Growing Tree Fruits Successfully

Oregon State University OSU Extension Service

Presented by Tree Fruit Specialists

Presentation Topics

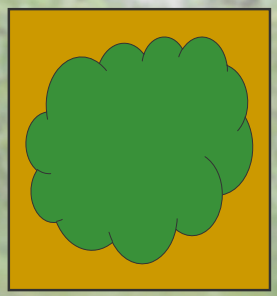
- Site and Soil
- Prepare Site and Irrigation
- Rootstock and Varieties
- Planting
- Pruning and Thinning Fruit
- Integrated Pest Management (IPM) and Common Pests of Tree Fruits
- Maintenance Schedule

Site Considerations

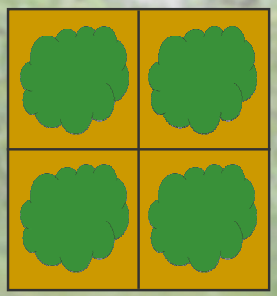
- Why are site conditions so important?
  - Spacing Recommendations
  - Sunlight Requirements
  - Micro-Climates

Spacing Recommendations

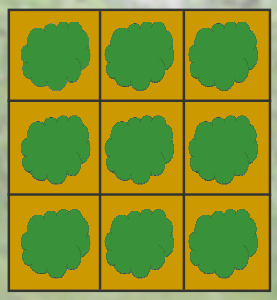
- Distance between fruit trees
  - Apple, Standard 30 ft.
  - Apple, Semi-Dwarf 15 ft.
  - Apple, Dwarf 10 ft.
  - Pear, Standard 20 ft.
  - Pear, Semi-Dwarf 15 ft.
  - Plum 15 ft.
  - Cherry, Sweet 20 ft.



30’ x 30’ = 1 Standard Apple Tree



30’ x 30’ = 4 Semi-Dwarf Apple Trees



Or 30’ x 30’ = 9 Dwarf Apple Trees

How to space the trees?

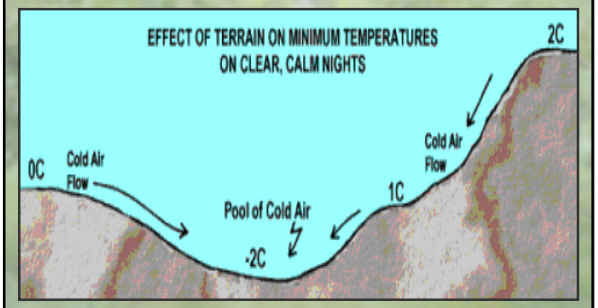
Sunlight Requirements

- Ideally 8 to 10 hours, for optimum...
  - Growth
  - Blossoming and pollination
  - Fruit set and production
- Minimum of 6 to 8 hours

Micro-Climates

- Variation in elevation
- Structures near your orchard site
- Surrounding trees, forests and fields
- Know your directional exposure
  - Sun, wind, rain and frost pockets

Cold Air Goes to the Bottom of a Slope



Source: http://www.islandnet.com/~see/weather/elements/frostpock.htm

You Can Divert the Cold Air Flow

Source: http://www.islandnet.com/~see/weather/elements/frostpock.htm

Soil Assessment

- Soil Percolation Test
- Soil Texture
- Send your soil to a soil lab for testing

Soil Percolation Test

- Tree fruits need well drained soils
- Do a percolation test:
  - Dig a hole 1 ½’ to 3’ deep and 6” to 12” wide
  - Fill the hole with water, let it drain
  - Fill the hole a second time and measure how much water drains per hour
    - A rate of 1 to 2 inches per hour is ideal

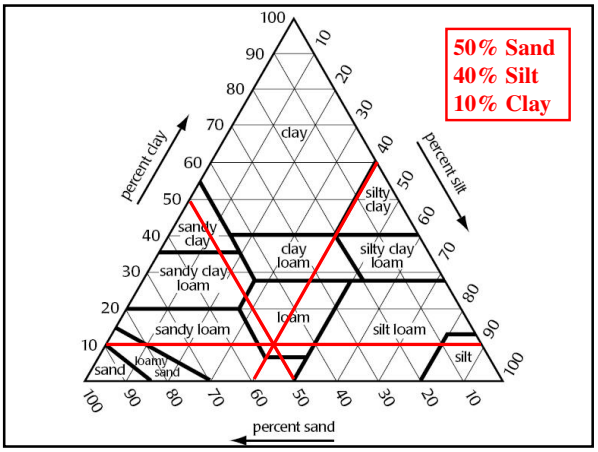
Soil Percolation Test

- A soil percolation test measures the water absorption rate of your garden soil.

