## **Unit E: Forest Management**

#### **Lesson 5 – Harvesting Forest Trees**

Use the slides below to answer the following questions:
Identify the major activities involved in harvesting forest trees.
Compare and contrast the various types of harvest cuttings.
Identify the important factors affecting tree-felling outputs.
Identify the factors involved in tree skidding.
,

#### Lesson

## Harvesting Forest Trees

## Student Learning Objectives.

- Identify the major activities involved in harvesting forest trees.
- Compare and contrast the various types of harvest cuttings.
- Identify the important factors affecting tree-felling outputs.
- 4. Identify the factors involved in tree skidding.

## Major Activities Involved in Harvesting Forest Trees

- Harvesting, or logging, has been called the key to forestry.
- The best silvicultural plans are executed through the proper use of logging.

#### Silviculture

- Silviculture is the art of producing and tending a forest.
- Conversely, the productivity of timber stands can be virtually destroyed by poorly planned or careless logging.

#### Silviculture

- Even in forests managed primarily for purposes other than timber production, some logging is often inevitable.
- The cost of logging is a major factor in the production of wood products.
- Timber is heavy, hard, and difficult to handle.

#### Silviculture

- Logging is in the category of occupations that are considered dangerous.
- Therefore, the activities associated with logging require persons skilled in woods work and the operation of logging equipment.

#### Silviculture

- Some states require forest-land owners to submit a harvest plan prior to the beginning of logging operations.
- The major purpose for this is to promote logging activities that minimize soil erosion and other types of non-point source pollution (pollution whose source cannot be definitely pinpointed).

## General Points of a Logging Plan

- The location of cutting boundaries of the stand to be cut.
- 2. The marking of timber to be harvested (except when all the timber is to be cut).

## General Points of a Logging Plan

3. The cruise of timber to be removed. (A timber cruise is the process of determining estimates of timber volume, growth, stand density, and other kinds of information on a forest property.)

## General Points of a Logging Plan

- 4. The location of the most efficient log-loading sites.
- 5. The location of skid trails and haul roads.

## General Points of a Logging Plan

- 6. The description of equipment to be used and the types of logging to be done.
- 7. The location of emergency equipment storage points, including firefighting tools, first-aid containers, and other emergency equipment.

## The harvesting of trees involves several activities.

- 1. Cutting the trees
- Removing the limbs
- 3. Cutting the trees into lengths

## The harvesting of trees involves several activities.

- 4. Either skidding the logs to a central area for loading or loading pulpwood bolts at the general cutting area.
  - Skidding is pulling logs to a central point for loading onto trucks or railroad cars.
- 5. Transporting the trees to a mill.

## Types of Harvest Cuttings

- II. Harvest cuttings provide for the removal of mature timber, the establishment of reproduction, and the supplementary treatments of the timber-growing site to develop favorable conditions for seedling growth.
- There are a variety of methods involved in harvest cutting timber.

## Clear Cutting

- A. This involves the removal of virtually all the trees in the stand.
- This method is used for the purpose of baring the selected area prior to the establishment of an even-aged stand.

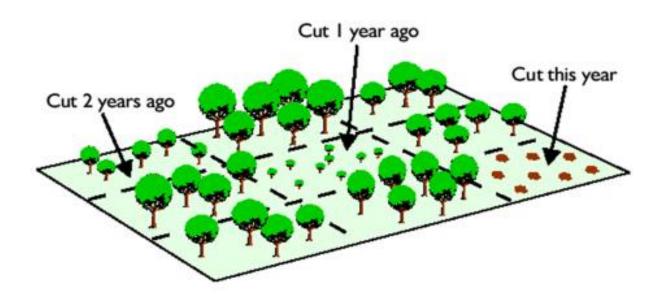
## Clear Cutting

- After clear cutting, regeneration may occur by planting or direct seeding of new trees.
- It may also occur as a result of seed from adjacent trees or from trees that cut in the process

## Clear Cutting

- Clear cutting is applicable in stands where the trees are no longer needed for growth and value increase, for a source of seed, for the protection of reproduction, or for other silvicultural purposes.
- This method is used in mature and overly mature stands to remove undesirable species and to facilitate site treatment, including the planting of superior tree stock.

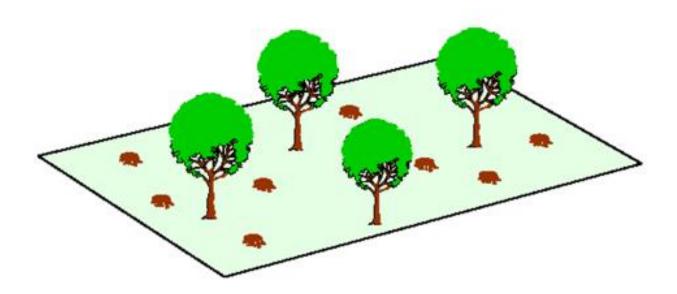
### **CLEAR CUTTING**



## Seed-tree Cutting

- Seed-tree cutting is a form of clear cutting in which seed-bearing trees are left suitably dispersed throughout the harvest area to provide for reproduction.
- This method is used with species that bear seed frequently and abundantly so that scattered seed trees will regenerate the area with desired species within a reasonable period.

## SEED-TREE CUTTING

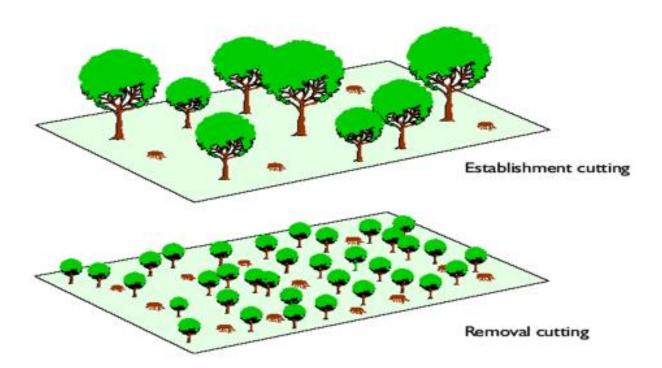


## Shelterwood Cutting

Shelterwood cutting is similar to the seed-tree method except that a greater number of trees are left after the initial cuts to provide shelter for the reproduction as well as a seed source for its establishment.

## Shelterwood Cutting

- A shelterwood harvest is completed in stages.
- The first stage is to harvest a portion of the crop trees sufficient to allow reproduction.
- This is known as the establishment cutting.



(Courtesy, Interstate Publishers, Inc.)

## Shelterwood Cutting

- The remaining trees, which are greater in number than in the seed-tree method, provide a seed source for this reproduction as well as protect the new seedlings.
- In the later stages, known as removal cuttings, the remaining trees are removed as the need for their shelter diminishes.

## Selection Cutting

- Selection cutting is a complex system of cutting used to create or maintain an uneven-aged stand.
- The goal of selection cutting is to remove mature timber in a manner and amount that will allow for reproduction sufficient to maintain the distribution of multiple age classes within the individual stand.

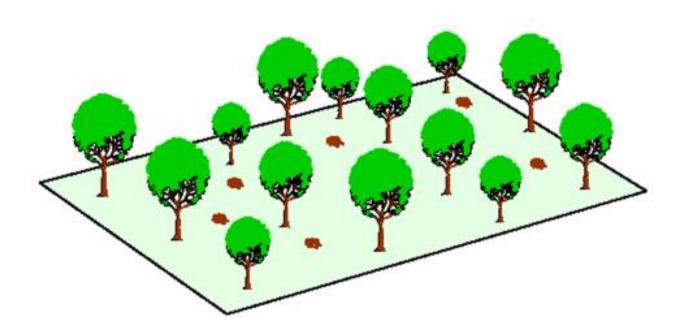
## Selection cutting may be carried out in two ways.

 In the single-tree selection method individual trees in the age class to be harvested are selected and removed.

## Selection cutting may be carried out in two ways.

2. In the group selection method the stand is divided into small groups or units that are then managed for a single age class within the larger uneven-aged stand.

## **SELECTION CUTTING**



### Factors Affecting Tree-felling Outputs

- Felling is the act of cutting or severing a tree from its stump.
- It is more however, than just cutting it down.
  - It means cutting the tree in such a way that it safely falls in the desired direction and results in the least damage to the tree as well as surrounding trees.

