RIPARIAN SHRUB BUFFERS REDUCE SURFACE WATER POLLUTANT LOADS

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Surface water resources in Kansas often contain concentrations of pesticides, nutrients, and sediments that are of concern to local citizens. The United States Geological Survey reported in 1999 that 97 percent of streams and 82 percent of lakes in Kansas would not fully support all uses as designated by state statutes (U.S. Geological Survey 1999). Bacteria and sediment contaminate a high percentage of streams while nutrients and pesticides contaminate many lakes.

One primary source of pollutants is water flow through watersheds from agricultural land (crop and grazing lands). The hydrology of streams and rivers in Kansas has been dramatically altered since settlement times in the 1800's. Cropland tillage practices, urban and transportation development, channel straightening, and livestock grazing practices have led to accelerated surface water movement, increased non-point pollution, and greater stream bank erosion.

Native riparian vegetative cover has been greatly reduced in much of the State. Reestablishing riparian buffers along streams could reduce flood damage and streambank erosion, improve wildlife habitat, and filter out pollutants including dissolved nutrients, pesticides, bacteria, and sediments.

The effectiveness of riparian buffers to remove pollutants from surface runoff is dependent on slowing sheet flow across the buffer, increasing infiltration, and prolonging subsurface flow. However, riparian buffers along agricultural fields in Kansas may not function effectively because physical barriers are inadequate to intercept the overland flow. In addition, surface flows are concentrated through terrace channelization or development of micro-relief near or in the riparian buffer. The later may result from sedimentation development at the entry of the buffer or flood deposits forming a levy on the bank of the stream.

There is little information available on the functionality of current riparian buffer areas in Kansas. Most of the riparian buffer research reported to date has been conducted in the Mid-Atlantic and southeastern United States (Lowrance and others 1985). The climate, soils, and hydrology of Kansas differ considerably from those on the eastern seaboard. Schultz and others (1994) have established several riparian studies in Iowa; however, important differences exist between Kansas and Iowa in the crop species grown, fertilizers and pesticides used, and in soil types and hydrology.

We have initiated a study to develop regional information on the effectiveness of riparian buffers to landowner and agency personnel in Kansas. This project will develop three riparian buffer demonstration and education sites across the State. Our objective is to evaluate the water quality-improving effectiveness of young, planted riparian buffers, and compare them to nearby native, mature, riparian woodland or grass-only filters. Monitoring equipment installed on the sites includes runoff samplers for both manual and automated collection of surface water samples and flow volume.

A shrub buffer demonstration and education site was established with American plum (*Prunus americana* Marsh.) in spring 2001. As will be done for all sites, we characterized the current vegetative cover and condition, soil properties, site characteristics, and past agricultural production practices. Surface runoff was sampled as water left the adjacent crop

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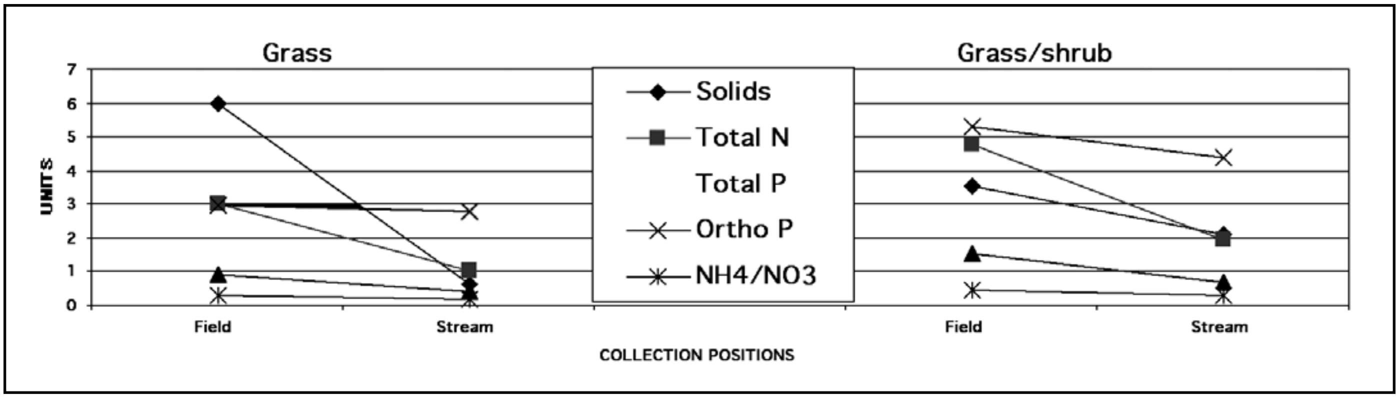

Figure 1.—*Average concentration of pollutants (ppm, relative) during four runoff events in 2001 through a grass buffer and a grass/shrub buffer.*

field and passed through the riparian buffers. We analyzed the water samples for various pollutants including total nitrogen, ortho and total phosphorous, and suspended solids in the KSU Agronomy Department laboratory following appropriate EPA protocols. Two additional sites to include a native woodland and a grassland will be established in subsequent years.

During four runoff events, both suspended solids and total nitrogen were greatly reduced in both the grass only and grass/shrub buffers as water moved downhill (fig. 1). Smaller reductions were found for ammonium/nitrate and total phosphorus. There has been a similar lowering of the pollutants in both the grass and grass/shrub buffers. Thus, initial results show that either type of permanent vegetation is effective in reducing sediment borne or soluble nutrients.

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