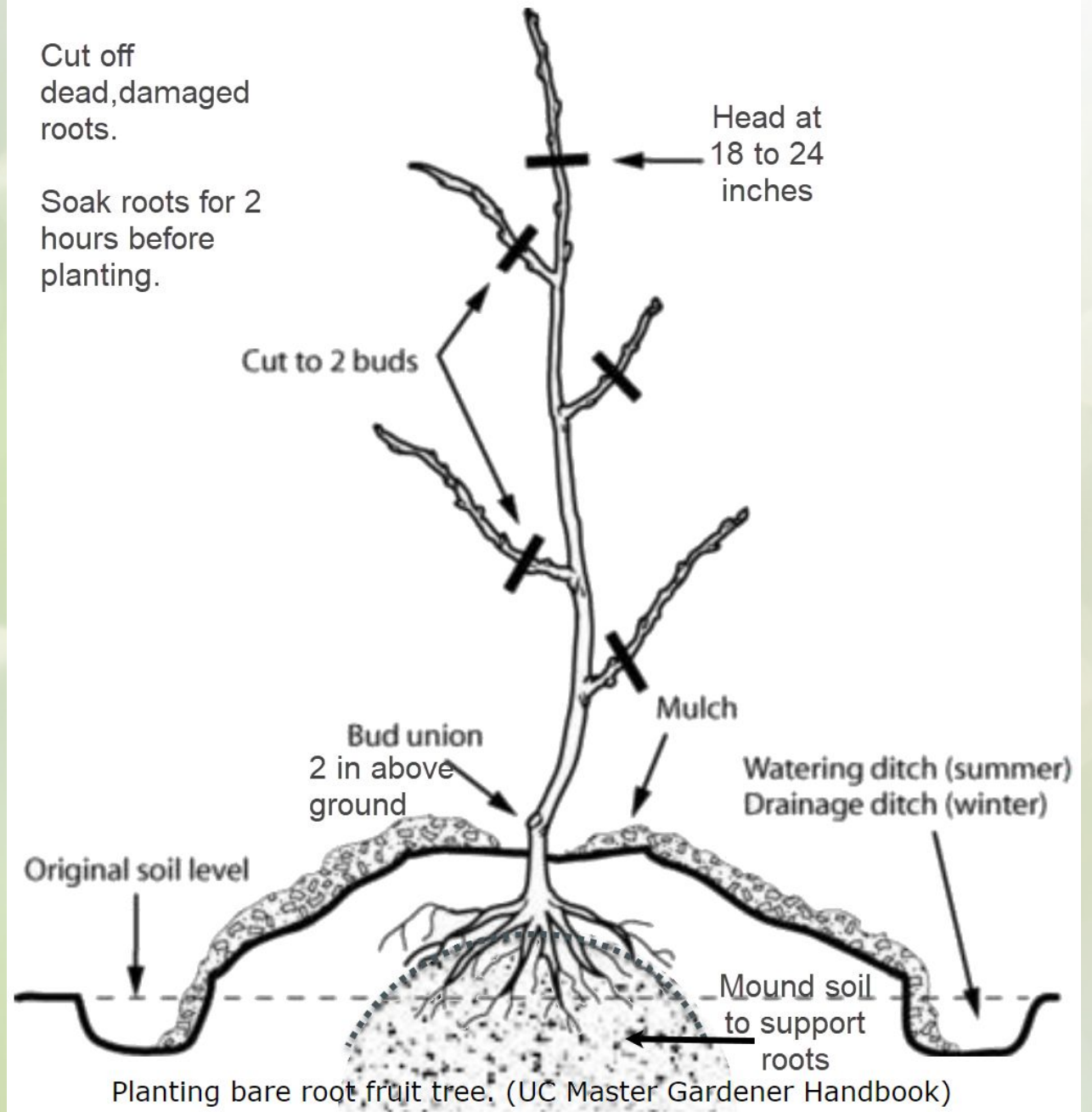
JARED JOHNSON/GOOD FRUIT GROWER

# Tree selection-Pears



# Bare root trees

- Don't let roots dry out.
- Unheated garage
- Dig hole least twice as wide and the same depth as the roots.
- Mound to support roots.
- Fill in with SAME SOIL that came out of the hole!
- Cover roots completely.
- Water thoroughly.
- <https://raintreenursery.com/collections/fruit-trees>
- <https://www.burntridgenursery.com/Fresh-Eating-Apples/products/12/>



# Soil Fertility

- Soil test results will tell you what you need.

[Sample report](#)

- General rule of thumb—

- If your tree is producing about **one foot of new growth or more a year** and has healthy looking foliage, it may not need much or any fertilizer. **Unnecessary fertilizing can increase disease and insect problems or kill your tree!**

<http://simplysoiltesting.com>





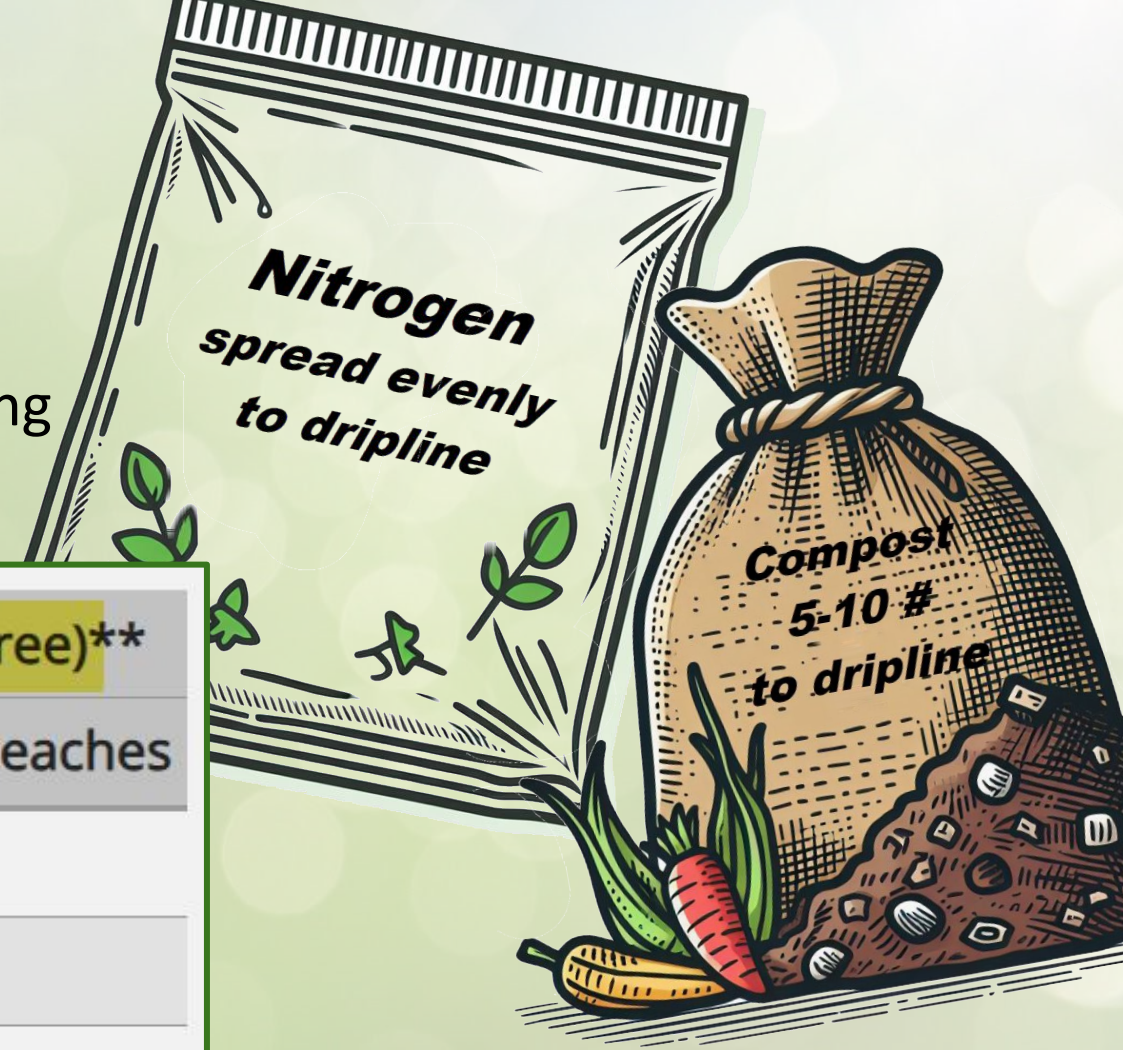
# Soil Fertility

- **Timing is critical.**
  - Nitrogen: apply when the tree is finished blooming
  - Do NOT fertilize after mid-June

| Tree age (years) | Pounds of fertilizer to apply (per tree)** |                   |
|------------------|--|-------------------|
|                  | Apples, pears, prunes                      | Cherries, peaches |
| 1                | 0-1.25                                     | 0-5               |
| 2                | 2.5  | 5                 |
| 3-5              | 2.5-3.25                                   | 5-7.5             |
| 6-7              | 3.5-5                                      | 7.5-10            |