## Limbing

- Limbing is cutting branches off either felled or standing trees.
- Cutting to length or bucking, is cutting the felled trees into log or bolt lengths.

## Factors Affecting Tree-felling Outputs

The amount of work and time required to process a tree has been greatly reduced by the introduction of the power chainsaw.

### Factors Affecting Tree-felling Outputs

- Also affecting the processing time is the kind and size of the tree being felled.
- Important factors affecting felling outputs are
  - 1. The volume per acre and size of timber to be cut.
  - · 2. The skill of logging crews.
  - 3. The condition of the terrain—the amount of brush growing there, the steepness of the land, and the wetness or dryness of the site.
  - · 4. The amount of defect in the timber.
  - · 5. The season of the year.

## Factors Involved in Tree Skidding

- IV. Skidding is the part of the logging operation in which the logs are dragged from where they were cut to length to a central location for loading onto trucks or railroad cars.
- In some cases this step is bypassed.

## Factors Involved in Tree Skidding

Short pulpwood bolts can be handcarried and loaded directly onto the truck from the point where the tree was cut.

## Factors Involved in Tree Skidding

- Factors involved in skidding are similar to those involved in felling, but the following must also be considered:
  - · 1. The difference in weight of logs.
  - · 2. The distance to skid.
  - 3. The amount of time required prior to skidding to bunch logs - collecting scattered logs into one place so they can be more efficiently skidded out to a central place.

## **Unit E: Forest Management**

Lesson 6- Examining Reforestation Practices
Use the slides below to answer the following questions:
Identify methods of reforestation.
Identify sources of tree seedlings.
Explain tree planting guidelines.
Explain how to care for and plant a seedling.

### **ENVIROMENTAL RESOURCES**

## Examining Reforestation Practices

## Student Learning Objectives.

- Identify methods of reforestation.
- Identify sources of tree seedlings.
- 3. Explain tree planting guidelines.
- 4. Explain how to care for and plant a seedling.

## Identify Methods of Reforestation

- The majority of forest owners rely on natural regeneration to restore most stands after logging.
  - However, in some instances human intervention is necessary.
  - In these cases, foresters artificially reforest an area.
- Some methods by which this accomplished are:

## Wild Seedlings

- Wild seedlings are those growing in the woods in a natural state.
- For all practical purposes, digging up and transplanting of such seedlings for reforestation purposes should be avoided.
- Such practice is uneconomical and inefficient.

## **Direct Seeding**

- Sowing repellent-coated seeds on an area where trees are desired is known as direct seeding.
- This method can be effectively and successfully employed under proper conditions.

## Direct Seeding

- Large areas can be directly seeded by hand, airplane, cyclone seeder, or grain drill.
- Also, the cost of establishing a stand by this method is usually less than the cost of planting tree seedlings.

## Some factors that affect the success of direct seeding are:

- Vegetative cover Heavy vegetative cover can prevent seed from reaching the soil and interferes with germination.
- A prescribed burn can be used prior to seeding to remove such cover in the desired area.

# Some factors that affect the success of direct seeding are:

- Soil moisture Soil moisture affects germination of seed and growth of seedlings.
- An insufficient amount of moisture following direct seeding will result in a low germination rate and/or a high mortality rate of seedlings.

## Some factors that affect the success of direct seeding are:

- 3. Birds and rodents Birds and rodents consume seed for food.
- Therefore, seed should be treated with a bird and rodent repellent before being broadcasted.

## Cuttings

- Some species of trees can be reproduced from cuttings.
- Cuttings are pieces of branches, usually 8 to 12 inches in length, cut from a tree.
  - Examples of species that can reproduce via this method are willow, cottonwood, and several conifers.

## Cuttings

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## Containerized Seedlings

- Using containerized seedlings for reforestation is becoming increasingly accepted.
- In this method, seeds are germinated in small pots of soil or other growing medium.
- After 8 to 32 weeks, the seedlings are planted without disturbing their roots.

## Advantages of this method are:

- Improved rates of survival and growth of seedlings.
- Difficult species are more readily produced.
- The planting season can be extended.

## Disadvantages of this method are:

- Cost. Containerized seedlings often cost at least twice as much as bare root stock.
- Seedlings are bulky, making them more difficult to handle and transport.
- Requires more site preparation than direct seeding

## Identify Sources of Tree Seedlings

II. Forest land owners interested in securing seedlings for reforestation or windbreaks should request an application from the state department of natural resources.

## Identify Sources of Tree Seedlings

- Seedlings for ornamental purpose are not usually sold by state agencies.
- In some instances, landowners may qualify for a small number of free seedlings from the state.
- Additional seedlings may be purchased if desired.

## **Explain Tree Planting Guidelines**

- III. A number of key factors should be considered when planning to reforest an area.
- They are:

### **Tree Planting Guidelines**

- A. Estimating needs It is important to order the proper species and number of seedlings required for the area to be reforested.
- It is suggested that landowners consult the state forestry agency or extension forester for advice on selecting the best species for the site.

# SEEDLINGS PER ACRE BASED ON SPACING USED

- 6 feet × 8 feet: 908 seedlings
- 6 feet × 10 feet: 726 seedlings
- 8 feet × 8 feet: 680 seedlings
- 8 feet × 10 feet: 544 seedlings
- 10 feet × 10 feet: 436 seedlings

## Tree Planting Guidelines

B. Areas in need of planting - The area that will be planted during the reforestation process should be considered in selecting the species to be planted.

## Some possible locations are:

- Cleared or abandoned farmlands
- Non restocking forest land
- 3. Openings in forest stands
- 4. Watershed protection areas
- 5. Windbreaks

## How to Properly Plant a Seedling

IV. There are several steps to follow to properly plant a tree seedling.

## How to Properly Plant a Seedling

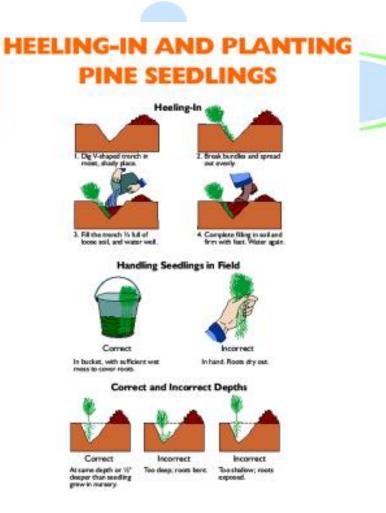
- Before planting, seedlings may be stacked in layers 8 to 10 deep for temporary storage without any adverse effects.
- It is important however to plant the seedlings as soon as possible after receiving them from the nursery.

## Heel-in Seedlings

- To heel-in seedlings means to store the young trees prior to planting by placing them in a trench and covering their roots with soil.
- In this process, seedlings are placed in a V-shaped heel-in trench and allowed to lean parallel to one side of the trench.
- The roots must be fully extended to the bottom of the trench.

## Heel-in Seedlings

- A seedling with curled roots will be difficult to plant correctly later.
- After placing the seedling in the trench, fill it three-fourths full with soil.
- The soil is then packed around the roots and then the rest of the trench is filled with soil.
- The soil is then covered with leaves to conserve soil moisture.



## How to Properly Plant a Seedling

- B. The site in which the seedlings will be planted must be prepared by removing any excess vegetative cover.
- This may be accomplished through prescribed burning, bulldozers, brush cutters, or plows.

## How to Properly Plant a Seedling

- C. Spacing of trees depends on the owner's objective.
- In pine trees, a spacing of 6 °— 8 feet or 8 °— 8 feet favors maximum cubic foot volume growth.
- A spacing of 12 feet between rows is sometimes used to allow the passage of vehicles and equipment.

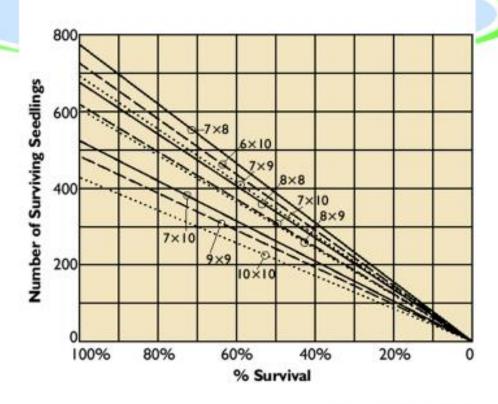
## How to Properly Plant a Seedling

Wide spacing, such as 10 °— 10 feet or 12 °— 12 feet, often allows trees to grow to large diameters in a relatively short time.

