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Seedling competition between native cottonwood and exotic saltcedar: implications for restoration

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Abstract Altered hydrology of southwestern United States rivers has led to a decline in native cottonwood (*Populus deltoides*). Areas historically dominated by cottonwood have been replaced by invasive saltcedar (*Tamarix chinensis*). Restoration of historic hydrology through periodic flooding of riparian areas has been a means of restoring native species. However, due to similarity in germination requirements of cottonwoods and saltcedars, flooding may create an unwanted increase in the number of saltcedar seedlings. Therefore, we evaluated competitive aspects of these co-occurring species in an extant riparian habitat in the arid southwestern US. We measured effects of competition between cottonwood and saltcedar seedlings

and among cottonwood seedlings during the first growing season following seedling establishment in 360, 0.5 × 0.5-m plots at the Bosque del Apache National Wildlife Refuge, New Mexico. We used five interspecific density treatments and five intraspecific density treatments. Cottonwood seedling biomass and height were twice that of saltcedar seedlings across all density treatments. As density of cottonwood increased, intraspecific competition increased in severity and biomass of cottonwood seedlings decreased. At 4 plants/0.25 m², cottonwood seedlings had the greatest biomass; whereas, survival was highest at 10 plants/0.25 m². Our results support greenhouse studies and suggest that if favorable germination conditions are established for cottonwood in floodplains, saltcedar seedlings that cogerminate could be outcompeted by native cottonwood seedlings.

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Introduction

Competition is considered an important factor in structuring plant communities (e.g., Tilman 1988; Grime 2001). However, ecologists find it difficult to make accurate predictions about the outcome of competitive interactions in many plant communities (e.g., Connell 1983; Connor and Simberloff 1979;