

Unit E: Urban Forestry

Lesson 4: Pruning Trees in Urban Settings

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

1. Identify reasons for pruning urban trees.
2. Describe how to prune trees safely.
3. Explain how trees close their wounds.
4. Identify tools used in pruning trees.

Recommended Teaching Time: 3 hours

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

- A PowerPoint has also been developed with use of this lesson plan
- http://www.na.fs.fed.us/Spfo/pubs/howtos/ht_prune/prun001.htm
- <http://www.extension.umn.edu/distribution/horticulture/DG0628.html>
- <http://www.arboday.org/trees/pruning/>

List of Equipment, Tools, Supplies, and Facilities

Writing surface
PowerPoint Projector
PowerPoint slides
Transparency Masters
Copies of student lab sheets
Pruning tools

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

- Branch ridge bark
- Callus
- Chain saw
- Collar
- Compartmentalization
- Crossing branches
- Drop crotch cuts
- Hand pruner
- Heading cuts
- Leader
- Loppers
- Pole saw/pruner
- Pruning
- Pruning saw
- Rootstock
- Scaffold branch
- Scion
- Subordination

- Sucker
- Thinning cut
- U-shape crotch
- V-shape crotch
- Watersprout

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.

Ask the students if they have ever seen a large limb that has been split off from a tree or if they have seen damage to trees caused by acts of nature (storms, winter snows, ice, etc.). Permit time for students to share their experiences with one another. Share photos of damage caused by weak branching structures due to lack of proper pruning. Ask them to identify any other reasons to prune trees. Introduce the lesson by stating the objectives to be covered.

Summary of Content and Teaching Strategies

Objective 1: Identify reasons for pruning urban trees.

(PowerPoint Slide #3)

I. **Pruning** is the term used for the selective removal or reduction of certain plant parts. Trees are pruned for a variety of reasons. Proper pruning leads to attractive, healthy trees. Some of the reasons for pruning trees include the following:

(PowerPoint Slide #4)

- Promote the development of a strong framework of branches.
- Restrict the size of the plant.
- Repair damaged limbs.
- Improve flowering displays.
- Reduce the spread of pests by removing diseased limbs.
- Direct the plant's growth in a particular direction.
- Maintain desired cultivars.
- Open the crown to allow for light and wind to pass.
- Maintain safe conditions for humans.
- Improve fruit quality.

****Utilize the PowerPoint slide and TM: E4-1—Reasons For Pruning to review this objective. Have students take notes during lecture-discussion. Ask questions during instruction to gauge student understanding of the concepts. Take a walk during class and point out reasons for pruning local trees.**

Objective 2: Describe how to prune trees safely.

(PowerPoint Slide #5)

II. Approved techniques have been established for pruning trees safely. Make good decisions as to why and how a tree is be pruned before any cut is made. All cuts should contribute to the pruning

goals that have been established. It is important to understand the parts of trees, the best times to prune, how trees heal, and how to remove large limbs.

(PowerPoint Slide #6)

- A. Some general rules of pruning should be kept in mind.
 1. Make cuts that will cause the least amount of damage to the tree.
 2. Begin pruning the tree while it is young.
 3. Choose the tools most suitable for the job, keep them sharp, and use them safely.

(PowerPoint Slide #7)

- B. Knowledge of major tree structures and their functions is important.
 1. A **leader** is a central branch that is dominant over other branches on the tree. It leads the growth of the tree. Co-leaders are not desirable. They are unattractive and lead to the development of weak V-shaped crotches. When co-leaders exist, the less desirable one of the two should be removed.
 2. **Scaffold branches** grow laterally from the trunk. The trees' weakest point is where scaffold branches attach to the trunk. The angle of attachment to the trunk influences the structural soundness scaffold branches.

(PowerPoint Slide #8)

- a. **U-shaped crotches** are created by branches that attach to the trunk at angles of 45° to 90°. These branches are structurally sound due to the wide angle.
- b. **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. Trees with V-shaped crotches are prone to splitting.

