Sediment TMDL for Eagle Creek and Joos Valley Creek

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Preface

This Total Maximum Daily Load (TMDL) for sediment addresses sedimentation and degraded habitat impairments conditions in the upper 7 miles of Eagle Creek, and the entire 7 mile length of Joos Valley Creek, a tributary of Eagle Creek. The TMDL identifies load allocations and management actions that will restore the biological integrity of these streams. Both streams were identified as a medium priority on the 1998 303(d) list.

Background

Eagle Creek and Joos Valley Creek are two streams in the Waumandee Creek watershed in Buffalo County, Wisconsin. Both streams were listed due to not meeting their potential designated uses. The upper 7 miles of Eagle Creek is identified as currently supporting a warmwater forage fishery (WWFF), but has potential to support a coldwater (Class II) sport fishery. Joos Valley Creek is identified as currently supporting a warmwater forage fishery (WWFF), but has potential to support a coldwater (Class III) sport fishery (WDNR 1990, 1996). Both streams are severely limited by excessive sediment loading, elevated water temperatures and habitat unsuitable to support a coldwater fishery.

The degraded habitat in both streams can be characterized as stream banks trampled by cattle, little overhanging vegetation and loose sediment over sandy, unstable substrate. As a result, much of the length of the streams is wide and shallow; not the narrow and deep cross-section characteristic of a healthy coldwater stream in the driftless area of the state.

The extensive coverage of the substrate with silt and soft organic sediment limits the areas of exposed gravel necessary for reproduction. It also greatly reduces the primary food sources that depend on clean interstitial areas. The relative smoothness of the substrate also minimizes areas for smaller forage fish to get out of faster currents. Sediment has been identified as the pollutant causing these impairments. As such, the extensive coverage of the substrate with sediment constitutes “an objectionable deposit” under the narrative water quality standards criterion in s. NR 102.04(1)(a) cited below.

The extensive sedimentation is a year round situation. As such, there is no “critical condition”. This is not to say that there is not variation on the sediment carried in runoff to a stream. (See section on Seasonal Variation below).

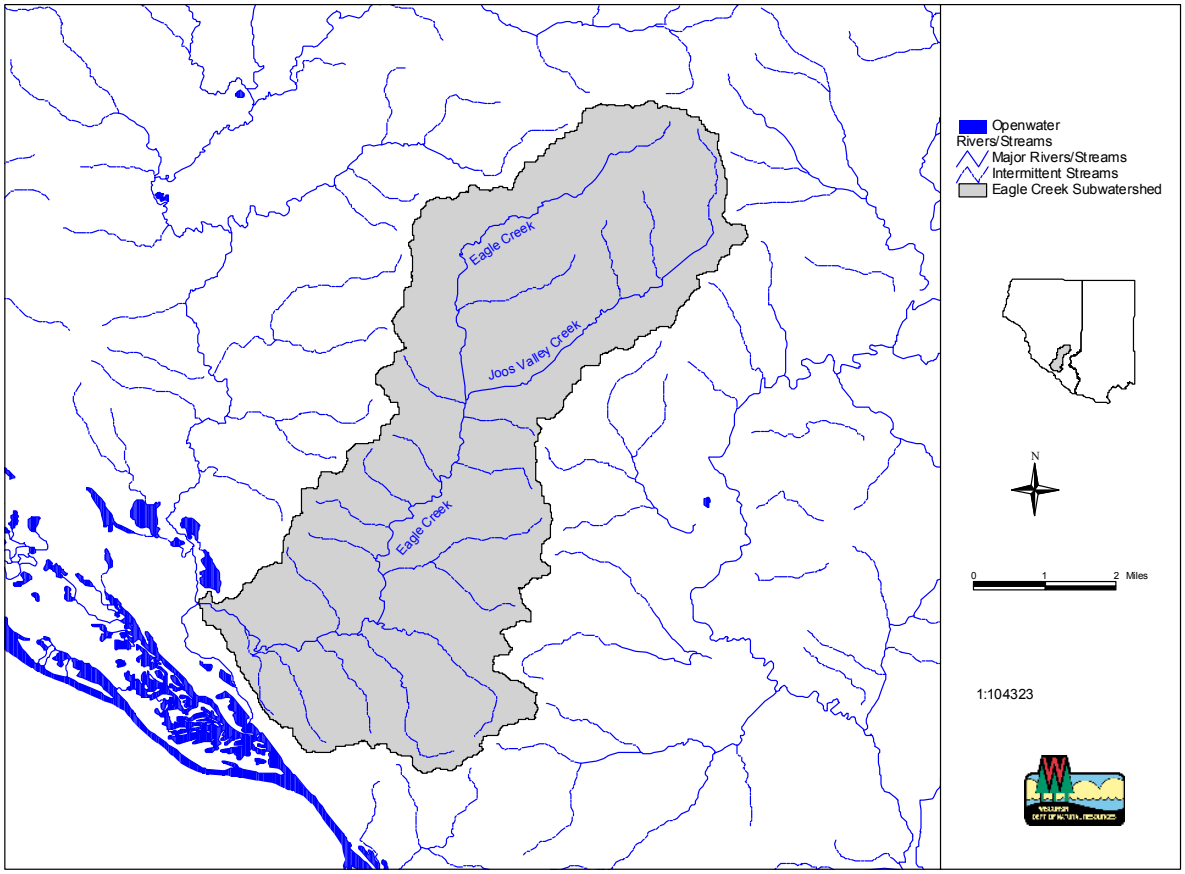
This TMDL addresses impairments in both streams (specifically sediment and loss of habitat), since they are located in the same drainage area (see Fig. 1). Elevated water temperatures will be indirectly addressed by reducing sedimentation and improving overall stream habitat conditions.

