EVALUATION OF THE WISCONSIN PRIORITY WATERSHED PROGRAM FOR IMPROVING STREAM HABITAT AND FISH COMMUNITIES

Progress Report for 2013

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SUMMARY

In 1989, an evaluation team was formed to evaluate the Wisconsin Priority Watershed Program in selected watersheds. This team was led by the Wisconsin Department of Natural Resources (WDNR) non-point-sources program, and consisted of scientists from the WDNR research program, personnel from U.S. Geological Survey, WDNR resource managers, local government staff, and professors and students from University of Wisconsin - Stevens Point. Evaluation of stream fish community and physical habitat conditions was conducted by the WDNR research program. The overall goal of this evaluation was to determine the extent to which installation of best management practices (BMPs) improves fish habitat and fish communities. This report summarizes the findings from the final two Priority Watersheds, Waumandee Creek and Milwaukee River South, that were part of the larger project that examined five Priority Watersheds.

The Waumandee Creek Priority Watershed is located in an agricultural setting. Instream habitat problems included sedimentation, lack of cover and depth, and high summer water temperatures. The riparian zones were heavily grazed and farmed with row crops. BMPs were installed in Eagle and Joos Creeks from 1992-2000. BMPs consisted of manure storage and barnyard-runoff facilities, streambank protection, cattle fencing, stream crossings, grade stabilization structures, nutrient management, and upland riparian management. Our sampling consisted of stream habitat and fisheries surveys, and temperature monitoring. This was done in 3 phases, 1990-1991 was the pre-BMP period, 1992-2000 was the transition period, and 2002-2007 was the post-BMP period. The goal of the project was to improve instream habitat and restore trout populations and biotic integrity. Generally, habitat improved at the treatment stations on Eagle and Joos Creeks. Improvements in cover, shading, rocky substrates, bank stability, and riparian zones were due to BMP installation of fencing, stream buffers, bank stabilization structures, LUNKER structures, and changes in riparian zones from pasture to meadow/shrub. Coldwater Index of Biotic Integrity (IBI) scores improved in Eagle Creek and at some of the stations in Joos Creek. Most of the improvements in the fish community were due to an increase in adult and young-of-year brook

trout. These increases were due to improvements in the habitat or possibly some movement of trout into the stations from upstream sources. Stream temperatures did not change much during the entire study period. Habitat and IBI scores for the paired reference sites and the regional reference sites were similar throughout the study period.

Study sites on the Milwaukee River South watershed are urban warmwater streams. Urbanization and channelization has led to major changes in hydrology and water quality. Some areas were even concrete lined. This led to major flooding problems and in 1998 a flood mitigation project was implemented on Lincoln Creek. BMPs included concrete removal, stream widening, meanders were constructed, banks were stabilized with rip-rap and rock gabiens, riffle/pool sequences were added, rubble/cobble and boulders were added to stabilize the streambed, and detention ponds were created. There were two phases of the project. Data collected between 1992-1998 was the pre-BMP period and the period from 2004-2008 was the post-BMP period. Habitat improved at all of the Lincoln Creek stations. At most stations, cover, rocky substrate, bank stability, and riffle/pool areas increased. Depth increased in the areas where pools were made. Riparian landuse changed to mostly meadow. Warmwater IBI ratings changed very little after BMP's were installed. Fish communities were still dominated by tolerant species and low numbers of individuals. The flood control project did accomplish its main goal of controlling flooding and it also restored the instream habitat to a certain extent. However, several problems still exist in the Lincoln Creek watershed. These include low base flow, water quality extremes, lack of shade and insteam vegetation, and a lack of small substrates. This has led to large, extreme blooms of *Cladophora* which has also caused water quality problems. These problems have kept the stream from reaching its potential and has kept the fish and invertebrate community comprised of tolerant species.

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INTRODUCTION

Since the late 1970's, the State of Wisconsin has been working toward reducing non-point source (NPS) pollution, primarily through the Priority Watershed Program. The Priority Watershed Program, jointly administered by the Wisconsin Department of Natural Resources (WDNR) and Wisconsin Department of Agriculture, Trade, and Consumer Protection, provides cost-sharing and technical assistance to encourage private land owners and local units of government to voluntarily install "best management practices" (BMPs) to improve land-use and reduce non-point-source pollution (Konrad et al. 1985). Major goals of the program include improved land use, water quality, aquatic habitat, fish communities, sport fisheries, and overall ecosystem integrity.

Until recently, the success of the Priority Watershed Program in improving stream resources had been poorly documented. Although Priority Watershed activities have been ongoing since the 1980's, few resources had been available for rigorous evaluation of the effectiveness of specific watershed projects (Wolf 1995). Additionally, standardized experimental designs and field sampling procedures had not been developed to carry out effective evaluations. Without evaluation data, it was difficult to conclusively demonstrate that the millions of dollars being spent on the Priority Watershed Program were having a significant positive effect on the environment. It also was impossible to determine what sort of land-use practices were most effective at reducing non-point-source pollution, and which BMPs worked best in particular situations.

In 1989, an evaluation team was formed to evaluate the Priority Watershed Program in selected watersheds that were representative of the major stream categories and types of nonpoint-source pollution occurring in Wisconsin. By 1999, 33 streams and 83 sampling sites in five Priority Watersheds and associated reference watersheds had been sampled to evaluate the responses of stream physical habitat, fish, and macroinvertebrate to whole watershed BMP implementations (Wang et al. 2001). Streams were sampled for this study in five different Priority Watersheds in the southern half of Wisconsin (Table 1). Very limited BMPs were implemented in the TRT sites in the Lower Grant Priority Watershed study area.

Therefore, sampling was discontinued in the Lower Grant watershed study area in 1997 (Wang et al. 2001). The Sheboygan River Priority Watershed received BMP installations from 1993-1999 and sampling was completed by 2002. Results from this study are given in Wang et al. 2001, 2006 and Corsi et al. 2005. The Spring Creek Priority Watershed received BMP installations from 1994-1999 and sampling was completed in 1999. Results from this study are given in Wang et al. 2000, 2001, 2002. In this paper, we report on findings from the remaining two Priority Watersheds, Waumandee Creek and Milwaukee River South.

METHODS

Habitat and Fish Sampling

The habitat and fish sampling procedures used in this study have been developed through extensive literature reviews, detailed field trials, and thorough data analyses conducted since the study began in 1990. Habitat and fish sampling occurred between the beginning of July and the end of August in the Waumandee Creek Study Area and between the middle of May and beginning of June in the Milwaukee River South Study Area (Table A2.2). More complete explanations are provided for habitat sampling procedures in Simonson (1993), Simonson et al. (1994a,b), Wang et al. (1996, 1998) and for fish sampling procedures in Lyons (1992a, 1992b), Lyons and Kanehl (1993), Simonson and Lyons (1995), and Lyons et al. (1996).

Detailed habitat sampling is carried out at all treatment and reference sites. Habitat data are collected at two spatial scales, the site scale, which provides a single value for each site, and the transect scale, which provides 12 to 60 or more values per site (Table 3). Each site is approximately 35 times the mean stream width in length (Lyons 1992a, Simonson et al. 1994a,b). Three kinds of measurements are used to generate values for site-scale variables. Water quality parameters, flow, and temperature are measured at the downstream edge of the site. Longitudinal channel parameters, including the total length of riffles, runs, and pools, and the mean distances between riffles and between bends, are determined by a mapping

of the entire site. Site location data, stream order, stream gradient, sinuosity, and basin area are determined from 1:24000 scale topographic maps. These latter five variables are determined only once, the first time a site is sampled, and assumed to be constant. However, all other variables are measured each time when the site is sampled.

In the Waumandee Creek Priority Watershed sites, continuous water temperatures were measured with a recording thermograph (Optic StowAway Temp, Onset Computer Corporation) between May and September, in order to determine summer temperature profiles. Thermographs were installed at 15 stations during various years from 1993-1996 and from 2004-2006 (Table 3, Table A1.5).

A variety of variables pertaining to stream channel morphology, bottom substrate, cover for fish, plant abundance, bank condition, and riparian land use/vegetation were measured at the transect scale (Table 3). At each site there were 12 or 13 transects, each equally spaced three stream widths apart (Simonson et al. 1994a,b). Width, habitat type, and cover variables are measured once along each transect. Bank and riparian variables are visually estimated separately for each side of the stream. Depth variables are measured and bottom substrate variables are visually estimated at five locations along each transect -- four equally spaced locations plus the deepest location (thalweg). At each location, depth variables are measured at a single point, and substrate variables are visually estimated within a 0.3 m square grid.

At all sites, fish are collected with a standard WDNR Direct Current (DC) stream shocker (described in Lyons and Kanehl 1993), or for a few very narrow streams, two pulsed DC backpack shockers were used in tandem. Two or three anodes are used, depending on the width of the stream. Captured fish are identified to species, counted, and weighed in aggregate. For selected species, total lengths, individual weights, and scales for aging are also collected (Table 3).

For all data, standard summary statistics are calculated (see Appendix 2 & 3). Habitat data are used to estimate overall habitat quality through the Fish Habitat Rating system (Simonson et al. 1994a). Fish data are used to estimate biological integrity and overall ecosystem health through the Index of Biotic Integrity (Lyons 1992b, Lyons et al. 1996).

