

Unit C: Maintaining the Fruit and Nut Tree

Lesson 3: Pruning and Thinning Fruit and Nut Trees

Student Learning Objectives: Instruction in this lesson should result in students achieving the following objectives:

1. Recognize the purpose of pruning and thinning fruit and nut trees.
2. Describe how to properly prune trees.
3. Recognize tools used for pruning and thinning tree fruits and nuts.
4. Describe specific methods for pruning and training fruit and nut trees.

Recommended Teaching Time: 2 hours

Recommended Resources: The following resources may be useful in teaching this lesson:

- A PowerPoint has also been developed for use with this lesson plan.

List of Equipment, Tools, Supplies, and Facilities

- Writing surface
- PowerPoint Projector
- PowerPoint Slides
- Transparency Masters
- Piece of paper for each student
- Crayons, colored pencils, markers, etc (optional)
- Tools used for pruning
- Trees which need pruned, or dead branches which can be cut

Terms: The following terms are presented in this lesson (shown in bold italics and on PowerPoint Slide #2):

Branch bark ridge	Scaffold branches
Callus	Suckers
Central leader	Training
Collar	U-shaped crotches
Compartmentalization	V-shaped crotches
Leader	Watersprouts
Open center	Whip

Interest Approach: Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

Give each student a piece of paper and if they would like some coloring utensils like crayons or markers. On this piece of paper have them draw what they believe the branches on a perfect fruit or nut tree should look like. Have them color the picture and write a description of their tree. For example, they might want to note the height of the tree, how wide the crown is, what type of fruit tree it is, etc. Have the students present their ideal fruit tree to the class. Once all students have presented their tree ask the class if they noticed any similarities or differences between the branches on the trees and discuss whether the similarities are good or bad.

**** Use this activity to lead into Objective 1.**

Summary of Content and Teaching Strategies

Objective 1: Recognize the purpose of pruning and thinning fruit and nut trees.

(PowerPoint Slide #3)

- I. Fruit and nut trees are pruned and trained for many reasons.
 - A. **Training** develops a strong tree structure that can support heavy crops without breakage and helps to bring young trees into production at an early stage.

(PowerPoint Slide #4)

1. Historically training was used to make pleasing trees forms for a formal garden, such as espalier and topiary.

(PowerPoint Slide #5)

- B. Pruning is necessary to:
 1. Maintain or reduce plant size.
 - a. Pruning can prevent a plant from overgrowing its space in the landscape and eliminates the need for drastic cutting of crowded, overgrown plants.
 - b. It can allow for growth of plants under or adjacent to the pruned plant.
 - c. It can also serve to reduce leaf area on newly planted trees and shrubs.
 2. Remove undesirable growth.
 - a. Pruning can encourage plant vigor through the removal of weak, overcrowded growth.
 - b. Such thinning often improves the visual balance or symmetry of the plant.

(PowerPoint Slide #6)

3. Remove dead, diseased, or broken branches.
 - a. Pruning will aid in maintaining the shape, vigor, and health of the plant.
4. Stimulate flowering and fruiting.

- a. Removal of the current year's old, faded flowers and fruit clusters will promote flower buds for the following season.
- 5. Rejuvenate and restore old plants to vigorous growth.
 - a. Proper pruning can restore a youthful, natural growth habit in certain overgrown shrubs.
- 6. Direct the plant's growth to a particular direction.

Find a picture of a fruit tree which has been pruned and well taken care of. Find another fruit tree which has been neglected. Ask the students, "Which tree looks healthier?" "Which will produce more fruit?" Discuss with the students the importance of pruning and why it is important to an orchard.

Objective 2: Describe how to properly prune trees.

(PowerPoint Slide #7)

- II. Before any pruning cuts are made, it is important to understand the parts of trees, the best times to prune, how trees heal, and how to remove limbs.
 - A. An understanding of major tree structures and their functions is important in pruning. These structures include:

(PowerPoint Slide #8)

- 1. A **leader** is a central branch that is dominant over other branches on the tree and leads the growth of the tree.
 - a. Co-leaders are not desirable as they are unattractive and lead to the development of weak V-shaped crotches.
 - b. When co-leaders exist, one of them should be removed.

