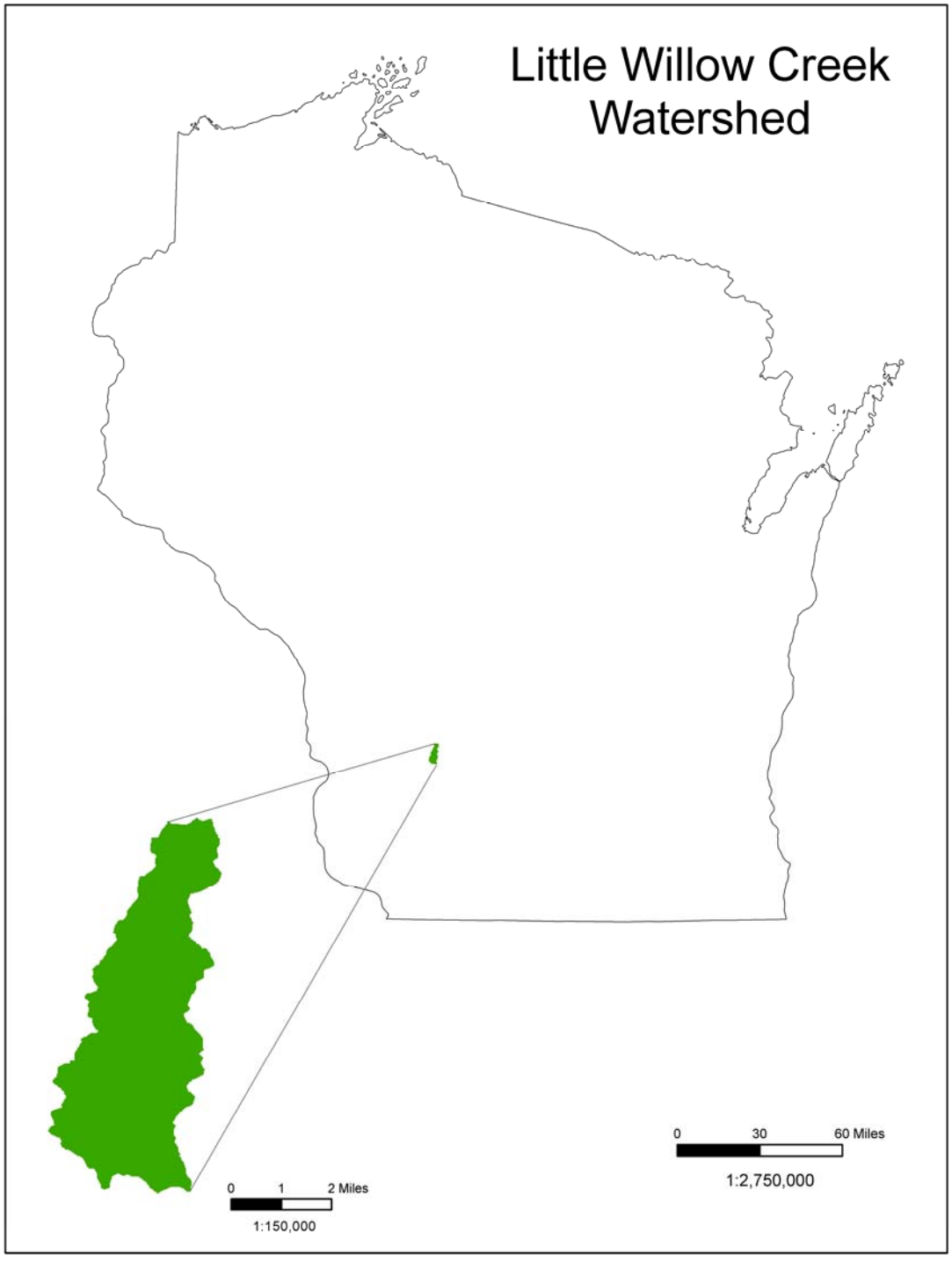
Total Maximum Daily Load:
Little Willow Creek
Richland County, WI

Little Willow Creek, Richland County, WI
Report Prepared by Mike Gilbertson

WISCONSIN
DEPT. OF NATURAL RESOURCES

Figure 1. Little Willow Creek Watershed Location in Wisconsin.



Wisconsin Department of Natural Resources
Bureau of Watershed Management

Sediment Total Maximum Daily Load for Little Willow Creek

INTRODUCTION

Little Willow Creek is approximately eight-miles long, located in the southeast portion of Richland County in southwestern Wisconsin. The Wisconsin Department of Natural Resources (WDNR) placed the entire 8 miles of Little Willow Creek on the state's 303(d) impaired waters list in 1996 as high priority due to degraded habitat caused by excessive sedimentation (Table 1). Little Willow Creek was selected for TMDL development because a "cluster" monitoring approach was applied to efficiently monitor on-point source sediment loading to several waterbodies in southwestern Wisconsin. The Clean Water Act and US EPA regulations require that each state develop TMDLs for waters on the Section 303(d) list. The purpose of this TMDL is to identify load allocations and management actions that will help restore the biological integrity of Little Willow Creek.

Table 1. Designated Uses of Little Willow Creek.

Waterbody Name	WBIC	TMDL ID	Impaired Stream Miles	Existing Use*	Codified Use*	Pollutant	Impairment
Little Willow Creek	1221300	243	0-7.5	Coldwater Class III	Coldwater Class II	Sediment	Degraded Habitat

*See Appendix B for Stream Classification Descriptions.

PROBLEM STATEMENT

Due to excessive sedimentation, Little Willow Creek is currently not meeting applicable **narrative water quality criterion** as defined in NR 102.04 (1); Wisconsin Administrative 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 mixing zone and effluent channels 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 body of water, shall not be present in such amounts as to interfere with public rights in waters of the state."

Excessive sedimentation is considered an objectionable deposit.

Little Willow Creek is currently not supporting its designated use as a coldwater (class II) fish community. The designated uses applicable to this stream are as follows:

S. NR 102.04 (3) intro, (a) and (c), Wisconsin Administrative 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.

> "(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 waters by the department of natural resources (Wisconsin Trout Streams, publication 6-6300 (80))."