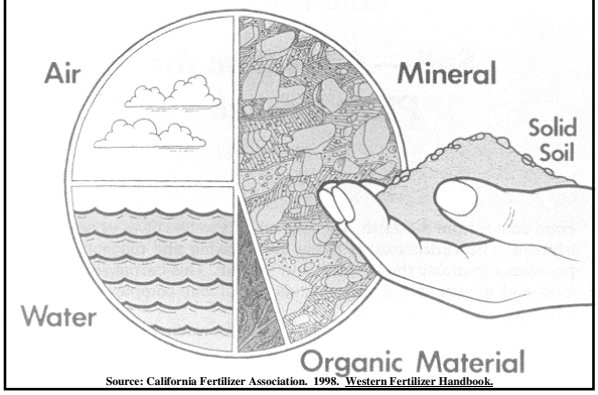
Soil Texture

- **Feel Test**:
  - Rub a small amount of DRY soil in the palm of your hand. What does it feel like? Gritty, smooth, floury?

Ribbon Test



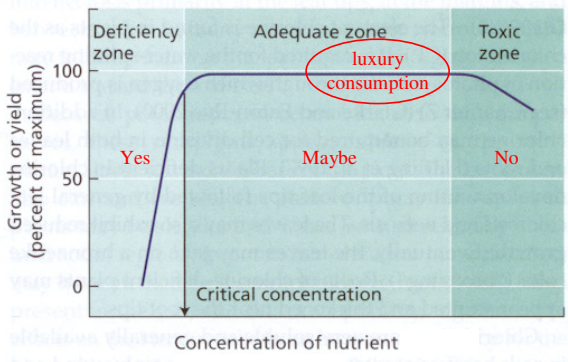
Four Principal Components of Soil



Source: California Fertilizer Association. 1998. Western Fertilizer Handbook.

Send your soil to a lab for testing

- A List of Analytical Labs Serving Oregon:
  - OSU Extension Publication EM8677
- What to test for?
  - pH (tree fruits prefer a soil pH of 6.5 to 6.8)
  - P (phosphorus)
  - K (potassium)
  - Ca (calcium)
  - Mg (magnesium)
  - B (boron) - ask for this test specifically



Interpreting Soil Test Results

Nutrient	Units	Low	Medium	High	Excessive
		"yes"	"maybe"		"no"
P	ppm	<20	20-40	40-100	>100
K	ppm	<150	150-250	250-800	>800
Ca	ppm	<1000	1000-2000	>2000	>>2000
Mg	ppm	<60	60-180	>180	>>180
B	ppm	<0.5	0.5-2	>2	>>2

Nutrient	Units	Low	Medium	High	Excessive
K	meq/100 g	<0.4	0.4-0.6	0.6-2.0	>2.0
Ca	meq/100 g	<5	5-10	>10	>>10
Mg	meq/100 g	<0.5	0.5-1.5	>1.5	>>1.5

For More Soil Information...

- View the Lane County Soil Survey at the NRCS Office
  - 780 Bailey Hill Road, Eugene 97405
  - 541-465-6443
- Soil Survey information is also available online at... http://www.or.nrcs.usda.gov/soils.html

Presentation Topics

- Site and Soil
- Prepare Site and Irrigation
- Rootstock and Varieties
- Planting
- Pruning and Thinning Fruit
- Integrated Pest Management (IPM) and Common Pests of Tree Fruits
- Maintenance Schedule

Prepare the Site

- Clear the area of weeds and rocks
- Amend the soil
  - Consider incorporating organic matter into the soil throughout the entire orchard
  - Recommendations from soil test
    - If lime is needed, it is best to add it ~6 months in advance of the planting date

Irrigation

- Establish an irrigation system
- Water needs to reach all trees
- Avoid overhead watering
- Summer watering
  - Water new trees weekly
  - Water established trees monthly

Irrigation Check

- Do a test run of irrigation system
- At the drip line of the tree, use a shovel or soil probe to obtain a handful of soil from about 8 inches deep
- Grab the soil - it should be moist, but not wet
- You will soon learn your soil!

