►Aerial photograph of the Rhodes site, April 2002.

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GRAZING STUDY Seeks Solutions

Iowa researchers look at minimizing negative effects on stream and water quality.

by ***Barb Baylor Anderson***

If streamside pastures are present on your farm, ongoing research in Iowa may soon offer solutions as to how to minimize the possible negative effects of grazing on the water quality of your streams. Researchers involved with the three-year study are measuring the impact of grazing management on water quality and hope to identify the best grazing management practices to maintain water quality.

"We are also looking for ways producers can best allow cattle to graze and still have access to water," confirms Dick Schultz, professor, Iowa State University (ISU) Natural Resource Ecology and Management Department.

Schultz and a handful of other researchers are all part of the Agroecology and Animal Management Issue Teams of the Leopold Center for Sustainable Agriculture at ISU. They have joined with the Iowa Cattlemen's Association on the project. Funding is provided through the Iowa Department of Natural Resources, the Leopold Center and the Iowa State Water Resources Research Institute to find new approaches to reducing nonpoint-source water pollution.

The study began in May 2001 at several locations across the state of Iowa, including ISU's Rhodes Research Farm, and with cooperating cattle producers on their farms. Researchers analyze different grazing practices with cows, including continuous grazing, rotational grazing and intensive rotational grazing to different residual heights. Data collected from the sites will eventually be used to offer producers whole-farm nutrient-flow solutions for the grazing systems tested.

"We are estimating the amounts of sediment and phosphorus (P) in sheet and rill and gully runoff during different times of the year in paddocks grazed to different forage heights during the summer, and in paddocks managed by hay harvesting during the summer with forage stockpiled for grazing during the winter," Schultz says.

"We keep track of the amount of phosphorus inputs that go through the livestock and pastures, and compare that with the amount of phosphorus that leaves the pastures in the form of runoff."

To determine sediment and phosphorus loss in runoff, Schultz says rainfall simulations are conducted at six sites (see Fig. 1). The slopes within each paddock range from 1° to 7° or from 7° to 15°. Six more sites were selected within the buffer zone below each paddock. Three of the sites are at the base of the paddock, and three are 33 feet (ft.) within the buffer strip. Each simulation runs for an hour and a half with a precipitation rate estimated at 2.8 inches (in.) of rainfall per hour.

During simulations, the amount of rainfall and runoff is measured at 10-minute (min.) intervals. A sample of runoff is collected and added to a composite sample that can be used to determine total sediment, total phosphorus and soluble phosphorus. Phosphorus and sediment are also measured in runoff from natural rainfall.

In addition to simulating and measuring runoff, the researchers are gauging stream bank erosion, believed to be a major source of sediment and phosphorus from grazed riparian pastures. Steel pins have been installed in various stream banks and are measured periodically to see how much of the pins becomes exposed from the soil. Schultz says preliminary data show the rainfall infiltration rate and the sediment and phosphorus flow are highly affected by the soil moisture content and the slope of the land.

Tangible results sought

The next step will be to take the information gleaned from tests to provide suggestions for cattle producers.

"We plan to show the effect of grazing management practices on sediment and phosphorus losses in surface runoff during natural rains," Schultz explains. "The information can then be used to develop best management practices to help producers control nutrient runoff from pastures."

Already, Schultz notes that the grazing strategies used seem to be linked to surface runoff and phosphorus movement. Tests show grazing to forage heights as short as 2 in. increases loss of sediment, total phosphorus and dissolved phosphorus due to less ground cover as compared to ungrazed areas. He says harvesting hay or managing grazing to leave a greater amount of forage on the pasture increases ground cover and significantly reduces loss of sediment, as well as total and soluble phosphorus in runoff.

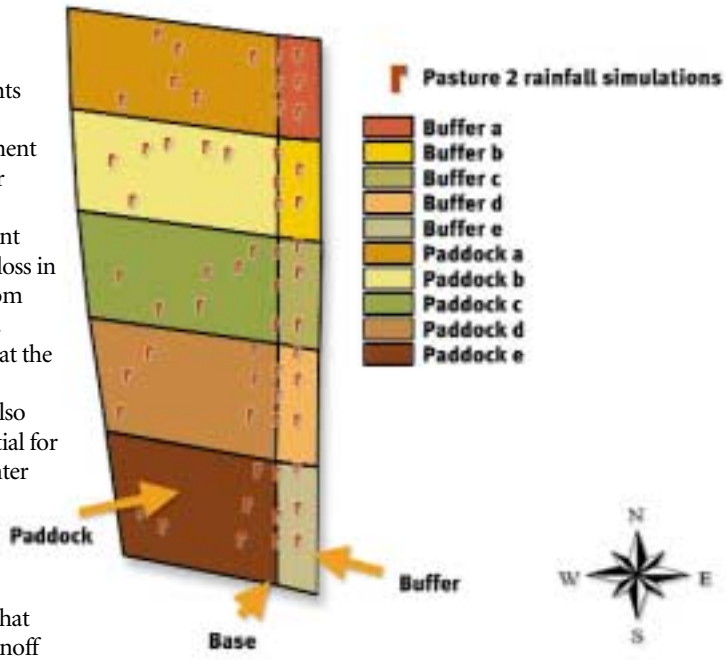
"As a result, we might suggest forages be maintained at appropriate heights through suitable grazing management to maintain water infiltration and minimize sediment and phosphorus loss in surface runoff from pastures," he says. "Placing a buffer at the base of a grazed paddock would also reduce the potential for phosphorus to enter surface water."

Schultz believes the research will ultimately show that the amount of runoff that makes it to water channels is relatively small, unless the water finds its way to concentrated flow pathways. The bad news is that many such pathways exist on operations that are continuously overgrazed.

"Many of these spots are related to 'loafing' areas along channels where livestock seek shade," he explains. "These areas become very compacted and are a ready source of sediment and phosphorus when it rains."

Schultz adds that the percentage of bare banks in pasture areas grazed by continuous stocking is much greater than along riparian buffers and crop fields. "We believe the major source of sediment and phosphorus in streams is the bank's access points, such as loafing areas," he says. "Under such conditions, it may become imperative to keep livestock from stream channels if water quality is to be improved."

Fig. 1: Pasture 2 sites for rainfall simulations



Possible solutions

Schultz says cattle producers might consider two possible solutions for keeping livestock out of the water channel: (1) prevent cattle from entering the riparian area by installing buffers across the extent of the riparian zone, or (2) limit access to the channel with narrow fencing and either direct access to water through developed crossings or indirect access using devices such as pumps.

"There seems to be resistance to fencing narrow corridors in riparian areas," Schultz says. "But it would seem that fencing methods are available that could be used for such purposes. Demonstration areas could also be used to convince farmers that with the help of programs such as EQIP (Environmental Quality Incentives Program) and other conservation programs in the new farm bill, these methods could be used successfully."

Another approach for maintaining water quality may be to use a well-managed rotational grazing system, Schultz adds. Such a system maintains adequate forage to minimize pasture runoff, prevents the development of cow paths and maintains stream-bank structure. He also notes that forage yield and quality will likely be increased by a rotational grazing system, creating a "win-win" situation of improving pasture forage quality and water quality at the same time.

"Cattle producers can do their part by improving grazing practices to maintain water quality," Schultz says. "In developing a plan to improve stream water quality, remember that pastureland is just a part of a watershed. Agricultural and other activities upstream may affect the success of management practices downstream, so a water quality improvement plan needs to consider the impact of management on all components of the watershed."