<https://extension.oregonstate.edu/catalog/pub/ec1503>

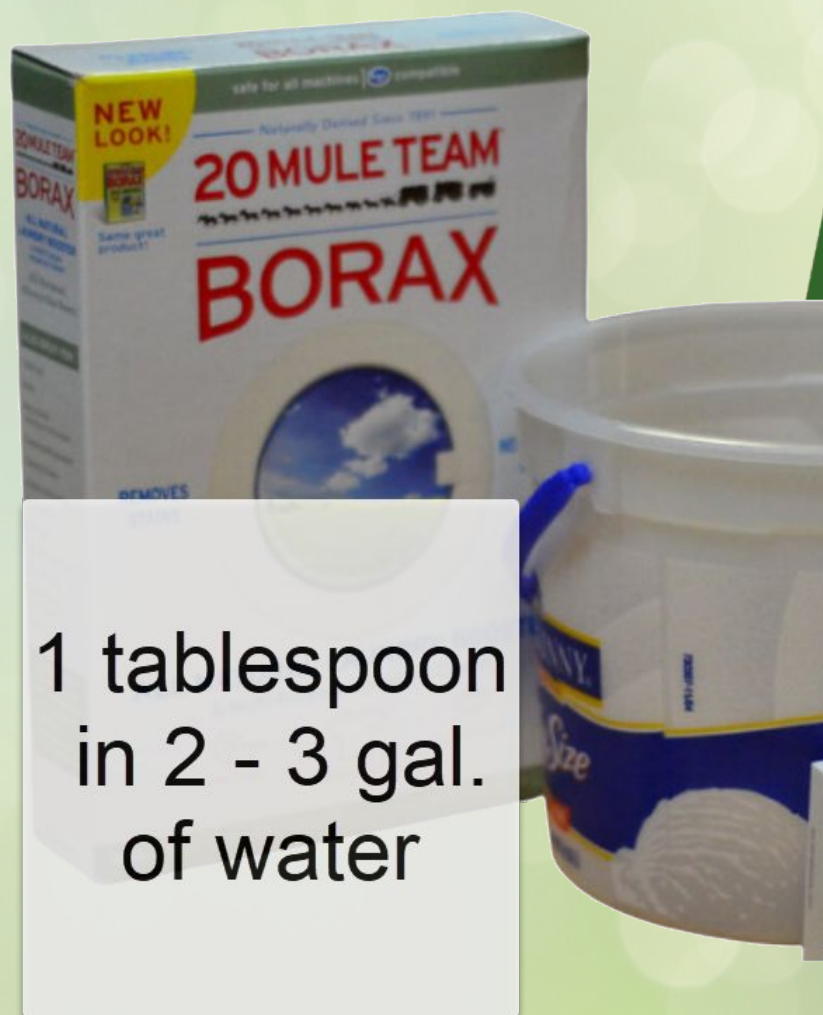
Chart is based on 10%nitrogen. Halve for 10%, double for 5%



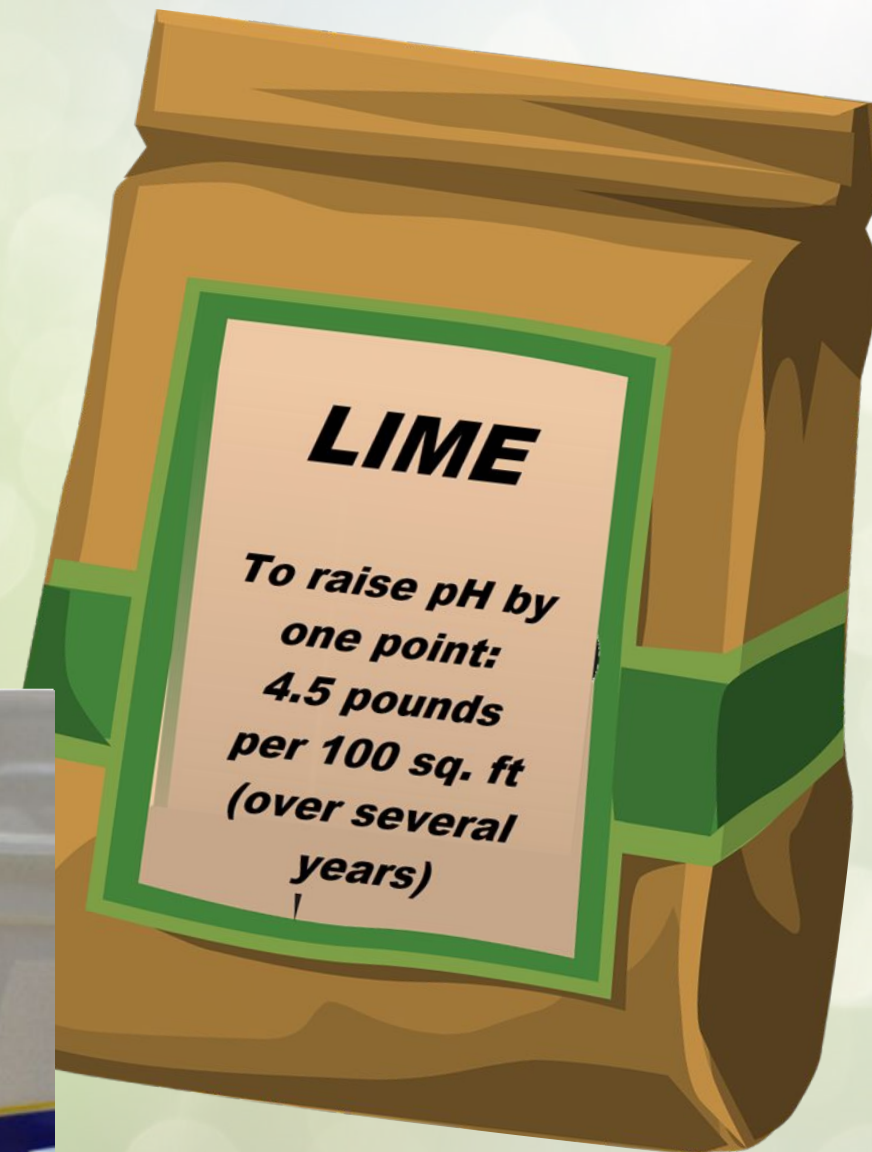
1 pound fertilizer= 2 cups

# Soil Fertility

- 
- **Timing is critical.**
  - **Autumn-** winter rains required to move them through the soil to the roots.
    - Potassium, phosphorus, magnesium, and calcium



1 tablespoon  
in 2 - 3 gal.  
of water

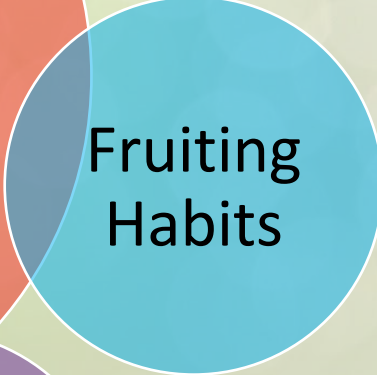
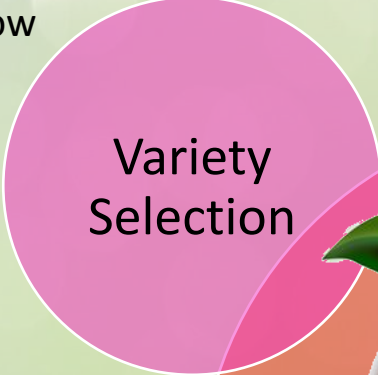
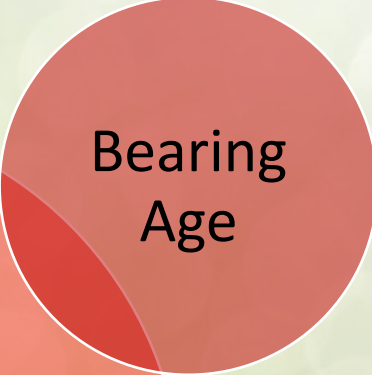


# Why Fruit Trees Fail to Bear

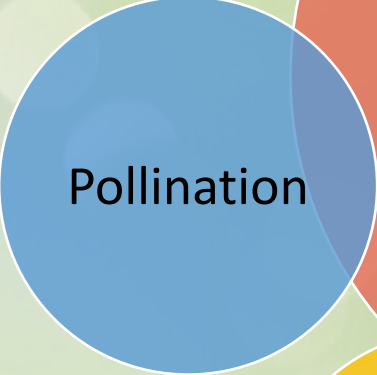
Dwarf apples/pears bear 1-2 years earlier.  
 Trees with moderate growth rates bear sooner than those that grow very slow or very quickly.

Environmental stress  
 Diseases/insects can reduce the size and quality of fruits

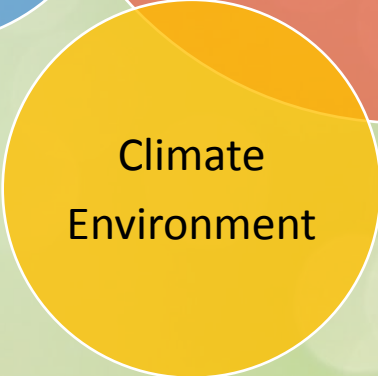
- Apple -2 to 5
- Apricot – 2 to 5
- Fig – 2 to 3
- Peach – 2 to 4
- Pear – 4 to 6
- Plum – 3 to 6
- Cherry sour – 3 to 5
- Cherry sweet 4 to 7



Correct **biennial bearing**-early and heavy thinning in heavy-bearing year



Pollinizer tree needed?  
 Cold can affect availability of pollinator insects



Peach, sweet cherries sensitive to cold ( -10°) during dormancy  
 Open blossom--damage <27°  
 Closed flower bud-- <24°



Sun  
 Water  
 soil nutrition  
 Competition--weeds, grass  
 Mulch  
 Pruning

# Non-pest/disease Problems

- Broken branch
  - Splint branch if not too high and not completely broken off
  - If broken off, re-shape tree by pruning
- June drop
- Failure to bear fruit
- Burrknot \*



Note the formation of small root initials in the area of the knot. These knots were on the branches of this 'Gala' apple. OSU Plant Clinic collection, 2012.



Knots can be seen above, at or below the soil line. Multiple burrknots can be seen on this Braeburn tree on EMMA 111 rootstock. Jay W. Pechholdt, 2013.



How to Repair Broken Branches by Growing Wisdom  
<https://www.youtube.com/watch?v=9TFFvAj1FXs>

<https://pnwhandbooks.org/plantdiseases/host-disease/apple-malus-spp-burrknot>

# Bitter Pit

- Nutritional imbalance ↓ boron, ↑ potassium
- Low movement of calcium in the fruit
- Hot, dry weather in July and August
- Irregular and low summer irrigation



<https://www.canr.msu.edu/uploads/attachments/bitternutrition-EricHanson.pdf>  
Bitter pit associated with localized deficiency of calcium in apple fruit. Lesions typically concentrated towards the calix end of fruit.

