

A COMPARISON OF ECOHYDROLOGICAL FUNCTION FOR A NATIVE C₄ GRASS, NATIVE C₃ FORB AND C₄ CROP DURING A WET YEAR.

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Abstract: Daily and seasonal patterns of water use by native prairie vegetation exert an important control on water fluxes within ecosystems to watersheds. However, the replacement of prairie by annual crops in the Midwest has significantly altered the hydrologic cycle. In this study, water use was assessed for two dominant tallgrass prairie species, big bluestem (*Andropogon gerardii*, C₄ grass) and coneflower (*Ratibida pinnata*, C₃ forb) in a reconstructed prairie, and for corn (*Zea mays*, C₄ crop), in Central Iowa. Water use was estimated from sap flow measurements recorded from July 31 to August 27, 2008. Microclimate and evapotranspiration (ET) data were collected over the same time period. On a whole plant basis, average daily water use during the measurements period was highest for corn (438 g), intermediate for coneflower (38 g), and lowest for big bluestem (17 g). However, on a leaf area basis, daily water use was lowest for corn (0.9 kg m⁻²), and similar for coneflower and big bluestem (2 kg m⁻²). At the plot scale, average daily crop ET was slightly greater (4.3 mm) than prairie ET (3.9 mm). Daily sap flow by prairie species was highly sensitive to increased soil moisture from rain events, but corn was not. Our findings suggest that both C₃ and C₄ prairie species are capable of maintaining high water use during a relatively wet year, which might reduce runoff. Overall, prairie vegetation may play an important role in regulating hydrologic flows in agricultural landscapes dominated by annual crops.