



CENTRAL HARDWOOD NOTES

Silvicultural Systems For Oak-Hickory And Oak-Pine

This Note covers only applying the regeneration component of silvicultural systems and assumes that the objective is to reproduce oaks. Thinning and stand maintenance are covered in other notes.

Most central hardwood stands are dominated by oaks, but as we harvest present stands the reproduction will contain larger numbers of other species and fewer oaks. Basic ecological processes are at work so this is likely to occur no matter what silvicultural system you use (see Note 2.01 *Ecological Principles: Climate, Physiography, Soil, and Vegetation*).

When planning harvest cuts to regenerate oak-hickory stands, you must first evaluate the potential of the existing advance oak reproduction to replace the stand (see Note 3.02 *Assessing Regeneration Potential*). The results of this evaluation will help you determine which regeneration method is best.

Even-Age Methods

- Seed Tree-This method is not recommended for reproducing oaks. Leaving only a few seed trees per acre will result in poor distribution of the heavy seed and any newly established oak seedlings will not be able to survive the competition from rapidly growing sprouts and other vegetation.
- Clearcutting-This method is appropriate when the amount of oak advance regeneration *plus* stump sprouting is adequate to replace the stand.

Steps to apply clearcutting:

1. Determine size of area to be designated as a stand. Stand size can be variable. The minimum size recommended is 2 acres. Stands smaller than 2 acres have a large proportion of their area in the border zone where reproduction grows slowly because of competition from surrounding trees. Generally you should restrict the stand to a single condition or size class of timber and site quality. Size of the forest property will also influence stand size.
2. Arrange and shape clearcuts so they mingle with uncut stands and blend into the landscape as much as possible.
3. Harvest all merchantable trees.
4. Cut or kill remaining culls and small trees larger than about 2 inches d.b.h. Killing the culls instead of cutting them will provide nesting holes and perches for birds. Cutting some of them will also provide habitat for some other wildlife species (see Notes 9.05 *Treating Mature Stands for Wildlife*; 9.06 *Enhancing Wildlife Habitat When Regenerating Stands*; 9.07 *Stand Size, Distribution, and Rotation Length for forest Wildlife*).
5. Composition of the new stands will vary according to where the forest property is located within the central hardwood forest. In the eastern part of the region

on the more moist, productive sites, the new stands may also contain yellow-poplar, white ash, black cherry, red and sugar maple, beech, and probably minor amounts of other species. On the drier sites the new stands will be essentially pure oaks when they reach 15 to 20 years of age.

- Shelterwood-If there is not enough oak advance reproduction to replace the stand, you should use the shelterwood method. Inadequate oak advance reproduction is most likely on the middle and lower north and east facing slopes throughout the central hardwood forest. The shelterwood method can be used for either natural oak reproduction or for planting oaks (see Note 3.06 *Seeding and Planting Upland Oaks*).

Research to design shelterwood methods that will consistently reproduce oaks successfully is incomplete. Current studies should provide better information in the next 5 to 10 years. The best information available follows.

Steps to apply shelterwood cutting:

1. Determine stand size the same as for clearcutting.
2. Control the understory that will compete with the small oaks by cutting or preferably killing the unwanted species up to about 2 inches d.b.h.
3. Reduce the overstory to about 70 percent stocking. Leave the best dominant and codominant trees as uniformly spaced as possible. Kill all unmerchantable trees larger than 2 inches d.b.h.
4. Monitor seedling establishment and growth and make additional light overstory cuts if needed. Control the understory again if it redevelops to a point where it restricts the growth of oak reproduction.
5. When a survey shows the regeneration potential of the oak reproduction is adequate to replace the stand, remove the remaining overstory trees in one cut (see Note 3.03 *How To Assess the Oak Regeneration Potential in the Missouri Ozarks*).

The length of time required to get oaks established and let them grow to adequate size is not yet known but will probably be 20 years or more.

Uneven-Age Methods

- Single Tree Selection-This method is not recommended for reproducing oaks because it gradually reduces the number of oaks in the overstory and creates conditions that are more favorable for reproducing shade-tolerant species. Small oak seedlings are unable to grow into the main canopy under a single tree selection.
- Group Selection-This method can be used to reproduce oaks satisfactorily. The groups must be kept small. The diameter of a circular opening should not exceed 1-2 times the height of the dominant trees in order to maintain the uneven-age character of the stand.

Steps to apply group selection cutting:

1. Evaluate the potential of the oak advance reproduction to fill each opening (group) created by cutting (see Note 3.03 *How To Assess the Oak Regeneration Potential in the Missouri Ozarks*).
2. If the oak advance reproduction is adequate, harvest all merchantable trees in the group cut or kill all remaining culls and trees larger than 2 inches d.b.h. in the group.
3. If the oak advance reproduction is not adequate to fill the opening, cutting to create the opening will not result in oak reproduction and the opening will be filled by whatever species is present in the understory. In this case follow the procedure for the shelterwood method where the openings will be located. The 70 percent stocking goal may not be attainable in the small groups so take care to leave seed-producing oaks in the planned openings. Removing the lower-story competition may be all that is needed to increase the amount of light needed on the forest floor to regenerate oaks.

Modifications for the Oak-Pine Type

Any of the even-age methods and the group selection method are suitable for regenerating oak-pine stands. Reproducing the pine component is likely to be difficult because the understory will be dominated by hardwoods. As in the oak-hickory type the oak component of the reproduction will come from advance reproduction. Oak advance reproduction is usually well established on oak-pine sites. Thus the goal will be to maintain or increase the pine component. The amount of pine reproduction will be determined by the presence of a seed source and the thoroughness of site preparation (see Notes 3.04 *Treatments to Encourage Natural Regeneration* and 3.10 *Seeding and Planting Pines*).

Steps to apply the seed tree method:

1. Leave 10 to 15 of the best seed producing pines per acre indicated by the presence of old cones on the trees.
2. Control unwanted hardwoods in the understory and prepare a seedbed
3. Harvest the seed trees 2 to 3 years after sufficient pine seedlings are established. Take care to disturb the reproduction as little as possible.

Steps to apply the clearcutting method:

1. Clearcut progressively from east to west in strips 100 to 200 feet wide to take advantage of the generally prevailing westerly winds for better pine seed dispersal. Allow 5 to 10 years between cuts.
2. Control unwanted hardwoods and prepare a seedbed as needed.
3. Direct seed or plant if natural seedfall is not adequate.

Steps to apply the shelterwood method:

1. Reduce the overstory stocking to 60 percent leaving seed-producing pine trees as uniformly spaced over the stand as possible. You will probably have to leave oaks in the residual shelterwood stand also.

2. Control unwanted hardwoods and prepare a seedbed as needed.
3. Remove the shelterwood 2 to 3 years after sufficient pine seedlings are established.

Steps to apply the group selection method:

1. Place groups so that seed-bearing pines are along or close to the border of the openings.
2. Control unwanted hardwoods and prepare a seedbed as needed.
3. Remove all overstory trees within the group.

References

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- Sander, Ivan L.; Merritt, Clair; Tyron, E.H. 1981. Oak-hickory. In: *Choices in silviculture for American forests.* Washington, DC: Society of American Foresters: 23-29.
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