

Sediment TMDL for Becky Creek¹

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This Total Maximum Daily Load (TMDL) for sediment addresses sedimentation and degraded habitat impairment conditions in Becky Creek, located in the Upper Chippewa River Basin in Rusk County, Wisconsin. The TMDL identifies load allocations and management actions that will restore the biological integrity of this stream. Becky Creek is identified as a high priority water with pollutants listed as sediment and bacteria on the approved 2004 303(d) list of impaired waters.

Background and

Becky Creek is a cold water stream that flows out of the Blue Hills in the northwest portion of the Soft Maple and Hay Creek Watershed. Becky Creek is 8.0 miles in length with a drainage area of 10.74 sq.miles. Its designated use is a coldwater fishery for its entire length. The mouth of Becky Creek is located in northeast Atlanta Township with its headwaters located in southern Murry Township. The creek flows directly into the Chippewa River. Becky Creek's watershed does not include any Indian County.

Becky Creek is located within one of 11 subwatersheds that make up the Soft Maple and Hay Creek Priority Watershed. In the management plan for the priority watershed project, stream bank pasturing, county and township road maintenance and construction, riparian habitat degradation, upland sediment delivery, manure and nutrient runoff are identified in the watershed plan as sources of pollutants impacting Becky Creek.

A description of the population, soils, topography, geology and other physical characteristics of the Soft Maple and Hay Creek Watershed is contained in Chapter 2 of *Nonpoint Source Control Plan for the Soft Maple and Hay Creek Priority Watershed Project*. For a map of the Becky Creek Subwatershed, please see Map 2-3 in Chapter 2 of the Plan.

Description of Water Quality in Becky Creek

Becky Creek was monitored on two occasions – 1995 and 2000. In 1995 three sites were monitored. In 2000, two sites were also monitored with the downstream site being the same as the downstream site in the 1995 monitoring. In total, four sites were

¹ Due to very limited and inadequate fecal coliform sampling, a TMDL for bacteria cannot be prepared. The data available are insufficient to meet the 303(d) list methodology.

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monitored. The following is a site-by-site description starting upstream and moving downstream.

Site 1 – ~ mile 6.0 from mouth.

The upstream-most 1995 site showed an unimpaired condition. Habitat ratings were good and the concentrations of total phosphorus, suspended solids, and other pollutants approached undisturbed, background levels. Much of the area draining to site 1 is in forest.

Site 2 – mile 4.6 from mouth

This 2000 site shows degraded habitat due to excessive stream bank erosion. Stream bank erosion results in a lack of overhanging grasses and a lack of cover for trout. There were few trout found. Unlimited access of horses was noted as the cause of the stream bank erosion. This impairment was not noted on the 2004 303(d) list. The land use between sites 1 and 2 changes to predominantly agriculture.

Site 3 – mile 1.0 from mouth

This site represents the upstream end of an impaired segment with the impairment extending to the mouth of Becky Creek. In 1995, the habitat rating was fair. Total phosphorus and suspended solids increased substantially and for some parameters by 300 percent above the upstream site.

Site 4 – near mouth

This site was monitored in both 1995 and 2000. Both assessments indicated excessive bank erosion and fair fish habitat. Becky Creek at this location has widened and become shallower due to the bank erosion and sediment deposition. The shallow waters coupled with turbid conditions are elevating water temperatures. Total phosphorus and suspended solids increased by 50 percent from site 3. Suspended solids export rates are high between sites 3 and 4. The stream bank erosion is likely due to a combination of cattle access and flood flow scouring.

Critical Condition

The extensive sedimentation is a year-round situation. As such, there is no “critical condition”. The extensive sedimentation occurs year round. Given the nature of the problem, there is no evidence to indicate that the depth or areal extent of the sediment deposits varies throughout a year. Under some stream flow regimes, sediment reaching the stream is deposited on the bed, and at other times, sediment is scoured and

transported downstream. 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.

Sediment from eroding croplands, on the other hand, varies both seasonally and with the intensity of the rainfall events. Much of the sediment enters during spring runoff and intense summer rainstorms. Sediment from eroding stream banks is a result of erosion that occurs during high stream flow periods. Sediment from stream banks trampled by livestock may occur any time that livestock have access to the stream.

Water Quality Standards

As described above, two segments (near mile 4.6 and mile 0 to 1.0) of Becky Creek are not currently meeting applicable narrative *water quality criterion* as defined in NR 102.04 (1); Wis. Adm. 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.

The designated use for Becky Creek is a cold water fishery. The complete list of fish and aquatic life designated use sub-categories is contained in S. NR 102.04(3) intro, (a) and (b), Wis. Adm. Code; as follows:

"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 the federal water pollution control act amendments of 1972, P.L. 92-500; 33 USC 1251 et.seq.

"(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)).

"(b) *Warm water sport fish communities.* This subcategory includes surface waters capable of supporting a community of warm water sport

fish or serving as a spawning area for warm water sport fish.

“ (c) *Warm water forage fish communities.* This subcategory includes surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life.”

