

# *HARVEST PRACTICES*

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Timber harvest practices in North America have changed remarkably since the first logs were harvested along American shores. Early European explorers found a dependable supply of tall, straight trees to replace broken ship masts and timbers in coastline forests. There was no need to obtain timber permits, and no environmental impact statements were required. Early settlers in North America

enjoyed these same privileges. They could harvest trees as they wished, and the seemingly endless timber supplies, though abundant, were discovered to be a finite resource. Timber harvests today are highly regulated and controlled, and the average citizen in the United States is unlikely to ever harvest a tree in his or her lifetime.

## OBJECTIVES

After completing this unit you should be able to

- identify factors that influence decisions affecting timber harvests
- describe some important components of a timber harvest plan
- distinguish between harvest methods leading to even-aged and uneven-aged forests
- explain how the planned method of forest regeneration affects the selection of a harvest method
- evaluate the practice of salvage logging
- relate the volume of timber harvests to forest growth as they affect the forest management concept of sustained yield
- speculate why the National Environmental Policy Act included a requirement for an environmental impact statement to be filed as part of each timber harvest plan
- list and explain each of the steps involved in harvesting timber
- explain the historical relationship between road construction in forests and surface water quality
- describe some methods used to minimize litigation related to timber harvests.

## TERMS FOR UNDERSTANDING

bucking	environmental	limbing	shelterwood
bunching	impact	litigation	method
chainsaw	statement	logging	siltation
choker	EPA	prehauler	skidder
deadwood	forwarder	sawhead	yard
	landing	seed tree method	

## PLANNING THE HARVEST

Many steps are involved in the process that leads to a timber harvest. Forest management decisions are influenced by many factors besides science-based research. Among these influences are the legislative actions taken by congress and the state legislatures. Legislation has led to regulation of many aspects of the forest industry. Environmental impact statements, occupational safety regulations, and forest management rules have all changed the way timber harvests are planned and conducted in both private and public forests.

A timber harvest, also known as **logging**, is a natural outgrowth of planning. Once a long-range management plan for a forest has been implemented, it is expected that proven silviculture practices will lead to a harvest of quality timber on a timetable consistent with maintaining sustainable yields. Most forest managers can predict, with reasonable accuracy, how long it will take for an even-aged timber stand to mature. They also know that, once the trees have matured, a harvest must be planned and initiated to avoid timber losses. Heartrot and decay become serious problems in over-age forests. The increase in

timber volume due to growth is more than offset by losses due to rotting.

Planning for timber harvests begins long before any trees are cut. One of the first decisions that must be made is the type of harvest that will be conducted. This unit will consider ways that the different timber harvesting methods are implemented.

### Clearcutting

One of the most important considerations in planning a timber harvest is to determine what method will be used to regenerate the forest. If an even-aged stand is desired, it can be achieved by planning the way the current stand of trees is harvested. For example, an even-aged stand of Eastern White Pine can best be established by the clearcutting method of harvesting. This is followed by site preparation and either planting seeds or seedlings to regenerate the desired stand.

Clearcutting is an unpopular harvest method among some political action groups due to the loss of scenic value and dangers to the environment both real and perceived. If clearcutting is the method of choice, harvests in adjacent areas must be timed to assure that forests of different ages are established.

In the political world of the 21st century, it will be important to restrict the size of clearcut harvests to reduce the potential for erosion. Harvest planning should also provide for using selection cutting methods near roads and leaving unharvested buffer zones of trees near streams to protect water quality and to provide wildlife habitat. These kinds of compromises will be necessary if clearcutting harvest methods are to be used in the future.

### Seed Tree Method

The seed tree method of timber harvesting is part of a management plan in which mature trees of the desired species are protected from cutting in scattered locations throughout the forest. Their purpose is to provide seed for regeneration of the forest. In most instances, site preparation is necessary to reduce competition from shrubs and established seedlings of less desirable species. This method is effective with southern pine and western larch in establishing even-aged timber stands. The seed tree method has limitations in situations where site preparation is not practiced.

### Shelterwood Method

The **shelterwood method** is a modified seed tree harvest method in which mature trees are left in the harvested area in sufficient numbers to provide shade and protection for seedlings. Once seedlings have become established, some of the mature trees are harvested leaving an overstory that provides partial shade on the forest floor. The number of these mature trees harvested in the first cutting depends on the shelter needs of the seedlings. These needs vary from one species to another, and the species that eventually become dominant in the stand may be strongly influenced by the availability of shelter during critical periods of development.

When the new stand has become well established, the remaining mature trees are harvested. This harvest method has proven to be effective where harsh environmental conditions such as hot, dry hillside locations make it difficult for young trees to survive. This method for establishing even-aged timber stands also tends to be viewed less critically than clearcutting because the landscape is never completely stripped of trees.

