Plum Creek Watershed

Nonpoint Source Assessment Report

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I. INTRODUCTION

As recommended in the *Lower Fox River Basin Water Quality Management Plan (1991),* monitoring was conducted in 1992 in the Plum Creek Watershed (Figure 1) to determine the impacts of nonpoint source pollution on water quality. Plum Creek and its tributaries make up the entire rural watershed.

II. METHODS AND PROCEDURES

Water samples were collected and preserved following the Quality Assurance/Quality Control Field Procedures Manual (1988). Samples were analyzed for total and dissolved phosphorus, total and volatile suspended solids, nitrogen series, biochemical oxygen demand, fecal coliform and fecal streptococcus. All samples were chilled on ice and sent to the State Lab of Hygiene for analysis.

Dissolved oxygen and temperature were measured with either a YSI Model 54 Dissolved Oxygen/Temperature meter or Hydrolab DataSonde 3 Submersible Water Quality Logger. pH was measured with a Fisher-Scientific Accumet Model 1001 meter. Flows were obtained using a Marsh-McBirney Model 201 flow meter.

Stream habitat conditions were evaluated throughout the watershed in the spring, summer, and fall and recorded on the Stream Habitat Evaluation Form in the Stream Classification Guidelines for Wisconsin (Ball, 1982).

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

III. RESULTS AND DISCUSSION

Habitat evaluation and macroinvertebrate monitoring results for Plum Creek watershed are presented in Table 1. Water chemistry results with nutrient loading data is presented in Table 2.

Aquatic life habitat of Plum Creek and its tributaries is generally poor. Clay is the predominant substrate type with little gravel, rubble and sand present. Many of the pools that are necessary to support fish and other aquatic life have been filled in from bank erosion and upland sediment runoff. The streambanks are eroding because of the lack of stable bank protection and from frequent flooding. Stream flow appears to be a major limiting factor for aquatic life in Plum Creek in the summer months. For example, flows were recorded as low as 0.4 cfs at CTH "D" on July 29, 1992.

Figure 1.

