

A Preliminary Inventory of Benthic Macroinvertebrates of the Kinnickinnic River, Pierce and St. Croix Counties, Wisconsin

by

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Abstract

This project was designed to document the macroinvertebrate fauna of the Kinnickinnic River through systematic benthic collecting over the course of a calendar year. The inventory resulted in the collection of 15,341 specimens representing 51 families, 12 orders of insects and crustaceans, and 140 taxa presently identified to genus or species. The survey was designed to be qualitative but data obtained provide information on which species are most common. In addition to the development of a well-documented fauna the collected specimens serve as a reference collection for continuing analyses and will exist as a permanent archive with which comparisons can be made in future decades.

Introduction

The Kinnickinnic River of west-central Wisconsin is a rich natural resource valued for its inherent beauty as well as its role as "... the premier trout stream of west central Wisconsin." (Humphrey and Shogren 1995). Ongoing efforts are in place by government agencies, namely the Wisconsin Department of Natural Resources (WDNR) and St. Croix and Pierce County Land Conservation Departments (with Priority Watershed project status granted in 1995) and private individuals and groups, such as the Kinnickinnic River Land Trust (KRLT) and Trout Unlimited (TU), to preserve the quality of the environment of the watershed. Previous or ongoing projects designed to document stream status include streamflow monitoring (USGS), water chemistry (WDNR), stream temperature (WDNR, TU), fish surveys and habitat assessment (WDNR), and biotic indexing using macroinvertebrates (WDNR).

Previous records of Kinnickinnic River watershed arthropods exist as accounts made by the Wisconsin Department of Natural Resources, the BIO 333 Entomology class at the University of Wisconsin-River Falls, and the author.

Aquatic macroinvertebrate records for ten sites in the Kinnickinnic watershed are attributable to the WDNR. These (Table 1) represent eight collections from 1995, one from 1996, four from 1997, and one from 1998 (Schreiber *pers. comm.* 1997, 1998; Schreiber 1998). All 1995 sites were sampled on one of two days in October. Three 1997 samples were obtained on a day in May and one was made in late March. Additional single-site collections (CTH J and Parker Creek) are also on record for April 1996 and October 1998 (Schreiber *pers. comm.* 1998), respectively. These samples were obtained for the purpose of determining water quality, using the HBI (Hilsenhoff biotic index) (1982, 1987), and were not designed to be comprehensive summaries.

Since 1992, students in BIO 333, Entomology, in the Department of Biology, UW-RF, have been involved in regular fall sampling and family-level biotic indexing (Hilsenhoff 1988) on the Kinnickinnic River and its tributary, the South Fork, under the direction of the author. These collections normally yield a fauna of 15-17 families with the Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies)

Table 1. Summary of previous Wisconsin Department of Natural Resources biotic index collections within the Kinnickinnic River watershed. (WDNR FHES = 1996 WDNR Fish Habitat Evaluation Station)

Waterbody	Location description	Nearest WDNR FHES	Fall 1995	Spring 1996	Spring 1997	Fall 1998
Kinnickinnic	50 ft below bridge on CTH F	2	95-10-10			
Kinnickinnic	50 m below confluence with Rocky Branch	6	95-10-10			
Kinnickinnic	75 yds above confluence with Rocky Branch	6			97-05-21	
Kinnickinnic	former Cedar St. bridge site (along new retaining wall)	7			97-05-21	
Kinnickinnic	75 yds above bridge on Division St.	7	95-10-10			
Kinnickinnic	150 yds above STH 35-65 bridge, sampled off Quarry Rd.	8	95-10-10		97-05-21	
Kinnickinnic	50 yds below bridge on CTH J	13	95-10-10	96-04-10	97-03-27	
South Fork	50 ft above confluence with Kinnickinnic River	1	95-10-10			
South Fork	Approx 50 yds above bridge on STH 65	2	95-10-10			
Parker Creek	50 ft above bridge on Pleasant Avenue	2	95-10-10			98-10-27

well represented. However, because they necessarily occur during fall semester, they provide only a single season fauna at a limited number of locations.

Additionally, the proposer carried out a series of regular Kinnickinnic River arthropod collections from February through July, 1997, for the purpose of documenting the early- and mid-season faunas. Because these collections represent a wider seasonal base of insects, numerous additional species were noted. The application of longer-season collection and technical appraisal of these species suggested that many questions still existed regarding the fauna of this watershed. For example, conventional wisdom has it that there should be emergences of *Ephemerella subvaria* and *E. invaria* from the Kinnickinnic in April-May and May-June, respectively. However, larval documentation exists at present only for *Ephemerella needhami*, *E. inermis* (WDNR 1995, 1996, 1997; Garry unpublished data) and *E. catawba* (WDNR 1996, 1997).

Before this study no attempt had been made by any agency or institution to complete a comprehensive, season-long summary of the macroinvertebrate species present in the Kinnickinnic River.

Methods

Sample sites

Sample sites were selected to represent the river mainstem throughout its 23-mile length (Figure 1). All primary sites were within WDNR Fish Habitat Evaluation Stations established on the Kinnickinnic River in 1996. These stations had previously been surveyed for stream structure, including substrate characteristics, and these data were made available for this study by Marty Engel, Senior Fisheries Biologist, WDNR (*pers. comm.* 1997). Seventeen sites (Table 2) were sampled regularly in 1999 and three (indicated as B sites in Table 2) were sampled irregularly as secondary sites. Collection locations extended from Kinnickinnic River State Park (Site 1) to north of Interstate-94 (Sites 16 and 17). The diversity of sites is demonstrated in Figure 2.

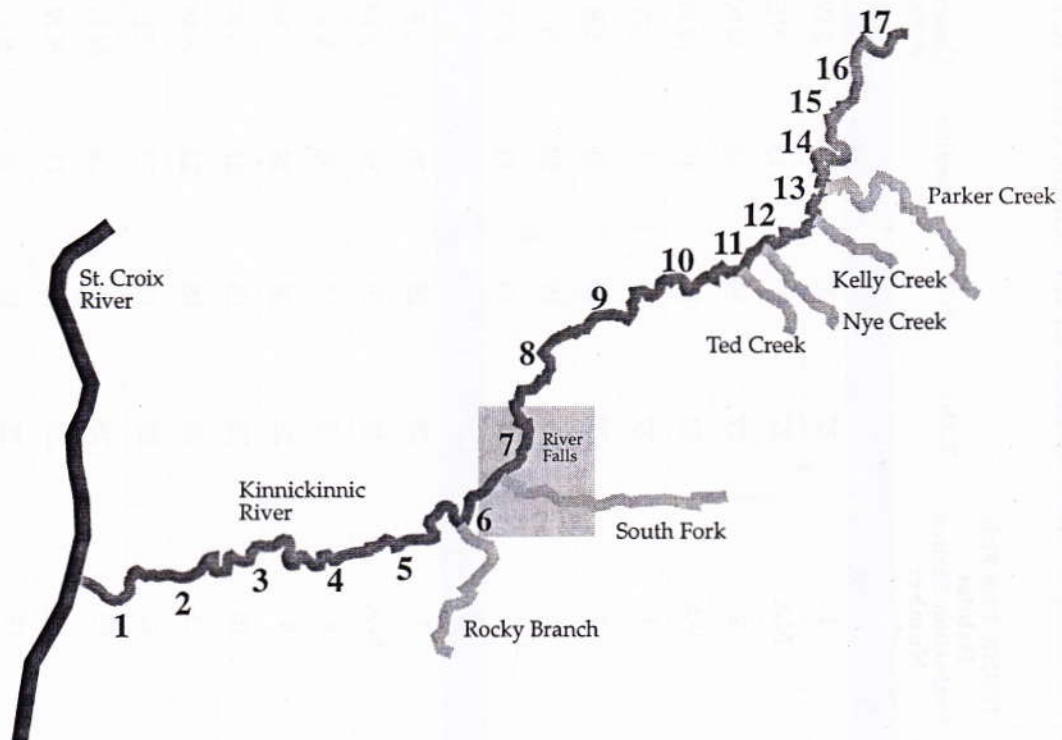


Figure 1. Map of Kinnickinnic River showing locations of 17 primary sample sites.