### Selection Cutting

Selection cutting as it is described in this unit is not the same as the selection cutting that occurred as native forests were harvested. In that instance, selective cutting was a harvest system in which only the high value trees were harvested. Eventually this left only trees that were of less desirable varieties. Selection cutting, as described here, is a timber harvest method used to identify and harvest trees near the end of their productive lives. It is important to harvest these trees while they are still vigorous, and before they become victims of decay or disease.

Harvest planning is a continual process when selection cutting practices are followed. This is because trees are removed from the forest at regular intervals as they mature. Regular inspections and forest inventories are required with this kind of harvest methods to assure that the correct amount of timber is harvested. When too much timber is harvested, the ability of the forest to produce at a sustained level gradually decreases. Eventually the size of the trees diminishes, and larger numbers of trees are required to maintain the same harvest yields.

Sustained yields can be established and maintained by determining the forest growth, and harvesting only as much timber as the forest can replace. When selective cutting is practiced, a plan with a regular harvest rotation or a minimal tree size is needed. Prior to each harvest, individual trees are evaluated, and a harvest decision is made. The harvest decision is based on the vigor,

and the potential future production of each individual tree. Growth rate is a good indicator of vigor, and individual trees may be retained in the forest instead of harvesting them because they are still healthy and their potential for growth is high. Individual trees must be evaluated and marked for each harvest when selection cutting is practiced.

## ENVIRONMENTAL IMPACT STATEMENTS

The passage of the National Environmental Policy Act (NEPA) in 1969 required the filing of an environmental impact statement. This is a science-based study of the harvest area which specifically details the expected effects of human activity on the environment and wildlife in the area. Such studies must be

completed before timber harvests may be conducted on federal lands. This piece of legislation has had major impacts on forest management practices in the western area of the United States where large tracts of federal forest lands are concentrated.

## ENVIRONMENTAL PROFILE: THE ENVIRONMENTAL PROTECTION AGENCY

The **Environmental Protection Agency** (EPA) was established in 1970. This agency is charged to protect and maintain the environment for future generations. The EPA is responsible for the enforcement of environmental laws designed to reduce pollution of air and water due to noise, radiation, pesticides and harmful chemicals and materials. This agency has established the water quality standards and it monitors the disposal of toxic waste. EPA monitors chemical residues in humans, wildlife and food.

An environmental study on the impacts of logging includes the effects of road construc-

tion in the area. This activity has the potential of causing pollution of streams with runoff water laden with silt. Among the issues that such a study will address are soil types and the expected effects of logging activity on soil stability. Effects of logging on native plants and wild birds and animals are included in the environmental impact statement. The presence of an endangered or threatened species in the area may result in major modifications in a timber harvest plan or even stop all logging activities. The environmental impact statement also addresses the ways that environmental damage and pollution problems will be prevented.

## HARVESTING PRACTICES

Timber harvests involve a number of separate operations that take place in the forest. The first of these activities is felling the tree. This can be done mechanically when the size of the trees and the slope of the terrain will allow it. Trees up to 24" in diameter at the butt can be felled mechanically, but larger trees are usually felled with a gasoline powered saw called a **chainsaw**. Trees harvested for pulpwood are often sheared off at the base with hydraulic shears. Concerns about compression damage to sawlogs using this method have resulted in the development of a **sawhead** mounted on a mechanical feeler replacing the more common shears.

The process that follows the felling of a tree is **limbing** or removal of the tree limbs. Limbs have little value except for pulpwood or biomass. They are removed from the tree to facilitate handling. Despite the development of mechanical limbers that break limbs off the tree trunk, much of this work is still done with a chainsaw. It is followed by the **bucking** process during which the tree is cut into segments of the proper length for hauling or processing. Much of this work is done with chainsaws although mechanical methods are available for performing the limbing and bucking processes.

Logs for which the intended use is lumber production must be moved to sites where they can be loaded for transport to a sawmill. This site is called a **yard** or **landing**. Logs in close proximity to one another are assembled in small piles. This is called **bunching**, and its purpose is to allow several logs to be skidded to the landing at the same time. This is done with a machine such as a **skidder** that drags logs to the landing. Some logging operations use mechanical winches or cable yarding systems. These two yarding methods involve pulling or lifting the log with a cable from the place where it was felled to the yard. On sensitive or inaccessible terrain, it is a common practice to use helicopters to carry logs to the yard or landing. A **prehauler** or **forwarder** is a machine equipped with a grappler or knuckleboom loader used at the landing. Its best use is to pick up logs for the purpose of sorting, stacking or loading them for transport.

