

Appendix D

Harvest Methods



Cover photo: Pines overlook at Red Bluff Campground, Mark Twain National Forest, USDA
Forest Service

Photographer: Joe Walker

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Silvicultural Systems and Regeneration Harvest Methods

The principal objective in harvesting timber is to regenerate a stand and maintain it in a healthy, vigorous condition to meet a number of resource management objectives. These include enhancing forest health and species diversity, restoring historic natural vegetation and community type, visual management, wildlife habitat, timber quality, and integrated pest management. Moving toward the desired condition is foremost in selecting the harvest method.

Even-aged System

Even-aged methods regenerate and maintain a stand with a single age class. The three types are clearcut, seed tree, and shelterwood. Forest-wide Standards and Guides require a minimum of 7 to 10 percent of all even-aged harvest units be retained as reserve trees. According to the Dictionary of Forestry published by the Society of American Foresters, even-aged management as practiced on the Mark Twain is actually two-aged management because of the amount of reserves. To avoid confusion, the Mark Twain will continue to refer to clearcutting, seed tree, and shelterwood “with reserves” as even-aged management. However, the resulting stand may be two-aged or trend towards an uneven-aged condition as a consequence of both an extended period of regeneration establishment and the retention of reserve trees that may represent one or more age classes.

Uneven-aged System

Uneven-aged methods regenerate and maintain a multi-aged structure by removing some trees in all size classes either singly or in small groups. The two major types are group selection and single tree selection. A stand may be considered uneven-aged if three or more 20-year age classes are developed within the stand (Roach, 1974). Harvesting, with repeated entries, is an ongoing process with uneven-aged management. For example under an uneven-aged system with a 20-year cutting cycle there would be regeneration harvesting activity, perhaps accompanied by pre-commercial thinning or other cultural work, approximately every 20 years.

Clearcutting with Reserves

Clearcutting with reserves is the cutting of essentially all trees except for reserve trees, producing a fully exposed microclimate for the development of a new age class. Regeneration can be from natural seeding, direct seeding, planted seedlings, or advance reproduction. Varying numbers of reserve trees are not harvested to attain goals other than regeneration.

Seed tree with Reserves

Seed tree with reserves is the cutting of all trees except for a small number of widely dispersed trees retained for seed production, and to produce a new age class in a fully exposed microenvironment. Some of the seed trees or other reserve trees are retained after regeneration has become established to attain goals other than regeneration.

Shelterwood with Reserves

Shelterwood with reserves is the cutting of most trees, leaving those needed to produce sufficient shade to produce a new age class in a moderated microenvironment. The sequence of cutting can include three types of cuttings: (a) an optional preparatory cut to enhance conditions for seed production, (b) an establishment cut to prepare the seed bed and create a new age class, and (c) a removal cut to release established regeneration from competition with the overwood. Some of the shelterwood trees or other reserve trees are retained after regeneration has become established to attain goals other than regeneration.

Group Selection

Group selection is a method of regenerating uneven-aged stands in which trees are removed, and new age classes are established, in small groups. The objective of this method is to establish regeneration at each harvest cycle, thereby producing an uneven-aged stand. Because the removal of groups will permit more light to reach the forest floor than with single tree selection, group selection can be used to encourage a higher proportion of shade-intolerant species. The width of smaller groups is commonly twice the height of the mature trees, and the width of larger openings is up to two acres.

Single Tree Selection

Single tree selection is the periodic removal of individual trees. The goal is to maintain a given number of trees in each diameter class. This practice should not be confused with “high-grading” where only the best large trees are cut. In order for the practice to work, some trees must be cut within most or all diameter classes. To maintain the desired distribution of trees by diameter classes or diameter group (i.e., basal area in pole-size timber) it may be necessary to remove trees of less than saw timber size at different periods of the cutting cycle. Harvesting, with repeated entries, is an ongoing process in single tree selection. It involves the cutting of selected individual trees throughout most or all size classes, creating stands of mixed ages and sizes. It simulates natural disturbances such as might result from the periodic death of scattered trees in a climax forest. Since regeneration is established under the partial shade of the overstory, and new seedlings must survive for long periods under this shade, single tree selection is useful as a regeneration cutting method primarily for species that are shade tolerant. However, it has been shown that this method can be used to successfully regenerate oak/pine forests in the Missouri Ozarks with careful attention to residual overstocking, and when restricted to favorable sites and aspects.

Intermediate Treatments

Release

Release is a treatment to free young trees from undesirable competition (usually overtopping), and can be used to improve the composition, structure, condition, health, and growth of a stand. Release treatments are made no later than 10 years of age in shortleaf pine stands and no later than 15 years of age in hardwood and hardwood-pine stands.

Pre-commercial Thinning (PCT)

Pre-commercial thinning is used to maintain or improve species composition by favoring desired species, and to obtain desired stocking levels for forest health and increased growth.

PCT treatments are made between 10 to 30 years of age in shortleaf pine, and between 15 to 35 years of age in hardwood and hardwood-pine stands.

Commercial Thinning

Commercial thinning is an intermediate treatment that reduces basal area by cutting and removing trees by means of a commercial timber sale. The treatments may be made to improve growth, enhance forest health, obtain advanced regeneration, or move the stand toward its natural community type. Methods of thinning include:

Thinning from Above

The removal of trees from the dominant and co-dominant crown classes in order to favor the best trees of those same crown classes.

