Effect of Spatial Scale on Modeling and Predicting Mean Cavity Tree Density: A Comparison of Modeling Methods

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ABSTRACT

Cavity trees are integral components of healthy forest ecosystems and provide habitat and shelter for a wide variety of wildlife species. Thus, monitoring and predicting cavity tree abundance is an important part of forest management and wildlife conservation. However, cavity trees are relatively rare and their abundance can vary dramatically among forest stands, even when the stands are similar in most other respects. This makes it difficult to model and predict cavity tree density. We utilized data from the Missouri Ozark Forest Ecosystem Project to show that it is virtually impossible to accurately predict cavity tree occurrence for individual trees or to predict mean cavity tree abundance for individual forest stands. However, we further show that it is possible to model and predict mean cavity tree density for larger spatial areas. We illustrate the prediction error monotonically decreases as the spatial scale of predictions increases. We successfully explored the utility of three classes of models for predicting cavity tree probability/density: logistic regression, neural network, and classification and regression tree (CART). The results provide valuable insights into methods for landscape-scale mapping of cavity trees for wildlife habitat management, and also on sample size determination for cavity tree surveys and monitoring.

KEYWORDS

CART, Logistic Regression; Neural Network; Oak Forest; Prediction Accuracy

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