East Twin River Watershed

Nonpoint Source Assessment Report

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I. INTRODUCTION

As recommended in the *Twin-Door-Kewaunee River Basin Water Quality Management Plan (1995)*, Lake Michigan District Department of Natural Resources monitored streams in the East Twin River watershed (Figure 1) in 1994 to evaluate the extent of nonpoint source impacts on water quality. This information, along with existing watershed data, was used to rank the priority of the watershed for potential selection in the Priority Watershed program.

II. METHODS AND PROCEDURES

Described below is monitoring that was conducted in the East Twin River watershed to evaluate the extent of nonpoint source pollution impacts on the water resources and the process used to rank the priority of the watershed for selection as a possible priority watershed project.

Stream habitat conditions were evaluated throughout the watershed in the spring, summer and/or fall and recorded on the Stream Habitat Evaluation Form (Ball, 1982). This rates the quality and quantity of habitat available in the stream for aquatic life.

Aquatic macroinvertebrates were collected in spring and fall at several locations in the watershed and sent to UW-Stevens Point for sorting and identification. Sample results were evaluated using the Hilsenhoff Biotic Index (HBI) which provides a relative measure of organic loading to the streams (Hilsenhoff, 1987).

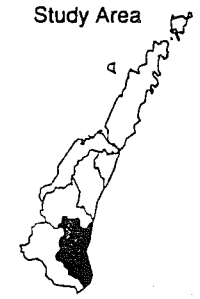
Fish species present in the streams were determined using the Master Waterbody Listing For Fish Sampled All Years For Lake Michigan District (Fago, 1986). Species tolerances were determined Using the Index of Biotic Integrity (IBI) to measure Environmental Quality in Warmwater Streams of Wisconsin (Lyons, 1992).

Water chemistry monitoring results were retrieved utilizing the EPA's federal STORET retrieval system. Monthly samples of the East Twin River from 1977 to 1994 were reviewed.

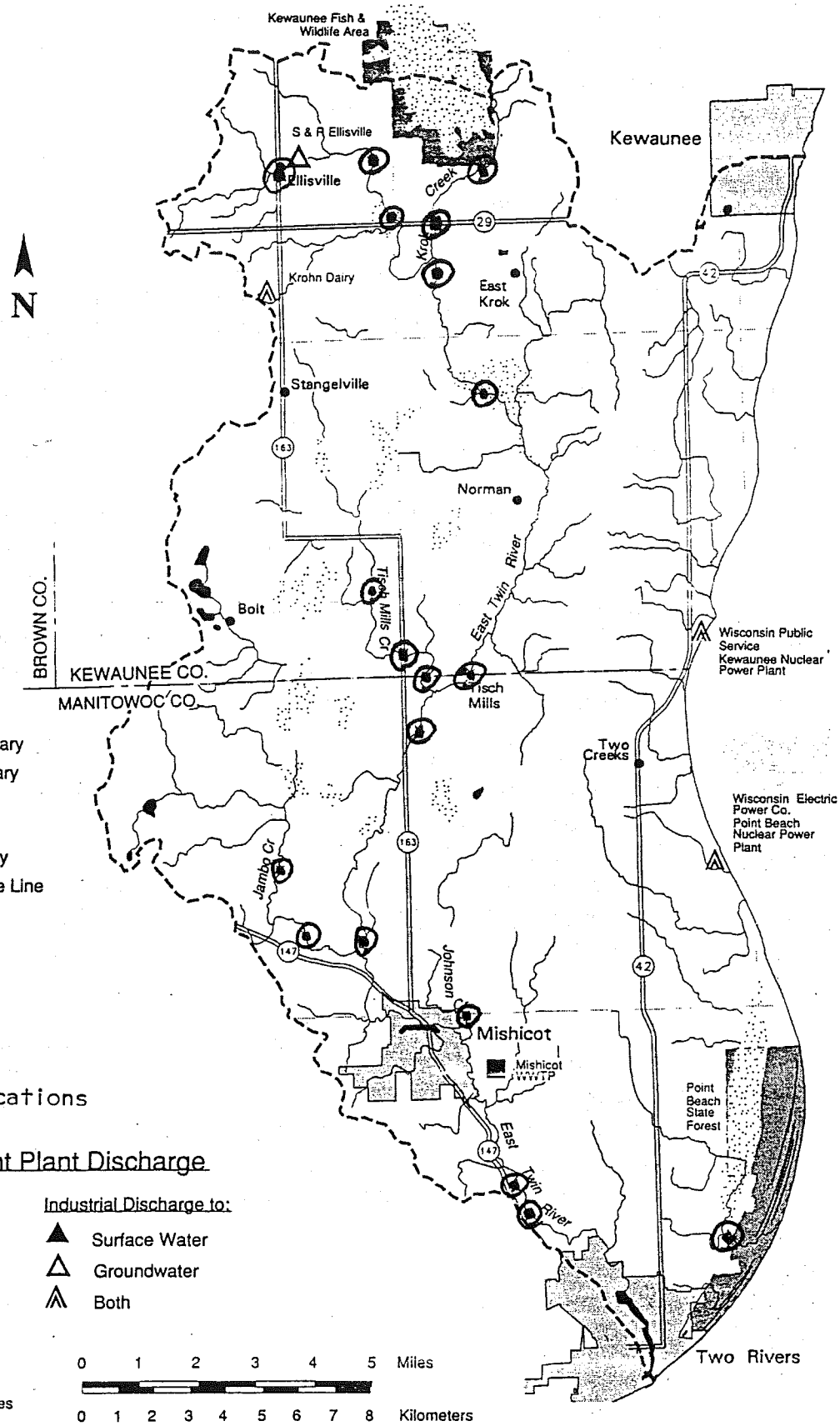
Using criteria defined in the Department of Natural Resources Planner's Guidance (1991), existing and new water quality information was applied to such things as endangered resources, the fishery, water chemistry, macroinvertebrates, vegetation, and physical habitat so the watershed can be prioritized for selection as a priority watershed project. Based on impacts on the water resources from nonpoint sources of pollution, each major tributary stream and the overall watershed is given a high, medium, or low priority ranking. High ranked watersheds will be eligible for selection as a priority watershed project.