Choice of Study Sites

Several different study site types have been defined. Stream sites that are termed "treatment" (TRT) sites; that is, sites where changes in watershed and riparian land use caused by installation of BMPs are expected to lead to major improvements in stream environmental quality (Table 2, Table A2.1). Sampling also occurs at stream sites outside of the Priority Watersheds, at what are termed "reference" sites, for comparison with the treatment sites. Reference sites are located in watersheds where few or no significant changes in watershed land-use are expected (i.e, not in Priority Watersheds). They are sampled to provide insight into what would have happened at the treatment sites if no treatment had actually taken place (i.e., no BMPs were installed). Reference sites provide an estimate of the temporal and spatial variation in fish and habitat parameters that are caused by factors other than changes in landuse, such as climatic variation (e.g., floods and droughts). Reference site data are essential to infer whether changes observed at treatment sites are likely due to installation of BMPs and changes in land use, or due to other factors unrelated to Priority Watershed activities.

Two different types of reference sites, paired and regional least-impacted, have been established (Table 2, Appendix Table A2.1). Paired reference sites (PRR) are matched or "paired" with a specific treatment site or group of sites, and are chosen to have the same combination of stream size, summer water temperature, and stream gradient as their corresponding treatment sites. They are located as close as practical to the appropriate Priority Watershed, so that they will experience similar weather patterns.

Regional least-impacted reference (REG) sites are not as closely matched with treatment sites as paired reference sites, although they do have the same general combination of stream size, summer water temperature, and stream gradient. Regional least-impacted reference sites are chosen to represent the best attainable environmental quality for "typical" streams of a particular type within a particular region, given the human uses of that region (Hughes et al. 1986, 1990). Thus, they may be located fairly far from the treatment sites, although still within the same ecoregion. Their watersheds have relatively good land use,

and their habitat quality, fish communities, and overall ecosystem integrity are relatively unimpacted by environmental degradation. However, they are certainly not pristine streams. Regional reference sites provide a broader context and an upper endpoint against which to compare the treatment sites. More details on selection of Priority Watersheds and reference site criteria is given in Wang et al. 2001.

Study Area

The study watersheds are located in west-central Wisconsin (Waumandee Creek Priority Watershed, Figure 1) and southeast Wisconsin (Milwaukee River South Priority Watershed, Figure 2) (Table A1.1). Each study area consisted on one to two treatment, two paired reference, and two regional least-impacted reference streams (Table 2). These sites were deliberately chosen to have similar characteristics in elevation, climate, geolgy, soil, flow and temperature regimes, stream size, and gradient.

Waumandee Creek Study Area

Habitat problems in the Waumandee Creek Priority Watershed Study Area consist primarily of excessive sedimentation, lack of cover and depth, and high summer water temperatures (Tables A2.2-A2.5). These habitat problems are a direct consequence of poor riparian and watershed land use. Most riparian areas are heavily pastured. Grazing in the riparian area has removed bank grasses and woody plants, thus eliminating shading and overhanging vegetation. This has resulted in higher water temperatures and less overhead hiding cover for fish. Along with grazing, livestock trampling has destabilized the banks, leading to increased erosion. Sediment from the eroding banks has clogged gravel and cobble stream substrates, which has probably eliminated trout spawning habitat and reduced production of many important invertebrate food items (Waters 1995). Sediment has also filled in pools, reducing the depth of the stream and creating a relatively wide and shallow exposed channel that can be quickly warmed to a temperature unsuitable for trout. Sediment eroded from upstream in the watershed can be transported long distances and in many instances has affected the stream channel well downstream

of the sources of the sediment. Agricultural development of the watershed has probably also led to modified stream hydrology, with greater extremes in flows. Increased frequencies and magnitudes of floods and droughts are unfavorable for reproduction and survival of trout and other intolerant fish species.

The treatment streams, Eagle and Joos Creeks, range from second to fourth order, have moderate gradients (3-10 m/km) and are located in forest dominated watersheds with intensive agricultural activities in the valleys along the streams (Table A2.1). Eagle Creek has a basin area of 37.0 km^2 and Joos Creek has a basin area of 15.6 km^2 at the lower study areas (Table A2.1). They are tributaries of Waumandee Creek, which flows into the Mississippi River. Joos Creek is a tributary of Eagle Creek. At the beginning of the study, both creeks were classified as a Class III trout fishery. There were three treatment stations on Eagle Creek and four treatment stations on Joos Creek. There was also a headwater reference station on each stream, Eagle 4 and Joos 5, that were sampled only one time in 1997. These sites received no BMP implementation. Stations on Eagle Creek ranged from 86-110 m and stations on Joos Creek ranged from 85-155 m (Table A1.1).

In 1990, Joos and Eagle Creeks were designated as Priority Watersheds. BMPs were first installed in late summer 1991 (after our annual sampling) at Eagle 2 and Joos 2. At Eagle 2, the stream banks were fenced to keep livestock off the banks and out of the stream. At Joos 2, the stream banks were also fenced and banks were stabilizedand cover was added with rip-rap and a LUNKER structure. However, by 1997, only partial BMPs were installed in the entire watershed. Sampling was discontinued until sufficient BMPs were implemented. By 2000, the majority of the goals of the project were determined to have been achieved. In Eagle Creek, 3 of 4 manure storage facilities, 8 of 11 barnyard-runoff facilities, 1,396 m of 4,166 m of streambank protection, 591 m of 3,880 m of fencing, 2 of 7 stream crossings, 9 of 10 grade stabilization structures, 470 of 562 acres of nutrient management, and 260 of 1360 acres of other upland BMPs were implemented (Graczyk et al. 2012). In Joos Creek, 0 of 3 manure storage facilities, 2 of 7 barnyard-runoff facilities, 2,070 m of 3,121 m of streambank protection, 518 m of 3,338 m of fencing, 1 of

2 stream crossings, 1 of 1 grade stabilization structures, 0 of 437 acres of nutrient management, and 0 of 710 acres other upland BMP's were implemented (Graczyk et al. 2012). By 2002, at Eagle 2, the property had been sold. The new owner had no livestock and the fencing was removed. Also, rip-rap had been added to the upstream end of the station. At Joos 3, partial fencing was done between 2002-2004, but not from 2005-2006. By 2002, Joos 4 had bank stabilization and cover added in the form of rip-rap and a LUNKER structure.

Therefore, data collected from 1990-1991 is considered the pre-BMP period. The period from 1992-2000 is considered a transitional period, with BMP's being implemented periodically throughout the period. The period from 2002, when sampling resumed again, to 2007 is considered the post-BMP period for both watersheds.

The paired reference streams, Bohris Creek and Trout Run Creek, are third order streams and have gradients ranging from 4-6 m/km (Table A2.1) . Watershed landuses for these two streams are similar to those of Eagle and Joos Creeks and did not change during the study period. Bohris Creek has a basin area of 24.0 km^2 and Trout Run Creek has a basin area 19.3 km^2 at the furthest downstream sampling sites. They are tributaries of the Trempealeau River, which flows into the Mississippi River. As of 2002, Trout Run is a Class II trout stream and Bohris Creek is not classified as a trout stream. There were two stations on each stream. Bohris Creek stations ranged from 88-130 m and Trout Run Creek stations ranged from 100-117 m (Table A1.1).

The two regional least-impacted reference streams, Timber Coulee Creek and Cady Creek, are third order streams and have gradients ranging from 5-9 m/km (Table A2.1). The primary landuses in these two subwatersheds are row crop agriculture, pasture, and woodland and they did not change during our study (Wang et al. 2002). Timber Coulee Creek has a basin area of 35.2 km^2 and Cady Creek has a basin area of 36.4 km^2 at the lower-most sampling stations. Timber Coulee is a tributary of Coon Creek, which flows into the Mississippi River. Cady Creek is tributary of the Eau Galle River, which flows into the Chippewa River which flows into the Mississippi River. As of 2002, Timber Coulee and Cady Creek are Class I

trout streams. There were two sampling stations on each stream. Timber Coulee Creek stations ranged from 175-274 m and Cady Creek stations ranged from 171-185 m (Table A1.1).

Milwaukee River South Study Area

The resource problems in the Milwaukee River South Priority Watershed are caused by the major urbanization of the area. Urbanization has led to major changes in hydrology and water quality. The streams are very "flashy", quickly reaching flood stage following only moderate rain storms or snow melt. Between 1960 and 1997, more than 4,000 separate flooding problems were reported along Lincoln Creek (Ehlinger et al. 2003). However, during periods without runoff, flows become very low. Water quality is highly degraded with runoff from streets, parking lots, roofs, and industrial/commercial areas. Concentrations of metals, salts, and/or organic compounds may reach toxic levels for many fish species during runoff events. Some areas of the stream channels have been completely enclosed in concrete and provide essentially no habitat for fish. Other areas remain in a more-or-less natural condition, with riparian areas protected by park land, but most parts of the stream are channelized and often lack hiding cover for fish or contain excessive amounts of fine sediment that has been deposited during runoff events.

During 1997 and 1998, Lincoln Creek experienced two 100-year flood events (Ehlinger et al. 2003). A flood mitigation project was implemented by the Milwaukee Metropolitan Sewerage District in 1998 in conjuction with the city of Milwaukee and other Milwaukee County municipalities. The main purpose of the plan was flood control with a secondary objective of the restoration of the stream channel and riparian corridor. Construction began in late 1998 and was completed by the end of 2001. Over two miles of concrete from the channelized section of Lincoln Creek was removed, the streambed was widened, lowered, and meanders were constructed to allow stormwater to remain within the banks during flood events (Ehlinger et al. 2003). The stream banks were stabilized with rip-rap and rock gabiens and two detention ponds were created to contain flood waters and control the release of storm water to the stream (Ehlinger et al. 2003). In addition, rubble/cobble and boulers was added in order to stabilize the

streambed.