More specifically, Eagle Creek originates in the northeast portion of the subwatershed, along the Glencoe Ridge, and flows approximately 14 miles before emptying into Waumandee Creek in a wetland northeast of Merrick State Park. The headwater area of Eagle Creek has generally good water quality, cool water temperatures and habitat suitable for a limited (very few fish) brook trout fishery. Moving downstream, the stream is impacted by sedimentation and elevated water temperatures.

Further downstream near the confluence of Joos Valley Creek, Eagle Creek is ditched, water temperatures increase and the stream bottom is covered with fine sediment.

Joos Valley Creek is a major tributary of Eagle Creek and flows southwest 7 miles before emptying into Eagle Creek. The headwater area has steep gradients, significant spring seeps and a coarse gravel substrate. Moving downstream, the stream is severely impacted by streambank erosion, sedimentation and elevated water temperatures. A limited coldwater trout fishery exists in the upstream area and the lower portion supports a warmwater forage fish community.

Figure 1. Eagle Creek Subwatershed, Buffalo County, Wisconsin.



A description of the population, soils, topography, geology and other physical characteristics of the watershed is contained in Chapter 2 of *A Nonpoint Source Control Plan for the Waumandee Creek Priority Watershed Project.*

Water Quality Standards

The upper 7-mile portion of Eagle Creek and all of Joos Valley Creek are not currently meeting applicable narrative *water quality criterion* as defined in NR 102.04 (1); Wis. Admin. Code:

> "To preserve and enhance the quality of waters, standards are established to govern water management decisions. Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development or other activities shall be controlled so that all waters including the mixing zone and effluent channel meet the following conditions at all times and under all flow conditions: (a) *Substances that will cause objectionable deposits on the shore or*

> *in the bed of a water, shall not be present in such amounts as to interfere with public rights in waters of the state*."

Excessive sedimentation is considered as an objectionable deposit.

