

USDA Forest Service Southern Region – It’s All About GRITS¹

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Genetic resource management programs across the U.S. Department of Agriculture Forest Service (USDA FS) play a key role in supporting successful land management activities. The programs are responsible for developing and providing plant material for revegetation, seed management guidelines, emergency fire recovery assistance, genetic conservation strategies, climate change guidance, and partnership opportunities. The primary objective of the USDA FS genetics programs is to provide the genetically most appropriate plant material to support diverse, sustainable and resilient forests. These key concepts are captured in the USDA FS National Genetics Strategic Plan (Forest Service internal document, 2004; unpublished). The Southern Region (R8) National Forest System (NFS) Genetic Resource Management Program (GRMP) is engaged in following these concepts. By working collaboratively with the national forests and other partners, the GRMP is a leader in meeting current and future needs. By developing and integrating new ideas into our management strategies, the Genetic Resources In TranSition (GRITS) philosophy succeeds in supporting future healthy forests.

The Southern Region is home to some of the most biodiverse forests in the United States. Over 140 tree species occupy coastal, piedmont and mountain landscapes. The southern ecosystems are increasingly vulnerable to forest health issues and climate change impacts. For example, over 30 species of pests and disease pathogens affect forests in R8. Our forest landscapes are changing, so monitoring the state of our tree species is critical. Furthermore, we need to plan for healthy and productive forest structure and forest composition in 100 years. Though locally adapted and regionally appropriate seed sources are meeting current goals, will the same sources be adapted in 100 years? How to match species to future sites affected by climate change (e.g., fire, drought, excess moisture) requires careful considerations. Seed zones need to be revised, similar to the updated USDA Plant Hardiness Zone Map. Planting in the right areas, for now and for the future, will support resilient forests. For those species currently imperiled, or residing in vulnerable areas (e.g., high elevation or low coastal), assisted migration may be an option for their conservation. The bottom-line: trees will adapt, migrate or die, so actions are necessary to take to preserve species diversity across the landscapes, promote adaptation and support future forest resiliency.

To manage multiple issues and multiple tree species across diverse landscapes, and to continue to be effective in supporting successful reforestation and restoration, a prioritization strategy had to be developed. In 2010, the Eastern Forest Environmental Threats Assessment Center (EFETAC) and R8 GRMP developed an assessment tool entitled “Forest Tree Genetic Risk Assessment System” (FORGRAS) (Potter and Crane 2010). This assessment system is a flexible framework, utilizing factors such as life history trait data, climate change and pest and pathogen threat information, to categorize, rank and prioritize our many tree species for conservation, monitoring, management and restoration. The assessment factors included intrinsic attributes (e.g., population structure, fecundity, seed dispersal ability, crop frequency, range, density, rarity, regeneration capacity); external threats to genetic integrity (e.g., pest, diseases, loss of habitat, fragmentation, drought); and conservation factors (e.g., evolutionary distinctiveness, regional responsibility).

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FORGRAS has identified at least 12 tree species that are currently imperiled. The R8 GRMP has increased tree conservation efforts, engaged more external partners, and initiated more seed collections for a variety of these species. The focus was initially on glacial refugia in the Southern Appalachian Mountains, but we have expanded our efforts to encompass other ecoregions where tree species are threatened. Currently, we are working with Carolina and eastern hemlocks, several pines (Table Mountain, pitch, longleaf, shortleaf), red spruce, Atlantic white cedar, balsam and Fraser firs, American chestnut, Ozark chinquapin, butternut, oaks (Boynton, Oglethorpe, Maple-leaf, Arkansas, Georgia, Florida, Lacey) and ash (Texas, blue, pumpkin, Carolina).

Partnerships are critical to R8, and we work with numerous internal and external groups. All agencies and organizations have limited resources, so collaborations facilitate achieving multiple goals. Our internal partners include Southern Research Station units, National Genetics Lab (NFGEL), National Seed Lab, Forest Health Protection, and National Forest units. Our primary external partner is the Central America and Mexico Coniferous Resources Cooperative (CAMCORE), North Carolina State University. Others include the Longleaf Alliance, Shortleaf Initiative, Atlantic White Cedar group, Southern Appalachian Red Spruce Initiative, The American Chestnut and the Ozark Chinquapin Foundations, American Public Gardens Association members, universities, tree improvement and nursery cooperatives, and state and private nurseries.

Safeguarding and maintaining the genetic resources and genetic variation across multiple species will require tailoring of conservation, management, monitoring and restoration measures for each. Strategies and guidance are in development or being implemented in R8, including (1) developing new or updated seed zones, (2) establishing *in situ* and *ex situ* seed production areas, (3) mixing seed lots to match updated or new seed zones, (4) designing new planting range maps and (5) writing field protocols on how to establish living tree conservation banks and restoration tree seed reserves (Echt et al. 2011) within seed orchards or in general forested areas on the national forests. R8 GRMP seed orchards have already begun work on establishing living tree conservation banks using the imperiled tree species seed collections.

In summary, a variety of threats, most importantly climate change and insect and disease infestations, will increase the likelihood that forest tree species could experience population-level extirpation or species-level extinction during the next century. Region 8's FORGRAS tool has provided a list of species to target for monitoring efforts and for proactive gene conservation and management activities. GRITS is essential to support and maintain healthy, sustainable, resilient and productive vegetation on the National Forests, for now and into the future.

Literature Cited

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