The treatment stream, Lincoln Creek, ranges from first to third order, has low to moderate gradients (1.1 – 4.7 m/km), and is located in a highly, urabanized area (Table A2.1). Lincoln Creek has a basin area of 53.1 km^2 at the lower study area (Table A2.1). It is a tributary of the Milwaukee River which flows into Lake Michigan. There are eight stations on Lincoln Creek. Lincoln 10 is a reference station that received no BMPs and remained a concrete lined channel throughout the study. All other stations on Lincoln Creek received BMP implementation. Station lengths ranged from 116-300 m (Tables A1.1).

The paired reference streams, Underwood Creek and Little Menomonee River, are second to third order streams and are low to moderate gradient streams (0.3 – 2.4 m/km) (Table A2.1). At our sites, both streams are channelized. Underwood Creek is located in a highly urbanized area; whereas, Little Menomonee is located in an agricultural area outside of Milwaukee, WI. Underwood 2 is a concrete lined channel and remained that way throughout the study. Both streams are tributaries of the Menomonee River which flows into Lake Michigan. There are three stations on Underwood Creek and two stations on the Little Menomonee River. Underwood Creek stations ranged from 101-216 m and Little Memononee River stations ranged from 100-144 m in length (Table A1.1).

The two regional least-impacted reference streams, East Branch of the Milwaukee River and the Oconomowoc River, are third order streams and have low gradients (0.4 – 1.3 m/km) (Table A2.1). The East Branch of the Milwaukee River is located in a forested area in the Northern Kettle Moraine State Forest; whereas, the Oconomowoc River is located in an agricultural area west of Milwaukee, WI. The East Branch of the Milwaukee River is a tributary of the Milwaukee River which flows into Lake Michigan. The Oconomowoc River is a tributary of the Rock River which flow into the Mississippi River. There are two stations on each of these rivers. East Branch of the Milwaukee River stations ranged from 283-380 m and Oconomowoc River stations ranged from 279-304 m (Table A1.1).

RESULTS AND DISCUSSION

Waumandee Creek Priority Watershed

As stated before, data collected from 1990-1991 is considered the pre-BMP period. The period from 1992-2000 is considered a transitional period, with BMPs being implemented periodically throughout the period. The period from 2002, when sampling resumed, to 2007 is considered the post-BMP period for both watersheds.

The BMPs that were installed in the Waumandee Creek Priority Watershed were designed to reduce sediment and nutrient inputs into the stream and to provide stable, well-vegetated banks and riparian areas. An ultimate goal was to improve instream habitat and restore trout populations and biotic integrity. Certain indicators of habitat quality (calculated using the Habitat Rating System, Simonson et al. 1994a) at Joos Creek and Eagle Creek improved after BMPs were installed (Table 4). The overall habitat ratings at Eagle 1 improved slightly from fair to good during the transition period and stayed at good during the post-BMP period. Instream cover in the form of overhanging vegetation increased (Table A2.3). At Eagle 2, ratings increased from fair to good during the transition period and from good to excellent during the post-BMP period. At this station average depth, bank stability, shading, cover (overhanging vegetation), and percent gravel increased, and landuse changed from pasture to meadow/shrubs (Tables A2.3 – A2.4). Streambank fencing and the addition of rip-rap led to the improved habitat. At Eagle 3, ratings remained the same (good) during the transition and post-BMP periods. At Joos 1, ratings were generally in the fair to good range (Table 4). Improvements included increased cover in the form of overhanging vegetation, and shading and bank stability improved (Table A2.3). A large beaver dam was constructed in 1993 which caused a fair amount of bank erosion, which gradually improved after the dam was removed. At Joos 2, ratings were fair during the pre-BMP period, improved to good during the transtition period, and improved even better to excellent during the post-BMP period. Improvements included increased cover, shading, rocky substrate, and bank stability, and the riparian zone went from pasture to meadow/shrubs. Most of the improvements were due to streambank fencing and the addition of rip-rap and a LUNKER structure. At Joos 3, habitat ratings varied from fair to good throughout the study. Some improvements in

cover, boulders, and bank stability occurred with the addition of partial fencing in some years and the addition of rip-rap at one bend. Joos 4 habitat ratings ranged from good to excellent throughout the study. Improvements in cover, shading, bank stability, and rocky substrate were due to the addition of rip-rap and a LUNKER structure, and the riparian zone buffer grew into meadow/shrub. These results demonstrate that BMP implementation improved overall stream physical habitat conditions at least at the local level. Obvious habitat improvements occurred where stream buffers, fencing, bank stabilization structures, and LUNKER structures were installed. In some areas, as time went on, riparian zones improved from pasture to a meadow/shrub environment. Similar results have been documented in the other two Wisconsin Priority Watershed projects that were completed, Spring Creek and Sheboygan River (Wang et al. 2000, 2002, 2006, and Corsi et al. 2005). Graczyk et al. (2012) concluded that there were improvements in water quality (suspended solids, total phosphorus and ammonia nitrogen) from the pre-BMP period to the post-BMP period for both Joos and Eagle Creek Watersheds. These improvements were attributed to the implemention of BMPs and the reduction of the number of cattle in the watersheds.

Habitat ratings for the paired reference sites, Bohris Creek and Trout Run Creek, remained the same throughout the study period (Table 4). Ratings were from fair to good at Bohris Creek and fair at Trout Run Creek. Habitat problems include lack of cover, shading, and rocky substrates, shallow depths, areas of extreme bank erosion, and disturbed riparian land-use in the form of pasture (Tables A2.3 – A2.4). Habitat problems in these streams were similar to habitat problems before BMPs were implemented in Eagle and Joos Creeks. Habitat ratings for the regional reference sites, Timber Coulee Creek and Cady Creek, also remained the same throughout the study (Table 4). Ratings were from good to excellent at Timber Coulee and Cady Creek. Timber Coulee has some areas that lack depth, shading, and disturbed riparian land-use in the form of development (lawn), but has good cover, bank stability, and some areas in undisturbed riparian landuse in the form of meadow. Cady Creek has some areas that lack depth, cover, and unstable banks, but has excellent rocky substrate, good shading, and undisturbed riparian landuse in the form of woods. These streams were chosen as regional reference sites, in part, because of their good

instream habitat characteristics and good riparian landuse.

Water temperatures did not change much in both Eagle and Joos Creeks from the transition period to the post-BMP period (Table A2.5). At Eagle Creek 1-3, during the transition period, summer mean temperatures ranged from 15.2-18.9 ^{o}C and summer maximum temperatures ranged from 17.5-22.6 ^{o}C. During the post-BMP period, summer mean temperatures dropped slightly and ranged from 14.8-17.5 ^{o}C and summer maximum temperatures ranged from 17.7-20.5 ^{o}C. At Eagle 4, the headwater site, summer mean temperatures were 12.0 ^{o}C and summer maximum temperatures were 13.7 ^{o}C during the post-BMP period. In Joos 2-4, during the transition period, summer mean tempertures ranged from 14.7-20.2 ^{o}C and summer maximum temperatures ranged from 18.4-24.3 ^{o}C. During the post-BMP period, summer mean termperatures were similar at 14.9-18.2 ^{o}C and summer maximum temperatures were also similar at 18.2-21.4 ^{o}C. At Joos 5, the headwater site, summer mean temperatures were 13.4 ^{o}C and summer maximum temperatures were 15.6 ^{o}C. Both streams appear to have the potential to support a coldwater thermal regime and fish community. Both Bohris Creek and Trout Run Creek had similar summer mean and summer maximum temperatures as Eagle and Joos Creeks. The regional reference sites, Cady Creek and Timber Coulee Creek, were even slightly warmer than the headwater sites of Eagle and Joos Creeks, but were colder than the other Eagle and Joos stations. The BMPs applied to the Eagle and Joos Watersheds did not seem to influence the thermal regime of either creek.

Coldwater fish IBI scores and ratings improved in Eagle Creek and at some of the stations in Joos Creek. At all of the Eagle Creek stations, scores improved during the post-BMP years (Table 4). Ratings improved from very poor to fair. Improvements were primarily due to increases in brook trout (Tables A3.1 – A3.3). At Eagle 2, from 2002 – 2006, over half the catch of brook trout were young-of-year and at Eagle 3 the majority of brook trout caught were young-of-year (WDNR, unpublished data). One young-of-year brook trout was caught at Eagle 1 in 2006. It should be noted that brook trout exist in the headwaters of Eagle Creek. In 1997, at Eagle 4, 15 brook trout were captured (Table A3.4). However, these results clearly show that improvements from BMPs in the form of habitat and water quality

improvements led to brook trout reproduction. As of 2002, Eagle Creek remains a Class III trout stream. Similar results were shown in the Spring Creek Watershed for brown trout (Wang et al. 2002). At Joos Creek, IBI scores changed somewhat at some of the stations (Table 4). At Joos 1 scores remained at very poor except for 2005 when one young-of-year brook trout was caught Table A3.5). At Joos 2 (treatment station) scores remained at very poor. No brook trout were caught at Joos 2 during the entire study (Table A3.6). At Joos 3 scores remained at very poor to poor except in 2006 when the rating went to fair because of eight brook trout being caught, four of which were young-of-year (Table A3.7). At Joos 4, scores were very poor except in 1993, 2004, 2005, and 2006 when brook trout were caught (Table A3.8). Four young-of-year brook trout were caught in 2005 at this station. However, it should be noted that brook trout were caught in very low numbers at both stations. Similar to Eagle Creek, brook trout are present in the headwaters of Joos Creek. In 1997, at Joos 5, 87 brook trout were captured (Table A3.9). These increases in brook trout could be due to the habitat improvements, but it is also possible that brook trout from the headwaters area moved downstream into Joos 3 and Joos 4. The difference between improvements in Eagle Creek versus Joos Creek are probably due to more BMP's being added to the watershed in both riparian and upland BMP's, more instream habitat improvements in the form of rip-rap, fencing, and LUNKER structures, the reduction of cattle, and possibly slightly colder temperatures. Also, at Joos 3, livestock grazing and a chicken farm may have had an influence on the downstream stations in the form of increased sedimentation and organic waste (Wang et al. 2002). As of 2002, Joos Creek is not classified as trout water.