Source: http://www.cmhc-schl.gc.ca/en/co/maho/la/la_001.cfm

Presentation Topics

- Site and Soil
- Prepare Site and Irrigation
- Rootstock and Varieties
- Planting
- Pruning and Thinning Fruit
- Integrated Pest Management (IPM) and Common Pests of Tree Fruits
- Maintenance Schedule

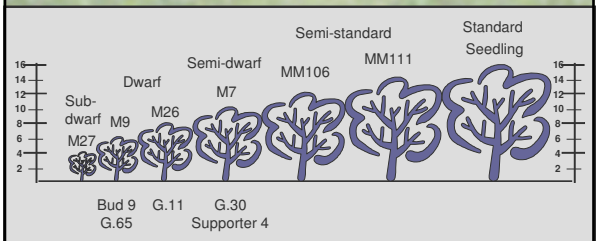
Choosing a Rootstock

- What size of tree is best?
  - How much space do you have?
  - Do you have deer?
  - No ladder or ladder work
  - Differences between Standard, Semi-Dwarf, and Dwarf trees

Spacing of Trees

- The EASY answer: The height is the distance between trees
  - Dwarf: 1 to 8 feet tall
  - Semi-dwarf: 16 feet tall
  - Standard: 25 to 30 feet…and taller if not pruned

Apple Rootstocks



How to Select Varieties

- Select disease-resistant varieties
- Select varieties with maintenance requirements in mind
- Size
- How much fruit do you want?
- Pollination

Apple Varieties

- Until 1950, ~1,200 varieties of apples had been developed
- 1950 – 2011, over 200 varieties of apples developed

Common PNW Apple Varieties

- Akane
- Braeburn
- Earligold
- Elstar
- Empire
- Fuji
- Gala
- Golden Delicious
- Granny Smith
- Gravenstein
- Jonagold
- Lodi
- Newton
- Red Delicious

Apple Scab-Resistant Varieties

- Akane (Tokyo Rose)
- Chehalis
- Enterprise*
- Liberty
- Prima
- Pristine*
- Tydeman Red

* also powdery mildew-resistant

Common PNW Pear Varieties

- European
  - Anjou (Green and Red)
  - Bartlett (Yellow and Red)
  - Bosc
  - Comice
  - Reimer Red
  - Seckel
  - Starkcrimson
- Asian
  - Chojuro
  - Hosui
  - Kosui
  - Nijisseki
  - Shinseiki

Common PNW Plum Varieties

- European
  - Brooks (prune)
  - Italian (prune)
  - Moyer (prune)
  - Parsons
  - Stanley
- Asian
  - Burbank
  - Early Golden
  - Red Heart
  - Shiro

Common PNW Cherry Varieties

- Bada
- Compact Stella
- Kordia (Attika)
- Lambert
- Lapins
- Regina
- Royal Ann
- Stella
- Sweetheart

Common PNW Peach Varieties

- Early Elberta
- Frost*
- Genetic dwarfs
- July Elberta
- Red Haven
- Rochester
- Veteran

*leaf curl resistant

How much fruit do you REALLY eat?

- Mature Apple Tree
  - Standard: 20 boxes
  - Semi-Dwarf: 6 to 10 boxes
  - Dwarf: 3 to 6 boxes
- Note: One box/bushel is equal to 42 pounds

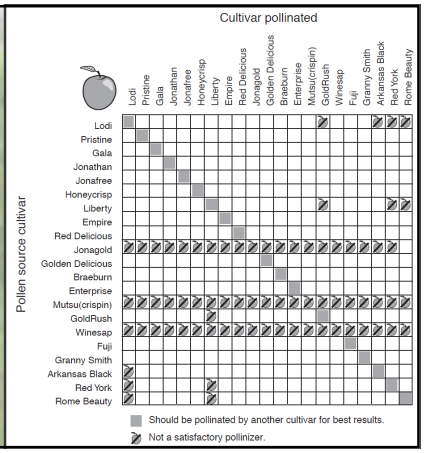
Years to Fruit

- Apple: 2-5
- Apricot: 2-5
- Cherry, sweet: 4-7
- Cherry, sour: 3-5
- Nectarine: 2-4
- Peach: 2-4
- Pear: 4-6
- Plum: 3-6

