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Are There Alternatives to Fencing the Dairy Herd Out of Streams?

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In the May Issue of the Virginia Dairyman, Jones and Knowlton concluded an article on fencing dairy cattle out of streams by stating that cattle should be fenced out of streams and ponds because it's the right thing to do, both environmentally and economically. In addition, we said that agriculture has been implicated as the major source of nutrients, sediments and pathogens (fecal coliforms including *E. coli* and fecal streptococci) to rivers, streams, and lakes. There is significant evidence that, if allowed access to streams, animals are a direct source of pollutants, and they reduce riparian vegetation which makes them vulnerable to erosion and physical alteration of stream banks. Also, we need to understand that standards used by the Department of Environmental Quality in evaluating surface water quality take into consideration an evaluation of nutrients, pathogens (disease causing organisms such as fecal coliform), siltation, toxins (pesticides, metals, etc.), benthic macroinvertebrate communities, fish tissue analysis, pH, temperature, and dissolved oxygen (DEQ and DCR, 1996).

Many researchers have shown that stream bank fencing will improve water quality (including improvements in nutrient loading, macroinvertebrate communities, fecal coliform, and stream bank erosion). However, fencing of every stream from cattle may not be an economical. Fencing of riparian areas (the zone adjacent to a stream or any other water body) will cost substantial amounts of money. This includes installation and annual maintenance cost. In addition, the width and route of some streams fluctuate widely throughout the year as rainfall varies. Complete exclusion of cattle from these streams may be virtually impossible unless livestock are excluded from very large areas of land. Moreover, it is still unknown if fencing every stream is necessary to achieve and/or maintain quality surface water. In this article, we will review the impact of various livestock management techniques on the water quality of streams.

Impact of Stream Fencing

"Stream Fencing" in this context means both the total exclusion of livestock from streams and the use of fences to restrict livestock to crossings and/or small watering areas.

A Pennsylvania study assessed conditions in two streams with extensive riparian grazing and in a third stream with no grazing. All streams flowed into the Susquehanna River. There was a nearly complete lack of woody vegetation in the riparian zone of pastured areas. In ungrazed areas, the stream bank was vegetated with a mixture of grasses, shrubs, and trees. Of the ungrazed stream banks, 6% were eroded, but 81% of the stream banks were eroded in grazed areas. Total suspended solids and sediment yields

were much higher in the streams with grazed pastures. In ungrazed areas, there was much less silt and sand and more gravel substrate than in grazed areas. Subsequently, a combination of stream bank fencing, bank stabilization and installation of rock-lined animal crossings were implemented. These changes resulted in large reductions in total suspended solids and in fine substrates in the two streams that had been grazed. Exclusion of livestock from stream banks promoted rapid re-vegetation and stabilization of eroding areas. Reductions in sediment load were accompanied by increased populations of the insects (mayflies, stoneflies, beetles, bugs and flies), worms, snails, prawns, and marron that serve as food sources for fish, as well as improvement in fish communities.

In another study, three Franklin County cow/calf farms were provided several alternative sources of water and were fenced out of the stream (or a pond in one case) which had been their source of drinking water. Fecal bacteria and total nitrogen and phosphorus downstream were reduced by an average of 50%, 11%, and 52%, respectively, on these three farms.

A third study was conducted on a stream in Clarke County. This research was conducted to evaluate a procedure for distinguishing sources of fecal coliform (cattle, wildlife or human). The fecal coliform identified in nine out of 11 surface water samples taken from the stream were predominately from cattle. BMPs were installed which primarily consisted of fencing cattle from the stream and installing alternative water supplies, stream crossings, and stream watering areas. A comparison of pre and post BMP stream samples indicates that fecal concentration decreased by an average of 80% at three monitoring stations. This dramatic reduction is most likely due to implementation of the stream fencing BMP.

Off-Stream Water Sources

Some research indicates that merely providing off-stream water sources will reduce time spent in streams even without fencing cattle out of streams. On two Southwest Virginia beef cattle operations, cattle had access to a stream as their source of drinking water. Seven months later, water troughs were installed in the pastures but cattle continued to have access to the stream. Cattle grazed toxic tall fescue which tends to encourage cattle to stand in creeks or ponds or wallow in mud during hot portions of the day. The average length of time spent drinking from the stream decreased from 6.7 minutes to 0.7 minutes and the average time within the stream area, mostly in search of food because pasture had been cut and baled the day before observation, declined from 12.7 to 6.2 minutes. On one of the farms, stream bank erosion was reduced by 77%. In addition, loading with fecal bacteria, total nitrogen and total phosphorus was reduced by 51%, 54%, and 68%, respectively. It was concluded that off-stream water sources for grazing cattle are quite effective in reducing the amount of stream pollution without resorting to stream bank fencing.

On the three Franklin County cow/ calf farms, it was observed that when given a choice, cattle preferred using the alternative water sources over the stream, even during hot weather when they had to walk a good distance.