IBI scores for the reference stations were similar throughout the study period (Table 4). The paired reference sites, Bohris Creek and Trout Run Creek, ranged from very poor to fair. Bohris Creek is dominated by tolerant species such as creek chub and white sucker, with some brook stickleback and johnny darters present (Tables A3.10 – A3.11). Trout Run has a few brown and brook trout present, but the majority of the fisheries consists of longnose dace, creek chub, white sucker, and johnny darter (Tables A3.12 – A3.13). As of 2002, Trout Run Creek was classified as a Class II trout stream and Bohris Creek

was not classified as trout water. The regional reference streams, Timber Coulee Creek and Cady Creek, rated fair to excellent (Table 4). Timber Coulee Creek is dominated by brown trout and slimy sculpin, with some fantail darter, brook stickleback, and white sucker present (Tables A3.14 – A3.15). Cady Creek is dominated by brook trout and mottled sculpin, with some longnose dace present (Tables A3.16 – A3.17). As of 2002, both streams are classified as Class I trout waters. The paired reference sites were more similar to Eagle and Joos Creeks; whereas, the regional reference sites show the best attainable fish communities in the region.

Milwaukee River South Priority Watershed

Data collected from 1992-1998 is considered the pre-BMP period. The period from 2004-2008 is considered the post-BMP period.

During the pre-BMP period, habitat ratings for Lincoln Creek, ranged from poor to fair (Table 4). At most stations, habitat problems included lack of depth, pool areas, cover, and shading, severe bank erosion at some sites, and either high percentages of fine substrates or concrete lined channels (Tables A2.3 – A2.4). Stations with concrete lined channels included Lincoln 1, 5, 6, and 10 (Other substrate, Table A2.4). Bank erosion scores were very good at these sites; however, this was due to the concrete lined banks. During the post-BMP period, ratings increased to good to excellent at all of the Lincoln Creek stations (Table 4). Only a couple of years had fair ratings. At Lincoln 1, a concrete site, the concrete was removed, the channel was widened, riffle and pool areas were made, rocky substrates (rubble/cobble and boulder) were added, and riparian landuse turned to meadow (Tables A2.3 – A2.4). At Lincoln 4, cover, rocky substrates, and riffle and pool areas increased, shading and bank erosion decreased, and riparian landuse changed to meadow (Tables A2.3 – A2.4). At Lincoln 5 and Lincoln 6, both concrete stations, the concrete was removed, the channel was widened and deepened, a series of riffles and pools were made, and rocky substrates were added (Tables A2.3 – A2.4). These improvements led to increases in cover, depth, pools, and rocky substrates. Riparian landuse changed to rock/ meadow due to the addition of rock

gabiens along the bank. At Lincoln 7, the stream was narrowed, riffle/pool areas were added, rocky substrates were added, bank erosion decreased somewhat, and riparian landuse changed to meadow (Tables A2.3 – A2.4). However, cover did not increase. A detention basin was added just upstream from this station. At Lincoln 8, the stream was relocated to a different area in Havenwoods Environmental Center. The stream was channelized, channel widths were made more uniform, depths were increased somewhat with the addition of riffle/pool areas, rocky substrates were added, bank erosion and shading decreased, and riparian landuse changed to meadow (Tables A2.3 – A2.4). At Lincoln 9, rocky substrates were added which increased the riffle areas and shading increased with the change in riparian landuse to meadow/shrubs. A detention pond was created just upstream from this station. Lincoln 10, the concrete reference station, did not change. In general, the additions of riffle/pool sequences increased the width, depth and cover for fish, and bank sloping, rock gabiens and landuse changes improved bank stability, riparian zones, and cover for fish. The removal of trees and shrubs from the riparian zones decreased shading. The addition of rubble/cobble/boulder did increase rocky substrates, add some cover, and stabilized the streambed but created a homogeneous streambed that lacks good substrate for fish reproduction and colonization of macroinvertebrates. Ehlinger et al. (2003) found similar findings using the same pre-BMP data with additional habitat data collected in 2000-2001 by University of Wisconsin – Milwaukee personnel. The BMP's applied to Lincoln Creek seem to have accomplished the main goal of flood control and has generally improved the physical habitat of the stream.

Habitat ratings at the paired reference site, Little Menomonee River, remained the same at fair throughout the study (Table 4). Both of these stations are channelized, lack riffles and pools, cover is scarce, and streambanks are highly eroded (Table A2.3). Little Menomonee 2 lacks rocky substrate (Table A2.4). Riparian land-use for both stations is woodland. Habitat ratings for the other paired reference site, Underwood Creek 2, also remained the same at poor (Table 4). This site is channelized and is concrete lined (Tables A2.3 – A2.4). Riparian landuse is developed and is in a park setting. Underwood 4 and 5 are back-to-back stations. Habitat ratings are similar at fair to good (Table 4). These stations are

channelized, lack depth and cover, have eroded banks, and are set in an urban area with some meadow, shrubs, and woods within 5m of each bank (Table A2.3). Underwood 4 has limited riffle areas; whereas, Underwood 5 has good riffle/pool/run sequences. Both stations have good sand/gravel substrates (Table A2.4). Habitat problems in these streams were similar to habitat problems before BMPs were implemented in Lincoln Creek.

Habitat ratings at the regional reference sites, East Branch of the Milwaukee River and Oconomowoc River, remained at fair to good throughout the study period (Table 4). East Branch of the Milwaukee River is low gradient without riffles and deep pools, but depths of runs is good, cover is good, banks are stable, and the riparian zone is undisturbed with woods, wetland, and shrubs (Table A2.3). Substrates are predominantly silt/sand with some gravel present (Table A2.4). The Oconomowoc River stations have good depth and cover, stable banks, good shading, and undisturbed riparian zones of meadow, shrubs, woods, and wetlands (Table A2.3). Oconomowoc 1 has good riffle/pool/run sequences with excellent rocky substrate; whereas, Oconomowoc 2 is more low gradient with run habitats containing predominantly silt/sand substrates (Table A2.4). These sites represent undisturbed streams in this area that are generally low gradient and warmwater, although short moderate-gradient stretches with well-defined pool-riffle structure also occur.

During the pre-BMP period, warm-water IBI ratings for Lincoln Creek, ranged from very poor to poor (Table 4). Fish communities were dominated by mostly tolerant species consisting of fathead minnow, white sucker, and green sunfish (Tables A3.17 – A3.24). Except for Lincoln 4 in some years, numbers of fish species and individuals caught were low. At the concrete sites, very few fish were caught at all. Post-BMP ratings showed very little improvement in fish communities with ratings of very poor to fair (Table 4). Generally, fish communities were still dominated by tolerant species of common carp, fathead minnow, whitle sucker, and greem sunfish (Tables A3.17 – A3.24). However, numbers of species and individuals improved slightly. At Lincoln 1 and 4, scores improved in the early years after BMP installation from 2004-2006, but then declined during 2007-2008. This may have been due to the

successful spawning and survival of smallmouth bass, an intolerant fish, in the earlier years. Scores definitely improved at the old concrete sites, Lincoln 5 and 6, and generally got better as the study progressed with the best year in 2008 with a rating of fair. This was due to a decline in carp at these stations. Despite improvements in habitat at all of the Lincoln Creek stations, fish communities did not improve very much and were still dominated by tolerant species, thus keeping IBI scores low.

IBI scores for the paired reference site, Little Menomonee River, generally stayed the same with ratings from poor to fair (Table 4). Both of these sites are dominated by tolerant species such as white sucker and creek chub, with some bluegill, northern pike and johnny darter present (Tables A3.25 – A3.26). Generally, low numbers of individuals were caught. The other paired reference site, Underwood Creek, had similar scores throughout the study with ratings from very poor to poor (Table 4). Underwood 2, the concrete site, had both very low number of fish species and individuals (Table A3.27). Underwood 4 and 5, were dominated by tolerant species such as blacknose dace, creek chub, and white suckers (Tables A3.28 – A3.29). Some northern pike and johnny darter were present. Both sites had generally low numbers of species and individuals. Underwood Creek is very similar to Lincoln Creek in that it is an urban stream with fish communites dominated by tolerant species.

Conversely, the regional reference sites on the East Branch Milwaukee River and Oconomowoc River have high-quality warmwater fish communities with a high diversity of species. IBI ratings ranged from fair to good for both rivers (Table 4). The East Branch of the Milwaukee River had up to 29 different species; whereas, the Oconomowoc had up to 31 different species (Table A3.30 – A3.33). Both contained good numbers of the rock bass, an intolerant sportfish, and the East Branch Milwaukee also had a few northern pike and good numbers of bluegills. Both streams have small numbers of the intolerant Iowa darter, and the Oconomowoc River also has two other intolerant species, slender madtom (a Wisconsin endangered species) and rainbow darter. These sites serve as good representatives of the best streams in this region.

