Uneven-Aged Silvicultural Systems

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In the current wave of public concern about clearcutting, the selection method of uneven-aged silviculture has been consistently advocated as an alternative. Its advantages over clearcutting include improved cash flow, production of high-quality sawtimber and better aesthetics. As a result, many foresters with little or no education or experience in uneven-aged silviculture have been eagerly imposing the selection method in forest stands across the nation. However, in many cases the stands are really being managed by uninformed, mistaken or wishful intent rather than by strict attention to acknowledged uneven-aged standards.

Uneven-aged silviculture can be misapplied in two ways. The first is when a supposedly uneven-aged system is really even-aged. This has serious implications for National Forest management planning, where fundamental decisions are based on whether a stand is even-aged or uneven-aged. The second, which has greater implications for consulting foresters, is that a so-called uneven-aged system is really "selective cutting" or "high-grading" — the exploitive harvest of the best trees in the stand for short-term gain at the sacrifice of long-term yield potential. This is a hidden dilemma, because the failure of selective cutting may not become apparent for several decades.

Uneven-aged silviculture has been successfully conducted in many forest types in the United States. Foremost among the successes have been northern hardwoods, ponderosa pine, mixed intermountain conifers, and southern pines, including loblolly pine, shortleaf pine and longleaf pine. Based on these reports and other experiences, the following guidelines were developed to help foresters distinguish between even-aged and uneven-aged silviculture in a given stand.

Cutting Cycle Versus Rotation

Even-aged silviculture is based on the rotation, defined as the length of time between stand regeneration and final harvest. Treatments such as site preparation, release, thinning and harvest cutting occur over the entire stand, usually one at a time, during the rotation. Conversely, uneven-aged silviculture is based on the cutting cycle, defined as the number of years between successive cuttings in the stand. The cutting cycle is usually constant from one cycle to the next, but can be adjusted a year or two to take advantage of market variability or changes in stumpage price. Within any single cutting cycle in the uneven-aged stand, all the silvicultural treatments found through the even-aged rotation can be imposed, but only in those portions of the stand where the treatment is needed.

Three or More Age Classes Versus One or Two Age Classes

In even-aged stands, trees of the desired species are the same age or age class; the difference in age between the oldest and youngest tree within a given age class can be no more than 20 percent of the rotation age. Silviculturists allow for at most two age classes in an even-aged stand to encompass a seedbearing and/or sheltering overstory. In uneven-aged stands, trees of the desired species occur in three or more distinct age classes. But after establishing that three age classes exist, the age distribution of the trees in an uneven-aged stand is much less important than the distribution of diameter classes.

Reverse J-Shaped Curve Versus Bell-Shaped Curve

The diameter distribution of the desired species in an even-aged stand is a normal or bell-shaped curve. The diameter distribution of the desired species in an uneven-aged stand is typically some form of reverse J-shaped or negative exponential curve, in which the number of small trees per acre is greater than the number of large trees. The general structure of an uneven-aged stand can be imagined as the combination of bell-shaped curves from a series of even-aged stands from a fully-regulated forest.

Multiple Crown Layers Versus Single Crown Layer

The crown profile of the desired species in an even-aged stand is a single upper layer in the canopy, or at most two distinct layers in stands that have two age classes. But the crown profile of the desired species in an uneven-aged stand contains tree crowns in many layers of the canopy. While many even-aged stands develop a prominent understory composed of undesirable species, such stands should not be confused with uneven-aged stands. The crown profile must contain the proper distribution of size classes for the desired species in an uneven-aged stand.

Gap-Phase Minor Disturbance Versus Stand-Level Major Disturbance

Regeneration in even-aged stands mimics that which occurs following a catastrophic ecological event that removes most, if not all, of the previous stand. The species that colonize this early-successional
Treatment of Subunits within the Stand Versus the Stand as a Whole

In even-aged stands, a typical treatment, whether it be regeneration, site preparation, intermediate treatment or reproduction cutting, usually is applied to the entire area at an appropriate time during the rotation. Conversely, in uneven-aged stands a typical treatment is conducted as a component of the cutting-cycle harvest, occurring only within distinct subunits of the stand. However, the full variety of silvicultural practices—regeneration, site preparation, intermediate treatment and reproduction cutting—are commonly conducted somewhere on subunits within each uneven-aged stand during every cutting cycle.

