

Organic Fruit Tree **Management Plan**

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Chapter 1: Planting

Right Tree, Right Place

Consider several factors when designing a planting

1. Sunlight – All fruit trees thrive the best in full sunlight (minimum of 6 to 8 hours of sunlight a day) but some (paw paws, native persimmons, serviceberries, red mulberries) can survive in partial sunlight.
2. Proper spaces – Each tree should have at least 10-15 ft. distance from other trees or objects, depending on the size and type of tree. The closer the trees are together, the more pruning they will require to stay healthy. Unless it's possible to train the tree, plant each tree at least 10 ft. from any structures. Make sure each tree has enough space to grow vertically also. (avoid putting standard trees under power lines or in the way of the sunlight of smaller plants)

Typical Tree Heights:

Dwarf: 5-12ft

Semi-dwarf: 15-20ft

Standard: 25-30ft

3. Water issues – access to water, proper drainage
4. Soil quality – test soil, may need to amend soil if poor quality or if hazardous, the soil will need to be replaced.
5. Call Miss utility – to locate any underground utility

Choosing the Right Fruit Tree

- Factors to consider for each tree.
 - o Diseases, pests, and environmental factors for each tree.
 - o Level of commitment for each tree.

Fruit Trees

Low Maintenance Trees (mostly watering, light pruning)

- *Pawpaws* – The Pawpaw is one of the best understory fruit tree. It does not need full sunlight and does well under a larger shade tree. Because the Pawpaw is also one of the only native fruit trees in the DC area, there are no real pests or disease problems. Pawpaw trees prefer moist, deep and fertile soil that is well drained and slightly acidic (pH 5-7). Avoid heavy, wet, and

alkaline soil. The Pawpaw typically grow 20 ft. high and 15 ft. wide and can live anywhere from 25 to 80 years. The only drawback of a Pawpaw is its difficulty to pollinate. Pawpaws need cross-pollination and should be planted close together. Cross pollination can be helped using an artist's paint brush to pollinate by hand. Pawpaws ripen on the tree in Sept/Oct when the fruit softens and lightens in color.

Persimmons – Persimmons prefer full sunlight but can survive with a reduced harvest in partial sunlight environments. The Native or American Persimmon does better in partial shade. Persimmons can adjust to a wide variety of soils as long as it's not too salty and drains well. Persimmons have a strong tap root so it's recommended to dig a deep hole when planting. They have few insect and disease problems. They can grow up to 25 ft. tall and at least as wide. Persimmons can live for 50 -75 years and can bear fruit the whole time. There are two different types of persimmons: Astringent and nonastringent. Both can ripen on the tree once the fruit turns soft. If you have animal issues you can harvest persimmons early and store them in room temperature until they soften.

Figs – Figs require full sunlight to produce fruit but can survive with a greatly reduced harvest in partial sunlight. Figs prefer light to medium soil with good drainage and can survive in nutritionally poor soil. The Fig tree can grow 10 to 20 ft tall and wide. Figs can produce fruit for several decades, but can live substantial lives upwards to 200 years. Figs can be susceptible to harsh winters and late frosts. It is recommended to plant the fig tree on the south side a structure in the most protected area from the winter north winds. If an unusually harsh winter is predicted for the first couple of years after transplant, wrap the tree in a breathable material, such as burlap, for protection. If a late frost is predicted wrap the tree in burlap to protect to protect its buds and its first harvest. Figs have 2 harvests: one in late spring and one starting in mid summer. The fig tree's branches tend to droop and may require pruning for clearance.

Serviceberries- Serviceberries prefer full sun but can flourish in partial sun areas. Serviceberries can grow between 20-30 ft tall and 15 ft wide. Birds love the berries. Don't plant near any Junipers (Red Eastern Cedars) or they could get Juniper Rust. Serviceberries prefer moist well drained soil but can grow in most soil conditions. Live 20-60 years.

Mulberries – Mulberries are very disease and pest resistant trees. They prefer full sunlight but can grow in partial sunlight. There are dwarf varieties that stay under 20 feet but most mulberries will grow at least 40 ft and some varieties can grow up to 80 feet. Avoid planting them near sidewalks or you'll have a mess with the fruit. White Mulberries are invasive so only plant the red Mulberries.

Hazelnut –The American Hazelnut tree is a native tree in the DC area. Hazelnut trees can survive in full or partial sunlight. The trees grow 15-20 Ft. high and 10-15 Ft. wide. Hazelnuts can live 20-80 years. Hazelnut trees have few disease and pest issues. They can be affected by Filbert Fire Blight and the Filbert Weevil. If there are Filbert Fire Blight areas prune out the branch back to it's connection.

Medium Maintenance Trees (watering, pruning, fruit thinning, some disease and pest maintenance)

Pears- Pear trees require full sunlight. Pears like slightly acidic soil that is well drained. Pears can grow 30ft. high and 20 ft. wide. Many Pear trees are grafted on to dwarf root stocks to keep the tree under 15 ft. Pears can bear fruit for 30-40 years and live up to 50 years. European Pears are extremely susceptible to Fire Blight, a very deadly and incurable disease. Asian Pears are more very resistant to Fire Blight and less susceptible to pests, than European Pears. Asian Pears can be picked ripe and are crisp like an apple. Most European Pears (Seckel Pear is an exception) must be picked before ripe and ripened over several weeks in room temperature storage. It's important to monitor Pear trees for any signs of Fire Blight and prune off the diseased parts at its base when spotted. Prune any branches that may form bad crotch angles and prune the middle of the tree for better circulation.

Plums – Plum trees prefer full sunlight. They can tolerate most soils but need good drainage. Plum trees can grow 15 to 25 ft. tall and wide. Plum trees can live 15-30 years and bear fruit most of the time. Plums have an enormous harvest each year and will need to be thinned to prevent breakage. Plum trees need to be pruned in their inside to increase circulation and prevent Brown Rot. Plum trees are susceptible to female plum cucurlio, which requires an organic spray, such as 'Surround', in the Spring. Plums can produce a lot of fallen fruits and need to be cleaned up quickly. Japanese plums are early bloomers and if a late frost is predicted they must be wrapped in burlap. Japanese plums are best for fresh fruit, while European plums are great for jams and prunes and can be eaten fresh. American plums are great for preserves but are too tart to eat fresh unless they are a hybrid with Japanese plums. Non-fruiting or ornamental plums are referred to as flowering plums.

High Maintenance Trees (watering, pruning, fruit thinning, lots of pest and disease maintenance)

Cherries – Cherry trees require full sunlight. Most Cherry trees prefer moist soil with good drainage and moderately acidic pH levels. Cherry trees can live around 15-20 years. Cherry trees can grow 8-30 ft. One attraction of fruiting Cherry trees is their short growing season around 60 days. Cherry trees are very susceptible to birds eating the fruit. This can be prevented from building netted structures to hanging shiny objects from the tree. Plant Cherry trees away from large trees where squirrels play. Cherry trees should be planted on elevated areas to protect them from "frost pockets." Cherry trees require some pruning to open up the canopy and reduce the risk of diseases. It's recommended that cherry trees be pruned in the summer, instead of winter, to reduce the threat of silver leaf. Apply proper sanitation methods to protect the tree from diseases. In hot, humid areas, cherry trees can be susceptible to cankers, a bacterial disease that can cripple or kill a disease. Visible signs of cankers are dark round circles with cracking and sap oozing. To prevent, employ sanitation methods and keep the cherry tree healthy. Prune any disease wood immediately at the limbs base. Cherry trees are also susceptible to brown rot and should be planted in areas with air movement and pruned regularly to open up the canopy.

Apples – Apple trees require full sunlight. Apple trees can tolerate a lot of different soils, but will need high levels of nutrients, a neutrally balanced pH level, and good drainage. Apples can grow up to 40 ft. tall but are often grafted on to dwarf rootstocks to keep them around 10 ft. Apple trees can live up to 80 years, but most usually make it to 35-45, bearing fruit for 30-40 years. Dwarf trees live around 20-30 years. Apples will need regular pruning and thinning. A regular application of ‘Surround’ organic spray, starting in spring as the petals fall, and continuing throughout the growing season (at least twice a month), is the best organic defense against pests and diseases. Mix Surround with lime-sulfur to suppress powdery mildew, apple scab, sooty blotch and fly speck. Lime-sulfur is also an excellent dormant spray that will kill overwintering scale, insects eggs, and mites. Surround also prevents sunburn damage on apples, which is a problem in the DC area. At the first sign of green tissue fungus, spray a fungicide premix solution until the fungus goes away.

Peaches – Peaches need full sunlight. They require well-drained, somewhat sandy soils with natural pH levels and very rich nutrients. Peach tree roots can descend almost 3 feet into the soil. Peach trees will grow between 10 to 25 ft. high and wide. Most live around 15 years due to environmental stressors, but with proper care Peach trees can live up to 50 years. Due to its enormous harvest and weak limbs, regular yearly pruning and thinning is required to prevent limb breakage. Peaches produce on year old wood. But the wood that produces the fruit will never produce again. So it’s important to prune heavy every winter. Peaches are susceptible to a great many diseases and pests. It is recommended to spray peaches with Surround right after the flower petals fall in spring. Reapply as needed (usually twice a month, unless it rains heavily) to keep the fruit covered until harvest. If there is a problem with brown rot or bacterial spot, mix lime-sulfur, or a home remedy fungicide, with the Surround spray to cure. Young peaches are susceptible to the larvae of the peach tree borer moth at their soil line. Applying moth balls covered in sand or fresh wood ashes around mid-June at the base of the tree should deter adults from laying their eggs. The peach tree is also susceptible to many bark diseases that show up as cankers, or dead areas of bark. Familiarize yourself with *Fusicoccum*, *Cytospora*, and *Leucostoma* cankers and avoid these by pruning only in late spring or early summer (when pruning cuts heal fastest), prune scaffold branches to open up the canopy and increase circulation, and protect the tree from any injury by using arbor guards and possible fencing. Peaches are probably the hardest tree to grow in DC, but if the owner is willing to spend time maintaining the tree, it becomes one of the most rewarding fruit trees.

Basics of Planting

1. Pre-mark the spots for each trees.

2. Dig the planting hole at least 3 times as wide as the rootball to mix up and aerate the soil. Plant the tree so the root flare (the start of the natural swelling where the roots and the trunk connect) is level with the ground. Make sure not to bury the root flare.
3. When amending clay mix organic compost/manure with the dirt in the planting hole. When amending all of soils layer the amendment on top to ensure even water flow through out the soil. Do not use fertilizer during the planting because it could burn the new roots
4. Remove all grass from the drip line (At least a 3 feet radius in a circular perimeter around the tree). Do not mix grass back into the hole because grass has growing inhibitors.
5. Spread about 2-4 inches of mulch around the drip line. * Do not pile mulch around the trunk of the tree. Volcano mulch piled against the trunk will decompose the bark of the tree and prevent water from reaching the root ball.
6. To compartmentalize energy to improve root growth and protect branch angles it's important to pull the fruit off before the planting and at the beginning of the growing season for the first 2 years.
7. Use an arbor guard at the base of the tree to protect it from rodents and weedwackers.
8. Install a slow drip ooze tube or gator bag to be filled up once a week for watering, until trees go dormant in the winter, for at least the first 2-3 years. Once trees have established themselves they should only need additional water during dry conditions.
9. If a fruit tree cannot stand up on its own, planted on a steep slope, or in danger of strong winds, the tree may need to be staked. Don't stake a tree unless it needs it and don't leave the stakes on for more than a year, unless conditions require ongoing staking. Unnecessary staking can prevent a fruit tree from growing strong.
 - a. When staking, always stake outside of the rootball. Use a flexible tie, such as arbor tie, that won't restrict the tree growth or rub a sore spot on the tree. Don't tie the wrap too tight around the tree trunk. The tree should have some room for limited movement. Movement will stimulate root growth. If it is tied too tight it could restrict growth. Tie the stake to a low part of a tree, usually just above the lowest branch.

Seasons for Planting

There are two different perspectives on which season to plant fruit trees.

- Spring planting – gives time to establish roots for the next winter. Best to plant early as possible in the season, before May or before fruit trees bloom. Make sure to monitor water hydration in summer.
- Fall planting – gives times to establish roots for next summer. Best to plant early as possible in season, but making sure the summer heat is over. October is ideal. Make sure to monitor cold/frost conditions during winter.

Cold/ Late Frost Plan

It's important to winterize first year trees. Especially in case of a late frost in the spring, there needs to be a way to protect the flowers. If the flowers die due to a late spring frost, there will be no fruit that year. There are several considerations to keep in mind.

1. Plant less hardy trees against the south side of a wall (to protect from northern winter winds and provide the most sunlight possible)
2. Wrap more vulnerable and less winter hardy trees in burlap throughout the winter.
3. Keep enough burlap wrapping ready in case a late frost is predicted. Wrap all trees with blooming flowers in burlap if a late frost is predicted. If a late frost kills the buds there won't be any fruit that season.
4. To avoid winter sunburn it is recommended to paint the trunk with a white latex non-oil paint or wrap with aluminum foil to reflect the winter sun.

