Summary of Important Results from Biological Research Conducted by Camcore Over the Last 25 Years

W. S. Dvorak[1]

We have learned that the ancestor of loblolly pine (*Pinus taeda*) is shortleaf pine (*Pinus echinata*) and that the progenitor of slash pine (*Pinus elliottii* var. *elliottii*) is most likely an ancient form of Caribbean Pine (*Pinus caribaea* var*. hondurensis*). *Pinus oocarpa* from Mexico and Central America appears to be the evolutionary grandfather of all pine species in the Oocarpae and some species in the Australes subsections. Genetic distances between species in both taxonomic subsections as defined by RAPD markers are often correlated to our ability to make successful wide hybrid crosses. Reproductive cycles of pines vary from 14 to 48 months.

The magnitude of genetic diversity in Mexican pine populations appears to be related to geography. There is little correlation between levels of genetic diversity identified by molecular marker analyses and provenance performance for adaptability and growth, with the exception of studies conducted on *P. maximinoi*. *Ex situ* conservation efforts at the species and provenance level have been successful for many of the Camcore species, but pollen contamination between species like *P. patula* and *P. greggii* and *Eucalyptus grandis* and *E. urophylla* in some exotic environments complicate strategies to maintain gene bases of "pure" species.

The early wood density of species like *P. tecunumanii, P. maximinoi*, and *P. patula* var. *longipedunculata* is higher than that of loblolly pine when trees of both groups are grown as exotics in places like Brazil and South Africa. As a result, these Mexican pines exhibit a more gentle pith-to-bark density gradient than do the US southern pines, and a more stable, uniform wood. Provenance differences in wood density in *P. patula* and *Eucalyptus urophylla* appear to be biologically significant. Near infrared (NIR) analysis suggests that regression models developed for a pine species in one country can be used successfully to predict chemical wood properties of selected trees of the same species in another country.

The Mexican pines show great variability in their resistance to Pitch canker (*Fusarium circinatum*) and Diplodia needle blight (*Sphaeropsis sapinea*). Several of the Oocarpae pines (*P. oocarpa, P. pringlei, P. jaliscana, P. tecunumanii* (low elevation) show great tolerance to Pitch canker. Evolutionary history and disease resistance patterns seem to be correlated. *Pinus tecunumanii* and *P. oocarpa* also show good resistance to Diplodia needle blight while *P. patula* and *P. greggii* are very susceptible. Significant provenance differences in Diplodia susceptibility and strong positive correlations between productivity and disease resistance offers hope for improvement though selection and breeding in some environments.

Conservation approaches used for tropical and subtropical tree species appear applicable to temperate species in the US. Joint efforts are underway by Camcore and the USDA Forest Service to conserve populations of Carolina Hemlock (*Thuja caroliniana*) threatened by the exotic adelgid (*Adelges tsugae*) in the highlands of the southeastern US by moving seeds from selected population to southern Latin America. Field conservation banks in Brazil and Chile will serve as gene reservoirs in case local experts cannot control the introduced pest.

[1] Professor, Department of Forestry and Environmental Resources, NC State University