

Evaluation of the Aquatic Macroinvertebrate Fauna of the Middle Portion of the Sauk River, Stearns County, Minnesota, 2010.

Submitted to:

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INTRODUCTION

The Sauk River Watershed District (District) entered into a Joint Powers Agreement under which the District would provide physical assessments, chemical monitoring, and aquatic macroinvertebrate assessment of aquatic habitats for the State of Minnesota Pollution Control Agency (MPCA). The project is known as the Upper Sauk River Water Quality Assessment Project. The District worked in cooperation with the Lake Superior Research Institute (LSRI) at the University of Wisconsin-Superior in 2008 and 2009 to provide professional training to its staff in the collection of samples of aquatic macroinvertebrates, and to use these organisms to evaluate the water quality of the upper portion of the Sauk River (Schmude 2010). In the fall of 2010, the Sauk River Watershed District conducted a similar assessment for the middle reach of the Sauk River. The current report provides an evaluation of the water quality of the middle portion of the Sauk River for 2010 based on the aquatic macroinvertebrates.

METHODS

District personnel sampled six sites along the middle portion of the Sauk River in Stearns County on October 13, 2010. More sites would have been sampled, but high water in this section of the river prevented access to additional sites. The sites listed below are arranged in order from the most upstream site to the most downstream site.

1. River's Edge in Sauk Centre
2. Sauk River Park in Melrose
3. County Road 65
4. County Road 31
5. Spring Hill Park on County Road 14
6. St. Martin Canoe Access Point off County Road 12

Sampling methods followed those established by the MPCA (Genet and Chirhart 2004). A qualitative, multihabitat sample was collected at each site using a D-frame net (500 μ m mesh) and a five-gallon pail. A total of 20 netting efforts (or jabs) were collected at each site. Each of the major habitat types (riffles, undercut banks, submerged or emergent macrophytes, snags and woody debris, and leaf packs) that were present within the reach of river were sampled in equal proportions. All of the material from the 20 netting efforts (minus the water) was consolidated in the five-gallon bucket and preserved in 10% formalin solution.

In the laboratory, the sample was thoroughly rinsed and the debris was spread onto a gridded Caton tray. Grids were randomly chosen and the material in the grid was removed to be examined under a dissecting microscope. All organisms were systematically sorted from the debris until 300+ specimens were obtained. A grid was picked in its entirety if 300 specimens were achieved before the grid was completely processed. Identifications of macroinvertebrates were made by the author to the lowest taxonomic level practical based on the scientific literature and the expertise of the author. Processed samples will be kept and stored at LSRI.

RESULTS

River's Edge

The HBI value (8.24) was the highest for the six sites that were sampled, resulting in a poor evaluation of the water quality. In addition, taxa richness (37) and EPT taxa richness (8) were the lowest values for the study. The clearly dominant taxa were chironomid midges, especially those in the pollution-tolerant genus *Glyptotendipes*.

The top five taxa by percentage:

Chironomidae	65
Hydropsychidae	12
Corixidae	6
<i>Hyaella</i>	4
<u><i>Dugesia</i></u>	<u>4</u>
Cumulative	91

Sauk River Park at Melrose

Even though this site was rated better (HBI value 6.35 – fair) than the previous upstream site, taxa richness was the same (37) and EPT taxa richness was only slightly higher (9). Chironomid midges and hydropsychid caddisflies were the two dominant taxa, similar to the previous upstream site, but the percentages between the two taxa were more similar. The appearance of the caddisflies *Hydropsyche bidens* and *H. simulans* indicate that the river at this site is a larger habitat (Schmude and Hilsenhoff 1986) compared to the Upper Sauk River where these species were not collected (Schmude 2010)

The top four taxa by percentage.

Chironomidae	35
Hydropsychidae	29
Oligochaeta	13
<u>Simuliidae</u>	<u>5</u>
Cumulative	82

County Road 65

This site was rated “fairly poor” based on the HBI value (6.74). The value for EPT taxa richness (10) was slightly higher than the previous two upstream sites. However, the value for taxa richness (51) was considerably higher, and it was as high as the highest value reported for the six sites that were sampled in the Upper Sauk River (Schmude 2010). This higher value was due to greater diversities of chironomid midges and waterboatmen (Corixidae). Midges again dominated the fauna, especially the genus *Micropsectra*. A larger population of the caddisfly *Hydropsyche simulans* was recorded at this site compared to the previous site, which again indicates a larger stream.

The top four taxa by percentage.

Chironomidae	40
Simuliidae	11
Hydropsychidae	10
<u><i>Hyaella azteca</i></u>	<u>10</u>
Cumulative %	71

County Road 31

The HBI value (5.22) provided a rating of “good” for the water quality at this site. This value was further supported by the highest EPT taxa richness value (19) for this study, and the highest total taxa richness value (60) for all of the sites currently sampled on the Sauk River over the last three years (Schmude 2010). The fauna was dominated by 12 species of waterboatmen (Corixidae). Numerous species of corixids are known to fly to larger streams to overwinter (Hilsenhoff 1984a), and their presence indicates that the District personnel sampled undercut banks and/or vegetation along the shoreline where these typically lentic insects congregate in the fall and winter. For the Upper Sauk River study, fewer specimens and species were collected, but this may simply be due to the lack of collecting samples in October; the latest collection for the Upper Sauk River occurred in mid September (Schmude 2010). The mayfly *Anthopotamus myops* (Potamanthidae) was collected for the first time during the three years of sampling the river; it is typically collected in larger rivers. Also, the mayfly *Baetisca lacustris* (Baetiscidae) was collected. This is another medium to large-river inhabitant (Hilsenhoff 1984b). Only one individual of this species was collected in the Upper Sauk River (Schmude 2010).

