Silvicultural Terminology

Each silvicultural term usually covers a variety of specific treatments. Further evolution of terminology may be necessary to describe treatments of complex stands, especially those containing many species.

The terms are passive descriptors and not active dictators of treatment. No one treatment can be regarded as having an ideal preordained form akin to the school figures of figure-skating. The clarity of these terms has also been corrupted by slovenly usage both inside and outside the profession. Many terms have been borrowed from German words and translated into vernacular English words with meanings broader than the technical ones.

When silvicultural terms are used in specific cases, precision of technical meaning can be gained by adding modifying words. This is especially desirable if a term describes a routine of treatment prescribed for a given set of circumstances. For example, "Pearson improvement selection cutting" defines a specific set of procedures for ponderosa pine silviculture different from several others.

Standardized definition of the terms can be found in the English-language version of *Terminology of Forest Science, Technology, Practice, and Products* edited by F. C. Ford-Robertson and published by the Society of American Foresters in 1971. The reader is directed to this reference for a complete lexicon. Following is a commentary on some of this terminology designed to clarify and reduce confusion.

A *silvicultural system* is a program of treatments for a whole rotation. It is a terminological device that helps insure some uniformity and long-term continuity of treatment. Attention is focused on the crucial step of stand regeneration by *naming the silvicultural system the same as the method of regeneration cutting* by which the stand is replaced.

SILVICULTURAL SYSTEMS AND REGENERATION METHODS.

1. *High-forest systems*—producing stands originating from seed. The regeneration comes from sexual reproduction by the parent trees whether it be from natural seeding (including the release or even the sprouting of preestablished advance growth), artificial seeding, or planting.
   a. *Even-aged systems*—stands consist of trees of the same or nearly the same age. Arbitrarily, a stand is even-aged if the range of tree age does not exceed 20% of the rotation length. Age is usually measured from the time the trees are first open to the sky and thus able to grow in height without restriction.
      (i) *Clearcutting method*—removal of entire stand in one cutting, reproduction obtained artificially, or by natural seeding from adjacent stands, or from trees cut in the clearing operation. In the silvicultural sense, it usually refers to regeneration operations in which virtually all woody vegetation is removed from the site preparatory to establishment of new trees. Sometimes the terms "clearfelling" or "silvicultural clear-cutting" are used to insure this particular meaning. Unfortunately, "clear-cutting" has also been commonly used to describe cutting operations in which only the utilizable trees are cut. If residual trees remain, such cutting can usually be described as a crude variant of one of several different kinds of partial cutting, including thinning. Such terms as "high-grading" or "economic clear-cutting" are often appropriate to these variants.
      (ii) *Seed-tree method*—removal of old stand in one cutting, except for a small number of trees left singly, in small groups, or narrow strips, as a source of seed for natural regeneration. Distinguished from shelterwood cutting by the fact that the seed trees do not cover enough ground to provide any significant shelter to the new trees—a matter that depends more on the width of the crowns of the seed trees than upon their number. This method is sometimes viewed merely as a variant of clear-cutting.

(iii) *Shelterwood method*—establishment of a new, essentially even-aged, stand from the release, typically in a series of cuttings, of new trees started under the old stand. The essential characteristic is that the new stand is established naturally or artificially before the last of the old one is removed. In its most intensive development, the shelterwood method may involve a series of three different kinds of cutting: (a) a *preparatory cutting* designed to foster the potential seed producers or speed decomposition of litter; (b) a *seed cutting* which is the true regeneration cutting and is aimed at getting the new crop established; and (c) one or more *removal cuttings* to release the newly established crop or to harvest the remaining old trees.

Regeneration by the release of natural advance growth is sometimes regarded as a form of "clear-cutting" but the terms "one-cut shelterwood" or "overstory removal" are less ambiguous and preferable because they focus attention on the nature of the source of regeneration.

