Using classification trees with Landsat imagery, ancillary variables, and FIA data to map tree species in Massachusetts, USA
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1 Introduction
Spatially explicit maps of the current distributions of tree species that comprise mixed temperate forests are necessary tools for practical biodiversity assessments, conservation efforts, forest health monitoring, and modeling future pest-risk and climate change scenarios. Though in recent years spatial data for modeling purposes have become abundant, there is a lack of species-level models of forested regions in the northeastern United States.

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2 Study Area

3 Forest and Inventory and Analysis Data

4 Environmental and Remotely Sensed Data

(a) Digital elevation model (DEM), (b) slope (SLOPE), (c) precipitation (PRECIP), (d) mean annual temperature (TMAX), (e) precipitation in August (SeptNDVI), (f) precipitation in September (OctNDVI), (g) MassGIS1999 and use (LU99).

R-squared values for relationships between non-categorical variables used in analysis. The strongest relationships are between ODEM and PRECIP (0.3275) and SeptNDVI and OctNDVI (0.2166).

5 Method

FIA data

Explanatory Variables

6 Results

Pitch pine, 93.6%

Eastern hemlock, 76.3%

White oak, 76.3%

Sugar maple, 83.1%

7 Main Findings

Pitch pine has the highest accuracy of the four species considered, likely because it is a very localized species. Found predominantly along the coast of Cape Cod, few locations in Massachusetts suit the ecological needs of Pitch pine. Conversely, in this study area, Eastern hemlock and White oak are relatively generalized species whose distributions are more widespread and less site driven. The root node for both Sugar maple and Eastern hemlock is DEM, which indicates that both distributions rely heavily on topography, which greatly restricts their modeled distributions. Eastern hemlock and Sugar maple are two dominant tree species in western Massachusetts, the portion of the state with the greatest topographic variation. Future research should attempt to include soils information, as well as generate continuous surface depicting the probability of species presence.

When land use is selected as a variable, the classes ‘forest’, ‘woody perennial’, ‘residential’, ‘open land’, ‘pasture’, and ‘cropland’ tend to indicate species presence. In the tree diagram for White oak, the class ‘transportation’ is used to explain presence, which for all other tree diagrams indicates absence.

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