Honeycrisp very susceptible

# Boron Deficiency

1. Increasing pH above pH 6.5
2. Very wet or very dry soils
3. Increased leaching



**Boron deficiency internal and external symptoms.**

(Photo: Mary Ann Hansen, Virginia Polytechnic Institute, Bugwood.org)

# Split Fruit



**split fruit due to dry soil  
conditions followed by  
unusual amount of water**

# FRUIT TREES—JUNE DROP—WHY?

- Especially on apple trees, you'll find a lot of smallish apples on the ground. "Survival of the fittest."
- Frequently poor pollination
- If shedding any insect damaged fruit
- Thin the fruit yourself BEFORE June drop.
  - Help tree put energy into producing large, healthy fruit
  - Prevent alternate-year bearing



[https://www.starkbros.com/blog/wp-content/uploads/2012/05/FruitDropPlums\\_LG.jpg](https://www.starkbros.com/blog/wp-content/uploads/2012/05/FruitDropPlums_LG.jpg)

**Note:** June drop occurs with peaches and plums, too. They should have been thinned in May—3-4 weeks after blooming. If you didn't, the tree will do it for you. Prune plums may need extra thinning-4 inches apart.

<http://homeorchard.ucdavis.edu/8047.pdf>



# FRUIT TREES—THINNING APPLE TREES

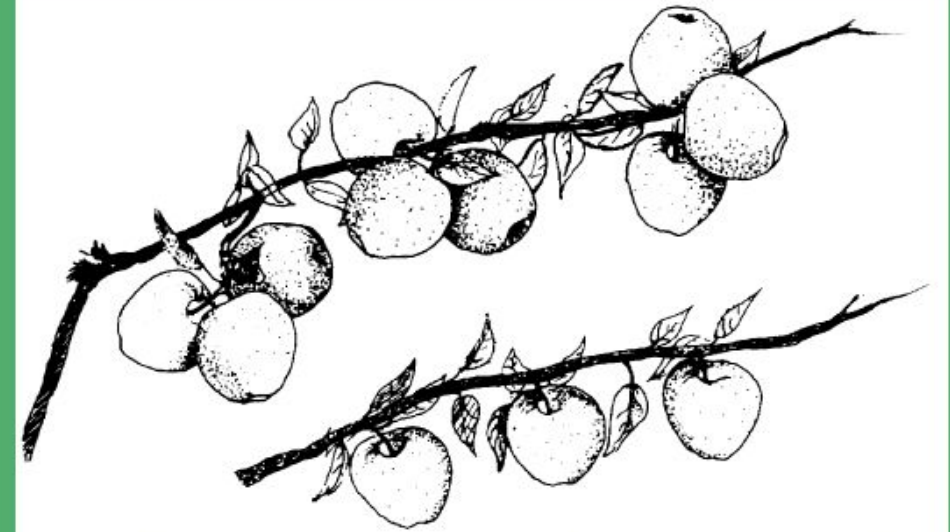
- Sooner you thin the fruit, the less of the tree's resources the apples will use.
  - Bigger, tastier fruit
  - Less chance of tree injury from excess weight
  - Helps next year's fruit buds form
  - Helps to even out the production from year to year



# FRUIT TREES—THINNING

## APPLE TREES

- Thin to 4-6 inches apart on each branch.
  - Remove smaller apples, and ones that have spots or other signs of damage
  - Break up large clusters, leaving plenty of space for the apples to develop
  - Use your fingers to twist the apples off, or carefully cut them off with pruners.



Fruit thinning. Top drawing: unthinned apple branch. Apples, pears, peaches, nectarines, and Asian pears should be thinned so that they are approximately 4 to 6 inches apart, as shown in the lower drawing.  
Nickola Dudley .ncsu.edu



# Non-pest/disease Problems -

## Small Fruit, Biennial bearing

VIDEO:

<https://extension.umn.edu/small-farms/farmbytes-thin-apples-better-harvests>

### Fruit Thinning

- More consistent bearing each year
- Bigger better fruit
- Protects tree from breakage
- Less codling moth damage

### Instructions

- Remove all but 1 or 2 fruits from the cluster when they are about thumbnail-size.
- For apples, pears, peaches- leave 4-6 inches between fruit on any branch
- Plums can be 3-4 inches apart.
- Cherries don't need thinning.



[https://extension.umn.edu/sites/extension.umn.edu/files/styles/caption\\_small/public/apples-thinning.jpeg?itok=huVh2LWJ](https://extension.umn.edu/sites/extension.umn.edu/files/styles/caption_small/public/apples-thinning.jpeg?itok=huVh2LWJ)

Your turn--Which ones would you remove?



# Sunscald

<https://forestry.usu.edu/news/utah-forest-facts/sunscald-injury-or-southwest-winter-injury-on-deciduous-trees>

<https://thetroyker.ru/en/the-ceiling-when-it-is-better-to-whitewash-the-trees-why-do-the-trunks-of-trees-in-the-garden/>



Progression of sunscald on apple following 3-day heat dome of 110° temps

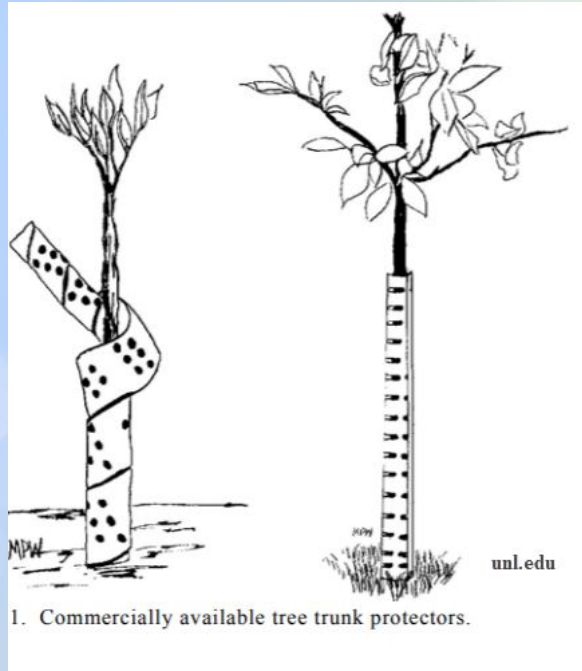


Sunscald 1 week past 110° F.



Sunscald 4 weeks past heat dome

# Animal damage

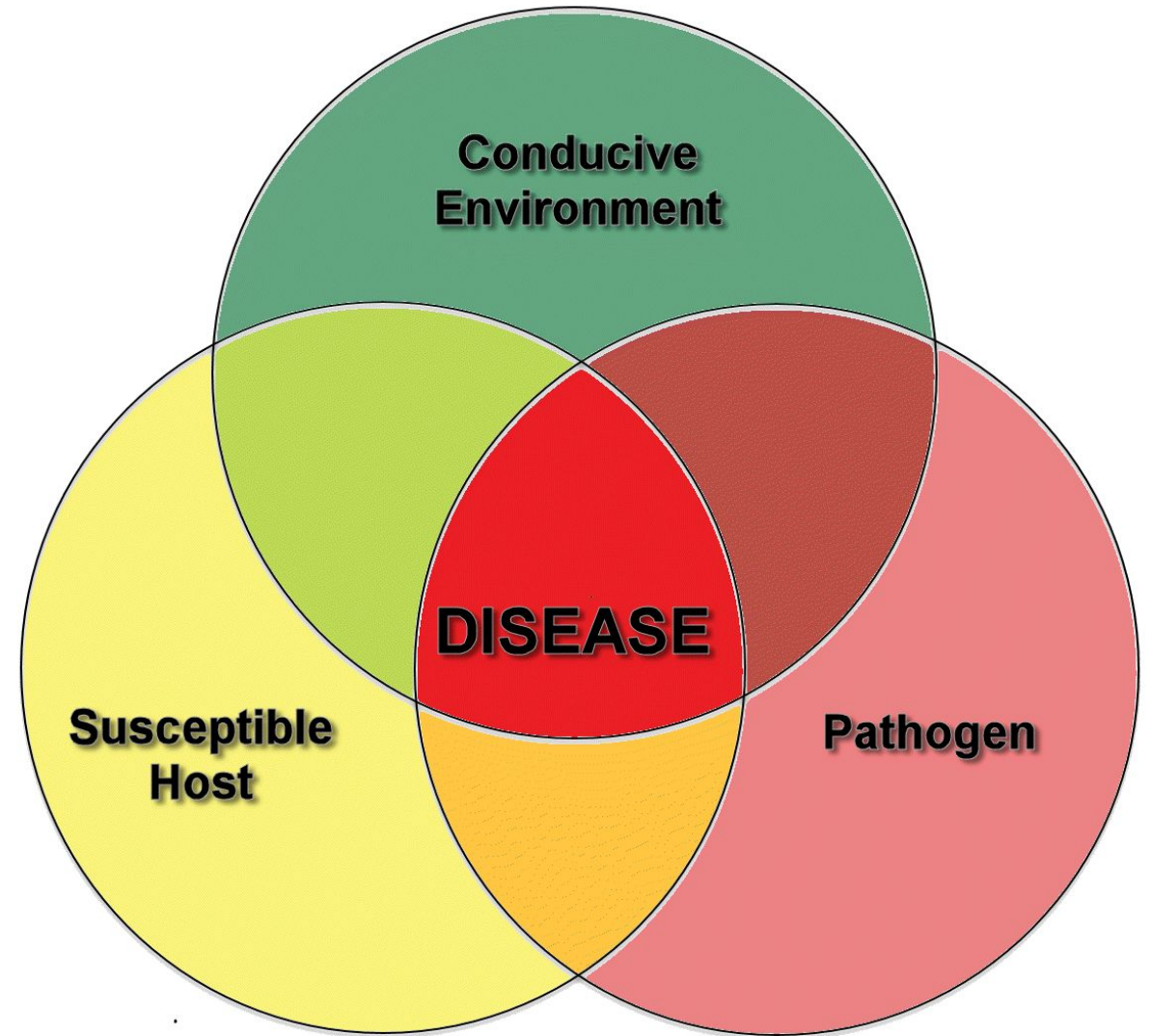


Bury 3 inches in the ground to exclude voles (field mice)



# Disease Triangle

- **Conducive Environment: Do YOUR part!**
  - Remove fruit and leaves with disease spots, hail damage, or other defects.
  - Pick up fallen fruit and leaves
  - Water properly
  - Remove grass and weeds around young trees
  - Mulch to moderate soil moisture and keep weeds from competing with tree for moisture and nutrients
  - One inch of water/week during the summer dry season.
  - Tree guards protect young trunk from sun and animal pests
  - Prune to allow good air circulation
  - Avoid use of broad spectrum pesticides



# Home Orchards--a HUGE responsibility

We have a **legal and social responsibility to control pests**--both insect and disease--that come with growing fruit trees.