Pollination

- Most fruit trees either require another variety for pollination or produce better when pollinated by another variety
- The bloom time of a pollinizer must be similar to that of the variety to be pollinated
- Pollination charts identify suitable pollinizers
  - There are NO comprehensive pollination charts!
  - Some varieties of fruit trees cannot be used as pollinizers
    - For example, see 'Winesap' on the following slide

Apple Pollination Chart



Source: "Pollination of Fruits & Nuts," Purdue University Cooperative Extension Service

Pollination

- Several species of bees pollinate fruit trees, including honey bees and bumble bees
- Orchard mason bees (*Osmia lignaria*), are exceptional pollinators that are active in the cool weather of early spring
- Pesticides may adversely affect pollinators. ALWAYS follow label directions!

Photo Source: Wikipedia

Presentation Topics

- Site and Soil
- Prepare Site and Irrigation
- Rootstock and Varieties
- Planting
- Pruning and Thinning Fruit
- Integrated Pest Management (IPM) and Common Pests of Tree Fruits
- Maintenance Schedule

Planting

- When trees are available in nurseries
- Dig the hole as deep as the root ball and twice as wide as the root ball
- Leave a small mound of dirt in the hole
- Soak bare root trees for ½ hour
- Spread roots out uniformly over mound

Planting

- Plant with the graft union at least 3” above ground level
- Back fill hole with native soil
- Water and mulch
- Water deeply once a week first year
- Remove any plastic or metal labels
  - Record variety and rootstock

Planting

- Dwarf trees should be staked
- Wrap trunk with flexible mouse guard (optional)
- Paint trunk with white latex paint (optional)
  - 50/50 mix of paint and water

Trunk Wraps and Painting

Presentation Topics

- Site and Soil
- Prepare Site and Irrigation
- Rootstock and Varieties
- Planting
- Pruning and Thinning Fruit
- Integrated Pest Management (IPM) and Common Pests of Tree Fruits
- Maintenance Schedule

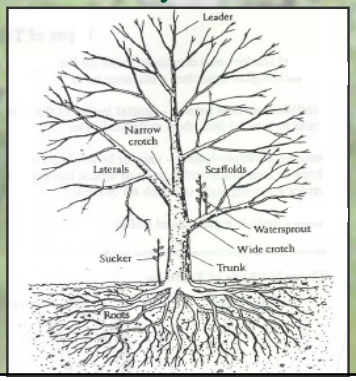
Why Prune?

- To maintain tree health
- To increase air flow and light penetration
- To improve natural form
- To control size
- To increase fruit production

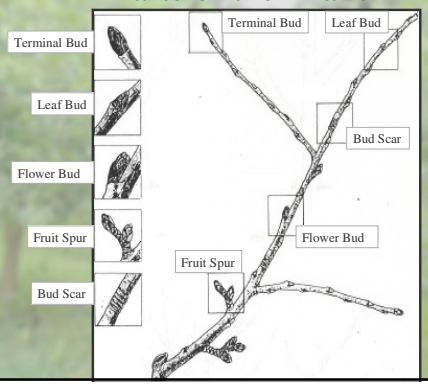
When to Prune?

- Best when trees are dormant
  - November – March
  - July 15 – August 15
  - Or when you need to do it!
  - Cherries generally pruned in summer to minimize bacterial canker