One of the main problems to the restoration of fish and macroinvertebrates in Lincoln Creek is the

extreme seasonal blooms of an algae, *Cladophora*. Ehlinger et al. (2003) studied Lincoln Creek from 2001-2002 and sampled fish, invertebrates, habitat, nutrients, temperature, dissolved oxygen, and flow. They found that the high abundance of *Cladophora* was due to the large rubble/cobble/boulder substrates that were added to the stream aided in algal attachment, reduced flows from the flood control project did not dislodge the algae and flush the system, and higher light and temperature levels from the lack of shading near the stream aided in the growth of the alge. They noted that oxygen levels varied greatly during the day with concentrations of less than 1 mg/L at night and levels as high as 20 mg/L during the day. These extremes were related to the abundance of *Cladophora.*. During our study, we found a sharp increase in *Cladophora* from the pre-BMP period to the post-BMP period. At the non-concrete sites, algae percentages ranged from 2 – 26% during the pre-BMP period; whereas, algae percentages ranged from 10 – 96% during the post-BMP period (WDNR, unpublished data). Obviously, the problem has persisted and grown larger since the post construction phase of the flood control project.

The flood control project did accomplish its main goal of controlling flooding and it also restored the instream habitat to a certain degree. However, problems still exist that prevent Lincoln Creek from reaching its potential. From our study and the study conducted by Ehlinger et al. (2003), major problems still include low base flow, water quality extremes, and lack of shade, instream vegetation, and small substrates. This has led to large blooms of *Cladophora* and a fish and invertebrate community made up of mostly tolerant species.

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REFERENCES CITED

Corsi, S. R., J. F. Walker, L. Wang, J. A. Horwatich, and R. T. Bannerman. 2005. Effects of Best-Management Practices in Otter Creek in the Sheboygan River Priority Watershed, Wisconsin, 1990-2002. U. S. Geological Survey, Scientific Investigations Report 2005-5009.

Ehlinger, T. J., C. D. Sandgren, and L. Schacht DeThorne. 2003. Monitoring of stream habitat and aquatic biotic integrity, Lincoln Creek, Milwaukee County, Wisconsin. Department of biological Sciences, University of Wisconsin – Milwaukee. 42 p.

Graczyk, D. J., J. F. Walker, R. T. Bannerman, and T. D. Rutter. 2012. Effects of best-managemtn practives in Eagle and Joos Valley Creeks in the Waumandee Creek Priority Watershed, Wisconsin, 1990-2007. U.S. Geological Survey Scientific Investigations Report 2011-5119. 25 p.

Hughes, R. M., D. P. Larsen, and J. M. Omernik. 1986. Regional reference sites: a method for assessing stream potentials. Environmental Management 10:629-635.

Hughes, R. M., T. R. Whittier, C. M. Rohm, and D. P. Larsen. 1990. A regional framework for establishing recovery criteria. Environmental Management 14:673-683.

Konrad, J. G., J. S. Baumann, and S. E. Berquist. 1985. Nonpoint pollution control: the Wisconsin experience. Journal of Soil and Water Conservation 40:55-61.

Lyons, J. 1992a. The length of stream to sample with a towed electrofishing unit when fish species richness is estimated. North American Journal of Fisheries Management 12:198-203.

Lyons, J. 1992b. Using the index of biotic integrity (IBI) to measure environmental quality in warmwater streams of Wisconsin. General Technical Report NC-149. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station.

Lyons, J., and P. Kanehl. 1993. A comparison of four electroshocking procedures for assessing the abundance of smallmouth bass in Wisconsin streams. General Technical Report NC-159. St. Paul, MN. U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 35 pp.

Lyons, J., L. Wang, and T. D. Simonson. 1996. Development and validation of an index of biotic integrity for coldwater streams in Wisconsin. North American Journal of Fisheries Management 16:241-256.

Simonson, T. D. 1993. Correspondence and relative precision of stream habitat features estimated at two spatial scales. Journal of Freshwater Ecology 8:363-373.

Simonson, T. D., J. Lyons, and P. D. Kanehl. 1994a. Guidelines for evaluating fish habitat in Wisconsin streams. General Technical Report NC-164. St. Paul, MN. U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 36 pp.

Simonson, T. D., J. Lyons, and P. D. Kanehl. 1994b. Quantifying fish habitat in streams: transect spacing, sample size, and a proposed framework. North American Journal of Fisheries Management 14:607-615.

Simonson, T. D., and J. Lyons. 1995. Comparison of catch per effort and removal procedures for sampling stream fish assemblages. North American Journal of Fisheries Management 15:419-427.

Wang, L., T. D. Simonson, and J. Lyons. 1996. Accuracy and precision of selected stream habitat estimates. North American Journal of Fisheries Management 16:340-347.

Wang, L., J. Lyons, and P. Kanehl. 1998. Development and evaluation of habitat rating system for low gradient Wisconsin streams. North American Journal of Fisheries Management 18:775-785.

Wang, L., J. Lyons, P. Kanehl, D. Marshall, and M. Sorge. 2000. Responses of stream habitat, macroinvertebrate, and fish to watershed BMPs: lessons from Wisconsin. Proceedings of Watershed 2000, July 9-12, 2000, Vancouver, Canada.

Wang, L., J. Lyons, and P. Kanehl. 2001. Evaluation of the Wisconsin Priority Watershed Program for improving stream habitat and fish communities. Progress Report for 2001. Fish Research Section, Bureau of Research, Wisconsin Department of Natural Resources, Monona, Wisconsin.

Wang, L., J. Lyons, and P. Kanehl. 2002. Effects of watershed Best Management Practices on Habitat and fish in Wisconsin streams. Journal of the American Water Resources Association 38:663-680.

Wang, L., J. Lyons, and P. Kanehl. 2006. Habitat and fish responses to multiple agricultural Best Management Practices in a warm water stream. Journal of the American Water Resources Association 42(4):1047-1062.

Waters, T. F.. 1995. Sediment in streams. Sources, biological effects, and control. American Fisheries Society Monograph No. 7, Bethesda, Maryland.

Wolf, A. T.. 1995. Rural nonpoint source pollution control in Wisconsin: the limits of a voluntary program? Water Resource Bulletin 31:1009-1022.

TABLES

Table 1. General characteristics of Priority Watersheds that are part of evaluation monitoring for fish and habitat. Fisheries classification indicates the fisheries potential of the streams in the watershed; these watersheds were designated Priority Watersheds in large part because many streams within them did not meet their potential. High quality coldwater streams typically do not exceed 24 ^{o}C as a maximum summer daily mean water temperature, and have trout as their primary sport fish. Even very small coldwater streams may support trout fisheries if environmental quality is good. Warmwater streams routinely have maximum summer daily mean temperatures greater than 24 ^{o}C. Warmwater sport fish such as bass and sunfish occur only in larger high-quality warmwater streams; small high-quality warmwater streams support a wide variety of non-game "forage" fish species. High gradient streams are greater than 3.0 m/km over most of their length; whereas, low gradient streams are generally less than 3.0 m/km.

Evaluation Watershed	Predominant Ecoregion	Land Use	Fisheries Classification	Stream Gradient
Waumandee Creek	Driftless Area	Rural	Coldwater Sport	High
Lower Grant River	Driftless Area	Rural	Warmwater Forage & Warmwater Sport	High
Spring Creek	Southeastern Wisconsin Till Plains	Rural	Coldwater Sport	Low
Sheboygan River	Southeastern Wisconsin Till Plains	Rural	Warmwater Forage	Low
Milwaukee River South	Southeastern Wisconsin Till Plains	Urban	Warmwater Forage & Warmwater Sport	Low

Table 2. Streams and stations that were sampled. The Priority Watershed refers only to the Treatment Streams; all Reference Streams were in different watersheds. The numbers in parentheses indicate the number of stations sampled on each stream.

Stream Type	Priority Watershed	Treatment Streams	Paired Reference Streams	Regional Reference Streams
Coldwater Sport High Gradient	Waumandee Creek	Eagle Crek (3) Joos Creek (4)	Bohris Creek (2) Trout Run Creek (2)	Timber Coulee Creek (2) Cady Creek (2)
Warmwater Forage & Sport Low Gradient	Milwaukee River South	Lincoln Creek (7)	Underwood Creek (3) Little Menomonee River (2)	E. Br. Milwaukee River (2) Oconomowoc River (2)

Table 3. Habitat and biological variables measured or estimated at stations during 1995 and afterward.

