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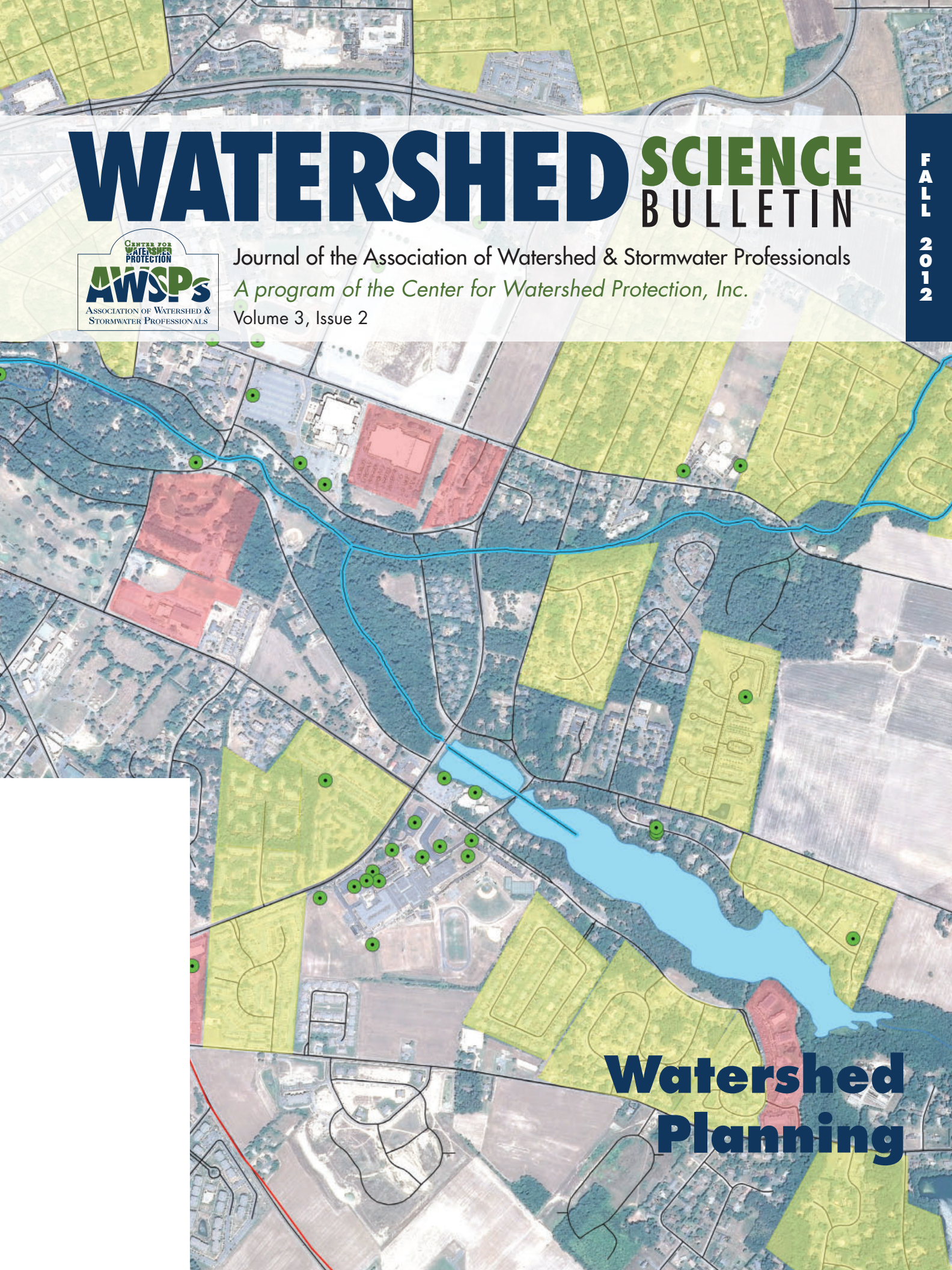

Watershed Planning

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Cover photo courtesy of the Center for Watershed Protection
showing Wicomico River watershed field assessment locations in Salisbury, Maryland.