Table 2. Summary of sample sites utilized in the Kinnickinnic River benthic macroinvertebrate inventory, 1999.

UWRF macroinvertebrate collection site number	WDNR 1996 Fish Habitat Evaluation Station Number	T. (N)	R. (W)	Section	Quarter section	Location/access	Approximate river mile upstream from confluence with St. Croix R.
Pierce County							
1	1	27	20	13	SW	Kinnickinnic River State Park	0.5
1B	NA	27	20	13	NE	Kinnickinnic River State Park	-
2	2	27	19	18	NW	Upstream from CTH F	2.1
2B	NA	27	19	17	NW	No public road; accessed via Edgar property	-
3	3	27	19	8	SE	No public road; accessed via Chambers property	3.8
4	4	27	19	9	SE	No public road; accessed via Erickson property	5.4
5	5	27	19	10	SE	No public road; accessed via Peterson property	6.5
6	6	27	19	11	NE	Upstream from confluence with Rocky Branch	8.4
St. Croix County							
7	7	28	19	36	SE	Upstream from Division Street, River Falls	10.0
7B	NA	28	19	36	SW	Downstream from CTH MM, River Falls	-
8	8	28	18	30	SW	Upstream from STH 65	10.8
9	9	28	18	29	NW	Upstream from Quarry Road	12.8
10	10	28	18	21	SW	Upstream from Liberty Road	14.6
11	11	28	18	22	NW	Upstream from North River Road	16.0
12	12	28	18	15	SE	Upstream from CTH JJ	17.4
13	13	28	18	14	NW	Upstream from CTH J	18.0
14	14	28	18	11	SW	Upstream from Steeple Drive	18.9
15	15	28	18	2	SW	Upstream from CTH N	20.6
16	16	28	18	2	NE	Upstream from Interstate-94	21.4
17	17	29	18	36	SW	Upstream from 140th Street	22.4

Site 1 within Kinnickinnic River State Park, upstream from confluence of St. Croix River. T.27N., R.20W., Sec.13, SW. River mile 0.5. Substrates are primarily sands and gravels. (Photo: 33b-04, 9 Jun. 2001)



Site 5 accessed via L. Peterson property. T.27N., R.19W., Sec.10, SE. River mile 6.5. Substrates are primarily gravels and rubble/cobble. (Photo: 33b-09, 10 Jun. 2001)



Site 11 upstream from North River Road. T.28N., R.18W., Sec.22, NW. River mile 16.0. Substrates are primarily sands and silts. (Photo: 04-15, 15 Nov. 1998)



Site 17 upstream from 140th Street, north of Interstate-94. T.29N., R.18W., Sec.36, SW. River mile 22.4. Variable substrates with sand dominating and roughly equal proportions of gravel and silt. (Photo: 05-16, 27 Dec. 1998)



Figure 2. Representative collection site locations on the Kinnickinnic River.

Sampling sequence and frequency

Scouting of sample sites began in January of 1999; sampling began in February 1999 and continued through December of that year. Sample stations were visited at a typical frequency of one per week; occasionally two sites were visited in the same week. Because the purpose of the study was not to resample individual sites at a regular interval, 10-11 sites were selected to represent a sweep from downstream to upstream. When the uppermost sample was completed for a given sweep, sampling began again at the lower end. Over the course of the year this approach allowed five sweeps of the river from above the delta at the St. Croix River to north of Interstate-94 (Figure 3). Each sweep required approximately 10 weeks.

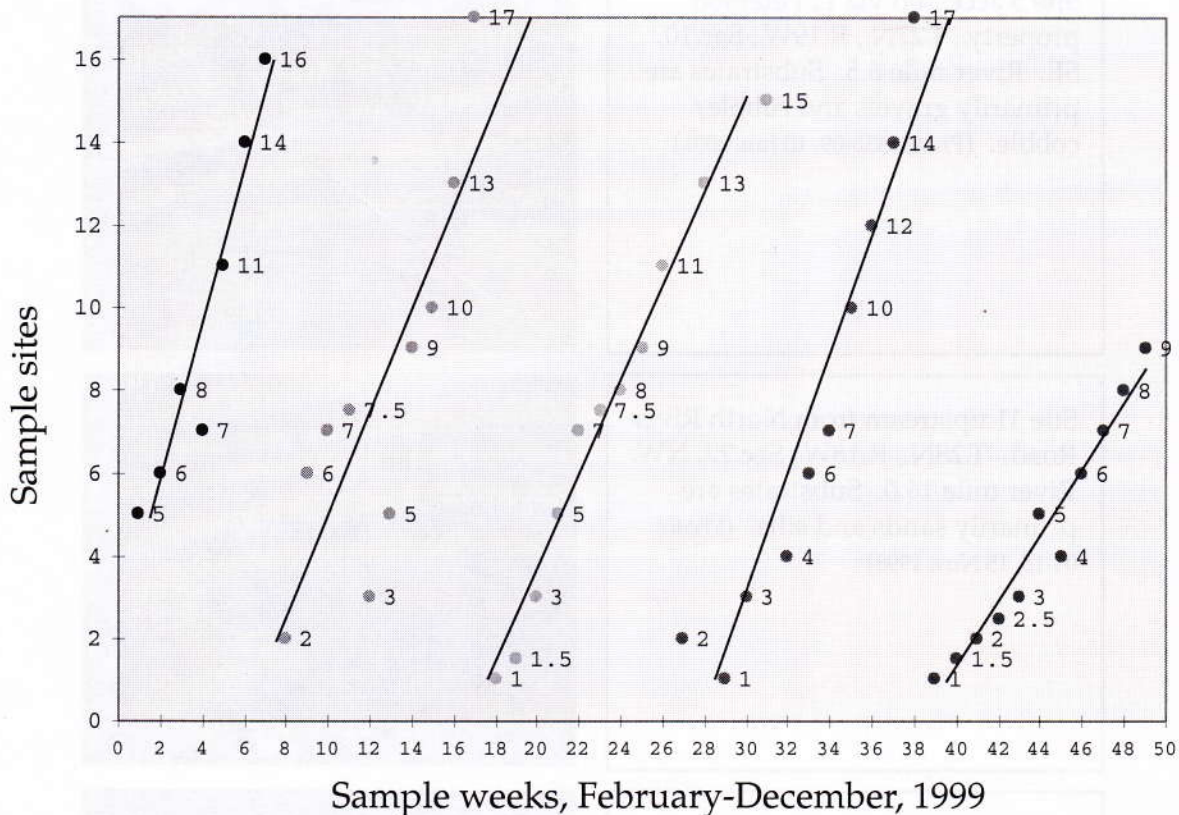


Figure 3. Graphical representation of five river sweeps for the 17 primary and three secondary sample sites, 1999. Secondary sites are plotted as a number followed by 0.5.