LITTLE WILLOW CREEK BACKGROUND

Little Willow Creek is a 7.5 mile spring and seepage-fed trout stream in southeastern Richland County that flows south until it reaches Willow Creek near Richland Center, Wisconsin. It has a moderate to high gradient of approximately 40 feet per mile and drains an area of approximately 14 square miles. The entire length of this stream is listed as impaired due to degraded habitat from non-point source sedimentation. Current or existing use of Little Willow Creek is considered Cold – Class III trout fishery throughout the entire length of the stream.

Table 1. Little Willow Creek Land Use, NASS 2001 (Ag. 2006).

Land Use	Percent
Woodland	62.40%
Pasture, Non-ag	22.05%
Ag	10.29%
Urban	4.58%
Shrubland	0.54%
Wetland	0.13%
Water	0
Barren	0

Wisconsin Department of Natural Resources (WDNR) staff conducted habitat surveys in June 2006 at Spiral Road and MacAvoy Road The current WDNR quantitative habitat assessment tool for wadeable streams (WDNR, 2002) at MacAvoy Road scored this section of stream as having "good" habitat. At Spiral Road the habitat assessment scored this section of stream as being "fair" habitat.

Little Willow Creek shows excessive erosion throughout most of the section from the mouth upstream to Ginther Road. At MacAvoy Road and above, there is less agricultural land use than the downstream sections of the stream, and agricultural impacts to the stream are minimal. Generally, above MacAvoy Road the stream has a buffer from 5 to 30 meters in width. The majority of the watershed is forested land which mostly exists on the steep hillsides of the valley (Table 1). The valley floor is mostly pastured/non-agricultural land (22%), while agricultural land use consumes about 10% of the watershed (Appendix A). Although agricultural land use makes up a small portion of the whole watershed, intense pasturing and overgrazing consumes the majority of the riparian corridor from the mouth upstream to Anderson Road. It is likely that the land use percentages won't change much

for the foreseeable future as the topography in the watershed would make it difficult for intense development to occur, and this area of the state currently isn't under much pressure for development.

Water chemistry data were collected by WDNR at Spiral Road during 2006 and 2007 to assess the extent of the sedimentation to Little Willow Creek (Table 2). Water samples were analyzed for Total Suspended Solids (TSS), and the results were graphed with instantaneous flow data to show the trend of increased suspended solids during higher flows, indicating periods of increased sediment loading and fine particle substrate re-suspension (Figure 2). The majority of the samples were collected during normal flow conditions. A successful effort was made to collect event samples and at least 4 samples were collected during periods of high flow (although exactly where along the hydrograph can only be estimated). Although it is difficult to directly relate TSS concentrations to sedimentation rates and therefore habitat quality without a greater understanding of the hydro-dynamics of the waterbody, these TSS values will be useful when they are compared to TSS concentrations after management activities are installed in the watershed, particularly during high flow events. At Spiral Road, the water is generally turbid, and there was an accumulation of approximately 20" of silt on the stream bed through most of 2007. High flows during the August 2007 flooding of southwestern Wisconsin removed this heavy siltation. Background TSS concentrations at Spiral Road are between 40-50 mg/L. The greatest concentration of TSS sampled during this monitoring period was 542 mg/L.

Table 2. TSS Concentrations Collected from Little Willow Creek at Spiral Road

Sample Date	Time	Flow (cfs)	TSS (mg/L)	T-tube
04/04/2006	15:00		52	
05/08/2006	12:00	1.1	6	
06/07/2006	10:32		113	
07/07/2006	10:45	3.2	43	
08/10/2006	11:00	3.0	54	
09/08/2006	10:14	2.9	28	53.2
09/11/2006	10:30	14.4	542	6.6
10/06/2006	13:30	3.4	17	63.8
03/23/2007	11:25	7.6	91	23.2
04/04/2007	13:30	10.1	98	25
05/04/2007	12:35	3.6	40	46.8
06/06/2007	13:05	3.7	80	29.8
07/10/2007	11:40	2.8	109	10.2
08/08/2007	12:30	8.4	266	16.6
08/22/2007	12:15	5.1	117	
09/21/2007	11:30	6.1	36	51.4
10/17/2007	10:35	6.5	33	64.8

Surface water temperature was collected at MacAvoy Road and in the headwaters during 2006 and 2007, and at Spiral Road during 2006 (Figure 3). The groundwater inputs in the headwaters buffered summer temperatures in the upper stream sections between 50 and 60 degrees Fahrenheit, and daily maximum temperatures of 62 degrees F. At MacAvoy Road, the maximum daily mean temperature exceeded 72 degrees Fahrenheit (coldwater characteristic) twice and exceeded the instantaneous maximum temperature of 77 degrees (coldwater characteristic) on 6 days during 2006. At Spiral Road, the maximum daily mean temperature exceeded 72 degrees 4 times, and exceeded the instantaneous maximum temperature of 77 degrees 17 times in 2006. The high downstream water temperatures at Spiral Road are likely due to the lack of riparian shading below MacAvoy Road, very little groundwater inputs (except the far upper

reaches), and the high concentration of suspended solids within the water column that absorb and retain heat from the sunlight.

Figure 2. Instantaneous Flow vs. TSS Concentration Graph on Little Willow Creek at Spiral Road, Spring 2006 – Fall 2007.

