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OAK REGENERATION PRACTICES: OAK SHELTERWOOD

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Oak shelterwood method to manipulate the amount of partial sunlight reaching the forest floor to promote growth of oak advance seedlings. Photo Credit: *Wayne K. Clatterbuck*

The shelterwood method of regeneration is an even-aged silvicultural practice that involves a series of disturbances (harvests) that are timed to meet regeneration objectives of species desired. A 'shelter' of overstory trees remains to influence the regeneration process. Shelterwoods are flexible because the amount of sunlight that reaches the ground can be manipulated by the amount of canopy retained to meet the light tolerance of the desired regenerating species. The purpose of the shelterwood method is to culture larger size of advance reproduction prior to removal of the overstory. The partial sunlight provided by the shelterwood method favors development of oak advance reproduction while discouraging undesirable species.

Treatment of undesirable midstory and understory vegetation by herbicide or cutting allows penetration of sunlight for the development of slower-growing oak seedlings. Midstory removal can be conducted separately or in conjunction with the shelterwood method being careful not to introduce an excessive amount of sunlight that will encourage growth and competition from other species. Otherwise, oak advance reproduction that may establish after a bumper acorn year under these dense, midstory canopies grow minimally in height and eventually die. Partial light conditions (20 to 35 percent of full sunlight) should be maintained for several years to assure ascendance of shade-intermediate oak seedlings to larger sizes. Too much sunlight favors development of faster-growing shade-intolerant species (yellow-poplar, cherry, sweetgum) rather than oak, while too little sunlight encourages more tolerant and less desirable species (beech, maples, many midstory species).

Oaks also will regenerate from stump and seedling sprouts. These sources of reproduction should also be considered when assessing oak regeneration potential. Oaks up to 10 inches in diameter stump sprout readily, while stump sprouting progressively declines with increasing diameter on those stumps greater than 10 inches. Since large diameter oaks do not sprout well and smaller oaks are infrequent in mature stands, most oak regeneration comes from advance reproduction and not from sprouting.

Oak seedlings become established after a bumper crop of acorns that occurs every three to five years. Shelterwood should not be considered unless oak seedlings are present to be recruited to a larger size.
The practice should be delayed until an acorn crop and germination occur. Although other species will still be present and will respond somewhat to an increase in sunlight, the number of oak seedlings after a bumper acorn crop should overcompensate for the number of seedlings of other species. If these few larger seedlings of other species begin to negatively impact the growth of oak advance reproduction, then they should be controlled by herbicides.

Table 1. Decision Model for Oak Shelterwoods (AR= Advance Reproduction)

Oak AR Absent	Small Oak AR Present	Large Oak AR Present
Wait Until Bumper Acorn Crop and Germination	↓	↓
Provide Intermediate Light Conditions Conducive for Growth of Oak AR. Control Unwanted Vegetation.		
Once Oak AR is 4-to-5-Feet Tall, Remove Overstory to release Oak Seedlings.		

Poorly formed and too few shelter trees remain after the harvest allowing direct sunlight to the forest floor. The regeneration is composed of competing species that are growing faster and displacing the slower-growing oaks. Photo Credit: *Wayne K. Clatterbuck*

Shelterwood and midstory removal (if needed) increases the amount of diffuse light levels that benefits the slower-growing oak seedlings and limits the growth of competing species. This practice is conducted without opening gaps in the overstory which allow increased light penetration that would support the growth of faster-growing, shade-intolerant species rather than oaks. The small-diameter, undesirable midstory trees are removed first, then ascending to larger-diameter midstory trees without removing overstory trees that would create canopy gaps.

Development of oak advance reproduction to a larger size is essential to have oaks in the next generation. Most managers accept ≈200 oak advance reproduction per acre that are greater than 4-feet in height as sufficient to have a proportion of oaks in the future overstory. Once the desired number and size of oaks are present, the overstory can be harvested completely or in stages gradually releasing the developing oaks. A future crop tree release may be necessary to reduce the number of stems and provide more growing space for desirable oaks.

The oak shelterwood regeneration method is an effective tool to regenerate shade-intermediate oaks and discourage competitive growth of both intolerant and tolerant species.

Determining the partial light conditions that will encourage the growth of oak reproduction and constrain growth of competing species is tricky. These competing species should be suppressed by management actions. The keys to success are developing 4- to 5-foot-tall, advance reproduction of oak and control of competing vegetation before removal of the overstory. The benefit is oak reproduction is secured and developed before the overstory harvest. The weakness is small, advance oak reproduction must be cultured to larger sizes to compete with faster-growing species and allow ascendance of oak to the upper canopy. This process is applied 3 to 10 years before the overstory harvest. Implementing an oak shelterwood is a cost that is carried forward until revenue is generated by the final harvest cut.

FURTHER READING

Stringer, J. 2006. Oak shelterwood: A technique to improve oak regeneration. Extension Publication SP676. Knoxville, TN: University of Tennessee Extension, Institute of Agriculture. 8 p. (https://utia.tennessee.edu/publications/wp-content/uploads/sites/269/2023/10/SP676.pdf)

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