Sampling procedure

Within each of the WDNR Fish Habitat Evaluation Stations visited, a 50 to 100 m section was selected for diversity of benthic habitats. Ten samples were then taken to be represent this diversity. The majority of samples were obtained with the standard D-frame aquatic net (DuBois 1993, Hilsenhoff 1982, Hilsenhoff 1995, Hilsenhoff

et al. 1972). Some silt samples were obtained with the use of a 300 um sieve. Typical habitats sampled within the stations were based on substrates of various sediment sizes (silt, sand, gravel, cobble, boulder), submerged vegetation, underbank roots and vegetation, snags, and detritus in various forms. An attempt was made to keep the number of samples relative to the proportion of each habitat within the station. For example, a collection would have multiple silt samples if that substrate was common at that location.

It is important to note that the sampling protocol was modified during the year to make the collections more inclusive and representative. Initially, samples were based on three D-net subsamples per site; these were focused on riffle areas. As the year progressed, Hilsenhoff (*pers. comm.* 1999) suggested broadening the sampling procedure and provided specific ideas on multihabitat sampling. Therefore, a change in the procedure to a 10-subsample, multihabitat approach began with the sample taken at Site 9 on 9 June 1999 and this approach continued through the rest of the year. This resulted in 24 samples (February through May) which were focused on riffle regions and 25 samples (June through December) which were multihabitat.

Netted specimens and debris were removed from the stream and transferred to a standard cafeteria tray (36 cm x 46 cm) which had been filled with approximately one centimeter of water. The net was inverted over the tray and its contents emptied of specimens and debris. The net was inspected and specimens were physically picked from the netting. Specimens were individually removed from the tray with a curved forceps and placed in a 118-ml jar containing 70% EtOH. Samples were picked in this way until all were removed or 15 minutes had elapsed. All specimens representing a single site were combined to form a multihabitat, composite sample in the field. Each site collection required approximately 1.5-2.0 person-hours to complete. Composite samples were returned to the lab for sorting and identification. If the sample was not going to be sorted within a day or two of collection, the field alcohol was replaced with fresh 70% EtOH.

At the time of collection, records were made regarding habitats available and sampled. A prepared data form was used to record: 1) date and collection starting and ending times, 2) meteorological conditions, 3) air and water temperature (obtained with a Taylor Model 9841 digital thermometer), 4) stream status relative to normal, especially relative turbidity and water level, 5) records on photographic documentation made during collection, and 6) notes on the nature of the substrates from which the 10 subsamples were acquired.

Sorting and identification of specimens

Specimens were sorted at 10X magnification using a Bausch & Lomb StereoZoom 7 binocular microscope. Once separated, they were transferred to 8-ml (17 mm x 52 mm) glass vials (Research Products International Corp.) and filled half full with 70% EtOH (half filling allows observation of specimens without removal

from the vial). The following collection data accompanied each specimen vial: 1) state name, 2) river name, 3) WDNR waterbody number, 4) subwatershed name, 5) closest landmark (bridge crossing, etc.), 6) township, range, section, quarter section, 7) WDNR Fish Habitat Evaluation Station number, 8) UTM zone and coordinates (based on datum WGS 84), 9) collection number, 10) collector's name, and 11) date.

Identification of specimens to family and genus was based on two primary keys, Hilsenhoff (1995) and Merritt and Cummins (1996). Keying to species utilized sources suggested in Hilsenhoff (1995). Problematic specimens were referred to group-specific authorities for identification or confirmation, as required. Colleagues who assisted with identifications or provided helpful confirmations are listed in Table 3.

Table 3. Individuals who assisted with macroinvertebrate identification and confirmation.	
Taxonomic group	Resource person(s)
EPHEMEROPTERA, Ephemerellidae	Dr. William Hilsenhoff (University of Wisconsin-Madison, Emeritus) Drs. R. Pat McCafferty and W. Pat Randolph (Purdue University)
PLECOPTERA, Perlodidae	Dr. Stan Szczytko (University of Wisconsin-Stevens Point)
TRICHOPTERA, Hydropsychidae	Dr. Guenter Schuster (University of Kansas) and Dr. David Etnier (University of Tennessee) Dr. Kurt Schmude (Great Lakes Lab, University of Wisconsin-Superior) Dr. Ralph Holzenthal (University of Minnesota-St. Paul)
DIPTERA, Chironomidae	Dr. Leonard Ferrington, Jr. (University of Minnesota-St. Paul)
DIPTERA, Simuliidae	Dr. Peter Adler (Clemson University)
ISOPODA, Asellidae	Dr. Doug Smith (University of Massachusetts)
DECAPODA, Cambaridae	Dr. Raymond Bouchard (Philadelphia Academy of Sciences)

Results

Through calendar year 1999, 49 visits were made to designated sampling sites along the length of the mainstem of the Kinnickinnic River. These represent 24 riffle-only and 25 multihabitat, composite samples totaling 329 D-net and sieve samples. These collections yielded a total of 15,341 specimens with an average of 313 specimens collected per site visit. With the exception of one site visit near the confluence with the St. Croix River which lacked full wadeability, the range of specimens per visit was 131 (Site 11B; 21 February 1999) to 572 (Site 10; 10 August 1999).

While the study focused on benthic insects, aquatic crustaceans (Crustacea) and mites (Arachnida) were also collected. The course of collections yielded 12 orders of insects and crustaceans, 51 families, and 140 taxa identified to genus and/or species.

A taxonomic summary of the macroinvertebrates collected during this study is presented in Table 4. Figure 3 shows example macroinvertebrates which are common in the Kinnickinnic. Two additional summaries included are Table 5 in which species are arranged by location of collection and Table 6 where they are arranged by date of collection.

Chironomidae (midge) identifications were made by Dr. Leonard Ferrington, Jr., University of Minnesota, St. Paul campus who kindly brought his extensive expertise to this fauna. Dr. Ferrington individually examined the entire 1999 chironomid collection of 2688 larvae, pupae, and pupal skins.

Simuliid specimens collected into ethanol are not identifiable beyond the species-complex level (Adler *pers. comm.* 2001). At the present time (calendar year 2002) members of the family Simuliidae are being recollected (survey detailed below) using a storage medium (3 parts ethanol + 1 part acetic acid) which will allow species determination. A selected sample of black fly larvae examined by Dr. Peter Adler of the Department of Entomology, Clemson University, determined the following three species complexes in the Kinnickinnic system:

Simulium tuberosum complex
Simulium venustum complex
Simulium vittatum complex

Discussion and Conclusions

The two primary objectives of this project were: 1) to inventory the aquatic insects of the Kinnickinnic River and its tributaries in Pierce and St. Croix Counties,

Table 4. Summary of benthic macroinvertebrate taxa collected from the Kinnickinnic River in 1999.

Order	Family	Genus/species
EPHEMEROPTERA		
	Ephemerellidae	<i>Ephemerella inermis</i>
		<i>Ephemerella invaria</i>
		<i>Ephemerella needhami</i>
		<i>Timpanoga simplex</i>
	Ephemeridae	<i>Hexagenia</i> sp.
	Leptophlebiidae	<i>Leptophlebia</i> sp.
	Leptohyphidae (=Tricorythidae)	<i>Tricorythodes atratus</i>
	Heptageniidae	<i>Stenacron interpunctatum</i>
		<i>Stenonema mediopunctatum</i>
		<i>Stenonema vicarium</i>
		<i>Stenonema</i> sp.
	Isonychiidae	<i>Isonychia</i> sp.
	Baetidae	<i>Acentrella</i> sp.
		<i>Baetis brunneicolor</i>
		<i>Baetis flavistriga</i>
		<i>Baetis tricaudatus</i>
		<i>Plauditis punctiventris</i>
ODONATA		
	Calopterygidae	<i>Calopteryx</i> sp.
	Coenagrionidae	<i>Enallagma</i> sp.
	Aeshnidae	<i>Aeshna</i> sp.
PLECOPTERA		
	Taeniopterygidae	<i>Taeniopteryx nivalis</i>
		<i>Taeniopteryx</i> sp.
	Perlidae	<i>Paragnetina media</i>
		<i>Perlesta decipiens</i>
	Perlodidae	<i>Isoperla bilineata</i>
		<i>Isoperla dicala</i>
		<i>Isoperla slossonae</i>
		<i>Isoperla transmarina</i>