Figure 1.

East Twin River Watershed (TK02)



Twin-Door-Kewaunee River Basin



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III. RESULTS AND DISCUSSION

The East Twin River watershed with monitoring locations are shown in Figure 1. A summary of habitat evaluation results, biotic index results, and stream classifications for the major tributaries in the watershed are presented in Table 1. Following is a discussion of monitoring results for each of the major watershed streams.

East Twin River

The East Twin River is 34.5 miles long with a watershed of 133 square miles. The East Twin River is located in Kewaunee and Manitowoc Counties and discharges to Lake Michigan near Two Rivers. The watershed drainage area is predominately agricultural. The upper 7.6 miles of the East Twin River is classified as class I and II trout water. From the confluence of Krok Creek downstream to its mouth, East Twin River is classified as warm water sports fish community. Anadromous salmon and trout seasonally run as far upstream as the Mishicot dam.

Aquatic life habitat evaluations rated the cold headwater portion of the East Twin River as good to fair habitat. A fine layer of silt covers most of the hard rocky substrate and has accumulated near the banks and in slow areas. Some of the stream banks are pastured, eroded and lack sufficient shade. Macroinvertebrate samples collected at East Townline Road received biotic index values of 4.65 in spring and 4.36 in fall which rates this portion of the East Twin River as good to very good water quality with some to possible slight organic pollution present.

Aquatic life habitat was rated as fair at both Krok Road and CTH J. Rocks and riffles are absent and dark organic matter completely covers the sandy substrate. At these locations, the river is slow moving and exhibits characteristics of a wetland. The banks are well buffered and trees and shrubs shade the river. Dissolved oxygen and temperature monitoring conducted at CTH J from June 22 to 28, 1994 shows normal diurnal oxygen and temperature fluctuations. Dissolved oxygen did not drop below the state standard of 5 mg/l nor did temperatures exceed the 89°F standard at any time (Appendix A).

Just upstream of the Kewaunee and Manitowoc County line, the habitat of the East Twin River rated as fair. The rocky substrate is covered by silt and periphyton growth. Bank erosion is obvious with several raw areas present. Macroinvertebrate samples at CTH BB received biotic index values of 5.51 in spring and 4.05 in fall which rates this section of the East Twin River as fair to very good water quality with fairly significant to possible slight organic pollution present.