- Year round commitment during the entire lifetime of the trees.
- Diseases and insect pests that are uncontrolled will affect your trees, and your neighbors trees,
- More important, not taking care of your problems can impact commercial fruit and nut production.
- Some pesticides will be required, but our IPM strategy should minimize the use of broad spectrum chemicals.
- Protect Washington's worldwide reputation for excellent quality tree fruit!



# Backyard Fruit Tree Spray Schedules



The spray recommendations for home garden fruit trees have been updated for 2019. The list of PDFs below shows the suggested spray schedules for each tree crop.

- [Apples](#)
- [Cherries](#)
- [Peaches, Nectarines, and Apricots](#)
- [Pears](#)
- [Plums and Prunes](#)
- [Walnuts](#)

WASHINGTON STATE UNIVERSITY  
CHELAN COUNTY EXTENSION

Chelan - Douglas Counties Horticultural Pest and Disease Boards

**SUGGESTED SPRAY SCHEDULE FOR HOME GARDEN APPLES - Revised 2019**

| Growth Stage   | Description  | Target Information  | Chemical Sprays   | Important  |
|--|--|---|---|--|
| Delayed-Dormant<br> | In late winter, just as buds begin to show first green tissue. | <ul style="list-style-type: none"> <li>Spray when daytime temperature is between 45 - 55 F, with no frost forecast overnight. Finish spraying by noon to insure good dry time. Spray for over-wintering scales, aphids, and mites.</li> <li><i>Oils are not effective against woolly apple aphids</i></li> <li>Manage pests as they hatch in early spring.</li> </ul> | <ul style="list-style-type: none"> <li>Superior type petroleum horticultural oils</li> <li>Products available under a variety of labels. Follow directions on label carefully to avoid plant damage. U.R. rate of 92% or more.</li> </ul>   | <p><b>Important</b></p> <p><b>This is the most important stage and chemical spray to control pests.</b></p>  |
| Pink<br>           | Just as flower clusters open, but before flowers open.         | <ul style="list-style-type: none"> <li>Powdery mildew control.</li> <li>Hatching insect pests such as mealybug, lygus bug, stinkbug, aphid, mites.</li> <li>Feeding caterpillars such as leaf rollers, army or cut worms</li> </ul>   | <ul style="list-style-type: none"> <li>See "Pink"</li> <li>All season horticulture oil (Ex. R-T-U Year Round Spray Oil)</li> <li>Sulfur (Ex. Lilly Miller Sulfur Dust Fungicide/Insecticide Dust or Spray)</li> <li>Potassium laurate (Ex. Safer Brand Insect Killing Soap Conc); Acetamiprid (Ex. Ortho Flower, Fruit &amp; Vegetable Insect Killer). Esfenvalerate (Ex. Monterey Bug Buster II RTS)</li> <li>Spinosad (Ex. Monterey Garden Insect Spray); <i>Bacillus thuringiensis</i> (Bt) (Ex. Ferilome Dipel Dust)</li> </ul> | <p><b>Do not use horticulture oil if using sulfur at any time of year. It can be toxic.</b></p> <p><b>Do not apply sulfur spray to Delicious varieties at this time as severe fruit drop can occur later.</b></p> <p>* <i>Make sure spray covers top and bottom of leaves.</i></p> |
| Bloom  | When flowers are open.   | <b>Avoid pesticide application during bloom to protect honeybees!!!!</b>  |   |  |

# Fruit Care Calendar

|              |   |   |  |   |  |   |   |   |  |
|--------------|---|---|--|---|--|---|---|---|--|
| <b>Jan</b>   | <a href="#">apply control</a> for <a href="#">peach leaf curl</a> apply three (3) times 3 weeks apart starting in early January until <a href="#">bud break</a> | plant <a href="#">bare root</a> trees, vines, <a href="#">graft scionwood</a>       | <a href="#">apply fertilizer &amp; lime</a>  | <a href="#">Collect scion wood while fully dormant</a>              | <a href="#">Anthracnose Control</a>                          | <p><b>June</b></p> <p>net cherries, <a href="#">strawberries</a>, and <a href="#">blueberries</a></p> <p>Late June: Set out <a href="#">apple maggot</a> traps</p> <p><a href="#">Codling Moth Control</a><br/><a href="#">Organic pest management</a></p> <p><a href="#">Cut back June-bearing strawberries after harvest, fertilize</a></p> <p><a href="#">finish bark grafting trees</a></p> <p><a href="#">begin transplanting nursery trees</a></p> <p><b>Dec.</b></p> | <p>Reduce irrigation if tree is growing vigorously (&gt;16-18 inches new growth)</p> <p>Remove fruit infected with disease or insects immediately.</p> <p>monitor <a href="#">apple maggot</a> control</p> <p>summer <a href="#">pruning</a></p> <p>prepare ground for <a href="#">spring planting</a></p> <p><a href="#">collect scionwood</a></p> | <p>train young trees stake, use <a href="#">spreaders</a></p> <p>cut suckers</p> <p>remove <a href="#">laterals on stone fruit</a></p> <p>support fruited branches</p> <p>avoid late pruning</p> <p><a href="#">begin dormant pruning</a></p> | <a href="#">Fruit Thinning</a> apple-pear  |
| <b>Feb</b>   | <a href="#">protect peach, apricot, nectarine blossoms from frost</a>   | Prune Grape Vines UC Pruning Videos <a href="#">Cane Spur</a>                       |  | dormant season <a href="#">pruning &amp; Video</a>                  | <a href="#">Mason Bee Release</a>                            |   |   |   | <a href="#">Fertilize blueberries &amp; raspberries</a>  |
| <b>March</b> | <a href="#">Prune/fertilize</a> blueberries   | <a href="#">Fertilize raspberries/blackberries</a>                                  | <a href="#">delayed dormant control</a> (Buds begin to swell but before green tips start to show.) |   | <a href="#">Stone Fruit Control brown rot &amp; shothole</a> |   |   |   |  |
| <b>April</b> | repair trellis support systems <a href="#">Fruit trees</a> <a href="#">Grapes</a>   | check for <a href="#">tent caterpillars</a> , <a href="#">leaf rollers</a> , use BT |  |   |  |   |   |   | <a href="#">Grape Spray mildew botrytis</a>  |
| <b>May</b>   | <a href="#">Codling Moth Control</a> <a href="#">Organic pest management</a>  | If necessary, <a href="#">fertilize when trees finish blooming</a>                  | <a href="#">aphids, scale, mites</a>   | <a href="#">apply sticky trap ant barrier</a> (see "Ant Management) | <a href="#">Fruit Thinning (video) apple-pear peaches-</a>   |   |   |   | extract <a href="#">mason bee</a> cocoons  |
|              |   | <a href="#">Check/install irrigation.</a>   | <a href="#">scab and mildew control (apple, pear)</a>  |   | <a href="#">Fertilize blueberries &amp; raspberries</a>      |   |   |   | Sanitation-cleanup diseased/dropped fruit & leaves Monitor <a href="#">anthracnose</a> and begin control after harvest |
|              |   | Check soil moisture at 6 inches deep. irrigate if                                   |  |   |  |   |   |   |  |

Adapted from <https://nwfruit.org/fruit-tree-care-calendar/>

Available:

<https://tinyurl.com/fruit-tree-calendar>

# Useful tools

But they only work if you use IPM, too!



## Fungicides

- Copper based
- Sulfur based
- Neem\* Contact
- Horticultural oil

Contact

## Insecticides

- Spinosad \*
- Pyrethrins Contact
- Insecticidal soaps Contact (potassium laureate)
- BT (*Bacillus thuringiensis*)

ALWAYS read the label!  
ALWAYS follow directions!

\* apply late evening

DON'T Apply to FLOWERING PLANTS!



# Primary Apple and Pear Pests in SW Washington

- Anthracnose
- Bitterpit\*
- Apple Scab
- Codling moth
- Apple Maggot
- Birds
- BMSB
- Tent Caterpillars and other caterpillars
- Rust
- Pearleaf blister mite



Photo by Alice Slusher. My very own beautiful Liberty apples chewed on by #@\*&! scrub jays!

