Abstract

Restoring Seasonal Tropical Forests in Mexico: Using Designer Communities to Direct Succession

The proposed research follows upon current research on mycorrhizae and ecophysiology of planted trees in seasonal tropical forest, Mexico. Defining measurable goals for restoration is on of the central issues in restoration ecology, and is especially problematic in species rich and disturbed systems such as seasonal tropical forest. Designer communities will be established to initiate succession in two sites, and measure the feedbacks that the developing communities have on 1) ecophysiological characteristics of the trees over time, 2) biodiversity of colonizing plant species, 3) mycorrhizal fungal diversity and effects on plant growth, and 4) soil properties. Because of the high beta diversity in tropical forest, the original species composition cannot be duplicated, but species with defined ecophysiological characteristics can be selected that may either slow or hasten succession. These characteristics include fast and slow-growing plants, sun and shade plants, large and small-seeded, drought tolerance, C/N of leaf tissue, wood density, and others. Three kinds of communities will be established, late seral, early seral, and a mix of seral species.

The studies will be done in two locations to compare restoration treatments. One is the El Eden Ecological Reserve on the Yucatan Peninsula, the other is the Chamela Biological Reserve on the Pacific Coast. The sites have many species in common, but different land use problems. The El Eden region has frequent escaped fires from shifting cultivation and invasion of the flammable Pteridium aquilinum, while the Chamela area forests are being converted to pasture. El Eden has a rich seed and propagule bank after fire, and sites will be prepared by selective harvesting and thinning as well as planting. In contrast, preliminary evidence from Chamela pastures suggests there may be virtually no native seedbank, and some 20 tree species per treatment will be planted.

We hypothesize that the growth rate and seral status of the managed community will have different feedbacks on community and soil properties. The rate of canopy closure will vary, as will animal seed dispersers and diversity of plant colonization. Our current research shows about 25 species of arbuscular mycorrhizal (AM) fungal species to date in either of these forests, and their composition is different in early and late seral forest. Thus AM fungi are a low diversity, tractable group of organisms to study the feedbacks of diverse plant community on AM species composition. We also propose experiments to determine which AM species are contributing to the observed plant responses. Finally, we will examine changes in soil nutrient pools over time.

Another major objective of this research is information transfer. The ecophysiology of a large number of species has been studied at Chamela, but only dew at El Eden. This knowledge is of practical use when creating designer communities with desired characteristics. One of our goals is to determine how much information from Chamela can be used to select species in common with El Eden and examine similarities in the restored successional plant communities with

respect to ability of different species to establish, grow in sun and shade, develop a closed canopy, and other characteristics.