As stated above, Eagle Creek and Joos Valley Creek were listed due to not meeting their potential uses. The designated uses applicable to Eagle and Joos Valley Creek are as follows:

S. NR 102.04(3) intro, (a) and (b), Wis. Adm. Code:

> "FISH AND OTHER AQUATIC LIFE USES. The department shall classify all surface waters into one of the fish and other aquatic life subcategories described in this subsection. Only those use subcategories identified in pars. (a) to (c) shall be considered suitable for the protection and propagation of a balanced fish and other aquatic life community as provided in federal water pollution control act amendments of 1972, P.L. 92-500; 33 USC 1251 et.seq.
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> > "(a) Cold water communities. This subcategory includes surface waters capable of supporting a community of cold water fish and aquatic life, or serving as a spawning area for cold water fish species. This subcategory includes, but is not restricted to, surface waters identified as trout water by the department of natural resources (Wisconsin Trout Streams, publication 6-3600 (80)."

Existing Sediment Loads

The Waumandee Creek watershed is characterized by steep topography, narrow valleys and numerous streams. The ridge tops are approximately 400 feet above the valley floors. Although only 34% of the land is in agricultural use, much of the farming (cropping and pasturing) occurs on ridge tops or on valley bottoms along streams. The close proximity of farming to these streams was a major reason why this watershed was selected as a priority watershed in 1985.

The entire Eagle Creek subwatershed is 30 square miles (19,199 acres) and is located in the southeastern portion of the Waumandee Creek watershed. The portion of the Eagle Creek subwatershed draining to the impaired waters is 14.3 square miles.

Based on a detailed analysis using the WINHUSLE Model (information on model previously submitted to EPA Region 5), the Eagle Creek subwatershed has the highest cropland soil loss (erosion rate), and generates the largest upland sediment load reaching the stream (2,690 tons/year) of the entire Waumandee Creek watershed. Most of the sediment entering Eagle Creek is from cropland (55%) and pasture and grazed woodlots (44%). These sources combined make up about 52% of the land area of the subwatershed. A large percentage of the drainage area (45%) is in woodland and is the source of minimal sediment to the streams.

During the inventory phase of the Waumandee Creek Priority Watershed, streambank erosion was estimated to contribute about 1,342 tons of sediment per year reaching Eagle Creek (approximately 55 tons/stream mile). Streambank erosion rates in Joos Valley Creek were estimated at 90 tons/stream mile reaching the stream. The NRCS volumetric method (mass based on height, width and depth) was applied to field data collected on individual eroding stream banks to estimated sediment reaching the streams. Adjacent land in the lower portions of both streams was heavily pastured with extensive trampling of banks by cattle (WDNR 1990).

Total Load Capacity, Wasteload Allocation and Load Allocation

The objective of this TMDL is to produce habitat conditions in both streams that meet narrative water quality standards and support a Class III coldwater trout fishery, as described in NR 1.02(7)(b), Wis. Adm. Code, as follows:

"A class III trout stream is a stream or portion thereof that:

a. Requires the annual stocking of trout to provide a significant harvest, and

b. Does not provide habitat suitable for the survival of throughout the year, or for natural reproduction of trout."

"A class II trout stream is a stream or portion thereof that:

a. Contains a population of trout made up of one or more age groups, above the age of one year, in sufficient numbers to indicate substantial survival form one year to the next, and

b. May or may not have natural reproduction of trout occurring; however, stocking is necessary to fully utilize the available trout habitat or to sustain the fishery.

Total Load Capacity

Based on a review of the data for Eagle Creek, in the best professional judgment of Department water quality staff the total load capacity assigned to Eagle Creek, including Joos Valley Creek was an average annual amount of sediment of 1,704 tons[1]. However, the Department will monitor the stream to track the anticipated response. If the load reduction is sufficient to achieve the load capacity and the stream has not adequately responded, the load capacity will be reviewed and lower appropriately. In the event that the stream adequately responds with a load reduction that is still above the load capacity, the Department will either pursue "de-listing" of the streams (possibly making this TMDL irrelevant) or will revise (upward) the load capacity.