		<i>Isoperla</i> sp.
	Pteronarcyidae	<i>Pteronarcys pictetii</i>
		<i>Pteronarcys</i> sp.
TRICHOPTERA		
	Hydropsychidae	<i>Ceratopsyche alhedra</i>
		<i>Ceratopsyche alternans</i>
		<i>Ceratopsyche slossonae</i>
		<i>Ceratopsyche</i> sp.
	Philopotamidae	<i>Chimarra aterrima</i>
	Psychomyiidae	<i>Psychomyia flavida</i>
	Glossosomatidae	<i>Glossosoma</i> sp.
		<i>Protoptila</i> sp.
	Hydroptilidae	<i>Hydroptila</i> sp.
		<i>Ochrotrichia</i> sp.
	Brachycentridae	<i>Brachycentrus occidentalis</i>
	Lepidostomatidae	<i>Lepidostoma</i> sp.
	Leptoceridae	<i>Nectopsyche</i> sp.
	Limnephilidae	<i>Anabolia consocia</i>
		<i>Frenesia missa</i>
		<i>Hesperophylax designatus</i>
		<i>Limnephilus rhombicus</i>
		<i>Limnephilus</i> sp.
		<i>Platycentropus</i> sp.
		<i>Pycnopsyche</i> sp.
	Uenoidae	<i>Neophylax</i> sp.
MEGALOPTERA		
	Sialidae	<i>Sialis</i> sp.
HETEROPTERA		
	Belostomatidae	<i>Belostoma flumineum</i>
	Corixidae	<i>Hesperocorixa</i> sp.
		<i>Sigara</i> sp.
	Nepidae	<i>Ranatra</i> sp.
	Notonectidae	<i>Notonecta</i> sp.
	Pleidae	<i>Neoplea striola</i>
	Gerridae	<i>Aquarius</i> sp.

COLEOPTERA		
	Dytiscidae	<i>Agabus</i> sp.
		<i>Hydroporus?</i> sp.
		<i>Ilybius</i> sp.
		<i>Laccophilus</i> sp.
		<i>Liodessus</i> sp.
		<i>Neoporus</i> sp.
	Gyrinidae	<i>Dineutus</i> sp.
		<i>Gyrinus</i> sp.
	Haliplidae	<i>Haliphus immaculicollis</i>
		<i>Pelodytes edentulus</i>
		<i>Pelodytes</i> sp.
	Dryopidae	<i>Helichus striatus</i>
	Elmidae	<i>Optioservus fastiditus</i>
		<i>Optioservus trivittatus</i>
		<i>Stenelmis grossa?</i>
	Hydrophilidae	<i>Helophorus</i> sp.
		<i>Hydrobius</i> sp.
		<i>Sperchopis tessellata</i>
		<i>Tropisternus</i> sp.
DIPTERA		
	Ceratopogonidae	<i>Probezzia</i> sp.
	Chironomidae	
	Orthoclaadiinae	<i>Cardiocladius albiplumis</i>
		<i>Cardiocladius</i> sp.
		<i>Chaetocladius</i> sp.
		<i>Corynoneura</i> sp.
		<i>Cricotopus</i> sp.
		<i>Cricotopus trifascia</i>
		<i>Eukiefferiella</i> sp.
		<i>Heterotrissocladius</i> sp.
		<i>Orthocladus (Euortho.)</i> sp.
		<i>Orthocladus (Ortho.)</i> sp.
		<i>Orthocladus/Cricotopus</i> gp. 1
		<i>Orthocladus/Cricotopus</i> gp. 2

		<i>Parachaetocladius</i> sp.
		<i>Parakiefferiella</i> sp.
		<i>Parametriocnemus</i> sp.
		<i>Thienemanniella</i> sp.
		<i>Tvetenia</i> sp.
	Chironominae	<i>Chironomus</i> sp.
		<i>Cryptochironomus</i> sp.
		<i>Dicrotendipes</i> sp.
		<i>Microtendipes</i> sp.
		<i>Parachironomus</i> sp.
		<i>Paracladopelma</i> sp.
		<i>Paratendipes</i> sp.
		<i>Paralauterborniella</i> sp.
		<i>Phaenopsectra</i> sp.
		Genus nr. <i>Phaenopsectra</i>
		<i>Polypedilum</i> sp. 1
		<i>Polypedilum</i> sp. 2
		<i>Saetheria</i> sp.
		<i>Stictochironomus</i> sp.
		<i>Cladotanytarsus</i> sp.
		<i>Micropsectra</i> sp.
		<i>Paratanytarsus</i> sp.
		<i>Rheotanytarsus</i> sp.
		<i>Tanytarsus</i> sp.
	Diamesinae	<i>Diamesa</i> sp.
		<i>Pagastia</i> sp.
	Prodiamesinae	<i>Odontomesa</i> sp.
		<i>Prodiamesa</i> sp.
	Tanypodinae	<i>Conchapelopia</i> / <i>Thienemannimyia</i> gr.
		<i>Macropelopia</i> sp.
	Culicidae	<i>Anopheles</i> sp.
	Dixidae	<i>Dixa modesta</i>
	Ptychopteridae	<i>Bittacomorpha clavipes</i>
		<i>Ptychoptera</i> sp.
	Simuliidae	<i>Simulium tuberosum</i> complex

		<i>Simulium venustum</i> complex
		<i>Simulium vittatum</i> complex
	Tipulidae	<i>Antocha</i> sp.
		<i>Dicranota</i> sp.
		<i>Hexatoma</i> sp.
		<i>Limnophila</i> sp.
		<i>Pilaria</i> sp.
		<i>Tipula</i> sp.
	Athericidae	<i>Atherix variegata</i>
	Empididae	<i>Hemerodromia</i> sp.
	Muscidae	<i>Limnophora</i> sp.
	Tabanidae	<i>Chrysops</i> sp.
AMPHIPODA		
	Gammaridae	<i>Gammarus pseudolimnaeus</i>
ISOPODA		
	Asellidae	<i>Caecidotea racovitzai</i>
DECAPODA		
	Cambaridae	<i>Orconectes rusticus</i>
		<i>Orconectes virilis</i>
ACARI		
		Unidentified

a



b



c



d



Figure 3. Example common benthic macroinvertebrates of the Kinnickinnic River
a. *Ephemerella inermis* (Ephemeroptera:Ephemerellidae) (Photo 42-31)
b. *Isoperla transmarina* (Plecoptera:Perlodidae) (Photo 40-06)
c. *Brachycentrus occidentalis* (Trichoptera:Brachycentridae) (Photo 39-33)
d. *Gammarus pseudolimnaeus* (Amphipoda:Gammaridae) (Photo 43-25)



Figure 1. Examples of insects that are common in the environment. (a) Housefly (Musca domestica), (b) Mosquito (Culiseta inornata), (c) Fruit fly (Drosophila melanogaster), and (d) Tsetse fly (Glossineta morsitans).

Table 5. Summary of benthic macroinvertebrates collected from the Kinnickinnic River in 1999, arranged by primary site collection (● = primary site collection; ○ = secondary site collection where primary site collection did not occur).