# Codling Moth (Apples and Pears)

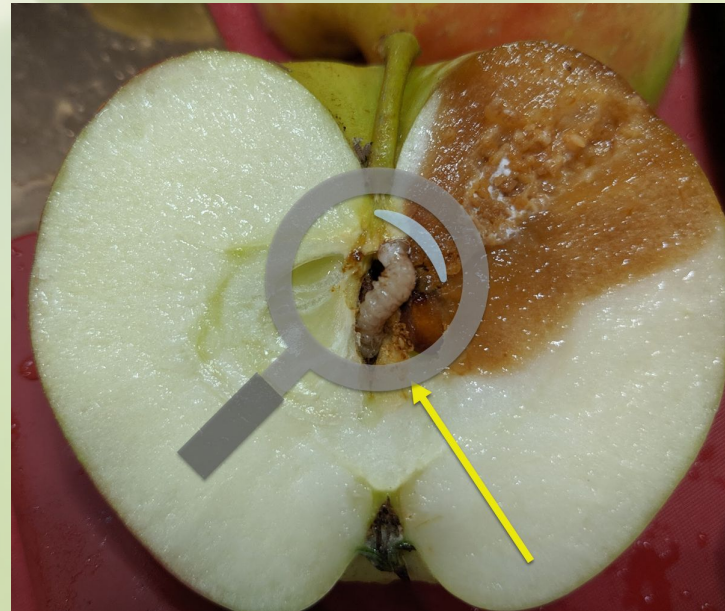
- First generation emerges **in spring just before bloom (late Apr/Early May)**—can fly a mile to mate.
- 100 eggs on new fruit
- Larvae feed on fruit surface, then burrow in
- Mature larvae leave fruit, find sheltered place to spin cocoons .
- Some larvae stay in cocoons through winter and emerge as adults in spring
- Others transform immediately to pupae and emerge as adults a couple weeks later for a second generation

<http://hortsense.cahnrs.wsu.edu/Search/MainMenuWithFactSheet.aspx?CategoryId=3&PlantDefId=64&ProblemId=100>



Codling moth *Cydia pomonella* Linnaeus Adult © Ken Gray Insect Image Collection

<https://pnwhandbooks.org/insect/tree-fruit/apple/apple-codling-moth>



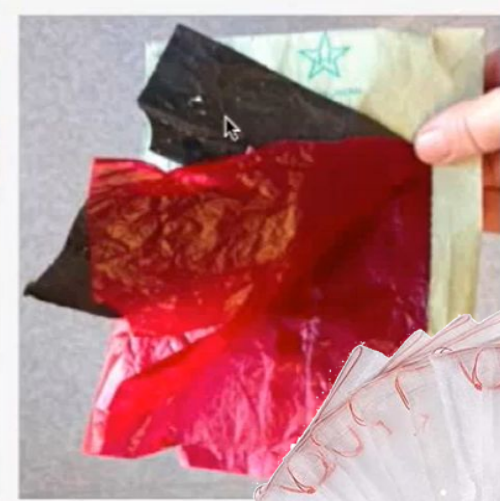
# Codling Moth

- Mechanical Control-Trunk bands and fruit bagging
- Larvae exit fruit
- Pupates under bark
- Bands offer attractive shelter for pupation
- Install corrugated cardboard strip in early May and remove late June
- Second generation: Install new strip mid-July and leave on until November.

Excellent resource:  
<https://extension.umn.edu/yard-and-garden-in-sects/codling-moths>



# Codling Moth



Fruit bagging

Fancy Japanese bags, paper bags with twist tie, footies.

Bag 10 days after petal fall (when MOST petals have fallen off blossom) and after fruit (1/2 - 3/4 inch) have been thinned to one fruit per cluster, 6-7 inches apart.

Remove three weeks before harvest to allow the fruits to color properly

Sanitation--pick and destroy infested fruit, do not allow to sit on ground.



Figure 21. These apples have been sprayed with kaolin clay to protect them from insect pests. Photo courtesy of Charles Brun.

# Codling Moth-Chemical Approach

- 
- IPM approach--spray twice for each generation
- How do you know? Eggs hatch 3 weeks after adults begin to fly...
- MONITOR with a sticky pheromone trap to catch male moths.
- Less precise, but works: Apply Spinosad product about **10 days after full petal fall**; twice in June (10-14 days apart), ; once in July and once in August
- Spinosad gives reasonably good control.
- 





# Apple Maggot

- Adult apple maggots (a fly) begin to emerge from the soil starting around **July 1**, continuing through most of the summer.
- Adults lay eggs on the fruit
- Each female fly can lay hundreds of eggs.
- Larvae tunnel through fruit
- When apples drop to the ground, the larvae transform into pupae in the soil.
- Pupae spend the winter underground, emerging as adults the following summer.

<http://hortsense.cahnrs.wsu.edu/Search/MainMenuWithFactSheet.aspx?CategoryId=3&PlantDefId=59&ProblemId=19>



<https://extension.umn.edu/yard-and-garden-insects/apple-maggot>

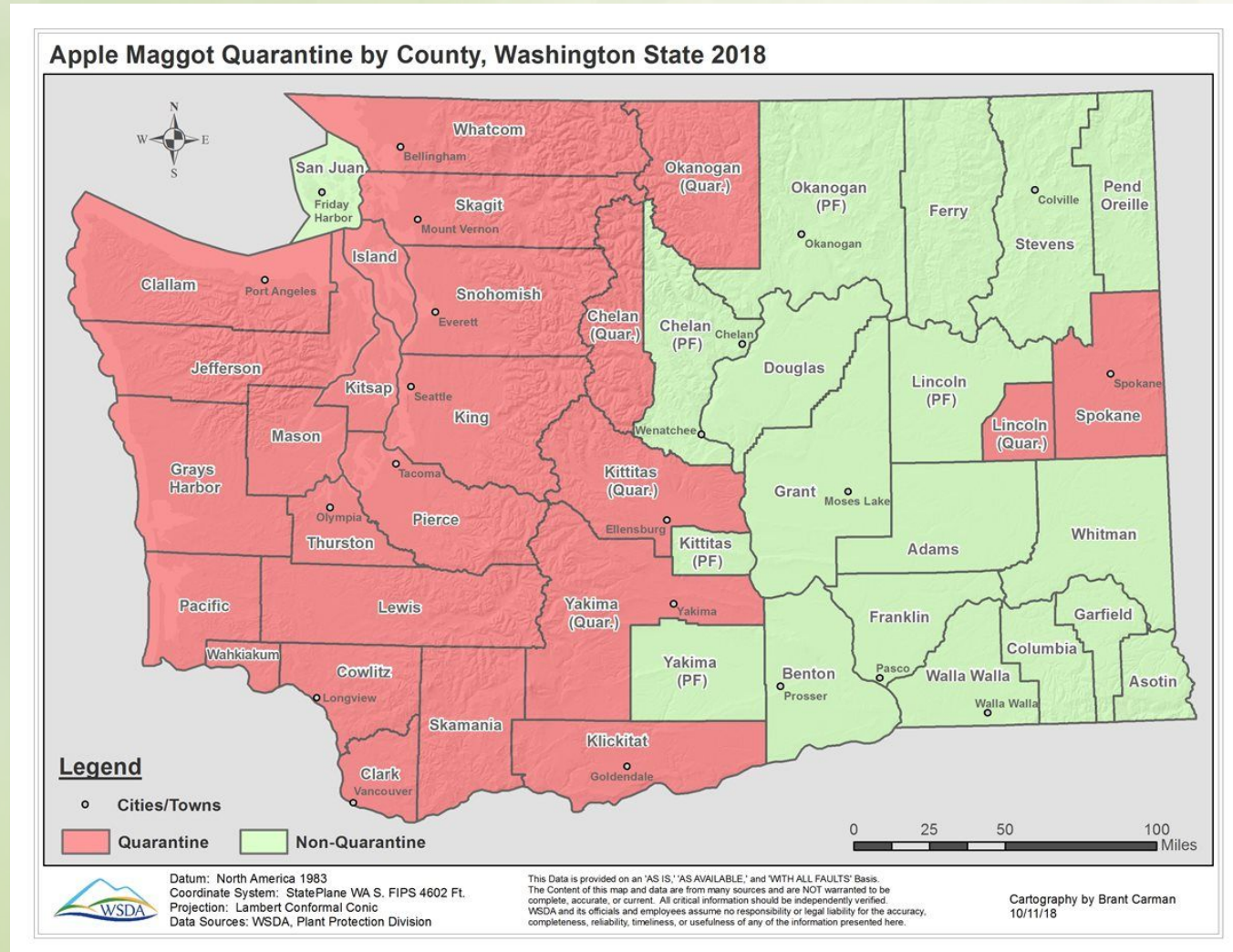


# Apple maggot quarantine

- State law prohibits the movement of homegrown fruit and municipal waste from a quarantined area into or through a pest-free area.

This is EXCELLENT

<https://extension.umn.edu/u/yard-and-garden-insects/apple-maggot#kaolin-clay-1814713>



# Apple Maggot management (Mid-June/July)

- Red ball sticky traps with ammonia lure--for monitoring only
- Sanitation—remove and destroy infested fruit from tree and any on the ground—Stop them from dropping to the ground to overwinter.
  - Do not compost. Leave fruit in black garbage bag in the sun for a week.
- Cover the fruit with fruit bags after “June drop” and fruit thinning.
- Cover the entire tree with netting.
- Pesticides
- Spinosad 17-21 days after petal fall.
- Chemical management: Pesticides in early July, repeat applications every 7 to 14 days until preharvest, or more frequently if it rains.
  - spinosad (organic), Not organic: acetamiprid, esfenvalerate



# Powdery Mildew

Infrequent west of cascades

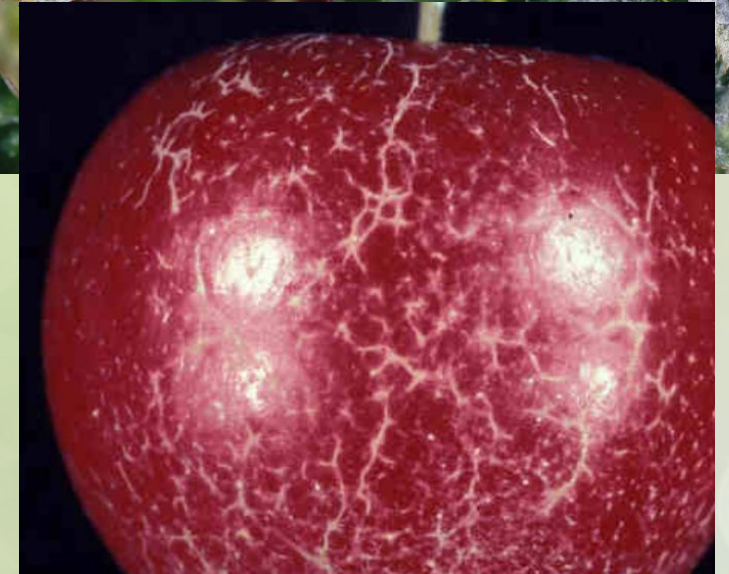
Choose resistant varieties.