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TABLE OF CONTENTS

FEATURED CONTENT

BULLETIN DEPARTMENTS

Demonstrating the Effects of Best Management Practices on Watershed Water Quality in the Eagle and Joos Valley Creeks, Wisconsin

The Eagle and Joos Valley creeks are part of the larger Waumandee Creek watershed in Buffalo County, Wisconsin (Figure 1). Joos Valley Creek joins Eagle Creek, which drains 80.6 km^2, about halfway along its route to the Mississippi River. Eagle Creek then joins the larger Waumandee Creek before flowing into the Mississippi River at Fountain City Bay.

Work on the Eagle and Joos Valley creeks began in 1985 with the development of the *Waumandee Creek Priority Watershed Plan*. 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 water quality in the creeks. The plan, completed in 1990, identified several nonpoint sources of pollution that were degrading water quality. In some areas along the waterways, the streambanks were trampled by grazing cows. Streambanks had little overhanging vegetation, and a large amount of sediment was washed off the landscape. The streams were not able to support the coldwater fisheries that were once present in the creeks.

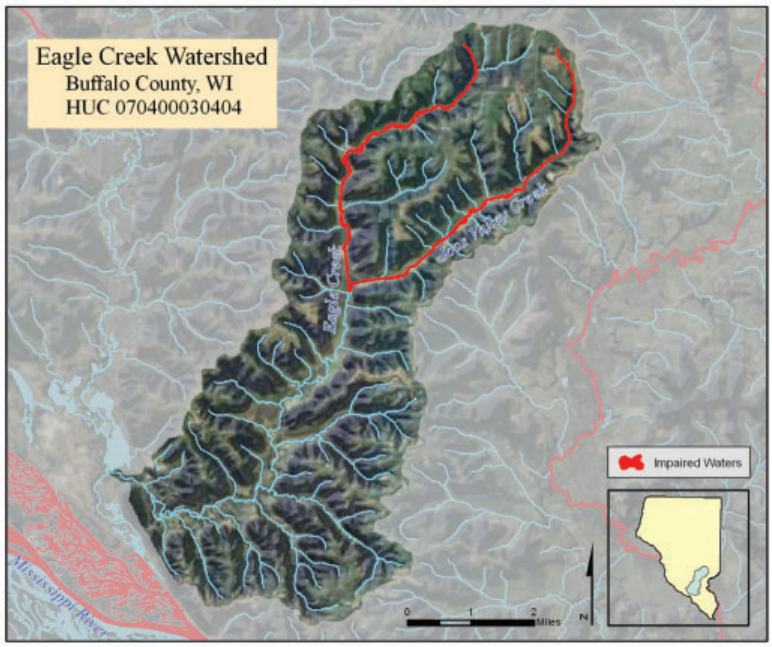

Figure 1. Eagle Creek watershed. 1 mile ≈ 1.6 km.

Both creeks were included in the state's 1998 impaired waters list which, in accordance with Section 303(d) of the federal Clean Water Act, identifies waters not meeting water quality goals. This listing required the state to analyze the effects of sediment loads on the attainment of water quality standards in the two creeks. The analysis led the state to develop a total maximum daily load (TMDL), approved in 2003, that identified pollutant sources causing the water quality impairment and included a goal for a 58% reduction in average annual sediment load based on 1990 conditions. Because sediment contains phosphorus, efforts to control sediment also end up controlling significant amounts of phosphorus, a nutrient that causes algal blooms.

Tom Schultz, Buffalo County conservation technician, is an expert on efforts to improve water quality in the Eagle and Joos Valley creeks, having worked in these watersheds and in the larger Waumandee Creek watershed for 26 years. Schultz notes that he did not have to sell the concept of reducing sediment and phosphorus loads in the creeks and stabilizing the streambanks to restore local trout populations: "I had local farmers very interested in making improvements on their farms—the landowners 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."[1]

A 17-year-long collaboration between the Wisconsin Department of Natural Resources and the US Geological Survey attempted to quantify how water quality changed in the Eagle and Joos Valley creeks following the installation of watershed BMPs. The study monitored the amount of suspended solids, ammonia nitrogen, and phosphorus in the Eagle and Joos Valley creeks before the watershed BMPs were installed, during the installation phase, and for seven years after the majority of the BMPs had been installed. The study found substantial reductions in pollutant loads in these creeks. A comparison between pre- and post-BMP monitoring data for Eagle Creek showed reductions of 89% for suspended solids, 77% for

[1] Julia Riley, Improving Watershed Water Quality: Eagle and Joos Valley Creeks Demonstrate the Effects of Best Management Practices (Madison, WI: Wisconsin Department of Natural Resources, 2011), 1.

total phosphorus, and 66% for ammonia nitrogen. Similarly, in Joos Valley Creek, the study found reductions of 84% for suspended solids, 67% for total phosphorus, and 60% for ammonia nitrogen.