Order/family	Genus/species	Collection Site Number																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
EPHEMEROPTERA																		
Ephemerellidae	<i>Ephemerella needhami</i>	○		●		●		●	●	●	●			●				
	<i>Ephemerella inermis</i>	●	●	●	●	●	●	●	●	●	●	○		●	●	●	●	●
	<i>Ephemerella invaria</i>	○				●												
	<i>Timpanoga (Dannella) simplex</i>									●				●	●	●		
Ephemeridae	<i>Hexagenia</i> sp.	●																
Leptophlebiidae	<i>Leptophlebia</i> sp.				●	●												
Leptohyphidae (=Tricorythidae)	<i>Tricorythodes atratus</i>	●	●	●	●	●	●	●			●				●			
Heptageniidae	<i>Stenonema mediopunctatum</i>	○	●	●	●	●	●											
	<i>Stenonema vicarium</i>	●	●	●	●	●	●	●	●	●								
	<i>Stenonema</i> sp.	●	●		●													
	<i>Stenacron interpunctatum</i>		●	●	●		●											
Isonychiidae	<i>Isonychia</i> sp.	●	●		●													
Baetidae	<i>Acentrella</i> sp.	○					●	●	●									
	<i>Baetis brunneicolor</i>	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	<i>Baetis flavistriga</i>	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●
	<i>Baetis tricaudatus</i>	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	<i>Plauditis punctiventris</i>	●	●	●	●	●	●	●	●	●	●	●		●				
ODONATA																		
Calopterygidae	<i>Calopteryx</i> sp.			●														
Coenagrionidae	<i>Enallagma</i> sp.		○															
Aeshnidae	<i>Aeshna</i> sp.																	●
PLECOPTERA																		
Taeniopterygidae	<i>Taeniopteryx</i> sp.					○	●	●	●	●		○			●		●	
Perlidae	<i>Paragnetina media</i>	○	●	●	●	●	○	●	●									
	<i>Perlesta decipiens</i>	○	●	●	●		●											

Table 5. Continued.

Order/family	Genus/species	Collection Site Number																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Perlodidae	<i>Isoperla bilineata</i>	●		●														
	<i>Isoperla transmarina</i>	●	●	●	●	●	○	●		●								
	<i>Isoperla slossonae</i>	●	●	●	●	●	●	●	●	●	●							
	<i>Isoperla dicala</i>			●		●			●	●								
	<i>Isoperla sp.</i>			●		●		●										
Pteronarcyidae	<i>Pteronarcys sp.</i>	●	●	●		●			●	●	●							
TRICHOPTERA																		
Hydropsychidae	<i>Ceratopsyche alhedra</i>	●	●	●	●	●	●	●	●	●								
	<i>Ceratopsyche alternans</i>	●	●	●	●	●	●		●	●								
	<i>Ceratopsyche slossonae</i>	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●
Philopotamidae	<i>Chimarra aterrima</i>							●		●								
Psychomyiidae	<i>Psychomyia flavida</i>							●										
Glossosomatidae	<i>Glossosoma sp.</i>	●	●	●				●		●								
	<i>Protoptila sp.</i>	●	●	●	●	●	●	●		●								
Hydroptilidae	<i>Ochrotrichia sp.</i>	○		●	●													
	<i>Hydroptila sp.</i>	●	●		●		●											
Brachycentridae	<i>Brachycentrus occidentalis</i>	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Lepidostomatidae	<i>Lepidostoma sp.</i>		○					●	●	●								
Leptoceridae	<i>Nectopsyche sp.</i>	●																
Limnephilidae	<i>Anabolia consocia</i>																●	
	<i>Frenesia missa</i>																●	
	<i>Hesperophylax designatus</i>																●	
	<i>Limnephilus rhombicus</i>																	●
	<i>Limnephilus sp.</i>				●													●
	<i>Platycentropus sp.</i>											●						
	<i>Pycnopsyche sp.</i>			●				●			●							
Uenoidae	<i>Neophylax sp.</i>			●														
MEGALOPTERA																		
Sialidae	<i>Sialis sp.</i>		●			●		●	●		●		●		●		●	●

Table 5. Continued.

Order/family	Genus/species	Collection Site Number																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
HETEROPTERA																		
Belostomatidae	<i>Belostoma flumineum</i>	●	●	●			●	●								●		
Corixidae	<i>Hesperocorixa</i> sp.			●							●							
	<i>Sigara</i> sp.			●														
	Unidentified	●	●	●	●	●	●	●	●	●					●	●		●
Nepidae	<i>Ranatra</i> sp.		○					●							●			
Notonectidae	<i>Notonecta</i> sp.			●														
Pleidae	<i>Neoplea striola</i>										●							
Gerridae	<i>Aquarius</i> sp.		●						●	●								
	Unidentified nymphs/adults				●			●	●			●						●
COLEOPTERA																		
Dytiscidae	Unidentified	●	●	●	●	●	●		●							●		●
Gyrinidae	<i>Gyrinus</i> sp.			●					●									
	<i>Dineutus</i> sp.	●																
Halipilidae	<i>Pelodytes edentulus</i>																	●
	<i>Pelodytes</i> sp.			●				●										
	<i>Halipus immaculicollis</i>																	●
Dryopidae	<i>Helichus striatus</i>			●	●			●	●	●		●						
Elmidae	<i>Optioservus fastiditus</i>	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●
	<i>Optioservus trivittatus</i>								●	●								
	<i>Stenelmis</i> sp.									●								
Hydrophilidae	<i>Helophorus</i> sp.		●									●				●		●
	<i>Sperchopis tesselata</i>			●							●							
	<i>Tropisternus</i> sp.		○	●	●		●											
	Unidentified							●								●		
DIPTERA																		
Ceratopogonidae	<i>Probezzia</i> sp.	○				○										●		
	Unidentified																	●
Chironomidae	<i>Cardiocladius albiplumis</i>							●										
	<i>Cardiocladius</i> sp.	○			●													

Table 5. Continued.

Order/family	Genus/species	Collection Site Number																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	<i>Chaetocladius</i> sp.							●									●	
	<i>Corynoneura</i> sp.						●											
	<i>Cricotopus</i> sp.	○	●	●	●		●						●					
	<i>Cricotopus trifascia</i>	●	●	●				○	●		●		●	●				
	<i>Eukiefferiella</i> sp.	○	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●
	<i>Heterotrissocladius</i> sp.							●	●			●	●		●	●		●
	<i>Orthocladius (Euortho.)</i> sp.	○	●	●	●	●	●	●		●								
	<i>Orthocladius (Ortho.)</i> sp.												●					
	<i>Orthocladius/Cricotopus</i> gp. 1		●				●					○			●		●	
	<i>Orthocladius/Cricotopus</i> gp. 2	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	<i>Parachaetocladius</i> sp.				●					●				●				
	<i>Parakiefferiella</i> sp.	○	○					●					●	●				
	<i>Parametricnemus</i> sp.		●	●	●	●	●	●	●									●
	<i>Thienemanniella</i> sp.						●											
	<i>Tvetenia</i> sp.	●	●	●	●	●	●	●	●	○	●							
	<i>Chironomus</i> sp.	●				●	●	●										
	<i>Cryptochironomus</i> sp.	○	●	●	●	●	●	●	●		●	●	●					●
	<i>Dicrotendipes</i> sp.		●	●	●		●	●	●		●				●	●		
	<i>Microtendipes</i> sp.	○	●	●	●			●	●	●	●	●	●					
	<i>Parachironomus</i> sp.				●													
	<i>Paracladopelma</i> sp.	○									●	●		●				●
	<i>Paratendipes</i> sp.																	●
	<i>Paralauterborniella</i> sp.									●				●				●
	<i>Phaenopsectra</i> sp.	●	○				●			●								
	Genus nr. <i>Phaenopsectra</i>																●	
	<i>Polypedilum</i> sp. 1	●	●	●	●		●	●	●		●			●	●			
	<i>Polypedilum</i> sp. 2						●						●					
	<i>Saetheria</i> sp.	○																
	<i>Stictochironomus</i> sp.	●	●	●	●	●	●	●			●	●		●	●	●		●
	<i>Cladotanytarsus</i> sp.	○	●	●				●										

Table 5. Continued.