(PowerPoint Slide #9)

3. **Watersprouts** are soft, green shoots that usually grow vertically from existing branches. If allowed to grow, they may cross and rub against other branches. They should be removed from the tree.
4. **Crossing branches** are those branches that grow in different directions and make contact with one another. The friction created by the rubbing together of these branches may open wounds. The wounds allow disease and insects to enter. In addition, they are unattractive. Regular removal of branches that are growing towards the tree's center will eliminate most crossing branches.
5. **Suckers** are soft, green shoots that develop at the base of the tree. Like watersprouts, suckers are of no ornamental value to the tree. It is particularly important to remove suckers from grafted plants.

(PowerPoint Slide #10)

In grafting, the **rootstock** (root system) has different qualities than the **scion** (top growth). If suckers from the rootstock are allowed to grow, they will interfere with the desired ornamental effect of the scion.

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

(PowerPoint Slide #11)

- C. When to prune relates to the season of the year in which trees are cut and the tree's stage of maturity at which the pruning is carried out.
 1. Late winter and early spring are the best times to prune most deciduous trees. Pruning at that time of year, when trees are dormant, has advantages:

- a. Branching structure is more visible without the presence of leaves.
 - b. The limbs are much lighter without leaves.
 - c. Tree cuts made at these times of the year give the tree an entire growing season in which to heal.
2. Some trees such as maples, birches, and elms will ooze sap if pruned in the late winter or early spring. Although the sap causes no damage, it is best to prune these types of trees in midsummer when the sap is not flowing.

(PowerPoint Slide #12)

3. Pruning newly transplanted trees requires special considerations and should be done with restraint. The key to a tree's survival is its ability to develop a new root system. Removing limbs means the loss of energy from producing leaves and storing starches that contribute to root growth and development. Removal of over 15 percent of the crown at the time of transplanting slows tree growth for several years. Pruning of newly transplanted trees should be restricted to the removal of co-dominant leaders, dead and diseased wood, and V-shaped crotches.
4. A tree's second pruning should occur two to four years after planting. During the second pruning, crossed branches, limbs that have died back, and some lower branches are removed. To contribute to a strong trunk, it is best to not remove all of the lower branches at once.
5. The tree should be pruned again five to seven years after planting. The amount to be removed should be minimal.

(PowerPoint Slide #13)

- D. Subordination is an important concept in pruning. **Subordination** involves cuts made that slow the growth of a branch, and is accomplished by removing lateral branches and/or reducing the length of the parent branch cause the branch to become subordinate or less dominant. Subordination is used with all tree sizes, and is often most appropriate when multiple leaders on a small tree are involved. Identify the best of the leaders, and prune the others. The pruned branches will grow more slowly than the un-cut branch selected to be the leader. The un-cut branch will emerge as the dominant leader, while the others will become major limbs of the tree.

(PowerPoint Slide #14)

- E. Three basic techniques are used to prune trees. They include drop-crotch cuts, thinning cuts, and heading cuts.
- 1. **Drop-crotch cuts** are effectively used to shorten tree limbs and reduce the size of a tree. It involves cutting the leader limb back to a lateral branch. The lateral branch remaining should be at least one-third the diameter of the leader removed.
 - 2. **Thinning cuts** are those cuts made to remove a branch from the parent stem or trunk. They open up the tree rather than reduce its size. This is the most common pruning method for large, established trees.
 - 3. **Heading cuts** are made between the nodes on a stem with a hand pruner or lopper. Heading cuts are commonly used with nursery stock.

(PowerPoint Slide #15)

4. Procedures for removing large limbs should be followed to ensure safety. Large limbs can be very heavy. Such weight will not only injure people, but it can also damage the tree if the limb is not removed properly. Improper removal often strips bark from the tree. Removal of large limbs involves a series of cuts.