Most logs are scaled at the landing or at the mill before they are processed. When logs

are felled by different workers, it is a common practice to stack the logs in individual piles. This makes it possible for a logging contractor to pay individual workers according to the amount of timber they cut. Most logging contractors pay their workers according to the amount of timber product they deliver. This creates incentive for workers to work quickly, safely and efficiently. Safety is a key factor in efficiency in the forest because no money is earned by workers who are injured so badly that they cannot work.

In instances where trees are to be used for pulpwood, they are usually debarked and chipped in the forest. Where whole tree chipping operations are practiced, the entire tree may be chipped for biomass or pulpwood, and the chips are usually transported to pulpmills or generating plants in large transport vans.

The basic operations outlined here may be performed in a different order, or modified in any logging operation.

## ROAD CONSTRUCTION

Logs are usually transported by truck, although railroad cars may be used once the logs are out of the woods. It is sometimes cost effective to use the railroad for long transports while reserving trucks for short hauls. The advantage of using trucks to haul timber products is that they are very adaptable to different transportation needs, such as hauling logs or hauling chips. They can also be readily maneuvered to logging sites.

One of the biggest environmental problems associated with timber harvests is the construction of logging roads to gain access to the harvest area. Road construction is a major part of many logging operations. It must be done properly, especially in mountain areas,

to avoid serious **siltation** problems in streams caused by silt particles settling out of runoff water. Silt contamination destroys fish habitat and fills lakes and reservoirs with soil. Many problems of this nature can be avoided when logging roads are constructed to channel excess water into areas where the rate of flow is slowed down enough to allow silt particles to settle out. When this is done, damage from siltation is greatly reduced.

Other logging activities that contribute to silt contamination of surface water include skidding and yarding of logs. All of these activities expose soil directly to rainfall, and they cause the soil to become highly susceptible to erosion.

## SALVAGE LOGGING

Salvage logging is an emergency harvest practice when large numbers of trees are killed by insects, diseases, fire or other natural disasters. A standing tree that died before it is harvested is called **deadwood**. It still contains good lumber, but wood quality begins to decline rapidly if the tree is not harvested within two or three years. The actual length of time that can elapse before deadwood is harvested depends on the tree

species. Deadwood begins to dry out after a few months, and the wood in the center of a log does not become dry as quickly as the outer layers of wood. This often causes the surface of the log to crack as the outer shell shrinks.

Trees blown down by wind bursts must be harvested soon afterwards to avoid damage to the wood caused by a combination of soil

moisture, molds and mildews. Insect damage sometimes extends deep into the heartwood of a tree. Some insects continue to damage the tree even after it has died. It is important to perform salvage logging operations within a few months to preserve the quality of the wood.

Timber killed by fire often remains standing for an extended time. In many instances, the soil is very fragile following a fire, and special

measures must be taken during the harvest operation to avoid causing serious damage to the soil. In some instances, salvage logging operations are conducted by cutting damaged trees with chainsaws, and using helicopters or even balloons to carry logs to landings. This is done by fastening a steel cable called a **choker** around the log to cable it to be lifted to a landing where it is loaded on a truck or train to transport it to the mill.

## MINIMIZING LITIGATION

**Litigation** is the act of filing a lawsuit with a court. Legal actions filed with the courts to prevent logging operations have become favorite tools of some special interest groups of people. Many timber sales proposed on public lands must be defended in court before the sale can proceed. Care must be exercised by agencies to anticipate legal issues

during the harvest planning period, and the issues must be dealt with as part of the environmental impact statement. Anticipating legal arguments allows the U. S. Forest Service and other public agencies to deal with potential legal issues by gathering data before the timber sale is advertised.

## CAREER OPTION: LITIGATION SPECIALIST

The U. S. Forest Service and other state and federal agencies depend upon people well educated in the legal issues affecting forests and natural resources to research and defend the agency against lawsuits and to bring court action against people who violate laws. A license to practice law is required of those

who defend or prosecute cases in court. Some litigation specialists work as researchers and are not lawyers; however, a law degree and a license to practice law are generally considered to be prerequisites for this career.

## LOOKING BACK

Harvest management of forest lands is influenced by public pressures in the form of legislation, occupational safety rules, environmental impact studies, and forest regulations. Each of these influences has changed harvesting practices on both private and public lands. All of these influences have caused the planning component to be one of the most important steps in a timber harvest. A decision to harvest a stand of timber is based on the maturity and health of the trees, and the method of harvest depends upon the findings of an environmental impact study and whether an even-aged or uneven-aged forest is planned. Clearcutting, seed-tree and shelterwood methods of timber harvesting lead to the growth of even-aged stands. Selection cutting is used where uneven-aged stands are desired.