Plum Creek (LF 03) and Fox River - Appleton (LF04) Watersheds

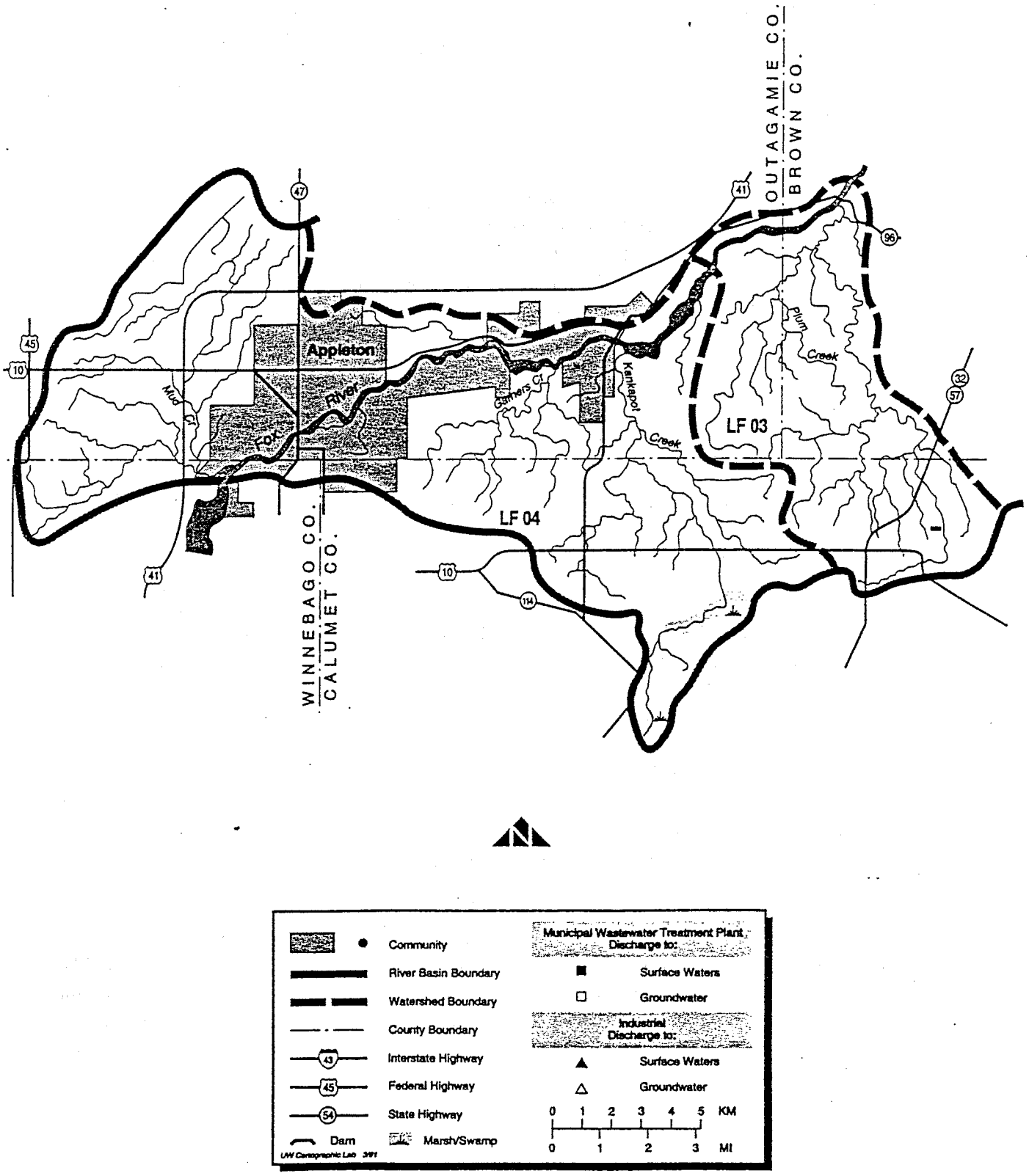


Table 1.

Plum Creek Watershed

Biotic Index and Habitat Evaluation Monitoring Results

1992

Stream	Location	Habitat Rating[1] Spring	Summer	Fall	Hilsenhoff Biotic Index[2] Spring	Fall
Plum Creek	CTH D	165/fair	222/poor	222/poor	6.48/fair	5.16/good
Plum Creek	Hills Road	201/poor	___	224/poor	6.44/fair	6.26/fair
Plum Creek	Holland Road	218/poor	___	___	7.67/poor	___
Plum Creek	Lamers & Clancy Road	229/poor	___	235/poor	6.55/fairly poor	7.16/fairly poor
Tributary to Plum Creek	County Line Road	231/poor	___	___	8.01/poor	___

1. Habitat Rating:

0 - 70 = Excellent habitat
71 - 129 = Good habitat
130 - 200 = Fair habitat
>200 = Poor habitat

2. Hilsenhoff Biotic Index:

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

Table 2. Plum Creek Event Nutrient Loadings -- 1992

Date	Flow cfs	Tot-P mg/l	Ortho-P mg/l	Sus. Solids mg/l	Vol. SS mg/l	NH_3-N mg/l	NO_2+NO_3 mg/l	Tot Kjel-N mg/l	BOD mg/l	MFCC /100 ml	Fecal Strep /100 ml	Temp °C	D.O. mg/l	pH su
7/13/92	0.94	1.34	0.89	132	21	0.024	ND	1.9	4.0	1000	910	18.6	7.9	8.62
7/14/92	2.52	1.51	1.04	110	26	0.026	0.030	2.6	5.9	170	230	13.3	12.8	8.7
*7/29/92	0.39	1.68	1.33	81	16	0.019	0.012	2.1	5.2	n/a	n/a	17.0	n/a	8.5
9/10/92	0.36	2.10	1.76	82	22	0.018	0.019	1.6	3.9	n/a	n/a	14.5	7.2	8.15
9/15/92	4.41	2.61	2.29	115	20	0.036	ND	1.4	3.5	560	470	18.2	7.8	7.49
11/2/92	6.19	1.31	1.06	51	12	0.018	0.045	1.3	7.6	1000	28000	4.0	n/a	n/a

Date	Flow cfs	Tot-P lb/day	Tot-P lb/mi²	Tot-P g/hect	Ortho-P lb/day	Ortho-P lb/mi²	Ortho-P g/hect	Sus. Sol. lb/day	Sus. Sol. lb/mi²	Sus. Sol. g/hect	O-P as % of T-P	Vol SS as % of TSS
7/13/92	0.94	6.80	0.32	0.56	4.52	0.21	0.37	670.03	31.61	55.36	66.42	15.91
7/14/92	2.52	20.55	0.97	1.70	14.15	0.67	1.17	1,496.88	70.61	123.68	68.87	23.64
*7/29/92	0.39	3.54	0.17	0.29	2.80	0.13	0.23	170.59	8.05	14.10	79.17	19.75
9/10/92	0.36	4.08	0.19	0.34	3.42	0.16	0.28	159.41	7.52	13.17	83.81	26.83
9/15/92	4.41	62.15	2.93	5.14	54.53	2.57	4.51	2,738.61	129.18	226.28	87.74	17.39
11/2/92	6.19	43.79	2.07	3.62	35.43	1.67	2.93	1,704.73	80.41	140.86	80.92	23.53

Plum Creek at County Highway "D" drains 21.2 square miles or 13568 acres.[1]

[1]Source: *Drainage Area Data For Wisconsin Streams*, USGS Open-File Report 83-933, pg 83.

*Note: Results from 7/29 can be considered non-event data.