Habitat Variables		Biological Variables
Site Variables	Transect Variables	Site Variables
Location Information	Stream Width (m) Current Normal	Number Caught, by Species, of Fish
Temperature (°C) Air (at sampling) Water (at sampling) Water (continuous)	Cover For Fish (m) Undercut Bank Overhanging Vegetation Woody Debris Other Debris Boulders Submerged Macrophytes Emergent Macrophytes Other	Biomass Caught, by Species, of Fish
Conductivity (µmhos/cm)		Number Caught, by Species, of Fish with Deformities, Eroded Fins, Lesions, and/or Tumors
Turbidity (NTU)		
Dissolved Oxygen (mg/l^1)		Total Lengths of Individual Creek Chubs, White Suckers, Panfish, and Gamefish
Flow (m^3/sec)		
Water Level	Habitat Type Riffle Pool Run Other	Weights from a Subsample of Individual Smallmouth Bass
Gradient ($m\ km^{-1}$)		Scales (for age and growth) from a Subsample of Individual Smallmouth Bass
Stream Order	Water Depth (m)	
Basin Area (km^2)	Fine Sediment Depth (m)	Voucher Specimens for selected Fish Species
Channel Condition	Embeddedness of Rubble/Cobble and Gravel (m)	
Sinuosity		
Station Length (m)	Bottom Substrate (%) Bedrock Boulder Rubble/Cobble Gravel Sand Silt Clay Detritus Other	
Distance Between Bends (m) Riffles (m)		
Total Length of Riffles (m) Pools (m) Runs (m)	Algae Abundance (%)	
	Macrophyte Abundance (%)	
	Shading (%)	
	Bank Erosion (m and %; left and right banks)	
	Bank Land Use (%) Cropland Pasture Barnyard Developed Meadow Shrubs Woodland Wetland Exposed Rock Other	
	Riparian Buffer Width (m; left & right banks)	

Table 4. Summary of scores from fish Index of Biotic Integrity (IBI) and scores from Habitat Rating System for all streams that are being currently sampled. "-" indicates no data were collected. Coldwater IBI qualitative ratings: 0 = very poor, 10-20 = Poor, 30-50 = Fair, 60-80 = Good, 90-100 = Excellent; warmwater IBI qualitative ratings: 0-19 = Very poor, 20-29 = Poor, 30-49 = Fair, 50-64 = Good, 65-100 = Excellent. Qualitative habitat ratings for streams narrower than 10 m: <25 = Poor, 25-49 = Fair, 50-74 = Good, ≥75 = Excellent; for streams wider than 10 m: <20 = Poor, 20-59 = Fair, 60-79 = Good, ≥80 = Excellent. For stream stations with concrete channels, their habitat scores were set to zero. Some of the IBI and habitat scores may be slightly different from these in the previous annual reports because the IBI scores were corrected when total catch (excluding tolerant species) was less than 50/300 m^2 and habitat scores were corrected by using the mean of bend to bend ratios for each site from all sampling years.

			Fish Community			Habitat Quality		
Stream	Station	Year	Type of Water	IBI Score	Rating	Rating System	Score	Rating
Waumandee Creek Priority Watershed Study Area								
Eagle Creek	1	1992	Cold	0	Very Poor	Stream	45	Fair
	1	1993	Cold	0	Very Poor	Stream	60	Good
	1	1994	Cold	0	Very Poor	Stream	55	Good
	1	1995	Cold	0	Very Poor	Stream	63	Good
	1	1996	Cold	0	Very Poor	Stream	53	Good
	1	1997	Cold	0	Very Poor	Stream	60	Good
	1	2002	Cold	0	Very Poor	Stream	50	Good
	1	2003	Cold	20	Poor	Stream	59	Good
	1	2004	Cold	30	Fair	Stream	61	Good
	1	2005	Cold	20	Poor	Stream	67	Good
	1	2006	Cold	40	Fair	Stream	59	Good
Eagle Creek	2	1990	Cold	0	Very Poor	Stream	28	Fair
	2	1991	Cold	0	Very Poor	Stream	32	Fair
	2	1992	Cold	0	Very Poor	Stream	50	Good
	2	1993	Cold	0	Very Poor	Stream	60	Good
	2	1994	Cold	30	Fair	Stream	50	Good
	2	1995	Cold	0	Very Poor	Stream	60	Good
	2	1996	Cold	0	Very Poor	Stream	52	Good
	2	1997	Cold	0	Very Poor	Stream	57	Good
	2	2002	Cold	50	Fair	Stream	67	Good
	2	2003	Cold	40	Fair	Stream	75	Excellent
	2	2004	Cold	50	Fair	Stream	75	Excellent
	2	2005	Cold	50	Fair	Stream	79	Excellent
	2	2006	Cold	50	Fair	Stream	77	Excellent

Table 4 continued on next page .

Table 4 continued.

Stream	Station	Year	Fish Community			Habitat Quality		
			Type of Water	IBI Score	Rating	Rating System	Score	Rating
Waumandee Creek Priority Watershed Study Area (Continued)								
Eagle Creek	3	1992	Cold	0	Very Poor	Stream	60	Good
	3	1993	Cold	0	Very Poor	Stream	59	Good
	3	1994	Cold	0	Very Poor	Stream	54	Good
	3	1995	Cold	10	Poor	Stream	58	Good
	3	1996	Cold	0	Very Poor	Stream	58	Good
	3	1997	Cold	0	Very Poor	Stream	59	Good
	3	2002	Cold	30	Fair	Stream	68	Good
	3	2003	Cold	10	Poor	Stream	61	Good
	3	2004	Cold	40	Fair	Stream	67	Good
	3	2005	Cold	40	Fair	Stream	60	Good
	3	2006	Cold	60	Good	Stream	64	Good
Eagle Creek	4	1997	Cold	40	Fair	Stream	40	Fair
Joos Creek	1	1992	Cold	0	Very Poor	Stream	53	Good
	1	1994	Cold	0	Very Poor	Stream	47	Fair
	1	1995	Cold	0	Very Poor	Stream	49	Fair
	1	1996	Cold	0	Very Poor	Stream	74	Good
	1	1997	Cold	0	Very Poor	Stream	53	Good
	1	2002	Cold	0	Very Poor	Stream	69	Good
	1	2003	Cold	0	Very Poor	Stream	58	Good
	1	2004	Cold	0	Very Poor	Stream	72	Good
	1	2005	Cold	30	Fair	Stream	79	Excellent
	1	2006	Cold	0	Very Poor	Stream	74	Good
Joos Creek	2	1990	Cold	0	Very Poor	Stream	46	Fair
	2	1991	Cold	0	Very Poor	Stream	43	Fair
	2	1992	Cold	0	Very Poor	Stream	59	Good
	2	1993	Cold	0	Very Poor	Stream	66	Good
	2	1994	Cold	0	Very Poor	Stream	59	Good
	2	1995	Cold	0	Very Poor	Stream	60	Good
	2	1996	Cold	0	Very Poor	Stream	67	Good
	2	1997	Cold	0	Very Poor	Stream	63	Good
	2	2002	Cold	0	Very Poor	Stream	73	Good
	2	2003	Cold	0	Very Poor	Stream	78	Excellent
	2	2004	Cold	0	Very Poor	Stream	91	Excellent
	2	2005	Cold	0	Very Poor	Stream	86	Excellent
	2	2006	Cold	0	Very Poor	Stream	73	Good

Table 4 continued on next page .

Table 4 continued.

Stream	Station	Year	Fish Community: Type of Water	Fish Community: IBI Score	Fish Community: Rating	Habitat Quality: Rating System	Habitat Quality: Score	Habitat Quality: Rating
Waumandee Creek Priority Watershed Study Area (Continued)								
Joos Creek	3	1992	Cold	10	Poor	Stream	36	Fair
	3	1993	Cold	0	Very Poor	Stream	42	Fair
	3	1994	Cold	0	Very Poor	Stream	41	Fair
	3	1995	Cold	10	Poor	Stream	51	Good
	3	1996	Cold	0	Very Poor	Stream	56	Good
	3	1997	Cold	10	Poor	Stream	52	Good
	3	2002	Cold	0	Very Poor	Stream	40	Fair
	3	2003	Cold	0	Very Poor	Stream	53	Good
	3	2004	Cold	0	Very Poor	Stream	56	Good
	3	2005	Cold	0	Very Poor	Stream	55	Good
	3	2006	Cold	40	Fair	Stream	49	Fair
Joos Creek	4	1992	Cold	0	Very poor	Stream	62	Good
	4	1993	Cold	30	Fair	Stream	76	Excellent
	4	1994	Cold	0	Very Poor	Stream	67	Good
	4	1995	Cold	0	Very Poor	Stream	66	Good
	4	1996	Cold	0	Very Poor	Stream	66	Good
	4	1997	Cold	0	Very Poor	Stream	69	Good
	4	2002	Cold	0	Very Poor	Stream	77	Excellent
	4	2003	Cold	0	Very Poor	Stream	73	Good
	4	2004	Cold	30	Fair	Stream	85	Excellent
	4	2005	Cold	30	Fair	Stream	89	Excellent
	4	2006	Cold	30	Fair	Stream	76	Excellent
Joos Creek	5	1997	Cold	40	Fair	Stream	61	Good
Bohris Creek	1	1990	Cold	10	Poor	Stream	46	Fair
	1	1991	Cold	10	Poor	Stream	53	Good
	1	1992	Cold	10	Poor	Stream	59	Good
	1	1993	Cold	20	Poor	Stream	55	Good
	1	1994	Cold	50	Fair	Stream	46	Fair
	1	1995	Cold	20	Poor	Stream	50	Good
	1	1996	Cold	30	Fair	Stream	48	Fair
	1	1997	Cold	30	Fair	Stream	49	Fair
	1	2002	Cold	20	Poor	Stream	54	Good
	1	2003	Cold	20	Poor	Stream	55	Good
	1	2004	Cold	10	Poor	Stream	35	Fair
	1	2005	Cold	10	Poor	Stream	43	Fair
	1	2006	Cold	20	Poor	Stream	42	Fair

Table 4 continued on next page.
Table 4 continued.

