

Lesson C6–1

Using Hand Tools

Unit C. Nursery, Landscaping, and Gardening

Problem Area 6. Using and Maintaining Tools and Equipment

Lesson I. Using Hand Tools

New Mexico Content Standard:

Pathway Strand: Power, Structural and Technical Systems

Standard: III: Apply principles of service and repair to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.

Benchmark: III-G: Use tools in the workplace to demonstrate safe use and proper skills with construction/fabrication hand tools.

Performance Standard: 1. Demonstrate proper use of measurement and layout tools. **5.** Identify and demonstrate proper hand and power tool maintenance procedures.

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

1. Discuss the type of digging and grading hand tools and their use.
2. Explain the major types of pruning and cutting hand tools and their use.
3. Describe the types and uses of miscellaneous hand tools in horticulture.
4. Discuss common hand tools used in horticulture.
5. Explain how to maintain hand tools.

List of Resources. The following resources may be useful in teaching this lesson:

Recommended Resources. One of the following resources should be selected to accompany the lesson:

Instructional Materials Service. *Identifying, Maintaining, and Storing Tools and Equipment Used in Horticultural Plant Production*. College Station, Texas: Texas A & M University (8929-A).

Other Resources. The following resources will be useful to students and teachers:

Schroeder, Charles B., et al. *Introduction to Horticulture*, Third Edition. Danville, Illinois: Interstate Publishers, Inc., 2000.

Cooper, Elmer L. *Agricultural Mechanics: Fundamentals & Applications*, Fourth Edition. Albany, New York: Delmar Publishers, 2002.

Biondo, Ronald J. and Charles B. Schroeder. *Introduction to Landscaping: Design, Construction, and Maintenance*, Second Edition. Danville, Illinois: Interstate Publishers, Inc., 2003.

List of Equipment, Tools, Supplies, and Facilities

Writing surface
Overhead projector
Transparencies from attached masters
Copies of student lab sheets
Hand tools
Linseed oil
Old paint brush
Lubricating oil
Rags
Files

Terms. The following terms are presented in this lesson (shown in bold italics):

Anvil hand pruners
Back pack sprayers
Bow saw
Broadcast spreaders
Curved blade pruning saw
Drop spreaders
Garden hoe
Garden rakes
Grading hoe
Grading rakes

Grafting knives
Grass shears
Grubbing hoe
Hand crank spreaders
Hand spades (trowels)
Hedge shears
Hoes
Lawn roller
Lawn/utility carts
Leaf rakes
Lopping shears (loppers)
Measuring wheel
Patch budding knife
Pecan budding knife
Pitchfork
Pole pruner
Pruning knives
Pump up sprayers
Round point (gravel) shovels
S blade hand pruner
Scoops
Spades
Spading fork
Square point shovels
Thatch rake
Weeding hoe
Wheelbarrows

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 students if they have ever started on a task, but soon became frustrated because they didn't have the correct tools for the job. Have you ever known the tool you needed but didn't know its name? Ask if they have experienced the frustration of finding the correct tool but discovering the tool being broken or dull. The students will see the value of being able to identify, maintain, and utilize hand tools.

Summary of Content and Teaching Strategies

Objective 1: Discuss the types of digging and grading tools and their use.

Anticipated Problem: What digging and grading hand tools are available and how are they used?