(PowerPoint Slide #9) This slide is an illustration of a central leader on a young fruit tree. If possible show the students a real tree that has been trained to have a leader.

(PowerPoint Slide #10)

- 2. **Scaffold branches** grow laterally from the trunk.
 - a. The trees' weakest point is where scaffold branches attach to the trunk.
 - b. The manner in which the branches are attached to the trunk influences their structural soundness.

(PowerPoint Slide #11) *This slide illustrates scaffold branches. If possible show the students a real tree with scaffold branches.*

(PowerPoint Slide #12)

- c. **U-shaped crotches** are created by branches that attach to the trunk at angles of 45° to 90°. These branches are structurally sound.
- d. **V-shaped crotches** are created by branches that attach at sharp angles. The joint is weak because the bark is crushed between the branches as the tree grows and expands.
 - i. Trees with V-shaped crotches are prone to splitting due to weather conditions.

(PowerPoint Slide #13) *This slide is an illustration of a V and U shaped crotch on a fruit tree. If possible, show the students a tree with these two angles.*

(PowerPoint Slide #14)

3. **Watersprouts** are soft, green shoots that usually grow vertically from existing branches.
 - a. They seldom flower and should be removed from the tree.
 - b. If they are allowed to grow, crossing branches may result.

(PowerPoint Slide #15) *This slide illustrates watersprouts on a tree and shows where they need to be cut. Discuss watersprouts with the students and ask them why watersprouts should be removed.*

(PowerPoint Slide #16)

4. Crossing branches are unattractive.
 - a. The friction created by the rubbing together of these branches may open wounds.
 - i. The wounds allow disease and insects to enter.
 - b. Regular removal of branches that are growing towards the tree's center will eliminate most crossing branches.

(PowerPoint Slide #17) *This slide illustrates a branch crossing over another branch. Ask the students why these branches are important to remove.*

(PowerPoint Slide #18)

5. **Suckers** are soft, green shoots that develop at the base of the tree.
 - a. Like watersprouts, suckers are of no ornamental value to the tree.
 - b. It is particularly important to remove suckers from grafted plants
 - c. If suckers from the rootstock are allowed to grow, they will interfere with the desired effect of the scion.

(PowerPoint Slide #19) *This slide illustrates suckers on a tree. If possible show the students suckers on a real tree.*

(PowerPoint Slide #20)

6. Dead, diseased, and broken wood should be removed from the tree.
 - a. Removal of dead and diseased wood reduces the spread of disease.
 - b. Pruning dead wood also eliminates safety hazards.

(PowerPoint Slide #21)

- B. Once a tree has been pruned an open wound could cause infection from fungus or bacteria.
 1. Trees produce chemicals that inhibit decay caused by fungi and bacteria.
 - a. The chemicals that are produced seal the tree's wound.
 - b. This formation of a chemical barrier is called **compartmentalization**.

(PowerPoint Slide #22)

- c. Chemical barriers are at the base of every branch.

- i. The **branch bark ridge** is a raised line of bark that forms on the upper side of where the branch joins the bark.
- ii. The **collar** is the swollen tissue surrounding the base of the branch.
- iii. These structures contain chemicals that inhibit the spread of disease.
- iv. When a tree is wounded, it forms a **callus**, or protective growth of tissue over the wound.
- v. Removal of the branch bark ridge and collar destroys the tissues that defend the tree from infection and decay.

(PowerPoint Slide #23)

- C. On older mature fruit trees some branches can be quite large making the task somewhat dangerous—safety is the utmost consideration when pruning large limbs.
 - 1. Care needs to be taken to keep both people and tree safe.
 - 2. Improper removal often strips bark from the tree.

(PowerPoint Slide #24)

- 3. To avoid stripping the bark, the following steps should be followed when removing large limbs:
 - a. Make an undercut about 1/3 of the way through the limb.

(PowerPoint Slide #25)

- b. Cut the upper side of the limb about 2.5 centimeters from the undercut.
 - i. This cut should be made closer to the trunk than the first cut to swing the branch toward the tree before it drops.
 - ii. A cut made further from the trunk will cause the limb to drop without swinging.

(PowerPoint Slide #26)

- c. Make the final cut closer to the trunk than the previous two.
 - i. The proper cut is one that is made as close to the collar and branch bark ridge as possible without causing damage to those tissues.
 - ii. After the final cut is made, the wound should be left exposed.
 - aa. Sealers are never needed.
 - bb. They promote decay by keeping conditions moist.