Stream	Station	Year	Fish Community			Habitat Quality		
			Type of Water	IBI Score	Rating	Rating System	Score	Rating
Waumandee Creek Priority Watershed Study Area (Continued)								
Bohris Creek	2	1990	Cold	0	Very Poor	Stream	53	Good
	2	1991	Cold	0	Very Poor	Stream	57	Good
	2	1992	Cold	20	Poor	Stream	42	Fair
	2	1993	Cold	0	Very Poor	Stream	55	Good
	2	1994	Cold	0	Very Poor	Stream	48	Fair
	2	1995	Cold	20	Poor	Stream	44	Fair
	2	1996	Cold	10	Poor	Stream	52	Good
	2	1997	Cold	10	Poor	Stream	46	Fair
	2	2002	Cold	10	Poor	Stream	61	Good
	2	2003	Cold	0	Very Poor	Stream	45	Fair
	2	2004	Cold	0	Very Poor	Stream	61	Good
	2	2005	Cold	0	Very Poor	Stream	74	Good
	2	2006	Cold	0	Very Poor	Stream	53	Good
Trout Run Creek	1	1990	Cold	10	Poor	Stream	38	Fair
	1	1991	Cold	10	Poor	Stream	46	Fair
	1	1992	Cold	20	Poor	Stream	40	Fair
	1	1993	Cold	20	Poor	Stream	41	Fair
	1	1994	Cold	0	Very Poor	Stream	40	Fair
	1	1995	Cold	10	Poor	Stream	53	Good
	1	1996	Cold	10	Poor	Stream	35	Fair
	1	1997	Cold	30	Fair	Stream	35	Fair
	1	2002	Cold	20	Poor	Stream	45	Fair
	1	2003	Cold	0	Very Poor	Stream	36	Fair
	1	2004	Cold	30	Fair	Stream	39	Fair
	1	2005	Cold	10	Poor	Stream	49	Fair
	1	2006	Cold	0	Very Poor	Stream	41	Fair
Trout Run Creek	2	1994	Cold	0	Fair	Stream	31	Fair
	2	1995	Cold	0	Very Poor	Stream	32	Fair
	2	1996	Cold	0	Very Poor	Stream	27	Fair
	2	1997	Cold	0	Very Poor	Stream	28	Fair
	2	2002	Cold	30	Fair	Stream	44	Fair
	2	2003	Cold	30	Fair	Stream	39	Fair
	2	2004	Cold	50	Fair	Stream	28	Fair
	2	2005	Cold	60	Good	Stream	33	Fair
	2	2006	Cold	20	Poor	Stream	30	Fair

Table 4 continued on next page .

Table 4 continued.

Stream	Station	Year	Fish Community: Type of Water	Fish Community: IBI Score	Fish Community: Rating	Habitat Quality: Rating System	Habitat Quality: Score	Habitat Quality: Rating
Waumandee Creek Priority Watershed Study Area (Continued)								
Timber Coulee Creek	1	1993	Cold	80	Good	Stream	59	Good
	1	1994	Cold	80	Good	Stream	59	Good
	1	1995	Cold	50	Good	Stream	63	Good
	1	1996	Cold	60	Good	Stream	64	Good
	1	1997	Cold	70	Good	Stream	54	Good
	1	2002	Cold	60	Good	Stream	62	Good
	1	2003	Cold	40	Fair	Stream	67	Good
	1	2004	Cold	60	Good	Stream	64	Good
	1	2005	Cold	50	Fair	Stream	72	Good
	1	2006	Cold	50	Fair	Stream	71	Good
Timber Coulee Creek	2	1994	Cold	70	Good	Stream	72	Good
	2	1995	Cold	60	Good	Stream	64	Good
	2	1996	Cold	60	Good	Stream	50	Good
	2	1997	Cold	70	Good	Stream	50	Good
	2	2002	Cold	60	Good	Stream	79	Excellent
	2	2003	Cold	60	Good	Stream	82	Excellent
	2	2004	Cold	60	Good	Stream	80	Excellent
	2	2005	Cold	50	Fair	Stream	88	Excellent
	2	2006	Cold	60	Good	Stream	88	Excellent
Cady Creek	1	1995	Cold	90	Excellent	Stream	72	Good
	1	1996	Cold	90	Excellent	Stream	74	Good
	1	1997	Cold	90	Excellent	Stream	69	Good
	1	2002	Cold	100	Excellent	Stream	63	Good
	1	2003	Cold	100	Excellent	Stream	56	Good
	1	2004	Cold	90	Excellent	Stream	75	Excellent
	1	2005	Cold	80	Good	Stream	71	Good
	1	2006	Cold	100	Excellent	Stream	71	Good
Cady Creek	2	1995	Cold	90	Excellent	Stream	69	Good
	2	1996	Cold	100	Excellent	Stream	61	Good
	2	1997	Cold	90	Excellent	Stream	66	Good
	2	2002	Cold	100	Excellent	Stream	70	Good
	2	2003	Cold	90	Excellent	Stream	60	Good
	2	2004	Cold	100	Excellent	Stream	80	Excellent
	2	2005	Cold	90	Excellent	Stream	78	Excellent
	2	2006	Cold	100	Excellent	Stream	73	Good

Table 4 continued on next page .

Table 4 continued.

Stream	Station	Year	Fish Community			Habitat Quality		
			Type of Water	IBI Score	Rating	Rating System	Score	Rating
Milwaukee River South Priority Watershed Study Area								
Lincoln Creek	1	1994	Warm	0	Very Poor	Stream	0	Poor
	1	1995	Warm	37	Fair	Stream	0	Poor
	1	1996	Warm	0	Very Poor	Stream	0	Poor
	1	1997	Warm	0	Very Poor	Stream	0	Poor
	1	1998	Warm	0	Very Poor	Stream	0	Poor
	1	2004	Warm	25	Poor	Stream	46	Fair
	1	2005	Warm	25	Poor	Stream	60	Good
	1	2006	Warm	40	Fair	Stream	55	Good
	1	2007	Warm	5	Very Poor	Stream	60	Good
	1	2008	Warm	10	Very Poor	Stream	60	Good
Lincoln Creek	4	1992	Warm	15	Very Poor	River	29	Fair
	4	1993	Warm	5	Very Poor	River	31	Fair
	4	1994	Warm	15	Very Poor	River	37	Fair
	4	1995	Warm	12	Very Poor	River	28	Fair
	4	1996	Warm	0	Very Poor	River	31	Fair
	4	1997	Warm	0	Very Poor	River	30	Fair
	4	1998	Warm	0	Very Poor	River	35	Fair
	4	2004	Warm	35	Fair	River	67	Good
	4	2005	Warm	10	Very Poor	River	61	Good
	4	2006	Warm	30	Fair	River	71	Good
	4	2007	Warm	20	Poor	River	64	Good
	4	2008	Warm	5	Very Poor	River	50	Fair
Lincoln Creek	5	1994	Warm	0	Very Poor	Stream	0	Poor
	5	1995	Warm	0	Very Poor	Stream	0	Poor
	5	1996	Warm	0	Very Poor	Stream	0	Poor
	5	1997	Warm	0	Very Poor	Stream	0	Poor
	5	1998	Warm	0	Very Poor	Stream	0	Poor
	5	2004	Warm	15	Very Poor	Stream	81	Excellent
	5	2005	Warm	15	Very Poor	Stream	86	Excellent
	5	2006	Warm	20	Poor	Stream	91	Excellent
	5	2007	Warm	15	Very Poor	Stream	98	Excellent
	5	2008	Warm	35	Fair	Stream	60	Good

Table 4 continued on next page.

Table 4 continued.

Stream	Station	Year	Fish Community: Type of Water	Fish Community: IBI Score	Fish Community: Rating	Habitat Quality: Rating System	Habitat Quality: Score	Habitat Quality: Rating
Milwaukee River South Priority Watershed Study Area (Continued)								
Lincoln Creek	6	1994	Warm	0	Very Poor	Stream	0	Poor
	6	1995	Warm	0	Very Poor	Stream	0	Poor
	6	1996	Warm	0	Very Poor	Stream	0	Poor
	6	1997	Warm	0	Very Poor	Stream	0	Poor
	6	1998	Warm	0	Very Poor	Stream	0	Poor
	6	2004	Warm	10	Very Poor	Stream	83	Excellent
	6	2005	Warm	15	Very Poor	Stream	81	Excellent
	6	2006	Warm	30	Fair	Stream	87	Excellent
	6	2007	Warm	20	Poor	Stream	90	Excellent
	6	2008	Warm	35	Fair	Stream	82	Excellent
Lincoln Creek	7	1994	Warm	5	Very Poor	Stream	33	Fair
	7	1995	Warm	0	Very Poor	Stream	58	Good
	7	1996	Warm	0	Very Poor	Stream	16	Very poor
	7	1997	Warm	0	Very Poor	Stream	44	Fair
	7	1998	Warm	25	Poor	Stream	35	Fair
	7	2004	Warm	10	Very Poor	Stream	73	Good
	7	2005	Warm	5	Very Poor	Stream	73	Good
	7	2006	Warm	25	Poor	Stream	71	Good
	7	2007	Warm	20	Poor	Stream	74	Good
	7	2008	Warm	20	Poor	Stream	72	Good
Lincoln Creek	8	1994	Warm	0	Very Poor	Stream	39	Fair
	8	1995	Warm	0	Very Poor	Stream	41	Fair
	8	1996	Warm	0	Very Poor	Stream	40	Fair
	8	1997	Warm	0	Very Poor	Stream	44	Fair
	8	1998	Warm	0	Very Poor	Stream	43	Fair
	8	2004	Warm	0	Very Poor	Stream	72	Good
	8	2005	Warm	15	Very Poor	Stream	66	Good
	8	2006	Warm	15	Very Poor	Stream	67	Good
	8	2007	Warm	15	Very Poor	Stream	63	Good
	8	2008	Warm	20	Poor	Stream	66	Good

Table 4 continued on next page .