Cut the Worst Trees and Leave the Best, Versus Vice Versa

An essential feature of the selection method is to employ a proper procedure whereby trees in all diameter classes are eligible to be considered crop trees, and conversely, trees of all diameter classes are considered for harvest. To qualify as legitimate uneven-aged practice, some discrimination among the immature trees must occur, such that the poorest are harvested during the cutting cycle operations and the best are retained. The best and largest trees are only cut when trees with better growth potential can replace them—whether the replacements are small sawlogs, pulpwood or regeneration. Carelessly cutting only the best trees is a quick way to deplete the future productive potential in the stand.

Sustained Yields Over Time Versus Unsustainable Yields

A key to success with uneven-aged silviculture is to constantly acquire regeneration of the desired species after each cutting cycle harvest. Success is defined both as adequate numbers and adequate distribution. Adequate numbers of seedlings and saplings must be acquired, so that they can develop into saplings and subsequently into the merchantable classes. Submerchantable stand development drives the long-term sustainable yields from the stand.

A failure to sustain long-term yields leads to selective cutting. Yet the term selective cutting itself is confusing; it has no consistent silvicultural meaning among foresters or the general public and is often used to avoid saying high-grading. All too often, though, selective cutting and high-grading are synonymous, in that the best trees are cut and the poorest left on the site. This is a ticket to silvicultural disaster by releasing trees of poor form and slow growth. Because of the inconsistent meaning associated with it, the term selective cutting should be discontinued in all but its negative, high-grading silvicultural connotation.

Volume or Structural Regulation Versus Area Regulation

The key to uneven-aged

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silviculture is the long-term regulation of yield. Volume regulation, in which the allowable cut is based on the periodic increment over the preceding cutting cycle, has been shown to be effective in several long-term cases in the United States, but requires experienced foresters to implement. Structural regulation, in which the allowable cut is based on an ideal reverse J-shaped stand structure, is a more recent development that requires less subjective skill than volume regulation. Although it lacks the long-term track record of volume regulation, all evidence indicates that regulation of stand structure works as well, if not better.

However, stand-level area regulation, where small groups of the stand are cut based on area and cutting interval rather than structure or volume, is more accurately classified as even-aged silviculture than uneven-aged silviculture. If a forester bases the cut in an unmanaged stand on an area, tree age and cutting-cycle length, the method is probably better viewed as even-aged. On the other hand, if the harvest is conducted using volume control or structural control — even if the harvest is concentrated in a few large subunits of the stand — then we suggest that the system is in reality uneven-aged. Efforts to combine area regulation with either volume or structural regulation are too inefficient, too costly and involve an unnecessary duplication of effort.

**Summary**

Differences in interpretation of these guidelines among foresters may lead to debate about the importance of achieving these standards — which is encouraged. If systems that deviate from these guidelines are proposed as uneven-aged, the proposers might do well to examine whether the deviations are not resulting from an effort to retain some semblance of even-agedness for convenience, operability or other non-silvicultural constraints. The ultimate failure of a poorly-grounded, uneven-aged system may not occur for several decades — by which time the future potential of the stand is irretrievably sacrificed. Foresters attempting to practice uneven-aged silviculture can check their prescriptions against these guidelines, and might want to consider adjusting their operations to ensure that the guidelines are achieved.

**Additional Readings**


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**LETTERS**

First Meetings

Bruce Wakefield’s “First Meetings” in the Spring 1991 issue of The Consultant is one of the best practical advice articles I have ever seen for dealing with woodland owners. It would be one of the highlights in a how-to-do-it manual for consultants.

If more members would take the time to share their professional experience, it could significantly contribute to the ACF objective to improve the standard of work done by ACF foresters. Bruce and The Consultant are to be congratulated for this excellent article.