## How to Properly Plant a Seedling

- D. There are a variety of procedures that can be used to plant seedlings.
- As a rule, only about 75 to 80 percent of all properly planted seedlings will survive.

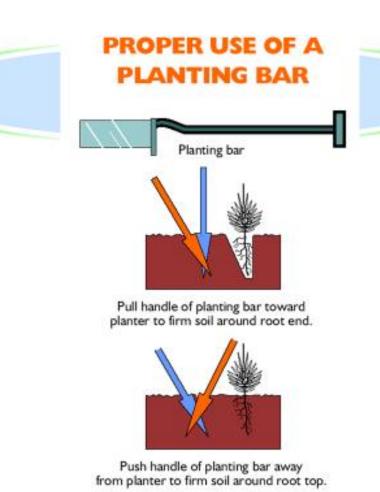
#### PLANTING PROCEDURE



(Courtesy, USDA Forest Service)

## Some of the procedures are:

- 1. Hand planting—The planting bar (dibble) is a metal tool used to make a hole in the soil and is one of the best tools for planting seedlings by hand.
  - The planting bar has four parts: handle, shaft, blade, and foot step.
  - The wedge-shaped steel blade is usually 8 to 10 inches long and about 3 inches wide, tapering to a sharp edge at the base.



#### Some of the procedures are:

- Machine planting—As expected, machine planting is much faster than hand planting.
- A two-person crew can set out 7,000 to 10,000 seedlings a day on suitable sites.

#### **Unit E: Forest Management**

#### **Lesson 7– Applying Safe Practices in Forest Management**

Use the slides below to answer the following questions:

Identify potential hazards in forest management.

Identify safety equipment used in forest management.

#### Lesson

#### Applying Safe Practices in Forest Management

#### Student Learning Objectives.

- Identify potential hazards in forest management.
- Identify safety equipment used in forest management.

#### Potential Hazards in Forest Management

- Safety is an issue that should be of concern for any one involved in the forestry industry.
- Anytime that a person enters the forest there are hazards.

#### Some of the potential hazards are:

- A. Falling branches
- B. Bees and hornets
- C. Stinging nettle, briars, and thorns
- D. Chainsaw kickback -

#### Kickback

- Kickback is the sudden, unexpected upward and backward movement of the chain and guide bar.
- It occurs when the cutting teeth on the chain or the chain itself catches or binds in the cut.
- Because the chain is moving at very high speeds, if the chain or teeth strike a hard substance, or get pinched in the cut, the whole saw will move with great force.

#### Some ways to avoid kickback are:

- Avoid cutting with the tip or upper quarter of the bar.
- Use a tip guard that covers the end of the bar.
- 3. Operate the saw in the correct cutting position, stand at an angle to the saw so that if a kickback were to occur the saw would miss your head and neck.

#### Some ways to avoid kickback are:

- 4. Keep both hands on the saw while cutting. Keep your left elbow stiff. This will help prevent the saw from striking you should it kickback.
- 5. Don't use a chainsaw to cut wood from old buildings, unless you are absolutely sure that all nails, screws, or other metal objects have been removed.

#### Safety Equipment Used in Forest Management

II. There are many pieces of safety equipment that a forester should have on hand and know how to properly use.

#### Some of the basics are:

A. Hardhat—A hardhat protects the forester's head from falling limbs, branches, and even the fruits of some trees.

#### Some of the basics are:

- B. Safety glasses—These provide eye protection from low branches and shrubs when following a compass line.
- They also help keep shaving and saw dust out of the eye of a chainsaw operator.

#### Some of the basics are:

C. Long-sleeved shirts—These are needed to provide protection to the skin from insect bites and from poisonous plants, such as poison ivy, poison oak, and poison sumac.

#### Some of the basics are:

- D. Heavy trouser or chaps—These items protect the legs from stinging nettle, briars, and thorns.
- Special chaps should be worn when operating a chainsaw to provide extra protection against injury.

#### Some of the basics are:

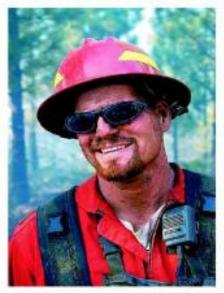
E. High-top boots—This type of boot should be worn to provide good ankle support to reduce the chance of injury.

#### Some of the basics are:

F. First-aid kit—A properly supplied first-aid kit should always be on hand when working in the forest.

### FIREFIGHTERS SAFETY EQUIPMENT

Firefighters should always wear a hardhat and safety glasses.





(Courtesy, USDA)

(Courtesy, USDA)

#### SAFETY PLANS

Fire Information Board includes maps, fire information, and the daily Incident Action Plan.



(Courtey, USDA)



(Courtey, USDA)

"Six minutes of safety" is an interagency safety initiative, which on a daily basis, addresses high risk situations. The fire community is continuously working to find new ways to keep fire fighters safe on the fire line.



A sawyer fells trees or snags for line construction or safety. They also buck trees or wood out of the way for line construction.



(Cautery, 17321A)

#### **Unit F: Forest Products**

#### Lesson 1 – Identifying Forest Products and Uses

Lesson 1 – Identifying Forest Products and Uses
Use the slides below to answer the following questions:
Describe forestry.

Identify forest products.

Identify the uses of forest products.

#### Identifying Forest Products and Uses

Lesson



#### Learning Objectives

- 1. Describe forestry.
- 2. Identify forest products.
- 3. Identify the uses of forest products.

#### What is forestry?

 I. Forestry is the science and art of managing forests so they continuously yield a maximum quality and quantity of forest products and services.

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#### What is forestry?

- A. Forestry includes logging and the manufacturing, marketing and use of wood products.
  - 1. Objectives include protection of watersheds, production of timber, provision of wildlife habitat, recreation, regulation of stream flow, control of erosion, and general aesthetics.

#### What is forestry?

 2. The United States could not maintain the standard of living it enjoys without the

products and services forests provide.



#### What are products of a forest?

 II. More than 10,000 different products, ranging from lumber to plastics, paper, and fabrics, are manufactured of wood.

• A. Each timber product is important in the total picture of timber management because each product allows the grower to remove timber, to receive payment for it and to improve the productivity of the stand.

#### What are products of a forest?

 1. Timber is wood used for lumber, paper, building boards, poles, piling and fuelwood.



- 2. Each timber product has its own specifications.
- Generally, the higher the value of the product is, the more the stringent or limiting are the specifications.
  - a. With softwood, the acceptable limits for pulpwood are quite broad, whereas the limits for poles and piling are quite narrow.

#### What are products of a forest?

 b. With hardwood, the range of material suitable for making railroad cross-ties is very broad, whereas the range suitable for veneer logs is very narrow.

- 3. Forest products.
  - a. Pulpwood is the raw material of a myriad of paper products.
  - Virtually all softwoods and hardwoods are now acceptable to pulp and paper mills.
    - 1. No two pulp or paper mill, or U.S. regions have identical pulpwood specifications.

#### What are products of a forest?

- 2. Pulpwood is classified as shortwood if less than 120 inches in length and longwood if it is 120 inches or more in length.
- 3. Some paper mills purchase treelength pulpwood, that is, the whole tree is harvested instead of being cut up before being loaded or stacked.

- 4. All trees must be cut fairly close to the ground, and limbs must be trimmed close to the surface of the stick.
- 5. Sticks must be cut from sound, live trees that are unmarred by charred or pitched wood or that contain metal.

#### What are products of a forest?

 b. Fence posts provide good outlets for small timber, especially the timber cut in the thinning of softwood plantations.



• 1. Pines are the preferred species for posts because of the ease of treating pine with preservatives, but some hardwoods, such as sweetgum, are increasingly being used for posts.

