

Course	Agricultural Science II
Unit	Forestry
Lesson	Forestry Tools and Equipment
Estimated Time	Four 50-minute blocks

Student Outcome

Describe the safe use of forest tools.

Learning Objectives

1. Identify some common tools used for pruning and planting.
2. Identify some common tools used for harvesting trees.
3. Describe how to use a chain saw safely.
4. Describe how to fell trees safely using a chain saw.
5. Describe how to limb trees safely using a chain saw.
6. Describe how to buck logs safely using a chain saw.

Grade Level Expectations

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. PowerPoint Slides
 - ☐ PPt 1 – Tools for Pruning and Planting
 - ☐ PPt 2 – Using the Cant Hook
 - ☐ PPt 3 – Chain Saw Safety
 - ☐ PPt 4 – Safe Bucking Procedures
2. *Forestry* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1986.
3. *Forestry Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2008.

Supplies & Equipment

- ☐ Chain saw for demonstration of safe use

Supplemental Information

1. Internet Sites
 - ☐ Forestry equipment and supplies. Pacforest Supply Company. Accessed May 28, 2008, from <http://pacforestsupply.com/>.
2. Print
 - ☐ Baker, D.E., and B.E. Cutter. *Basic Chain Saw Safety and Use*. (Guide G1959). Columbia: University of Missouri Extension, reviewed 1998. Accessed May 30, 2008, from <http://extension.missouri.edu/xplor/agguides/agengin/g01959.htm>.

Interest Approach

Knowing the tools used in the forest industry is essential for occupational success. Even more important is to know the safe use and handling of these tools.

Communicate the Learning Objectives

1. Identify some common tools used for pruning and planting.
2. Identify some common tools used for harvesting trees.
3. Describe how to use a chain saw safely.
4. Describe how to fell trees safely using a chain saw.
5. Describe how to limb trees safely using a chain saw.
6. Describe how to buck logs safely using a chain saw.

Instructor Directions	Content Outline
Objective 1 <i>Discuss with students the common hand tools used in pruning and planting trees. Refer to PPt 1. Allow students to develop skills with these tools in a lab setting.</i> ☐ PPt 1 – Tools for Pruning and Planting	Identify some common tools used for pruning and planting. Pruning saw 1. Curved blade – maneuverable, light weight 2. Makes smooth cuts 3. Used for pruning hardwoods such as black walnuts Hand shears and pruners 1. Used to shape Christmas trees 2. Must be kept sharp to facilitate clean cuts Planting tools 1. Planting machine 2. Planting bar
Objective 2 <i>Discuss with students the uses of harvesting tools. Refer to PPt 2 when discussing the cant hook.</i> ☐ PPt 2 – Using the Cant Hook	Identify some common tools used for harvesting trees. Axe 1. Many tasks previously done by an axe are now done by chain saws. 2. Light single bit axe with a 2-1/2 to 3 pound head and 24 inch handle may still be useful. a. It can be useful in cutting small brush and limbs that interfere with felling. (Chain saw is unsafe for this.) b. Poll (back) of axe can be used to drive wood or plastic wedges. c. Blade can chop out chain saw if stuck in a cut. 3. Care and safety are important. a. Keep the blade sharp; a dull blade is unsafe (likely to glance off objects).

Instructor Directions	Content Outline
	b. Never use poll end to drive steel wedge. (Steel splinters break off and can be projected into eyes.) Wedges 1. Wedges keep the chain saw from being pinched in cut. 2. They are used to start tree falling in proper direction. 3. Never use steel wedges in chain saw cut. a. Wedge contact with chain will ruin the chain. b. Plastic, wood, or soft metal wedges should be used. Woodchopper's maul – splitting maul 1. This maul is used for hand splitting fuelwood. 2. It is the only tool needed for hand splitting short pieces of wood. Cant hook or peavey 1. Used to pry or roll logs. 2. Always roll logs away from user to avoid rolling logs on feet. 3. It is also used as a lever in lifting logs. 4. Pry logs away from stumps in felling. Chain saw 1. This is the most widely used, indispensable tool in today's logging operation (used in 90 percent of wood cutting jobs). 2. It accounts for the vast amount of accidents in logging operations. (It must be used safely.)
Objective 3 <i>Discuss with students the safe use of a chain saw. Refer to PPT 3. Using actual equipment, demonstrate how to use the chain saw safely.</i>  PPT 3 – Chain Saw Safety	Describe how to use a chain saw safely. Danger associated with chain saws 1. Recent study found 50,000 people required hospital treatment from injuries associated with chain saws. 2. Operator can make careless mistakes. a. Reaching across saw b. Losing control of saw c. Loss of balance due to loss of footing (accounts for 1/6 of accidents) d. Kickback 3. Safety awareness can reduce the incidence of injury.