Purchasing factors to Consider

1. If you have a chance to select the trees being planted look at several factors
 - a. Trunks – make sure its straight, strong, smooth bark without too many pruning scars, make sure the top hasn't been cut off (topped), and make sure the root flare and grafting union is not buried. Look for any fungus or diseases.
 - b. Branches – check for breaks or bark tears, make sure branches are evenly spaced out and at good angles (45-60 degrees). Ideally with more mature trees, approximately 2/3 of the tree should have branches. Look for any fungus or diseases.
 - c. Leaves – make sure color and abundance matches the time of the season. Make sure leaves are balanced across the tree. Avoid any lion tail formations. Look for any fungus or diseases.
 - d. Fruits – look for any fungus or diseases.
 - e. Roots – if you have a chance to examine the roots on a containerized tree make sure they're white or yellow (not black or dried out), not girdling around the pot too bad, and don't smell like rotten eggs (bad odors indicate root rot)
2. When you receive the trees, prune off any dead, diseased, or broken branches. Remove any fruit which will divert energy from recovering from transplant shock. Don't prune roots until planting.

Types of Trees

1. B&B (Bound and Burlaped)
 - More resilient trees – Roots are adjusted to normal soil resulting in less shock and girdling. Trees are more established.
 - *always identify the root flare before planting. Sometime root flares are buried and need to be dug out and the root ball leveled with grade.
 - Easy to store and maintain before plantings.

* While storing make sure to water with a slow flow hose to absorb the water and prevent dirt run off.

- More expensive costs (purchasing and shipping)
- More labor intensive plantings (large and heavy trees)
- Less root mass, during digging up to 90% of the roots can be removed.
 - * It's very important to water B&B trees extensively for the first two years until the root mass can be replenished.

2. Containerize

- Cheaper than B&B and easier to handle/transport
- Easy to store and maintain before plantings
- More stress for roots when planting because of the soil it was grown in tends to be higher quality than the soil it will be planted in. So the roots can have a harder time adjusting to the soil.
 - *When containerized trees are left in a container for too long the roots we begin to girdle around the container. Make sure during planting to cut away all the girdling roots on the sides and bottom. Either slice repeatedly with a knife until the roots don't girdle or remove an inch completely off of the outside layer of the sides and bottom with a sharp square shovel. Girdle root video - <http://www.youtube.com/watch?v=9MSS6l1PjQ4>

3. Bare root

- Cheap and easy to transport.
- More root mass than B&B
- Once the bare root trees leave the nursery, bare root trees need to get in the ground within a week at the longest. Heel the trees in a mixture of soil and hay and water the trees everyday. If you are storing them longer than a week use a refrigerator at 35 degrees with 80% humidity. They can also be stored in a gravel raised bed that is watered at least 2 times a day. With no soil, the roots can dry out and die if left exposed for any time.
- Narrower planting window. Bare root trees are dug while in dormancy and are kept in refrigerated dormancy until the planting. Bare Root trees can only be ordered in the spring and must either be planted right away, or store in a
- Restricted availability. Some species may not be available bare root.
- A little more complicated to plant than the others.

Planting directions for bare root.

1. Plant As Soon As Possible! If you can't plant right away, you will need to heel them in a shady area, making sure to keep the roots covered, moist, and cool, until you can plant them.
2. Prune back any dead roots with pruners. Dead roots are typically blackened, dry, and brittle while healthy roots are white, yellow and flexible.

3. Soak the roots in water for about 2 hours before planting. Add a cup of kelp extract to help with the temperature and transplant shock. Do not allow roots to remain in direct sunlight and open air for long. Damage can occur in as little as 15 minutes.
4. Dig a whole with enough space for the roots to spread out. In the bottom of the whole make a cone shape from the soil.
5. Spread the roots over the cone, making sure the plant roots are in complete contact with the soil. You don't want any air pockets developing between the roots and the soil.
*Also make sure the root flare is at grade.
6. As you firm the soil in around the roots, hold the plant as straight as you can so when you are finished you don't have tree or shrub that lists to one side. As you are backfilling, use your fingers to work the soil in-between the roots to make sure there are no air pockets.
7. Water thoroughly when done.

4. In-ground Fabric Bag



- Trees grown in small fabric bags
- Smaller root ball size, when compared to a B&B tree.
- More roots in the In-Ground fabric bag. Approximately 80% of the root structure is harvested with a tree grown in an In-Ground fabric bag. By contrast, a study at Michigan State University showed that up to 98% of a tree's root structure can be cut away when digging a B&B tree. The fabric bag is quickly cut and removed to reveal a great balanced root structure.
- The science of the In-Ground fabric bag is as the roots of the plant grow, they hit the fuzzy inside fabric of the bag. Importantly, roots do not circle on the fabric as they do against plastic. Instead the root is caught by the fuzzy inner surface of the material. The root penetrates the fabric. The tough fabric, however, prevents the root from expanding. The root is choked or girdled by the fabric. The choking causes the root to lose its apical dominance and lateral branching or pruning occurs inside the bag.



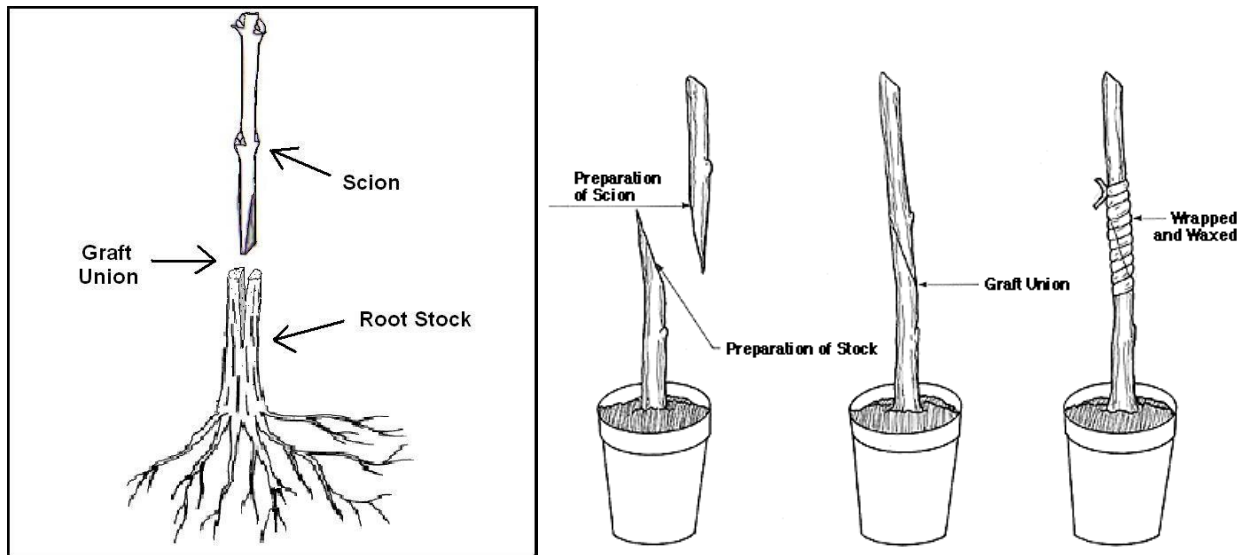
- These pictures highlight how much roots are saved with in-ground root bags. The picture on the right compares a bare root tree on the left to an in-ground fabric bag on the right.

Dwarf rootstock

For urban orchard environments it's highly recommended to purchase dwarf rootstock trees. Dwarf and semi dwarf rootstocks have many benefits over standards

- Dwarf trees are easier to manage
- Fruits in 2 instead of 5 years
- Small trees dry out faster, leaving less chance for diseases
- Dwarf trees produce 100% high quality fruit, as oppose to standards which can produce around 60% (fruit produced in the shade of the tree has less sugar and taste. Dwarf trees have less shade.

*when purchasing dwarf rootstock trees make sure it's from a reputable nursery and always double check the scion/rootstock combination online. Large commercial places (home depot, etc) typically graph weak connections producing repeat customers as their trees snap in half within the first 5 years.



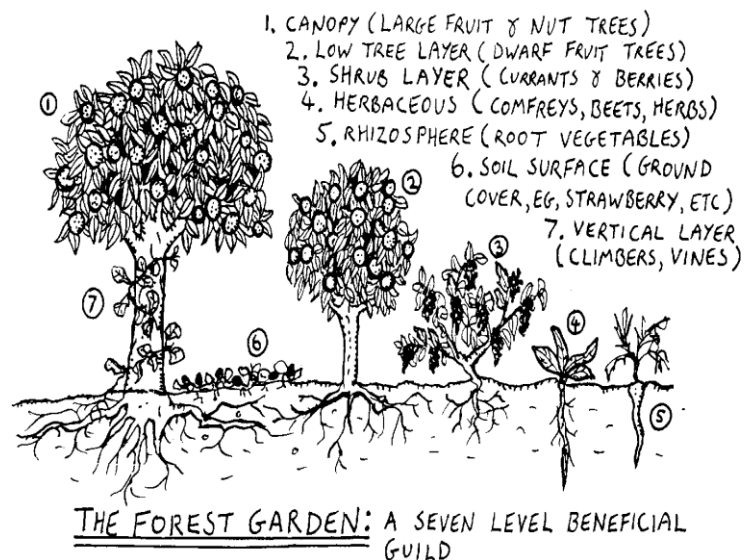
Good dwarf rootstocks

- Apples
 - o Malling 9
 - o Geneva 41
- Pears
 - o Conics/magen on a Quince rootstock
- Plums, peaches
 - o Pixy
 - o St Julien A
- Cherries
 - o Colt
 - o Gisela 5 rootstocks

Chapter 2: Creating a “Guild”

Guilds

A guild, or forest garden, is a multi-layered plant community consisting of various combinations of companion plants, or plants that assist each other’s growth in different ways, as cover crops to diversify the understory and assist the growth of the fruit trees.



Recommended companion plants

1. Comfrey - a nitrogen fixer and dynamic accumulator which means it holds nutrients in the soil so other plants and fruit trees can get them
2. Strawberry - a ground cover, helps soil stay moist and keeping weeds from being able to germinate
3. Clover - a ground cover and nitrogen fixer, also deters crab grass, which is terrible for trees and annual crops.
4. Legumes – beans and peas – Good nitrogen fixers - adds nitrogen to the soil
5. Alliums – aromatic plants that keep bad bugs away such as aphids, boars, etc, (other affective alliums: Leeks, onions, Sweet Basil, catnip (repels mice too), mint (an invasive so be careful), shallots, chives, and garlic) *alliums can inhibit the growth of beans and peas if planted close.
6. Buckwheat – smothers weeds due to its quick growth, adds calcium to the soil, and attracts predatory insects.
7. Flowering plants – berry bushes, marigolds, wildflowers, carrots, parsnip, fennel, dill, coriander, daisies, acacias and tamarisk, etc – attract predator insects to kill bad bugs

8. Wormwood (Artemisia) - When planted as a border it helps keep animals and many bugs out of the garden.
9. Mole Plants and Castor Bean – repels moles and mice, * poisonous plants

*** Be aware of ants – ants do not harm fruit trees or plants. They eat harmful caterpillars, help dispose of waste, and can occasionally help with pollination. But they are attracted to aphid dew and have been known to protect aphids and even carry them from plant to plant, helping to spread aphids. If this is the case its good to repel ants from your garden using Anise, buckwheat, catnip and clover. You can also keep ants off a tree by greasing around the base of the trunk with a thick layer of Vaseline or a skirt of sump-oil soaked rag.

There are a ton of different guilds that can be done. These are just some possibilities. The main theme here is diversity. Monocrops situations require more human intervention to control pests. Here are 2 links to more companion plants:

http://www.homeandgardensite.com/companion_planting.htm

<http://www.ghorganics.com/page2.html>

Pollination

While designing a planting it's important to consider pollination factors

- Before purchasing trees, evaluate the pollination requirement of the given fruit trees.
- Most fruit trees need cross-pollination for good fruit set, and you may need to buy more than just one variety. Even trees that self-pollinate can still benefit in fruit quality from cross pollination.
- All varieties of apples require some cross-pollination. All sour cherries are self-fruitful. All sweet cherry varieties, except Stella, are self-unfruitful and must be cross-pollinated.
- A pollinator shouldn't be more than 100 ft. away.
- The honey bee is the most important carrier of pollen.
 - o Bringing a bee hive into the acre the fruit trees are located can help pollinate
 - o Bring plants that attract bees such as dandelion blooms, wildflowers, sunflowers, etc
 - Good link for bee attracting plants: <http://www.thedailygreen.com/going-green/tips/bee-friendly-plants>
 - o *Make sure not to use not to use pesticides*, because pesticides are not selective and kill off beneficial bugs along with pests.
 - o Use local native plants. Research suggests native plants are four times more attractive to native bees than exotic flowers.
- Pawpaws and certain other trees have difficulty pollinating and may require some assistance by hand pollination. Hand pollination uses a small, soft artist's brush to transfer pollen to the stigma. Pollen is ripe for gathering when the ball of anthers is brownish in color, loose and

friable in the spring. Pollen grains should appear as small beige-colored particles on the brush hairs. The stigma is receptive when the tips of the pistils are green, glossy and sticky, and the anther ball is firm and greenish to light yellow in color.