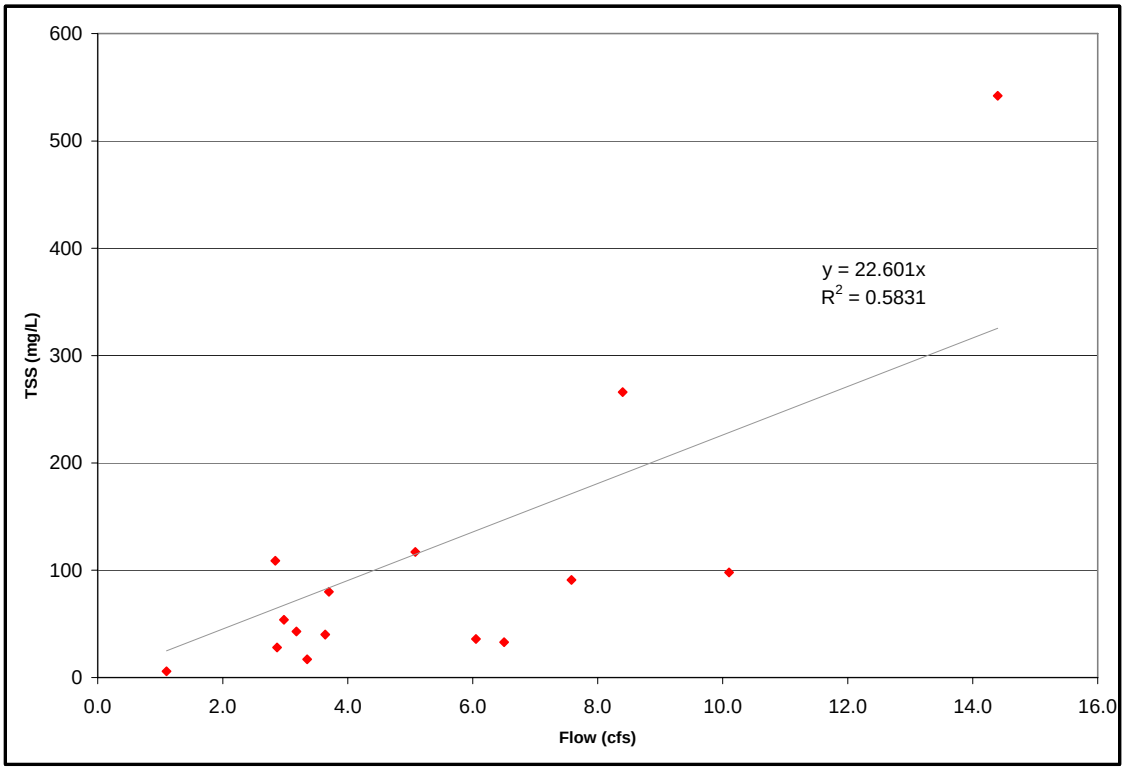
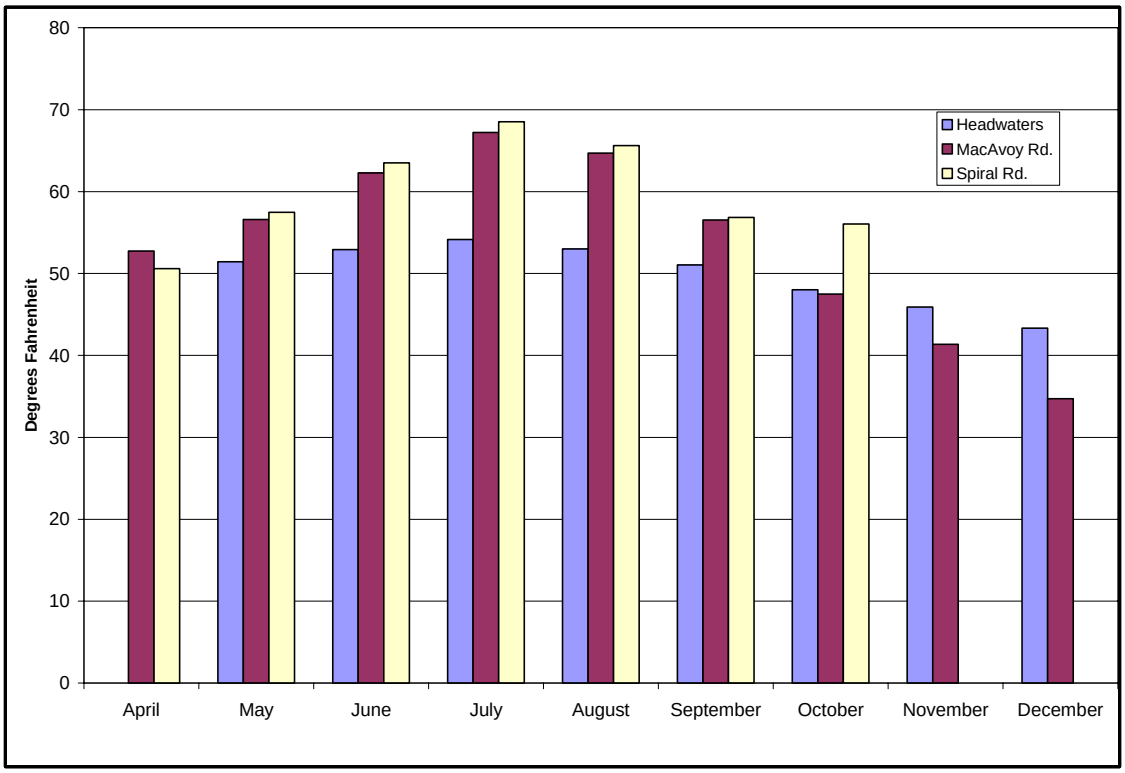


Figure 3. Average Water Temperature of Little Willow Creek, 2006-2007.



Fish assessments were conducted at Spiral Road and Anderson Road during July 2005. Although several brown trout were found at Spiral Road, few other coldwater species were found which contributed to the "poor" coldwater IBI score (coldwater IBI = 20). At Anderson Road the majority of fish collected were tolerant species, and no coldwater species were found. The coldwater IBI scored the fish assemblage as "very poor" (coldwater IBI = 0) (Table 3). A contributing factor to the low fish assessment scores may be the migration block at Spiral Road. WDNR fish biologists believe the size of this blockage prevents migration for most fish, except possibly for medium and larger trout (11" and longer)

Table 3. Fisheries Surveys of Little Willow Creek, 2005.

	Spiral Road	**Anderson Rd**
Brown Trout	13	0
Creek Chub	27	30
Johnny Darter	2	23
Mottled Sculpin	3	0
Western Blacknose Dace	1	0
White Sucker	42	14
Cold Water IBI	20 (poor)	0 (very poor)

Macroinvertebrate assessments were conducted on Little Willow Creek in Fall 2006 at Spiral Road, MacAvoy Road, and in the headwaters at a stream crossing on private property. The Hilsenhoff Biotic Index (Hilsenhoff, 1987) was used to calculate the score.

The HBI scores indicate "very good" water quality at Spiral Road and MacAvoy Road, and "excellent" water quality at the headwaters site (Table 4).

Table 4. Macroinvertebrate samples from Little Willow Creek.