(PowerPoint Slide #16)

- a. Make an undercut about 1/3 of the way through the limb about a 30 centimeters from the trunk.
- b. Make the second cut the upper side of the limb about 2.5 centimeters from the undercut. This cut should be made closer to the trunk than the first cut to swing the branch toward the tree before it drops or further from the trunk for the limb to drop without swinging.

(PowerPoint Slide #17)

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

****Use TM: E4-2— Tree Structure, TM: E4-3—Pruning Obvious Faults, TM: E4-4—Removing A Large Limb, TM: E4-5—Final Cuts Of A Large Limb to illustrate concepts. Have the students expand their notes based on the discussion. Have the students follow the procedure in LS: E4-1—Pruning A Tree to get hands on experience in pruning trees. The discussion can also serve as a way to monitor students' mastery of the material.**

Objective 3: Explain how trees close their wounds.

(PowerPoint Slide #18)

III. Trees have the ability to close or seal wounds with chemicals that inhibit decay caused by fungi and bacteria. This form of defense is called **compartmentalization**.

- A. At the base of every branch there is a branch bark ridge and a collar. The **branch bark ridge** is a raised line of bark that forms on the upper side of where the branch joins the bark. The **collar** is the swollen tissue surrounding the base of the branch. These structures contain chemicals that inhibit the spread of disease. It is important that during the pruning process that the branch bark ridge and collar tissues that defend the tree from infection and decay are not damaged.

(PowerPoint Slide #19)

- B. When a tree is wounded, it begins to form a **callus**, or protective growth of tissue over the wound. Eventually, the callus growth covers the wound.

Objective 4: Identify tools used in pruning trees.

(PowerPoint Slide #20)

IV. There are a number of tools used for pruning purposes. Proper tool selection for the job and safety are primary concerns.

- A. **Hand pruners** are best used on small branches. **Loppers** are used for somewhat larger branches. The two major styles for both of these tools are scissors and anvil. Scissor style pruners are preferred as the blade slices the plant stem. Anvil style pruners are less desirable as plant stems are crushed when cut.
- B. **Pruning saws** have larger teeth with wider spacing than carpenter's saws. The large teeth and spacing ease the cutting of larger limbs.
- C. **Pole saws/pruners** are specialty tools that allow a person to reach high limbs from the ground.

D. **Chain saws** are gas powered or electric and have a chain that cuts continuously. They are best used on large limbs. Chain saws are extremely dangerous if used improperly. To avoid hazards, obtain training on their safe operation. Some safety tips follow:

(PowerPoint Slide #21)

1. Study branches before making any cuts.
2. Accelerate the saw before beginning a cut.
3. Keep feet completely still while the chain is turning.
4. Do not use the guide bar's upper tip for cutting.
5. If pinching occurs, shut the saw off before extracting the saw blade.
6. Wear proper safety gear.

****Bring pruning tools to class. Discuss their features, maintenance, and safe use. Use TM: E4-7—Pruning Tools to show the types of tools used. Set up a field trip to witness arborists at work. Ask an arborist to explain pruning techniques and practices used in the field. Get the students ready for the visit by having them prepare questions in advance. Review the material presented. Evaluate student mastery of the material by administering a written exam and through laboratory work**

Review/Summary: Restate the student learning objectives at the conclusion of the lesson. Review the material that has been covered in class discussions, laboratory activities, and other learning experiences. Call on students to explain the content associated with each objective. Use their responses as the basis for determining any areas that need re-teaching. Questions at the end of the chapters in the textbook may also be used in the review/summary. Reinforce student learning by having students work with trees on the school grounds or off campus. Questions on PowerPoint Slide #22 can also be used.

Application: LS: E4-1—PRUNING A TREE

Evaluation: Focus on student achievement of the objectives for the lesson when evaluating student performance. Use various evaluation techniques, such as student performance during oral review of the material, application of skills in the land lab setting, completion of the laboratory sheet, and a written exam. A sample written test is included with this lesson and can be adapted to local needs.