[1] As measured (calculated) for the mouth of Eagle Creek.

Preliminary implementation results in the headwaters of Eagle Creek show early stages of the restoration of the brook trout fishery, including natural reproduction, from limiting cattle access to the stream and stabilizing trampled and eroding stream banks. (See WDNR report to EPA Region 5 submitted to Donna Keclik.) Therefore, it is possible that the load capacity (and the corresponding load reduction needed) is higher than identified above. In addition, these preliminary results indicate that stabilization of the stream bank is likely more important to the restoration of the habitat than the total sediment load reduction. These preliminary results may indicate that the appropriate load capacity may be associated with the load corresponding to the minimization of the sediment from the stream banks alone. Again, these are preliminary results.

Wasteload Allocation Since there are no point sources in the watershed the wasteload allocation is zero. If a point source discharge were proposed, one of the following would need to occur:

- An effluent limit of zero sediment load would be included in the WPDES permit
- An offset would need to be created through some means, such as pollutant trading.
- A re-allocation of sediment load would need to be developed and approved by EPA.

Load Allocation The load allocation corresponds to the total load capacity since the wasteload allocation is zero and the margin of safety is implicit. To achieve the load capacity, a 58% reduction in average annual sediment load based on 1990 conditions is needed. The sediment load allocation for 1990 conditions in the Eagle Creek subwatershed is summarized in Table 1.

Table 1. Sediment load allocation for Eagle Creek and its tributaries, including Joos Valley Creek. All values are expressed in average annual tons of sediment reaching the streams.

Category	Annual Load (Tons)	Percent Reduction	Reduction in Load (Tons)	Reduced Annual Load (Tons)	Load Allocation (Tons)
Cropland and other Agricultural Lands and Uplands	2,690	50%	1,345	1,345	

Stream banks (primarily agricultural)	890 (Eagle Creek)	80% (Eagle Creek)	712	178	
	452 (all other streams)	60% (all other streams)	271	181	
Totals:	4,032	58%	2,328	1,704	1,704

Margin of Safety

An implicit margin of safety is used for this TMDL. Additional load reduction should be achieved though implementation of additional best management practices in the watershed. A primary example is the establishment of vegetative buffers along streams through activities such as the Conservation Reserve Enhancement Program. Vegetative buffers along streams were not included in estimating the load allocations. In October 2001, the Conservation Reserve Enhancement Program was approved for portions of Wisconsin, including Buffalo County and the Waumandee Creek Watershed. Implementation of the Conservation Reserve Enhancement Program in this watershed would result in establishment of riparian vegetative buffers, resulting in a 10 to 15% greater control of sediment. This value is based on the buffers controlling at least 75% of the sediment in overland flow and assuming about 15 to 20% of the sediment reaching the stream through overland flow (80 to 85% reaching the stream through concentrated flow channels). In addition, the establishment of overhanging grasses along the stream will trap some of the sediment carried in the stream.

Seasonal Variation

There is no seasonal variation in the sedimentation of these streams. Sediment is a "conservative" pollutant and does not degrade over time or during different periods of the year. The extensive sedimentation occurs year round. Under some stream flow regimes, sediment is deposited, and at other times, sediment is scoured and transported downstream. Much of the sediment in these streams remains within the confines of the stream until major floods scour some of the accumulated sediment. However, over time the net result has been an accumulation of sediments in and along the streams under the current amounts of sediment reaching the stream.

Undoubtedly, the amount of sediment reaches Eagle Creek and Joos Valley Creek through major rainfall and snowmelt runoff events throughout the year.[2] However, most of the sediment enters during spring runoff and intense summer rainstorms. Considerable

[2] The reader should clearly differentiate between sedimentation – the deposition of sediment – and the sediment as a pollutant reaching the stream. The first is a year round situation where the depth of the sediment deposition may vary in response to flood flows in the stream. The second is the pollutant itself, which reaches the stream during storm events.

sediment also enters the stream from eroding stream banks during runoff events. The best management practices to achieve the load allocation are selected and designed to function for 10-year or 25-year, 24-hour design storms; providing substantial control for the major rainfall events.