#### What are products of a forest?

 2. Trees for posts must be reasonably straight and have fairly dense wood to provide adequate post strength.

- c. Mine timber is the timber used in mines to support the construction of tunnels, shafts, openings and chambers.
  - 1. Hardwoods, principally oak, and the southern pines are the main species used as mine timber.
  - 2. The species used for this purpose must rate high in bending and column strength.

#### What are products of a forest?

- d. Railroad cross-ties are used to support steel railroad tracks.
  - 1. Larger-sized, low grade southern pine,
     Douglas fir and other softwoods and
     virtually all species of low grade hardwood
     are suitable for making railroad cross-ties.
  - 2. Generally, trees that are not suitable for other uses are best sold for use as crossties.

- e. Sawtimber trees are generally trees that are large enough and of sufficient quality to cut into sawlogs that produce lumber, veneer and plywood.
  - 1. Nearly all softwoods can be harvested for sawtimber.
  - Virtually all species of hardwood of adequate quality can also be used to produce lumber.

#### **WOOD PRODUCTS**



 a. Lower grades of hardwood can be used to produce board road, a lowgrade lumber used to build roads for oil-well drilling rigs.

#### What are products of a forest?

- f. Poles are round timbers most often used to support utility lines.
  - 1. Most utility poles are produced from pine, Douglas fir, cedar and western larch timber.
  - 2. The specifications for pole timber are very high.

Poles must be free of defects, such as crossbreaks or cracks, bird holes, hollow butts or tops from red heart or other decay, or splits in butts or tops; they must also be free of metal.

#### What are products of a forest?

 g. Piling are round timbers, generally driven into the ground to support other structures and generally pressure-treated with creosote.

- 1. Piling is used for the construction of bridges, docks, wharves, foundations, and in other heavy general construction.
- 2. The same requirements used in selecting poles are used in selecting piling.

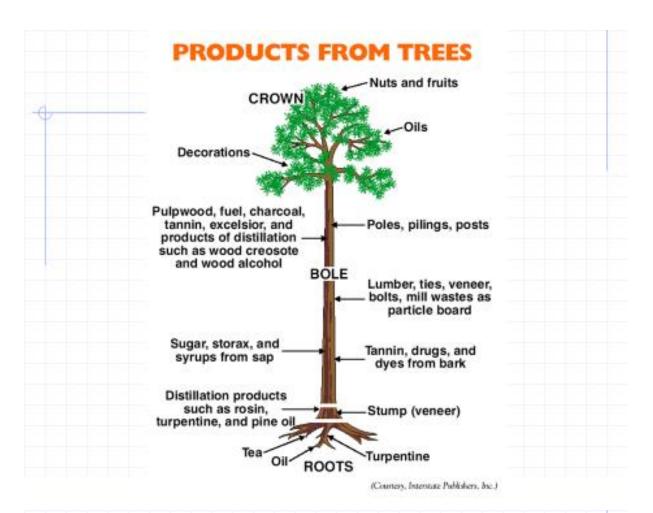
#### What are products of a forest?

 h. Veneer is a thin sheet of wood of uniform thickness produced by peeling, slicing, or sawing logs, bolts, or flitches.

- 1. A flitch is a thick piece of clean wood, usually squared.
- 2. Sliced veneer is usually confined to very valuable furniture or panel stock.
- 3. Veneer may cut thick enough to be used as is, or it may be glued together in thin sheets to form plywood.

#### What are products of a forest?

- 4. The portion of the tree used for veneer must be free of defects, including rot and limbs.
  - Frequently, veneer logs are cut from the lower portion of the tree stem, and a sawlog is cut from the remaining merchantable portion.



 III. Forests provide important and widely used products.

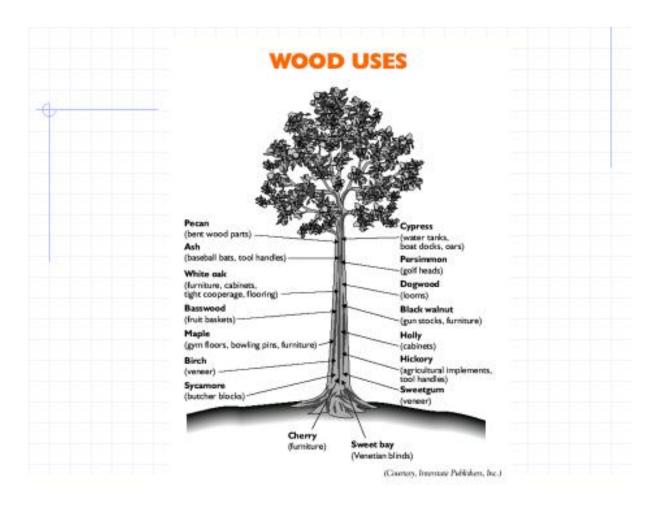
- A. Numerous products are made of and from wood.
  - 1. A single-use forest is a forest managed for one purpose.
  - 2. A multiple-use forest is one managed for more than one purpose.
    - a. More emphasis is placed on multipleuse forestry and its role in ecosystem management.

- 3. The roots of the tree provide tea, oil and turpentine.
- 4. The stump provides veneer, distillation products such as resin, turpentine and pine oil.

 5. The trunk provides wood products such as pulpwood, poles, pilings, posts, lumber, ties, veneer, bolts, and mill wastes, such as particle board.

### What are the uses of forest products?

 a. Other uses of forests include: fuel, charcoal, tannin, drugs, oils and dyes from bark, sugar, storax, and syrups for sap, excelsior and products of distillation, such as wood creosote and wood alcohol.



- 6. The crown provides decorations, nuts and fruits and oils.
- 7. Most woods have some specific purposes. The following are a few of the common woods and their uses.
  - a. Pecan is used for bent wood parts.

- b. Ash is used to make baseball bats and tool handles.
- c. White oak is used in furniture, cabinets, tight cooperage and flooring.
- d. Basswood is used to make fruit baskets.

- e. Maple is used in gym floors, bowling pins, and furniture.
- f. Birch and sweetgum are used in veneer.

- g. Sycamore is used to make butcher blocks.
- h. Cypress is used to make water tanks, boat docks and oars.
- i. Persimmon is used in golf clubs.
- j. Dogwood is used in looms.

- k. Black walnut can be found in gun stocks and furniture.
- I. Holly is used in cabinets.
- m. Hickory is used in agricultural implements and tool handles.

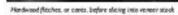
### FOREST PRODUCT SPECIFICATIONS





Hardwood sensor logs before sensor slicing operation







ence pests ready for pressure deating with preservative

(Courtesy, Interstate Publishers, Inc.)

#### **Unit F: Forest Products**

Lesson 2 – Understanding the Characteristics of Wood
Use the slides below to answer the following questions:
Where does the water found in wood originate?
Name three common properties of wood identification.
How is the weight of wood expressed?
How is wood identified as hardwood or softwood?

## UNDERSTANDING THE CHARACTERISTICS OF WOOD



LESSON PLAN NRES C1-14

#### ANTICIPATED PROBLEMS

- What are the chemical characteristics of wood?
- 2. What are the physical characteristics of wood?
- 3. What are the characteristics of hardwoods and softwoods?

#### CHARACTERISTICS OF WOOD

 Wood is often thought of as the hard, fibrous substance that forms the greatest part of the stems and branches.



4

#### PROPERTIES OF WOOD

- There are several chemical properties of wood.
  - 50% cellulose
  - 28% lignin
  - minor quantities of other materials

#### PROPERTIES OF WOOD

- Cellulose forms the framework of the cell walls and is the product used in the manufacture of paper.
- Lignin is the cementing material that binds the cells together and is also found mixed with cellulose in the cell walls.
  - When the lignin is dissolved with chemicals, the cells may be separated for papermaking.

6

#### PROPERTIES OF WOOD



FIGURE 1. Paper manufacturing requires cellulose from trees.

- The relationship between moisture and wood is very important in understanding wood behavior.
- The wood-water relationship causes most of the problems in using wood products.

8

- Nearly all wood properties are affected by the amount of water in wood.
- The amount of water in wood is affected by changes in temperature and humidity.

- The water found in wood originates in the living tree.
- When a tree is harvested, most of the cells still contain a high percentage of water.



10

- The water in wood is found in two areas.
  - Water contained in the cell wall is called bound water and the bond formed with the cell wall is not easily removed.
  - Water contained in the cell cavity is called free water. Free water is the first to be removed.

