Tree Diversity:
New Solutions To Current
Homogeny & Loss

by Dr. Kim D. Coder, Professor of Tree Biology & Health Care
Warnell School, University of Georgia, Athens, Georgia, USA

Tree diversity concepts are becoming more critical within communities and among tree health care providers. It is becoming clear there are advantages and disadvantages to tree diversity with great differences of opinion between ecological conscious laypeople and professional resource managers.

One important fallacy is that diverse systems are inherently more stabile than less diverse systems. A complex community ecosystem is made of many cells of simple systems which we tend to clump together into large tree management units. Increasing stability and increasing diversity are not linked. In community situations, the chaos of a few simple system losses can tilt ecoplex diversity downward.

This presentation will concentrate on new ideas from research attacking tree diversity issues in community forest and landscape management. Tree diversity measures are a combination of the number of different species (richness) and their abundance (evenness). In many communities, and written in some inventory reports, species numbers alone are celebrated as tree diversity.

Having a token single planting of a tree is almost ecologically meaningless. Until inventories are completed, many stakeholders in communities do not realize how little diversity exists across the entire management unit. Again, having one spot with many species does not make the city diverse if ever other spot is dominated by two species.

Tree diversity is usually measured using indexes or statistics which combine the number of species, called richness, with the abundance, importance, or evenness of tree species. In simple terms, richness is the number of tree species per acre, where diversity is the number of tree species per acre plus their relative abundance per acre.

For example, a park could have 25 different tree species with 3 species comprising 90% of all the tree stems. In a relative sense this is not a diverse site although species richness is 25. Alternatively, a park with 25 different species with 20 tree species comprising 90% of all trees would be considered more diverse because many tree species are important on the site.

One component of using various diversity indexing numbers which can seem backwards to stakeholder groups is the richness loss conundrum. In some ecoplexes, if the number of tree species (richness) declines, tree species diversity indexes may climb, especially if the species lost were important and widespread species. For example, elm (***Ulmus***) or ash (***Fraxinus***) loss my cause an increase in diversity values because relative abundance and evenness of the remaining species increase.

One way of considering tree diversity on a site or across an area would be using the Berger-Parke Index. This index uses the number of trees cited on an inventory as the most abundant species divided by the total number of trees in the inventory. The result is a single index number approximating tree diversity and can be used to compare across sites.

Across North America, Europe, and the Pacific Rim, cities are undergoing a number of tree diversity related changes including species and family homogenization and loss, structural diversity and ecological volume loss, genetic diversity loss, and tree habitat loss. For example, the same identical tree continues to be planted in many places. It is not simply cultivar overabundance, but the tendency toward using the same cultivars constantly.

Tree family diversity is another key component. Many stress guilds are focused at the tree family level while we shift planting between related genus / species within a family. A greater number of tree families planted, and a prejudice (prohibition) against the most common genera planted is critical for increasing diversity. Use of a number of species per number of families ratio continues to fall in most communities meaning fewer tree families are represented. Our community treescapes are becoming uniform and homogenized. In some cases limited planting lists (with few tree families listed), and regulatory pressures accentuate this problem.

Studies have shown it is not fragmentation of tree planting and growing areas which limit tree diversity and growth, but loss of total habitat area. In other words, making many miniature tree pockets

and parks can only aid in tree diversity issues when the total area of ecological volume is increased.

On the other hand, a recent trend in consolidation of ecological viable space in large chunks of green space actually does nothing for tree diversity issues if total habitat area and ecological volume are not increased. Programs which minimize fragmentation of tree spaces have proven ineffective in supporting or increasing tree diversity.

To counteract these changes, simple enrichment planting programs have been proposed and implemented -- some of which tend to make diversity loss problems even greater. In addition, the balance within tree diversity management remains compromised by reducing cost (ease) of maintenance and associated loss of tree provided benefits.

We tend to plant well-behaved, uniform, small statured, genetically similar, and short-lived trees. This tendency leads to diversity loss through ecological process stress and through human expectations based upon tree-illiteracy.

This presentation will discuss tree diversity definitions, the three types of tree diversity (special, taxonomic, and genetic), and provide a number of real solutions to tree diversity change and loss problems.