Instructor Directions	Content Outline
	Safety preparation 1. Safety begins before saw operation begins. 2. Read and study owner's manual. 3. Outfit yourself with proper clothing and protective equipment. a. Clothing - Well fitted (free of dangling edges) - Long hair tied back - Additional protection – nylon mesh leg chaps or knee pads b. Hard hat - Provides protection - Must be properly fitted - Protects head from falling limbs c. Safety goggles or safety eyeglasses - Prevents injury from flying wood chips - Use safety eyeglasses with side shields d. Earmuffs or ear plugs (protect ears from harmful noise level) e. Non-slip gloves - Lightweight - Protect hands from abrasions and wood cuts f. Safety boots - Good gripping soles - High tops to protect ankles - Steel toes to protect feet 4. Prepare the saw a. Properly sharpened chain - Situations that indicate sharpening is needed • It tends to cut sideways • Cut shows fine powder instead of chips • Operator finds himself pressing down - Follow manual to sharpen chain b. Correct chain tension - Too loose – chain will derail - Too tight – chain will bind - Chain stretch usually occurs during first half hour of operation. - Follow the manufacturer's recommendations for the correct chain tension.

Instructor Directions	Content Outline
	c. Proper lubrication - Automatic oilers • Make sure oiler is properly adjusted • Check bar oil mechanism to make sure it is not plugged up. - If chain smokes while operating, there is not enough lubrication. d. Tool kit - Few extra cans of oil - Wrenches to fit all lugs and nuts on the saw - Screwdriver - Round file and guide for touching up chain - Flat file and depth gauge to file depth guides - Small brush to clean away sawdust and wood chips around gas cap and cooling fins - Extra spark plugs - Cleaning rags - Sharp axe (2-1/2 to 3 pound head, 24 inch handle) - Wood or plastic wedges - Supply of fuel in a UL listed safety can - First aid kit Safe operating techniques 1. Refueling and starting the engine a. Refueling - Use the manufacturer's recommended fuel mix. - Use a funnel or flexible nozzle to avoid spillage on engine. - Only refuel engine when it is cool. - If fuel spills, clean engine thoroughly. - Refuel with chain saw on ground and in area cleared of combustible material. - Never smoke while refueling. - Each time you refuel, check chain tension, nuts, bolts, and oil flow. b. Starting the engine - Saw should be started on a firm base, teeth free of obstacles. - With one foot placed on bracket to rear of unit, set starting controls. - Grip top handle of saw firmly with one hand.

Instructor Directions	Content Outline
	- Use other hand to pull rope. - Never “drop start” saw; this is an invitation to disaster. c. Cutting - While cutting always hold saw with both hands, thumb firmly locked around front handle. - Stand with feet well apart, body well-balanced. - Stand to the side of the saw while cutting (never behind it). - Keep clear of work. - Never cut above shoulder level. - Always be aware of helpers and bystanders while cutting. d. Avoiding kickback - Hold saw firmly. - Use a saw equipped with a chain brake or kickback guard. - Watch for twigs that can snag chain. - Don’t let bar pinch in cut. - Saw with lower part of bar, never with tip. - Maintain high speed when entering a cut. - Keep chain sharp. - Never reach over shoulder height to cut.
Objective 4 <i>Discuss with students the general procedures for felling trees. Demonstrate or have an experienced person demonstrate tree felling at a local farm. Have students assist in judging direction of fall, clearing area, and developing a felling plan of safety.</i>	Describe how to fell trees safely using a chain saw. Consider the characteristics of the tree and direction of fall 1. Observe how it leans. 2. Notice if there is an uneven top. 3. Observe growth or breakage. 4. Determine wind direction. Clear the ground 1. Clear working space around the tree. 2. Use axe to cut away brush and saplings. Develop a felling safety plan in advance 1. Plan your escape route to side of fall at a 45° angle. 2. Plan a safe place to drop saw, allowing you an unhampered escape. 3. Clear trees and brush that might obstruct your escape route.

Instructor Directions	Content Outline
	Follow the felling procedure 1. Hold saw firmly in both hands; take a well-balanced stance. 2. Make cut close to base of tree, but high enough to avoid saw in ground. 3. Notch undercut at least 1/3 of the trunk diameter on the fall side of tree. (Make lower cut of notch first to avoid pinching saw.) 4. Make felling or back cut on the opposite side of the trunk 2 inches above and parallel to horizontal notch. a. Leaves wood fibers to act as a hinge b. Keeps tree from kicking back on stump 5. Guide saw into tree; do not force it. 6. Remove saw from tree and shut off. 7. Retreat along planned route. Use wedges 1. Used to make tree fall in the desired direction. 2. Always use two wedges rather than one. 3. Use wood or plastic wedges and drive with poll of axe or mallet. 4. Strike wedges squarely. (Careless blows may pop the wedge out, swinging the tree backwards.)
Objective 5 <i>Discuss with students the process of limbing felled trees. If possible, demonstrate limbing on trees. Have students involved in making decisions in the order of limbing.</i>	Describe how to limb trees safely using a chain saw. Limbing – branch removal from felled trees Limbing safely 1. Decide the order of limbs being cut, making sure taking the limb will not cause tree to roll on you. 2. Do not use tip (greatly increases chance of kickback). 3. Remove limbs on top side of trunk as far as possible. 4. When possible, saw from the uphill side. 5. Lesser branches should be removed. 6. Saw limbs on opposite side of trunk from where you are standing as much as possible. (Trunk is barrier between operator and saw.) 7. Avoid reaching with saw. (Move to limbs and have good stance before cutting.) 8. Exercise caution when removing lower branches. a. Cutting bottom branches as work progresses will be necessary.