 The fiber saturation point is reached when there is no free water in the cell cavity and any remaining water is in the cell wall.

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- Extractives are organic, non-wood substances that give color, odor, or other characteristics to wood.
  - Their presence may or may not affect the amount of water in the wood.



## MOISTURE CONTENT OF WOOD



- The moisture content of wood is a measure of the amount of water contained in the wood.
  - The weight of water in a wood sample expressed as a percentage of the dry wood weight

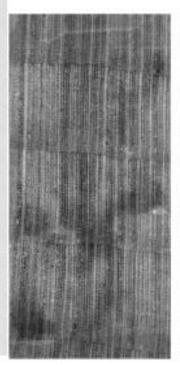
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- Woods can be divided into two groups:
  - Those without pores (non-porous)
  - · Those with pores (porous)

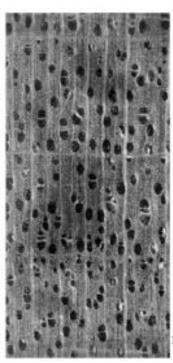
- The porous woods are further divided into ringporous and diffuse-porous.
  - Ring-porous woods have larger pores found in the springwood and smaller pores found in the summerwood.
  - Diffuse-porous woods have rather small and evenly scattered pores throughout both the springwood and the summerwood.

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## POROUS AND NON-POROUS WOODS







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#### WEIGHT OF WOOD

- The weight of wood is usually expressed in terms of weight per cubic foot or weight per thousand board feet.
- Since wood readily absorbs moisture, its weight depends on two factors:
  - the weight of the wood material
  - the moisture retained in the wood

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#### WEIGHT OF WOOD

- A more practical way of expressing the weight of wood in relation to its moisture content is in terms of its specific gravity.
  - Specific gravity is the ratio of the weight of an oven-dried volume of wood to the weight of the same volume of water.

#### MANUFACTURING WITH WOOD

- In the manufacturing of furniture it is sometimes necessary to bend wood.
  - Some hardwoods are more readily softened by heat and moisture for bending than are other hardwoods.



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- Other physical properties of wood.
  - Resin ducts or canals, found in pine, are intercellular passages surrounded by resin-secreting cells. The ducts are often filled with resin.
  - Resin is a vegetable substance secreted by certain plants and trees and is a characteristic of coniferous trees.

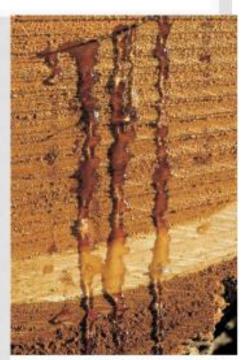


FIGURE 3. Resin can be located within pine trees.

## PROPERTIES OF COMMON WOODS

Properties for wood identification:

- color
- luster
- taste
- hardness
- odor
- texture

Properties important for wood use:

- · weight
- strength
- stiffness
- bending
- woodworking qualities
- hardness
- durability
- permeability to staining and shrinkage

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- Trees are divided into two classes:
  - Hardwoods, which have broad leaves
  - Softwoods, which have needlelike leaves or scale leaves and are called conifers.

- No degree of hardness divides the hardwoods from the softwoods.
- Some hardwoods are soft and some softwoods are hard.

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- The term softwood originated in New England, where the loggers applied it to the light wood of white pine, a conifer. (applied to all conifers, regardless of their wood density.)
- Hardwood was the term given to hard maple, a dense wood, and there after to all deciduous species.

- Wood can readily be identified as a hardwood or softwood by the presence or absence of pores when viewed in a transverse section.
  - If no pores are present, the section is a softwood.

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#### SOFTWOODS

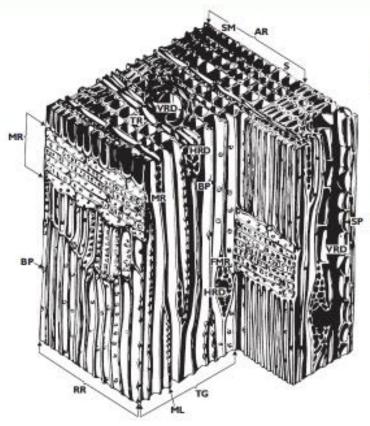


FIGURE 4. Because pines are softwood trees, sap is transferred through the use of fibers.

- When the wood from a conifer is viewed from the top, in transverse section, tracheids or water carriers, form the bulk of the wood surface.
  - Between the various cells is a cementing substance called the middle lamella.

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#### SOFTWOOD CROSS-SECTION



AR = annual ring

BP = bordered pits

FMR = fusiform medullary rays

HRD = rays with horizontal resin ducts

ML = middle lamella

MR = medullary rays

RR = endgrain

S = springwood cells

SM = summerwood cells

SP = simple pits

TG = surface of wood sample

TR = tracheids

VRD = vertical resin duct

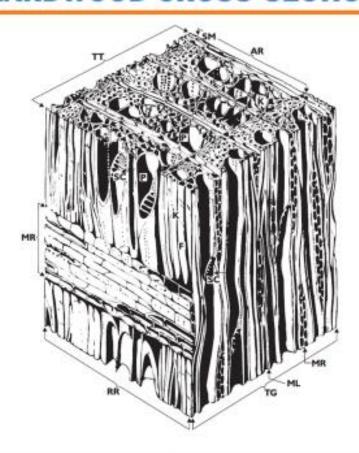
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- When the wood is viewed in a vertical plane, medullary rays will be seen and their function is to store food and distribute it horizontally.
- · Two types of rays:
  - Fusiform medullary rays
  - Rays with horizontal resin ducts

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- Hardwoods have specialized pores or vessels for conducting sap.
  - The pores in hardwoods vary in size depending on the species.
  - Some are visible to the naked eye.

#### HARDWOOD CROSS-SECTION



AR = annual ring F = wood fibers

K = pits

ML = middle lamella

MR = medullary rays

P = pores

RR = vertical plane

S = springwood

SC = grating

SM = summerwood

TG = surface cut at right angle to radius

TT = horizontal plane

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- Hardwood vessels are cells with open ends, one above the other, and continuing as open passages for long distances.
  - In the heartwood and sapwood of some species, the pores are filled with tyloses, which is an organic material that is extruded into tracheids and pores of trees from adjacent parenchyma cells.

 Parenchyma cells are thin-walled structures that participate in the metabolism and storage of sugars.

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- The strength giving elements of hardwood are called wood fibers.
  - Usually wood fibers have small cavities and thick walls.
  - In the fiber walls are found pits by which the sap passes from one cavity to another.

## HARDWOODS



FIGURE 5. Hardwood commonly comes from oak trees.

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#### **Unit F: Forest Products**

#### **Lesson 3 – Processing Forest Products**

Use the slides below to answer the following questions:
Explain the harvesting and the logging plan of forest products

Identify the logging activities.

Describe the processing of forest products.

## Lesson

## **Processing Forest Products**



## Learning Objectives

- 1. Explain the harvesting and the logging plan of forest products.
- 2. Identify the logging activities.
- 3. Describe the processing of forest products.

# How are forest products logged and what is a logging plan?

- I. Harvesting or logging has been called the key to forestry.
- A. The best silvicultural plans are executed through the proper use of logging.
- The productivity of timber stands can be virtually destroyed by poorly planned or careless logging.

## How are forest products logged and what is a logging plan?

1. The cost of logging is a major factor in the production of wood products.

Timber is heavy, hard and difficult to handle.

# How are forest products logged and what is a logging plan?

- a. Logging costs are high, so efficient and economical harvesting is essential to sustained forest management yield.
- As a result of the rising costs logging must be carefully planned and integrated with silvicultural and forest protection activities.
- The logging plan should be a part of the total forest management plan.

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- The logging plan should be a part of the total forest management plan.

# How are forest products logged and what is a logging plan?

- 3. The cruise of timber to be removed.
  - A cruise estimates timber volume by species and products, timber size, and location.
- 4. The location of the most efficient log-loading sites.
- 5. The location of skid trails and haul roads.