Avoid excess nitrogen fertilizer.

Fungicide spray when leaves are just separating in the bud (or after most blossom have dropped). Repeat weekly.

Prune out affected shoots, and prune to improve air circulation.

Options: Neem oil (Apply at night), Potassium bicarbonate, horticultural oil, sulfur, myclobutanil (apply at night)



Caption: Russetting from powdery mildew on fruit  
Photo by: G.G. Grove

# Apple Scab (and Pear)

- Fungus
- Blackish brown blotches on leaves
- Shed infected Bud/blossom
- Scabs on fruit
- Fungus overwinters on dead apple leaves or fruit on the ground, spores spread by cool, rainy weather in spring

<http://hortsense.cahnrs.wsu.edu/Search/MainMenuWithFactSheet.aspx?CategoryId=3&PlantDefId=59&ProblemId=15>



Scab lesions can distort the growth of the fruit as can be seen between the healthy on the left and the diseased on the right. Photo part of the OSU Extension Plant Pathology Slide collection



Note the olive-brown lesions on this apple leaf. Apple scab (*Venturia inequalis*) Photo by Iain MacSwann, 1972

# Apple Scab (and Pear)

- Fungicides only protect healthy trees from becoming infected. Once leaf spots appear in the tree, fungicides will not control the disease.
- Plant scab resistant trees in sunny area with good air circulation and prune properly
- **Shred** leaves in fall (decreases infection transmission rates by 85-95%).
- Or **Rake up and remove leaves** (ok to compost if shredded).
- Sulfur, Copper, Armicarb (potassium bicarbonate). Apply in April when buds show at ½ in., re-apply when the buds grow swollen and start to open, and again when 1/2 inch of green leaf tissue is peeking out.



Figure 40. This apple spur is classified as "1/2 inch green tip"—the proper time to apply fixed copper for scab management. Photo courtesy of Charles Brun.

**Don't apply fungicides/insecticides to blooming trees!**

<https://pollinators.msu.edu/resources/growers/fungicidesafety/fungicides-during-bloom/>

# Brown Marmorated Stink Bug (BSMB)

- They're everywhere!
- When they find a good spot, they secrete a hormone to attract other BMSBs
- Impervious to most pesticides



<https://hudsonvalleyone.com/2019/05/22/program-seeks-volunteers-to-help-release-stinkbug-killing-wasp/>



<http://hortsense.cahnrs.wsu.edu/Search/MainMenuWithFactSheet.aspx?CategoryId=3&PlantDefId=59&ProblemId=841>

The tell-tale signs of stink bug damage (Hudson Valley Research Laboratory)

# Recognize immature stink bugs



Allentown, Pennsylvania 1996\*Vancouver, WA 2010\*Kalama, WA 2014  
and the rest is history!

<https://extension.umn.edu/nuisance-insects/brown-marmorated-stink-bug> Photo W. Hershberger



# Earwig damage

More likely on soft-skinned fruit



## ***Earwig Damage***



# Caterpillars on fruit trees

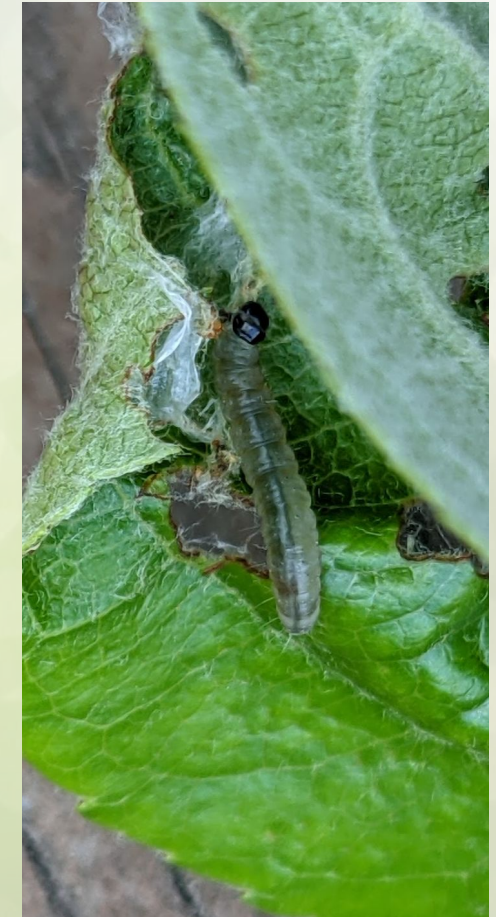
Leafrollers--monitor your garden and handpick and squish

Don't use broad spectrum pesticides--will kill beneficial insects that help to control insects.

Chemicals--

BT, Neem, dormant spray oil, spinosad

BT can be used only if the caterpillars are actively feeding



# Rust-it takes TWO to tango!

Pear Trellis Rust & Juniper  
acorn-like structures on back of  
leaf--late summer



<https://pnwhandbooks.org/sites/pnwhandbooks/files/plant/images/pear-pyrus-spp-pacific-coast-pear-rust/rustcallerypear.jpg>

Photo by Melodie Putnam

Photo by Jay Whitehead

Pacific Coast Pear & incense cedar  
most obvious after flowering and  
before July.



Aecia on top side of leaf.

*B.C. Ministry of Agriculture and  
Lands (Jespersion)*



Acorn-shape aecia form on the  
lower leaf surface.

*Neil Bell, 2016.*



Aecia on bottom side of leaf.

<https://pnwhandbooks.org/plantdisease/host-disease/pear-pyrus-spp-trellis-rust-european-pear-rust>

# Pear Rusts

- Sanitation
- Resistant varieties
  - Asian and European kinds are affected. 'Bartlett' is usually less affected while 'Winter Nellis' is severely affected. Resistant varieties aren't listed for trellis rust
- [Pear Trellis Rust](#)--Usually appears late summer. Remove all junipers within 1000 feet
  - Some juniper species such as *Juniperus communis*, *J. confertifolia* 'Blue Pacific' and *J. virginiana* 'Hetz' are more resistant to the disease than other species.
- [Pacific Coast Pear Rust](#)--Appears before July. Remove alternate hosts around the orchard.
  - Spores from the gel on incense cedar can be blown 6 for 10 mile

# Pearleaf Blister Mites

- Tiny insects lay eggs under leaves, causing “blistering” galls
- Usually affect only a single tree or even a single branch-but severe infestation weakens tree, affects fruit bearing
- Infest bud scales in August-September to overwinter.
- Apply horticultural oil as the buds begin to swell in the spring.
- Remove affected leaves

<http://hortsense.cahnrs.wsu.edu/Search/MainMenuWithFactSheet.aspx?CategoryId=3&PlantDefId=64&ProblemId=104>



© MELODIE PUTNAM, OREGON STATE UNIVERSITY

# Stone fruits

- Cherries
  - Sweet
  - Tart (Pie)
- Plums-
  - European
  - Asian
- Peaches-Nectarines
- Apricots

## Common Problems

- Peach leaf curl
- Bacterial canker
- Brown rot
- Coryneum blight
- Bark splitting
- Fruit cracking
- Pollination problems occur when bad weather at bloom time.
- Cold damage for early bloomers
- Spotted Wing Drosophila

# Growing Cherries in Western WA

- Tart (pie) cherries less susceptible than sweet cherries
  - Bloom later—less blossom damage, better pollination
  - Fruit Cracking
  - Bacterial canker/gummosis (lethal for sweet cherries)
  - HOWEVER—new disease resistant varieties using dwarfing Giessen rootstock
- Birds
- Spotted Wing Drosophila (aka suzukii)

Tart cherries don't need pollinizer tree, Sweet cherry tree must have a proper pollinizer



# Plums

- Japanese—Bloom very early, susceptible to frost damage
  - Cling stone— round, brightly colored red, yellow
  - Recommended: Methley, Beauty, Shiro (most reliable), Hollywood
- European—bloom later
  - “Prune” plums—free-stone
  - Aphids common on new growth--apply dormant spray for control
- Most require cross-pollinating



Victory European plum--usually needs thinning



Beauty Japanese type plum



# Growing Peaches and Nectarines in the PNW

- Well drained soil
- Need heavy pruning to because they bear fruit only on NEW WOOD.
- Perhaps the only peaches that can do well here in our wet, cold springs are genetic dwarf peaches planted in pots (3-5 ft. tall).
- Cover with a plastic bag from December – late February, then remove bag.
- Better yet, keep under roof away from the rain to minimize fungal diseases and frost damage to blossoms.
- Peaches have a LOT of [cold-related disorders](#) , including [“split pit”](#)



“**Hardired**” (yellow flesh) is the only nectarine recommended as consistently productive for our cool maritime climate conditions.

# Aphids

- Don't damage the fruit, but can damage leaves enough to decrease the tree's health.
- Honeydew---> black mold
- **BENEFICIAL INSECTS!!** (Avoid pesticide use!)
- Adults lay eggs in bark crevices and buds--hatching in spring; 2-3 generations
- Don't over-fertilize; control weeds around the trees--especially mustard family
- **Late March** apply horticultural oil to bark and buds--works well to keep populations down by smothering them.
- Neem and insecticidal soaps--must be sprayed **ON** the aphids to work!



Whitney Cranshaw, Colorado State University, Bugwood.org  
licensed under a Creative Commons Attribution 3.0 License.

# Peach Leaf Curl

- Fungal disease affecting leaves and twigs
- Overwinters on twigs and buds
- Major problem in Western WA
- Severe leaf drop affects fruit production, reduces vigor of trees, and increases susceptibility to winter injury.
- PLANT RESISTANT VARIETIES-Frost is resistant but not immune.
  - 'Krummel', 'Muir', and 'Redhaven' are reported to be tolerant. 'Rosy Dawn

Remove and destroy infected leaves

- Be proactive--start in late fall when half of the leaves have dropped
  - Apply copper-ammonia fungicide (E.g.-Monterey Liqui-cop Fungicidal Garden Spray
  - First week of January, then every 3 weeks with the last treatment just before the leaves open



Note the reddish swellings or galls on these peach leaves. OSU Extension Plant Pathology Slide Collection, 1976.

