Regeneration of Patch Harvests in Even-Aged Northern Hardwoods in New England

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ABSTRACT: *One suggested approach to converting even-aged northern hardwoods to an uneven-aged condition is the use of small-patch harvests to initiate new regeneration of desired species. Past experience indicates that such harvests may be less successful in second-growth, even-aged stands than in older stands due to the abundance of sprouts and noncommercial species. Remeasurement of 47-yr-old patch harvests, applied to a 70-yr-old even-aged stand, growing on a beech-red maple site in New Hampshire showed that paper and yellow birch dominated the regeneration composition of patch centers. North. J. Appl. For. 20(4):188–189.*

Key Words: Group selection, patch selection, regeneration.

One of the recent silvicultural concerns is how to convert even-aged stands to an uneven-aged condition suitable for the continuation of a single-tree or group/patch selection system. Since these even-aged stands usually support understory trees of the same age as the main canopy, often of undesirable species, one approach commonly utilizes small patches designed to produce new regeneration of desirable species (Kelty et al. 2003, Nyland 1998).

Patch harvests in old, uneven-aged northern hardwood stands in New England are effective in regenerating yellow birch, paper birch, and white ash on sites where tolerant species such as beech and hemlock would predominate under a single-tree selection regime (McClure and Lee 1993, Leak 1999, Marquis 1965). For example, in patches about 1/3 to 2/3 ac in size and 24 to 44 yr old, valuable intolerants/intermediates comprised 1/3 of the basal area (McClure and Lee 1993). Under single-tree selection, these species commonly account for less than 10% of the successful regeneration (Leak and Wilson 1958).

However, early results from small-patch harvests in young, even-aged stands showed less promise (Marquis 1965), possibly due to the abundance of weed species from buried seed, excessive stump sprouting, and lower seed production. If small-patch harvests are to be used in converting even-aged northern hardwoods in New England to uneven-aged, we need to know how well these harvests will work. To provide this information, a second-growth, even-aged stand on the Bartlett Experimental Forest, New Hampshire that had been patch cut in 1954 was remeasured in the summer of 2002.

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Methods

The stand was 60 ac in size and about 70 yr old at the time of a summer harvest in 1954. The stand developed after a clearcut for timber and railroad engine fuel in the late 1800s, although a few holdovers remained. A few acres had been cleared for agriculture. At the time of harvest, beech (*Fagus grandifolia*), red maple (*Acer rubrum*), and hemlock (*Tsuga canadensis*) accounted for 2/3 of the basal area, with about 20% in paper (*Betula papyrifera*) and yellow (*B. alleghaniensis*) birches. The soil was a sandy till, which promotes a very vigorous component of beech. Average stand diameter was about 9 in.

The 1954 cut consisted of 10 patches averaging about 1/2 ac in size. There was a log, millwood, and pulp market, so utilization was fairly complete for trees 5 in. dbh and larger. No cultural work was done. In summer of 2002, a round 1/20 ac plot was measured toward the center of each patch (2/3 chain from the patch edge). The patch center, the predominant condition in patches of this size, is the area where trees of all tolerance classes can compete; it is well-known that a narrow band of tolerants occurs along patch edges (McClure and Lee 1993). In this plot, all trees 5 in. dbh and larger (over 4.5 in.) were recorded by species and dbh. Trees that were obvious culls were not included in the summarized results.

Results

Basal area per ac (5 in. and larger) in the centers of the patches, now about 47 yr old, averaged 64 ft^2/ac. Paper and yellow birch accounted for a little over 50% of the basal area, while beech comprised 26%. In the initial 70-yr-old stand, the birches accounted for about 20% of the basal area (Table 1). The birches were more prevalent than beech on 6 out of the 10 plots. The lowest percentage of birch on any plot was 14%.

Table 1. Percentage basal area by species in initial stand (1954) and in current (2002) patch centers.

	Initial stand	Current patch centers	
Species	6 in. +	5 in. +	8 in. +
	(%)		
Beech	23.7	26.4	9.1
Yellow birch	11.7	17.0	18.9
Sugar maple	3.1	2.7	3.0
Red maple	28.4	15.4	26.7
Paper birch	8.5	34.5	39.3
White ash	2.1	1.7	3.0
Red spruce	7.1	1.5	—
E. hemlock	13.8	0.8	—
Others	1.6	—	—

Trees 8 in. dbh and larger (the more dominant trees) in the patches averaged 23 sq ft/ac; about 60% were birches and 9% beech. On this site, nutrient-demanding species such as white ash (*Fraxinus americana*) and sugar maple (*A. saccharum*) were minimally represented.

Observations indicated that the patches had supported an abundance of pin cherry (*Prunus pensylvanica*) and striped maple (*A. pensylvanicum*). The majority of these stems were either dead or nearly dead; possibly, this accounts for the rather low basal area of live trees in the patches. The understory in the uncut stand between patches was predominantly beech.

Applications

Although initial 3 yr measurements indicated that patch regeneration in young even-aged northern hardwoods might not be successful (Marquis 1965), measurements after 47 yr in ten different patches in another stand showed that yellow and paper birch were the dominant species in patch centers. Birch was more than twice as abundant in the patch centers than in the original 70-yr-old stand that had originated from clearcutting. The difference in findings between the Marquis' study and this one is simply a matter of time. The even-aged stand studied by Marquis was about the same age, on a better site with less beech competition. Keep in mind that patch borders or edges support a higher percentage of tolerant species (e.g., beech and hemlock). The proportion of edge diminishes as patch size gets larger.

The conclusion is that patches in even-aged northern hardwoods in New England will successfully encourage the regeneration of yellow and paper birches, even on sites that are conducive to vigorous beech regeneration. Patch harvests should be useful in conversion from even-aged to uneven-aged systems, or in the short-term regeneration of even-aged stands through a progressive series of patch cuts.

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