## How are forest products logged and what is a logging plan?

- 6. The description of equipment to be used and the type of logging to be done; such as, short logs, long logs, or tree lengths.
- 7. The location of emergency equipment storage points, including firefighting tools, first-aid containers, and other emergency equipment.

 II. Logging is considered a dangerous occupation.

#### LOGGING SAFETY

Safety equipment is very important in any logging job.



(Country, Huspama Forest and Garden Company)

- A. The activities associated with logging require persons skilled in woods work and the operation of logging equipment.
  - 1. Logging activities involve
    - (1) cutting the trees
    - (2) removing the limbs (limbing),
    - (3) cutting the trees into lengths,
    - (4) either skidding the logs to a central point for loading or loading pulpwood bolts at the general cutting area.

# What are the activities associated with logging?

- a. Each of these operations require special skills and equipment.
- Because of rising labor costs, equipment is utilized over labor whenever possible.

- 2. Felling is the act of cutting or severing a tree from its stump.
- It involves cutting the tree is such a way that is safely falls in the desired direction and results in the least damage to the tree and surrounding trees.

#### TREE FELLER



3. Limbing is cutting branches off either felled or standing trees.

# What are the activities associated with logging?

- 4. Bucking or cutting to length is cutting the felled trees into log or bolt lengths.
- The length of the log is dependent on the tree species and the desired final product.

- a. Important factors affecting the felling and cutting-to-length operations.
- 1. The volume per acre and size of timber to be cut.

# What are the activities associated with logging?

- 2. The skill of logging crews.
- 3. The condition of the terrain; the amount of brush, the steepness of the land, and the wetness or dryness of the site.
- 4. The amount of defect in the timber.
- 5. The season of the year.

• 6. Skidding is the part of the logging operation in which the logs are dragged from where they were cut to length to a central location for loading onto trucks or railroad cars.

#### LOG LOADING



- a. Factors involved in skidding are similar to those involved in felling or cutting to length with the following exceptions:
  - 1. The difference in weight of logs.
  - 2. The distance to skid.
  - 3. The amount of time required prior to skidding to bunch logs.

# What are the activities associated with logging?

- 6. Loading is lifting logs or bolts from the ground and placing them on trucks, trailers and railroad cars.
- a. Care is taken to compact the load so that it will withstand the jostling action during hauling.

- b. Small pulpwood bolts are loaded by hand.
- c. Large logs are loaded with a drum-powered cable wench on trucks, hydraulic cranes, front-end hydraulic loaders, large cable cranes and cables attached to the tractor skidders.

# PULPWOOD

- 6. Most logs and bolts are hauled from the woods by trucks to a woodusing mill or to a railroad siding, where they are reloaded for shipment to a distant mill.
- a. Every size and type of truck manufactured is used to haul bolts and logs.

## What are the activities associated with logging?

• 7. New logging equipment, called whole tree chipper system, cuts and chips the whole tree and hauls the chips to pulp and paper mills, building board plants, cedar oil mills, and other units that use tree chips in their manufacturing processes.

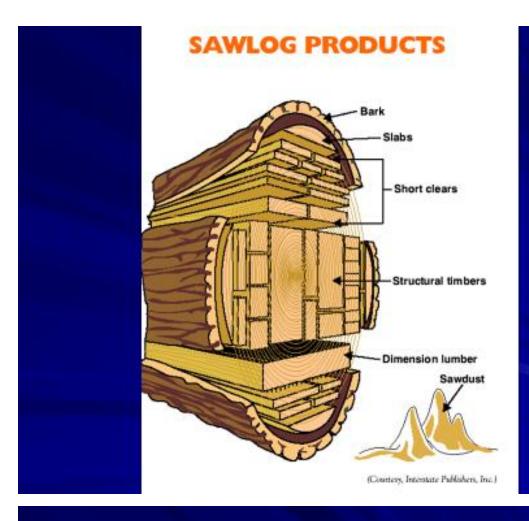


- a. Machines are also being used to lift the entire tree from the ground.
- The advantage of removing the entire tree that the stump and roots, which are normally wasted, are utilized along with the above-ground portion of the tree.

III. Once logs or bolts reach a woodusing firm, they may be debarked, sawed, shaped, peeled cooked, burned, glued, or dried.

## How are forest products processed?

A. These treatments result in the production of lumber, paper, plywood, building boards, poles and piling, railroad cross-ties, fence posts, furniture, handles, charcoal, and a large variety of other products.



- 1. When logs arrive at a sawmill, they are generally stored until needed for processing.
- At fully integrated operations, treelength logs are utilized according to their most efficient use.

- 2. From the storage deck, logs are moved by bull chains, jack ladders or rolled into the mill.
  - a. A bull chain is a chain device used to pull logs up into the saw mill.
  - b. A jack ladder is another version of the bull chain and it can look like a ladder.
  - c. At larger mills, the logs are debarked prior to entering the mills so that slabs and edgings may be hogged or chopped into pulp chips.

## How are forest products processed?

- 3. The logs are rolled one at a time onto a carriage or holding device for sawing.
- A mill worker, called a sawyer, controls the headsaw to get the most and best lumber from each log.
  - a. The headsaw removes slabs (outer portions of the logs) to reduce log cylinders into cants, a squared-off log made by cutting off the rounded portion of the log.

- b. The headsaw reduces the cants into boards and smaller cants that move into a gangsaw or resaw.
- Cants can then be cut into lumber of specific sizes by gangsaws or resaws.

## How are forest products processed?

4. The saws of the edger cut boards (1-inch lumber) and dimensions (2inch plus lumber) are cut into proper widths.

- 5. The trimmer cuts the lumber into proper lengths.
- From the trimmer, the lumber is carried by a green chain into a long shed for sorting.
  - a. A green chain is a system of moving rollers that carry the freshly cut lumber (green, unseasoned lumber) from the saws.

## How are forest products processed?

- 6. Workers pick the lumber off the green chain and sort it according to size.
- 7. Experts grade the lumber according to specifications for quality adopted by the lumber manufacturing industry.

- 8. The lumber may be stacked in the yard for air-drying or loaded onto special cars for entry into dry kilns.
- In kilns, the lumber is rapidly seasoned under controlled conditions to reduce the moisture to levels suitable for the area in which the lumber will be used.

- 9. Some mills have planning units that surface or smooth the rough lumber.
  - In this case the grading takes place after surfacing.
- 10. The sawdust is conveyed to a storage bin and will eventually be sold to pulp and paper mills.

- 11. Innovations of automating sawmill operations:
  - a. At very high rates of speed, electronic sorters automatically stack the lumber by size.
  - b. Closed-circuit TV allows machine operators to control equipment that is hundreds of feet away.

- c. X-ray machines and computers scan logs and instantly decide the most profitable way for headsaws to cut them.
- d. Computerized headsaws boost rough lumber recovery to 60 percent.
- e. Thin saw blades reduce sawdust volumes by 5 percent.

- f. Laser beams and water-jet headrigs may eliminate most sawdust and the need for some lumber planing.
- g. Electro-mechanical machines can measure the stiffness and strength characteristics of individual pieces of lumber.
- The lumber can then be stamped a strength value and marketed as stress rated or stress graded.

- B. Paper has been around for about 2,000 years.
- Cooking wood fiber in a chemical solution is the most widely used method of making pulp.

- 1. When pulpwood bolts or logs arrive at a mill, they are stored in huge piles for later use.
  - a. From the stacks, the pulpwood moves by conveyors to debarking machines, where the logs are tumbled together in huge drums or sprayed with high pressure jets to remove the bark.

### How are forest products processed?

b. The bolts move to large chippers that slice off small wood chips for the chemical process or to large, coarse grindstones that reduce the bolts to short fibers for the ground wood process; the latter method is used to make much of the country's newsprint.

2. To make paper, the cellulose must be chemically separated from the lignin binder by cooking the wood in sulfite, soda or sulfate solutions.

- a. This is done in digesters or huge pressure cookers, where the wood and the chemicals are cooked under steam pressure that reduces the whole to a mass of wet pulp.
- The chemicals are removed and the pulp is thoroughly washed.

- b. From this stage, the wood pulp goes through beaters that separate the individual fibers.
- Often sizing (for smoothness and water resistance), bleach, and color are added during this process.