Anatomy of a Tree



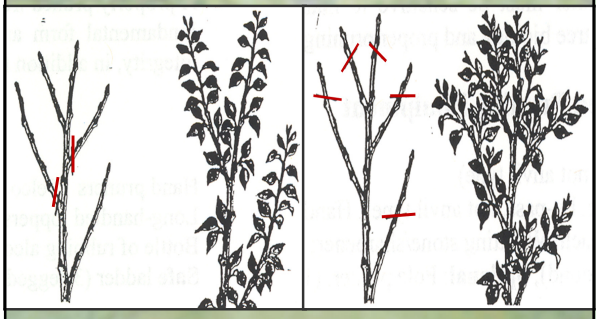
Parts of the Branch



Fruiting Wood

- **Apple**: 2nd year wood (that which grew the year before last)
- **Cherry**: 1st & 2nd year wood (look for spurs)
- **Nectarine**: 1st year wood (that which grew last year)
- **Peach**: 1st year wood
- **Pear**: 2nd year wood
- **Plum/Prune**: 1st year wood

Only two types of pruning cuts: Thinning & Heading

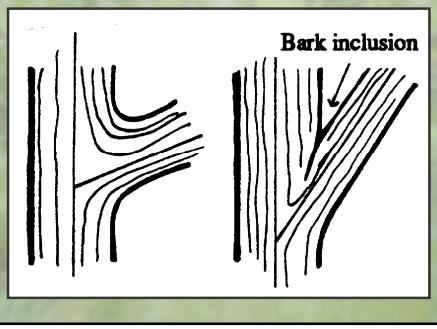


Spur versus Tip Bearing

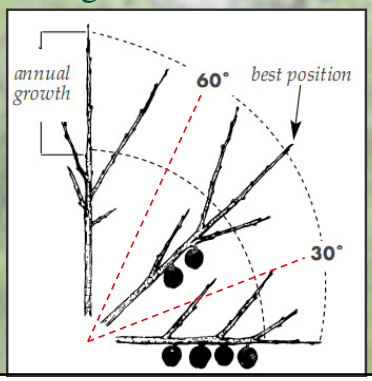
- Most apple varieties bear on spur systems
  - Avoid unnecessary spur removal
- A few apple varieties bear at the tips of branches
  - Avoid unnecessary heading cuts
  - Common varieties include: Cortland, Fuji, King, Granny Smith

Photo Source: University of Wisconsin

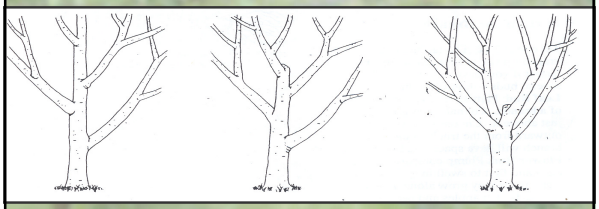
Training for Proper Crotch Angle



Training for Fruit Production

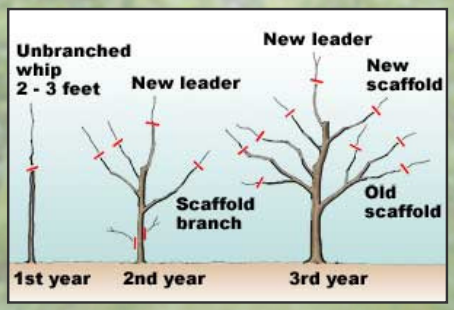


Types of Tree Forms



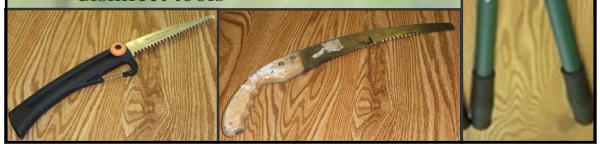
Central Leader | **Modified Central Leader** | **Vase or Multiple Leader**

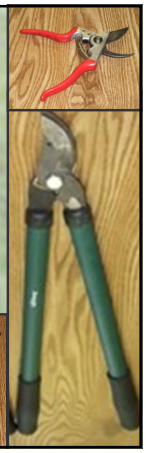
Example of Training Tree Fruits



Pruning Tools

- Hand Pruners
- Long-handled Loppers
- Hand-saw
- Rubbing alcohol works well to disinfect tools





Three Legged Ladder (optional)

Fruit Thinning

- Increases the size of fruit
- Stops biennial production
- When fruit is the size of a Quarter
  - Between about May 15 - June 15
- Thinning also protects the branches from breakage

Pruning classes

- List dates and locations for 2012

Presentation Topics

- Site and Soil
- Prepare Site and Irrigation
- Rootstock and Varieties
- Planting
- Pruning and Thinning Fruit
- Integrated Pest Management (IPM) and Common Pests of Tree Fruits
- Maintenance Schedule

What IPM is

- IPM is a comprehensive system of orchard management that incorporates sound cultural practices, establishing thresholds for pest damage, regular monitoring, proper plant problem diagnosis, and using the least toxic (yet effective and practical) methods available for managing pests that cause damage exceeding thresholds.