(PowerPoint Slide #27) *This slide illustrates the three cut method used to remove large branches. Have the students practice this cut on some dead wood or on a tree that needs to be pruned.*

There is a great deal of information in this objective so the following Transparency Masters should be covered: TM: C3-1 is an illustration of U and V shaped crotches. Discuss the concerns of the crotch angle to a fruit tree. TM: C3-2 is an illustration of an improperly pruned tree. The red arrows point to something on the tree which should be removed. Have the students determine what is wrong.

Objective 3: Recognize tools used for pruning and thinning tree fruits and nuts.

(PowerPoint Slide #28)

- III. Proper pruning requires proper tools, employing correct methods, and applying the methods accurately to the appropriate plant.
 - A. Tools should be of the highest quality you can afford, and they should be sharp.

- B. Keep them in good condition by lubricating regularly, cleaning to prevent rust, and only using them for their intended function.

(PowerPoint Slide #29)

1. Hand shears (for branches up to 0.6 cm diameter)
 - a. Both scissors and blade/anvil types are available in 15-22 cm sizes. Scissor type cuts more closely, while anvil type allows the cutting of slightly larger branches.

(PowerPoint Slide #30)

2. Pole pruners (for branches beyond arm's reach)
 - a. Either a pruning head with rope action or a saw can be mounted on a pole pruner. A "take apart" handle makes storage easier. A metal handle pole pruner is not safe for use near utility lines.

(PowerPoint Slide #31)

3. Lopping shears (for branches up to 3.81 cm diameter)
 - a. Scissors and blade/anvil types each have 40-76 cm handles. Strong but light-weight handles are critical.

(PowerPoint Slide #32)

4. Hedge shears (for clipping new growth into formal shapes)
 - a. Power and hand types are available in 15-45 cm blades.
 - b. These shears are not useful for pruning large branches or for any pruning which is intended to maintain a plant's natural appearance.

(PowerPoint Slide #33)

5. Pruning saws (for branches over 2.54 cm diameter)
 - a. Pruning saws are characterized by coarse teeth to prevent gumming.
 - b. Most cut on the pull stroke for easier, safer use.
 - c. Chain saws are dangerous to use for pruning.
 - d. They are best used for cutting up limbs already pruned or for removing dead plants.

Bring in these tools to show the class. Pass them around and let them see what they are. Use caution as some of these tools are sharp and the students could hurt themselves.

Objective 4: Describe specific methods for pruning and training fruit and nut trees.

(PowerPoint Slide #34)

IV. Methods for pruning and training fruit and nut trees.

- A. Fruit and nut trees should be pruned the day they are planted.
- B. The two methods used are **central leader** or **open center**.

(PowerPoint Slide #35)

1. Apple, apricot, cherry, pear and plum trees are generally pruned to the central leader method.
 - a. The growth pattern of these trees is for the main stem of the tree to be dominant and the central leader training method promotes this characteristic.

2. Peach and nectarine trees may be pruned to either a central leader or open center method since they do not have a strong tendency for one shoot or branch to dominate the growth of other shoots or branches.

(PowerPoint Slide #36)

C. The **central leader** system has a central trunk from which the scaffold branches develop and forms a pyramid shape.

1. If the newly planted tree is a **whip** (it is a tall stick and has no branches) then cut it to about 81 centimeters to stimulate branch growth.

(PowerPoint Slide #37) *This slide illustrates a whip in which the top has been removed. Bring in a real whip to show the class.*

(PowerPoint Slide #38)

2. For a new tree that already has side branches, cut back the trunk to 81 centimeters. Cut off any branches along the trunk between the ground and 61 cm high. Cut back any remaining side branches to 5-10 cm, leaving no more than 2 buds on each branch stub.

(PowerPoint Slide #39)

3. In the first summer make sure the top shoot becomes the leader and pinch back all other shoots.

(PowerPoint Slide #40)

4. If there has been a lot of new growth before the first winter, choose 3 to 5 branches for the first set of scaffold branches.
 - a. These branches should spiral around the trunk with about 10 cm vertical distance between each branch.
 - b. Cut off the other side branches and any vertical branches that may compete with the leader.
 - c. Prune back the main leader shoot, but keep it as the highest part of the tree to maintain your pyramid shape.

