IDAHO STATE FORESTRY CONTEST

CHAPTER 9 - SILVICULTURE[1]

Silviculture, according to the Society of American Foresters dictionary, is "The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet diverse needs and values of landowners and society on a sustainable basis."

Foresters practice silviculture to improve tree growth, forest health, timber quality, economic return and other values over the long term. The primary silvicultural tool for managing forests is cutting trees, whether through a **stand regeneration cut**, where trees are left as seed sources or where seedlings are planted afterward, or a **thinning**, where trees are cut to make more room for the remaining trees. A thinning may be **commercial**, where logs are taken to the mill, or "**precommercial**" where sapling trees are cut.

If silvicultural treatments are done properly, they can:

- Reduce insect, disease and other forest health problems
- Improve the genetic quality of natural regeneration
- Shorten the time until next harvest
- Produce higher value trees in the next harvest
- Improve wildlife habitat and other forest values

In planning a stand regeneration cut or thinning, people sometimes focus mainly on the dollar value of the trees removed but to plan for the future forest, the quality of trees left in the stand must be the foremost consideration. The choice of individual **leave trees** depends somewhat on the desired spacing and which species are best adapted to the site. However, many other factors must also be considered, including the following:

Forest Genetics

Choosing high quality leave trees is critical to the future health and quality of a forest stand. Foresters use three guiding principles to select the best quality leave trees:

1. Trees that will be structurally stronger and produce the highest quality of wood before the next harvest
2. Trees that will produce the most wood before the next harvest
3. Trees that will pass on desirable genetic characteristics to their offspring (naturally regenerating seedlings)

1 Adapted from Leave Tree Selection, by Chris Schnepf, Area Extension Forester, University of Idaho Extension

Successive partial harvests made without considering leave tree quality often erode the genetic quality of forest trees.

Trees are distinguished by their **genotype** (their "DNA") and their **phenotype** (the combined expression of genotype and environment, which results in a tree's observable characteristics). It is often difficult to determine whether a tree's characteristics are due to genotype or environment. For example, a tree may have a forked top because of genetics or porcupines, or both.

We can only choose leave trees on the basis of what we can see – their phenotype. It doesn't necessarily matter whether the characteristics are primarily due to environment or to genotype. Even if a tree has poor characteristics due primarily to its environment, we would want cut it to create more space to allow the growth of adjacent superior trees to increase.

Tree Health

Many insects, diseases and animals can damage trees. Most are a natural part of the forest, at least to some degree, but sometimes these organisms damage more trees than we would like.

Unfortunately, we have often inadvertently created a favorable environment for these damaging organisms that allows them to increase in population beyond normal levels. For example, forest fire *exclusion* is one of the primary underlying causes of forest insect and disease epidemics. This is because ground fires tend to kill understory tree species that are susceptible to these damaging organisms. Stand replacing fires also help to regenerate species that are more resistant to insects and disease.

Removing trees with evidence of insect or disease damage can sometimes help to "disinfect" a forest by reducing the abundance of a detrimental organism (such as dwarf mistletoe). Even if harvesting is unlikely to reduce infection or infestation, removing damaged trees creates more growing space for the healthier, more desirable trees. Also, since we are leaving trees which were not as affected by damaging organisms, we may be promoting genetically inherited pest resistance.

Trees with these problems should be selected to remove:

- Witches brooms from dwarf mistletoe
- Conks, seams and other evidence of stem decay fungi
- Tops broken by porcupines, wind or other causes
- Excessive bark scarring or other mechanical damage
- Thin crowns, flat tops or other indicators of poor growth and vigor

Growth Rate

Leaving high quality trees (relative to phenotype) in a forest stand will provide for the best growth rates and quality possible and higher value timber for future harvests. These trees will also pass on their desirable *inherited* traits to their seedling offspring.

To pick the most robust leave trees, you should favor trees with:

- **40-60% crown ratio** – The crown ratio is the portion of the tree with living branches. A 50% crown ratio means that fifty percent of the tree's total height has living branches coming from it. Trees with smaller crowns are less able to take advantage of the growing space provided in thinnings.

- **Healthy foliage** – Leave trees should have abundant needles with good color in their needles.

- **Long leader or internodes** – Every year, pines and fir grow a new set of horizontal branches called a **whorl**. The places these branches emanate from are called **nodes**, and the distance between them is referred to an **internode**. An internode usually represents one year of height growth. Longer internodes indicate better height growth.

- **Pointy tops** – If you can see the top of the tree, is it "pointy" or rounded in shape? Trees with pointy tops are generally more actively growing in height. As a conifer gets older, height growth slows and the top becomes rounded or flat.

- **Bark characteristics** – Tree diameter does not necessarily indicate age. A small diameter tree with bark that looks like one of its 100+ year old cousins is likely to be a slow-growing tree. For example, old ponderosa pine bark is platy and yellow, while younger ponderosa bark tends to be black.

Growth Quality

Favoring trees with better form promotes a higher return for the next harvest, because logs will have more merchantable volume. These trees also pass on these characteristics (to the degree that they were inherited) to the new tree seedlings (their offspring).

Favor trees with the following growth form characteristics[2]:

BRANCHES	BOLE (TRUNK)
Medium sized	Straight
Not too dense (broomed) or thin crown	No forks
Not too heavy branching (e.g. open grown)	No crook
No ramicorn branching	No sweep
No sharp branch angles	No major doglegs

[2] **Adapted from Plus Tree Selection Guidelines, provided by Lauren Fins, Inland Empire Tree Improvement Cooperative**

Instructor's Guide: Practicing Silviculture for the Forestry Contest

Foresters use an almost artistic weighing of all the criteria given above when choosing leave trees. They make thousands of side-by-side comparisons between adjacent trees to decide which trees best satisfy the most critical criteria for the site.

Use the booklet *Logging Selectively* by Chris Schnepf (publication PNW 534) as a supplemental reference for this section of the contest manual. A companion video titled "I want to log selectively" is also available for checkout from UI Extension Offices, IDL Offices, or purchase from the University of Idaho Educational Communications.

The following exercise provides contestants a good opportunity to practice evaluating and rating four trees of varying quality (based *only* on form, not defect). The instructor chooses and flags out sets of four trees that:

- *Are visible from one location*

- *Are all the same species*
  At first, rating criteria should be limited to individual tree characteristics, rather than site or stand characteristics. For advanced groups, multiple tree species may be chosen to integrate species site adaptation into this exercise.

- *Are all the same age class*
  The purpose of limiting practice to even-aged stands is to help contestants to focus on individual characteristics of trees that have been competing in an even-aged stand. Many forest stands in Idaho are even-aged, having regenerated after fires. [**Note:** As an enrichment activity for advanced groups, stands with multiple age-classes could be selected, and the relative ability of different species to "release", given their silvics and the site, etc., could be discussed. However, this level is beyond the scope of the Forestry Contest]

- *Provide a diversity of individual tree characteristics to consider* based on all criteria discussed in this chapter. Try to include a range of tree quality in each set. Consider flagging a number of different sets of trees to allow for practice on specific characteristics, especially those that may be difficult to understand. For example, one set could be composed of relatively equal, high quality trees except for a degree of sweep or some other individual characteristic.

Rank the four trees in a set from "best" to "worst" **leave** trees, then discuss together why some trees are better than others.