Improving Watershed Water Quality:

Eagle and Joos Valley Creeks Demonstrate the Effects of Best Management Practices

By Julia Riley

Tom Schultz, Buffalo County Conservation Technician, points up to the top of a draw in the steep and rugged valley that drains rainwater into Eagle Creek and describes the two erosion control structures hidden in the oak and maple trees on the bluff. After 26 years of working in this watershed and on the larger Waumandee Watershed, Shultz is an expert on what has been done to improve water quality in this watershed.

Eagle Creek is about an hour's drive north of La Crosse in Buffalo County, where its waters eventually drain into the Mississippi River. Joos Valley Creek joins forces with Eagle Creek about half-way along its route, and together they flow around the bottom of Eagle Bluff, the highest point overlooking the Mississippi River 550 feet below. Then Eagle Creek, draining a watershed approximately 19,926 acres, joins the larger Waumandee Creek before they flow into the Mississippi River at Fountain City Bay. The steep bluffs of the watershed were sculpted over 10,000 years ago by runoff from rapidly melting northern glaciers.

Mud Bank on Joos Valley Creek before management practices.

Schultz's work in the watershed began in 1985 with the Waumandee Priority Watershed Plan that includes Eagle and Joos Valley creeks. Wisconsin's Priority Watershed Program planning process inventoried types of land uses, identified water quality issues and recommended best management practices (BMPs) to control pollutants causing degradation of the water quality in the creeks. The plan was completed in 1990 and identified several nonpoint sources of pollution degrading water quality.

Joos Valley Creek after management practices.

In some areas along the waterways, the streambanks were trampled by grazing cows. There was little overhanging vegetation on the streambanks and a large amount of sediment was washed off the landscape. The streams were unsuitable to support the coldwater fisheries that were once present in the creeks. Both creeks were included in the state's 1998 Impaired Waters List, required under Section 303(d) of the federal Clean Water Act, as waters not meeting water quality goals.

The Clean Water Act required that the state prepare an analysis of the amount of sediment the creeks could allow before exceeding water quality standards. The result of the analysis was development of a Total Maximum Daily Load, called a TMDL, that was approved in 2003. The TMDL identified pollutant sources causing the water quality impairment and included a goal for 58% reduction in average annual sediment load based upon 1990 conditions. Because sediment contains phosphorus, if you can control sediment, you also end up controlling significant amounts of phosphorus – a nutrient that causes algae blooms.

Schultz notes he didn't have to sell the concept of reducing sediment and phosphorus loads in the creeks and stabilizing the stream-banks to restore local trout populations, "I had local farmers very interested in making improvements on their farms – the land owners here are conservation-minded. About 40% of the landowners now are absentee owners who live in Portage, Milwaukee or Madison, but they want to do the right thing for the land."

Joos Valley Creek sampling station,

So what does it take to do the "right thing"? To help answer that question, a 17-year long collaborative study between the DNR and U.S. Geological Survey (USGS) attempted to quantify how water quality changed in Eagle and Joos Valley creeks following the installation of watershed management practices. The final report, "The Effects of Best Management Practices in Eagle and Joos Valley

Streambank erosion before restoration

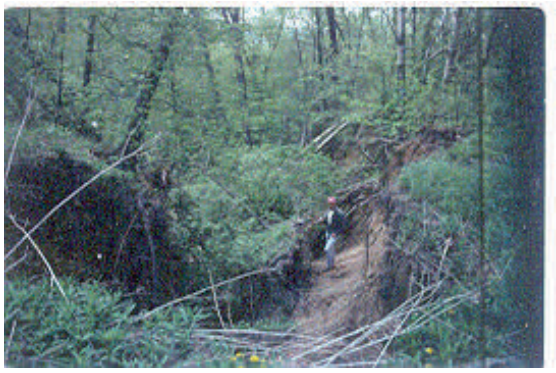
Installation of rip-rapping and stabilization of streambank.

Creeks in the Waumandee Creek Priority Watershed, Wisconsin, 1990-2007" is slated for final publication. The study monitored the amount of suspended solids, ammonia nitrogen and phosphorus in Eagle and Joos Valley creeks before watershed best management practices (BMPs) were installed, during the installation phase, and for seven years after the majority of management practices were installed.

Roger Bannerman, DNR Water Resources Management Specialist and a co-author of the USGS study commented, "The study documented lower median storm loads for suspended solids, total phosphorus, and ammonia nitrogen for both Eagle and Joos Valley creeks during the post-BMP period compared to the pre-BMP period. The percent reductions for Eagle Creek were 89% for suspended solids, 77% for total phosphorus and 66% for ammonia nitrogen. The percent reductions for Joos Valley Creek were 84% for suspended solids, 67% for total phosphorus and 60% for ammonia nitrogen."

