Public Abstract
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Title:WOODY SPECIES AND FOREST STRUCTURE IN NORTHERN MISSOURI RIPARIAN FORESTS WITH DIFFERENT AGES AND WATERSHED SIZES

A chronosequence (1 to 250+ years) of 160 woody species plots was established throughout northern Missouri riparian forests to explain the influence of site hydrology and stand age on species distribution and forest structure. Site hydrology was estimated by the surrogate variables of watershed size, height above the channel shelf, distance to channel, stream segment gradient, depth to water table, and percent clay. Stand age was found to be the dominant factor affecting species distribution and forest structure across the chronosequence. Watershed size was found to influence only species distribution; forest structure (tree height, coarse woody debris, size and age distributions) was not affected by watershed size.
A conceptual model was developed and tested on the importance of site hydrology to species distribution and forest structure. Tree data were grouped into the flood tolerant and wetland indicator functional groups and these groups were used for model validation. The importance of very flood tolerant and obligate wetland species increased in larger watersheds suggesting that site hydrology shapes northern Missouri riparian forest species distribution. The flood-pulse hypothesis suggests that flood duration increases in larger watersheds and the conceptual model was based on this hypothesis; however, gage analysis suggested flow duration on the floodplain did not increase with watershed size. In addition, gage analysis indicates that flow duration is not biologically significant on these floodplains. Thus, it is hypothesized that other flooding variables or soil moisture content (groundwater) are important for the increase in the very flood tolerant or obligate wetland species in larger watersheds; additionally, the larger size of the geomorphic features in larger watersheds could increase the colonization of the very shade intolerant cottonwood and black willow.
Stand age was found to be important in structuring forest communities, explaining species replacement patterns, and species richness. Early successional communities were found to differ in species composition between watershed sizes. Small watersheds (< 1000 km2) had silver maple and boxelder as the early successional community, while early successional communities in larger watersheds (> 1000 km2) were dominated by cottonwood and black willow. It is hypothesized that larger watersheds have the sediment transport capacity to create the bare mineral soil regeneration sites required for tree species in the family Salicaceae. Correlations of species importance values and stand age indicated that 12 of 18 species were influenced by stand age and five of the six remaining species could be considered mid-successional, thus not expected to increase montonically with stand age.
Watershed size was also associated with species distribution and tree species diversity patterns in these riparian forests. Correlation analysis indicated that the distributions of 12 of the 18 most abundant species were influenced by watershed size. Non-metric multidimensional ordination indicated that watershed size was an important variable in species distribution of riparian forest communities. In addition, species richness and Shannon-Weaver diversity index values decreased in larger watersheds. The mechanism for the decrease in tree diversity is unknown but gage analysis indicated that flood frequency or duration could not be the cause; in addition, the other flooding variables of height, sedimentation, and stream power (shear stress) would not result in differential species survival. It was hypothesized that smaller watersheds had smaller fluvial landforms with greater habitat heterogeneity resulting in greater tree diversity.
Contrary to the functional group and species analysis, forest structure and tree growth rates were not associated with watershed size although I hypothesized that forest structure likely would be influenced by drought in smaller watersheds and flood duration in larger watersheds. Sapling and seedling density were

not strongly influnced by stand age but stand age clearly influenced tree height and CWD; however, watershed size did not influence any of these measures. Tree growth rates were not related to watershed size; of the variables tested only tree density affected tree growth rates.

There were seven significant trends in the tree-watershed data: 1) very flood tolerant species importance values increased in larger watersheds; 2) shade tolerance was the dominant mechanism structuring riparian communities; 3) watershed size influenced species distribution; 4) early successional species differed among watershed sizes; 5) species richness decreased with increasing watershed size; 6) mortality rates were fairly uniform among watershed sizes; and 7) forest structure was not influenced by watershed size. In the incised alluvial channels of northern Missouri, the increases in flood tolerance, decreases in species richness, and the lack of influence on forest structure could be the result of groundwater dynamics or less habitat heterogeneity in larger watersheds rather than differences in flood duration; in addition, flooding interacts with seedling germination and patch size to create highly diverse forests.