Table 1. Water Resource Conditions in the East Twin River Watershed

River	Location	Stream Classification[1]	Date	Habitat Evaluation[2]	HBI[3] Spring	HBI[3] Fall
East Twin River	Zander Road	WWSF	10/12/94	158 - Fair	4.51 Good	3.77 Very Good
			05/02/94	89 - Good		
			06/27/94	111 - Good		
	East Townline Road	Cold(II)	04/07/94	132 - Fair	4.65 Good	4.36 Very Good
			10/12/94	186 - Fair		
	CTH BB	WWSF	04/07/94	161 - Fair	5.51 Fair	4.05 Very Good
			10/12/94	154 - Fair		
	CTH F	Cold(II)	07/05/94	125 - Good	----	----
	Hwy 163	Cold(II)	07/05/94	113 - Good	----	----
	E. Hillcrest Road	WWSF	06/27/94	102 - Good	----	----
	Rock Ledge Road	WWSF	06/27/94	86 - Good	----	----
	CTH J	WWSF	06/22/94	146 - Fair	----	----
	Maplewood Road	WWSF	6/27/94	102 - Good	----	----
	Krok Road	WWSF	06/22/94	183 - Fair	----	----
Tisch Mills Creek	Hwy 163	Cold(II)	05/02/94	91 - Good	3.37 Excellent	3.89 Very Good
			06/27/94	104 - Good		
			10/12/94	145 - Fair		
	CTH BB	Cold(II)	03/30/94	86 - Good	3.02 Excellent	2.89 Excellent
			10/12/94	138 - Fair		
	Collegiate Road	WWFF	07/05/94	156 - Fair	----	----
Krok Creek	Hwy 29	WWFF	04/07/94	151 - Fair	4.57 Good	----
	CTH F	WWFF	07/05/94	158 - Fair	----	----
Jambo Creek	Jambo Creek Road	Cold(II)	10/12/94	132 - Fair	2.85 Excellent	----
			03/30/94	70 - Excellent		3.71 Very Good
			06/27/94	88 - Good		
	Twin Bridge Road	LFF	06/27/94	184 - Fair	----	----
Molash Creek	CTH O	WWFF	05/02/94	120 - Good	6.56 Fairly Poor	----
			06/27/94	187 - Fair		
Johnson Creek	Randolph Street	LFF	06/27/94	195 - Fair	----	----

(continued on next page)

1. Stream Classification:

Cold: cold water trout stream communities includes surface waters capable of supporting a community of coldwater fish and other aquatic life or serving as a spawning area for coldwater fish species.

Class I: streams are high-quality streams where populations are sustained by natural reproduction.

Class II: streams have some natural reproduction but need stocking to maintain a desirable fishery.

Class III: streams sustain no natural reproduction and require annual stocking of legal size fish for sport fishing.

WWSF:warm water sport fish communities includes surface waters capable of supporting a community of warmwater sport fish and/or serving as a spawning area for warmwater sport fish.

WWFF: warm water forage fish communities includes surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life.

LFF: limited forage fish communities includes surface waters of limited capacity because of very low, naturally poor water quality or poor habitat.

2. Habitat Evaluation Rating:

<70 = excellent habitat
71 - 129 = good habitat
130 -200 = fair habitat
>200 = poor habitat

3. Hilsenhoff Biotic Index (HBI):

Biotic Index	Water Quality	Degree of Organic Pollution
0-3.50	Excellent	No apparent organic pollution
3.51-4.50	Very good	Possible slight organic pollution
4.51-5.50	Good	Some organic pollution
5.51-6.50	Fair	Fairly significant organic pollution
6.51-7.50	Fairly poor	Significant organic pollution
7.51-8.50	Poor	Very significant organic pollution
8.51-10.0	Very poor	Severe organic pollution

Downstream at Zander Road, East Twin River received habitat ratings as fair and good. At this location, the substrate has a nice variety of rock and riffles with deep pools. The river banks are well buffered with diverse tree and shrub growth. Bank erosion is not evident. Macroinvertebrate samples received biotic index values of 4.51 in spring and 3.77 in fall which rates this section of the East Twin River as good to very good water quality with some to possible slight organic pollution present.

The river is similar near Rock Ledge Road, however, more silt and sand bars are evident. A layer of fine silt deposited on the rocky substrate is easily suspended with disturbance. Aquatic life habitat rated as good.

Downstream of Mishicot at Maplewood Road and at East Hillcrest Road, the river becomes much wider, deeper, and slower then upstream. The turbid water makes it hard to see the bottom. Habitat rated as good even though the rocky substrate is covered with a layer of fine silt. Dissolved oxygen and temperature monitoring conducted at East Hillcrest Road from June 27 to July 5, 1994 found no violations of state standard at any time (Appendix B). The river does exhibit normal daily oxygen and temperature fluctuations.

Monthly water chemistry samples collected on the East Twin River at CTH VV from 1977 to 1994 found total and dissolved phosphorus and suspended solids concentrations elevated above desirable levels on many occasions. The mean total phosphorus was slightly high at 0.13 mg/l and the mean dissolved phosphorus was considerably high at 0.064 mg/l. Biochemical oxygen demand, ammonia, and dissolved oxygen levels were generally in the acceptable levels.