There are often reasons to delay removal of the overstory, such as the provision of longer protection to the new crop or the gaining of additional growth on the overwood trees. If this sort of delay induces irregularity in height growth of the new stand, the variant is called *irregular shelterwood cutting*. This regeneration procedure may have some of the attributes of selection management, but differs in that the new stand is essentially even-aged. Also, *shelterwood* cutting can be laid out *uniformly* throughout a stand, or in *groups* or *strips* which are rather quickly extended through the whole stand.

b. *Uneven-aged systems*—the stands created or maintained include three or more distinctly different age classes. Stands with two age classes are ordinarily not regarded as uneven-aged because the condition tends to be a temporary one likely to be identifiable with the shelterwood or seed tree methods. Since virtually all trees regenerate after some sort of disturbance and grow in even-aged aggregations most of their lives, the concept of the uneven-aged stand is really a device of convenience for administrative and scientific purposes.

The definition of "stand" becomes a crucial but elusive consideration in determining how large an *even-aged aggregation* should be before it is called a separate stand. This semantic dilemma can be solved by setting the minimum size of an even-aged stand equal to the minimum mapping unit on forest maps used in administration. A given forest might have many even-aged stands if set up for intensive management, or a few large uneven-aged stands if it is not feasible to designate small stands.

(i) *Selection method*—any high-forest or system designed to create or maintain uneven-aged stands. Such systems usually remove old trees in *groups* or in *strips* wide enough to allow new trees to start and remain free to grow in height. It can also be done by removing large individuals in the *single-tree selection method*. In the latter cases, success usually depends on progressively enlarging the openings through subsequent cuttings. Under the selection system, the stand always has some relatively old trees. New regeneration is established by periodic partial cuttings. The method requires regular entries into the indefinite future. Some of the cuttings may be intermediate in immature age classes rather than true regeneration cuttings.

The arrangement of age classes in the selection method may be such that the stand becomes a self-contained sustained-yield unit; yet, it does not have to be, provided that at least three distinct age classes are maintained. One practical way of developing the stand as a kind of sustained-yield unit is to cut so that the distribution of diameter conforms to some predetermined *J*-shaped curve. However, it should be noted that this kind of diameter-distribution curve applies only if the trees are all of the same species. Similar diameter distributions can be found in some even-aged, mixed stands.

It must be stressed that "selective cutting" is a term so corrupted in use that is has become a descriptor of any sort of partial cutting. It is *not* a technical forestry term.

Some forms of selection management include one of the attributes of shelterwood cutting, especially irregular shelterwood cutting, in that advance-growth regeneration is established in parts of the stand. Also, the tendency of any small even-aged group to expand when adjacent groups are harvested may confuse even the trained observer.

Consider the uneven-aged stand as being a simple collection of minute even-aged units too small for administrative delineation. The best standard is the requirement that selection cutting be that which maintains or creates stands that have three or more classes. For administrative convenience, it is probably best to assign borderline cases to the even-aged condition.

2. *Coppice or low-forest systems*—producing stands originating from vegetative sprouting by the trees that are harvested (stump sprouts, root suckers, and naturally rooted layers). Coppicing usually involves short rotations with dense stands of short trees. In *simple coppice cutting*, the stands are kept almost perfectly even-aged. The term *coppice with standards* applies to schemes in which scattered trees, the *standards*, are left to grow through two or more coppice rotations. Sometimes the standards may be chosen from stems that originate from seeds. The term *coppice selection* applies to schemes in which stands of vegetative origin are treated so that they have three or more age classes.

INTERMEDIATE CUTTINGS. *Intermediate cuttings* are treatments conducted to modify or guide the development of an existing crop of trees, but not to replace it with a new one. They involve the selective removal of some vegetation to allow the expansion of the crowns and root systems of remaining plants. Vacancies created in the growing space are not large or permanent enough to allow height growth of any new trees that become established because of the treatments. Since the treatments do not always include harvesting, the British term, *tending*, may be more precise. The common American term, *timber stand improvement*, or simply *stand improvement*, unambiguously covers all intermediate cuttings or tending operations that require financial investment and do not involve harvest of useful material. *Intermediate cuttings*, as a more general category, may involve harvests.

