

Understory plant community variability among tamarisk, cottonwood, and willow canopy types along a regulated reach of the Dolores River, Colorado—Implications for ecological restoration

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Riparian environments in their natural state are maintained by natural flow regimes that native species have evolved to over thousands of years. Many researchers hypothesize that the alteration of the natural flow regime is a principal driver in the shift of riparian plant community composition and structure to favor non-native plant establishment. Recently, numerous tamarisk removal studies have been initiated to restore the ecological integrity of riparian environments across the Southwest. While removal of tamarisk and establishment of native woody canopy types is desirable, little information exists on what vegetation might naturally replace tamarisk when the tamarisk canopy is removed. We conducted a study quantifying woody canopy types and understory plant community composition and structure and associated abiotic environmental variables along 154 km of a regulated reach of the Dolores River, Colorado. We established 18 plots along this river stretch for each major woody canopy type (tamarisk, cottonwood, willow). Each plot location had to meet a set of pre-determined criteria, which included minimum size of riparian habitat, accessibility, and similar geomorphic setting (i.e. relatively broad alluvial valley). We used consistent variable overstory canopy plot sizes for each woody canopy type to quantify canopy stand structure because woody canopy types grow in differently shaped polygons on the landscape. We systematically place eight 1 m² (0.5 x 2.0 m) plots along a 30 m transect within each overstory plot to quantify understory composition and structure. Overall, there were significant differences (Pseudo F 2.73, p=0.0002) in the understory plant communities among woody canopy types. Pairwise comparisons illustrated that the tamarisk canopy type was significantly different from the cottonwood (p=0.0002) and willow (p=0.0002) canopy types. There were no significant differences (p=2.5) in understory plant communities between the cottonwood and willow canopy type. *Acroptilon repens* (IV 54, p=0.004), *Chenopodium rubrum* (IV 48, p=0.001) *Cardaria draba* (IV 26 ==0.01), and *Bromus tectorum* (IV 25, p=0.04) were indicator species, species that are particularly faithful, for the tamarisk canopy type. *Poa pratensis* (IV 41, p=0.0006) and *Rhus trilobata* (IV 27, p=0.009) were indicator species for the cottonwood canopy type. *Equistem arvense* (IV 49, p=0.0002), *Phalaroides arundinacea* (IV 44, p=0.0004), *Glycyrrhiza lepidota* (IV 35, p=0.0002) and *Clematis ligusticifolia* (IV 34, p=0.001) were indicator species for the willow canopy type. Our results illustrate that understory plant communities vary among different woody canopy types along a 154 km regulated reach of the Dolores River. Specifically, the tamarisk canopy type was dominated by invasive weeds and ruderals. These results demonstrate that land managers need to take a holistic approach to tamarisk removal, which includes managing for invasive and ruderal species in the understory plant community to ensure the removal of one invasive species doesn't result in an increase of other invasive species.