Site	HBI Score	Rating
Headwaters	3.416	Excellent
MacAvoy Rd	4.007	Very Good
Spiral Road	4.289	Very Good

Above MacAvoy Road, much of the stream hydrology has been modified by way of historical channelization. The altered hydrology creates efficient sediment transport downstream and maintains clean substrate within the channelized stream sections as shown in the habitat survey, and has been field confirmed. However the altered hydrology upstream has created excessive stream bank erosion conditions downstream from Anderson Road to the mouth. The channelization prevents the stream from dissipating energy (particularly during high flow periods), and that energy is delivered downstream causing accelerated lateral channel movement, which is an indication of an imbalanced stream system.

SOURCE ASSESSMENT

Point Sources

There are no point sources located on or discharging to Little Willow Creek.

Nonpoint Sources

Direct measurements of bank erosion were used to assess the nonpoint sources of sediment in Little Willow Creek. A survey of several accessible eroding stream sections were conducted in the fall of 2007 to estimate the annual volume of soil loss using the Natural Resources Conservation Service (NRCS) Stream Bank Erosion Calculation Method (NRCS, 2003). The surveyed areas are described in Appendix C. The data gathered from the bank erosion surveys was then used to establish an erosion volume per length of stream coefficient that was applied to un-surveyed eroding stream lengths to efficiently predict the erosion volume for the whole stream. The eroding stream sections above Spiral Road were assigned an erosion coefficient of 469 lbs/yr/ft, while downstream of Spiral Road was assigned an erosion coefficient of 382 lbs/yr/ft. Different erosion coefficients were used because the terrain and erosion characteristics downstream of Spiral Road are significantly different than above Spiral Road It was estimated that 11.8 tons/day of stream bank erosion occurs on Little Willow Creek. If management practices are installed to create stable stream conditions showing "slight" erosion, it is predicted that erosion can be reduced by 85-90% (1.3 tons/day). Existing and target erosion values for the eroding stream segments are outlined in Appendix D.

LINKAGE ANALYSIS

Establishing the link between watershed characteristics and resulting water quality is a crucial step in TMDL development. By striving to return watershed characteristics closer to natural conditions, improvements in overall stream health can be achieved. However, determining natural conditions of the stream is challenging due to lack of historical information to represent conditions prior to human disturbance.

Sedimentation of Little Willow Creek is occurring in the down stream sections due to a combination of excessive stream bank erosion and agricultural runoff. There are some areas in the lower third of Little Willow that are overgrazed and the livestock has un-restricted access to the stream resulting in slumping stream banks and little vegetation to bind the soil. The livestock over grazing of the land and un-restricted access creates bank conditions that are more susceptible to erosion during periods of high flow. Also, excessive stream bank erosion is the result of historical changes to the stream hydrology in the upper stream segments. Although WDNR does not have record allowing channelization work to Little Willow Creek, it is visually obvious that work was done in the previous decades on the stream to restrict lateral movement of the channel and prevent flooding of neighboring fields without considering the downstream effects. As a result of upstream channelization, Little Willow Creek is unable to dissipate stream energy (particularly during high flows) because of straight channels and tall banks, until water reaches downstream where channelization did not occur, and the energy is released on the stream banks causing massive erosion. The excessive stream energy downstream also causes rapid lateral movement of the channel as evidence by the amount of channel scarring in the downstream sections of Little Willow Creek.

Sedimentation from stream bank erosion is the suspected cause of habitat degradation in Little Willow Creek. Fine sediments covering the stream substrate reduce suitable habitat for fish and other biological communities by filling in pools and reducing available cover for juvenile and adult fish. Sedimentation of riffle areas compromises reproductive success of fish communities by covering the gravel substrate necessary for spawning conditions. Field observations during 2006 and 2007 confirming heavy sedimentation occurring at Spiral Rd. and extending upstream approximately 1000 ft. can be linked to “poor” cold water IBI scores from 2005. The filling in of riffle areas also affects the fish communities’ food source, macroinvertebrates, which have difficulty thriving in areas with predominately silt substrate as opposed to a substrate composed of gravel, cobble/rubble, and sand mixture. In addition, sedimentation can increase turbidity in the water column, causing reduced light penetration necessary for photosynthesis in aquatic plants, reduced feeding efficiency of visual predators and filter feeders, and a lower respiratory capacity of aquatic macroinvertebrates due to clogged gill surfaces. Sedimentation of the substrate can also cause an increase in other contaminant levels, such as nutrients, which are attached to sediment particles and transported into the stream during runoff events.

Biotic integrity scores for fish communities are expected to increase as measures are taken to reduce sedimentation and embeddedness of the substrate, and increase stability of exposed banks.

TMDL DEVELOPMENT

A TMDL is a quantitative analysis of the amount of specific pollutants reaching an impaired lake or stream to the extent that water quality standards will be met. As part of a TMDL, the amount of pollutant that the water can tolerate and still meet water quality standards must be identified. Little Willow Creek in-stream habitat has been impaired by excessive sedimentation due to historical channelization in the upstream segments causing an imbalanced stream system. The goal of this TMDL is to reduce sediment loads to Little Willow Creek to a level that narrative water quality standards will be met and biological communities in the stream will be restored to their potential.

In addition to identification of pollutant loading, a TMDL also identifies critical environmental conditions used when defining allowable pollutant levels. However, in this circumstance there is no critical condition in the sedimentation of this stream. Critical conditions more appropriately apply to pollutants such as phosphorus where the impact to the waterbody occurs in conditions of higher water temperatures and low flow conditions where excessive phosphorus can cause eutrophic conditions. Phosphorus is often bound to sediment particles during periods of sediment loading. Because Little Willow Creek is not listed as being polluted by excessive phosphorus, this TMDL does not address the activities of phosphorus in Little Willow Creek. Sediment is a "conservative" pollutant and does not degrade over time or during different critical periods of the year. EPA acknowledges this in its 1999 Protocol for Developing Sediment TMDLs, "the critical flow approach might be less useful for the sediment TMDLs because sediment impacts can occur long after the time of discharge and sediment delivery and transport can occur under many flow conditions." The excessive sedimentation is a year-round situation. This is not to say that there is no variation in the sediment carried via runoff to a stream (refer to Seasonality Section below).

ALLOCATIONS

The total annual loading capacity for sediment is the sum of the wasteload allocations for permitted sources, the load allocations for non-point sources, and the margin of safety, as generally expressed in the following equation:

$$\text{TMDL Load Capacity} = \text{WLA} + \text{LA} + \text{MOS}$$

WLA = Wasteload Allocation (From Point Sources) = 0 tons/year (no point sources)
LA = Load Allocation (From Nonpoint Sources)
MOS = Margin of Safety

Waste Load Allocation

Since there are no point sources in the watershed, the wasteload allocation is zero. If a point 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 WLA and MOS are zero.