Pollination Definitions

- **Pollination:** the transfer of pollen from the anthers to the stigma of a flower.
- **Self-pollination:** when the transfer of pollen occurs within the same variety.
- **Cross-pollination:** when the transfer of pollen occurs between two varieties.
- **Self-unfruitful:** very little fruit will set unless the blossoms are fertilized with pollen of another variety.
- **Self-fruitful:** varieties that set fruit with their own pollen.
- **Cross-unfruitful:** two varieties that, when cross-pollinated, will not set fruit.
- **Compatible:** varieties that fertilize each other.
- **Parthenocarpic:** fruit that is set and grown without fertilization (no seeds present)

Chapter 3: Pest Control

Preventative Methods

Handpicking and squishing method - walk the orchard closely at least twice a week, especially while the leaves are fully developing in the spring, and then again as fruits are growing.

Soap Spraying - trees with a lot of bugs can be treated by using a biodegradable soap. Mix soap very lightly (5 Tbsp. per gallon/2 % dilution) with a water spray and spray fruit trees completely 4 to 7 days consecutively, until bugs are gone.

Using traps and Lures - Traps and lures are a way to monitor and control insect problems. There are many types of traps available. They use pheromone lures, baits or contain sticky substances that are affixed to different colored surfaces that attract a specific range of insects. It's important to use the right lure and trap for each specific insect.

Some traps are durable and can be reused by simply replacing the bait or the removable sticky pad; others are disposable after they are filled.

Some examples of lures and traps

<http://www.pestwizard.com/PestWizardConsumerProductCatalog.pdf>

- Be aware of traps. Some instances traps could attract more pests to the area. Don't hang the traps right next to the fruit trees. Make sure there's a few non fruit trees between the traps and the fruit trees.

Protective bags - After fruit has been thinned on a tree an effective way to protect the fruit while it grows, from both insects, animals, and sunburn, is to wrap each fruit in a protective bag. Paper bags with twist ties or ziplock bags work well. When using ziplocks make sure to either cut slits in the bag or trim the corners to allow moisture to escape. (ziplock instructions <http://gordosoft.com/orchard/bagging.htm>) Nylon shoe try-on footies are recommended for peaches because they are more breathable and work better with the lack of stems on peaches. To save money and labor use large bags that can bag more than one fruit on clusters.



Sanitation in Fruit Crops – Fruit tree orchards need to adopt good orchard sanitation practices, especially in the fall after the growing season. The destruction of harboring places for insects and diseases plays a large part in any sanitation program. Common weekly practices of an orchard sanitation program include removing all dropped fruit, raking up or shredding all dropped leaves, and pruning and destroying all diseased and damaged branches.

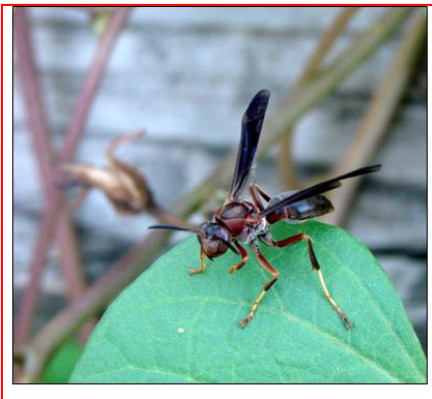
Organic Sprays – See chapter 5 for information.

Beneficial Insects - Insects that protect your plants by killing harmful insects. Planting certain companion plants can attract these insects. You can also buy these bugs, called biological control, at certain garden stores. But if there's no supporting plants to feed the adults they will probably fly away instead of laying eggs.

- Research the right plant to attract the right insect. Use native plants when possible. (<http://nac.unl.edu/bufferguidelines/docs/5/5.2ref.pdf>)
- Beware of some biological controls such as the preying mantis which will eat both pests and beneficial insects.

Parasitic Wasps

Female wasps lay eggs in aphids, which kills them



Lady Bugs

great against aphids, scale, spider mite, and mealybugs



Tachnid Flies

Parasitic insects that lay their eggs on most garden pests



larva

LaceWings

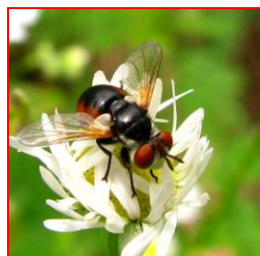
adults and larvæ prey on orchard pests.



Adult



Larva



Adult

Syrphidae

Syrphid fly larvae feed on aphid



Adult



Larva

Snakeflies

Both adults and larvæ prey on orchard pests.



Adult



Larva

Soldier and Ground Beetle

feed on aphids, caterpillars, grasshopper eggs, slugs, seeds



Soldier Beetle



Ground Beetle

Spiders

All spiders are predatory, which makes them excellent biological control agents.

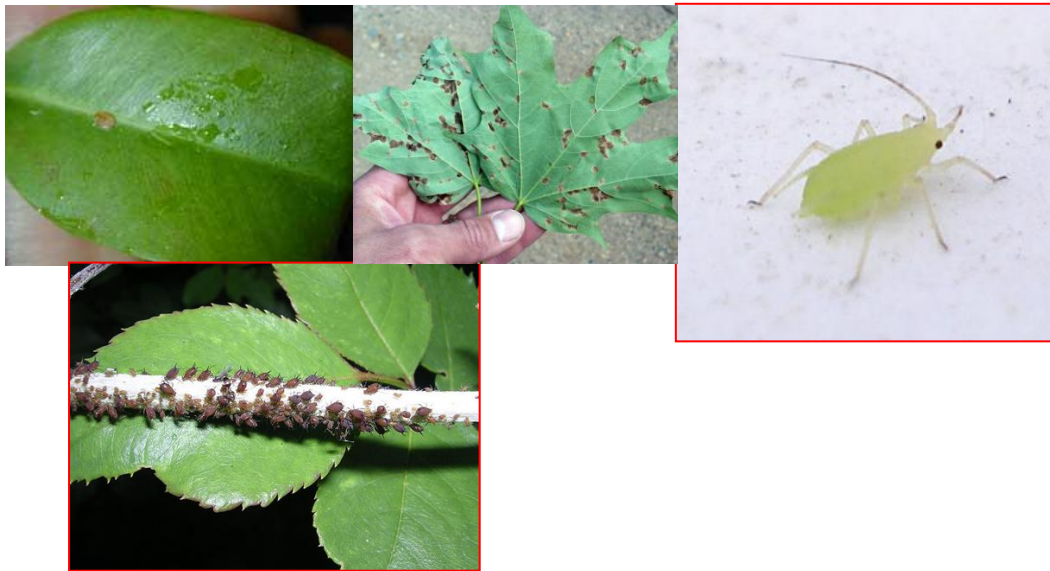


Pests to look for:

2 Kinds of Pests

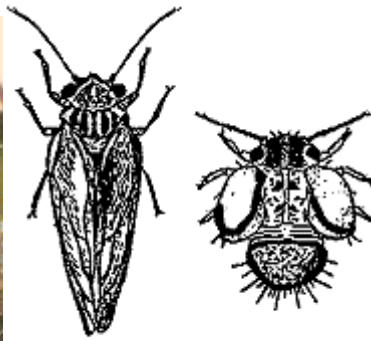
- *Direct pests* – pests that attack the fruit
- *Indirect pests* – pests that attack the plant

Aphids – small sap sucking insects that are some of the most destructive insects to fruit trees. They excrete excess sap called honey dew, which at first makes the leaf look shiny and eventually it will turn the leaf black.



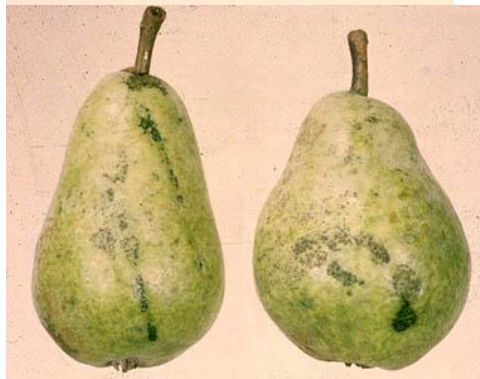
Can be treated by using biodegradable soap and squishing them. Recommended to treat aphids 3 times a week during aphid season (spring and fall)

Pear Psylla – aphid type of insect that excretes honeydew sap onto leaves and fruit that will turn into black marks. Honeydew injury occurs when excess honeydew drips onto and congregates on lower leaves and fruit. Under bright sunlight and dry conditions, the honeydew can kill the leaf tissue and produce a symptom called "psylla scorch". The honeydew is a good medium for sooty mold growth. When it occurs on the fruit, it russets the skin and makes the fruit unsalable. Pear trees with past problems of excessive honeydew characteristically have black bark due to the sooty mold.



Pear psylla
Adult (x10)

Last stage nymph



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OSU Insect Clinic



Predatory insects such as the Ladybird beetles, lacewings, syrphids, and snake flies have become effective ways to control Pear Psylla.

Fruit Tree Borer - A fruit tree borer is a type of insect that feeds on the wood of the fruit tree.

Borer Larva



Peach Tree Borer



Bark Injury



Bark Injury



- This pest prefers injured and weakened trees. White wash the lower trunk and branches to discourage egg laying. Prune and burn during the winter any limbs with shot holes.

Codling Moth - Codling moths are small insects that lay **eggs** in apples. When the eggs hatch, the larvae eat the apples.

Codling Moth



Larva



Fruit Damage



- An effective way to control Codling Moth infestations are good sanitation, bagging fruit, and trapping. Sanitation should be the first step in any codling moth control program. Every week

or two, beginning about six to eight weeks after bloom, check fruit on trees for signs of damage. Remove and destroy any infested fruit showing the frass-filled holes. Removing infested fruit before the larvae are old enough to crawl out and begin the next generation can be a very effective method for reducing the population. Thinning out the infested fruit has the added benefit of encouraging the remaining fruit on the tree to grow larger.

- It also is important to clean up dropped fruit as soon as possible after they fall, because dropped fruit can have larvae in them. Removing infested fruit from the tree and promptly picking up dropped fruit from the ground is most critical in May and June but should continue throughout the season.

Caterpillar – insects that attack the leaves, buds, and fruits of trees.

Caterpillar



Caterpillar tent



- Destroy caterpillar tents immediately when discovered. If you're having caterpillar problems, you can set a trap by wrapping the tree trunk all the way around with two sided sticky tape or grease bands about 2ft above the ground. The traps need to be employed from approximately October onwards. During the months of November through to January, the wingless female moths emerge to crawl up the trees for mating. This is the critical time to employ this preventative measure in order to stop the caterpillars reaching the high branches where they lay eggs. Other species of crawling pests capable of causing fruit damage are active during later months; therefore this procedure will require regular re-application to remain effective. You need to reapply grease (don't use car grease or anything toxic for birds or plants) regularly and kept the strips clear of debris.

Stink Bugs - Invasive bugs imported from china with no natural predator or no effective insecticide.



Best way to get rid of them is to pick them by hand. You may not want to squish them because they will release a bad smell.

There are homemade remedies with some success. Cutting the top off a plastic bottle and taping the top upside down in the body will create a trap for stinkbugs. Put a LED light at the bottom of the bottle to attract the stink bugs in. You can place these traps around your orchard at night.

Also this bottle trap without the light is good for capturing the bugs by hand.

This link will demonstrate how to make and use this bottle trap.

<http://www.wjactv.com/video/28028425/index.html>

White Flies

- Tiny sap sucking insects, who feed on the underside of a leave
- Excrete honeydew which can cause mold growth



Treatment

- Washing with biodegradeable soaps and high pressure water spray
- Biological control: Lacewings & Ladybugs

Fruit Flies - Adults are about 1/8 inch long and usually have red eyes. Fruit flies lay their eggs near the surface of fermenting foods or other moist, organic materials. Upon emerging, the tiny larvae continue to feed near the surface of the fermenting mass. The reproductive potential of fruit flies is enormous; given the opportunity, they will lay about 500 eggs. The entire lifecycle from egg to adult can be completed in about a week.

Fruit Flies



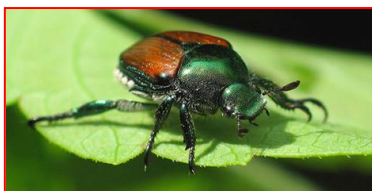
The sting mark



- Clean up any fallen fruit immediately. If composting the dropped fruit, make sure the fruit does not sit on top exposed. If there is a fruit problem one way to prevent the rest of your fruit from being infected is to wrap plastic bags around your fruit to protect them until the fruit flies go away. Wrap the green fruit as well. Alliums will spread aromas hiding your fruit smells from fruit flies.

Japanese Beetles – Japanese beetles alone won't cause much damage, but they tend to congregate which may cause a lot of damage to trees. They chew the leaves back to the veins and can completely defoliate a whole tree. The good thing is that the adult beetle are only around for about a month. If some of your trees can survive their stay there are several ways to handle them.

- Walk around the orchard before sunrise (they are more lazy in the morning and less likely to fly away) with a bucket of soapy water. Knock them in the water.
- Surround spray and a hot pepper/garlic spray will deter them (see chapter 5)
- Lures and pheromone traps can be effective but can attract more beetles to your site. Make sure there are non-fruiting trees in between the lure and your fruit trees.



Other less common fruit tree pests

Scale insects



Spider Mites



Leaf miners



Plant Bug



Leaf Hoppers



More information about pests

<http://www.ipm.ucdavis.edu/PMG/GARDEN/FRUIT/apples.html>

<http://www.caf.wvu.edu/kearneysville/wvufarm1.html>

Chapter 4: Fruit Tree Pathogens

Diseases

Apple and pear Scab: Apple and pear scab appears as a dark, rough patch on the surface. Lesions that were initiated early in the season are large, and the fruit may be cracked, since the skin there can't expand well as the fruit enlarges. High moisture can cause scab.