Sustained yield is an important concept in harvest management, meaning that the amount of timber harvested cannot exceed the amount of forest growth that occurs without depleting timber resources. The EPA is a federal agency charged with making sure environmental impact studies are conducted appropriately and filed before timber harvests are conducted. Trees are harvested using both mechanical methods and human labor. Trees are felled, limbed, gathered, loaded and hauled as part of the harvesting process. Road construction is done in such a manner that soil erosion will be minimized to protect surface water from silt contamination. Legal issues must be anticipated and steps must be taken during the planning process to resolve potential legal problems.

## QUESTIONS FOR DISCUSSION AND REVIEW

### Essay Questions

1. Name some factors that influence decisions affecting timber harvests.
2. What are the key components in a timber harvest plan?
3. List some timber harvest methods that lead to the regeneration of even-aged forests and uneven-aged forests.
4. How is the seed-tree harvest method different from the shelterwood harvest method?
5. How is the selective harvest method applied in a forest?
6. Explain how forest managers determine the amount of timber that should be harvested to establish and maintain a sustained yield.
7. Why do you think Congress passed the National Environmental Policy Act requiring environmental impact statements to be filed as part of timber harvest plans?
8. List the main steps involved in harvesting timber, and explain how each step is performed.
9. What effect does the construction of roads for timber harvests sometimes have on the quality of surface water?
10. What are the positive and negative effects of the forest management practice known as salvage logging?
11. What kinds of data do forest managers include in timber harvest plans to minimize the potential for litigation in the court system?

### Multiple Choice Questions

1. The greatest losses of wood in a forest past maturity is due to:
  - a. decay
  - b. flooding
  - c. fire
  - d. insects
2. Which of the following timber harvest methods results in an uneven-aged forest?
  - a. coppice method
  - b. seed-tree method
  - c. selection cutting method
  - d. shelterwood method
3. The timber harvest method that removes all trees from the harvest area is the:
  - a. seed-tree method
  - b. shelterwood method
  - c. selection cutting method
  - d. clearcutting method
4. A timber harvest method in which enough mature trees are saved in the harvest area to provide shade on the forest floor is called the:
  - a. shelterwood method
  - b. seed-tree method
  - c. coppice method
  - d. selection cutting method
5. A type of forest regeneration in which the new generation of trees arises from the stumps of the harvested trees is the:
  - a. seed-tree method
  - b. coppice method
  - c. selection cutting method
  - d. shelterwood method
6. The responsibility to enforce timber harvest regulations requiring environmental impact studies is a duty of a government agency known as:
  - a. EPA
  - b. BLM
  - c. USFS
  - d. EPA

7. A problem associated with logging activities such as log skidding and road construction resulting in contamination of surface water is known as:
  - a. bucking
  - b. siltation
  - c. scaling
  - d. skidding
8. A timber harvest practice in which logs are cut into marketable lengths is called:
  - a. bucking
  - b. siltation
  - c. scaling
  - d. skidding
9. A timber harvest operation in which entire trees are processed in the forest to produce biomass is called:
  - a. debarking
  - b. bucking
  - c. chipping
  - d. chaining
10. A type of timber harvest initiated due to timber damage caused by insects, fire or other natural disasters is called:
  - a. selection cutting
  - b. salvage logging
  - c. coppice harvesting
  - d. damage control

### LEARNING ACTIVITIES

1. Invite a forest owner or a representative from the Forest Service to make an illustrated presentation and lead a class discussion on forest harvesting practices. He or she might be asked to bring some examples of old saws and harvesting equipment along with some modern harvesting tools and equipment. Discuss the following points and any others that might be important in your region of North America:
  - changes in timber harvest practices
  - changes in forest species in a particular forest
  - harvest issues that often lead to litigation
  - laws and regulations and their effects on timber harvesting
2. Make two identical models of a watershed using real soil in a shallow tray. Design it in such a way that it can be tilted to different slopes. Design a water distribution system to be placed at the top of the model and a water collection system to be placed at the lower end of the model. Place a mulch of leaves and plant material on the soil surface and apply an adequate amount of water through the distribution system to cause water to flow into the collection system. The amount of water used and the rate of flow must always be the same with both experimental models. Collect all of the runoff water and strain it through a filter to collect any silt that it may contain. Dry the filter and compare its weight with that of a dry, clean filter. Repeat the experiment using the second model with the only difference being that no plant cover is used on the second model. Compare the results. Repeat the experiment changing only the slope of the model watershed. Compare results for plant cover versus no plant cover and for differences in slope. Exhibit the model and report your results in a science fair.