- c. In the final step, the wet pulp enters the Fourdrinier paper machine.
- The pulp is sprayed onto a wire screen that allows the wood fibers to interlace while the water is drawn off.

- d. From the screen, a continuous mat of wood pulp moves onto a belt of wool felt and then through a series of rollers that press more water out.
  - The material then moves into the dry end of the Fourdrinier through a series of heated rollers called dryers.
- e. Finally, the finished product is wound into rolls that vary in width and weight.

- 3. Paper mills turn out a variety of materials, from raw pulp, to giftwrapping paper, newsprint, magazine and book stock, writing paper, milk carton stock, bond, wax paper, and kraft.
- a. Kraft is the paper made into brown paper grocery bags, cardboard boxes (called liner board) and similar products.

4. Some building materials, such as roofing felt and fiberboard, are also made during the pulping process.

### How are forest products processed?

• 5. Wood pulp is used to manufacture other non-paper products: rayon, cellophane, nitrocellulose, acetate plastics, photographic film, smokeless powder, tire cord, cellophane tape, telephone parts, plastic handles, toys and many other products.

C. Veneer is a thin sheet of wood, ¼ inch or less in thickness, used to make containers, such as baskets and boxes, and furniture items.

- 1. Plywood is manufactured from three or more sheet of veneer glued together, with the grain of alternate sheets running at right angles for strength.
  - a. Plywood is used for paneling, sheathing, furniture, concrete forms, sporting equipment, and hundreds of other uses.

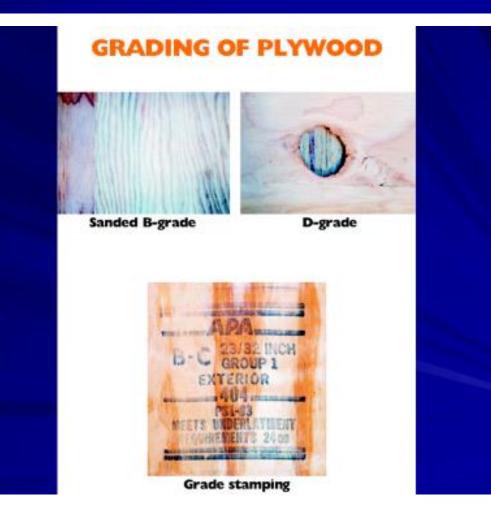
- 2. When veneer or plywood logs arrive at a plant, they are cut into lengths to fit the lathe or veneercutting equipment.
  - a. Logs are usually heated for several hours in vats of hot water or stem chests.
- This aids removal of bark and softens the wood for easier cutting.

- b. The logs are moved to the lathe or veneer-cutting machine with a mechanical hoist.
- A log is turned in the lathe to peel off a thin sheet of continuous rotary veneer, or it is sliced or sawed into sheet by veneer-cutting machines.

1. Rotary veneer moves down a conveyor to large knives or clippers, where it is cut into required sizes and defective portions are removed.

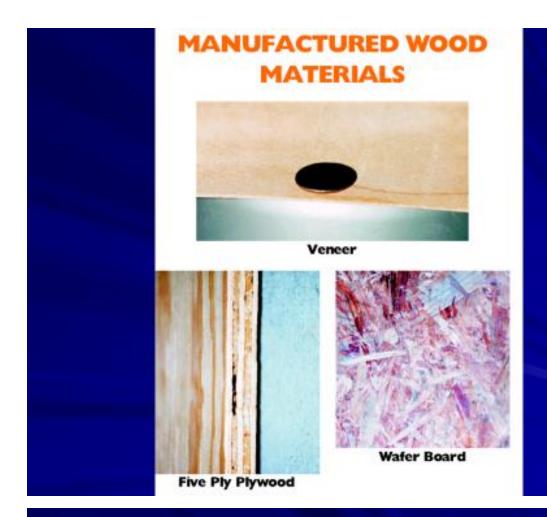
- c. Veneer sheets are seasoned in dryers, run through glue machines and assembled into sets, depending on the number of plies or sheets in the plywood.
- The sets are inserted into hot presses, where they are glued together.

- 1. From the presses, the sets are trimmed to size. In higher grades of plywood, the defects are patched.
- Finally, if required, the plywood is sanded on one or both sides.



- 3. Since the late 1970s, plywood has lost its market to Oriented Strand Board (OSB).
- OSB utilizes low-value wood material that is cheaper to produce than plywood veneers.

- 3. Since the late 1970s, plywood has lost its market to Oriented Strand Board (OSB).
- OSB utilizes low-value wood material that is cheaper to produce than plywood veneers.



- D. When poles and piling arrive at a treatment plant, they are run through a debarking and rossing machine to remove the bark and smooth the surface before treatment.
- 1. Some poles are hand-peeled in the woods, and some are debarked and rossed at central points before arriving at the treatment plant.

2. From the debarking and rossing machine, the poles are cut to length and stacked onto small railroad cars for loading into pressure-treating vats.

- E. A few railroad cross-ties are still hewn or cut in the woods.
- However, most ties are sawn in small portable sawmills and are made from low-quality hardwood logs.

- F. Bark and wood residue, formerly waste materials, have become products in short supply.
- High value uses for bark are for decorative purposes and as soil mulches.
  - 1. Because of the rising cost of energy, bark and wood residue are being used as fuel in many mill operations.

### How are forest products processed?

G. Many other products are made from wood, but they generally represent only a small fraction of the total timber harvested.

- 1. Fuelwood is one of the most important products.
  - The demand for fuelwood (wood used for home heating) is increasing in response to rapidly rising cost of fossil fuels.
- 2. The demand for cooperage, the material used to make wooden barrels, continues to decline as other packaging materials supplant barrels and kegs.

- 3. Pallets, constructed from lumber and plywood, have greatly mechanized product shipments made by truck, rail, water, or air.
- 4. Furniture and fixtures are other wood products utilizing both hardwoods and softwoods.

5. Treated posts are increasingly used not only for fences on farms and ranches but also for residential fences and for landscaping.

### **Unit F: Forest Products**

### **Lesson 4 – Protecting and Preserving Wood**

Lesson 4 – Protecting and Preserving wood	
Use the slides below to answer the following questions:	
Explain the principal causes of wood deterioration.	
Identify commercial and noncommercial wood preservatives.	
Identify naturally durable woods.	
Describe preservatives used for wood.	
Explain the non-pressure preservative treating processes.	

# Protecting and Preserving Wood

Lesson



### Learning Objectives

- 1. Explain the principal causes of wood deterioration.
- 2. Identify commercial and noncommercial wood preservatives.
- 3. Identify naturally durable woods.
- 4. Describe preservatives used for wood.
- 5. Explain the non-pressure preservative treating processes.

 I. Like other materials, wood deteriorates as a result of interaction with the environment.

### What causes wood to deteriorate?

- A. Wood exposed to fungi, damp or moist places, or certain insects will deteriorate.
  - 1. Wood products placed near the surface of the ground are very susceptible to decay and to destruction by insects.
  - 2. In general, all wood contacting the ground or exposed to weather should be treated with a preservative.

 Using a preservative is even more important in regions where high rainfall and mild climate are factors.



### What causes wood to deteriorate?

- B. When planning a project made of wood or that will utilize wood, following accepted precautions will reduce the chances that the wood will deteriorate prematurely.
  - 1. Consider conditions that present potential decay or insect problems.

 2. Design and treat new construction to protect wood from moisture, decay hazards, and insects.

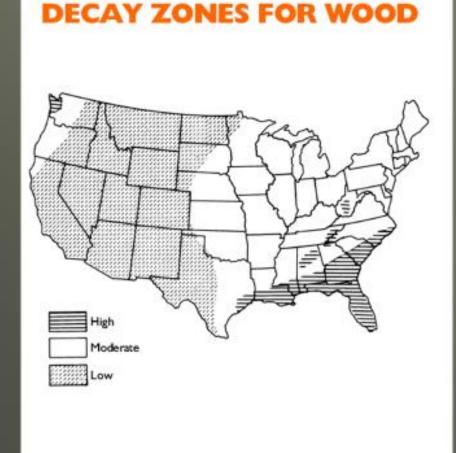
### What causes wood to deteriorate?