It's important to prune dense trees and set up an orchard irrigation system that doesn't get the foliage wet. Prune any infected areas during fall orchard sanitation which will help reduce overwintering spores.



Bitter and Black Rot: A rot caused by fungi, primarily found in apples and pears, with obvious concentric rings in the fruit. The rotted flesh is soft for bitter rot and firm for black rot. Calcium nutrient supplements may help the severity of bitter and black rot.

Pruning for Good circulation, proper orchard sanitation, organic fungicides, and lime sulfur sprays will help prevent and treat Brown Rot.



Brown Rot: a fungal disease that spoils fruit and can infect all stone fruits, including cherries. A full blown infection can wipe out an entire crop just before harvest. Blooms and new shoots coated with moisture for a minimum of five hours can be infected by spores that overwintered. Infected blossoms

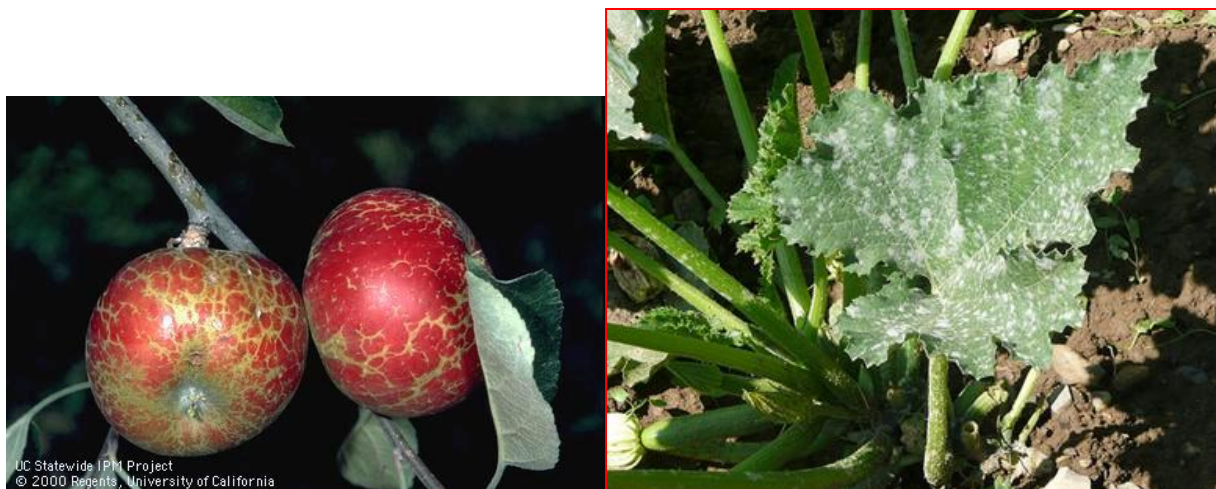
shriveled and do not set fruit. Brown rot on fruit begins as a soft brown spot that turns into powdery masses of spores. The fruit is consumed very quickly but the majority stays attached to the tree. The wrinkled dried out mummies cling to their twigs carrying the next year's brown rot spores. Remove all mummies found on the tree and orchard floor.

Pruning for good circulation, proper orchard sanitation, organic fungicides, and lime sulfur sprays will help prevent and treat Brown Rot.



Powdery Mildew: Powdery mildew can be recognized easily on most plants by the white to gray powdery mycelium and spore growth that forms on both sides of leaves, sometimes on flowers and fruit, and on shoots. The disease attacks new growth including buds, shoots, and flowers as well as leaves. New growth is dwarfed, distorted, and covered with a white, powdery growth. Infected young fruits develop web like, russeted scars. On tree fruits a rough corky spot on the skin will develop where infection occurred. Infected leaves later develop dry, brownish patches along with nondescript patches of white powdery fungus on the lower surface and reddish discoloration on the upper surface.

Pruning for good circulation, proper orchard sanitation, organic fungicides, and avoiding excessive nitrogen can be used to treat and prevent Powdery Mildew.





Cedar-Apple Rust: When the fungus attacks leaves, the lesions look like orange spots. Cedar-apple rust appears on fruit first as bright orange, slightly raised lesions, but may take on a more brown and cracked appearance as the fruit enlarges. The fungus overwinters on galls on the cedar tree. Wetting of galls in the spring initiates expansion of the spore horns and production of basidiospores which are carried to the apple tree to infect leaves and fruit during extended wetting periods. Mild winters with wet early springs helps Cedar-Apple Rust spread.

Removing winter galls on any nearby cedars and using organic fungicide treatments during the first wet spring rains may help prevent Cedar Apple Rust. Try to plant fruit trees and Cedars away from each other. There is no treatment once infected, except for waiting till next year.

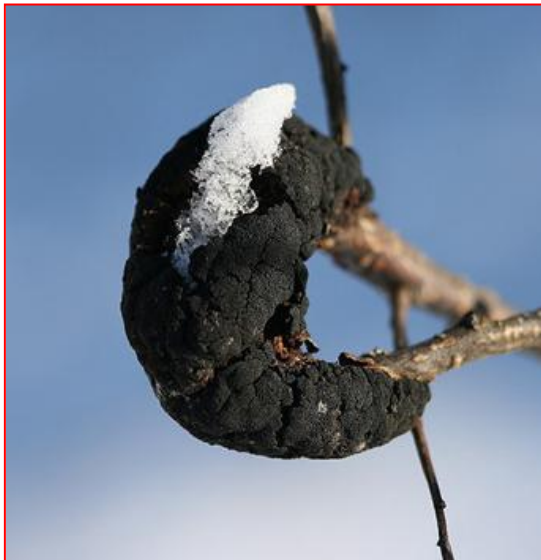


Cedar Rust Galls



Black Knot: Black knot is a very destructive fungal disease on susceptible cultivars of plum and cherries. The disease occurs only on the woody parts of trees, primarily on twigs and branches, and sometimes on trunks and scaffold limbs. The warty swellings first become visible on new shoots in late summer or the following spring. At first the knots are olive-green and corky, but with age turn black and become hard and brittle. The knots vary in length from one inch to nearly one foot.

Pruning for circulation, sanitation pruning of any disease parts, and applying organic fungicide will help treat and prevent future black knot.



Fire blight: Fire blight is a destructive bacterial disease of apple and pear, recognized by a severe blighting of blossoms, shoots, limbs and fruit. In spring, branch and trunk canker symptoms can appear as soon as trees begin active growth. The first sign is a watery, light tan, bacterial ooze that exudes from cankers (small to large areas of dead bark that the pathogen killed during previous seasons) on branches, twigs, or trunks. The ooze turns dark after exposure to air, leaving streaks on branches or trunks. Infected flowers and flower stems wilt and turn black on pear trees and brown on apple trees. Fire blight causes small shoots to wilt and form a crook at the end of each infected shoot. Succulent tissues of shoots and water sprouts (root suckers) also are subject to infection. Dead, blackened leaves and fruit cling to branches throughout the season, giving the tree a scorched appearance, hence the name “fire blight.”

The best way to fight Fire Blight is to prune the infected areas away ASAP before it spreads into larger wood. Make sure to prune the branch far enough off that the cambium is green, instead of black.



Peach Leaf Curl: A fungal disease which affects peaches which first attacks the foliage first, reducing the fruit crop. By late spring the infected leaves will turn reddish brown and fall off. The trees will produce new leaves and shoots which should grow normally if the weather dries up. Tips of new shoots can be distorted. Pruning affected shoots does not provide any control.

Organic fungicidal spray applied at the end of the growing season will help control the spread next spring. Select Peach trees that are resistant to Peach Leaf Curl. (ie. Red Haven)



Good links for more information on tree pathogens

<http://www.ipm.ucdavis.edu/PMG/GARDEN/FRUIT/apples.html>

<http://www.caf.wvu.edu/kearneysville/wvufarm1.html>

<http://ag.arizona.edu/pubs/diseases/az1124/#introduction>

Prevention and Control of Fruit Tree Pathogens

1. Select disease resistant cultivars
2. Employ proper orchard sanitation, especially in the fall.
 - a. Remove infected areas quickly and do not compost the infected areas.
 - b. Prune any dead or broken branches
 - c. Clean up the ground at the base of each tree of any leaves and fallen twigs.
 - d. Prune back any branches that are touching other structures, to prevent crawling organism from climbing on
 - e. Pick up and remove/compost all leftover fruit
 - f. Spray an organic dormant oil and fungicide to prevent infection next spring.

*Sanitize pruners between each infected tree prevent the spread of certain pathogens.
3. Keep a healthy amount of air flowing through your tree by pruning the inside canopy and plant trees in as much sunlight as possible. (See pruning section). Also prune any dead, diseased, broken or rubbing branches, which are good entry points for insects and pathogens.
4. Try to water the soil rather than the leaves of the tree.

5. The healthier the tree the less susceptible it will be to fungal diseases. Make sure the tree is in the right place, mulched in spring and fall, and feed it plenty of compost, manures, and/or organic fertilizer.
6. Control sucking insects such as aphids, leafhoppers, and pear psylla, which can spread certain diseases.
7. Use Organic and home remedy sprays. (see chapter 5 sprays)

Chapter 5: Sprays

It's important for the health of the environment, the people gardening and eating the produce, and the ecosystems (including the beneficial insects) to use organic and home remedy sprays.

Holistic sprays

Instead of focusing on every pest and disease individually, the holistic spray strategy focuses on increasing the overall health of the tree, decreasing its chances for pests and diseases. Typically pests and diseases target less healthy trees. This strategy focuses on two rounds of sprays in the spring and winter dormancy. The strategy uses various organic solutions mixed together to create a holistic spray. Michael Phillips is an excellent reference for the recipes of each solution.

Organic Solutions can consist of: neem oil, kelp extract, fish oil, compost tea, garlic, biodegradable soap, molasses. Water

Holistic Orchard Schedule by Michael Phillips

<http://www.groworganicapples.com/organic-orcharding-articles/holistic-orchard-seasonal-checklist.php>

Surround Spray

Surround is an edible organic spray which coats fruits and trees with a clay mixture that weathers well and adheres to fruit until it is washed off at harvest. Applied with a sprayer the clay film acts as a preventative on major insect pests including, plum curculio, apple maggot, codling moth, aphids, Japanese beetles, pear psylla, leafhoppers and leaf rollers. It is not destructive to beneficial insects. Spraying Surround is safe for the environment.

It is recommended to spray surround over the entire plant, including both sides of the leaves, after the blossoms fall to protect against insects laying eggs such as the codling moth. Reapplications should be sprayed throughout the growing season in the summer.

Reapplication is generally required every 7-14 days. Intervals can be widened to 14 to 21 days later in the season when new growth diminishes. When the dry foliage has lost its white appearance, reapplication is necessary: Heavy rainfall, new growth, and wind erosion will affect film quality. Reapply to re-establish coverage after heavy rain as soon as the foliage is dry. However, reapplication may not

be necessary if all target surfaces remain thoroughly coated. Excessively thick coatings are not recommended.

Use ½ lb. to a gallon of water. (i.e. a ½ gallon of mixture will spray a full size peach tree).

For information

<http://www.ediblelandscaping.com/plants.php?func=view&id=207>

<http://www.groworganicapples.com/surround-kaolin-clay/>

Organic and Home Remedy Sprays

Organic fungicides – good for different funguses like powdery mildew

Many organic fungicides can be bought or made. One easy recipe is
4 teaspoons of baking soda
4 teaspoons of biodegradable soap
Mixed with one gallon of water and applied through a spray bottle.

Neem Oil

Neem oil is best used as a preventative or in low disease pressure situations for fungus problems. Use to control diseases such as powdery mildew, anthracnose, botrytis, rust, leaf spot, and flower blight.

Pepper Spray

Must be resprayed every week or after any rain. It's effective for deterring most chewing and sucking insects and animal pests.

6 cloves of garlic
1 Tbsp dried hot pepper
1 minced onion
tsp biodegradable soap
1 gallon hot water

Blend & let sit for 1 - 2 days. Strain & use as spray.

Compost Tea

Compost tea is made by steeping compost in water

Benefits

- When sprayed on leaves, protects against pests and diseases
- Increases amount of plant available nutrients
- Speeds the breakdown of toxins

What you need

Finished compost, 5 gallon bucket, aquarium pump and bubbler, air tubing, pillowcase, water, molasses, stirring stick

Directions - <http://www.dep.state.pa.us/dep/deputate/airwaste/wm/recycle/tea/tea1.htm>

More Home Remedy Sprays

<http://www.ghorganics.com/page15.html>

More store bought organic sprays

<http://www.thepineywoodsnursery.com/supplies-pineywoods-nursery.html>

Types of Sprayers

It is best to spray trees on cloudy days or in the early evening when they are not in direct sunlight. When buying a sprayer, make sure there's a wide spray option. Most sprayers are for weed killing and only have a single stream spray.

Hose Sprayer – cheap and effective but you need access to a hose with decent pressure



Handheld Sprayer – Cheap, great if you don't have hose access, pressure operated by a hand pump, may take multiple refills to finish a large job.



Backpack Sprays - Expensive, great if you don't have hose access, pressure operated by a hand pump, able to easily carry more solution than the handheld sprayer. Ideal for larger orchards, with no hose access.



