Information Needs for Comparing Even- and Uneven-Aged Management in Mixed Hardwoods

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Abstract.—Mixed hardwood forests have unique characteristics that influence their suitability for various management systems. Focusing on gaps in current silvicultural and economic knowledge, this paper describes the information needed to compare the economics of even- and uneven-aged management strategies in these forests.

INTRODUCTION

Economic management guides for mixed hardwood forests need improvement. Forest managers frequently disagree over the most appropriate management techniques. Conflicting recommendations characterize the few economic guides that are available. The problem, simply put, is to identify scientifically the silvicultural systems that offer economic advantages in mixed hardwood timber stands.

The purpose of this paper is to describe the information needed to compare the economics of even- and uneven-aged management in mixed hardwood forests. Silvicultural and economic gaps in this information will be explored, and potential sources for the needed information will be discussed.

Equally qualified foresters are likely to differ in their opinion of preferred management strategies because many hardwood forests can be managed successfully with a wide variety of techniques. Some foresters prefer carefully applied selection systems with periodic sustained timber harvests. Others favor even-aged management with shelterwood or clearcut harvests. The choice of management strategy is often argued on a silvicultural basis, but many operational and economic factors often influence the best choice for each stand. There is no one best silvicultural system for all stands and all owners. The biological and market facts vary, and the stands differ from each other.

Forest managers and landowners ask various economic questions about management of mixed hardwood stands. The comparative financial advantages of one silvicultural system over another depends on relative costs, revenue potentials, and landowner preferences for the different output mixes produced by each option.

The pertinent economic question is what financial returns result from alternative management techniques. For uneven-aged management, questions involve the optimum level of growing stock to carry, the optimal frequency for partial cuts, and the selection of trees to cut or leave. For even-aged management, determination of minimum acceptable stocking levels, optimum rotation ages, and thinning frequency and intensity are critical.

Questions about risk also concern forest managers. Economic risk is a measure of expected variation in financial returns due to variations in net growth, markets, or catastrophic events. Risk can be quantified as the probability of attaining a given financial outcome with even-aged versus uneven-aged management, given an uncertain future.


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These economic questions apply to management of all mixed-species types. Stand conditions, costs, and timber markets differ from place to place and change over time, so financial returns also vary. No universal economic guidelines are available to help managers select the best options. Because of the wide variability, it is not possible to develop such guidelines for all mixed hardwood stands. Each stand must be judged separately to fully account for the unique conditions of each management opportunity and landowner objectives.

Methods to analyze and compare the financial advantages of different management techniques are generally well known. All methods rely on estimates of changes in stand value due to management actions. Data needed to determine the value and profitability of mixed hardwood stands are limiting in many cases. Analyses comparing even- and uneven-aged systems are limited by information gaps in five areas:

1. Costs of different forest management practices.
2. Future timber demands and prices.
3. Definition of appropriate silvicultural strategies.
4. Stand growth responses to management and harvesting treatments, especially effects on timber quality.
5. Long-term silvicultural trials.

The fifth information need, data from actual long-term documented silvicultural trials, is important for validating treatment hypotheses. Unfortunately, there are few long-term studies available in the eastern hardwood forest types. These data needs are discussed below.

MANAGEMENT COSTS

Various pieces of economic information are needed to compare hardwood silvicultural strategies. These data fall into two categories—differences in treatments costs and the relationships between silvicultural method and price. Published information on hardwood treatment costs is scant. Some information is available for Lake States forests (Olson and others 1978; Hilliker and others 1969; Winebar and Gunter 1984). Cost information for the South is available in a series of articles (Moak and others 1983; Hotvedt and Straka 1987).

Most natural hardwood stands are managed by specifying the frequency and degree of harvesting rather than direct treatments such as site preparation and planting, so most costs are indirect. Even- and uneven-aged management strategies require stand entries at different intervals. Empirical information is generally lacking on the actual costs associated with the planning and execution of harvests. The effects of complete or partial harvests are usually reflected in differing stumpage prices due to variation in harvesting costs. It can reasonably be expected that stumpage prices will be lower where harvesting costs are higher. This is common when low volumes are removed per acre, when only selected trees are cut, when extra care is required to protect residual trees, or when a greater proportion of low-value stems are cut to release growing space for crop trees. New research being conducted at the North Central Forest Experiment Station on the effects of cutting strategies on stumpage prices promises some insights into these opportunity costs.

The most significant cost affecting the comparative economics of hardwood management strategies is the cost of carrying timber inventory. Principles of financial maturity indicate that each tree in a mixed forest should earn the discount rate. Allowing individual trees to remain uncut after their value growth rate falls below the prevailing discount rate incurs significant opportunity costs. These trees earn less more vigorous and younger cohorts and take up growing space that could be occupied by replacement crop trees (Murphy and Gulidn 1987). This cost factor must not be underestimated, and the maintenance of diameter distributions to produce excessively large trees in either even- or uneven-aged stands is likely to be uneconomic.

Financially mature diameters vary by species, individual growth rate, tree quality, and local market conditions. Although financial maturity methods are generally well known, there are few current guides to assist managers. Stand harvest decisions are greatly affected by silvicultural and operational factors, so financial diameters form only a partial guide. Decisions to retain or remove individual trees also depend on the effect of release from competition on growth rate and quality. At the stand level, harvesting decisions are greatly influenced by the relative efficiency of partially logging stands.

TIMBER PRICES

The second data need is information on expected future stumpage prices and the relationship between stumpage price and tree quality. Hardwood stands managed by different silvicultural methods produce different mixes of species and tree grades. For some species, the margin between the lowest grades and the best grades can be hundreds of dollars. This margin can significantly affect long-run profits unless local markets are indifferent to timber quality. Stumpage prices are reported for many states (Rosen 1984), but few account for price differences due to tree quality or report real price changes over time.