Forest Genetics 2025

A joint meeting between the

Western Forest Genetics Association

Southern Forest Tree Improvement Committee

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A DEEP LEARNING APPROACH TO SPECIES DISTRIBUTION MODELLING FOR NORTH AMERICAN TREE SPECIES

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Selecting suitable tree species and seed sources for future climates requires reliable models of tree species distributions. We developed a deep neural network approach to estimate the range and abundance of major North American tree species, supporting the North America Seed Selection Tool (http://tinyurl.com/NA-SST). The web tool is meant guide climate-informed forest management and facilitate cross-border seed transfers. We combined forest inventory and ecological plot data from Canada, the United States, and Mexico for all major North American tree species. Misidentifications and out-of-range records were removed by cross-referencing Little's historical distribution maps with a 200km buffer for spatial inaccuracies. Predictor variables include historical climate normal data (1951–1980) for 12 bioclimatic variables at 1km resolution as well as topographic indices (e.g., slope position, exposure, etc) as well as remotely sensed land cover. The neural network models interactions among climate, terrain, and land cover classes, producing a frequency estimate reflecting the relative basal area of species, with two outputs: (1) species range maps in a sense of climatically suitable habitat conditions, and (2) actual species distribution maps that are filtered by remotely sensed deciduous and coniferous tree cover. The model output that delineates the climate habitat are integrated in the NA-SST web application, allowing forest managers to select candidate species and locate suitable seed sources under observed and projected climate change.