Chapter 6: Environmental Disorders

There are many different kinds of environmental factors that can affect your fruit trees.

Factors

Drought Stress – starts with an off-color look to leaves, a dull blue cast, rather than a shiny green. Then the leaves will dry, turn brown, curl up or go limp and eventually drop off, and the blossoms and small fruit will too. Dieback of the wood progresses from twigs to branches to the trunk. Roots are dying as well. Caught early, trees can recover right away. Limp leaves perk up quickly after watering. Foliage too dry for too long may still fall off and the tree will regrow new leaves.

To counter drought stress try watering the trees with slow drip ooze tubes or drip hoses. Make sure to give the trees at least 25 gallons from a slow drip (slow drip helps the root ball absorb water instead of letting it run off) once a week and on really hot days 2-3 times a week. Mulch the tree to help keep the water from drying up.



Oxygen deficit – an environmental disorder caused by too much water. The leaves in the beginning look like drought stress. Foliage wilts and drops off. Leaves often turn a pale yellow before wilting and falling. Additional symptoms of insufficient oxygen are a thinning canopy, slow growth rate, small leaf size, and chlorosis (the yellowing of leaves). Twigs may die back. Roots in chronically wet soil can turn black. The soil may look black and smell like rotten eggs. Root rot is likely to occur in oxygen poor wet soils.

To prevent oxygen deficit concentrate on absorbing or draining the water. Plant trees on slopes and away from areas where lots of water is being collected. In high water areas only plant good rain garden trees like pears, river birches, etc) you can plant companion plants around the base of the trees to help soak up water. If the soil has too much clay during planting try to amend it with other normal soil help the water drain.



Frost Damage - when temperatures go below freezing many fruit trees become susceptible to frost damage. Leaves and shoots turn brown, looking scorched. The top and outside of the canopy sustains injury from frost first. New growth is especially vulnerable; older leaves and stems are more cold-hardy. Late frost, those that occur in early spring can be very damaging to blooms and new fruit. Wait to prune off frost-killed branches until after the last frost of the season. Leave the dead leaves and twigs to protect the live wood below from later frosts. Wait until new growth begins below the frost killed portion to show where the wood is still alive. Prune to the highest live node.

To prevent frost damage plant trees on the south by south west side is the warmest location. Plant weaker trees near buildings to block the wind. Try to pick trees that are hardy enough for the DC climate zone. Wrap weaker or younger trees in burlap to protect against the wind.



Sunscald - Sunburn injury can affect both apples and pears. Symptoms are yellow or flushed areas on the fruit surface. With severe damage, injured areas turn dark while the fruit is still on the tree and surface cracks develop at the site. More commonly, damage is less severe and appears as small, yellow spots that are easily overlooked at harvest. When fruit is stored, these injured areas often turn dark brown. Sunburn on trunks can provide entry sites for borers.

To prevent sunburn damage by keeping a healthy leaf canopy with proper tree training and pruning. Paint trees with whitewash, white latex paint or use tree wraps when first planted and provide adequate irrigation to protect trunks in early years. Mix paint with water. Never apply full strength paint to tree trunks.

Sunburned fruit

Sunburn Bark (on the bottom left)



Nutrient deficiencies- the most commonly misdiagnosed environmental disorder. Symptoms of nitrogen deficiency begin with the oldest leaves turning yellow, while new leaves remain their normal shade of green. Autumn leaf drop occurs earlier for deciduous trees than it should. The veins of an iron deficient leaf remain green, while it yellows between them. If it continues new leaves turn almost white. Additional symptoms of this disorder are small leaves normal length shoots that are too narrow, and twig dieback.

If you suspect nutrient deficiency test your soil. If you live in the DC area, collect soil samples and mail them to the A&L Eastern Laboratories, INC. (www.al-labs-eastern.com) Once you get the results back you can decide how to amend the soil with fertilizer and compost.

Great video for soil testing

<http://www.youtube.com/watch?v=xljxBgLS4Q8>



Salt Damage – is occurs when the tree and soil comes into contact with a lot of salt, though improper fertilization, salty irrigation water, or solutions splashing the tree such as road deicing. Salt damage can cause yellow foliage, stunted growth, and older leaves with brown edges and tips. Prolong exposure can kill a tree. Salt splashed foliage turns brown on the point of contact.

Treatment of salt damages ranges from improving drainage or adjusting grade, so salt is easily leached away from trees. Flushing well-drained soils at the end of the winter, or incorporating gypsum or a similar commercial product into the soil before winter begins, has been found to reduce salt damage in some cases. To avoid salt splashed build the burm higher or construct a wall blocking the point on contact.



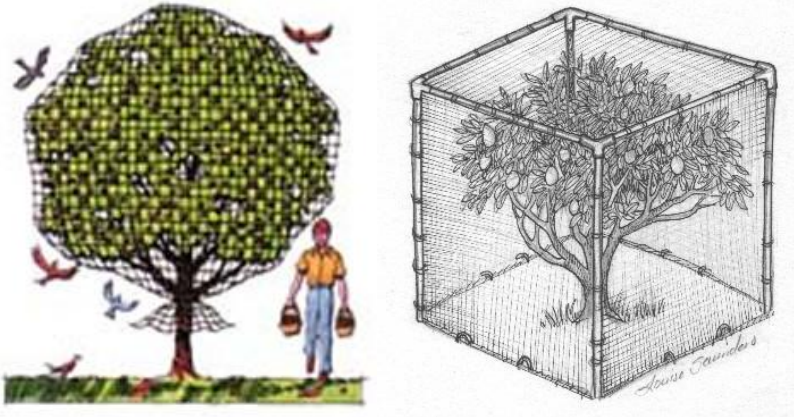
Smog Damage – high levels of smog can cause damage to tree leaves, causing discoloration of leaf surfaces. Leaves will look flecked or stippled with tiny brown spots that fade to gray or white. This can look like spider mite damage. (Check the underside of leaves for signs of the pest before assuming pollution damage. High levels of foliar injury from sulfur dioxide can cause leaves to turn white between veins. There's no treatment for smog damage. Try to plant trees resistant to smog in high pollution areas and keep the tree healthy in all other areas.



Chapter 7: Animal control

Birds

- If the fruit tree is not too big you can cover it under a net. This is especially helpful to protect cherry trees.



- How to net a fruit tree video: <http://www.youtube.com/watch?v=pcYHm9LXeEg>
- Birds also tend to scare from reflective light and shining things in fruit trees. Hanging metallic reflective objects such as CDs, pie tins, soda cans, etc, can deter birds from your trees. Shiny wind chimes work well.



- Plastic or wood owls have been known to scare birds away but they must be frequently moved around the tree to continually trick birds.
- Wrapping fruit in protective bags is very effective against birds
- Plant decoy trees in between large bird habitat trees and your fruit trees. Mulberries work really well for decoys.

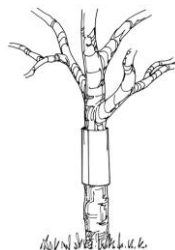


Squirrels

- Organic sprays (i.e. 1 part tobacco/5 parts water) applied weekly, or after each rain, can deter squirrels.
- Prune back tree limbs where squirrels play 6-8 ft. away from the fruit trees. Squirrels won't always travel on the ground to get to the other trees due to fear of predators.
- Place fake owls, hawks or snakes, squirrels' natural predators, around the tree.
- Havahart traps is a humane way to trap squirrels and let them loose far away from your fruit trees. Place this traps around your tree and in the tree if possible.
- Motion detector water sprinklers may prevent squirrels from getting near the tree.
- Nets can deter squirrels from getting to the fruit. If a squirrel really wants the fruit it can chew through the net, but most squirrels will be deterred.
- Plant decoy trees in between large squirrel habitat trees and your fruit trees. Mulberries work really well for decoys.

Rodents

- Tree guards for the base of the trees. The bottom of the tree guard should be buried at least 5cms in the ground.
- Regular close mowing of orchard ground cover helps to discourage mice. Nesting material and places to hide offered by brush and trash should be removed.
- Mixed white latex paint with thiram and paint the bottom of a tree to deter rabbits. (ie. Mix 400 g of Thiram 75 WP with 2 liters of water and stirring slowly into 4 liters of white exterior latex paint.) Oil based paints are toxic to tree and should not be used.
- Wormwood, Mole plants, and Cater Plants repel moles, mice and other some animals when planted around the fruit trees.
- To prevent rats from climbing the tree, put a smooth surface wrap around the base of the tree at least a foot high. Use plastic, sheet metal, or something else where rats can't climb up.



Deer

- Deer guards and deer fences wrapped around an individual tree or around an entire orchard can keep out deer.
 - o Make sure to use fence that is at least seven feet tall to keep deer from jumping over.



- Organic sprays (ie. 1 part tobacco/5 parts water) applied weekly, or after each rain, can deter deer.
- Repellents such as odor and taste repellents are being used in some areas. Odor repellents such as blood meal, moth flakes, soap (some trade names are Plantskydd, Hinder and Liquid Fence.) and human hair have been tried with varying degrees of success. Small nylon mesh bags (cut from old nylons) filled with an egg sized ball of fresh human hair, obtained from a men's barbershop and replaced every 4 to 6 weeks has worked well. These odor repellent bags are placed in every tree around the perimeter of the orchard or on the side from which the deer approach.
- Taste Repellents and Odor Repellents such as soaps and thiram mixtures should be applied before the animals begin feeding. These products produce an objectionable taste or odor which discourages deer from further feeding. Follow all label instructions carefully, as some of these treatments should not be used while edible portions of the crop are present. Some are not registered for use on food. Due to the nature of the products, re-treatment after heavy rainfalls may be necessary.
- Cut dryer sheets into strips and tie them onto the branches around the tree.

Deer Damage



Fruit Tree netting – Creating a netting structure at the base of a fruit tree or attached to the lowest branches can help catch falling fruit, preventing bruising and keeping small rodents from reaching the fruit.



Chapter 8: Fruit Thinning

Thinning

Most stonefruits (peaches, apricots, nectarines, plums) and pome fruits (pears and apples) can benefit from fruit thinning. Cherries, figs, persimmons, and nut trees do not require thinning. Several undesirable things can happen when excessive fruit is left on fruit trees. Weight of extra fruit can cause tree limbs to break. Excessive fruit set often will result in small fruit with poor flavor. Excessive fruit set also can result in alternate bearing in which a tree will produce little or no fruit in the year following a large fruit crop. Excess fruit can cause fruits to rub or hide water, causing fruit to become more susceptible to rot or disease.

Depending on the fruit species fruit should be thinned when they are either the size of a dime (early April for early ripening fruit and mid-May for late ripening fruit) or when they are at a blossom. Thinning too early on some species can result in split pits in stone fruits, especially peaches. Thinning too late on some species reduces the chances that fruit size will increase.

Cut off enough fruit so that the remaining fruits are spaced apart 2-4 inches for plums and apricots and 3-5 inches for peaches, pears and apples. For pome fruits (apples and pears) which produce large clusters, remove all but 1-2 pieces of fruit per cluster. Fruit that are touching each other can cause rot and damaged fruit.

- If possible leave fruit that will be exposed to more sunlight, because this will cause the fruit to be sweeter. Remove fruit hidden under leaves or branches first.
- To compartmentalize energy to improve root growth and protect branch angles it's important to pull the fruit off before the planting and at the beginning of the growing season for the first 2 years.

Methods

Hand-thinning

Involves removing enough fruit to leave the remaining fruit with sufficient space so they do not touch at maturity. On short spurs, this may mean leaving only two or three fruit per spur. If a long branch produces fruit on its entire length, thin more heavily, especially near the terminal end. Remove "doubles" (two fruit fused together) and small, disfigured, or damaged fruit when you have the option. Many times, it is possible to leave more fruit by selecting those on alternating sides of the branch.

Examples

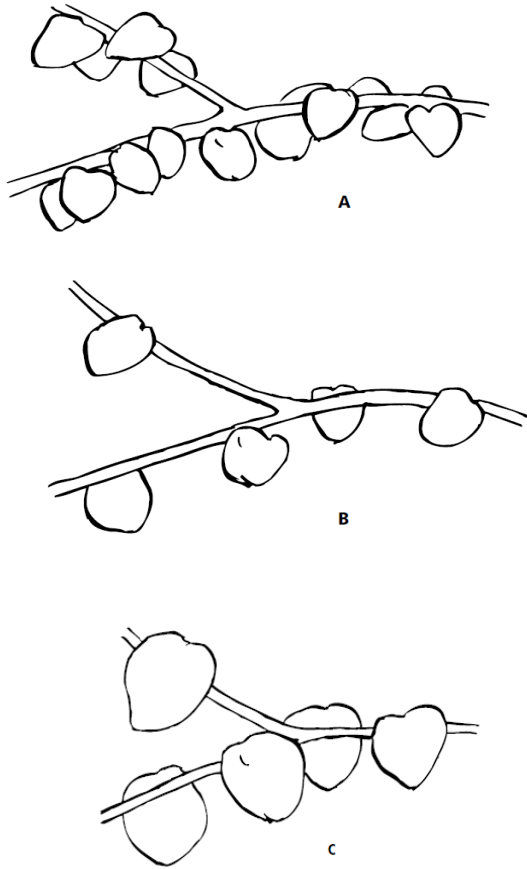


Figure A: Immature stone fruit before thinning

B: Immature stone fruit immediately after thinning

C: Thinned stone fruit at maturity

Great video on how to thin

<http://www.youtube.com/watch?v=YL2jfEnzaOI>

Pole-thinning

Is used mainly on large trees where hand-thinning would be cumbersome or impractical. Pole-thinning is much faster, and although it is less accurate, the results are often acceptable. Attach a short rubber hose, cloth or thick tape to the end of the pole to reduce scarring or bruising of branches. Strike individual fruit or clusters to remove a portion of the fruit. With experience, you will be able to strike a cluster once or twice with just enough force to adequately break up the cluster.

