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“Ecological Functions of Irrigation Dependent Wetlands”

Abstract

Specific ecological functions are known to be performed in particular wetland types, such as nutrient removal in marshes and groundwater recharge in wet meadows (Richardson 1994). The structure of wetland plant, insect, and animal communities reflect and influence these functions. In the Front Range and eastern plains of Colorado natural riparian wetlands are maintained by floodwaters of varying intensities and return intervals (Hauer and Smith 1998; Stromberg et al. 2007). In contrast, wetlands created by agricultural irrigation waters are often little connected to other wetlands and may be isolated within the upland matrix. This landscape configuration could result in functions that are different from those performed by natural riparian wetlands (Leibowitz 2003). The hydrologic connection to human constructed channels, reservoirs and drainage ways may degrade or enhance certain functions. My research will quantify and compare the ecological functions of natural and agricultural wetlands at study sites in Larimer and Weld counties Colorado. Wetlands in the study area have been assigned a National Wetlands Inventory (NWI) code to describe its dominant vegetation and water regime. I will test the FACWet approach to accurately predict x, y z, functions in irrigation created wetlands (Johnson et al. 2013) which has been adopted by the Colorado Department of Transportation to rapidly assess the capacity of wetlands to provide specific functions. This approach also incorporates surrounding landscape influences for a more complete ecological assessment. Understanding the strengths and weaknesses of rapid wetland functional assessments such as the Hydro Geomorphic approach (HGM), Functional Assessment of Colorado Wetlands (FACWet), or Wetland Rapid Assessment Procedure (WRAP) will be critical for their improvement. The identification of wetland functions that require detailed study for accurate measurement could highlight natural or constructed wetlands where current assessment methods do not provide sufficient information. Hauer and Smith (1998) suggested comparing functions of wetlands to a set of reference sites, such as natural intact historic wetlands. This is especially important when comparing wetland and riparian complexes where the biotic and geomorphic structure as well as water and sediment inputs may have been altered. I will identify and establish reference sites for both natural and agricultural wetlands in this comparison over a range of represented wetlands types included riparian forests, wet meadows and marshes. Wetland profiles based on their physical attributes, biological components, and position in the landscape will be combined with information about the irrigation infrastructure and potential alterations or net reduction in water allocations. I will develop a spatially explicit method to assign risk levels to wetlands under a scenario of reduced water. This integration will tie reductions in water in the irrigation system to reductions in wetland habitat and ecosystem function that might not otherwise be immediately apparent. The feedback to socio-economic decisions which incorporate cost and benefit analysis will benefit from a more complete picture of the economically valuable functions of wetlands and what might be lost. Conclusions from this work will be presented to a variety of audiences including the general public, water managers and scientists as articles and presentations.