Public Participation

Consistent with the Wisconsin DNR Continuing Planning Process and as required by Sections NR 120.08 (Watershed Plans), and NR 121.07(1), (Water Quality Management Plans), Wis. Adm. Code, there was public participation on the Waumandee Creek Priority Watershed Project Plan. There were public meetings in the developmental stage of the plan and a public hearing was held on the Waumandee Creek Priority Project Plan on February 1, 1990. Public comments were incorporated into the final plan. The Buffalo County Land Conservation Committee, Wisconsin DNR and the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) approved the plan. Since the load allocation in this TMDL is consistent with the Waumandee Creek Priority Watershed Plan the Department believes the public participation process used for the priority watershed project meets the intent of public participation requirements for a TMDL.

Reasonable Assurance

There are no point sources in the watershed. As such, the specific requirement to demonstrate "reasonable assurance" of nonpoint source load allocations is not entirely applicable. However, in the spirit of demonstrating implementation of the TMDLs, the following information is provided:

> Implementation of this TMDL is provided through Wisconsin's section 319 Management Plan. The 319 Plan (approved by EPA in 2000) describes the variety of financial, technical and educational programs available in the state. In addition, the plan describes "back-up" enforcement authorities for nonpoint source management in Wisconsin. The primary state program described in the 319 Management Plan is the Wisconsin Nonpoint Source Water Pollution Abatement Program (Section 281.65 of the Wisconsin Statutes and Chapter NR 120 of the Wisconsin Administrative Code).
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> Specific to this TMDL, Eagle Creek is part of a larger watershed project, the Waumandee Creek Priority Watershed Project. As part of a financing plan for priority watershed projects, long-term state cost sharing and local staff funding was committed to the Waumandee Creek Priority Watershed Project. A copy of the watershed plan is attached to this TMDL.

No new or additional enforcement authorities are proposed under this TMDL. However, future enforcement of nonpoint source performance standards and prohibitions will likely take place in the watershed. It is also anticipated that regulatory agricultural and non-agricultural performance standards and performance standards called for in Wisconsin Statutes will be implemented in the Waumandee Creek watershed. Administrative rules passed by the Natural Resources Board indicate that watersheds with impaired waters will have the highest priority for enforcement.

Farmers may also enroll in the Conservation Reserve Enhancement Program or similar programs to establish vegetated buffers on cropland and marginal pastures and the Cropland Reserve Program, which takes highly erodible lands out of agricultural use.

Another option available to landowners in the watershed is the Targeted Runoff Management (TRM) Grant Program through the WDNR. The TRM program is a competitive grant program that provides financial assistance to control polluted runoff from both rural and urban sites. The grant period is two years and the maximum cost-share rate is 70% of eligible costs.

Monitoring

Eagle Creek and Joos Valley Creek have been monitored as part of WDNR's whole stream study efforts since the early 1990's and will continue to monitored on an annual or biennial basis until it is deemed that the stream has responded to the degree that it can or until funding for these studies is discontinued. The intensive monitoring consists of a full array of chemical, biological and physical habitat assessments, including fish population analyses.

References

Baun, Ken and Sarah Snowden. 1988. The Wisconsin Nonpoint (WIN) Model, Version 2.2. Pub. No. WR-207-88.

Wis. Dept. of Natural Resources. 1990. A nonpoint source control plan for the Waumandee Creek Priority Watershed Project. Pub. No. WR-247-90.

Wis. Dept. of Natural Resources. 1996. Buffalo-Trempealeau River Basin water quality management plan. Pub. No. WR-228-96REV.

Attachment

Wis. Dept. of Natural Resources. 1990. A nonpoint source control plan for the Waumandee Creek Priority Watershed Project. Pub. No. WR-247-90.