Table 5. TMDL (Load Capacity) = WLA + LA + MOS
The sediment TMDL for Little Willow Creek is 1.3 tons/day

Existing Conditions	TMDL	WLA	LA	MOS	Reduction
11.8 tons/day	**1.3 tons/day**	0	1.3 tons/day	Implicit	89%

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The total existing sediment load to Little Willow Creek from streambank erosion calculations is approximately 11.8 tons per day. The target sediment load for the eroding streambanks is 1.3 tons/day for an overall reduction of 89% in Little Willow Creek. A target recession rate of 0.05 ft/yr was used to establish the TMDL. The target recession rate of 0.05 ft/yr is in the high end of the "slight" erosion category as defined in the NRCS Streambank Erosion Survey Protocol (Table 6). It is expected that once the streambanks are stabilized, Little Willow Creek will display more naturally occurring erosion characteristics consistent with a balanced stream system.

Table 6. Erosion Categories of the NRCS Streambank Erosion Survey.

Lateral Recession Rate	Category	Description
0.01-0.05	**Slight**	Some bare bank but active erosion not readily apparent. Some rills but no vegetative overhang. No exposed tree roots.
0.06-0.2	**Moderate**	Bank is predominantly bare with some rills and vegetative overhang. Some exposed tree roots but no slumps or slips.
0.3-0.5	**Severe**	Bank is bare with rills and severe vegetative overhang. Many exposed tree roots and some fallen trees and slumps or slips. Some changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross section becomes U-shaped as opposed to V-shaped.
0.5+	**Very Severe**	Bank is bare with gullies and severe vegetative overhang. Many fallen trees, drains, and culverts eroding out and changes in cultural features as above. Massive slips or washouts common. Channel cross section is U-shaped and stream course may be meandering.

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 WDNR will either pursue "de-listing" of the stream or will revisit the load capacity.

MOS

The margin of safety (MOS) accounts for the uncertainty about the relationship between the sediment loads and the response in the waterbody. The MOS is implicit in this TMDL because a conservative lateral recession rate of 0.05 ft/yr was chosen as the target. The goal of the TMDL is to reduce the amount of erosion to a level of which is naturally occurring and as described in the "slight" category of the NRCS streambank erosion technical guide "some bare bank but active erosion not readily apparent." By using 0.05 ft/yr, this TMDL allows the maximum amount of streambank recession and still be considered slight erosion. Also, MOS is implicit because the total eroding stream length was estimated using aerial photography and GIS measuring tools to efficiently measure stream sections that were inaccessible.

SEASONALITY

Sediment can be considered a "conservative" pollutant because it does not degrade over time. The detrimental effects of sediment on the aquatic community can be seen year-round, even though sediment loading occurs seasonally. Undoubtedly, the amount of bank sediment delivered to Little Willow Creek varies throughout the year depending on flow regimes and vegetative cover. Under some flow regimes, sediment is deposited, and at other times, sediment is scoured and transported downstream. Much of the sediment in this system remains within the confines of the stream until major floods scour accumulated sediment. The net result over time is an accumulation of sediments in and along the stream banks.

Erosion and sediment delivery are largely a function of climate where wet water years typically produce the highest sediment loads. Sediment inputs tend to be seasonal in association with high flows, typically during spring run-off or summer thunderstorm events. WDNR has directly considered sediment loading seasonal variation by basing the Little Willow Creek TMDL on stream bank erosion calculations that were based on survey measurements performed during the summer season.

REASONABLE ASSURANCE

To ensure the reduction goals of this TMDL are attained, best management practices (BMPs), such as streambank protection and riparian buffers, must be implemented and maintained to control sediment loadings from nonpoint source pollution. (There are currently no point sources discharging sediment to Little Willow Creek). Restoration of the natural stream flow and hydrologic function of the creek should be considered in the

upper reaches to effectively dissipate stream energy and thereby reduce erosion in the lower reaches. Many of these restoration and management measures require local participation to properly implement. Without local participation, it is likely that the reduction goals of the TMDL will not be attained.

The WDNR and Richland County Land Conservation Department (LCD) will implement the state agricultural and non-agricultural performance standards and manure management prohibitions listed in Chapter NR 151, Wisconsin Administrative Code., to address sediment in the Little Willow Creek watershed. Many landowners voluntarily install BMPs to help improve water quality and comply with the performance standards. Cost sharing is available for many of these BMPs. In most cases, farmers cannot be required to comply with the agricultural performance standards and prohibitions, unless they are offered at least 70% cost sharing.

The *Richland County Land & Water Resource Management (LWRM) Plan* workplan for 2008-2012 includes goals that address reductions for sediment loadings. The county's LWRM Plan also includes a strategy to implement the state performance standards and prohibitions.

The Richland County LCD and other local units of government may apply for Targeted Runoff Management (TRM) Grants through the WDNR. The TRM Grant Program provides competitive cost-sharing grants to support small-scale, 2-year projects to reduce nonpoint source pollution. TRM Grants fund up to 70% of eligible project costs, with the grant amount capped at $150,000. In 2007, the Richland County LCD received one TRM grant, totaling $150,000 for BMP implementation.

In addition to the implementation of state performance standards and WDNR cost-sharing programs, there are several federal and local programs that may assist in implementing this TMDL:

Conservation Reserve Program

The Conservation Reserve Program (CRP) is a federal, USDA program that provides annual rental payments for taking environmentally sensitive cropland out of production for 10 to 15 years. This land is usually highly erodible. The land must be planted and maintained in vegetative cover consisting of certain mixtures of trees, shrubs, forbs and/or grass species. Cost-sharing incentives and technical assistance are provided for planting and maintenance.

Conservation Reserve Enhancement Program

The Conservation Reserve Enhancement Program (CREP) is a joint federal, state, and local program that provides annual rental payments up to 15 years for taking cropland and marginal pasture adjacent to surface water out of production. A strip of land adjacent to the stream must be planted and maintained in vegetative cover consisting of certain mixture of trees, forbs and/or grass species. This land is highly sensitive and, by putting

land into this program, there is less sediment and nutrients getting into streams. Cost-sharing incentives and technical assistance are provided for planting and maintenance of the vegetative strips. Landowners also receive an upfront, lump-sum payment for enrolling in the program, with the amount of payment dependant on whether they enroll in the program for 15 years or permanently.

