Using Biotechnology to Conserve Eastern and Carolina Hemlock Germplasm

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Both hemlocks native to the eastern United States, eastern hemlock (*Tsuga canadensis*) and Carolina hemlock (*Tsuga caroliniana*), are threatened with extinction by the hemlock woolly adelgid (*Adelges tsugae*), a non-native insect that has now spread throughout the range of these two forest species. Although biocontrol measures for the insect are now being tested, the genetic diversity of both hemlock species is declining every year as populations of the trees are devastated by the pest. A system for long-term preservation of eastern and Carolina hemlock germplasm would help ensure that, even if biocontrol measures take decades to be optimized, the genetic diversity of these species could be maintained for restoration purposes. With the goal of aiding germplasm conservation, we have initiated the first embryogenic cultures of both eastern hemlock and Carolina hemlock to demonstrate the feasibility of conserving germplasm of these two species via cryopreservation of embryogenic cultures. In a preliminary study, we collected immature cones from eastern and Carolina hemlocks in North Carolina during July and August, dissected the cones to obtain immature seed explants, and cultured the immature seeds or embryos dissected from them on a pine embryogenesis induction medium containing 2,4-D. A low percentage of the explants produced callus that appeared similar to embryogenic callus reported for other conifers, and callus derived from one explant representing each species went on to produce cotyledonary stage somatic embryos following transfer to a maturation medium. Further research will determine the potential of these embryos to produce somatic seedlings and the ability of the embryogenic cultures to recover following cryostorage.