Great link for fruit thinning

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

Chapter 9: Pruning

Pruning

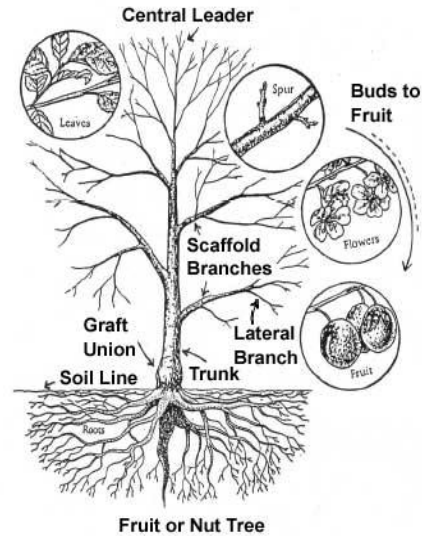
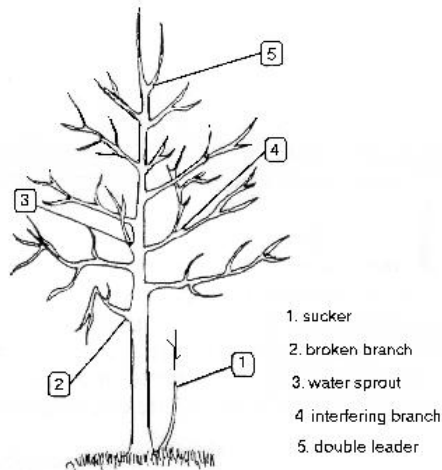
Pruning should be done in the winter while the fruit trees are dormant. This will invigorate the tree and cause it to grow more during the following season.

Steps of pruning:

1. Remove any dead, diseased or rubbing branches
2. If you want a tall and strong tree, establish a central leader by cutting back any competing limbs. If you want a short tree prune back the central leader and all large branches to an outward facing bud. This will create a short vase like structure.
3. Remove branches with crotch angles less than 60 degrees and any limbs pointed downward or water sprouts pointed directly upward.
4. Space out scaffold and lateral branches 4-6 inches, alternating on each side, to open up canopy. Make sure to space out each branch vertically and horizontally. If you're look straight down at the tree it should look like this diagram.



5. On dwarf trees scaffold branches may need to be shortened if they get too heavy.



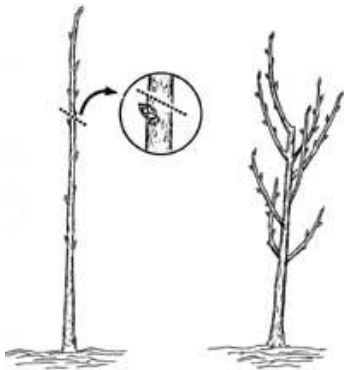
*It is recommended to get training on pruning techniques before pruning.

**Espalier and columnar trees need different pruning and training.

*** Do not use wound dressings because they will actually inhibit the healing process.

Training a Young Tree:

Fruit trees often are obtained as bare-root whips or as packaged and container-grown sizes. Bare-root whips may have few or no branches. The top bud, or terminal bud, will exhibit apical dominance over the over lateral buds, preventing many of them from branching out. If you cut the terminal bud off at the top this should free the other buds from its apical dominance and grow lateral branches.



Following planting, remove the top of the whip about 1/4 inch above a bud that is located approximately 30 to 36 inches above the soil line. This will cause branching.

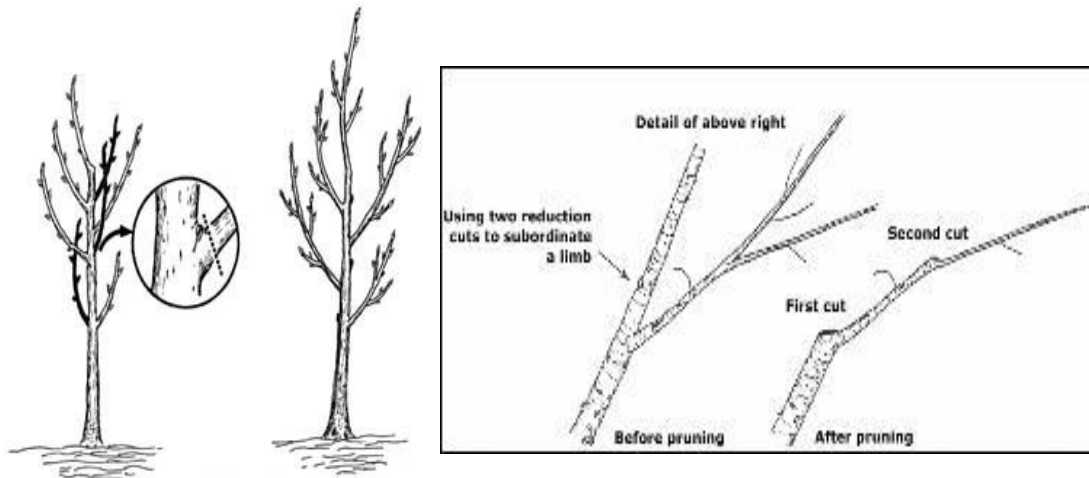
Young whip indicating location of top cut for forcing branches (left) and growth response at end of first year (right).

Making the cut:

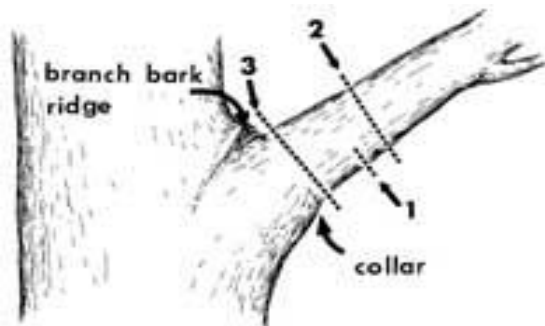
In order to make clean cuts its best to use well sharpened hand pruners and hand saws. To prevent rust keep the tools cleaned and oiled with vegetable oil. It is difficult to make clean cuts with pruning poles. Bad cuts can allow insects or diseases to enter.

When cutting a branch completely off, cut at a 45 degree angle just outside the branch collar. Don't leave a stub but don't cut into the collar. When subordinating (cutting it back but not completely off) cut just above a bud facing away from the trunk.

*always make the subordinating pruning cut just above an outward facing bud.



When cutting a branch that is too big for the hand pruners, use a hand saw. Make a 3 point cut to avoid stripping the bark as the branch comes off. Each number below indicates a cut. 1st cut is to avoid bark stripping. The 2nd cut is to relieve the weight. The third cut is the clean cut just above the branch collar.



Pruning Spurs

A spur is a short (3-5inch) branch where fruit tree flowers and sets fruits. Pruning encourages the tree to grow more of these fruiting spurs by removing competing suckers and unproductive wood. Too

many spurs in one area can decrease the quality of fruit. The highest quality fruit grow at the base of last year's growth and on young spurs. Therefore no spurs should be older than 5 years. Remove spur clusters down to 2-4 spurs.



Video for thinning spurs - <http://www.youtube.com/watch?v=36N4dUaUWMA>

Pruning to increase food production

Many trees, such as peaches and figs, only produce fruit on the current or second year growth and need to be pruned every year to produce additional fruit. This link goes over each tree's fruit production pruning recommendation.

<http://www.mcshanesnursery.com/more-about-pruning-fruit-trees/>

WHEN TO PRUNE:

Apples and Pears –

It is generally best to prune apples and pears when they are dormant in the late winter. Summer pruning is helpful to retard growth of the tree. So if the tree is growing very aggressively and getting taller than you like, take it back in July to control this growth.

Cherries –

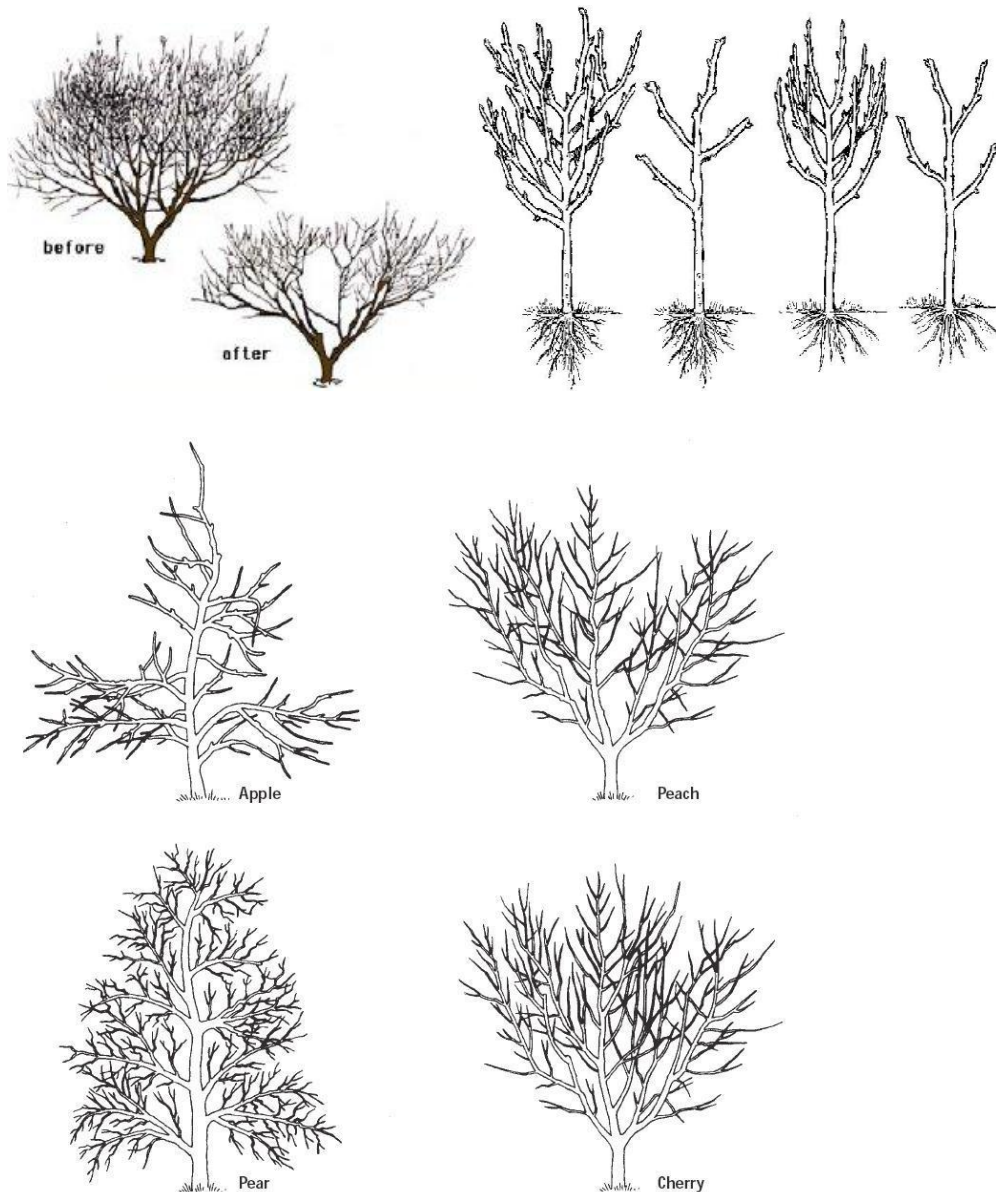
It is generally best to prune cherry trees when the weather is hot. Do not prune in the winter or late fall or early spring. Bacterial diseases are present in all non-arid environments and are particularly detrimental to sweet cherries. These bacteria are most active in cool, wet weather. So wait until the tree has leafed out and the warm late spring weather patterns are well established – usually by the end of May - to prune your cherry trees.

Peaches, Nectarines and Apricots –

The best time to prune peaches, nectarines and apricots is in the early spring. Try pruning after the last frost date for your area. At this time, most of the winter damage can be trimmed off and you will minimize the effect of late frost damage to your buds and blooms.

Plums –

As plums are very vigorous growers, you will want to prune aggressively. Bear in mind that summer pruning, when the trees is still growing, will help contain the spreading nature of your plum tree. You cannot over-prune a plum tree. So do clean up pruning in the winter, to get rid of broken and dead branches and shape up the tree. Then in July, prune again to maintain a manageable size.



*apples and pears have strong central leaders while peaches and cherries have co dominant leaders and look more like a bush

Pruning links

<http://www.coopext.colostate.edu/TRA/PLANTS/pruningstonefruittrees.shtml>

Advanced pruning

Peaches and nectarines trees

Pruned and trained to develop and maintain tree size and shape. They are generally trained into an open-center system with 2 to 3 major scaffold limbs forming an open center or vase shape.