(PowerPoint Slide #41)

5. In the second summer make sure that the top shoot is growing vertically and cut off any competing shoots.
6. During the second winter select another set of scaffold branches .61-.91 m higher than the first set.
 - a. If the tree didn't grow enough the second year, do this the third winter.

(PowerPoint Slide #42)

7. Every year after, keep doing the above until you have 3 or 4 sets of scaffold branches, and then simply keep that shape by pruning out watersprouts and any crossing, diseased, or unwanted branches.
 - a. Try to keep the lower branches longer than the upper ones to maintain the shape.

(PowerPoint Slide #43)

D. The **open center** system forms a vase shaped tree with no central leader.

1. Cut back the newly planted tree to 61-81 cm, depending on how low you want the major branches to form.

- a. Choose strong, well-spaced branches that are 15-25 cm below the cut to become primary scaffold branches.

(PowerPoint Slide #44)

2. If the young tree has some side branches, cut back the leader to 61-81 cm.
 - a. Select well-placed side branches that point out from the trunk in different directions 15-25 cm below the cut to become scaffold branches.

(PowerPoint Slide #45)

3. Cut back the selected branches to 5-10 cm stubs, and cut off all the other side branches.
 - a. By the end of the first growing season, the major scaffold branches should be formed.

(PowerPoint Slide #46)

E. Pruning can also be done to revitalize old trees and make them productive again.

1. To revive an old or neglected fruit or nut tree do the following every year.
 - a. Remove broken or diseased branches
 - b. Crossing limbs
 - c. Weak stems
 - d. Any branches growing inward to the tree's center

(PowerPoint Slide #47)

- e. Any growing vertically or straight down
- f. Thin out enough new growth to allow light to filter into the canopy when the tree has leafed out so the fruit can ripen and color properly
- g. Shorten any branches that are too long to avoid leggy growth
- h. Shape tree evenly and remember apples flower and fruit on old wood, so head back new growth to direct energy back into the flowers and fruit.

Have students practice these two methods of pruning commonly used in the orchard. If no trees can be found which need to be pruned, try and find some trees which have been pruned in this manner and observe the growth of the tree with the students.

Review/Summary: Use the student learning objectives to summarize the lesson. Have the students explain the response to the anticipated problem of each objective. Student responses can be used to determine which objectives need to be reviewed. Questions on PowerPoint Slide # 48 can be used as review.

Application: Have the students prune some trees. If none can be found have them practice the three cut procedure for large branches on some dead branches. Pruning is much like grafting and takes some practice to be able to complete it properly.

Evaluation: Evaluation should focus on student achievement of this lesson's objectives. A sample written test is attached.

Answers to Sample Test:

Matching

1. G
2. D
3. E
4. A
5. B
6. C
7. F
8. H

Short Answer

1. Make an undercut about 1/3 of the way through the limb. Cut the upper side of the limb about 2.5 centimeters from the undercut. Make the final cut closer to the trunk than the previous two.
2. Various answers possible but the following were covered in the lesson:
 - Maintain or reduce plant size.
 - Remove undesirable growth.
 - Remove dead, diseased, or broken branches.
 - Stimulate flowering and fruiting.
 - Rejuvenate and restore old plants to vigorous growth.
 - Direct the plant's growth to a particular direction

Test

Unit C Lesson 3: Pruning and Thinning Fruit and Nut Trees

Part One: Matching

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

- | | | | |
|-------------------|------------|----------------|----------------------|
| A. Callus | C. Suckers | E. Open center | G. Whip |
| B. Central leader | D. Collar | F. Leader | H. Scaffold branches |

- _____ 1. A newly planted tree that is a single stick with no branches.
- _____ 2. The swollen tissue surrounding the base of the branch.
- _____ 3. Forms a vase shaped tree with no central leader.
- _____ 4. Protective growth of tissue over a wound
- _____ 5. This has a central trunk from which the scaffold branches develop and forms a pyramid shape.
- _____ 6. Soft, green shoots that develop at the base of the tree.
- _____ 7. A central branch that is dominant over other branches on the tree and leads the growth of the tree.
- _____ 8. Branches which grow laterally from the trunk.