Order/family	Genus/species	Collection Site Number																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	<i>Micropsectra</i> sp.	○					●	●	●			●	●	●	●	●	●	●
	<i>Paratanytarsus</i> sp.												●	●				
	<i>Rheotanytarsus</i> sp.	●	●	●	●	●	●	●	●		●							
	<i>Tanytarsus</i> sp.		●				●	●			●					●		●
	<i>Diamesa</i> sp.	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	
	<i>Pagastia</i> sp.	○	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
	<i>Odontomesa</i> sp.	○	●	●			●	●	●	●	●	●	●	●	●	●	●	●
	<i>Prodiamesa</i> sp.	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●
	<i>Conchapelopia/Thienemannimy</i> a gr.	●		●	●		●		●						●	●		
	<i>Macropelopia</i> sp.				●	●			●		●		●		●			●
Culicidae	<i>Anopheles</i> sp.				●													
Dixidae	<i>Dixa modesta</i>							●		●			●			●		
Ptychopteridae	<i>Ptychoptera</i> sp.																	●
	<i>Bittacomorpha clavipes</i>																	●
Simuliidae	Unidentified	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Tabanidae	<i>Chrysops</i> sp.				●					●	●		●	●		●		●
Tipulidae	<i>Antocha</i> sp.	○	●	●		○	●	●	●	●	●	●						
	<i>Dicranota</i> sp.		●	●	●		●			●		○			●	●	●	●
	<i>Hexatoma</i> sp.			●		●			●				●					
	<i>Tipula</i> sp.	●	●	●	●	●	●	●	●	●			●					●
	<i>Pilaria</i> sp.							●	●			●						
	<i>Limnophila</i> sp.															●		
Athericidae	<i>Atherix variegata</i>	●	●	●	●	●												
Empididae	<i>Hemerodromia</i> sp.													●				
	Unidentified	○	●	●	●													
Muscidae	<i>Limnophora</i> sp.	●															●	●
AMPHIPODA																		
Gammaridae	<i>Gammarus pseudolimnaeus</i>	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

Table 5. Continued.

Order/family	Genus/species	Collection Site Number																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
ISOPODA																		
Asellidae	<i>Caecidotea racovitzai</i>				•	•	•	•	•					•	•	•		•
DECAPODA																		
Cambaridae	<i>Orconectes</i> sp.	○	•						•									
ACARI																		
	Unidentified	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Table 6. Summary of benthic macroinvertebrates collected from the Kinnickinnic River in 1999, arranged by month of collection (● = primary site collection; ○ = secondary site collection where primary site collection did not occur).

Order/family	Genus/species	Month of Collection											
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
EPHEMEROPTERA													
Ephemerellidae	<i>Ephemerella needhami</i>		●	●	●	●							
	<i>Ephemerella inermis</i>	●	●	●	●	●	●			●	●	●	
	<i>Ephemerella invaria</i>				●								
	<i>Timpanoga (Dannella) simplex</i>					●	●	●					
Ephemeridae	<i>Hexagenia</i> sp.								●				
Leptophlebiidae	<i>Leptophlebia</i> sp.										●		
Leptohyphidae (=Tricorythidae)	<i>Tricorythodes atratus</i>					●	●	●	●	●	●		
Heptageniidae	<i>Stenonema mediopunctatum</i>		●		●		●		●	●	●		
	<i>Stenonema vicarium</i>	●	●		●	●			●	●	●	●	
	<i>Stenonema</i> sp.						●		●				
	<i>Stenacron interpunctatum</i>						●		●	●	●		
Isonychiidae	<i>Isonychia</i> sp.						●		●				
Baetidae	<i>Acentrella</i> sp.				●	●	○					●	
	<i>Baetis brunneicolor</i>		●	●	●	●	●	●	●	●	●	●	
	<i>Baetis flavistriga</i>				○	●	●	●	●	●	●	●	
	<i>Baetis tricaudatus</i>	●	●	●	●	●	●	●	●	○	●	●	
	<i>Plauditis punctiventris</i>					●	●	●	●	●	●		
ODONATA													
Calopterygidae	<i>Calopteryx</i> sp.										●		
Coenagrionidae	<i>Enallagma</i> sp.									○			
Aeshnidae	<i>Aeshna</i> sp.							●					
PLECOPTERA													
Taeniopterygidae	<i>Taeniopteryx</i> sp.	●	●									●	
Perlidae	<i>Paragnetina media</i>	●	●		●	●	●	●	●	●	●	●	
	<i>Perlesta decipiens</i>					●	●						

Table 6. Continued.

Order/family	Genus/species	Month of Collection											
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Perlodidae	<i>Isoperla bilineata</i>		•	•	•								
	<i>Isoperla transmarina</i>	•	•	•	•					•	•	•	
	<i>Isoperla slossonae</i>	•	•	•					•	•	•	•	
	<i>Isoperla dicala</i>		•		•	•							
	<i>Isoperla</i> sp.		•									•	
Pteronarcyidae	<i>Pteronarcys</i> sp.	○	•			•	•	•	•	•	•	•	
TRICHOPTERA													
Hydropsychidae	<i>Ceratopsyche alhedra</i>	•	•	•	•	•	•	•	•	○	•	•	
	<i>Ceratopsyche alternans</i>	•	•	•	•	•	•		•	○	•	•	
	<i>Ceratopsyche slossonae</i>	•	•	•	•	•	•	•	•	•	•	•	
Philopotamidae	<i>Chimarra aterrima</i>	•	○										•
Psychomyiidae	<i>Psychomyia flavida</i>		•										
Glossosomatidae	<i>Glossosoma</i> sp.		•	•		•	•	•	•				•
	<i>Protoptila</i> sp.		•		•	•	•	•	•	○			
Hydroptilidae	<i>Ochrotrichia</i> sp.					○	•						
	<i>Hydroptila</i> sp.						•		•				
Brachycentridae	<i>Brachycentrus occidentalis</i>	•	•		•	•	•	•	•	•	•	•	•
Lepidostomatidae	<i>Lepidostoma</i> sp.				•	•				○	•		
Leptoceridae	<i>Nectopsyche</i> sp.					○			•				
Limnephilidae	<i>Anabolia consocia</i>						•						
	<i>Frenesia missa</i>							•					
	<i>Hesperophylax designatus</i>						•						
	<i>Limnephilus rhombicus</i>							•					
	<i>Limnephilus</i> sp.							•				•	
	<i>Platycentropus</i> sp.							•					
	<i>Pycnopsyche</i> sp.				•			•		•	•		
Uenoidae	<i>Neophylax</i> sp.		•										
MEGALOPTERA													
Sialidae	<i>Sialis</i> sp.	•		•		•	•	•	•			•	

Table 6. Continued.