The improvements to the watersheds are attributable to significant cooperation and partnership among local landowners and volunteers and financial support from the state and from private organizations. One of the first projects was the installation of electrical fencing above streambanks and stream crossings to prevent cows from entering the creeks. As Schultz stated, "… 90% of the dairy farms in these watersheds kept their cows on pasture. 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."[2] The Priority Watershed Program paid for 70% of the fencing cost. Contributions from the Fountain City and Alma rod and gun clubs helped reduce the landowner's share of the fencing cost to 10% for famers who needed additional financial assistance; although four or five farmers still could not afford it.

With the creeks protected from trampling, 30 to 40 areas in the watersheds were targeted for stream restoration. Lunker structures—which combine streambank protection to curb bank erosion with fish cover—were installed with the help of volunteers from the rod and gun clubs to improve fisheries. Box elders were removed, and the area was planted with herbaceous vegetation to stabilize the soil; mowing prevents the return of box elders. The streambanks were also regraded to slopes of approximately 6:1.

Earthen erosion control structure dams with underdrain piping were installed to remove the 3- to 6-m deep gullies that had formed as a result of soil erosion during rainfall events. The smaller dams on the tops of the ridges cost about $5,000 per installation; the larger (4.5- to 6.1-m) dams cost up to $12,000 per installation. Funds from the state's Priority Watershed Program provided a 70% cost share with landowners, who saw the benefit of removing these gullies and were supportive of the dam installations. The dam structures have effectively reduced soil erosion throughout the watersheds. Permanent pools of water have formed behind the larger dams, and the underdrains control the amount of water discharged from the 15.2- to 20.3-cm drain pipes onto grassed swales. The dams also provide flood control, as demonstrated in summer 2010, when a rainfall of more than 23 cm occurred over a 24-hour period. According to Schultz, "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."[3]

The water quality monitoring data support Schultz's assessment of the BMPs installed in the watersheds as the "right things" to do (Table 1). Wisconsin's Priority Watershed Program provided more than $392,000 for cost sharing on BMP installation. A special grant from the US Environmental Protection Agency provided an additional $52,000 for riprapping, streambank shaping and seeding, and barnyard runoff control systems. A series of BMPs implemented in the Eagle Creek and Joos Valley Creek watersheds successfully reduced the amount of suspended solids, and the TMDL sediment reduction goal has been exceeded. Both Eagle Creek and Joos Valley Creek were delisted from the state's 2012 impaired waters list—a cause for celebration!

Although the BMPs installed in the Eagle Creek and Joos Valley Creek watersheds clearly have improved water quality, an unanticipated change in land use, related to economic and generational shifts, also occurred. As many of the watersheds' 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 used for hunting and recreation by absentee owners. Those lands are often leased to local farmers, predominantly for corn production. Some of the smaller farms in Buffalo County are converting to less labor-intensive poultry farming. A few dairy farms still have pasture cows, but the number of cows in the watersheds has substantially decreased. Cows that once roamed woodland pastures on the steeper portions of the watersheds created soil erosion due to the compaction and disturbance of the more erodible soils. Woodland pastures have now been virtually abandoned, and this 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 US Geological Survey study supports historical observations that BMPs can and *do* make a difference in water quality. Those monitoring results support the sense locally that the "right" changes have been made. Wisconsin's Priority Watershed Program has ended, but the state's investment in the installation of watershed BMPs continues to pay off. With time, these changes will

[2] Ibid., 2.

[3] Ibid., 2–3.

Table 1. Summary of implemented rural BMPs in the Eagle Creek and Joos Valley Creek watersheds, Buffalo County, Wisconsin.

Best Management Practices	Units	Eagle Creek	Joos Valley Creek
Animal Waste Management			
Manure storage	No. facilities	3	0
Barnyard runoff control systems	No. facilities	8	2
Streambank Protection			
Streambank protection	m	1,394	2,066
Stream fencing	m	591	518
Stream shaping and seeding	m	145	560
Stream crossing	No. crossings	2	1
Upland Management			
Nutrient management	km^2	1.9	0
Grade stabilization	No. erosion control structures	9	1

bring a healthy trout population back to Eagle and Joos Valley creeks.

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