- 3. Use treated wood in constructions where wood cannot be kept at least 18 inches above the surface of the ground and protected from excessive moisture.
- Treat exposed large load-bearing beams with preservative.

- 4. Recognize that preservative is essential where wood in permanent structures is in contact with ground.
- 5. When wood decay is detected, immediately remove moisture from the wood so decay does not worsen.
  - Decay causing fungi grow even when there is only a little moisture on the surface of wood cells.

### What causes wood to deteriorate?

 6. Obtain professional advice, if needed, through the local state forestry agency.



- II. The purpose of treating wood is to protect it against insects and decay organisms.
  - A. Wood that is commercially pressure treated with a good preservative can be expected to give the most dependable service.

- 1. Pressure treatment requires expensive equipment and highly technical skills.
- 2. The wood to be treated is placed in a steel cylinder and sealed.
  - A preservative is pumped into the cylinder, and pressure and/or vacuum is applied so that the wood takes up the desired amount of preservative.

- B. Wood can treated at home with good results by proper use of recognized toxic preservative.
- Good preservatives applied poorly or poor preservatives applied carefully are of little value.
  - 1. A preservative protects wood from dangerous fungi and insects.

 2. A good preservative must do a number things.



- a. It must penetrate the wood to sufficient depth to form an exterior shell of poisonous wood that will prevent attacks by fungi and insects, even in surface checks that may later develop.
  - 1. A surface check is a crack, usually formed in the drying-out process.

- b. It must retain its toxic effect under field conditions for a number of years.
- c. It should not easily leach out of the wood while in service.
- d. It must not be flammable or injurious to the wood, or corrode metal.

- e. It should not be dangerous to animals and humans when used in normal concentrations.
  - 1. Protective clothing and accessories, and eyeware should be worn to guard against injury from spills and spatters.
  - It must be handled safely and applied according to the manufacturer's label.

- 3. Lumber treated with preservatives should be handled cautiously.
- Always wear skin and eye protection when handling treated lumber.
- Protection from breathing the sawdust when cutting treated lumber is necessary.

- 4. Treated lumber should not be used for interior applications.
- 5. Treated lumber should be sealed with paint or polyurethane after construction.
  - To prevent the preservative from being leached out.

• 6. Lumber treated with arsenic-based wood preservatives such as chromated copper arsenate (CCA) has been banned for residential use as a wood preservative by the EPA because arsenic is known to cause cancer in humans and will be phased out of production by January 2004.

- a. Because of the wide spread use of CCA-treated lumber, certain precautions should be followed to reduce exposure to arsenic.
  - 1. Seal wood annually with standard deck treatments.

- 2. Wash your skin when and where any contact has been made and especially before eating.
- 3. Do not store toys or tools under a deck.
  - Arsenic leached from the deck will accumulate on anything under it, including the soil.

- 4. Do not allow children or pets to have access under decks.
- 5. Cover a CCA-treated picnic table with a tablecloth before using.

• 7. Preservatives such as coal-tar creosote, solutions of creosote mixed with other toxic chemicals, pentachlorophenol (penta) solutions, and water-borne materials containing one or more compounds of copper, zinc, fluorine, and chromium bring good results.

# What are the commercial and noncommercial wood preservatives?

 However, coal-tar creosote and pentachlorophenol are only available for purchase and use by properly licensed users.

### What are the naturally durable woods?

 III. There are several naturally durable woods.

### What are the naturally durable woods?

- A. The natural durability of a given wood is determined by what part of the tree it is taken from.
- The sapwood of trees is not durable when it is in contact with the soil.
- Sapwood is the light-colored wood near the outer portion of the tree.

### What are the naturally durable woods?

 a. Sapwood is composed of living cells and conducts water and minerals to the tree crown.

### What are the naturally durable woods?

- 2. Heartwood, the dark inner core of the tree, is composed on non-living cells and naturally resists decay better than the sapwood.
- a. The heartwood is more resistant in some species than in others.

### What are the naturally durable woods?

 b. The heartwood of several species is considered naturally durable and, though untreated, can be used in areas where wood comes in contact with the ground.

### What are the naturally durable woods?

- 1. Black locust, black walnut, osageorange, catalpa, cedar, chestnut, chinkapin, juniper, lighter or pitchy pine, pacific yew, red mulberry, sassafras and white oak species are considered naturally durable.
- a. Black locust, lighter pine, red mulberry, pacific yew and osage-orange are considered the most durable.

- IV. Wood preservatives are used to preserve or extend the life of wood and wood products.
- A. Wood preservatives can be divided into two groups: preservative oils and water-borne salts.

### What preservatives are used for wood?

 1. Preservative oils have higher resistance to leaching than do salts and are more suitable for outdoor exposure.

- a. The following are examples of preservative oils.
  - 1. Coal-tar creosote, the most widely used industrial preservative, is a brownish or black oil made by distilling coal tar.
    - It is practically insoluble in water and has proven to be the best preservative for wood that will come in contact with water.

### What preservatives are used for wood?

 2. Coal-tar creosotes for nonpressure treatments are creosotes known as crystal-free coal-tar creosotes.

- In the process of manufacture, the crystal forming chemicals have been removed.
- Since the oil flows freely at ordinary temperatures, creosotes of this type are used when brush or spray applications are desired.

### What preservatives are used for wood?

• 3. Creosote mixtures are made from coal tar and are usually so toxic to fungi that they can be diluted up to 50 percent or more with other oils to lower the cost of using the preservatives.

- 4. Other creosotes include wood-tar, water-gas-tar, and oil-tar.
  - They have wood-preserving properties when of good quality and properly used.
- 5. Coal tar alone is not a good preserver.
  - It is not very poisonous to fungi and it does not penetrate wood very well.

### What preservatives are used for wood?

- 6. Of the chlorinated phenols, pentachlorophenol or penta, has gained wide acceptance as an effective wood preservative in cold soaking and in the hot-cold bath process.
- It is available in the dry flake form or ready to use solution.

• 7. Concentrated and ready to use solutions of copper naphthenate are available for mixing with petroleum oils to make a treating solution that is effective against termites and decay.
• 7. Concentrated and ready to use

### What preservatives are used for wood?

 2. Water-borne salts generally do not perform as well as preservative oils under conditions favorable to leaching.

 a. Water-borne salts are principally used where wood will not be in contact with the ground.

### What preservatives are used for wood?

However, some water-borne salts, such as those used in the double diffusion process, have been developed to the point where good performance can be expected even when the treated wood is in contact with the ground.

 b. Wood treated with water-borne preservatives is relatively clean, paintable, and free of objectionable odor.

### What preservatives are used for wood?

- c. The following are examples of water-borne salts.
  - 1. Zinc chloride preservative is relatively inexpensive, has no color, is uniform in quality and is not a fire hazard.
    - It will leach out of wood that is in contact with the soil and does not perform as well as other preservatives.

- 2. Chromated zinc chloride and copperized chromated zinc chloride were developed as improvements over zinc chloride.
- They are more resistant to leaching.

### What preservatives are used for wood?

- 3. There are a number of commercially available patented preservatives sold under the trade names of the companies that make them.
  - They are principally used for the treatment of wood where there is not ground contact and where the treated wood will be painted.

 3. Odor, paintability, color, and combustibility are other factors to consider when choosing a preservative.

#### Characteristics of Commonly Used Wood Preservatives

Preservative							
Characteristics	Penta			Water-			
	in Light Oil	In Heavy Oil	Creasate	Borne Treatments (CCA) <sup>1</sup>	Cooper- Napthenate		
Paintability	٧	NR	NR	E	F		
Color	tan	brown	brown to black	green	green		
Odor	٧	P	P	E	P		
Intimate contact with plants	NR	NR	NR	G	٧		
Intimate contact with animals	NR	NR	NR	NR	٧		
Handling	V	P	P	P	G		
Indoor Use	NR	NR	NR :	NR	F		
Effectiveness	E	E	E	E	F		

#### Legend

E-Excellent P-Poor G-Good V-Variable F-Fair NR-Not recommended

These characteristics are for treated wood following three months of storage or service.

<sup>1</sup>When oil-based paints are used, water-borne preservative-treated wood must be dried before

Source: General Report SA-GR2, Southeastern Area, State and Private Forestry, USDA Forest Service.