Order/family	Genus/species	Month of Collection											
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HETEROPTERA													
Belostomatidae	<i>Belostoma flumineum</i>						•	•	•	•	•		
Corixidae	<i>Hesperocorixa</i> sp.						•	•		•			
	<i>Sigara</i> sp.									•			
	Unidentified			•		•	•	•	•	○	•	•	
Nepidae	<i>Ranatra</i> sp.							•		○	•		
Notonectidae	<i>Notonecta</i> sp.						•						
Pleidae	<i>Neoplea striola</i>							•					
Gerridae	<i>Aquarius</i> sp.					•					•		
	Unidentified nymphs/adults					•	•	•					
COLEOPTERA													
Dytiscidae	Unidentified			•			•	•	•	•	•	•	
Gyrinidae	<i>Gyrinus</i> sp.									•	•		
	<i>Dineutus</i> sp.								•				
Haliplidae	<i>Pelodytes edentulus</i>							•					
	<i>Pelodytes</i> sp.						•			•			
	<i>Halipus immaculicollis</i>							•					
Dryopidae	<i>Helichus striatus</i>		○			•	•	•		○	•		
Elmidae	<i>Optioservus fastiditus</i>	○	•	•	•	•	•	•	•	•	•	•	
	<i>Optioservus trivittatus</i>					•							
	<i>Stenelmis</i> sp.					•							
Hydrophilidae	<i>Helophorus</i> sp.					•	•	•					
	<i>Sperchopis tesselata</i>						•	•					
	<i>Tropisternus</i> sp.						•			•	•		
	Unidentified						•	•					
DIPTERA													
Ceratopogonidae	<i>Probezzia</i> sp.	○					•		•				
	Unidentified			•									
Chironomidae	<i>Cardiocladius albiplumis</i>				○			•					
	<i>Cardiocladius</i> sp.					○	•		○				

Table 6. Continued.

Order/family	Genus/species	Month of Collection											
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	<i>Chaetocladius</i> sp.		●					●					
	<i>Corynoneura</i> sp.						●						
	<i>Cricotopus</i> sp.						●	●	●	●	●		
	<i>Cricotopus trifascia</i>			●	○	●	●	●	●	○			
	<i>Eukiefferiella</i> sp.	●	●	●	●	●	●	●	●		●		
	<i>Heterotrissocladius</i> sp.					●	●	●			●	●	
	<i>Orthocladius</i> (Euortho.) sp.		●	●	●						●		
	<i>Orthocladius</i> (Ortho.) sp.							●					
	<i>Orthocladius/Cricotopus</i> gp. 1	●	●										
	<i>Orthocladius/Cricotopus</i> gp. 2	●	●	●	○	●	●	●	●	●	●	●	●
	<i>Parachaetocladius</i> sp.			●								●	●
	<i>Parakiefferiella</i> sp.			●	●	●		●	○	○			
	<i>Parametrioctenus</i> sp.	●	○				●	●	●			●	
	<i>Thienemanniella</i> sp.						●						
	<i>Tvetenia</i> sp.	●	●	●	●	●	●	●	●	○	●	●	●
	<i>Chironomus</i> sp.		●					●	●			●	
	<i>Cryptochironomus</i> sp.					●	●	●				●	●
	<i>Dicrotendipes</i> sp.		●	●			●	●	●	●	●	●	●
	<i>Microtendipes</i> sp.			●	●	●	●	●	●	●	●	●	●
	<i>Parachironomus</i> sp.						●						
	<i>Paracladopelma</i> sp.			●		●		●	○				
	<i>Paratendipes</i> sp.			●				●					
	<i>Paralauterborniella</i> sp.			●		●							
	<i>Phaenopsectra</i> sp.			●		●	●			○			
	Genus nr. <i>Phaenopsectra</i>						●						
	<i>Polypedilum</i> sp. 1			●		●	●	●	●			●	
	<i>Polypedilum</i> sp. 2						●	●					
	<i>Saetheria</i> sp.					○							
	<i>Stictochironomus</i> sp.					●	●	●	●			●	
	<i>Cladotanytarsus</i> sp.				●	●	●						

Table 6. Continued.

Order/family	Genus/species	Month of Collection											
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	<i>Micropsectra</i> sp.		●			●	●	●	○		●	●	
	<i>Paratanytarsus</i> sp.			●				●					
	<i>Rheotanytarsus</i> sp.		●		●	●	●	●	●	○	●		
	<i>Tanytarsus</i> sp.			●		●	●	●			●		
	<i>Diamesa</i> sp.	●	●	●	●	●	●	●	●	●	●	●	
	<i>Pagastia</i> sp.	●	●	●	●	●	●	●	○		●	●	
	<i>Odontomesa</i> sp.				●	●	●	●	●	○			
	<i>Prodiamesa</i> sp.				●	●	●	●	●		●	●	
	<i>Conchapelopia/</i> <i>Thienemannimyia</i> gr.					●	●	●	●		●		
	<i>Macropelopia</i> sp.							●			●	●	
Culicidae	<i>Anopheles</i> sp.						●						
Dixidae	<i>Dixa modesta</i>				●	●	●	●					
Ptychopteridae	<i>Ptychoptera</i> sp.							●					
	<i>Bittacomorpha clavipes</i>							●					
Simuliidae	Unidentified	●	●	●	●	●	●	●	●	●	●	●	
Tabanidae	<i>Chrysops</i> sp.			●		●	●	●			●		
Tipulidae	<i>Antocha</i> sp.	●	●	●	●	●	●	●		●	●	●	
	<i>Dicranota</i> sp.	○	●	●		●	●	●			●	●	
	<i>Hexatoma</i> sp.			●		●				●	●		
	<i>Tipula</i> sp.	●	●		●	●		●	●	●	●	●	
	<i>Pilaria</i> sp.					●					●	●	
	<i>Limnophila</i> sp.						●						
Athericidae	<i>Atherix variegata</i>		●				●		●		●		
Empididae	<i>Hemerodromia</i> sp.					●							
	Unidentified				●	●	●						
Muscidae	<i>Limnophora</i> sp.						●	●	●				
AMPHIPODA													
Gammaridae	<i>Gammarus pseudolimnaeus</i>	●	●	●	●	●	●	●	●	○	●	●	

Table 6. Continued.

Order/family	Genus/species	Month of Collection											
		Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
ISOPODA													
Asellidae	<i>Caecidotea racovitzai</i>	•	•	•		•	•	•			•	•	
DECAPODA													
Cambaridae	<i>Orconectes</i> sp.					•			•			•	
ACARI													
	Unidentified		•	•		•	•	•	•	•	•	•	

Wisconsin emphasizing a watershed-wide approach and 2) to determine the relative abundances and distributions of sampled species within the watershed.

Macroinvertebrate diversity

The objective of obtaining an initial qualitative inventory of aquatic insects of the Kinnickinnic River provided the opportunity to sample broadly in the sense of both space and time. Limited species records for this watershed existed prior to this project. These were based mainly on riffle-only samples obtained 1) by the WDNR in 1995, 1996, 1997, and 1998 for biotic indexing purposes and 2) during coursework exercises in the BIO 333 Entomology class at the University of Wisconsin-River Falls assigned by the author.

The records made in this initial effort serve the purposes of: 1) providing an initial baseline of taxa present in the river, 2) determining preliminary spacial and seasonal distributions of these taxa, and 3) establishing a physical archive of specimens which will be useful for future work.

Although no direct faunal comparisons are possible with other rivers in the region, the inventory completed for the Bois Brule River, Douglas County, Wisconsin, by DuBois (1993) provides the closest technical macroinvertebrate reference. That study differed in many important aspects from the present in terms of its: 1) multiple year approach, 2) use of multiple methodologies [benthos, biotic indexing, and drift-net (drift net numbers not included below)], and 3) inclusion of tributary sampling in addition to mainstem sampling (tributary numbers not included below). But keeping in mind these limitations, some comparisons are of interest (Table 7). In terms of family and lower taxonomic levels the Kinnickinnic appears to be less diverse.

Table 7. Mainstem taxa numbers in the Brule (drift net and tributary numbers not included) and Kinnickinnic Rivers.