The top four taxa by percentage.

Corixidae	59
<i>Leptophlebia</i>	10
Chironomidae	3
<u><i>Hyaella azteca</i></u>	<u>3</u>
Cumulative %	75

Spring Hill Park

The water quality at this site was rated “very good” based on the lowest HBI value (4.37) recorded for the Sauk River over the last three years (Schmude 2010). This value was supported by a high EPT taxa richness value (17) and total taxa richness value (50). The HBI value was heavily influenced by the dominate mayfly *Leptophlebia*, which has a tolerance value of 4 and accounted for 45% of the fauna. Waterboatmen were also abundant, followed by flatheaded mayflies (Heptageniidae) and aquatic worms (Oligochaeta). The mayflies *Anthopotamus myops* and *Baetisca lacustris* were again collected at this site.

The top four taxa by percentage.

<i>Leptophlebia</i>	45
Corixidae	14
Heptageniidae	10
<u>Oligochaeta</u>	<u>8</u>
Cumulative %	77

St. Martin Canoe Access

Water quality decreased from the previous upstream site and was rated “fair” based on an HBI value of 6.30. The value for EPT taxa richness (14) decreased from the previous two upstream sites, but total taxa richness increased from the previous upstream site (54), which represented the second highest value for total taxa richness for the three year this river has been sampled (Schmude 2010). Chironomid midges re-emerged as the dominant taxa group, followed by the mayfly *Leptophlebia*, the scud *Hyaella azteca*, and the marsh beetle in the genus *Scirtes*. Relatively large numbers of scuds and marsh beetle larvae would indicate that shoreline habitats were sampled where lentic habitat was present.

The top four taxa by percentage.

Chironomidae	25
<i>Leptophlebia</i>	20
<i>Hyalella azteca</i>	17
<u><i>Scirtes</i></u>	<u>9</u>
Cumulative %	71

DISCUSSION

The three sites closest to the cities of Sauk Centre and Melrose received evaluations of fair to poor water quality based on the HBI Index (Table 1). In addition, these three sites for the current study recorded the lowest values for total taxa richness (37-51) and EPT taxa richness (8-10). Lower values were recorded for several sites in the Upper Sauk River (Schmude 2010).

Conversely, the three sites furthest downstream from any cities or towns received evaluations of fair to very good. In fact, the site at Spring Hill Park had the lowest HBI value (4.37) for all of the sites sampled over the last three years (Schmude 2010). Furthermore, these three sites recorded the highest values for total taxa richness (54-60) and EPT taxa richness (14-19). The high taxa richness values were the highest for all of the sites sampled over the last three years (Schmude 2010). The EPT values were also high for the Sauk River, but the highest values (20-25) were recorded for the site at Highway 57 (Todd County) in the Upper Sauk River.

The higher values of taxa richness were generally attributed to the increased number of taxa of lentic (still water) macroinvertebrates compared to the sites sampled in the Upper Sauk River (Schmude 2010); the taxa mainly included waterboatmen (Corixidae). It is possible that increased numbers of individuals and taxa of waterboatmen in the middle portion of the Sauk River were due to the later sampling date (Oct. 13) compared to the study in the Upper Sauk River (Sept. 11, 14) (Schmude 2010). However, it is also likely that the increased size in the river contributed to the habitat preference as an overwintering site for these insects.

On the other hand, numbers of taxa of mayflies, caddisflies, beetles, chironomid midges, snails, and oligochaete worms were lower in the middle portion of the Sauk River compared to the Upper Sauk River study. However, the inflated numbers of taxa in these groups for the Upper Sauk River were due to multiple sampling events over the course of two years, compared to one sampling event for the current study.

LITERATURE CITED

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Table 1. Values for taxa richness, EPT (Ephemeroptera, Plecoptera, Trichoptera) richness, HBI (Hilsenhoff Biotic Index) value, and HBI assessment (Hilsenhoff 1987) for six sites that were sampled on October 13, 2010, along the middle portion of the Sauk River, Stearns County, MN.

	River's Edge	Melrose Park	County Road 65	County Road 31	Spring Hill Park	St. Martin Canoe Access
Taxa Richness	37	37	51	60	50	54
EPT Richness	8	9	10	19	17	14
HBI Value	8.24	6.35	6.74	5.22	4.37	6.30
Assessment	Poor	Fair	Fairly Poor	Good	Very Good	Fair

<u>Biotic Index Range</u>	<u>Water Quality Assessment</u>	<u>Degree of Organic Pollution</u>
0.00 – 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 – 10.00	Very Poor	Severe organic pollution