

Overview of the Camcore (NC State University) and USDA Forest Service Cooperative Gene Conservation Program for Threatened and Endangered Tree Species Native to the Southern United States¹

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The southern United States is home to some of the world’s most biologically diverse temperate forests. These forests range from the Atlantic and Gulf coastal plains to the Southern Appalachian Mountains and are home to more than 140 tree species which provide a number of ecosystem services, including clean air and water, carbon storage, recreational opportunities, wood, and fiber to feed a growing population’s need for solid wood and paper products. Many of these species are threatened by natural and human-caused disturbances, including native and exotic insects, diseases, invasive plants, tropical weather systems, wildland fire, development, fragmentation, and climate change. Species with declining population sizes need dynamic approaches to *ex situ* gene conservation to secure seed resources for long-term preservation and the eventual restoration of the species and ecosystems. Since 2003, Camcore (Central American and Mexico Coniferous Resources Cooperative), International Tree Breeding and Conservation, North Carolina State University) and the U.S. Department of Agriculture Forest Service have collaborated on a cooperative gene conservation program to secure seed resources for tree species native to the southern United States recognized as threatened and endangered. Species targeted for seed collection to date include eastern hemlock (*Tsuga canadensis*), Carolina hemlock (*T. caroliniana*), Table Mountain pine (*Pinus pungens*), Atlantic white cedar (*Chamaecyparis thyoides*), red spruce (*Picea rubens*), Fraser fir (*Abies fraseri*), and four rare species of ash (*Fraxinus* spp.). Camcore employs studies of genetic and adaptive variation using microsatellite molecular markers, seed zone models, plant hardiness zones, and ecological sub-regions to design seed conservation strategies and to target seed collections to areas of high or unique variation. Substantial progress has been made with the hemlocks and Table Mountain pine, and project overviews have been published (Jetton et al. 2008. *Forest Ecology and Management*. 255: 3212–3221; Jetton et al. 2013. *Tree Planters Notes*. 56: 59–71; Jetton et al. 2015. *Tree Planters Notes*. 58: 42–52). To date, more than 2.5 million hemlock seeds representing 728 mother trees in 72 populations of eastern hemlock and 134 mother trees and 19 populations of Carolina hemlock have been placed into conservation. Seed collections from Table Mountain pine acquired nearly 400,000 seeds representing 262 mother trees in 38 populations. Projects with Atlantic white cedar, red spruce, and Fraser fir are ongoing, but have already acquired seed representing 205 mother trees in 28 populations of Atlantic white cedar, 83 mother trees in 12 populations of red spruce, and 129 mother trees in 10 populations of Fraser fir. The seed conservation project for ash is focused on four rare species that occur in the southern United States: Carolina ash (*F. caroliniana*), pumpkin ash (*F. profunda*), blue ash (*F. quadrangulata*), and Texas ash (*F. texensis*). Collections for these species are in the planning phases and will begin during the summer of 2016.

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