In a total of 13 samples collected between 1979 and 1983 throughout the entire East Twin River, fish species tolerant of environmental degradation were present five times more often than intolerant species. This indicates that the water quality and habitat is less than ideal and generally does not attract species that cannot tolerate somewhat degraded conditions.

Overall, nonpoint sources of pollution does not appear to be significantly degrading aquatic life habitat or macroinvertebrate communities in the East Twin River itself; however, concentrations of suspended solids and nutrients in the river at its mouth is a concern. These measurements indicate a significant loading of pollution to Lake Michigan from the entire East Twin River watershed. Therefore, the East Twin River received a high priority rating.

Krok Creek

Krok Creek is a four mile long warm water forage fish classified stream and is partly in the Kewaunee Fish and Wildlife Area. Krok Creek dischargers to the East Twin River in Kewaunee County. The creek is significantly impacted by Lipski Swamp. Aquatic life habitat rated as fair since the substrate is covered by dark organic debris and riffles are absent. A macroinvertebrate sample collected spring 1994 received a biotic index value of 4.57 which rates this section of Krok Creek as good water quality with some organic pollution present.

Nonpoint sources of pollution does not appear to be significantly impacting Krok Creek and therefore, received a low priority rating.

Tisch Mills Creek

The lower 1.9 miles of Tisch Mills Creek is classified as class II cold water while the remaining 6.1 miles are classified as warm water forage fish communities. Tisch Mills Creek originates in Kewaunee County but discharges to the East Twin River in Manitowoc County.

Much of the stream corridor is buffered by cedar swamp and bank erosion is not evident. Aquatic life habitat rated good to fair. In the upper reaches where the gradient is less, silt and sediment has accumulated in the stream bed reducing desirable habitat. In contrast, the steeper gradient in the lower reaches flush sediment from the rocky riffle areas and provide better habitat and reaeration. Some periphyton and moss grows on the rocks, but does not seem to significantly impact dissolved oxygen levels.

Macroinvertebrate samples received biotic index values of 3.37 and 3.89 at Hwy 163 southern crossing and 3.02 and 2.89 at CTH BB just upstream of the county line. These values indicate excellent to very good water quality with no apparent to possible slight organic pollution present at these locations.

Nonpoint sources of pollution does not appear to be significantly impacting Tisch Mills Creek and therefore, received a low priority rating.

Jambo Creek

Jambo Creek is a 9 mile long tributary to East Twin River. The lower 3 miles are classified as class II cold water while the next 5 miles are classifies as limited forage fish communities.

The characteristics of Jambo Creek in the upper reaches are much different then the lower reaches. The wide, deep, and slow moving creek in the upper reaches at Twin Bridges Road has significant sediment deposition and turbid water although the banks appear to be well buffered. Aquatic life habitat rated as fair. Dissolved oxygen was measured at 4.6 mg/l in June 1994. This is below the state standard of 5 mg/l.

The cold water springs along with the increased gradient provide better aquatic life habitat in the lower reaches then in the slower upper reaches. At Jambo Creek Road, habitat rated excellent, good and fair. The rock and rubble substrate at Jambo Creek Road provides reaeration and therefore excellent to very good water quality ratings based on the biotic index values of 2.85 and 3.71. These ratings indicate no apparent to possible slight organic pollution present. At this location, the creek is well buffered and bank erosion is not a problem.

Nonpoint sources of pollution seems to impact Jambo Creek in the upper reaches; however, the higher gradient and cold water springs improve the water quality and habitat significantly in the lower reaches. Therefore, Jambo Creek received a medium priority rating.

Johnson Creek

Johnson Creek is a 2.4 mile long limited forage fish community classified stream that discharges to the East Twin River near Mishicot. The upper half only flows intermittently. Since the substrate is dominated by soft sediment and muck, no riffles were present to collect macroinvertebrate samples. The stream banks are stable with little erosion observed. Aquatic life habitat rated fair at Randolph Street (CTH V) in June, 1994. At that time, flows were minimal even as far downstream as Randolph Street.

Aquatic life in this creek is most significantly impacted by minimal stream flows. Sediment appears to have accumulated in the stream channel and is most likely from nonpoint sources in the drainage area. Johnson Creek received a medium priority ranking.

Molash Creek

Molash Creek is a 6 mile long creek that travels through a significant wetland area in the Point Beach State Forest before discharging to Lake Michigan. Molash Creek is classified as warm water forage fish communities for the lower 3.5 miles and limited forage fish community for the remainder.