1. *Release cutting* includes all operations designed to regulate the species composition or improve the growth of very young stands, ordinarily those not past the sapling stage. When the trees removed are of the same age as those favored, it is called *cleaning*, when the trees removed are older than those released, the term *liberation cutting*, applies. The term *weeding*, is usually reserved for *cleanings* that are so intensive that virtually all undesirable species are removed.
2. *Improvement cutting* is an imprecise term for partial, nonregenerative cuttings in stands older than the sapling stage. They might ideally have been done as release cuttings when the desirable trees were in the seedling or sapling stage. Most improvement cuttings are done in mixed stands that are being put under silvicultural management for the first time and are quite similar to *thinnings*. In fact, the same kind of cutting applied to a pure, even-aged aggregation of trees would clearly be a *thinning*, often a *selection thinning*.
3. *Thinnings* are partial cuttings in even-aged aggregations of trees. They are designed to improve future growth by regulating stand density. Sometimes they harvest production that might otherwise be lost to suppression of trees. Thinnings can be classified in two different ways. In *commercial thinnings*, some or all of the wood harvested is put to use. Thinnings without utilization are *precommerical*. Thinnings are also grouped according to the crown classes of trees removed and reserved within the canopy stratum being thinned.

a. *Low thinning* is the practice of imitating or accelerating natural suppression losses by harvesting trees of the lower-crown classes and leaving those of the upper classes. The heavier the thinning, the higher the removals progress into intermediate and codominant crown classes.

b. *Crown thinning* is the direct stimulation of crowns of the dominant trees. Codominant trees are removed. Overtopped and intermediate trees are left to die to be removed in subsequent thinnings. *Crown thinning* has sometimes incorrectly been called "thinning from above," but this is too easily confused with *selection thinning.*

c. *Selection thinning* is that in which dominant (and sometimes some codominant) trees are removed. Trees of lower-crown classes remain. Often the purpose is removal of malformed or otherwise undesirable dominants. Sometimes it is to limit the harvest to the larger and more valuable trees; which may or may not constitute "high-grading," depending on judgements about subsequent stand development.

d. *Geometric* or *mechanical thinning* is the removal of some trees to leave others in a predetermined spacing or pattern such as strips and groups. Mechanical might also be misconstrued as "thinning done with machines." *Row thinning* is a special kind of *geometric thinning* in which whole rows of planted trees are removed.

e. Any single thinning operation which is a mixture of two or more of the four foregoing kinds of thinning, without any one predominating, is best called a *free thinning,* that is free of restriction to any one method. If the thinning method is changed from place to place in the same stand, the overall thinning program is *not* free thinning.

4. *Salvage cutting* is the harvest of dead, dying, damaged, or deteriorating trees primarily to put the wood to use before it becomes worthless.

5. *Sanitation cutting* is the removal of the same kind of trees, as well as those susceptible to attack, but for the purpose of reducing the spread of biotic pests.

Salvage and *sanitation cuttings* are likely to resemble one or more forms of *regeneration* or *intermediate cutting.* They may differ only in their intent or purposes rather than the resulting development of the remaining vegetation. If the agent leading to death or damage is merely suppression by overtopping trees, the removal of the trees involved is best regarded as low thinning.

SOURCES OF SILVICULTURAL INFORMATION. The list of references at the end of this section should be consulted for current textbooks and major technical reports. Many publications of importance to regional forest types and sites are available from USDA Forest Service Experiment Stations in St. Paul, Minnesota; Asheville, North Carolina; New Orleans, Louisiana; Fort Collins, Colorado; Berkeley, California; Portland, Oregon; and Ogden, Utah. Agricultural Experiment Stations and many colleges and universities also publish helpful bulletins.

Forest Science, *Journal of Forestry*, and *Southern Journal of Applied Forestry* all publish articles of silvicultural importance. *Forestry Abstracts*, published by the Commonwealth Forestry Bureau, Oxford, England, may be consulted when it is necessary to search the entire forestry literature for solution to special problems. Remember, ecological equivalents of most tree species and cover types exist and are successfully managed in other parts of the world.