- I. Early man created hand tools from stone, metal, and wood to simplify their work. Hand tools make our tasks much easier to accomplish. Learning to use the right tool for the job and using it correctly reduces frustration and increases the work that can be completed. A starting point is to learn to identify the tools that will be helpful in horticulture.
 - A. Shovels are versatile tools used for digging and scooping. Use a shovel to dig out areas and clean loose soil from planting holes. **Round point (gravel) shovels** are shovels with rounded sides coming to a point. They are better for digging especially into piles of landscape rock than are square point shovels. **Square point shovels** have straight sides with a square end. They are designed to level off areas and to square off the bottom of digging areas. **Spades** have shorter handles with narrower and flatter shapes than shovels. They are designed to penetrate the soil but have less scooping and carrying capacity than shovels. Use spades for digging holes, cultivating, edging, and for breaking up soil. They are useful in planting small shrubs and trees. **Hand spades (trowels)** have a short handle and are more pointed than a spade. They are used in digging holes to plant flowers and vegetables. **Scoops** are generally flat with high sides and work well for moving materials such as peat moss, sand, and crushed stone. They are not intended for digging purposes.
 - B. **Hoes** are tools used for hand cultivation and grading. A **garden hoe** is rectangular with only the bottom edge of the blade sharpened. It is used to break up the soil prior to planting and to loosen soil and remove weeds in planted areas. A **weeding hoe** consists of two sharp prongs located on top of a sharpened blade. The sharp prongs are effective for pulling weeds while the bottom edge is used as a regular hoe. Use a weeding hoe for cultivating hard, stony soil. A **grading hoe** is a hoe with a narrow, sharpened, and flat end. It is particularly helpful in loosening hard or compacted soil. A **grubbing hoe** has two narrow, sharpened and flat ends. Use a grubbing hoe to loosen compacted soil or to dig up shrubs.
 - C. A **spading fork** is a tool with four heavy tines or prongs used instead of a spade for turning over the soil when it is not too hard or compacted. When digging trees bare root, or lifting clumps of bulbs or herbaceous perennials, the use of a spading fork reduces possible damage to the bulbs, tubers, rhizomes, or roots. A **pitchfork** is a lightweight fork for moving coarse, lightweight materials such as straw and compost. It is not strong enough for digging soil.
 - D. **Leaf rakes** are used for raking grass clippings and leaves. Metal **garden rakes** are used for heavy duty raking, leveling, and grading. They are often used in smoothing seedbeds prior to planting. **Grading rakes** are lightweight magnesium rakes usually 42 inches wide. They are used for smoothing and grading prior to seeding a lawn and for lightly raking in

the seed after it is sown. A **thatch rake** has metal blades and is used to remove thatch (clippings and dead grass) built up in a lawn.

Use the actual tools or TM: C6–1A to help students learn to identify this group of tools. Discuss the use of each tool as the students learn the names. Quiz students on the names and uses of each tool.

Objective 2: Explain the major types of pruning and cutting hand tools and their use.

Anticipated Problem: What pruning and cutting tools are available and how are they used?

- II. Pruners are one of the most often used set of hand tools in horticulture.
 - A. **Anvil hand pruners** are hand held pruners usually 6 to 8 inches long with a sharp top blade that closes onto the anvil-shaped surface of the bottom blade.
 - B. An **S blade hand pruner** cuts like a pair of scissors with one blade passing by the other blade to cut the wood.
 - C. **Lopping shears (loppers)** are long handled (18 to 24 inches), heavy-duty pruners used for cutting limbs up to 1½ to 2 inches in diameter. The bottom blade is curved to help hold the limb while the top cutting blade cuts through the wood.
 - D. A **pole pruner** is basically a lopper on a pole. The jaws are closed by pulling a rope. The pole comes in sections 4 to 6 feet long. Branches as high as 16 feet in the air can be cut while you stand on the ground.
 - E. **Hedge shears** have 8 to 10 inch blades with handles to match. The shears work like a large pair of scissors with both blades being sharp. These shears are used for pruning landscape hedges and shrubs with young, tender growth.
 - F. **Grass shears** are a small version of the hedge shears. They are operated with one hand and designed to trim grass near landscape beds.
 - G. A **bow saw** is a pruning saw with four to five teeth per inch made to cut on the draw (pull) stroke. It is designed to be used to cut medium-sized branches.
 - H. A **curved blade pruning saw** has a curved blade with four to five teeth per inch that cut on the draw stroke. This saw is designed to prune large branches.
 - I. Knives are used for pruning, grafting, and budding.
 - A. **Pruning knives** are curved blade knives with a long wooden handle. They are used for removal of undesired stems and small branches.
 - B. **Grafting knives** are 3 to 4 inches long with smooth, sharp edges designed for accurate cutting. The accurate cutting is important to achieve a proper match of the graft shoot with the rootstock.
 - C. The **pecan budding knife** is a specially designed knife with two parallel blades set about 1 inch apart. This design allows for the precise removal of the bud shield from one tree and the bark of the other tree. Budding is simplified with the use of this knife.