Sediment may effect the fish community in a variety of ways that are deemed objectionable. In the downstream segment, mile 0 to mile 1.0, the sedimentation has reduced the depth of the water. This often causes the stream to widen, causing more sediment to enter the stream. The wide and shallow stream cross section allows more sunlight to enter the stream, elevating the temperature to where it may have a detrimental effect on the coldwater trout fishery. The substrate also does not provide suitable conditions for spawning and deeper, cooler holes are filled and lost. In addition, the eroding banks eliminate shading, food sources and cover. The loss of overhanging grasses eliminates the stream’s natural capacity to trap sediment along its edges and naturally narrow and deepen the water. In the impaired segment near mile 4.6, the trampled banks cause similar effects on the fish community, including making the stream wider, shallower and warmer.

Presently, one mile of Becky Creek is classified as a Class I cold water stream with the remainder being class III. Although class I, class II and class III trout fisheries all fall within the coldwater designated use, in the early 1980’s the entire length of Becky Creek was considered a class I trout fishery.

Existing Sediment Loads

The topography of the Soft Maple and Hay Creek Watershed, including the Becky Creek subwatershed, is primarily the result of glacial activity. This region has slopes that ranges from undulating to very steep.

Table 1 below on sediment loading for Becky Creek is derived from information shown in the Soft Maple and Hay Creek Priority Watershed Project Plan on page 43. However, as discussed in the section on water quality above emphasis must be given to stream bank erosion – particularly at the site about 4.6 miles from the mouth of Becky Creek.

Table 1. Sediment loading for Becky Creek. All values are in average annual tons of sediment reaching the stream.

	Average Annual Tons of Sediment to Stream	%
Croplands	567	76
Pasture, grassland and other uplands	negligible	
Stream banks	179	24
Total	746	100

All estimates of sediment load from croplands are made using the WINHUSLE Model (information on model previously submitted to EPA Region 5). This model uses results from the Universal Soil Loss Equation with runoff based on NRCS TR-55 routed from the field to the stream. Factors included in the modeling for each field include the type and rotation of crops grown on the land; the presence of any best management practices, such as contour cropping; the erosivity of the soil; the intensity of rainfall; the percent of slope; and the length of the slope. The values for each factor are provided in NRCS state field guide books. The runoff from each parcel and the sediment carried in the runoff is routed from field to field to stream taking into account the soil roughness and the size of the drainage area.

For sediment from stream banks, an NRCS volumetric approach is used. The height and length of the eroding or trampled bank is measured in the field. Based on “field clues” the rate of recession is estimated. The height, length and rate of recession define the three-dimensions of eroding volume. The volume times the density provides the mass of sediment in tons per year.

Total Load Capacity, Wasteload Allocation and Load Allocation

The objective of this TMDL is to produce habitat conditions in Becky Creek that meet narrative water quality standards described above, and support at least a class II trout fishery and hopefully restore a class I cold water trout fishery for its entire length. A class III trout fishery is not a self-sustaining community.

Chapter NR 1.02(7)(b), Wis. Adm. Code, describes the different classes of trout fishery 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 trout 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 from 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.”

“A class I trout stream is a stream or portion thereof with a self-sustaining population of trout.

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- a. Such a stream contains trout spawning habitat and naturally produced fry, fingerling, and yearling in sufficient numbers to utilize the trout habitat, or
- b. Contains trout with 2 or more age groups, above the age of one year, and natural reproduction and survival of wild fish in sufficient numbers to utilize the available trout habitat and to sustain the fishery without stocking.”

Total Load Capacity

The goal for each of the two impaired segments of Becky Creek is to restore a sustaining trout fishery. The sustaining trout fishery can be measured through a variety of metrics, including a cold water Index of Biological Indicators, a fishery metric. More directly related to the impairment, fish habitat assessment results can be used. For the upstream impairment, the bank portion of the assessment should be improved from poor to good. For the downstream segment, the substrate portions should improve to the fair to good range.

Based on a review of the data for Becky Creek, in the best professional judgment of Department water quality staff, the total load capacity assigned to Becky Creek at its mouth is an average annual amount of sediment of 533 tons².

We believe that this total load capacity is reasonable based on two factors. One is the emphasis on controlling stream banks as a sediment source. A high percent reduction in sediment from stream banks is called for in the load allocation. Control of eroding and trampled stream banks, where accessible, has been shown to be highly effective in other moderate to high gradient trout streams in Western Wisconsin.

The other factor is the early success in 2003 where over 2000 feet of streambank and instream structures were installed along Becky Creek within the Soft Maple and Hay Creek Priority Watershed Project. At the 4.6-mile location, the Rusk County Land Conservation Department worked with a landowner whose horses had destroyed the streambanks and created huge mudholes. Best management practices, such as streambank fencing, were installed along with midstream boulders. One week after this portion of the project was completed, trout were observed under the lunger structures.

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 lowered 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 stream (possibly making this TMDL irrelevant) or will revise (upward) the load capacity.

² As measured (calculated) for the mouth of Becky Creek.