Schultz's historical background on the management of the watershed and land use changes help explain the water quality findings, "About 90% of the dairy farms in this watershed pastured their cows. There were areas alongside the creeks that were torn up and trampled and looked more like a cobbled moonscape devoid of vegetation instead of pasture. We began working with the farmers, placing electrical fencing above the creek streambanks in the pastures to keep the cows out and creating crossing areas. We also used priority watershed money to cost-share with farmers for manure storage areas. Normally landowners were responsible paying 30% of those costs, but we had 4-5 farmers who didn't feel that could afford it. The Fountain City and Alma Rod and Gun clubs chipped in funds to help reduce the farmer's cost-share to 10%.

"Once the cows weren't trampling the streambanks, we began shaping and rip-rapping areas of the creeks to help stabilize the banks and prevent streambank erosion. Volunteers from the rod and gun clubs also helped with the installation of hundreds of lunker structures in the creeks to improve fisheries. We also did quite a bit of stream restoration work. When box elder trees take over areas of the streambank, they create shade, then you don't have undergrowth vegetation to stabilize the soil. You can get quite a bit of soil erosion along those parts of the creek. We targeted about 30-40 areas in the watershed for stream restoration where we removed the box elders, sloped the stream banks approximately 6-1, and then planted cover vegetation that can be mowed to keep the box elders from growing back.



Gully erosion before stabilization.

"Another big effort was controlling soil erosion from rainfall events. We had some fairly substantial highly eroded gullies – some 10-20 feet deep – coming down in the smaller ravines from the bluffs. In those areas we built earthen erosion control structure dams with underdrain piping. The smaller dams on the tops of the ridges ran about $5,000 per installation. The larger 15 to 20-foot dams ran about $12,000 per installation and many of them now have a permanent pool behind the dam. With money from the state's Priority Watershed Program, we were able to cost-share 70% with the landowner for the installation costs of the dams. Most landowners saw the benefit of removing these gullies from their land and wanted to put in the dams.

Erosion control structure with underdrain.

"The dam underdrains let out a controlled amount of water from the 6-8 inch drain pipes into grassed swales. These structures have really helped reduce soil erosion throughout the watershed. Another advantage of the dams is their use in flood control. In the summer of 2010, we had record rainfall of over 9 inches in a 24-hour period! There was water running over the emergency spillways in the erosion control dams, but they held back a considerable amount of water and helped prevent flooding downstream. I had people calling me telling me how the installation of all those

dams helped prevent a larger flooding event, how well the dams had worked, and that it was a good thing we'd put those in."

Lower Eagle Creek after restoration.

The water monitoring data supports Schultz's historical summary of the management practices installed in the watershed as the "right things" to do (see Table 1 below for a summary of the BMPs). Wisconsin's Priority Watershed Program provided over $392,000 for cost-sharing on the installation of the BMPs. A special grant from the U. S. Environmental Protection Agency provided an additional $52,000 for rip-rapping, streambank shaping and seeding, and barnyard runoff control systems. The amount of suspended soils was reduced through a series of successful BMPs in the Eagle and Joos Valley creeks watershed. The TMDL sediment reduction goal was exceeded. Both Eagle Creek and Joos Valley Creek are slated for delisting from the state's 2012 Impaired Waters List – a cause for celebration!

While the management practices installed in the Eagle and Joos Valley creeks watershed clearly have made improvements in water quality, what wasn't anticipated was the change in the land use related to economic and generational shifts. As many of the watershed's dairy farmers retired, younger family members were not interested in continuing dairy farming. The cows were sold off and about 40% of the farms are now owned by absentee owners who use the farms for hunting and recreation. Those lands are often leased to local farmers for predominantly corn production.

Tom Schultz, Buffalo County Conservation Technician and Roger Bannerman, DNR Water Resources Management Specialist

Some of the smaller farms in Buffalo County are converting to less labor-intensive poultry farming. A few dairy farms still pasture cows, but the number of cows in the watershed has substantially decreased. Cows that once roamed woodland pastures on the steeper portions of the watersheds also created soil erosion due to compaction and disturbance of the more erodible soils. Woodland pastureland has been virtually abandoned – which has been extremely beneficial to water quality. The voluntary removal of a significant number of cows from the landscape may also be an important unintended contributor to water quality improvement.

The long-term USGS study supports historical observations that BMPs can and **do** make a difference in water quality. Those monitoring results support a sense of what are the "right" changes that have been made. Wisconsin's Priority Watershed Program has ended, but the state's investment in the installation of watershed management practices continues to pay off. With time, these changes will bring a healthy trout population back to Eagle and Joos Valley creeks.

Table 1. Summary of Implemented Rural Best Management Practices in the Eagle Creek and Joos Valley Creek Watersheds, Buffalo County, Wisconsin

Best Management Practices (BMPs)	Eagle Creek	Joos Valley Creek
	Animal Waste Management	Animal Waste Management
Manure Storage – number of facilities	3	0
Barnyard Runoff Control Systems – number of facilities	8	2
	Streambank Protection	Streambank Protection
Streambank Protection – number of linear feet	4,575	6,778
Stream Fencing – number of linear feet	1,940	1,700
Stream Shaping and Seeding – number of linear feet	475	1,836
Stream Crossing – number of crossings	2	1
	Upland Management	Upland Management
Nutrient Management – number of acres	470	0
Grade Stabilization – number of erosion control structures	9	1