Public Abstract
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Title:LARGE-SCALE FOREST LANDSCAPE MODEL, DESIGN, VALIDATION, AND APPLICATION IN MANAGEMENT OF OAK DECLINE

Two challenges confronting FLMs have persisted: how to simulate fine, site-scale processes while making large-scale simulation feasible, and how to fully take advantage of extensive U.S. Forest Service Inventory and Analysis (FIA) data to initialize and constraint model parameters. First, a large-scale FLM, LANDIS PRO was developed to directly utilize current available forest inventory data. In LANDIS PRO, forest succession and dynamics are simulated by incorporating species-, stand-, and landscape-scale processes. Because stand-scale resource competition is achieved by implementing rather than simulating the emergent properties of stand development, LANDIS PRO is computationally efficient. Second, I proposed a framework for validating forest landscape projections from LANDIS PRO using Forest Inventory Analysis (FIA) data incorporating data assimilation techniques and multiple scales. Results showed model predictions were able to capture much of the variation overtime in species basal area and tree density at stand-, landtype- , and landscape-scales. Subsequent long-term predictions of natural succession patterns were consistent with expected changes in tree species density of oak-dominated forests in the absence of disturbance. Lastly, I used LANDIS PRO that includes stand-scale species density and basal area to evaluate the potential landscape-scale effects of alternative harvest methods (thinning, clearcutting and group selection) on oak decline mitigation. Projections indicated that group selection and clearcutting were the most effective methods in the management of oak decline in the short-term (20 years) and mid-term (50 years), respectively. However, in the long-run (100 years), there was no significant difference predicted among the three methods.