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) is a federal, NRCS program that provides technical assistance and cost sharing to farm operators to install conservation practices to reduce soil erosion and polluted runoff delivery to ground and surface waters. Farmers compete annually for the limited funds. The Richland County LCD is a member of the USDA Local Work Group that prioritizes resource concerns for this program.

Farmland Preservation Program

The Farmland Preservation Program is a state program that provides tax relief to farmland owners for maintaining their land in an agricultural use. To remain eligible for tax relief, program participants must comply with "Soil and Water Conservation Standards" that include the state agricultural performance standards and prohibitions.

LWRM Plan Implementation Cost-sharing Program

This cost-sharing program is administered by the Richland County LCD and Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP). DATCP annually provides funds for landowners to cost share the installation of conservation practices that are needed to accomplish the goals and objectives of the County's LWRM Plan. The cost-share funds can be used throughout the county but are often targeted to certain areas or resource concerns.

Managed Forest Law

This WDNR program provides a reduction in property taxes to woodland owners if they enroll their woodland in it for 25 to 30 years and develop and follow a forestry management plan. Technical assistance to develop the plans is provided by private consulting foresters and reviewed by WDNR foresters. Woodlands cover must cover at least 10 contiguous acres to be eligible. Any sites with erosion problems are noted in the plan.

Wildlife Habitat Incentive Program

The Wildlife Habitat Incentive Program (WHIP) is a federal, USDA program that provides cost-sharing payment to landowners for developing or improving fish and wildlife habitat on almost all types of land including cropland, woodlands, pastures, and streams. Practices used for development and improvement of habitat include: native plant

community establishments, fencing of livestock out of sensitive areas, and in-stream structures for fish.

MONITORING

The WDNR will monitor Little Willow Creek based on the rate of implementation of the TMDL. Monitoring will continue until it is deemed that the stream has responded to the point where it is meeting its codified use or until funding for these studies are discontinued. In addition, the stream will be monitored on a 5 to 6 year interval as part of a special project strategy to assess temporary conditions and trends in overall stream quality. The monitoring will consist of metrics contained in WDNR's baseline protocol for wadeable streams, such as the Index of Biotic Integrity (IBI), the Hilsenhoff Biotic Index (HBI), the current habitat assessment tool, and sampling of water quality parameters at a subset of sites.

PUBLIC PARTICIPATION

The Little Willow Creek TMDL was subject for public review from June 11th, 2008 to July 14th, 2008. On June 11th, a news release was sent to local newspapers, television stations, radio stations, interest groups, and interested individuals in the south-central region portion of the state. The news release indicated the public comment period and how to obtain copies of the public notice and the draft TMDL. The news release, public notice, and draft TMDL were also placed on the DNR's website: http://dnr.wi.gov/org/water/wm/wqs/303d/Draft_TMDLs.html

WDNR received zero public comments on the Little Willow Creek TMDL. In addition, EPA Region 5 submitted comments during the public comment period. All comments were documented, considered, and addressed, with many incorporated into the final report. Comments and responses can be found in Appendix F of this report.