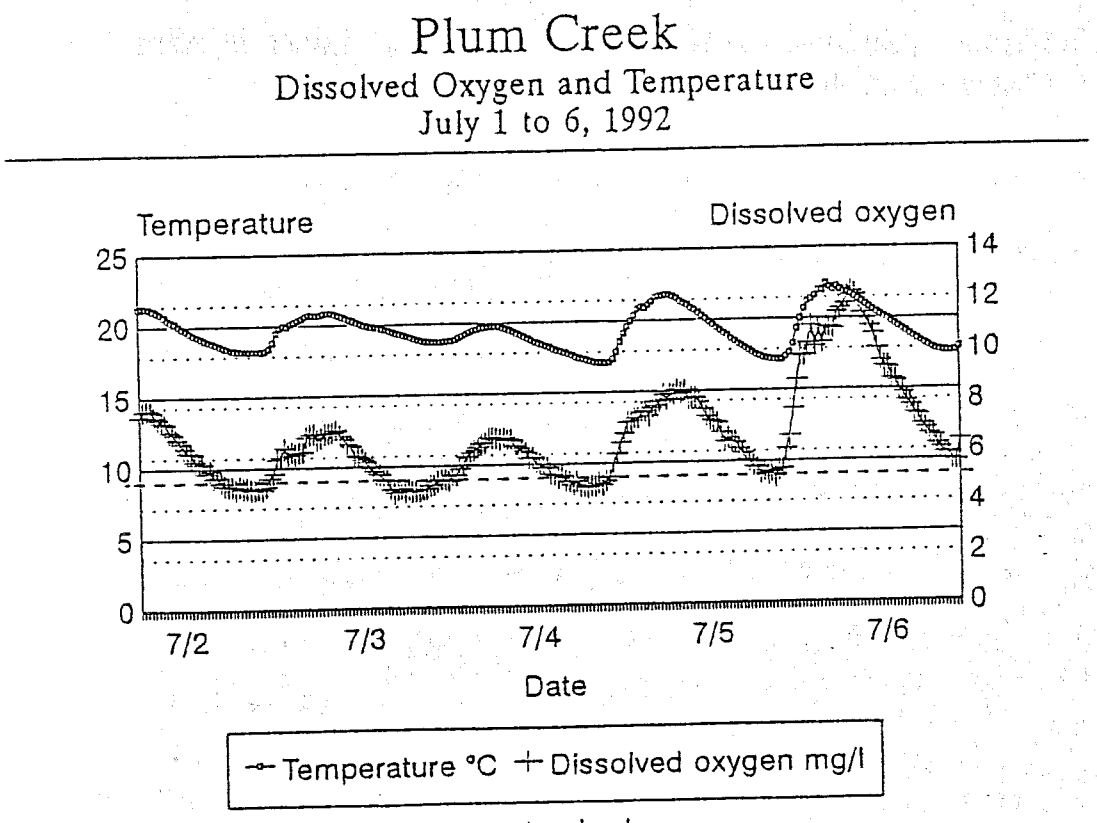
Macroinvertebrate sample results indicate good to poor water quality with some to very significant organic pollution present. Macroinvertebrate abundance and diversity appears to be limited by the lack of suitable habitat.

The water is generally very turbid in Plum Creek which limits light penetration for desirable rooted aquatic plants. Filamentous algae, however, appears to be common on the rocks and along the banks.

Suspended solids, total and dissolved phosphorus, and bacteria levels were excessively high in Plum Creek at CTH "D" during five separate runoff events and even during one non-event related monitoring period in 1992. At these concentrations and stream flows, pollutant loading to the Fox River is substantial from the Plum Creek watershed.

Dissolved oxygen and temperature measurements collected on Plum Creek at CTH "D" for six days in July 1992 show oxygen levels fall below the 5 mg/l state standard in early morning hours (Figure 2). These diurnal fluctuations are caused by nutrient enrichment and algal photosynthesis and respiration when higher water temperatures depress oxygen solubility.

Figure 2.



IV. CONCLUSIONS

The water resource condition of the Plum Creek watershed is currently poor. I do not believe management practices would change Plum Creek's current existing biological use classification of Warm Water Sport Fish Communities. In fact, the stream's severely low flows in summer and it's natural characteristics probably prevent it from even meeting it's current classification. However, a reduction of sediment, nutrients, and bacteria loading to Plum Creek and its tributaries would, in turn, significantly decrease the pollutant loading to the Fox River.

V. REFERENCES

Ball, Joe. (1982). Stream Classification Guidelines for Wisconsin. Wisconsin Department of Natural Resources.

Wisconsin Department of Natural Resources. (1988). Field Procedures Manual. Draft 2nd Edition.

Hilsenhoff, William. (1987). An Improved Biotic Index of Organic Stream Pollution.

Wisconsin Department of Natural Resources. (1991). Lower Fox River Basin Water Quality Management Plan.