Definition of Pest

- We will be using the term “PEST” to mean insects and diseases.

What IPM is Not

- IPM is neither inherently organic nor “conventional”; it is often somewhat of a middle ground between the two.

Cultural Practices

- Plant disease-resistant varieties that are less likely to succumb to disease pressures.
- Prune to maintain an open canopy so air flow can dry the foliage quickly after rain.
- Irrigate in a way that does not wet foliage.
- Remove and destroy leaves and fruit from the orchard in the fall to reduce sources of insect larvae, fungal spores, etc. that can re-infest the orchard later.

Establishing Thresholds

- One insect in an orchard doesn't warrant applying an insecticide to the entire orchard. However, one insect pest per fruit is probably well beyond the level considered by most people to be acceptable. What is considered acceptable varies from person to person, so knowing how much scab you can tolerate on your apples or how many worms you're willing to cut around is critical to knowing if and when to invoke additional pest management strategies.

Monitoring

- Establishing thresholds only works when you monitor to determine if and when those thresholds are exceeded.
- Regular monitoring also helps you to be familiar with what your orchard looks like when it's healthy, so you can easily recognize when something is wrong.
- Traps aid in monitoring for specific insect pests.

Proper Plant Problem Diagnosis

- Proper plant problem diagnosis must come before any pest management strategy is employed.
- Applying an insecticide simply because you see holes in leaves won't do any good if the holes are the result of a fungal disease.

Least Toxic Methods

- Once you properly diagnose a plant problem, use cultural controls, if available, followed by least toxic chemical controls.
- Knowing the life cycle of pest organisms is critical to selecting appropriate pest management strategies.

To Summarize IPM…

- Use sound cultural practices.
- Determine what levels of damage are acceptable to you.
- Monitor.
- Properly diagnose problems.
- Use the least toxic methods available to manage pests.

Common Diseases in Tree Fruits

Overview of Tree Fruit Diseases

- Apple - Anthracnose
- Apple - Powdery Mildew
- Apple - Scab
- Pear - Powdery Mildew
- Pear - Scab
- Pear - Pacific Coast Pear Rust
- Pear - Fire Blight
- Peach - Leaf Curl
- Peach - Shothole
- Cherry - Bacterial Canker

Apple - Anthracnose

- *Cryptosporiopsis curvispora*, a fungus
  - sexual: *Neofabraea malicorticis* is the most common
  - *C. kienholzii* and *N. alba* have also been found in western Washington
- All apple cultivars are susceptible
- Spartan, Gala, Melrose, and Akane are **highly susceptible**

Apple - Anthracnose
Cryptosporiopsis curvispora

Photo by Jay W. Pscheidt

Apple - Anthracnose
Cryptosporiopsis curvispora

Apple - Powdery Mildew

- *Podosphaera leucotricha*, a fungus
- **Very susceptible**: Braeburn, Jonathan, Rome, Newtown, Granny Smith, Gravenstein (fruits of Jonathan and Rome also may be severely affected)
- **Moderately susceptible**: Winesap
- **Less susceptible**: Golden Delicious, Red Delicious, and Delicious strains
- **Resistant**: Pristine and Enterprise (both also scab-resistant)

Apple - Powdery Mildew
Podosphaera leucotricha

Apple - Powdery Mildew
Podosphaera leucotricha

Apple - Scab

- *Venturia inaequalis*, a fungus
- **Good resistance and good quality**: Akane (Tokyo Rose), Chehalis, Liberty, Prima, Tydeman Red
- **Intermediate resistance**: Jonagold, Macoun, Melrose, Spartan, King
- **Cultivars not easily grown in western Oregon**: Red Delicious, Rome Beauty, Jonathan, Winesap, Granny Smith, Gala, Summerred, Jersey Mac

Apple - Scab
Venturia inaequalis

Pear - Powdery Mildew

- *Podosphaera leucotricha*, a fungus
- The disease is important on the cultivar d'Anjou where a smooth fruit finish is highly desired.
- Bartlett rarely has a problem with this disease.