Another study involving 21Wisconsin farms indicated that rotational grazing can provide a reasonable compromise between continuous grazing and fencing livestock out of streams. Rotational grazing appears to protect stream bank stability and aquatic habitats and provides good habitat for grassland birds and amphibians. A mixture of rotational pastures and buffer strips along a stream may provide a diversity of habitats for terrestrial wildlife, protection for aquatic communities, and economically sustainable choices for farmers.

In the Wisconsin study, streamside vegetation was managed either as a grassy buffer strip, a continuously grazed pasture, a rotationally grazed pasture, or a woody buffer strip. Stream bank stability and in-stream habitat were similar between the pastures with buffer strips and rotationally grazed pastures. Rotational grazing was found to encourage better sod development and help stabilize erosive stream banks better than continuous pasture. Stream habitat quality was similar for rotational and grassy buffer strip sites, and better than at either continuous pastures or woody buffer strips. But fish communities appeared to respond more positively to buffer strips than rotational grazing. Rotationally grazed sites and either buffer strip were better for aquatic insects, which are a food source for trout and an indicator of water quality. Continuous pastures resulted in poor habitat quality and poor fish communities. In addition, rotational pastures produced more than twice as much forage than continuous pastures (1,856 lb./acre vs 781 lb/a).

Other Livestock Management Techniques

There are other management techniques which may benefit water quality which have yet to be investigated. A short list includes the following:

Overseeding Fescue. It is common knowledge that endophyte-infected fescue inhibits cattle's ability to regulate their body temperature. Overseeding endophyte-infected fescue pastures with clover, orchardgrass, bluegrass, or other forages may reduce the time cattle spend in the streamside zone, thus improving water quality. It might also Improve the quality of pasture fed to heifers or dry cows.

Winter Feeding Sites. Some farmers use the flat area immediately adjacent to streams as their primary winter feeding sites. How much water quality benefit can be attained by relocating winter feeding sites away from streams while still using the streamside zone for grazing?

Shade. How much water quality benefit can be attained by providing shade for livestock away from the stream zone?

Table 1 summarizes a worksheet that was developed at Cornell University to evaluate the impact of certain livestock management practices on stream health. It assesses the degree of concern which should be created with respect to bank conditions, pasture vegetation, alternate water sources, and access by livestock to streams

Table 1. New York State's Agricultural Environment Management Assessment Worksheet, Cornell University http://www.cce.cornell.edu/ag/environmental-mgt/

	Lower - - - - - - - - - Level of Concern - - - - - - - - - Higher			
	1	**2**	**3**	**4**
Stream Management - Bank Conditions:				
What is the condition of the stream? Does it show signs of erosion?	Stream alignment is straight or slightly curved with no undercut banks AND The banks are vegetated AND No trees have fallen into the stream	Stream alignment is slightly curved with eroding banks less than a 3:1 slope AND No trees have fallen into the stream	Eroding banks are steeper than 3:1 but flatter than 1:1 AND/OR some trees have fallen into the stream from the bank	Eroding banks are raw or side slopes are 1:1 to vertical AND/OR many trees have fallen from the banks into the stream
Pasture Management:				
What is the condition of the vegetation?	Pasture is very well managed and all areas are fully vegetated	Pasture is well managed and fully vegetated except in minor areas of heavier animal traffic	Pasture is over-grazed and includes bare and weedy areas	Pastures have little vegetation and show evidence of runoff and erosion
What is the condition of the laneways?	Laneways are either fully vegetated or well developed with stone, gravel... No visible gullies	Laneways are partially vegetated and/or partially developed	Laneways are not developed. Areas are bare of vegetation and have evidence of runoff, erosion, or ponding	No laneway development. Lanes go up and down slope, have visible gullies, no vegetation, and water flows to watercourses
How are floodplains managed in the pasture area?	Livestock are fenced out of the floodplain area. OR no floodplain is located in the pasture	The floodplain is part of a well managed pasture system AND the livestock's water source is other than the stream and is located (along with salt and shade) out of the floodplain area	Pasture water sources are located both in and out of the floodplain AND/OR salt and shade is located both in and out of the floodplain	Livestock are allowed full access to the floodplain which has destroyed vegetation AND/OR the only water, salt and shade are located within the floodplain (high animal concentrations)
What is the stream management in the pasture area?	If livestock need to cross the stream, they do so over a constructed laneway complete with a culvert and gates at both ends (limited access), the stream is fenced, OR Livestock do not cross the stream	If livestock need to cross the stream, they do so across a constructed stone crossing with gates at both ends (limited access) AND/OR The stream is fenced with limited access for watering	Livestock have access to the stream in specific areas for watering and/or stream crossings. These areas are not fenced. (Livestock can cross over the stream at any time)	The stream is not fenced from livestock. (Stream is crossed in many places and is used as a water source for livestock)

In summary, there are still many unanswered questions about water quality and livestock access/management in riparian zones. Complete fencing of dairy cattle from streams (with alternative water or restricted stream access), alternative water systems (with stream access), or managed grazing (with alternative water and stream access) have all been shown to result in significant improvements in water quality. These need additional study. As with most BMPs, the appropriateness of any given BMP on a specific farm will vary.

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