- D. A **patch budding knife** is a specially designed cutter for the removal of a ½ by 1-inch rectangular patch bud from one tree and the same size patch area on another tree to be budded.

Display the actual tools to help the students identify them. Discuss the use of each tool as the students learn the names.

Objective 3: Describe the types and uses of miscellaneous hand tools in horticulture.

Anticipated Problem: How are miscellaneous tools used in horticulture?

III. Miscellaneous tools all have specific uses into the horticulture industry.

- A. Spreaders and sprayers are needed for seed, fertilizer, and pesticide application. **Hand crank spreaders** are used for small surface areas where power spreaders cannot be used. The canvass hopper contains the seeds or fertilizer, which is broadcast by turning the hand crank. **Broadcast spreaders** have wheel-driven gears, which turn a propeller and throw or distribute the seeds or fertilizer to a width of 8 to 12 feet. **Drop spreaders** have a tined roller in the hopper that is wheel-driven. Since the material is dropped directly under the hopper, the spread width is equal to the width of the hopper. Hand sprayers are used to apply fertilizer and/or pesticide solutions. **Pump up sprayers** are one to three gallon sprayers that use air pressure created by hand pumping. **Backpack sprayers** are similar to the pump up sprayers except the pressure can be built up by pumping while the sprayer is on your back and while you are spraying. Large areas can be sprayed faster with this sprayer.
- B. Lawn/utility carts and wheelbarrows are used to move soil, soil amendments (sand, peat moss, etc.), and mulch (shredded bark, wood chips, landscape rock, etc.). **Lawn/utility carts** are flat bottom carts with two wheels. **Wheelbarrows** typically have one pneumatic (air filled) tire with a 4 to 6 cubic feet capacity in a metal or plastic container. Larger wheelbarrows are now available with two wheels providing more stability for the heavier load.
- C. A **lawn roller** is a round cylinder filled with water or sand that can be pulled over loose soil to firm it. A common use is after seeding a lawn. Rollers pulled by a riding lawn mower are often used on an established lawn in the early spring.
- D. A **measuring wheel** allows one person to measure distances. Areas need to be measured to estimate purchases of seed, fertilizer, mulch, etc. Some wheels measure feet and inches while others require you to multiply the number of revolutions of the wheel times its diameter to figure the distance.

Use the actual tools to help students learn to identify this group of tools. Discuss the use of each tool as the students learn the names.

Objective 4: Discuss common hand tools used in horticulture.

Anticipated Problem: What are the common hand tools that are useful in horticulture?

- IV. Common shop hand tools are useful in horticulture. Have on hand hammers, wood chisels, cold chisels, files, pliers (diagonal side cutting pliers, needle nose pliers, and combination pliers), standard screwdrivers, Phillips screwdrivers, adjustable wrenches, vise grips, channel locks, and a tape measure. These tools may be used to help with tool maintenance and repairs.

Use the actual tools or TM: C6–1B to help students learn to identify this group of tools. Discuss the use of each tool as the students learn the names. Bring the tools to class and conduct a quiz.

Objective 5: Explain how to maintain hand tools.

Anticipated Problem: How should hand tools be maintained to extend their life and maximize their effectiveness?

- V. Properly maintain and store all hand tools to ensure an extended life and maximize their effectiveness. Tools kept in good condition and properly checked before and after each use are less likely to break during usage.
- A. Clean tools after each use of any soil and other debris. Wipe metal parts with an oily rag to prevent rusting. Rub wooden handles with linseed oil to keep the wood fibers from splitting and drying out.
 - B. Check tools for dull or bent blades. Sharp cutting tools are safer, do quality work, and require less effort to complete the job.
 - C. Check tool handles for cracks and breaks. Replace damaged handles or replace the tool.
 - D. Replace broken and worn out tools.
 - E. Lengthen tool life by storing tools inside. Metal parts are less likely to rust and wooden handles will last longer.
 - F. Organize your tools. Each tool should have a place and be kept in its place. Save time by knowing where to find each tool.