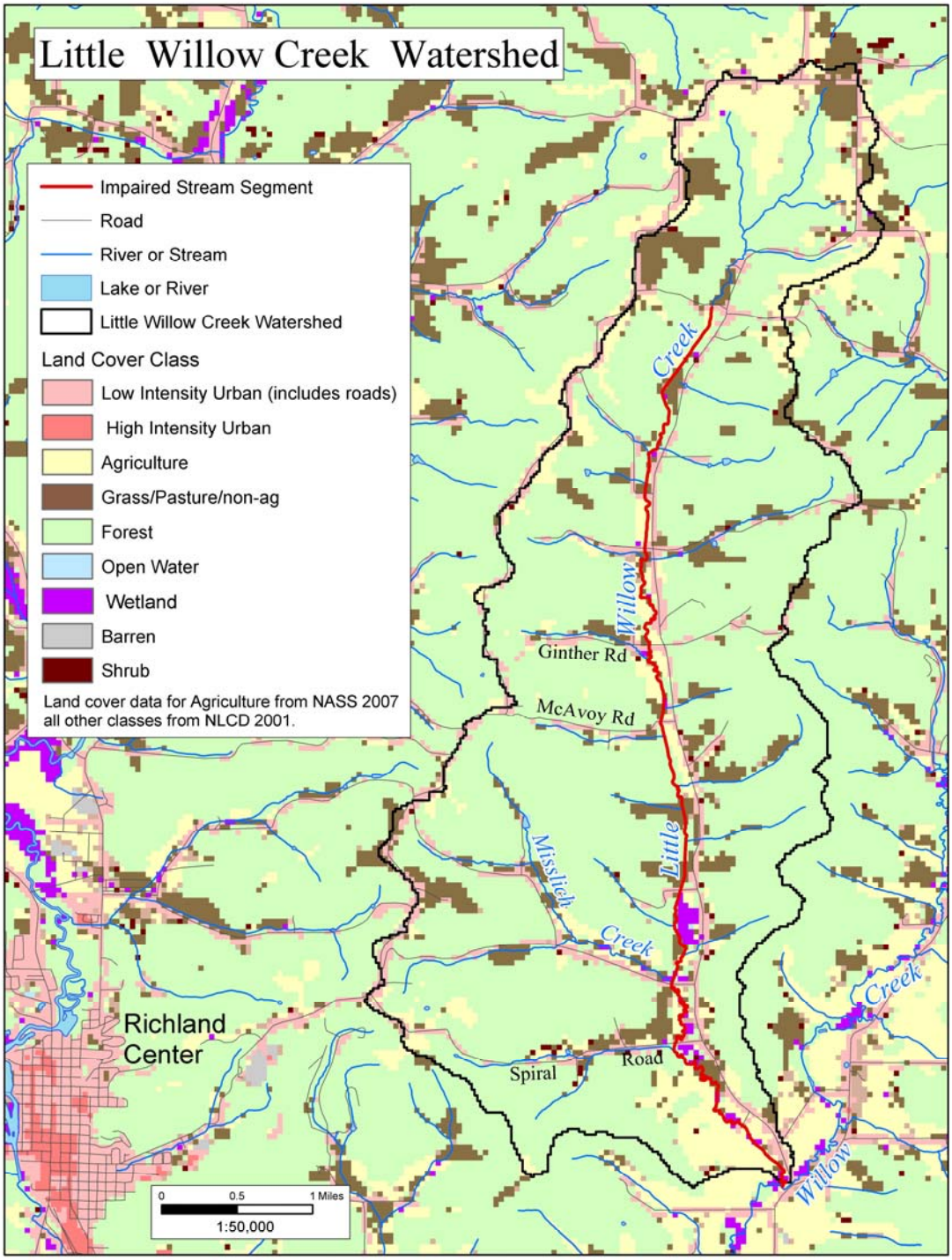
REFERENCES

Hilsenhoff, William. 1987. An Improved Biotic Index of Organic Stream Pollution. The Great Lakes Entomologist. Vol. 20. No. 1. Pages 31-39.

NRCS. 2003. Streambank Erosion, field technical guide. Natural Resources Conservation Service, Madison, WI.

WDNR, 2002. Guidelines for Evaluating Habitat of Wadeable Streams. Wisconsin Department of Natural Resources, Bureau of Fisheries Management. June 2002.

APPENDIX A
WATERSHED MAP



APPENDIX B
STREAM CLASSIFICATION AND DESCRIPTION

Stream Use Classification	Description
Cold	Cold water community; includes surface waters that are capable of supporting a cold water fishery and other aquatic life and serving as a spawning area for cold water species. This includes three levels of cold water classification (Class I, II, or III).
WWSF	Warm water sport fish communities; includes surface waters capable of supporting a community of warm water sport fish or serving as a spawning or nursery for warm water sport fish.
WWFF	Warm water forage fish communities; includes surface waters capable of supporting an abundant and diverse community of forage fish and other aquatic life.
LFF	Limited forage fishery; (intermediate surface waters (INT-D) includes surface water of limited capacity because of low stream flow, naturally poor water quality or poor habitat. These surface waters are capable of supporting only a limited community of tolerant forage fish and aquatic life.

Trout Stream Classification	Description
Class I	These are high quality trout waters, having sufficient natural reproduction to sustain populations of wild trout at or near carrying capacity. Consequently, streams in this category require no stocking of hatchery trout. These streams or stream sections are often small and may contain small or slow-growing trout, especially in the headwaters.
Class II	Streams having this classification may have some natural reproduction but not enough to utilize available food and space. Therefore, stocking is sometimes required to maintain a desirable sport fishery. These streams show good survival and carryover of adult trout often producing some fish of better than average size.
Class III	These waters are marginal trout habitat with no natural reproduction occurring. They require annual stocking of legal-size fish to provide trout fishing. Generally, there is no carryover of trout from one year to the next.

Table B-1. Stream use classifications. The existing use of Little Willow Creek is a Class III cold water fishery.

APPENDIX C
STREAMBANK EROSION SURVEY MAP

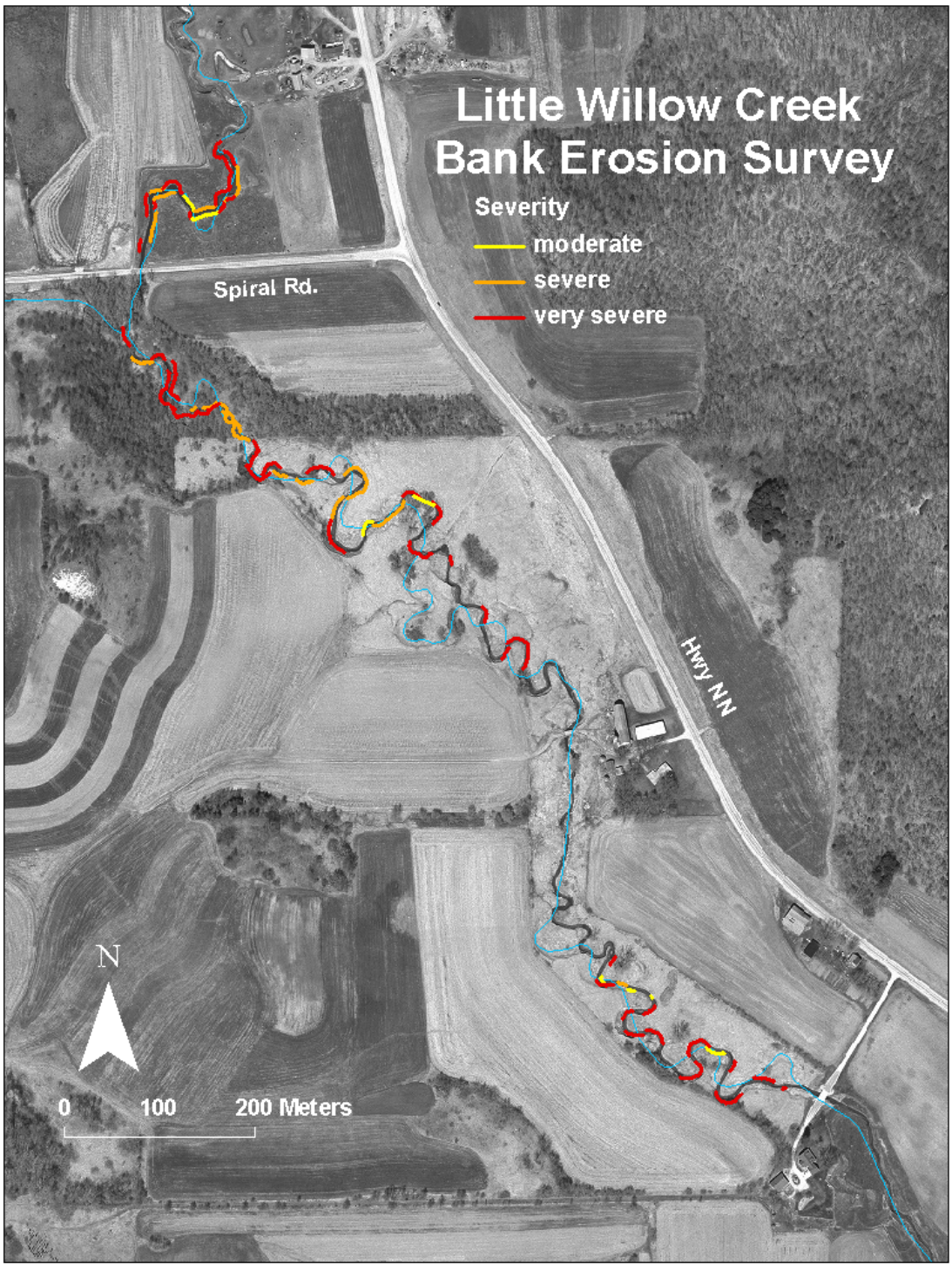


Figure C-1. Surveyed Streambabnk Erosion Used to Develop Erosion Coefficients in Other Eroding Stream Segments of Little Willow Creek, Richland Co.,WI.