Pruning at Planting

Head peach trees back to 24 to 30 inches at planting. Limbs arising below the heading-back cut should be cut in half to promote the development of strong, wide-angled scaffolds and thinned to leave only the best 3 or 4. Remove any limbs growing 15 inches or less from the ground.

Pruning Young, Non-Bearing Trees

In spring the year after planting, select 2 to 3 well-developed, wide-angled scaffold limbs and cut off all other limbs flush with the trunk. Head remaining scaffolds back slightly where growth has exceeded 30 inches. From the second to the fourth years, remove any branches that grow straight up through or toward the center of the tree. Prune lightly to eliminate overlapping and damaged limbs.

Pruning Bearing Trees

Peach trees bear fruit on shoots that grew the previous year. These 1-year shoots usually have three buds at each node. The smaller, center bud is a leaf bud and each of the two larger, outer buds is a flower bud. Thus, a major objective in pruning (and fertilizing) bearing peach trees is to stimulate new shoot growth. Maintain tree height at 9 to 10 feet by heading back scaffold branches to an outward growing lateral. Remove weak or diseased branches as well as those that grow up, through or across the center of the tree or downward. The remaining vigorous branches may need to be thinned out to prevent crowding. Head back long, thin branches to stiffen them.

*peaches need to be pruned every year because they produce so much fruit the weight will snap their branches. Prune scaffold branches back to 2 to 3 limbs

* peaches produce fruit on last year's wood and do not fruit on older wood or spurs.

Apples and Pear Trees

Pruning at planting

Cut back one-year-old whips (unbranched trees) to 33 to 36 inches above the ground. Trees less than 36 inches tall don't need heading back. If the trees you received from the nursery are well branched, leave as many well-positioned branches in the tree as possible to aid growth. Remove branches with crotch angles narrower than 60° and those lower than 18 inches from the ground.

Training the young pear tree

Young pear trees should be trained to the central-leader system used in training apple trees. Because of their more upright growth habit, young pear trees may appear too dense; however, once they begin to fruit, the branches will spread naturally. Limit pruning of young trees to those cuts necessary to maintain the dominance of the central leader. To promote fruiting at an earlier age, position lateral branches to achieve a branch angle of 60 to 75 degrees from the trunk or leader. Properly positioned branches will be almost, but not quite horizontal. This can be done by bending the branch to proper position and securing it with heavy twine tied to a stake driven into the ground. Insure that the twine does not girdle the branch.

Pruning the mature pear tree

Because of their susceptibility to fireblight, pear trees are pruned less severely than apple trees. Pruning is often limited to removing suckers and those branches that are out-of-bounds. It may be necessary to do some thinning out of smaller branches to allow better light and spray penetration and to improve size and color of the fruit. The optimum height of a mature standard pear tree is between 15 and 18 feet. This height can be maintained by cutting the central leader back to a weaker, upright growing side branch every 2 or 3 years.

Advanced pruning links

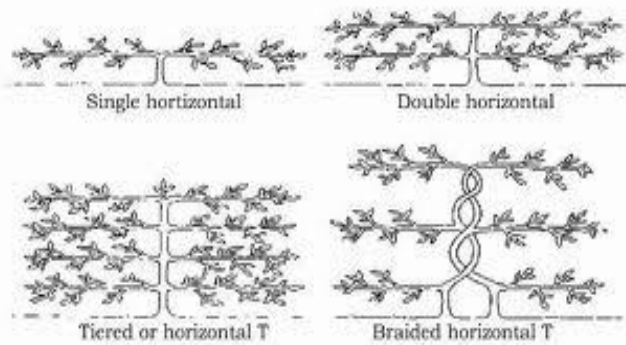
<http://extension.oregonstate.edu/catalog/pdf/pnw/pnw592.pdf>

Chapter 10: Training Trees

If you have limited space you can train trees to grow certain ways like along walls or vertical and narrow. Two helpful techniques to train a tree is espalier and columnar.

Espalier

Espalier trees are trained to not grow tall (usually around 4-6 ft.) and instead grow outward, in 2 opposite directions, along a wall, fence, trellis, or wire. The branches will be weak so they must be supported (usually by non-abrasive and expandable nylon rope or arbor tie), attached to a surface close by.



Factors to consider

- All fruit trees can be espaliered, but home gardeners usually prefer apple, pear, and plum trees. Apples are the easiest because they take the longest to harden, allowing for more time to bend.
- Many nurseries will sell espalier containerized fruit trees that are setup up to espalier. You just have to plant it within 4 inches of a wall and continue to attach the lateral limbs with wire to the trellis or wall as the limbs grow longer. Prune any new branches that go against the formation and remove unnecessary buds.
- If you need to train a tree to espalier, the tree must be in its first year or two of growth in order to be espaliered. Older trees are more difficult to train, as bending mature branches can take one to three years.
- Ideally, the gardener should build the first level of trellis used to support the espalier before the tree is planted. The lower horizontal and inner vertical components of the trellis may be all that are needed for the first year or two. Since the tree may require six to 10 years to reach mature size, higher and more distant features may be added later.
- The trellis may be removed once the tree's scaffold system has reached its final, rigid state and is strong enough to support a fruit load.
- If the trellis is not attached to a wall, you will need sturdy posts on the ends for support. Use 4x4-inch or heavier lumber, or three- to five-inch posts. Set about one-fourth of the length of the post underground. A 12-foot post would be sunk three to four feet in the ground to support a nine-foot high trellis. Twelve- or 14-gauge, galvanized wire is best for trellises.
- If possible plant the tree against the south facing wall to maximize on sunlight. To improve sunlight you can paint the wall white to reflect the sunlight.
- If the espalier tree is on a face of a wall make sure the tree itself is not touching the wall. The support structure needs to sit about 6" to 8" away from the wall to prevent the leaves of the tree from getting burnt, when the wall heats up to very high temperatures under the full summer sun.

There are many different types of support structures to choose from.

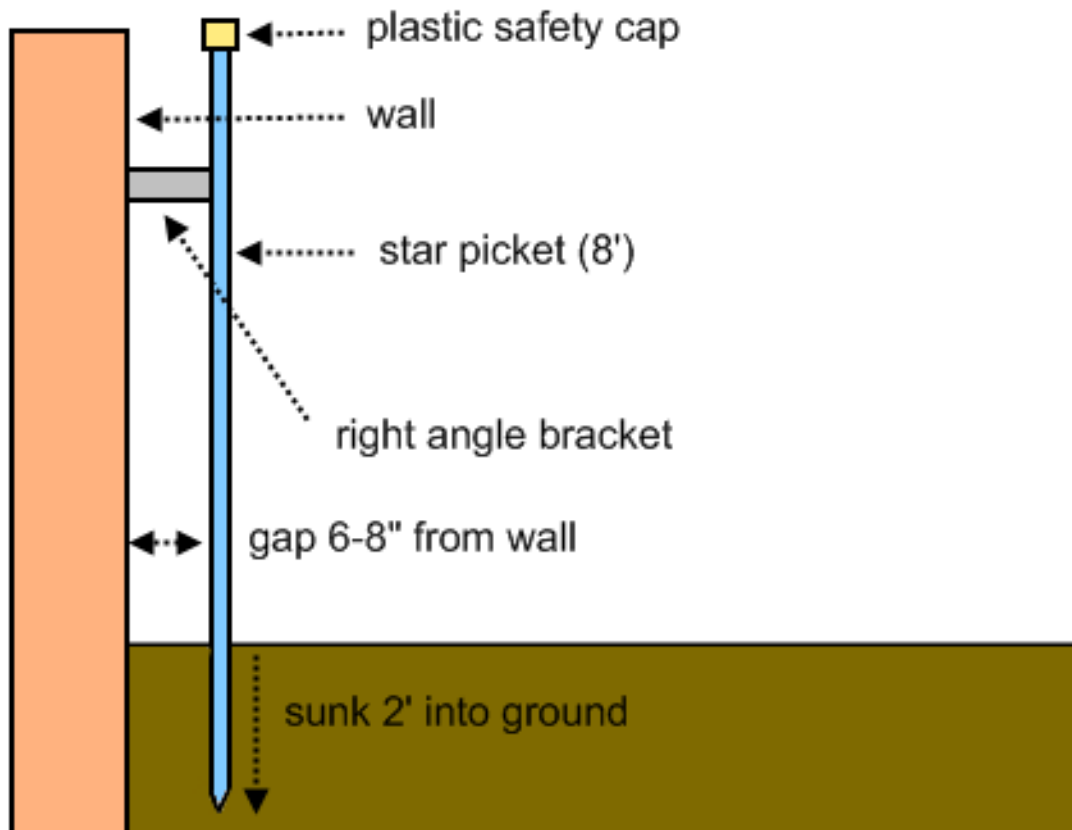
- a. The most common type is 6-8 inch gauge wire supported by two poles. If you use star pickets, they come with predrilled holes.



Construction Details

To construct the espalier support, you will need

- 8' (2.4m) star pickets (x2)
- Heavy duty 6-8" galvanised right angle brackets (x2)
- Plastic safety caps for ends of star pickets (x2)
- 5mm or 6mm bolts, nuts and washers for fastening bracket to star picket (x2)
- (for brick or concrete wall) masonry anchors of some sort to fasten bracket to wall (x4 or 6)
- 2mm thick plastic coated steel wire (*depends on width and number of support wires – 1 roll*)
- turnbuckles (x5)



Espalier support post fastened to wall

Construction basically consists of the following steps:

1. Fasten the brackets to the wall (using masonry anchors if it is made of brick or concrete) at the same height.
2. Line up the star picket the correct distance from the wall so it lines up with the bracket, and rotate it so that the edge with the holes is facing the wall. This is so the bracket can bolt to the star picket.
3. Slowly drive the star picket into the ground, aim to drive about 2' (60cm) into the ground, but make sure you stop driving it in when a hole in the star picket lines up with the hole in the bracket.
4. Bolt the bracket to the star picket, using a nut and washer or lock washer so that it doesn't loosen.
5. Put plastic safety caps at the tops of the star pickets (they have really sharp edges after you hammer them in!)
6. String up wires, one at a time, starting at bottom and working upwards, tie through hole in star picket (see details below), tie to turnbuckle, then fasten turnbuckle to opposite post and lightly tension.
7. When all wires have been strung, tension them all up, from the bottom ones, working upwards.

The most important thing to aim for here is a very sturdy structure. Here are a few important notes:

- Use the heaviest brackets you can, make sure they have the cross-bracing running from one end to the other, forming a closed shape like a triangle. The plain "L" shaped brackets aren't as strong as these.

- Both the brackets sideways, not vertically. Once you add the wires and tension them up, they will be exerting a sideways force to pull the support poles inwards towards each other. A bracket which runs horizontally is more strongly braced against a horizontal force.
- Use all the holes in your brackets to mount them on the wall. If each bracket has three, use all three. If you're tempted to just put two in, remember, you can make the thing 30% stronger for very little more effort!



The whole trellis is visible from this angle, brackets, posts and wires clearly visible



Braced bracket for extra strength, mounted horizontally and facing inwards for maximum strength. One bolt fastens the star picket to the bracket. Since the bolt occupies the hole on the star picket, the wire is fastened around the end of the bracket.



Barrel roll tie is used to fasten the wires to one side, in this case the left star picket, turnbuckles used on the other end on the right hand side.



Using turnbuckles with a hook on one end makes for quick attachment, just put the hook ends into the holes in the start picket (make sure you get the largest turnbuckles that will fit in the star picket holes). Wire attached to the eyelet end of the turnbuckle using a Haywire Twist and Barrel Roll tie.



Close look at the Haywire Twist and Barrel Roll tie

It's simple, cross the end over each other, then twist them both around together three times to make the Haywire Twist, then bend the short end or tag out so its sits at 90 degrees to the main wire, like an "L" shape, and wrap it three times around the main wire to complete the Barrel Roll part



The Haywire Twist and Barrel Roll tie with a clearer background (my sleeve)!

You will realise that you can't attach the turnbuckle hook through the hole in the star picket where the bracket is attached. The simple solution is to simply tie a small loop of wire securely around the bracket, and fasten it to that, as shown below.



Turnbuckle hook fastened to a secure wire loop on bracket where bolt occupies hole is star picket



Wire loop used on very to also, as plastic safety cap obscures top hole!

Now that the trellis is complete, you're ready to plant the tree, and train its branches along the trellis wires, and that will all be described in an up and coming project on this site!



B. Another method is to install a trellis along a wall, which sticks out at least 6-8 inches. Tie the branches along the trellis.





C. The third method is to use a preexisting terrace or chain-link fence. Then tie the branches along the terrace or fence.



Detailed instructions on training an espalier whip tree

<http://www.pallensmith.com/articles/espaliered-fruit-trees>

Espalier video link

<http://www.youtube.com/watch?v=h2qb25W7c2Y>

Columnar Trees

Columnar trees are trees that naturally grow tall and narrow. This tree is ideal in small spaces. The main columnar fruit tree right now is apple, while growers are experimenting with peaches and pears. An apple columnar tree will grow 8-10 ft. tall but only about 2 ft. wide.



Factors to Consider

- Columnar apple trees are also early producers, and will possibly grow fruit on their first year.
- Since they are smaller, the amount of fruit produced by columnar apple trees is less than is produced by semi-dwarf trees
- The fruit is full size, and therefore some thinning may be required for the tree to be able to support the weight.
- Lateral branching may occur and require pruning.