Answers to Sample Test:

Part One: Matching

1. e
2. a
3. h
4. b
5. g
6. i
7. f
8. c

- 9. d
- 10. j

Part Two: Completion

- 1. Subordination, lateral branches, parent branch
- 2. compartmentalization
- 3. removed
- 4. V-shaped crotches
- 5. Watersprouts
- 6. Late winter, early spring
- 7. Drop-crotch cuts, leader limb, 1/3
- 8. strips bark from the tree
- 9. left exposed
- 10. branch bark ridge, a collar

Part Three: Short Answer

- 1.
 - 1. Promote the development of a strong framework of branches.
 - 2. Restrict the size of the plant.
 - 3. Repair damaged limbs.
 - 4. Improve flowering displays.
 - 5. Reduce the spread of pests by removing diseased limbs.
 - 6. Direct the plant's growth in a particular direction.
 - 7. Maintain desired cultivars.
 - 8. Open the crown to allow for light and wind to pass.
 - 9. Maintain safe conditions for humans.
 - 10. Improve fruit quality.
- 2.
 - 1. Make cuts that will cause the least amount of damage to the tree.
 - 2. Begin pruning the tree while it is young.
 - 3. Choose the tools most suitable for the job, keep them sharp, and use them safely.
- 3. The key to a tree's survival is its ability to develop a new root system. Removing limbs means the loss of energy producing leaves and stored starches that contribute to root growth and development. Removal of over 15 percent of the crown at the time of transplanting slows tree growth for several years. Pruning of newly transplanted trees should be restricted to the removal of co-dominant leaders, dead and diseased wood, and Vshaped crotches.
- 4.
 - 1. Make an undercut about 1/3 of the way through the limb about a 30 centimeters from the trunk.
 - 2. Make the second cut the upper side of the limb about 2.5 centimeters from the under cut. This cut should be made closer to the trunk than the first cut to swing the branch toward the tree before it drops or further from the trunk for the limb to drop without swinging.

3. Make the final cut closer to the trunk than the previous two. The proper cut is one that is made as close to the branch collar and branch bark ridge as possible without causing damage to those tissues.

5.
 1. Study branches before making any cuts.
 2. Accelerate the saw before beginning a cut.
 3. Keep feet completely still while the chain is turning.
 4. Do not use the guide bar's upper tip for cutting.
 5. If pinching occurs, shut the saw off before extracting the saw blade.

Test

Unit E Lesson 4: Pruning Trees in Urban Settings

Part One: Matching

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

- a. Branch ridge bark
- b. Callus
- c. Collar
- d. Crossing branches
- e. Leader
- f. Pruning
- g. Pruning saw
- h. Scaffold branch
- i. Sucker
- j. U-shape crotch

- _____ 1. a central branch that is dominant over other branches on the tree.
- _____ 2. a raised line of bark that forms on the upper side of where the branch joins the bark.
- _____ 3. branches that grow laterally from the trunk.
- _____ 4. protective growth of tissue that grows over a wound.
- _____ 5. saws that have larger teeth with wider spacing than carpenter’s saws.
- _____ 6. soft, green shoots that develop at the base of the tree.
- _____ 7. term used for the selective removal or reduction of certain plant parts.
- _____ 8. the swollen tissue surrounding the base of the branch.
- _____ 9. those branches that grow in different directions and make contact with one another.
- _____ 10. created by branches that attach to the trunk at angles of 45° to 90° resulting in structurally sound branches.

