



CENTRAL HARDWOOD NOTES

Silvicultural Systems For Bottomland Hardwoods

Bottomland hardwood forests normally regenerate with species found in the overstory. These species reflect the timing, duration, depth of water, and nature of the sediment in past flooding. The longer water stands during the growing season and the deeper the sediment, the fewer the species that are able to survive. Flooding patterns often change over the life of a bottomland hardwood stand. If conditions moderate, more species can regenerate the site; if flooding worsens and sediment builds up, fewer species can occupy the site.

There are three sources of reproduction in bottomland forests—"advanced" understory seedlings (seedlings already growing), stump and root sprouts from harvested trees, and new seedlings. Advance reproduction over 18 inches tall is the most dependable source of regeneration of moderately tolerant to tolerant species and the only dependable source for oak. Sprouts from the stumps of cut trees under 12 inches d.b.h. are a major source of acceptable regeneration for most species; maples, green ash, and sweetgum are the most prolific. Sweetgum is also a good root sprouter. American elm, sycamore, green ash, sweetgum, boxelder, red and silver maple, black willow, and eastern cottonwood sometimes produce dense new stands from seed.

Bottomland hardwoods can be managed even-aged or uneven-aged. Silvicultural systems you should use for even-age management are clearcutting and shelterwood; seed tree is not recommended. Clearcutting is best where sprouts from the stumps and roots of harvested trees and advance reproduction will combine to form an acceptable species mix in the new stand. Where advance reproduction is sparse, clearcutting may still be suitable if the seedbed is free of grass and herbs. Sprouts plus new seeds deposited by wind and/or water over a 2- to 3-year period usually result in an acceptable new stand of mostly light-seeded species. Shelterwood is best to perpetuate the heavy-seeded species that are growing in the overstory. However, it may take many years to develop good stands of oak reproduction due to infrequent seed crops and high seed losses to birds and animals. If the regeneration period is too long, you may have to release oaks from understory competition at the same time you remove the remaining overstory.

For uneven-age management, group and single tree selection can be used provided you can accept slower tree growth and a high proportion of relatively shade tolerant species. Group selection will allow some shade intolerant trees to develop but regeneration will be slower than under clearcutting. Single tree selection results in stands composed almost entirely of species with moderate to high shade tolerance. Examples are sweetgum, red and silver maple, green ash, hackberry, and American elm. Oaks establish in single tree openings but soon become

overtopped by other tree species. Although trees of sprout origin may grow rapidly during the first 5 years, they develop much more slowly in single tree openings than in clearcuts over 40 to 50 years.

Whatever way you open the stand for regeneration, it is important to remove all trees more than 1 inch d.b.h. to reduce competition to new seedlings and sprouts. Such a treatment is essential where there is a dense mid-story of low value species such as boxelder. You should leave small trees, regardless of species or quality, close to the boles of high-quality residuals around the edge of regeneration openings. The shade will reduce epicormic branching on residuals and maintain bole quality.

There is no good way to naturally regenerate stands of eastern cottonwood and black willow, although a few trees may establish following clearcutting. Existing natural stands have developed on new alluvium created by river flooding. Both species require bare mineral soil, full sunlight, and an almost complete lack of herbaceous competition, a combination rarely found in older natural stands. Recommendations are summarized in the following table:

SUMMARY TABLE		
<u>If you favor</u>	<u>Condition:</u> Adequate regeneration is already established (300+ trees/acre >18 inches tall)	Adequate regeneration is not established
	<u>Then use:</u>	<u>Then use:</u>
Oaks	Clearcut or Group selection	Shelterwood
Green ash, silver maple, American elm	Clearcut or Group selection or Single-tree selection	Shelterwood or Clearcut ^{1 2}
Sweetgum	Clearcut	Clearcut ²
Sycamore	Clearcut	Clearcut ¹

¹ Bare or litter-covered seedbed required; grass or a dense herbaceous cover is unsuitable.

One hundred or more trees per acre between 2 and 12 inches d.b.h. will provide enough regeneration through coppice..

As both even-age and uneven-age stands develop they need periodic thinnings and perhaps even crop tree release to maintain vigorous growth and to favor the efficient production of desired species.

Reference

Johnson, R.L.; Shropshire, F.W. 1983. Bottomland hardwoods. In: Silvicultural systems for the major forest types of the United States. Agric. Handb. 445. Washington, DC: U.S. Department of Agriculture, Forest Service: 175-179.

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