Use TM: C6–1C to stress the key points in hand tool maintenance. Use LS: C6–1A to have each student recondition a digging tool or pruning tool. Use LS: C6–1B to have each student replace a wooden handle in a tool.

Review/Summary. The transparencies and lab sheets would be an effective way to review the use of hand tools.

Application. Using the lab sheets to recondition a tool and replace a wooden handle could be used to apply what has been learned about tool maintenance. Using the hand tools in digging, pruning, etc. will demonstrate the mastery of hand tool use.

Evaluation. Use of the hand tools, completing the lab sheets, and taking the test on the lesson can be used to evaluate students.

Answers to Sample Test:

Part One: Matching

1=j, 2=k, 3=i, 4=e, 5=c, 6=f, 7=a, 8=g, 9=d, 10=h

Part Two: Completion

1. Anvil
2. S blade
3. Lopping shears or Loppers
4. Pole
5. Hedge shears
6. Bow saw
7. Curved blade
8. Leaf
9. Garden
10. Grading

Part Three: Short Answer

1. The backpack sprayer allows the spraying to be done in less time with less effort than with a pump up sprayer.
2. Reconditioning tools includes cleaning, oiling the metal parts, sharpening the cutting edge, and rubbing the wooden handle with linseed oil.

Test

Lesson C6–1: Using Hand Tools

Part One: Matching

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

- | | | |
|-----------------|-----------------------|------------------------|
| a. garden hoe | e. pitchfork | i. spading fork |
| b. grading hoe | f. round point shovel | j. square point shovel |
| c. grubbing hoe | g. scoop | k. weeding hoe |
| d. hand spade | h. spade | |

- _____ 1. Tool used to level out the bottom of areas that are being dug out.
- _____ 2. Tool with two sharp prongs located on the top of a sharpened blade.
- _____ 3. Tool with four heavy tines used to dig with a minimum damage to roots.
- _____ 4. Tool used to move coarse lightweight material like straw.
- _____ 5. Tool with two narrow, sharpened and flat ends.
- _____ 6. Tool with curved edge that can be used to dig into and transport soil or gravel.
- _____ 7. Tool with the bottom edge sharpened for breaking up soil prior to planting and removing weeds after planting.
- _____ 8. Tool that is generally flat with high sides used for moving loose and lightweight materials.
- _____ 9. Tool held in one hand and used for planting flowers.
- _____ 10. Tool with a long narrow blade used for digging holes but not good for carrying soil.

Part Two: Completion

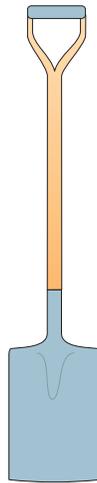
Instructions. Provide the word or words to complete the following statements.

1. An _____ pruner has a sharp top edge jaw that closes onto a solid metal jaw.
2. _____ hand pruners have two sharpened jaws that operate like a pair of scissors.
3. _____ have two short jaws with 18 to 24 inch handles that cut up to 1½ to 2-inch diameter limbs.

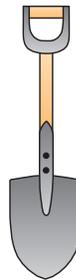
DIGGING AND GRADING HORTICULTURAL HAND TOOLS



Round Point Shovel



Square Point Shovel



Spade



Hand Spade



Garden Hoe



Leaf Rake



Garden Rake

(Courtesy, Interstate Publishers, Inc.)