Thinning from Below

The removal of trees from the lower crown classes to favor those in the upper crown classes.

Mechanical Thinning

The thinning of trees in either even-aged or uneven-aged stands involving removal of trees in rows, strips, or by using fixed spacing intervals.

Restoration Thinning

Thinning to a specified basal area to restore the natural community type.

Selection Thinning

Selection thinning is the removal of trees in the dominant crown class in order to favor the lower crown classes.

Improvement Cuts

Improvement cuts are used under the uneven-aged management system to achieve internal stand structure objectives when regeneration is not an objective. They may be applied each entry if necessary.

Choice of Regeneration Harvest Method

The Forest manages four principal timber types. These are Oak-Hickory, Oak-Pine, Shortleaf Pine, and Bottomland Hardwoods. The primary regeneration harvest methods for managing these timber types on the forest are clearcutting with reserves, seed tree with reserves, shelterwood with reserves, and group selection. Documentation of silvicultural systems for these timber types is found in two publications (Silvicultural Systems for the Major Forest Types of the United States-Agricultural Handbook 445, and Silvics of North America Volumes 1 and 2-Agricultural Handbook 654). The decision on which regeneration harvest method to use is based on desired condition, management objectives, stand conditions, and the silvical characteristics of the species present or desired.

*Clearcutting can be used only where it has been found to be the optimum method of regeneration to meet multiple-use objectives. Other even-aged harvest methods can be used only when determined to be appropriate. (16 USC 1604, Section 6(g)(3)(F)(i)) These determinations are made and documented as part of each individual project decision.

Table D-1 summarizes the cutting methods recommended for regeneration of the four major forest types found on the Mark Twain National Forest. For more detailed information, see *Silvicultural Systems for the Major Forest Types of the United States-Agricultural Handbook* 445, pp. 116 – 120 (Oak-Hickory); pp. 172 – 174 (Oak-Pine); pp. 157 – 161 (Shortleaf Pine); pp. 175 – 179 (Bottomland Forests).

Table D-1. Recommended Harvest Cutting Methods for Regeneration of Desired Forest Types

Forest Type	Clearcutting w/ reserves	Shelterwood w/ reserves	Seedtree w/reserves	Group Selection	Single Tree Selection
Shortleaf Pine	R	R	R	A	NGR
Oak-Pine	R	R	NR	A	NGR
Oak-Hickory	R	R	NR	A	NGR
Bottomland Hardwoods	R	R	NR	A	A

R = Recommended method; A = Acceptable method; NR = Not recommended; NGR = Not generally recommended

The decision of which regeneration method to use is made at the site-specific project level. The following discussion provides general information regarding each of the harvest cutting methods and under what circumstances they might be used.

Even-aged System

Even-aged systems are most suited to regenerating shade-intolerant species. With even-aged systems, regeneration harvests generally occur in a stand only once during the rotation age cycle, which on the Mark Twain National Forest ranges from 70 to 120 years.

Clearcutting with Reserves

Clearcutting is the optimum method for regenerating shade-intolerant species such as oak and shortleaf pine when advance reproduction is adequate or artificial regeneration is planned. Clearcutting may also be optimal for stands where the residual trees would not be worth retaining for a future crop, when stands have had the best trees removed in past harvests, in heavily damaged or declining stands. Clearcutting may be optimal for treating oak mortality related to oak decline, especially where red oak species predominate. Clearcutting may also be optimal for shifting species composition where the restoration of natural communities requires a stronger representation of shade-intolerant species.

Clearcutting is also used to provide shrub-brush habitat for wildlife species that use openings, edges, and low browse, such as white-tailed deer, rabbit, bobcat, most game birds, Bachman’s sparrow, northern bobwhite, prairie warbler, woodcock, indigo bunting, eastern towhee, yellow-breasted chat and ruffed grouse.

Seed tree with Reserves

Seed tree cuts can be used for regenerating shortleaf pine where the seedbed is satisfactory for natural pine seeding, there are adequate seed trees, and a good seed crop is anticipated. It

is not recommended for use with the hardwood species present on the Mark Twain because these species do not produce a consistent and reliable seed crop, and are not readily regenerated via seed sources.

Shelterwood with Reserves

The shelterwood method is most appropriate for species or sites where the shelter of a partial overstory is needed for reproduction, or to give desirable regeneration an advantage over less desirable species. Shelterwood cutting can be used to shift species composition where the restoration of natural communities (especially in savannas and woodlands) requires a stronger representation of shade-intolerant species. Shelterwood cuts are also useful for regenerating stands in areas with high visual quality objectives.

Uneven-aged System

Uneven-aged systems are most suited to regenerating shade tolerant species. With uneven-aged systems, regeneration harvests occur in a stand several times (approximately every 20 years) during the rotation age cycle, which on the Mark Twain National Forest ranges from 70 to 120 years.

Uneven-aged harvest methods are generally considered to be less visually impacting than even-aged methods due to the maintenance of continuously forested conditions, and so are useful in areas of high visual concern. However, the frequent and repeated harvest operations required by this system, and the associated increase in road maintenance, are objectionable to some.

Group Selection

Group selection harvest systems develop a vegetative condition with an interconnected canopy and many small openings (0.25 acre to 2 acres), providing habitat for those wildlife species that use a forested environment with many small openings in a variety of age classes.

Single Tree Selection

The single tree selection method can meet the needs of most cavity dwelling and closed canopy wildlife species, assuming it is carried out for many decades.*