Part Two: Completion

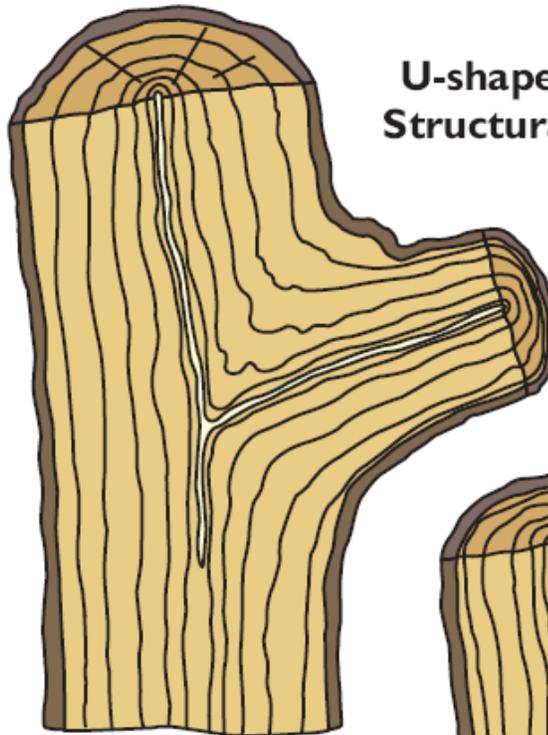
Instructions. Provide the word or words to complete the following statements.

- 1. _____ involves cuts made that slow the growth of a branch, and is accomplished by removing _____ and/or reducing the length of the _____ cause the branch to become subordinate or less dominant.
- 2. Trees have the ability to close or seal wounds with chemicals that inhibit decay caused by fungi and bacteria. This form of defense is called _____.
- 3. When co-leaders exist, the less desirable one of the two should be _____.
- 4. _____ are created by branches that attach at sharp angles.
- 5. _____ are soft, green shoots that usually grow vertically from existing branches.
- 6. _____ and _____ are the best times to prune most deciduous trees.

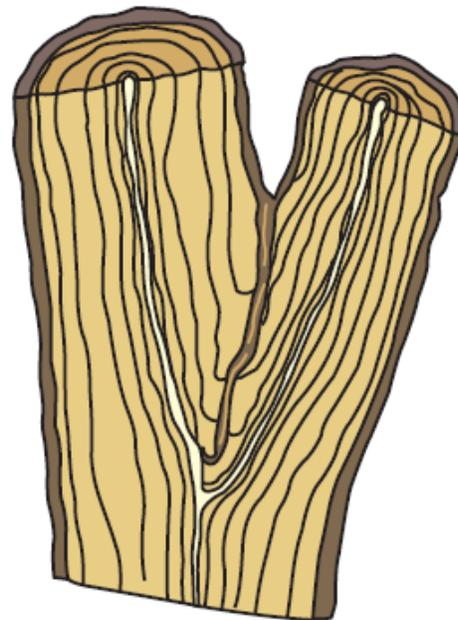
REASONS FOR PRUNING

1. **Promote the development of a strong framework of branches.**
2. **Restrict the size of the plant.**
3. **Repair damaged limbs.**
4. **Improve flowering displays.**
5. **Reduce the spread of pests by removing diseased limbs.**
6. **Direct the plant's growth in a particular direction.**
7. **Maintain desired cultivars.**
8. **Open the crown to allow for light and wind to pass.**
9. **Maintain safe conditions for humans.**
10. **Improve fruit quality.**

