A MULTIPLE-SPECIES ASSESSMENT OF RELATIVE GENETIC DEGRADATION RISK FROM CLIMATE CHANGE AND OTHER THREATS

Kevin M. Potter[1] and Barbara S. Crane

[1]Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC

Climate change is expected to pose a threat to the viability of forest tree species, which may be forced either to adapt to new conditions or to shift their ranges to more favorable environments. Changing climate conditions and threats of pest and pathogen infestation will increase the risk that forest trees could experience population-level extirpation or widespread decreases in productivity during the next century. In the face of these challenges, it will be important to safeguard existing adaptedness within species and to create conditions conducive for future productivity and evolution. Forest tree species, however, differ in their physiological tolerances, life-history strategies, and population dynamics. These differences could drive wide dissimilarities among species in their potential responses to changing climate conditions and other threats, and could affect the likelihood that particular species might be useful sources of biomass for energy production. Diverse management and genetic conservation strategies will be needed to ensure successful regeneration and restoration of species with differing characteristics and susceptibility to various threats. This will be a particular challenge in species-rich regions such as the Southern Appalachian Mountains of the southeastern United States. To facilitate the effective use of limited resources, we developed the Forest Tree Genetic Risk Assessment System (ForGRAS), which ranks the predisposition of forest tree species to genetic degradation, based on ecological and life-history traits, species-specific projections of climate change pressure, and predictions of pest and pathogen susceptibility. We then applied ForGRAS to 131 tree species native to the Southern Appalachians. This framework serves as a tool for planning management activities and conservation efforts, for evaluating species' genetic resources, and for detecting species' vulnerabilities. It has the advantage of accounting for multiple threats that may result in the most severe genetic impacts. The flexibility of ForGRAS allows for its application at multiple scales and across any area for which appropriate data exist for the species of interest.