Instructor Directions	Content Outline
	b. Key branches stabilizing tree should be left until last. c. It is difficult to determine if branch is supporting or not until saw weakens limb. d. Likelihood of tree rolling increases as more limbs are removed.
Objective 6 <i>Discuss with students the process of bucking. Refer to PPt 4. Demonstrate in lab setting or on a local farm.</i> ☐ PPt 4 – Safe Bucking Procedures	Describe how to buck logs safely using a chain saw. Bucking – cutting trunk into desired lengths 1. Generally less hazardous than felling or limbing 2. Safety skills still essential Special hazards 1. Log roll a. Work on the uphill side of logs b. Raise and chock trunk when possible 2. Kickback a. Avoid touching ground with tip of saw b. Avoid using the tip of the saw 3. Back strain – Do all manual lifting with back-and-strain saving techniques in mind. General procedure 1. When log is supported along entire length a. Cut from top b. Roll over and cut from opposite side until free c. Use care to avoid getting saw into ground 2. When log is supported from one end a. Cut 1/3 of diameter from one side (avoids pinching and splitting) b. Cut 2/3 of diameter from top, meeting first cut 3. When log is supported at both ends a. Make first cut from top 1/3 diameter b. Then cut 2/3 from underside, meeting first cut 4. Cutting firewood – laying on ground a. Make cuts on one side 3/4 of the way through log for each length b. Roll log over and cut through to first cut for each length c. A three-legged sawhorse is effective in steadying wood and making cuts easier and safer

Instructor Directions	Content Outline
Application	Other activities: 1. Plan a field trip to watch experts fell, limb, and buck trees.
Closure/Summary	Know the right tools for planting, pruning, and harvesting forest trees. Always use them with safety in mind as they are valuable to your success in the forest industry.
Evaluation: Quiz	Answers: 1. a. Pruning saw – hardwoods such as walnuts b. Hand shears and pruners – Christmas trees 2. a. Planting machine b. Planting bar 3. a. Axe – used for clearing small limbs and brush when felling; poll end used to drive wood or plastic wedges; can be used to chop out chain saw if stuck b. Wedges – used to keep chain saw from being pinched and to start tree falling in proper direction c. Woodchopper’s maul – used for hand splitting wood d. Cant hook or peavey – used to pry or roll logs e. Log jack – supports logs above the ground for bucking 4. Well-fitting clothes; nylon mesh leg chaps; hard hat; safety goggles; earmuffs or earplugs; non-slip gloves; steel-toed ankle-high boots with good grip 5. a. Sharpness b. Chain tension c. Proper lubrication 6. Start saw on the ground away from obstacles. Stand at the rear of the unit with one foot placed on the bracket. Grip top of saw firmly with one hand. Use other hand to pull rope. 7. Always hold saw with both hands with thumbs firmly locked around front handle. Stand with feet well apart and body well-balanced. Stand to the side of the saw while cutting, never behind it. Keep clear of work and never cut above shoulder level. Always be aware of helpers and bystanders while cutting.

Instructor Directions	Content Outline
	8. Plan an escape route to either rear or side of the tree fall. Plan a safe place to drop chain saw which will allow you an unhampered escape. 9. Answers should include two of the following: a. Tree rolling – decide proper order of limbing; choose limbs that do not support the tree. b. Saw striking operator - saw limbs as much as possible on opposite sides of trunk so that the tree forms a barrier between the operator and the saw; stand at a 45° angle to limbs being cut; never reach for branches being cut; have a good, solid stance. c. Kickback – don't "nose saw". 10. a. When bucking a log which is supported along its entire length, cut from the top down, roll the log over, and cut through to the first cut. b. When bucking a log which is supported from one end, cut 1/3 of the way into the diameter from one side, and then cut 2/3 of the way down from the top to meet the first cut. c. When bucking a log which is supported at both ends, make the first cut from the top 1/3 of the way into the diameter. Then cut 2/3 of the way in from the underside, meeting the first cut. 11. Answers should include four of the following points: a. Hold saw firmly b. Use chain brake or kickback guard c. Watch for twigs which could snag chain d. Don't pinch bar e. Saw with lower part of bar, not the tip f. Maintain high speed when entering a cut g. Keep chain sharp h. Never reach over shoulder height to cut 12. F 13. F 14. T 15. T