<http://hortsense.cahnrs.wsu.edu/Search/MainMenuWithFactSheet.aspx?CategoryId=3&PlantDefId=63&ProblemId=7867>

# Brown Rot-\* Blossoms

- Infected flowers wilt and die
- brown blossoms remain attached to the twigs, becoming covered with a grayish-brown fungal growth during wet weather
- Infected twigs develop sunken, elongate cankers with gumming at the margins.
- Apply fungicides just before blossoms open, at full bloom, and when most petals have fallen
- Prune out infected shoots, remove infected fruit from tree, ground
- Apply copper fungicide before bloom. After blooming, use a wettable sulfur to provide some protection



Sporulation is often seen in concentric rings. Jay W. Pscheidt, 2002.



Caption: Brown rot blossom infection  
Photo by: R.S. Byther

<http://hortsense.cahnr.wsu.edu/Search/MainMenuWithFactSheet.aspx?CategoryId=3&PlantDefId=61&ProblemId=35>

<http://hortsense.cahnr.wsu.edu/Search/MainMenuWithFactSheet.aspx?CategoryId=3&PlantDefId=61&ProblemId=35>

# Bacterial Canker

- Sweet Cherry very susceptible
- Plant resistant varieties--and don't plant old and new trees together
- Prune in summer after harvest when weather is dry
- Completely remove infected trees and branches girdled and killed by cankers.
- Cut out cankers--cut away bark around edges of infection with sharp knife, leaving smooth margins. Leave uncovered to dry.
- Treatment is of limited value, but copper-based fungicides and be used in October before rains start, and again in early January



Dead bud "disease" is first noted as dying buds on spurs in spring.

Cankers seldom form, but the diseased buds may produce a slight gumming. Jay W. Pscheidt, 2009.

<http://hortsense.cahnrs.wsu.edu/Search/MainMenuWithFactSheet.aspx?CategoryId=3&PlantDefId=61&ProblemId=34>

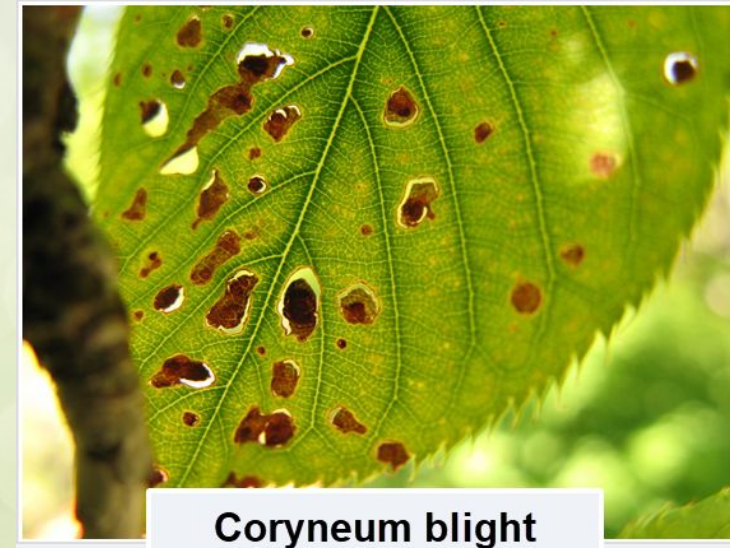
<https://pnwhandbooks.org/plantdisease/host-disease/cherry-prunus-spp-bacterial-canker>

# Coryneum Blight (Shothole)

- Spreads by water
- Avoid overhead watering (yeah, right!)
- Prune out and destroy dead buds, twigs (if present)
- Rake and destroy leaves

## Fungicides

- myclobutanil (apply late evening), sulfur, copper (Avoid chlorothalonil)
- Apply at petal fall, shuck fall, and 2 weeks later
- Rotate fungicide products



# Spotted Wing Drosophila

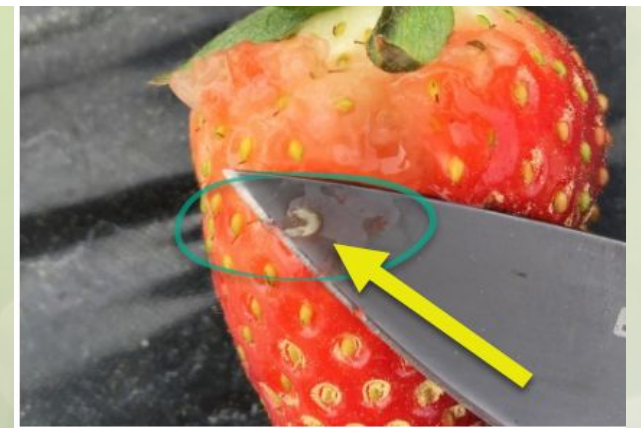
- 1/8 inch long, with red eyes and a yellow-brown body
- Attacks **healthy fruit** as it ripens on the plant
- Eggs are laid beneath the surface of ripening fruit as it begins to soften and show color



Spotted wing drosophila on a strawberry  
*Image Credit: Washington State University Extension*



*Caption: male SWD (thumbnail), damage on cherry (large)  
Photo by: Fly: J. Davis; fruit: M. Hauser, CDFA*



A spotted wing drosophila larva is dug from a Lowcountry strawberry.  
*Image Credit: Zachary Snipes / Clemson Extension* 71

<http://hortsense.cahnrs.wsu.edu/Search/MainMenuWithFactSheet.aspx?CategoryId=3&PlantDefId=61&ProblemId=789>

# Spotted Wing Drosophila

- Monitor for the presence SWD using vinegar traps (does NOT control them!) This will determine if/when a pesticide may help with control.
- Pick ripe/damaged fruit frequently, remove fallen fruit immediately
  - Dispose in sealed container
  - Do not compost infested fruit

Pesticides-- PROTECTIVE--are effective ONLY for adults.  
Has no effect on eggs and maggots in the fruit.

The fruit MUST be listed on the label!



<https://extension.unh.edu/resource/monitoring-spotted-wing-drosophila-swd-traps#:~:text=The%20bottom%20line%20is%20that,been%20shown%20to%20improve%20attractiveness.>



# Spotted Wing Drosophila

- **Spotted Wing Drosophila-Chemical control**
- Thoroughly spray foliage and ripening fruit.
- Multiple applications may be needed.
- Alternate between pesticides with different active ingredients.
- Check label for pre-harvest interval.
- Apply in the evening to protect pollinators, and don't apply on or near flowering plants.
- Use least toxic choices: products containing spinosad and pyrethrins (some are OMRI) More toxic: malathion, esfenvalerate



Oystershell scale  
*Lepidosaphes ulmi* Linnaeus  
Adult

© Ken Gray Insect Image Collection



Oystershell scale  
*Lepidosaphes ulmi* Linnaeus

© Ken Gray Insect Image Collection

# Scale Insects-- Oystershell and San Jose

Rub off or prune out affected wood if possible.

Late April: monitor for crawlers with double sided sticky tape

Apply Tanglefoot or other adhesive around hard-shell adults to catch crawlers

Apply oil to overwintering stage just prior to bud swelling in early spring.

Mid-June-July-10 days after full petal fall--Neem oil (azadirachtin), spinosad



Three San Jose scales settled on the surface of an apple. Each scale is about 1/16 diameter in size. Note the minute yellow crawler stage are also visible in this image.

© Ken Gray Insect Image Collection



Apple limb encrusted with San Jose scale.

Michael Bush, WA State University Extension

# Walnuts-Walnut husk fly

- Serious mid- to late season pest of walnuts in the West.
  - can attack peaches
- Size of housefly
- Infest the meat of the walnut--husks turn black



Walnut husk fly adult



Walnut husk fly larvae in walnut (Ken Gray Image Courtesy of Oregon State University)



Walnut husk fly eggs in walnut (Ken Gray Image Courtesy of Oregon State University)

# Walnut husk fly

- Remove fallen infested fruit and remove the
- Source of the infestation-probably a nearby walnut tree.
- Early July-hang yellow sticky traps at least 6 ft. above the ground in a shady part of the tree.
- Begin spray as soon as husk flies are detected
- Late **July-mid-August** (\*\*critical time for protections)
- Apply again in 10 days if the husk fly was a problem the previous year. A third application may be needed 3 to 4 weeks later if flies continue to be caught in traps.
- Neem oil (azadirachtin) or Spinosad-apply at dusk to protect pollinators.



Yellow sticky trap for walnut husk fly (R. Van Steenwyk)

The following table, developed by Washington State University, lists Fahrenheit temperatures for each stage of development at which 10% and 90% bud kill occurs after 30 minutes exposure. The percentage bud kill which causes crop

reduction will vary with each crop. For example, to have a full crop of cherries requires well over 50% bud survival in most years, while apples, pears, and peaches may only need 10-15% bud survival.

