



WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: Wetland Management in Agricultural Landscapes in the Prairie Pothole Region

Focus category: WL, AG, WQL

Key Words: wetlands, agro-economics, aquatic invertebrates

Duration: March 1, 1999 - February 28, 2000

FY 1999 Federal Funds: \$ 8,500

Non-federal funds allocated: \$17,400 \$10,000 \$7,400 (Total) Direct Indirect

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Congressional District: First

Statement of the critical regional or state water problems

Prairie Pothole Region (PPR) wetlands serve an important role in the hydrology and water quality of the region. Frequently cited wetland functions include flood water storage, groundwater and soil moisture recharge and nutrient filtering capacity. Although the majority of wetlands in the PPR are located in agricultural environments, the influence of agricultural management on wetland function and wetland contribution to long term crop production is poorly understood. We propose to integrate water quality and agro-economic data to evaluate wetland management options on cropland in the PPR.

Statement of results and benefits, and/or information

Past agricultural policy on wetlands e.g. "Swampbuster" has been based on traditionally defined wetland functions and values with little attention to their agro-economic role. A long term agro-economic analysis of yields and economic returns will be developed which can contribute to decision making in wetland management and policy development. This project will provide the missing links needed to improve wetland management practices in agricultural systems.

Nature, scope and objectives of the research

Goal: The goal of this project is to determine the impact of wetland management on the viability of agronomic and wetland systems in the Prairie Pothole Region.

Objective 1. To determine the influence of wetland landscapes on long term crop productivity.

Objective 2. To determine the influence of wetland landscapes on net returns to farmers and to analyze economic costs and returns of management alternatives.

Objective 3. To determine wetland management impacts on nutrient concentrations and aquatic invertebrate density in wetlands.

Wetland basins in the Prairie Pothole Region (PPR) of South Dakota were estimated to comprise 1.76 million acres in the mid-1980's (Dahl, 1990). More refined estimates by Johnson (1997) using GIS digital mapping techniques indicated nearly 2.2 million wetland basin acres or nearly 10% of land acreage in the PPR of SD. The importance of these wetlands to migratory waterfowl has been well established. Most wetland basins in the PPR of eastern SD are located on privately owned agricultural land. An estimated 65% of wetland basin acres are located in or adjacent to cropped fields, with 76% of temporary wetland basin acres located in cropped fields (Johnson et al., 1996).

Wetland functions include biodiversity, groundwater recharge, water storage, water quality, habitat, and direct human use of wetlands for hay, livestock forage, game production and hunting, and other recreation. These wetland functions produce outputs that may be valued by society. These economic and environmental variables are the major factors that influence social value of wetlands in agricultural areas (CAST, 1994; Berry and Buechler, 1993).

The economic demand for wetlands is derived from both the demand for wetland outputs and availability of other sources that can produce the same outputs. Wetland benefits may be grouped into conservation, direct output, indirect output, and nonuse benefits. Wetland owners, especially in agricultural areas, tend to place the highest values on direct output and conservation benefits of wetlands that impact the profitability of their farm operation (CAST, 1994). An important indirect output of wetlands that impacts profits is the effect of wetlands on crop yields in adjacent fields. Crop and forage budgets for fields containing wetlands are the basic data needed to examine these economic effects.

Since most wetlands are located on private lands, the perspective of landowners is very important. Many agricultural landowners view wetlands as nonproductive acreage or as operational nuisances. Economic issues are most commonly cited as justification for wetland drainage, including perceived potential for increased crop production, increased land value and financial gains to offset property taxes (Leitch, 1989). Economic evaluation of wetland conversion decisions in the Prairie Pothole Regions of Canada indicates the main factors favoring conversion of wetland to cropland are: crop price levels, government farm and conservation programs, owners nonuse of wetlands for hay/forage, and higher costs of field operations to farm around wetlands (VanKooten, 1993).

Recent wet conditions in eastern SD have limited the ability of farmers to plant, cultivate, and harvest their crops. The combination of economic issues, poor field conditions, and frustration about prohibitions on drainage since 1985 (due to the Wetland Conservation subtitle of the Food Security Act of 1985) has led to considerable interest in draining many wetlands. Johnson et.al.(1996) estimates that proposed "Swampbuster" revisions will put 35-49% of eastern SD wetland basins at high risk for drainage. The impact of potentially draining 300,000 to 450,000 wetland basins comprising 250,000 to 490,000 acres is poorly understood both economically and agronomically.

Preliminary agronomic and economic analysis by Rickerl et al. (1996) and Janssen et al. (1994) of three farming systems located in Lake and Minnehaha counties of eastern SD provides recent findings concerning the impacts of wetlands on crop yields and profitability. Economic analysis of 98 cropped fields in these three farming systems indicated that farming wetlands contributed to substandard net returns and high nutrient loads to wetland systems. Buffering the wetlands effectively reduced nutrient loads and improved net returns. High nutrient concentrations in wetlands can increase algal production and impact numbers of desirable invertebrate species. Aquatic invertebrates serve as a major component of waterfowl diets. Therefore, establishing wetland buffers can impact crop yields and economic returns, as well as water quality and waterfowl food supplies.

The novelty of this project is that it proposes an agroeconomic approach to wetland management and policy development in the PPR, but also includes evaluation of wetland functions related to water quality and wildlife. Although the majority of wetlands in the PPR are located in agricultural environments, their contribution to long term crop production is poorly understood. Past agricultural policy on wetlands e.g."Swampbuster" has been based on traditionally defined wetland functions and values with little attention to their agroeconomic role. This project will continue the development of a long term analysis as a potential contribution to decision making in wetland management and policy development.