COMMON SHOP HAND TOOLS USEFUL IN HORTICULTURE



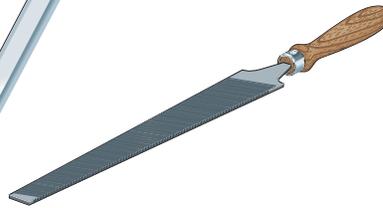
Hammer



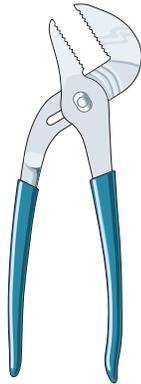
Wood Chisel



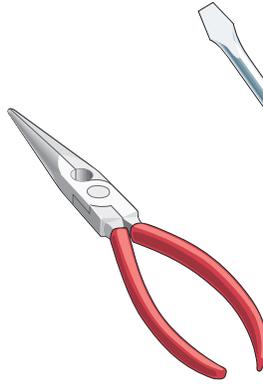
Cold Chisel



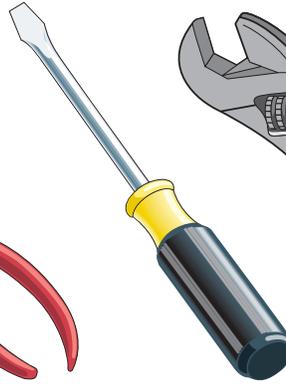
File



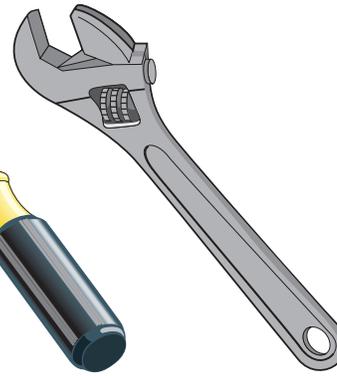
Channel Locks



Needle Nose Pliers



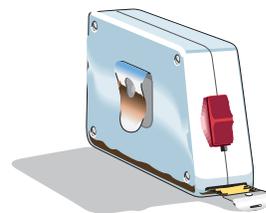
**Standard
Screwdriver**



**Adjustable
Wrench**



Vise Grips



Tape Measure

(Courtesy, Interstate Publishers, Inc.)

RECONDITIONING HAND TOOLS

1. **Clean any soil or other debris from tools.**
2. **Check tool for dull or bent blades.**
3. **Straighten bent blades in a shop vise.**
4. **Use steel wool or a wire brush to remove rust.**
5. **Use a flat file to sharpen the cutting edge.**
6. **Inspect the handle for cracks and breaks.**
7. **If the handle passes inspection, use a shop rag to rub linseed oil into the wood.**
8. **Replace a damaged handle or replace the tool.**
9. **Store the tools inside.**
10. **Organize your tools so you know where to find them.**

Lab Sheet

Reconditioning Hand Tools

Materials:

Hand tool in need of reconditioning
Wire brush
Steel wool
Flat file
Linseed oil
Shop rags

Procedure:

1. Clean any soil or other debris from tools.
2. Check tool for dull or bent blades.
3. Straighten bent blades in a shop vise.
4. Use steel wool or a wire brush to remove rust.
5. Use a flat file to sharpen the cutting edge.
6. Inspect the handle for cracks and breaks.
7. If the handle passes inspection, use a shop rag to rub linseed oil into the wood.
8. Replace a damaged handle or replace the tool.
9. Store the tools inside.
10. Organize your tools so you know where to find them.

Lab Sheet

Replacing Wooden Handles

Materials:

Tool needing a handle
Tool handle
Vice
Wooden wedge
Metal wedges
Punch
Handsaw
Boiled linseed oil
Plastic container the size of the tool
Wood rasp
Wooden mallet
Portable drill and bits
Hacksaw
Safety glasses

Procedures:

1. Clamp the tool head firmly in the vise.
2. Drill the wooden remains of the old handle out of the tool head.
3. Drive out the remainder of the old handle.
4. Compare the new handle to the tool head to see where wood needs to be removed.
5. Rasp the wood to a trial fit.
6. When the fit is snug, mark the handle on both sides.
7. Saw a kerf along the long center line of the handle $\frac{2}{3}$ of the depth of the head.
8. Drive the handle securely on to the tool head with the wooden mallet.
9. Grip the handle in the vise just below the head.
10. Saw the handle flush to the tool head with the hacksaw.
11. Drive in the wooden wedge until it spreads the handle to fill the head.
12. Saw the wooden wedge flush.

13. Drive one or two steel wedges across the wooden wedge to hold it in place.
14. Place the tool in a container of boiled linseed oil for 24 hours.
15. Dry the tool and rub the handle with linseed oil to seal it.
16. After the handle dries, buff it with a soft cloth.
17. Clean the area and put away the materials.