

SILVICULTURE

Overview

Forests are managed for many different benefits to either a landowner or to the public at large. In this class, students will learn the ways in which a forest is managed so that it remains healthy and productive, and so that it satisfies the goals of its owners.



Background

Forests are capable of producing a variety of values such as wood, clean water, clean air, wildlife habitat, recreation and aesthetic beauty. Forest stands, however, must be managed to maximize these benefits. Without management, trees often become damaged or stunted by overcrowding, disease, exposure to wind and rain and competition for light and nutrients.

Modern management of forest stands is called *silviculture*. Silviculture is the art and science of producing and tending a forest; the application of forest ecology and economics in the treatment of a forest; and the theory and practice of controlling forest establishment, composition and growth. Through silviculture, we get healthy, growing trees that not only produce more wood products, but do a better job for the environment than older trees whose growth has slowed.

In practice, silviculture includes the various treatments that may be applied to maintain and enhance utility for any purpose. Through harvesting, cutting, thinning, prescribed burning and various other methods, the variety and age of tree species within a forest, the density of trees, the arrangement of different layers, and lighting and shading can be manipulated. It is important to remember that these management techniques not only affect the present forest, but also influence its future characteristics.

It is the goal of the forester to create and maintain the kind of forest that will best fulfill the objectives of the owner. Nonindustrial landowners may be interested in hunting and want to maintain habitat for deer, quail and rabbits, or they may want to generate enough income from the land to pay for retirement or to send their children to college. Industrial landowners may be interested in maximizing timber

production, while government owned lands may be managed for multiple uses such as timber production, recreation and scenic beauty. When making management decisions, foresters must consider the costs and benefits of each option in relation to the landowner's overall goals. They then analyze the natural and economic factors that influence each stand, and then prescribe and conduct the most appropriate treatments.

Vocabulary

- **Artificial Regeneration:** The growth of new trees through seeding and planting.
- **Clearcutting:** A harvesting and regeneration method that removes all trees within a given area. Most commonly used in pine and hardwood forests that require full sunlight to regenerate and grow efficiently.
- **Increment Borer:** A hollow auger-like tool with a screw bit used to remove core samples from trees.
- **Natural Regeneration:** The growth of new trees from seeds carried by wind or animals or stored on sight, or from stumps without human assistance.
- **Plant Succession:** The progression of plant species from bare ground to mature forest.
- **Prescribed Burning:** The practice of using regulated fires to reduce or eliminate material on the forest floor for seedbed preparation or to control competing vegetation; simulates one of the most common natural disturbances.
- **Silviculture:** The art, science and practice of establishing, tending and reproducing forest stands of desired characteristics. It is based on knowledge of species' characteristics and environmental requirements.
- **Stand:** A group of trees that are sufficiently the same in species composition, arrangement of age classes and condition so that they can

Subjects

Math, science, social studies

Concepts

Ecosystems change over time through patterns of growth and succession. These patterns are affected by phenomena such as disease, insects, fire, weather and human intervention.

Organisms adapt to changes in the environment according to the genetic and behavioral capacity of their species.

Resource management and technological systems can help societies meet, within limits, the needs of a growing human population.

Altering the environment affects all life forms, including humans, and the interrelationships that link them.

Resource management technologies interact and influence environmental quality; the acquisition, extraction and transportation of natural resources; all life forms; and each other.

Objectives

Students will: (1) learn the characteristics of stands of trees, (2) prescribe forest practices for a stand based on observed and measured information, goals of ownership, income and costs, and (3) experience the analysis and decision making that go into managing forest land.

Materials Needed

- A 4-5-acre, even-aged stand (either old field or site prepared) if possible
- 1 increment borer for every 8-10 students
- 1 diameter tape for every 8-10 students
- 1 loblolly pine seedling per student
- 1 dibble for every 3 students

Time Required

In preparing for the class, allow time to gather materials needed.
Class can be taught in 1 hour.

be managed as a unit.

- **Thinning:** A tree removal practice that reduces tree density and competition between trees in a stand. Thinning concentrates growth on fewer, high-quality trees, provides periodic income and generally enhances tree vigor. Heavy thinning can benefit wildlife through the increased growth of ground vegetation.

Doing the Activity

1. Ask the students to name the major components of a forest and then review with them the general parts of a tree.

2. Introduce the activity by defining silviculture. Review the definition of a tree stand. Stress to the students that silvicultural practices affect all parts of the forest, not just trees. Have the students brainstorm about why we might manage a forest.

3. Next ask the students to tell you some of the benefits that we get from a forest (wood, clean air, clean water, wildlife, recreation, scenic beauty) and review the impact of silvicultural practices on these benefits.

4. Explain the purpose and use of an increment borer. Tell them that although the most reliable ring counts are made on complete cross sections, the same information can be found from the borer as from a cross-section, without destroying the tree. Explain and review the three things you can learn from looking at a core of wood: age (number of rings), growth rate (spacing between rings) and health of tree (condition of wood).

5. Divide the students into 4 groups, select students to be the manager for each group and assign each to represent either a park ranger, an industrial forester, a U.S. Forest Service forester or a consulting forester for a private landowner. Ask the groups to discuss, from their assigned perspectives, the benefits of the forest and determine what their primary product might be.

Discuss the following questions:

- What would be the primary interest of each of our “managers”?
- How might the forest management practices change depending on the goals of management?
- Why would an industrial forester be interested primarily in wood production? What would be the most important goal of the park ranger?

6. Divide the students into groups, with either the lead teacher or an assistant teacher for each group, and examine the stand that you selected prior to class. Show them how to bore a tree with the increment borer. Have them look at a core and, with your assistance, determine the age and growth rate and whether the tree has diseases.

7. Next, choose several trees, including some large and some small ones. Have each group bore a tree, measure the diameter, count the rings and compute the growth rate.

8. Ask the students if they see a pattern. Have them identify which trees are oldest, which trees are fastest growing, which trees tend to die out on their own. Also explain how this gives the best trees more sunlight, water, nutrients and room to grow. Introduce thinning as a method to speed up this natural process.

9. Introduce the idea of succession. Ask the students to tell you what must have been on the land prior to the stand. In many cases this will be old field or pasture, though occasionally a cutover. Explain how they can tell this by the age of the trees and other observations.

10. Discuss ways stands are reproduced through natural and artificial regeneration. Have the students explain how stands come to be established through seeding, planting, natural regeneration and sprouting. Discuss the pros and cons of each method (control of species and genetics, control of timing and control of spacing). Ask what would have to happen for a particular stand to be reproduced. Introduce the concept of forest disturbances and their role in succession. Have the students name several natural disturbances such as fire, flood, hurricane, etc. Introduce the concept of clearcutting and prescribed burning as ways to imitate natural disturbances to reproduce the stand. Discuss the pros and cons of each method.

11. Introduce the dibble. Show the students the proper way to plant a tree using a dibble. Let each student plant a tree.

Helpful Hints

- Try to get through the concepts as quickly as possible.
- Let the students ask questions, but make them think through the answers on their own.
- Don't allow more than 10 minutes for tree planting. They'll love it at first but quickly tire of it.

