A POTENTIAL QUANTITATIVE METHOD FOR ASSESSING INDIVIDUAL TREE PERFORMANCE

Lance A. Vickers, David R. Larsen, Daniel C. Dey, John M. Kabrick, and Benjamin O. Knapp¹

Abstract.—By what standard should a tree be judged? This question, perhaps unknowingly, is posed almost daily by practicing foresters. Unfortunately, there are few cases in which clearly defined quantitative (i.e., directly measurable) references have been established in forestry. A lack of common references may be an unnecessary source of error in silvicultural application and potentially confounds efforts to understand the biology and ecology of forest processes. The utility of the few references that have been established is immense. For example, foresters can assess site productivity for an area by calculating site index, which is a standardized, quantitative reference for site productivity. Moreover, foresters can compare site productivity across multiple areas (say, the Missouri Ozarks versus southern Indiana) because site index is a common reference that is widely accepted. Similarly, foresters can evaluate and compare stand density by calculating stocking percent.

Perhaps no field of forestry could better benefit from greater quantification than regeneration and early stand dynamics. Regeneration is arguably the most critical component of sustainable forest management, yet there has been little effort to develop quantitative methods for assessing the performance of individual trees throughout the regeneration period. There are qualitative metrics that are certainly useful (e.g., crown class), but subjectivity and other constraints complicate and limit their application. Furthermore, crown classes typically are not applicable for very young trees before crown closure. As a result, regeneration models and evaluations that use crown class to define success typically make predictions late in the post-harvest regeneration period.

In an effort to improve upon quantitative methods, we have developed growth references for a limited number of sites, scenarios, and species. Growth references have long been used in the medical field for quantitative clinical assessment of juvenile development. These growth references typically are in the form of charts with selected quantiles of a reference distribution for a variable of interest plotted against age (e.g., height-age). Our objective is to demonstrate the potential utility of this quantitative method for assessing the performance of individuals by using young trees in the Missouri Ozarks as an example. We describe how growth references based on quantiles from a height distribution of trees at the same age on similar sites could be useful tools to quantitatively compare trees that are too young to be classified by traditional crown classes. We also describe how growth reference charts may extend the inference window of stand reconstruction techniques (i.e., stem analysis). Potential for additional applications in modeling regeneration and early stand dynamics, as well as improving precommercial silvicultural prescriptions, is discussed.

The content of this paper reflects the views of the authors(s), who are responsible for the facts and accuracy of the information presented herein.

¹ Ph.D. Candidate (LAV), Professor of Biometrics (DRL), and Assistant Professor of Silviculture (BOK), University of Missouri, Department of Forestry, 203 Anheuser-Busch Natural Resources Building, Columbia, MO 65211; Project Leader (DCD) and Research Forester (JMK), U.S. Forest Service, Northern Research Station. LAV is corresponding author: to contact, call 573-882-4295 or email at lance.vickers@mizzou.edu.