Wasteload Allocation

Since there are no point sources in the watershed, including concentrated animal feeding operations (CAFOs), 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 waste allocation is zero and the margin of safety is implicit. To achieve the load capacity, about a 28% reduction in average annual sediment load based on mid-1990s conditions is needed. The sediment load allocation for mid-1990s conditions in the Becky Creek subwatershed is summarized in Table 2.

Table 2. Sediment load allocation for Becky Creek. All values are expressed in average annual tons of sediment reaching the stream.

Category	Load Allocation	Current Annual Load	% Reduction to achieve Load Allocation	Reduction in Load to achieve Load Allocation	Reduced Annual Load
Cropland and other Agricultural Lands and Uplands		567 ³	22% ⁴	125	442
Stream banks (primarily agricultural)		179 ⁵	49%	88 ⁶	91
Totals:	533	746	29%	213	533

The total annual loading capacity for sediment is the sum of the wasteload allocation and the load allocation, as expressed in the following equation:

³ From WINHUSLE model results.

⁴ From page 95 of Soft Maple and Hay Creek Priority Watershed Plan.

⁵ From page 43 of Soft Maple and Hay Creek Priority Watershed Plan.

⁶ From page 94 of Soft Maple and Hay Creek Priority Watershed Plan.

$$\begin{aligned} \textit{Load Capacity} &= \textit{WLA} + \textit{LA} \\ 533 \textit{ Tons/year} &= 0 \textit{ Tons/year} + 533 \textit{ Tons/year} \end{aligned}$$

Margin of Safety

An implicit margin of safety is used for this TMDL. Additional load reduction should be achieved through implementation of additional best management practices (BMPs) in the watershed. A primary example is the establishment of vegetative buffers along streams through activities such as the Continuous Sign-up Conservation Reserve Program. Vegetative buffers along streams were not included in estimating the load allocations due to the fact that they could not be modeled. They tend to provide an additional 10 to 15 percent sediment control overall. The Conservation Reserve Program Continuous Sign-up Program is being implemented in Rusk County. Therefore, additional practices will be installed beyond what was included in analysis.

In addition, WDNR believes the total load capacity is reasonable but conservative due to the inclusion of the sediment reduction from croplands and the sediment reduction from streambanks.

Seasonal Variation

There is no seasonal variation in the sedimentation of this stream. Sediment is a “conservative” pollutant and does not degrade over time or during different critical 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 this stream 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 stream under the current amounts of sediment reaching the stream.

Undoubtedly, the amount of sediment reaching Becky Creek through major rainfall and snowmelt runoff events varies throughout the year.⁷ However, most of the sediment enters during spring runoff and intense summer rainstorms. Considerable 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.

⁷ 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.

c. Public Participation

Previously, and 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 Soft Maple and Hay Creek Priority Watershed Project. There were public meetings in the developmental stage of the plan, and a public meeting was held on the Soft Maple and Hay Creek Priority Watershed Project on March 12, 1996 in Bruce, Wisconsin. The Rusk County Land Conservation Committee, Wisconsin DNR and the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) approved the plan.

Since this TMDL contains modeling information used in the watershed plan, but not published in the plan, and monitoring information collected since the 1996 public meeting, the Department of Natural Resources presented this TMDL for a 30-day public review. On April 3, 2005 a public notice was announced in a Department press release package that goes to over 800 newspapers, television stations, radio stations, interest groups and interested individuals statewide outside of the Department of Natural Resources. Electronic copies of the public notice and proposed TMDL were also sent to staff of the Rusk County Land and Water Conservation. In addition, the public notice and proposed TMDL were placed on the Department's website. The public comment period ended May 3, 2005. No public comments were received.

Reasonable Assurance

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).

Specific to this TMDL, Becky Creek is part of a larger watershed project, the Soft Maple and Hay 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 Soft Maple and Hay Creek Priority Watershed Project. The Becky Creek priority watershed plan also contains "critical site enforcement" requirements. As described on page 5 of the Soft Maple and Hay Creek Priority Watershed Plan, three trampled stream bank sites on Becky Creek were designated as critical sites. The owners of these lands are required to install best management practices to control these trampled sites. 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 Soft Maple and Hay Creek Priority watershed. Administrative rules passed by the Natural Resources Board indicate that watersheds with impaired waters will have the highest priority for enforcement.

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

The WDNR in conjunction with the Rusk County Land Conservation Department, intend to monitor Becky Creek throughout the priority watershed project implementation which is due to end in 2007. The monitoring will consist of metrics contained in the WDNR's baseline protocol for wadeable streams, such as the Index of Biological Integrity (IBI) and the current habitat assessment tool.

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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. 1996. Nonpoint Source Control Plan for the Soft Maple and Hay Creek Priority Watershed Project. Pub. No. WR-440-96.

Wis. Dept. of Natural Resources. 1995. Soft Maple and Hay Creeks Watershed Surface Water Resource Appraisal Report.

Attachment

Wis. Dept. of Natural Resources. 1996. Nonpoint Source Control Plan for the Soft Maple and Hay Creek Priority Watershed Project. Pub. No. WR-440-96.

Wis. Dept. of Natural Resources. 1995. Soft Maple and Hay Creeks Watershed Surface Water Resource Appraisal Report.