TREE STRUCTURE

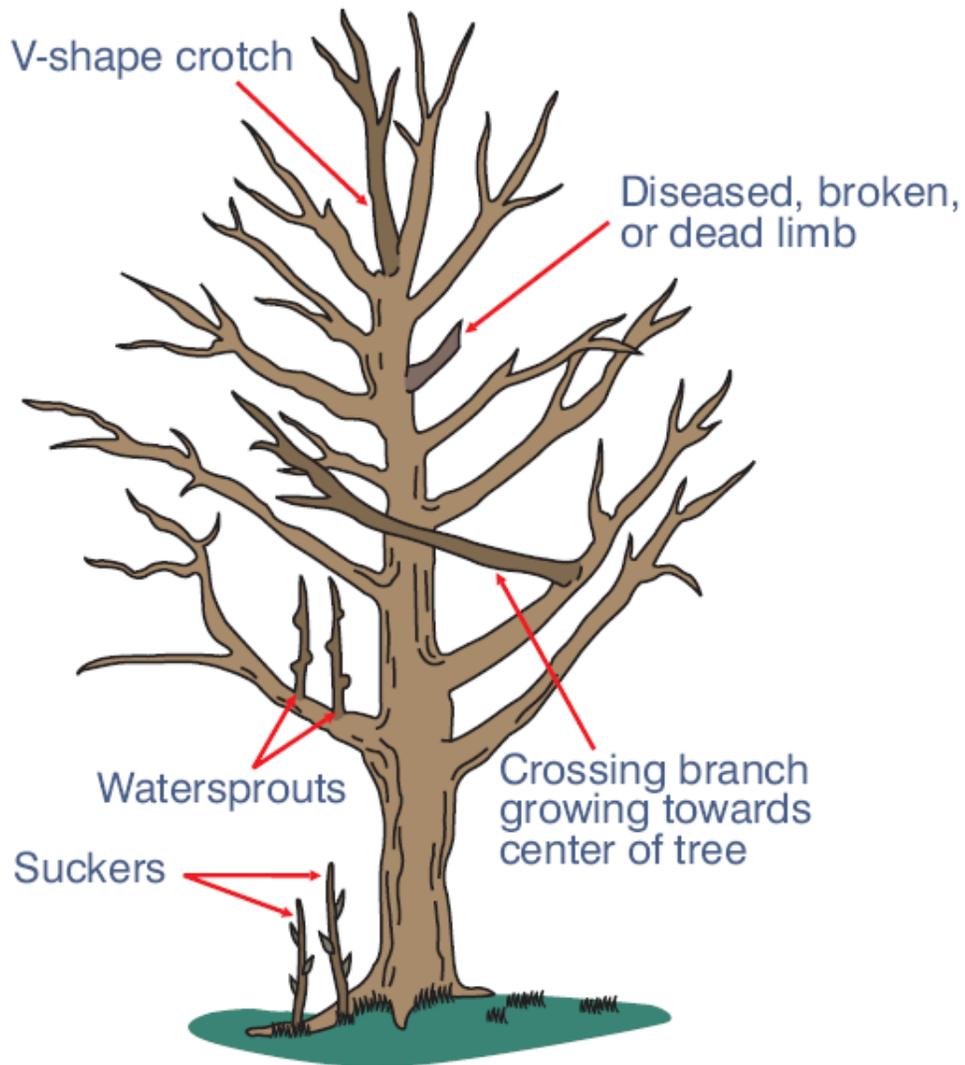


**U-shaped Crotch
Structurally Sound**

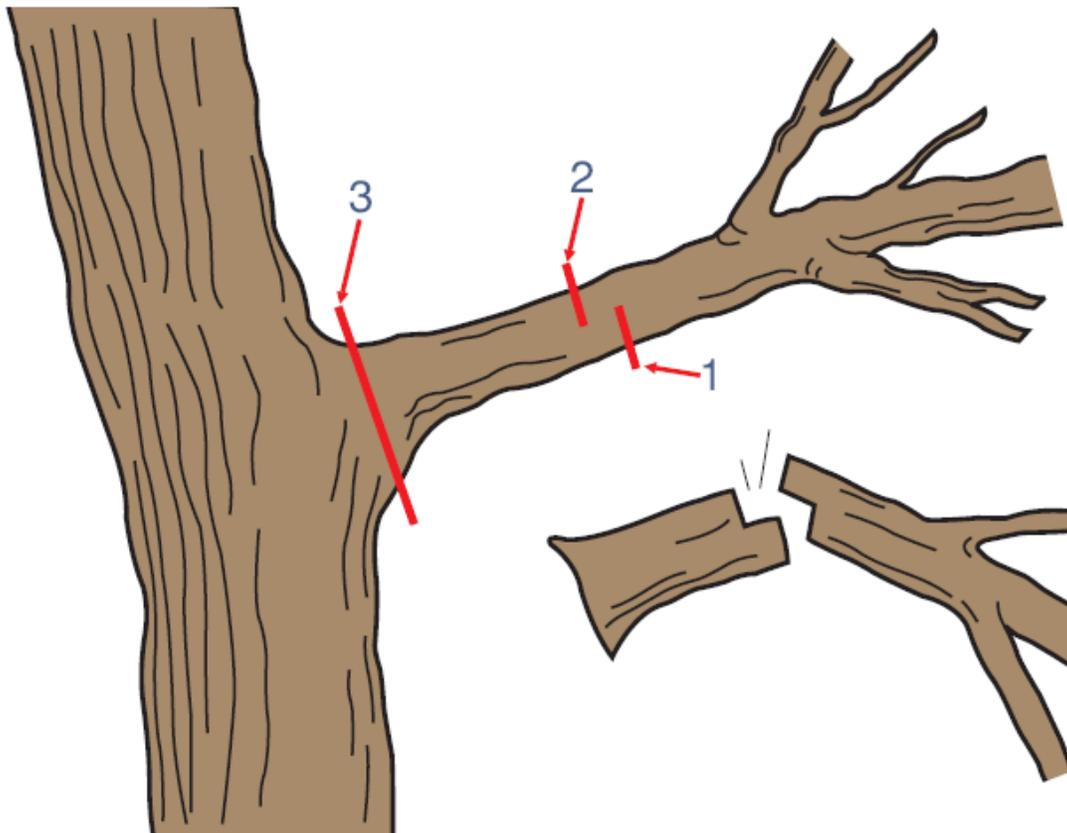