Chapter 11: Scaffold Training

Scaffolding

Improperly trained fruit trees have very upright branch angles, which result in excessive vigor and serious limb breakage under a heavy fruit load. Larger branches can be spread out using short wooden boards with a notch cut in each end for the branch to fit into. Hanging weights on the branch or tying it down with string wrapped loosely around the limb are other methods for spreading the branches. All upright growth from scaffold branches should be either pulled down to a horizontal position or removed when it is 3 to 4 inches long.

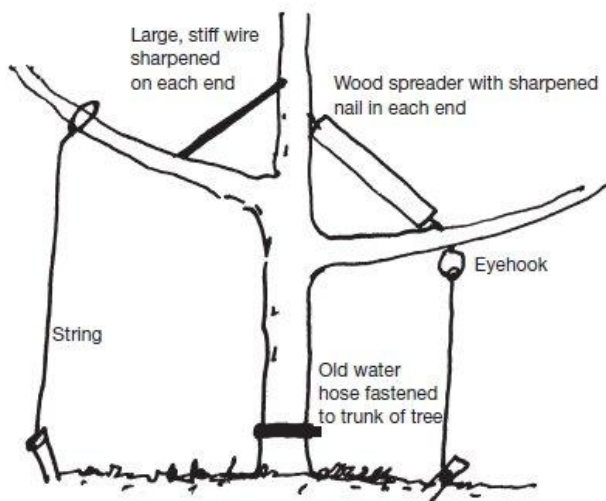


Figure 4. Several methods of spreading scaffold branches are shown above.

Clothes pins can be used as branch spreaders



Chapter 12: Fertilizing/Mulching

Soiling Test

If your fruit tree is having trouble producing fruit or if you know the soil quality is bad, fertilizer may help your tree. Before applying fertilizer it's important to do a soil test. The soil test will recommend what fertilizers to use and how much.

Pay attention to the pH levels tested. pH levels are measured 1 (most acidic) to 14 (most alkaline). You want your soil levels to be around 6.5-7.5. If your pH is too high or too low, trees won't be able to absorb certain nutrients. To raise pH levels add lime and to lower add elemental sulfur. Follow the soil test recommendations when applying lime or sulfur. Certain organic matter will also affect the pH levels. Coffee grounds will lower the pH while finally ground egg or oyster shells will raise it.

*it's also important to test the soil for any toxins such as lead. The EPA recommends not growing anything in soil containing over 100 parts of lead. A part from amending or replacing the soil, sunflowers, ferns, and ground down fish bones will absorb excess lead from soils over time.

Link for toxic soil http://preventdisease.com/news/11/080811_how_safe_soil.shtml

Fertilizer Considerations

Fertilizers come in two different types: organic and inorganic

Inorganic – dissolve in water and release their nutrients quickly. May have problems with nutrients leaching out, running off, transpiring into the atmosphere, and/or burning the roots (when fertilizers pull water from roots). Make sure to apply during the spring/summer time and only when you can adequately water the trees. *using inorganic fertilizers without a soil test can cause over fertilizing and can hurt the tree and environment.

Organic – release nutrients slowly as it decomposes, removes the threat of leaching, run off, transpiration, and root burning. Synthetic examples are urea formaldehyde and isobutylidene diurea (IBDA). Natural forms are manures, sewage sludge, blood, bone meal and compost. Organic matter improves nutrient levels, helps with the soil's water retention capacity, increases soil structure aggregation (which increases water infiltration and prevents soil compaction), balances pH levels, and can help prevent soil erosion.

Adding Mycorrhiza can significantly help your tree. Mycorrhiza is a fungus that shares a symbiotic relationship with tree roots. This relationship causes the roots to become more effective in absorbing nutrients and water and become more resistant to disease and droughts. Mycorrhiza occurs naturally but also can be bought and reintroduced in your soils. If you have a forest nearby, find a healthy large tree deep in the forest and dig up a handful of soil to mix in with your soil. This will introduce good mycorrhiza.

Amending with Organic fertilizers

- When adding amendments to a mature tree spread it around the surface of the soil and aerate it (poke holes in the soil), then water heavily.
- With younger trees sprinkle it around the surface of the soil and comb it in to the first two inches with your fingers or a garden fork. Then water heavily.
- When planting a new tree don't add the amendment to the original soil because it doesn't encourage root growth outside the hole and it could create water pockets, where water doesn't evenly spread out. Add the amendment on the surface on top as mentioned, unless you need to amend clay soil with sand. When adding sand you can add it directly to the original soil being backfilled.

Mulching

Mulching is a great way to provide long term nutrients while offering other benefits such as

- Weed suppression
- Warmth
- Water retention
- Good source of organic matter

*For the first two years it's important to reapply mulch every season or two to retain its benefits while suppressing weeds. It's critical to suppress weeds while the tree is being established to eliminate competition over much needed water and nutrients. The mulch won't stop all weeds and it's important to pull the weeds out at their root by hand.

Types of mulches

- Shredded wood mulch
 - Hardwood (last longer)
 - Soft wood (breaks down quicker)
- Woodchips – age/compost first, encourages fungal growth such as mycorrhizae
- Leaves – shred first
- *Hay is for horses, Straw is for mulching*
- Coca Hulls – toxic to dogs
- Grass – avoid treated grass
- Pine needles – adds acidity
- Sheet mulching
 - Newspaper/cardboard (breaks down)
 - Landscaping Fabric (interrupts nutrient cycling)

Companion plants

Companion plants are a great way to slowly add fertilizer and mulch to your soil. Nitrogen fixers such as clovers and legumes will extract nitrogen from the air and add it to soils. Deep rooted plants such as comfrey and rye will pull nutrients from deep within the soil and bring it to the surface. As the plant sheds its leaves and branches it will add a natural mulch which will eventually add organic matter to your soil. Plant companion plants sporadically around the base of the tree.

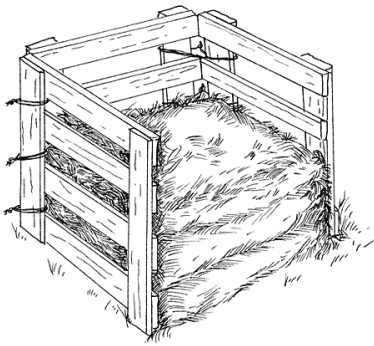
Chapter 13: Composting

Composting is a beneficial idea for your fruit orchard. A good composting system can provide extra nutrients for your soils and maintain your orchard's waste in a sustainable way.

2 ways to compose

- Compost pile or bin – cheap and easy way to compost.
 - o Main problems
 - possible bad odors when done incorrectly
 - pests attractions
 - urban laws banning or restricting them

* When constructing a compost bin, make sure the sides don't restrict airflow and can stay upright and there is proper drainage.



- Compost tumbler – more expensive (\$100-300) but better way to compost
 - o benefits
 - better ability to control bad odors
 - protection from pests
 - quicker composting speeds, due to easier oxygenation from easy rotating.
 - Main problem is the tumbler retains moisture longer, which could cause a bad odor. To remedy this have some brown material (mulch, straw, wood chips, etc) ready to mix in and make sure to turn the mulch more frequently. Leaving the door open for several hours a day can help remove excess moisture.

*Recommend to buy a tumbler with two chambers, so you can finish composting in one chamber while filling up the other chamber. Composting doesn't finish for 2-6 weeks after the last thing goes into the chamber.



With composting it's important to provide the right balance of "green" and "brown" material.

- Green – grass clippings, kitchen scraps, coffee grounds, green leaves, composted manure, hair
- Brown – brown leaves, brown grass, paper, twigs, wood products, straw, dryer lint, brown bag

*It's ideal to have approximately 2 parts brown to 1 part green.

Odor

If your compost has a rotten rather than earthy smell there are things you can do

1. Stir the compost more. Lack of oxygen can lead to rot instead of compost
2. Add more brown material
3. Decrease amount of water, too much water can cause bad odors.
 - a. Leave your tumbler's door open to air out for a few hours.
 - b. If you're using a pile/bin make sure it properly drains
 - c. During wet weather you may need to cover the top of the pile/bin, while being careful not to restrict the flow of oxygen on the sides.
 - d. Add more brown material to soak up the excess

*When dealing with compost moisture be mindful to get the right amount. Compost should be moist but not soggy. It should feel like a damp sponge. Too much causes bad odors, but not enough water can cause the composting process to slow down.

Things to not compost

1. *Diseased or pest infected plant parts (fruit, twigs, bark) – may survive the composting
2. Ashes – may contain toxic materials
3. Cat/dogs/bird droppings – may contain disease organisms

4. Colored paper – toxic materials
5. Lime – too acidic
6. Meat, fat, greases, bones – doesn't breakdown and can stop other compost from breaking down, can attract pest
7. Dairy – may attract pests, can cause odors
8. *Weeds/sod – may survived the composting
9. Anything nonbiodegradable, toxic, exposed to pesticides or herbicides, etc

For diseased or pest infected plant parts, weeds, or sod it is possible to compost if your compost exceeds 135 degrees Fahrenheit for a few days to reach thermal kill. A compost thermometer can be purchase to ensure the proper heat.

***Don't compost these things unless 100% sure the pile is hot enough. If not sure throw away in trash.

Chapter 14: Soil Compaction

Planting

If you're planting a tree in compacted soil, it's important to dig a hole at least three times the size of the rootball. Chop and mix the soil as well as you can. Scrap the inside sides of the hole with your shovel to help the roots expand outside the hole. As always when planting a tree do not stomp the soil down when you backfill the hole. Gently poke it down with the handle of your shovel.

Established Trees

If you're working with an already established tree there are several ways to help remediate the compaction. One way is called radial aeration, which involves using an air spade to carefully dig small trenches around the tree without damaging the roots. An air spade is really expensive and radial aeration is usually done by hired tree care professionals.

A cheaper way to remediate soils is to use a technique called vertical mulching. Use a soil auger that is no larger than 4 to 6 inches in diameter and drill several holes around the tree. Start at the drip line (where the canopy ends) and work your way out. If you hit a large root, stop and move over. Each hole should be around 12 inches deep and spaced at least 18 inches apart. Fill the hole with good loose topsoil, or a pea gravel, sand, peat moss mixture, and mulch on top.

Biological Solutions

Another alternate to breaking up compaction is to plant companion plants such as daikon radishes, Comfrey, Lespedeza, Cow Pea, Sudan grass, dandelion, and annual rye. These plants have strong deep roots that help to break up compacted soil. Either plant them as a cover crop at least a season before your planting or sporadically plant them around the trunk.

***When using daikon radishes don't harvest and leave in the soil to add organic matter.

Adding earthworms to a small area can also help remediate soil compaction.

***Make sure there's an organic mulch or organic material (leaves) available to eat before adding earthworms.

Prevention

The best thing for soil compaction is to prevent it from happening.

- Put up a fence or a barrier around the critical root zone (imaginary circle around the tree, multiple the diameter of tree by 12 inches to get the measurements) to keep traffic off.
- If you know there will be traffic keep a 4 inch layer of mulch around the critical root zone to cushion the traffic.
- Companion plants and flowers will also deter traffic.

Chapter 15: Harvesting

Ripening

Some fruits should be left to ripen fully on the tree and others should be harvested before it's fully ripe.

- Fruits that should be left to ripen on the tree are nuts, plums, apricots, figs*, cherries, Asian pear and pomegranates.
- Fruit that should be picked at maturity but before ripe include quince, persimmon, European pears and avocado. Some varieties, like European Pears, need to be refrigerated to induce ripening.
- All other fruits can be picked anytime at maturity depending on how soon it will be eaten.

*to induce ripening with figs put a drop of olive oil on the top hole of the fig.

Harvest timing

To extend your orchard's productivity it's recommended to use a variety of different blooming trees.

Most cherries and plums are early blooming trees with a harvest time of middle June/early July, while other fruit trees like apples, pears and peaches are usually late blooming with a Fall harvest. It's a good idea to check with your nursery when harvest times occur for each tree you purchase.

Ways to harvest

- Select dwarf trees and prune tall central leaders to keep trees small enough to harvest by hand
- For taller trees use fruit picking poles, pruning poles, orchard ladders, etc, to harvest tall fruit.

Fruit picking Pole

Fruit Tree Ladder



Chapter 16: Additional resources

References

Akin, Cem, and Leah Rottke. *The Home Orchard Handbook: a Complete Guide to Growing Your Own Fruit Trees Anywhere*. Beverly, MA: Quarry, 2011. Print.

University of California fruit tree guide

<http://anrcatalog.ucdavis.edu/pdf/8048.pdf>

UC pruning guide

<http://homeorchard.ucdavis.edu/8057.pdf>

Earthworks tree vocab

http://www.earthworksboston.org/replicate/08_Structure_and_Growth.htm#top

Pest and tree pathogen

<http://www.ipm.ucdavis.edu/PMG/GARDEN/FRUIT/apples.html>

<http://www.caf.wvu.edu/kearneysville/wvufarm1.html>

<http://ag.arizona.edu/pubs/diseases/az1124/#introduction>

<http://extension.unh.edu/resources/index.cfm?e=app.home>

Pest traps and Lures

<http://www.pestwizard.com/PestWizardConsumerProductCatalog.pdf>

Fertilizers

http://extension.unh.edu/resources/representation/Resource000584_Rep606.pdf

Further Assistance

For any further questions or assistance please contact me anytime at jsinger@caseytrees.org

Sincerely,

Josh Singer