APPENDIX D
STREAMBANK EROSION CALCULATIONS

Table D-1. Existing streambank erosion conditions .

Survey Station	Total Stream Length Surveyed (ft)	Erosion per Stream Length Surveyed (lbs/yr/ft)	Estimated Total Eroding Stream Length (ft)	Estimated Erosion (tons/day)
Downstream of Spiral Road	5000	382	6650	3.5
Upstream of Spiral Road	820	469	13000	8.4

Table D-2. Target streambank erosion conditions after installing management practices.

Survey Station	Total Stream Length Surveyed (ft)	Erosion per Stream Length Surveyed (lbs/yr/ft)	Estimated Total Eroding Stream Length (ft)	Estimated Erosion (tons/day)
Downstream of Spiral Road	5000	40	6650	0.4
Upstream of Spiral Road	820	51	13000	0.9

APPENDIX E
PHOTOGRAPHIC DOCUMENTATION OF STREAMBANK EROSION

Figure E-1. Typical bank erosion along Little Willow Creek downstream of Spiral Road

Figure E-2. Typical bank erosion along Little Willow Creek downstream of Spiral Road

Figure E-3. Typical bank erosion along Little Willow Creek downstream of Spiral Road

Figure E-4. A section of the stream bank was carved out as a result of the August 2007 flooding.

Figure E-5. A section of the stream bank was carved out as a result of the August 2007 flooding.

Figure E-6. Typical bank erosion along Little Willow Creek downstream of Spiral Road

Figure E-7. Typical bank erosion along Little Willow Creek downstream of Spiral Road

Figure E-8. Land use upstream of Spiral Road on Little Willow Creek.

Appendix B - EPA Comments and WDNR Responses
Little Willow Creek TMDL

Comments from EPA, responses compiled by Mike Gilbertson on July 30, 2008

1. Page 3, tell the reader what part of the state the county is in within the narrative, not just the map.

WDNR: This comment was addressed in the text. Language was added to describe the location of Little Willow Creek within Wisconsin.

2. How was this location prioritized for being chosen to do a TMDL? (Just a sentence or two.) Suggestions are due to severity of impairment, stakeholder involvement, etc.

WDNR: This comment was addressed in the text.

3. Add a sentence whether you expect any future population growth in the area.

WDNR: This comment was addressed in the text.

4. Page 4 you mention MacAvoy Road several times but it is not shown on any map. The same applies to Ginther Road and Anderson Road. The reader needs a much clearer picture of the upstream and downstream locations and for the references in your narrative.

WDNR: Road labels were added to watershed map in Appendix A.

5. Page 7. There needs to be stronger linkage in the data you provide for the reader to know there are good IBI scores or good habitat associated with low sediment values. Can you illustrate a better linkage by showing TSS data from another location with low TSS and high fishery scores so the reader can see the difference? You have only shown the downstream data at Spiral Road and a mix of high and low TSS values. Can any information from Tables 2 and 3 be correlated to show stronger linkage of high TSS and poor fisheries surveys? (data are from different years)

WDNR: Additional text was added in the Background section and Linkage Analysis section to better describe the problem of sedimentation and the linkage between high TSS and low fish IBI. The data are from two consecutive years, but the data is still relevant and comparable. The TSS concentration data can be used in the future to compare water quality data after management practices are implemented and the waterbody has had time to respond. TSS concentrations will be expected to be lower as less sediment will enter the system and, hence, less sediment will be made available for suspension, particularly during high flow events.

6. Page 9 The TSS target needs more explanation. You have the loading capacity, but will a target of 10, 50, or 100 mg/L TSS achieve that load? You link the target sediment load to a target recession rate, but there needs to be more computation shown to the reader how TSS links to these targets. How does measuring sediment in mg/l result in tons/day? Show more background calculation in the narrative or in Appendix D.

WDNR: Quantification of the sediment load to Little Willow Creek was done by way of measuring streambank erosion, not by instream TSS concentrations. Improvements in the watershed and reductions to sediment loading will be measured by future streambank erosion surveys after management practices have been installed in the watershed.

7. Page 9, last para., you need to convince the reader that there is no critical condition for sedimentation. My question arises because in many locations, though the sediment itself may not chemically degrade, many chemical contaminants are linked with sediment, such as phosphorus adsorption. Then phosphorous may cause problems at several "critical conditions" (transport in high flow, algal blooms/low DO in low flow). This may not be a problem here, but tell the reader in a sentence or two that you have also considered conditions important to other contaminants associated with the sediment. Stating that there are not any critical conditions may be too strong a statement and needs to be supported. Alternatively, you may state that since conditions are considered year-round, the critical conditions are accounted for, if you feel that is the case.

WDNR: Comments were addressed in the text and describe the importance of critical conditions for other pollutants such as phosphorus.

8. Page 10 Table 5 needs to say sediment somewhere in a header or column. Also, say implicit MOS not 0, that is not accurate, there is a MOS.

WDNR: "Sediment" was added to the Table 5 title. MOS was changed to "implicit" instead of 0.

9. Page 11 (typo "later" recession rate - should be "lateral").

WDNR: Correction made.

10. Seasonality is described but how is it incorporated into this TMDL? Just add a sentence or two.

WDNR: Comment was addressed in the text to describe seasonality.

11. Page 14 Public participation dates are in error.

WDNR: The public participation section was corrected for the final version of the TMDL.

12. Page 15 References, within the document you mention Hilsenhoff 1987 and Van Dyck 2007 and there is no footnote or reference.

WDNR: Appropriate references were cited in the text.