

Assessing Constructed Wetlands for Beneficial Use of Saline-Sodic Water

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Background

Changes in agricultural practices, and irrigation strategies combined with natural processes, have led to increased salinization of soil and water resources worldwide. Coal bed methane (CBM) development in the Powder River Basin of Montana and Wyoming results in the co-production of large volumes of sodic and moderately saline discharge water, and represents a potential source of salinization of soil and water resources.

Objectives

The objective of this study was to evaluate the potential of constructed wetlands as a tool for CBM product water management. This was accomplished by assessing seasonal water use, biomass production and water use efficiencies (WUE) of three plant communities.

Methods

Native species establish hydrologically distinct communities in former ephemeral channels now running with CBM product water, and nine species of those cataloged were selected and segregated into three communities. Closed-system wetland cells were constructed and each community was assigned to four of these cells, i.e., lysimeters. Chemistry of the supply water was sodic and moderately saline (EC ~ 3.4 dS/m, SAR > 25), typical of northern portions of the Powder River Basin where low to moderate electrical conductivities (EC 2-3 dS/m) and high sodium adsorption ratios (SAR > 20) are common.

Results

All three communities had similar total water use but WUE's differed significantly among the communities. Evaporation from a Class A evaporation pan was observed to be higher than evapotranspiration from the planted lysimeters, but this is not definitive as there was only one replication of the pan.

Species survival and colonization was very good for seven of the nine species selected. American bulrush (*Scirpus americanus*) had very sparse spring regrowth and Inland saltgrass (*Distichlis stricta*) was likely out-competed by Creeping spikerush (*Eleocharis palustris*).

Results of this study indicate that constructed wetlands planted with native, salt tolerant species have potential to utilize substantial volumes of CBM product water while remaining robust and viable. Although results suggest evaporation from an open water surface to be greater than evapotranspiration from a constructed wetland, constructed

wetlands have added benefits of providing wildlife habitat, recreation, and viewshed enhancement.