

Mycorrhizal Colonization in Cottonwood and Salt Cedar Stands along the Middle Rio Grande: Implications for Water Quality and Water Consumption

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PURPOSE OF STUDY

Riparian forests are effective filters for surface water and groundwater; but the maximum filtration capacity of different forest stands may vary by tree species. The formation of mycorrhizal associations improves the filtration capacity of plants. Mycorrhizae are fungi that colonize plant roots and enhance the plant's capability to acquire water and nutrients. Native cottonwood trees are known to harbor multiple species of mycorrhizae. In contrast, studies outside of New Mexico provide evidence that salt cedar, a non-native, does not form strong mycorrhizal associations. Yet salt cedar and cottonwood trees are able to acquire nutrients at equal rates despite potential differences in mycorrhizal colonization, according to preliminary research on root nitrogen uptake by vegetation along the Rio Grande. Efficient nutrient uptake rates, in concert with drought-adaptations and salinity tolerance, likely strengthen the spread of non-native salt cedar at the expense of native cottonwoods. However, land cover conversion from cottonwoods to salt cedar may not affect the filtration capacity of riparian buffers. The researchers will (1) compare patterns of mycorrhizal colonization in roots of salt cedar and cottonwood along the Middle Rio Grande, and (2) collect additional data on rates of root nitrogen uptake in order to validate early results that these rates are comparable across plant species.

RESULTS

- Data on root colonization are currently being analyzed. Preliminary results confirm other reports that cottonwood roots are highly colonized by mycorrhizae, whereas salt cedar along the Rio Grande do not form strong mycorrhizal associations.
- Root uptake experiments have been conducted using a stable isotope of nitrogen (^{15}N) in the forms of nitrate, ammonium, and glycine. Samples are currently being processed for stable isotope analyses.
- The study will be completed by December 31, 2005.

A monotypic stand of salt cedar at Sevilleta National Wildlife Refuge. Photo by J. Cleverly



Cottonwood gallery forest in South Albuquerque as seen from the Rio Grande. Photo by J. Follstad Shah

A stand of cottonwoods at Bosque del Apache National Wildlife Refuge that receives regular overbank flooding. The flood in this photo occurred in Spring 2001. Individuals in photo from left to right are graduate student researchers Jennifer Follstad Shah and Teresa Tibbets, and then-undergraduate student Leslie Cryan. Photo by J. Schuetz



Cottonwood gallery forest in South Albuquerque. This site does not experience overbank flood events. Photo by J. Follstad Shah



A stand of salt cedar at Bosque del Apache National Wildlife Refuge that receives regular overbank flooding. The flood in this photo occurred in Spring 2004. Individual in photo is a University of New Mexico undergraduate work study student, Nick Engquist. Photo by J. Follstad Shah



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