Order	Number of families		Number of genera/species	
	Brule River	Kinnickinnic River	Brule River	Kinnickinnic River
Ephemeroptera	11	7	24	16
Plecoptera	7	4	13	8
Trichoptera	12	10	28	19

Some notable species found in significant numbers in the Brule mainstem were not collected (or collected in very small numbers) in the Kinnickinnic in 1999. These include (Brule R. number/Kinnickinnic R. number) *Acroneuria lycorias* (Plecoptera:

Perlidae) (148/0), *Ephemerella invaria* (Ephemeroptera: Ephemerellidae) (782/2) and *E. subvaria* (Ephemeroptera: Ephemerellidae) (63/0), *Ceratopsyche sparna* (Trichoptera: Hydropsychidae) (197/0), and *Brachycentrus americanus* (Trichoptera: Brachycentridae) (109/0).

These data support the concept that the Kinnickinnic River, with its reputation for high quality water, its summercool nature, and large number of self-sustaining trout, is not particularly diverse. Waters (*pers. comm.* 2001), when asked for his perspective on the Kinnickinnic, predicted it would be a low diversity, highly productive river, based on its fertility (high alkalinity and nitrates).

One particularly notable result of these collections is documentation of the extent of the western ephemerellid mayfly *Ephemerella inermis* in the mainstem of the river (throughout the length of the river where suitable habitat is present), as well as its apparent prevalence in place of the expected *E. subvaria* and *E. invaria*. An early record of *E. inermis* in Wisconsin, based on larvae but not substantiated by adults, is reported by Randolph and McCafferty (1998) for specimens submitted by Hilsenhoff from Trout Creek, Iowa County (15 June 1984). This species was recorded for the Kinnickinnic River in unpublished individual biotic indexing samples for 1995, 1996, and 1997 recorded by the WDNR (Schreiber *pers. comm.* 1998). Larval specimens sent by the author to Hilsenhoff in the early part of this study were verified as *E. inermis*. Following the 1999 collections in this study, larval specimens and reared adult males were sent to R. Pat Randolph and W. Pat McCafferty, Purdue University, resulting in the following response: "From everything we can tell, there is a continuum of true *E. inermis* from Wyoming through Nebraska (we discovered recently), Iowa (also discovered recently), presumably Minnesota, and of course Wisconsin. Morphologically they are indistinguishable. We do not believe that what Edmunds considered a different species is valid. . . . for now, I have no problem with recognizing the true *E. inermis* in Wisconsin." (McCafferty *pers. comm.* 2002)

Relative abundances

Although methods were not structured for this work to provide quantitative data, specimen counts were recorded for all species. Certain species appear to occur in larger numbers than others in the river. Table 8 indicates those identified species representing a collection of 300 specimens or more during 1999.

In contrast to the numbers indicated in Table 8 some notable genera were collected only rarely. Anecdotal information provided by long-time anglers in the area speak of large hatches of *Hexagenia* (and *Isonychia*) in specified regions of the mainstem. However, today it appears that these emergences are greatly reduced. The 1999 survey resulted in the collection of a total of two *Hexagenia* and six *Isonychia* larvae. Few additional specimens of these genera have been collected during the course of sampling since the 1999 project.

Relative distributions

The Kinnickinnic River is regarded by many observers as two differing sections, the Lower Kinni and the Upper Kinni. The division between these sections is com-

Table 8. Species of macroinvertebrates collected from the Kinnickinnic River where numbers of specimens obtained exceeded 300 in 1999.

Order	Family	Genus/species	Number collected
EPHEMEROPTERA			
	EPHEMERELLIDAE	<i>Ephemerella needhami</i>	339
		<i>Ephemerella inermis</i>	2014
	LEPTOHYPHIDAE (=TRICORYTHIDAE)	<i>Tricorythodes atratus</i>	356
	BAETIDAE	<i>Baetis brunneicolor</i>	1178
		<i>Baetis tricaudatus</i>	1747
		<i>Plauditis punctiventris</i>	424
TRICHOPTERA			
	HYDROPSYCHIDAE	<i>Ceratopsyche alhedra</i>	475
		<i>Ceratopsyche slossonae</i>	705
	BRACHYCENTRIDAE	<i>Brachycentrus occidentalis</i>	491
DIPTERA			
	CHIRONOMIDAE	<i>Diamesa</i> sp.	698
		<i>Pagastia</i> sp.	412
AMPHIPODA			
	GAMMARIDAE	<i>Gammarus pseudolimnaeus</i>	793

monly perceived as the City of River Falls. There exists a substantial data set (Johnson 1995, Schreiber 1998) which indicates the effect of the city on river water temperatures and a much smaller data set (Garry unpublished data) which shows the different seasonal thermal patterns for the Upper and Lower Kinnickinnic River.

Viewing the macroinvertebrate collection data from the perspective of presence versus absence of taxa at each collection site (Table 5), several patterns of distribution appear. The first is composed of those species which occur throughout the stream and are found at all, or nearly all, collection sites. Examples of this distribution are *Ephemerella inermis*, two baetid mayflies, *Baetis brunneicolor* and *B. tricaudatus*, caddisflies *Ceratopsyche slossonae* and *Brachycentrus occidentalis*, and the amphipod crustacean, *Gammarus pseudolimnaeus*.

A second, perhaps more interesting, distribution is one where species are found

beginning near the Kinnickinnic River delta (Site 1) and are found more-or-less continuously upstream through Sites 9 or 10, which are located approximately 2 and 4 river miles upstream from the City of River Falls. (For reference, Site 7 is within the city limits and Site 8 is on the northern edge of the city.) This pattern is shown, for example, in all stonefly immatures collected, especially *Paragnetina*, *Isoperla* and *Pteronarcys*; *Taeniopteryx* is a notable exception. This also appears to be the pattern for the mayfly *Stenonema vicarium*, and the caddisflies *Ceratopsyche alhedra* and *C. alternans*. A few species, including *Tympanoga simplex* and several caddisflies appear to be distributed only in the upper reaches of the stream.

Follow-Up

The initial proposal for this project suggested a two-year collection period. Sufficient funding was obtained to carry out the work for one year. The year following 1999 was utilized for sorting, identification, and additional collections which could be used for biotic indexing purposes. Because of modifications in the sampling procedure of this study more-or-less midway through the funded year (1999), plans were made for a follow-up project which would be founded on this work and would be a two-year, entirely multihabitat sampling study. This new project, initiated in January of 2001, calls for monthly collections with the eight even-numbered sites sampled in the even-numbered months and the nine odd-numbered sites sampled in the odd-numbered months. This protocol provides a sample from each site on a bimonthly basis, including information on the fauna through the winter months. At the time of writing of this report, these collections were 75% completed with 1530 D-net samples representing 153 composite collections obtained.

River Access and Collector's Permit

Through the project collection period the proposer held WDNR Scientific Collector's Permit Number SCP-WD-42-C-99, allowing for aquatic macroinvertebrate collection in the Kinnickinnic River system in Pierce and St. Croix Counties. Public access to the Kinnickinnic River mainstem and tributaries is allowed by Wisconsin statutes following the "keep your feet wet" rule (M. Stone, WDNR, *pers. comm.*) and through WDNR public fishing access areas. The lower mainstem of the river is also navigable by canoe and these sites can be accessed legally by water approach without special permission. Many landowners cooperated by allowing crossing of private property to less accessible areas. Site 1 of this project existed within the Devil's Mixing Bowl Natural Area (previously the Kinnickinnic Gorge and Delta Scientific Area) which is within the boundaries of Kinnickinnic River State Park; permission to sample that portion of the river was granted by Darrel Richer, Park Manager (*pers. comm.* 1998).

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