**V-shaped Crotch
Prone to Splitting**

PRUNING OBVIOUS FAULTS

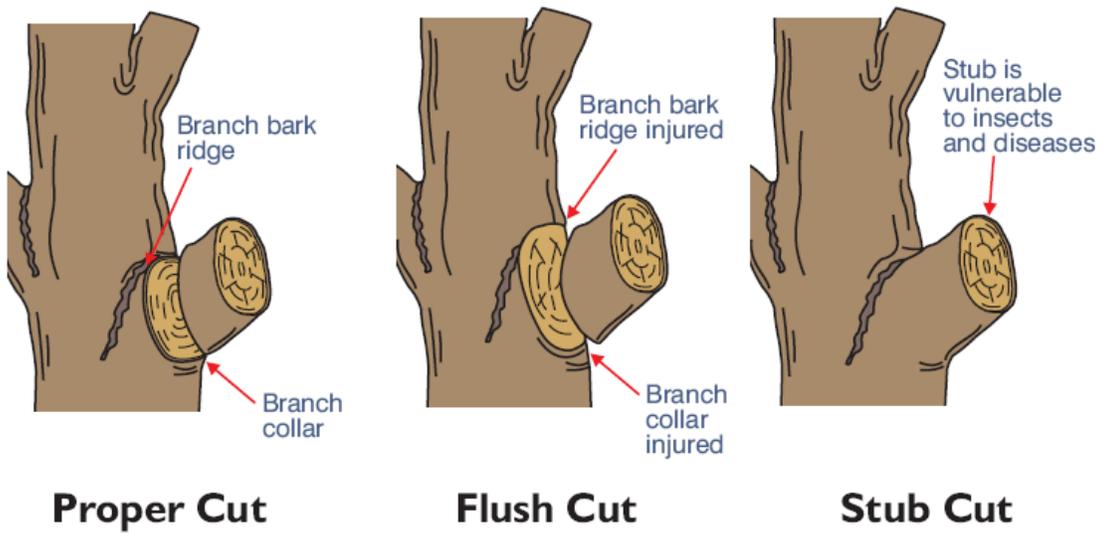


REMOVING A LARGE LIMB



(Courtesy, Interstate Publishers, Inc.)