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|            | Silver Tip | Green Tip | Bud burst<br>Half-Inch Green | Tight Cluster | First Pink<br>(Pink) | Full Pink<br>(Open Cluster) | First Bloom<br>(King Bloom) | Full Bloom and<br>Post-bloom |
|------------|------------|-----------|------------------------------|---------------|----------------------|-----------------------------|-----------------------------|------------------------------|
| <b>10%</b> | 15         | 18        | 23                           | 27            | 28                   | 28                          | 28                          | 28                           |
| <b>90%</b> | 2          | 10        | 15                           | 21            | 24                   | 25                          | 25                          | 25                           |

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|            | Swollen Bud<br>(Scale<br>Separation) | Bud Burst<br>(Blossom Buds<br>Exposed) | Green Cluster<br>(Tight Cluster) | White Bud (First<br>White, Popcorn) | Full White | First Bloom (King<br>Blossom) | Full Bloom | Petal Fall<br>(Post-bloom) |
|------------|--------------------------------------|--|----------------------------------|-------------------------------------|------------|-------------------------------|------------|----------------------------|
| <b>10%</b> | 15                                   | 20                                     | 24                               | 25                                  | 26         | 27                            | 28         | 28                         |
| <b>90%</b> | 0                                    | 6                                      | 15                               | 19                                  | 22         | 23                            | 24         | 24                         |

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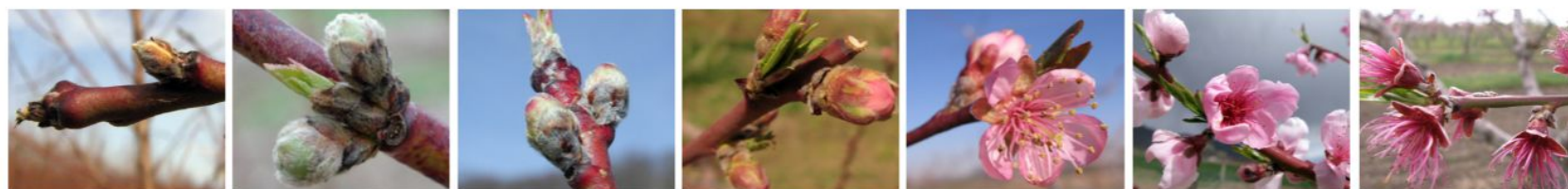
|            | First Swell<br>(Bud Swell) | Tip Separation<br>(Swollen Bud) | First White | First Bloom | Full Bloom | In the Shuck<br>(Petal Fall) | Shuck Split<br>(Post-bloom) |
|------------|----------------------------|---------------------------------|-------------|-------------|------------|------------------------------|-----------------------------|
| <b>10%</b> | 15                         | 20                              | 24          | 25          | 27         | 27                           | 28                          |
| <b>90%</b> | ---                        | 0                               | 14          | 19          | 22         | 24                           | 25                          |

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|              | Swollen Bud<br>(First Swell) | Bud Burst<br>(Green Tip) | Tight Cluster | White Bud (First<br>White, Popcorn) | First Bloom | Full Bloom | Post-bloom |
|--------------|------------------------------|--------------------------|---------------|-------------------------------------|-------------|------------|------------|
| <b>SWEET</b> |                              |                          |               |                                     |             |            |            |
| 10%          | 17                           | 25                       | 26            | 27                                  | 28          | 28         | 28         |
| 90%          | 5                            | 14                       | 17            | 24                                  | 25          | 25         | 25         |
| <b>TART</b>  |                              |                          |               |                                     |             |            |            |
| 10%          | 15                           | 26                       | 26            | 28                                  | 28          | 28         |            |
| 90%          | 0                            | 22                       | 24            | 24                                  | 24          | 25         |            |

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|     | Swollen Bud<br>(First Swell) | Calyx Green | Quarter-Inch Green<br>(Calyx Red) | Pink<br>(First Pink) | First Bloom | Full Bloom | Post-bloom |
|-----|------------------------------|-------------|-----------------------------------|----------------------|-------------|------------|------------|
| 10% | 18                           | 21          | 23                                | 25                   | 26          | 27         | 28         |
| 90% | 1                            | 5           | 9                                 | 15                   | 21          | 24         | 25         |

| <b>PLUM</b> | Swollen Bud | Side White | Green Tip | Tight Cluster | First White | First Bloom | Full Bloom | Post-bloom |
|-------------|-------------|------------|-----------|---------------|-------------|-------------|------------|------------|
| 10%         | 14          | 17         | 20        | 24            | 26          | 27          | 28         | 28         |
| 90%         | 0           | 3          | 7         | 16            | 22          | 23          | 23         | 23         |

<https://ecommons.cornell.edu/bitstream/handle/1813/5062/FLS-058.pdf?sequence=1>

# Excellent guide for diagnosing apple

“blemishes” specifically for Cosmic Crisp apples, but a good guide for all apples

## Table of Contents

### Defects visible during the growing season and at harvest

- [Stem puncture](#)
- [Clipper damage](#)
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### Defects visible after storage

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### Unique characteristics to WA 38

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- [Wandering sepal](#)
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<https://treefruit.wsu.edu/wa-38-defects-guide/>

# Nutrient Deficiency in Apples

<https://www.canr.msu.edu/uploads/files/Applenutrition-EricHanson.pdf>

- Nitrogen
- Magnesium
- Boron
- Calcium
- Manganese
- Zinc
- Iron

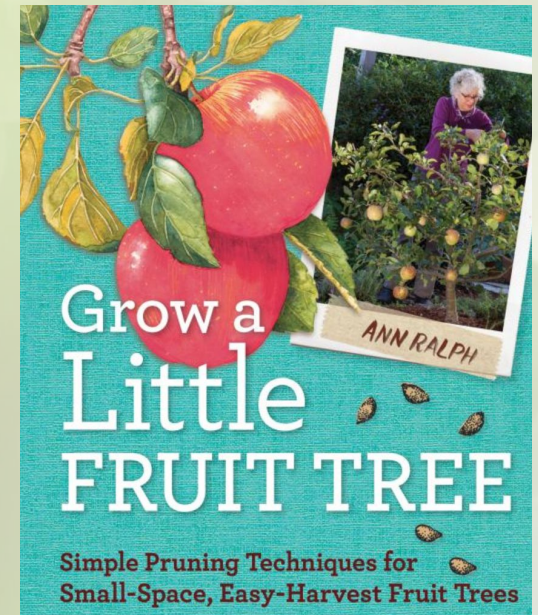


Nitrogen deficiency: pale green leaves and reduced shoot growth.



- [WSU Hortsense](#) ( Choose your fruit from the list at the left)
- PNW Handbooks (E.g., search for “PNW Handbooks apple”)
- [WSU Publication EM 066E \*Organic Pest and Disease Management in Home Fruit Trees and Berry Bushes\*](#)
- OSU Publication [EC 819 \*Growing Tree Fruits and Nuts in the Home Orchard\*](#)
- OSU Publication [PNW 400 \*Training and Pruning Your Home Orchard\*](#)
- *Grow a Little Fruit Tree: Simple Pruning Techniques for Small-Space, Easy-Harvest Fruit Trees* by Anne Ralph

• [ISBN-13 : 978-1612120546](#)



**We're here to help--if you have questions: <https://www.cowlitzcomg.com/plant-and-insect-clinic> or**

**360-577-3014 Ext. 1**

**Looking Ahead in your Garden and Landscape (Cowlitz County Plant and Insect Clinic):** Timely guide to help manage your garden and landscape proactively--  
<https://www.cowlitzcomg.com/lookingahead>

**Fruit Tree Handbook for Western Washington** [https://s3.wp.wsu.edu/uploads/sites/2109/2019/12/fruit\\_handbook\\_western\\_wa.pdf](https://s3.wp.wsu.edu/uploads/sites/2109/2019/12/fruit_handbook_western_wa.pdf)

**Root Stock information:** <http://treefruit.wsu.edu/web-article/apple-rootstocks/>

<http://treefruit.wsu.edu/varieties-breeding/rootstocks/>

<https://www.goodfruit.com/wp-content/uploads/appleRootstock-Feb12016WebPullout.pdf>

**Apple pollination charts:**

Great tree pollinator summary—short and sweet: <https://www.vanwell.net/pollination>

What trees will pollinate your fruit trees? Searchable: <https://www.orangeppintrees.com/pollinationchecker.aspx>

<http://treefruit.wsu.edu/web-article/apple-pollination/>

**Recommended varieties** <https://nwfruit.org/recommended-fruit-trees/>

<http://treefruit.wsu.edu/varieties-breeding/cultivar-guide/>

**Fertilizing the home orchard:** <https://extension.wsu.edu/maritimefruit/home-orchard-fertilizer-applications/>

**WSU Publication EM 066E *Organic Pest and Disease Management in Home Fruit Trees and Berry Bushes:***  
<https://research.wsulibs.wsu.edu/xmlui/bitstream/handle/2376/4902/EM066E.pdf?sequence=2&isAllowed=y>

OSU Publication *EC 819 Growing Tree Fruits and Nuts in the Home Orchard* <https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/ec819.pdf>

OSU Publication *PNW 400 Training and Pruning Your Home Orchard* <https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/pnw400.pdf>

*Grow a Little Fruit Tree: Simple Pruning Techniques for Small-Space, Easy-Harvest Fruit Trees* by Anne Ralph  
<https://www.amazon.com/Grow-Little-Fruit-Tree-Easy-Harvest/dp/1612120547>

Purdue Extension publication *ID-146-W Managing pests in Home Fruit Plantings* <https://www.extension.purdue.edu/extmedia/id/id-146-w.pdf>

Xerces Society *Organic Pesticides: Minimizing risks to pollinators and beneficial insects*  
[https://xerces.org/sites/default/files/2019-09/13-053\\_04\\_Organic-Approved%20Pesticides\\_web.pdf](https://xerces.org/sites/default/files/2019-09/13-053_04_Organic-Approved%20Pesticides_web.pdf)

North Carolina Extension *Why Is It Important to Prune Fruit Trees Every Year?* <https://wilkes.ces.ncsu.edu/2013/12/why-is-it-important-to-prune-fruit-trees/>

*Pruning & Training, The American Horticultural Society*, Christopher Brickell & David Joyce, Chapter covering tree fruits (starting on page 93)  
<https://www.amazon.com/American-Horticultural-Society-Training-Practical/dp/1564583317>

Orchard Pest Management

<http://treefruit.wsu.edu/crop-protection/opm/?pn=293>

What kind of apple is this? <http://www.applename.com/>

**FIGS**

*Great Guide! Growing Figs in the Pacific Northwest—it's all right here!* <https://rickshory.wordpress.com/2019/11/13/growing-figs-in-the-pnw/>

*Raintree Nursery—Growing Figs* <https://raintreenursery.com/pages/growing-fruit-trees-figs>

*OSU:* <https://extension.oregonstate.edu/news/dont-be-fooled-figs-grow-fine-western-oregon>

**To view this presentation PDF**

**<https://www.cowlitzcomg.com/fruits>**