Aquatic life habitat rated as good and fair. The substrate is mostly sand with muck accumulated near the edges and inside curves. Riffles are uncommon. Stream bank erosion does not appear to be a problem. The upper reaches have been ditched. Dissolved oxygen was measured at 4.6 mg/l in June 1994 at CTH O. This is below the 5 mg/l state standard. This may partly be due to the minimal stream flow in summer.

A macroinvertebrate sample collected in spring at CTH O received a biotic index value of 6.56 which rates this section of Molash Creek as fairly poor water quality with significant organic pollution present. It was difficult to collect the minimum 100 organism for analysis. Low dissolved oxygen levels along with limited stream habitat impact macroinvertebrate biotic index values and numbers.

Although, the most significant limiting factor for Molash Creek is low stream flow, nonpoint sources of pollution appear to impact Molash Creek by increasing sedimentation and lowering dissolved oxygen levels. Therefore, Molash Creek received a medium priority ranking.

IV. CONCLUSIONS

Krok Creek and Tisch Mills Creek received low priority rankings because nonpoint sources of pollution does not appear to have a negative effect on the water resources of these streams. Jambo Creek, Johnson Creek, and Molash Creek received medium rankings because of localized effects from nonpoint source pollution. Lastly, the East Twin River received a high priority ranking although the impacts to the East Twin River itself does not seem to be major, chemical monitoring near the river mouth shows significant suspended solids and nutrient loading to Lake Michigan from the entire East Twin River watershed. Therefore, overall, this watershed shall be ranked ***high*** priority for potential selection in the Nonpoint Source Priority Watershed Program.

V. REFERENCES

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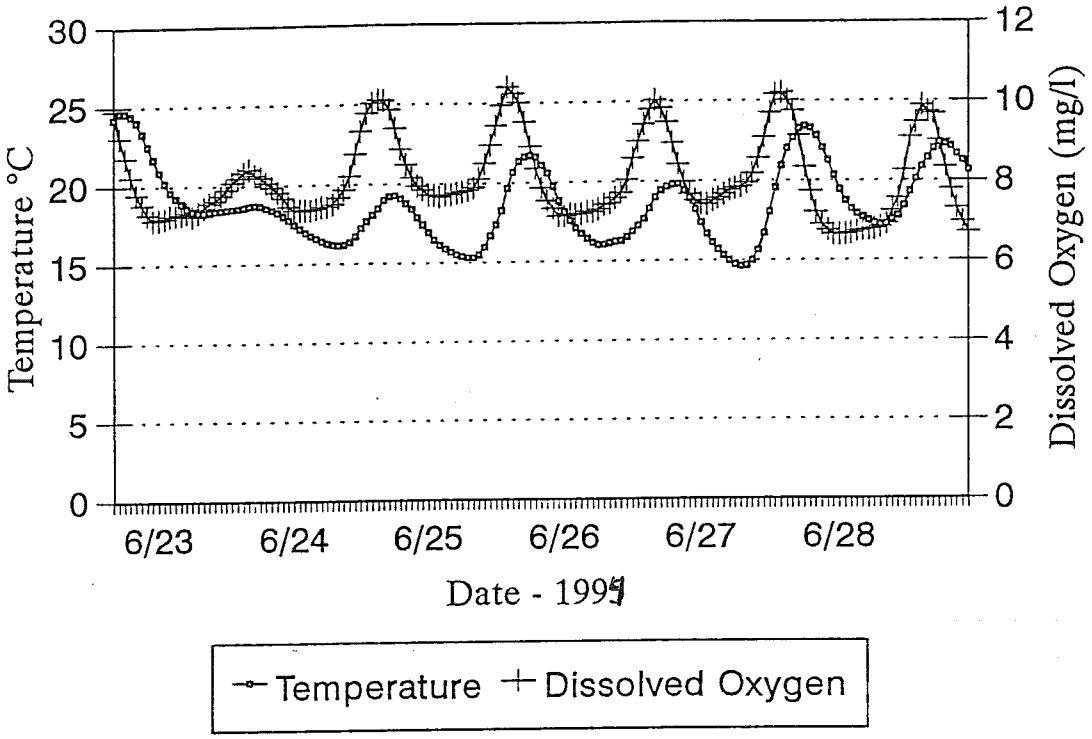
Lyons, John. 1992. Using The Index Of Biotic Integrity (IBI) To Measure Environmental Quality In Warmwater Streams Of Wisconsin.

Appendix A

East Twin River
CTH J



Appendix B

East Twin River
East Hillcrest Road