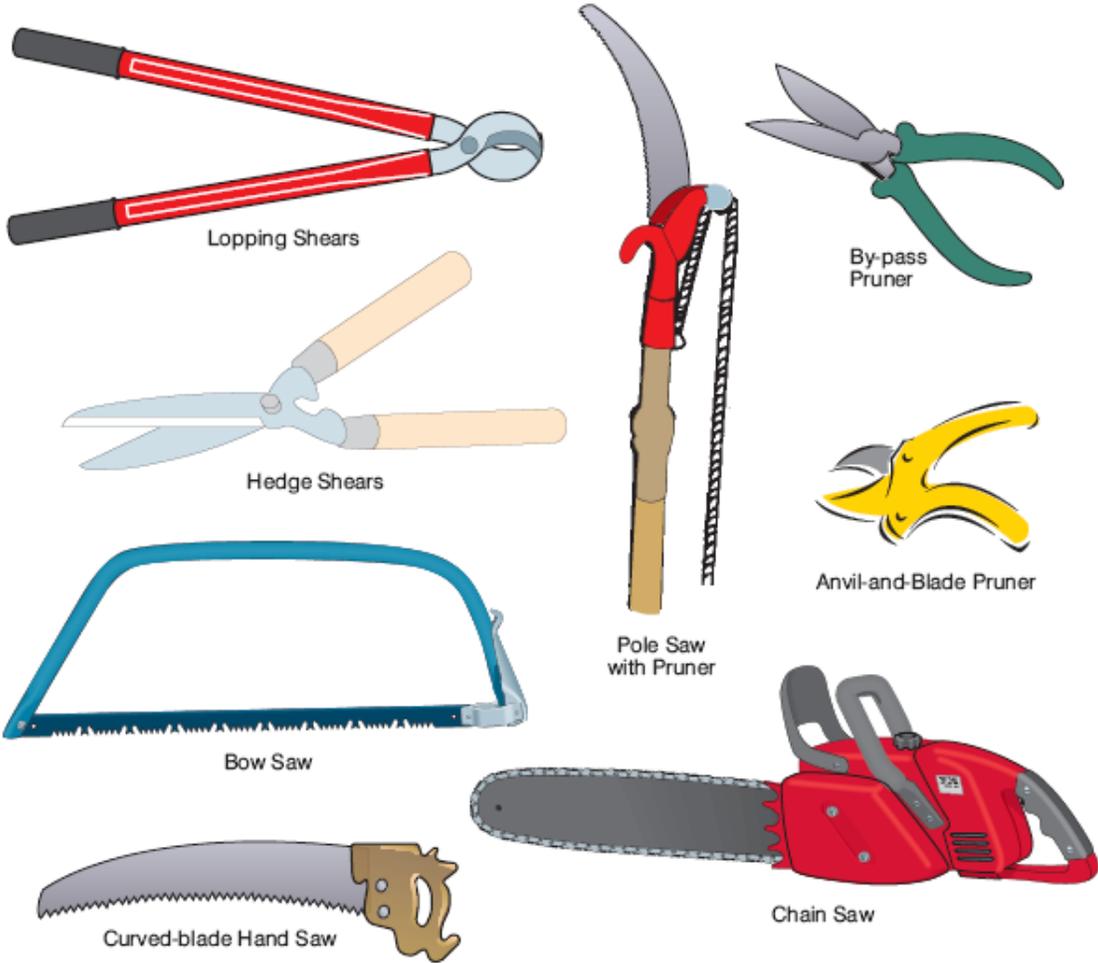
FINAL CUTS OF A LARGE LIMB



(Courtesy, Interstate Publishers, Inc.)

TM: E4-6

PRUNING TOOLS



LS: E4-1

Name _____

Lab Sheet

PRUNING A TREE

Objective:

Students will follow approved practices in pruning a tree.

Materials:

Hand pruners
Loppers
Pruning saw
Pole saw/pruners
Safety goggles

Procedure:

1. Identify trees on the school campus in need of pruning.
2. Gain approval from the school administration to prune the trees.
3. As a class or in groups identify those limbs that should be removed.
4. With safety in mind prune the trees.