Computation and uncertainty in ecological forecasting

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Abstract

Planning for global change and decision making will be improved by reliable forecasts of ecosystem variability. Key challenges to successful forecasting include feasible statistical methods to track variability and uncertainty and new computational approaches, include more efficient algorithms and data structures that would permit simulation of complex systems. This study addresses these challenges with an integrated approach. We are developing computational and statistical techniques that will allow us to develop forecasts of forest diversity change at broader spatial and temporal extents. We make use of an unusually extensive observational and experimental data base (long-term demographic modeling with landscape and climate context, large-scale experiments on disturbance and CO2 effects). Hierarchical Bayesian methods allow us to simultaneously estimate scale-specific (contextual) effects. Sources of variability and uncertainty that arise from individuals to stands to a region are then followed through a stand simulator that addresses responses to scenarios of land-cover, CO2, and climate change.