



Impacts of stream flow and climate variability on native and invasive woody species in a riparian ecosystem of a semi-arid region of the Great Plains, USA

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Riparian ecosystems support diverse plant communities that exert direct and indirect biological, physical and chemical influence on, and are influenced by, adjacent water through both above and below-ground interactions. Historically, riparian areas of the northern Great Plains (United States) have been dominated by the native *Populus deltoides* (eastern cottonwood). This species relies on regular floods for regeneration and groundwater access for success. Over the past sixty years, changes in flow management and agricultural practices, coupled with climate variability and drought, have altered stream flow and caused a dramatic decline in stream water yields and levels of groundwater. These and other biotic factors have promoted the expansion of the upland native woody species *Juniperus virginiana* (eastern redcedar), and the invasion of the non-native (introduced) *Elaeagnus angustifolia* (Russian olive) into riparian ecosystems. This invasion has further altered the water balance in the system and exasperated the problem of water scarcity with negative feedback on ecosystem services and growth of native woody species. The ability of *P. deltoides* to re-establish and grow is of concern for natural resource managers. The study utilizes tree ring analysis of annual growth rates and stable isotope ratios of ^{13}C and ^{18}O to determine 1) the response *P. deltoides* and invasive *J. virginiana* and *E. angustifolia* have to climate variation and stream flow regulation, and 2) the impacts of the two invasive species on the growth of native *P. deltoides*. Preliminary results have shown that *P. deltoides* annual growth rate (using basal area increment growth) continually declined over the last 40 yrs, while that of *E. angustifolia* steadily increased. Growth of both *P. deltoides* and *J. virginiana* displayed greater dependence on climatic factors than *E. angustifolia*. Ecological and hydrological significance of the results will be presented.