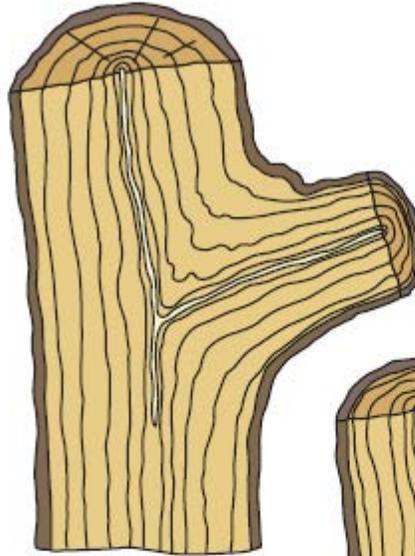
Part Two Short Answer

Instructions. Provide information to answer the following questions.

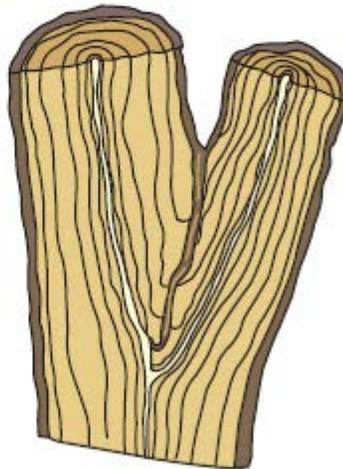
1. Explain in words or draw a diagram of the three cuts that should be made when pruning large limbs.

2. Discuss four reasons why trees should be pruned.

Tree Structure

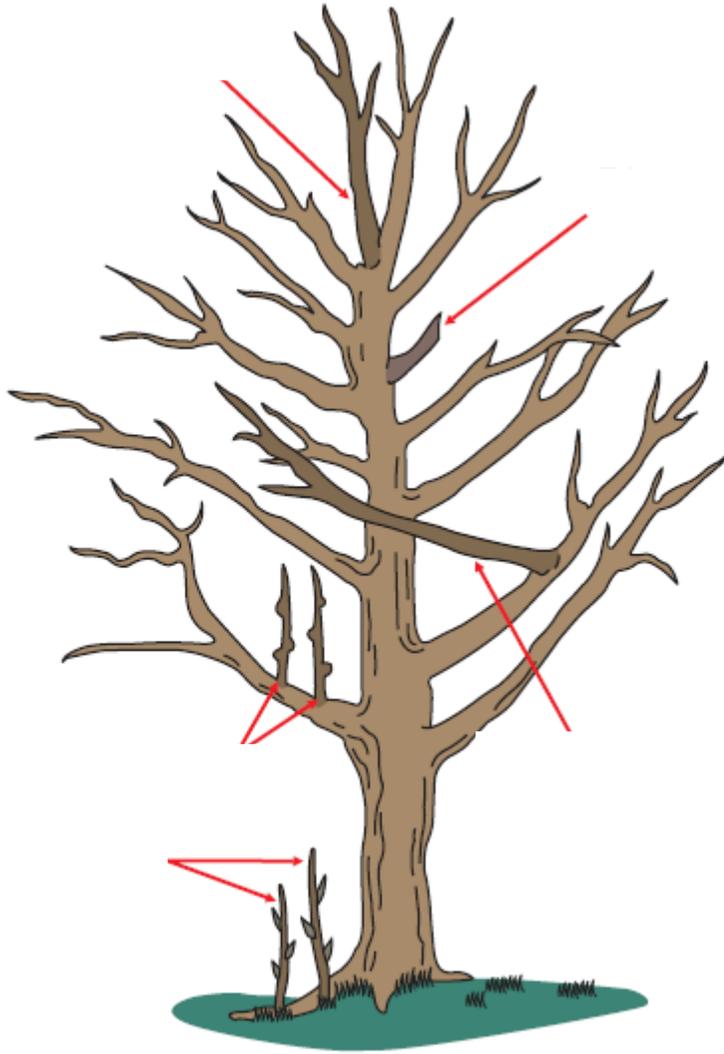


U-Shaped Crotch
Structurally sound



V-Shaped Crotch
Prone to splitting

Improper Pruning



(Courtesy, Interstate Publishers, Inc.)