Pear - Powdery Mildew
Podosphaera leucotricha

Pear - Scab

- *Venturia pirina*, a fungus
- The cultivars Forelle and Bartlett Red Sensation are very susceptible.

Pear - Scab
Venturia pirina

Pear - Scab
Venturia pirina

Pear - Pacific Coast Pear Rust

- *Gymnosporangium libocedri*, a fungus
  - *Gymnosporangium asiaticum* is on Asian Pears
- Winter Nelis is severely affected
- Bartlett is not affected

Pear - Pacific Coast Pear Rust
Gymnosporangium libocedri

Pear - Fire Blight

- *Erwinia amylovora*, a bacterium
- All important pear cultivars are susceptible to fire blight, and Bosc especially so.
- Fire Blight is not common in Oregon's Willamette Valley and may be confused there with *Pseudomonas* blight, *Nectria* twig blight, pear dieback caused by *Phomopsis* sp., and twig borer beetle damage.

Pear - Fire Blight
Erwinia amylovora

Peach - Leaf Curl

- *Taphrina deformans*, a fungus
- Redhaven is **very susceptible** in the PNW.
- **Leaf Curl resistant**: Autumn Rose, August Etter, Avalon, Avalon Pride, Charlotte, Early Charlotte, Early Crawford, Frost, Indian Free, Kreibich, Muir, Nanaimo, Oregon Curl Free, Q-1-8.

Peach - Leaf Curl
Taphrina deformans

Peach - Shothole

- *Wilsonomyces carpophilus*, a fungus (formerly *Coryneum beyerinckii*)
- The cultivars Lovell and Muir are reportedly **tolerant**

Peach - Shothole
(Coryneum Blight)
Wilsonomyces carpophilus

Cherry - Bacterial Canker

- *Pseudomonas syringae* pv. *syringae*, a bacterium
- **Very susceptible**: Royal Ann, Bing, Lambert, Napoleon, Sweetheart, Van
- **Tolerant***: Corum, Regina, Rainier, Sam, Sue

*Appear to have sufficient tolerance to canker to be grown commercially without serious tree loss.

Cherry - Bacterial Canker
Pseudomonas syringae

Common Insects in Tree Fruits

Insects

- Apple maggot
- Codling moth
- Leaf-roller
- Scale
- Aphids
- Mites
- Spotted Wing Drosophila (SWD)

Apple Maggot *Rhagoletis pomonella*

Apple Maggot *Rhagoletis pomonella*

- One generation per year
- Adult flies emerge in mid- to late-June
- Use yellow sticky traps to detect first emergence or red sticky spheres to detect egg laying
- Codling moth controls may be adequate to control apple maggot

Codling Moth *Cydia pomonella*

Codling Moth *Cydia pomonella*

- 2 to 3 generations per year
- In Lane County...
  - 1st generation typically emerges in early May with first major flight in early June
  - 2nd generation typically emerges in early June with first major flight in early July
- Pheromone traps are useful in identifying the presence of adult moths and timing pesticide applications accordingly

Apple Maggot Damage

Codling Moth Damage

Fruit Tree Leaf Roller
Choristoneura rosaceana

Leaf Damage

Oystershell Scale
Lepidosaphes ulmi

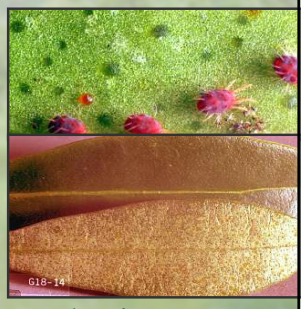
San Jose Scale Damage
Quadraspidiotus pernicious

Rosy Apple Aphid
Dysaphis plantaginea

Woolly Aphid
Eriosoma lanigerum

Two Spotted Spider Mite
Tetranchus urticae

Red Mite
Panonychus ulmi



Red Mite Damage

Spotted Wing Drosophila (SWD)
Drosophila suzukii

Common Disorders in Tree Fruits

Bitter Pit

- **Resistant**: Delicious and Winesap
- **Moderately susceptible**: Golden Delicious
- **Very Susceptible**: Northern Spy, Gravenstein, Grimes Golden, and Baldwin.

