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Why is the Performance of the Lake States Variant of FVS so Poor?

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Some forest simulation models are increasingly used despite criticisms of their allegedly empirical premises. For example, the Chicago Climate Exchange has now approved the TWIGS model family for calculation of carbon sequestration in managed forests that may be saleable on the exchange as a legitimate offset project. Notably, the Forest Vegetation Simulator variants in the Midwest, Central States and Northeast are based upon TWIGS fundamentals. In this study, we evaluated the LS-FVS family of diameter increment models as they have been variably implemented in the Great Lakes Region. We paired validation using regression-based equivalence tests with evaluation of trends in errors across species and predictor variables, using independent data from the Michigan Forest Inventory and Analysis program. Our evaluation shows that 10-year increment bias is substantial, almost 17% on average, and our tests failed to validate the model for every one of the 30 most common tree species in the region. Furthermore, the way the model is currently implemented in the Forest Vegetation Simulator partly masks poor performance at the tree level, but likely amplifies error at the stand level, a particularly troubling result in many conceivable applications. Our results also affirm that a simple adjustment factor as a function of dbh provides an inadequate correction of prediction bias. We argue that the diameter increment model needs to be re-engineered, not just to enhance credibility in modern applications, but to achieve a minimum performance standard as expected in the past. Without correction, where the model is used in forest planning the overprediction may lead to unsustainable management decisions that affect timber and non-timber resources.

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