BAYESIAN SPATIAL MODELING OF LOBLOLLY PINE SEED SOURCE MOVEMENT

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The establishment and analysis of provenance tests for investigating the genetic variation among forest trees has a long tradition in forestry. Such tests are generally intended to identify superior seed sources for planting at specific locations. The trials are usually replicated experiments established with seed from parent trees collected from different geographical regions within the species distribution and grown at several locations. The geographic location of the sites where the seed parents were collected and the location of the sites where the progeny trees were grown provide meaningful information for assessing the response of genotypes to environmental change. Furthermore, the climatic differences between the seed source and test site locations can be used to make predictions about the relative performance of provenances under different environmental conditions.

We developed a spatial Bayesian approach for modeling the expected height of trees from seed sources using as predictors climate variables associated with the location of origin and the planting site, and the growth potential of the planting site. The proposed modeling technique introduces a separable covariance structure that provides flexible means to describe and estimate effects associated with the origin and planting site locations. The model is developed and tested using the Plantation Selection Seed Source Study, a large replicated seed source test of loblolly pine (*Pinus taeda* L.) with test sites distributed throughout the southeastern United States. Application examples are presented and discussed using projections of future climate scenarios. The statistical model can be used as a quantitative tool for seed deployment aimed to identify the location of superior performing seed sources that could be suitable for a specific planting site under a specific climate scenario.

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