Water Core

- Most susceptible varieties are Rambo, Jonathan, Delicious, Stayman, Arkansas (Mammoth Black Twig), and Winesap.
- In the Northwest, Winesap is more often affected than any other.

Other Common Pests in Tree Fruits

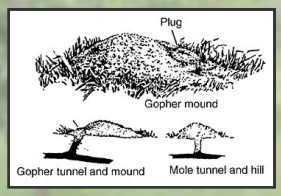
Meadow Mouse (Vole)

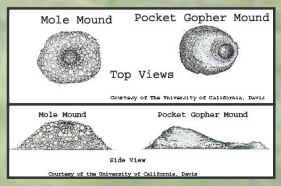
Sheep, Cow, Deer, Bird, Raccoon, or Horse damage

Gopher Mound

Pocket Gopher

Comparison of a Gopher Mound and a Mole Hill.





Presentation Topics

- Site and Soil
- Prepare Site and Irrigation
- Rootstock and Varieties
- Planting
- Pruning and Thinning Fruit
- Integrated Pest Management (IPM) and Common Pests of Tree Fruits
- Maintenance Schedule

Maintenance Schedule: *Winter*

- Dormant and Delayed Dormant Sprays
  - Copper - Anthracnose, Peach Leaf Curl
  - Lime sulfur or wettable sulfur- Scab
  - Dormant oil - aphid & mite eggs, scale
- Prune
  - Dead, diseased, and damaged wood
  - Excessive growth

Maintenance Schedule: *Spring* (during bloom)

- Copper - Anthracnose, Peach Leaf Curl
- Lime sulfur or wettable sulfur - Scab
- Dormant oil - aphid & mite eggs, scale

Maintenance Schedule: *Spring*

- Monitor for proper growth: ~18 inches/year
- Fertilize around the time trees finish blooming
  - Test soil to determine fertilizer requirements
  - Spread fertilizer evenly 1–2' away from the trunk
  - Avoid excess N, which encourages vegetative growth, bitter pit and lessens disease resistance
  - See EC 1503 Fertilizing Your Garden: *Vegetables, Fruits, and Ornamentals*

Maintenance Schedule: *Late Spring* (post-bloom)

- Copper - Anthracnose, Peach Leaf Curl
- Lime sulfur or wettable sulfur - Scab, Powdery Mildew

Maintenance Schedule: *Summer*

- Prune
  - For air flow and light penetration
  - Vegetative growth to control vigor
- Avoid over-irrigating
- Harvest and store
- Good sanitation - destroy infected fruit

Maintenance Schedule: *Summer to Harvest*

- Codling moth
  - Bag fruits with nylon peds or lunch bags
  - Horticultural oil: ~3-4 weeks after bloom, apply every 5-7 days for 4-5 weeks
    - Use pheromone traps to identify when adults emerge
  - Spinosad, kaolin clay (Surround), carbaryl, or combination "Fruit Tree Spray" (captan + carbaryl + malathion)
    - Carbaryl (Sevin) kills predatory mites which may result in an outbreak of spider mites

Maintenance Schedule: *Fall*

- Good sanitation
  - Remove infected/un-harvested fruit
  - Rake and remove leaves
  - If composting, don't return compost to orchard
- Spray when ~½ leaves have fallen to control diseases, mites, aphids, and scale
  - Horticultural oil
  - Copper

Resources

- EC 819 Growing Tree Fruits and Nuts in the Home Orchard
- EM8677 A List of Analytical Labs Serving Oregon
- FS 147 Picking and Storing Apples and Pears
- PNW 400 Training and Pruning Your Home Orchard
- EC 631 Managing diseases and Insects in Home Orchards
- EC 1503 Fertilizing Your Garden: *Vegetables, Fruits, and Ornamentals*
- Pacific Northwest Plant Disease Management Handbook
- Pacific Northwest Insect Management Handbook


Questions
Oregon State University OSU Extension Service
Presented by
Home Orchard Specialists