



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2003IA38B

Title: Effects of Grazing Management on Sediment and Phosphorus Losses from Pastures

Project Type: Research

Focus Categories: Water Quality, Non Point Pollution, Conservation

Keywords: Grazing, Pastures, Riparian areas, Water run-off, Phosphorus

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Abstract: Sediment and phosphorus loading of streams are major impairments of surface water sources in Iowa. While production of perennial forages may limit sediment and phosphorus losses in precipitation run-off, sediment and phosphorus loading of streams from stream bank erosion may occur in pastures that are grazed to short sward heights by excessive numbers of cows. Further nutrient loading of streams may result from direct deposition of nutrients in manure. Because sediment and nutrient losses may be limited by maintaining an adequate forage sward height and distribution of manure may be altered by controlling animal movement with fencing or placement of alternative water sources, grazing management may be used to limit nonpoint source pollution of pastures streams. Therefore, an experiment is proposed to 1. Quantify the losses and flow of sediment and phosphorus from stream banks in pastures grazed under different stocking systems; 2. Measure the daily duration of time that cattle occupy locations in streams, along stream banks, and in riparian and upland areas in pastures grazed under different stocking systems; 3. Quantify the frequency that cattle defecate in streams, along stream banks, and in riparian and upland areas in pastures grazed under different stocking systems; and 4. Develop site-specific models of grazing management practices that optimize the quality of stream water and the profitability of pastures in Iowa. Six 30-acre smooth brome grass pastures that have Clear Creek

running through them will be stocked with 18 cow-calf pairs in three grazing management systems: continuous stocking with full access to the stream; rotational stocking (9 paddocks) with full access to the stream within each paddock and alternative water distal from the stream; and rotational (8 paddocks) with deferred (1 paddock containing the stream) stocking with limited access to the stream and alternative water distal to the stream. Paddocks grazed by rotational and deferred stocking will be managed for 50% forage removal and grazed to a 4-inch residual height, respectively. Cattle movement and fecal distribution patterns will be measured monthly on a four (equidistant perpendicular to the stream) by five (in the stream, on the stream bank, and 100, 200 or greater than 200 feet from the stream bank) grid and related to ambient temperature, and forage height and mass. Sediment and phosphorus pollution from stream bank erosion will be measured as the change in length of 5/8-inch fiberglass pins placed 3, 6, 9, and 12 feet from the stream's edge in 10 locations in each pasture and the soil phosphorus concentration measured as different soil depths at the initiation of the experiment. Relationships of stream bank erosion to soil surface roughness, forage canopy cover and climatic conditions will be determined. Cow production costs and returns will be determined and used with the sediment and phosphorus losses in optimization models for water quality and economic returns. The results will provide data for the development of water quality plans that consider the benefits of improved grazing management practices and, thus, enhance both water quality and economic returns.

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