Table 4 continued.

Stream	Station	Year	Fish Community			Habitat Quality		
			Type of Water	IBI Score	Rating	Rating System	Score	Rating
Milwaukee River South Priority Watershed Study Area (Continued)								
Lincoln Creek	9	1994	Warm	0	Very Poor	Stream	35	Fair
	9	1995	Warm	0	Very Poor	Stream	33	Fair
	9	1996	Warm	0	Very Poor	Stream	27	Fair
	9	1997	Warm	5	Very Poor	Stream	35	Fair
	9	1998	Warm	0	Very Poor	Stream	31	Fair
	9	2004	Warm	0	Very Poor	Stream	75	Excellent
	9	2005	Warm	5	Very Poor	Stream	70	Good
	9	2006	Warm	15	Very Poor	Stream	57	Good
	9	2007	Warm	15	Very Poor	Stream	46	Fair
	9	2008	Warm	20	Poor	Stream	66	Good
Lincoln Creek	10	1997	Warm	0	Very Poor	Stream	0	Poor
	10	1998	Warm	0	Very Poor	Stream	0	Poor
	10	2004	Warm	0	Very Poor	Stream	30	Fair
	10	2005	Warm	0	Very Poor	Stream	30	Fair
	10	2006	Warm	0	Very Poor	Stream	30	Fair
	10	2007	Warm	0	Very Poor	Stream	26	Fair
	10	2008	Warm	0	Very Poor	Stream	27	Fair
Little Menomonee River	1	1995	Warm	35	Fair	Stream	37	Fair
	1	1996	Warm	37	Fair	Stream	43	Fair
	1	1997	Warm	0	Very Poor	Stream	44	Fair
	1	1998	Warm	30	Fair	Stream	38	Fair
	1	2004	Warm	32	Fair	Stream	44	Fair
	1	2005	Warm	22	Poor	Stream	49	Fair
	1	2006	Warm	50	Good	Stream	42	Fair
	1	2007	Warm	27	Poor	Stream	40	Fair
	1	2008	Warm	32	Fair	Stream	43	Fair
Little Menomonee River	2	1995	Warm	7	Very Poor	Stream	30	Fair
	2	1996	Warm	35	Fair	Stream	38	Fair
	2	1997	Warm	20	Poor	Stream	40	Fair
	2	1998	Warm	30	Fair	Stream	40	Fair
	2	2004	Warm	22	Poor	Stream	33	Fair

	2	2005	Warm	5	Very Poor	Stream	37	Fair
	2	2006	Warm	22	Poor	Stream	37	Fair
	2	2007	Warm	27	Poor	Stream	31	Fair
	2	2008	Warm	25	Poor	Stream	36	Fair

Table 4 continued on next page .

Table 4 continued.

			Fish Community			Habitat Quality		
Stream	Station	Year	Type of Water	IBI Score	Rating	Rating System	Score	Rating
Milwaukee River South Priority Watershed Study Area (Continued)								
Underwood Creek	2	1994	Warm	0	Very Poor	River	0	Poor
	2	1995	Warm	0	Very Poor	River	0	Poor
	2	1996	Warm	0	Very Poor	River	0	Poor
	2	1997	Warm	0	Very Poor	River	0	Poor
	2	1998	Warm	0	Very Poor	River	0	Poor
	2	2004	Warm	0	Very Poor	River	12	Poor
	2	2005	Warm	20	Poor	River	12	Poor
	2	2006	Warm	0	Very Poor	River	12	Poor
	2	2007	Warm	10	Very Poor	River	12	Poor
	2	2008	Warm	0	Very Poor	River	12	Poor
Underwood Creek	4	1991	Warm	0	Very Poor	Stream	41	Fair
	4	1992	Warm	0	Very Poor	Stream	27	Fair
	4	1993	Warm	20	Poor	Stream	38	Fair
	4	1994	Warm	20	Poor	Stream	25	Fair
	4	1995	Warm	20	Poor	Stream	31	Fair
	4	1996	Warm	30	Fair	Stream	34	Fair
	4	1997	Warm	0	Very Poor	Stream	31	Fair
	4	1998	Warm	0	Very Poor	Stream	31	Fair
	4	2004	Warm	15	Very Poor	Stream	36	Fair
	4	2005	Warm	37	Fair	Stream	39	Fair
	4	2006	Warm	5	Very Poor	Stream	53	Good
	4	2007	Warm	5	Very Poor	Stream	43	Fair
	4	2008	Warm	20	Poor	Stream	55	Good
Underwood Creek	5	1991	Warm	15	Very Poor	Stream	77	Excellent
	5	1994	Warm	15	Very Poor	Stream	49	Fair
	5	1995	Warm	25	Poor	Stream	57	Good
	5	1996	Warm	20	Poor	Stream	54	Good
	5	1997	Warm	0	Very Poor	Stream	58	Good
	5	1998	Warm	20	Poor	Stream	48	Fair
	5	2004	Warm	20	Poor	Stream	40	Fair
	5	2005	Warm	40	Fair	Stream	48	Fair
	5	2006	Warm	15	Very Poor	Stream	65	Good

	5	2007	Warm	5	Very Poor	Stream	58	Good
	5	2008	Warm	10	Very Poor	Stream	73	Good

Table 4 continued on next page .

Table 4 continued.

			Fish Community			Habitat Quality		
Stream	Station	Year	Type of Water	IBI Score	Rating	Rating System	Score	Rating
Milwaukee River South Priority Watershed Study Area (Continued)								
East Branch Milwaukee River	2	1994	Warm	58	Good	Stream	39	Fair
	2	1995	Warm	40	Fair	Stream	45	Fair
	2	1996	Warm	45	Fair	Stream	36	Fair
	2	1997	Warm	44	Fair	Stream	54	Good
	2	1998	Warm	49	Fair	Stream	46	Fair
	2	2004	Warm	55	Good	Stream	56	Good
	2	2005	Warm	60	Good	Stream	46	Fair
	2	2006	Warm	50	Good	Stream	56	Good
	2	2007	Warm	52	Good	Stream	50	Good
	2	2008	Warm	50	Good	Stream	39	Fair
East Branch Milwaukee River	3	1993	Warm	54	Good	River	56	Good
	3	1994	Warm	44	Fair	River	41	Fair
	3	1995	Warm	62	Good	River	41	Fair
	3	1996	Warm	52	Good	River	50	Good
	3	1997	Warm	50	Good	River	46	Fair
	3	1998	Warm	60	Good	River	49	Fair
	3	2004	Warm	50	Good	River	61	Good
	3	2005	Warm	55	Good	River	52	Fair
	3	2006	Warm	57	Good	River	48	Fair
	3	2007	Warm	50	Good	River	62	Good
	3	2008	Warm	50	Good	River	60	Good
Oconomowoc River	1	1993	Warm	57	Good	Stream	69	Good
	1	1994	Warm	57	Good	Stream	57	Good
	1	1995	Warm	59	Good	Stream	50	Good
	1	1996	Warm	45	Fair	Stream	57	Good
	1	1997	Warm	42	Fair	Stream	56	Good
	1	1998	Warm	57	Good	Stream	68	Good
	1	2004	Warm	62	Good	Stream	66	Good
	1	2005	Warm	45	Fair	Stream	53	Good

	1	2006	Warm	57	Good	Stream	52	Good
	1	2007	Warm	45	Fair	Stream	41	Fair
	1	2008	Warm	50	Good	Stream	63	Good

Table 4 continued on next page .

Table 4 continued.

			Fish Community			Habitat Quality		
Stream	Station	Year	Type of Water	IBI Score	Rating	Rating System	Score	Rating
Milwaukee River South Priority Watershed Study Area (Continued)								
Oconomowoc River	2	1995	Warm	46	Fair	Stream	52	Good
	2	1996	Warm	61	Good	Stream	43	Fair
	2	1997	Warm	42	Fair	Stream	49	Fair
	2	1998	Warm	57	Good	Stream	45	Fair
	2	2004	Warm	54	Good	Stream	58	Good
	2	2005	Warm	65	Excellent	Stream	49	Fair
	2	2006	Warm	45	Fair	Stream	65	Good
	2	2007	Warm	52	Good	Stream	49	Fair
	2	2008	Warm	55	Good	Stream	63	Good

APPENDICES

APPENDIX 1 -- SITE LOCATION INFORMATION AND MAPS

Table A1.1. Locations of study sites for full habitat and biological sampling .

Stream	Site	Start Location	Transect Spacing (m)	Station Length (m)
Waumandee Creek Priority Watershed Study Area				
Eagle Creek	1	28 m upstream of County Highway G bridge, above gauging station; T20N R11W S15 SW1/16 NE1/4; Buffalo County	8.5	105
Eagle Creek	2	97 m upstream of ford at Fetting farm; first above confluence with Joos Creek, off of Schaffner Valley Road; T20N R11W S10 NW1/16 SE1/4; Buffalo County	7	90
Eagle Creek	3	20 m upstream of private driveway bridge at Stettler farm, off of Schaffner Valley Road; T20N R11W S3 SW1/16 SE1/4; Buffalo County	6.5	86
Eagle Creek	4	110 m downstream from the last bridge crossing at Eagle Valley Road; T21N R11W S3 sw1/16 SE1/4; Buffalo County	9	110
Joos Creek	1	133 m downstream of private driveway bridge at Dust Farm, off of Joos Valley Road; T20N R11W S14 NE1/16 NW1/4; Buffalo County	8	100
Joos Creek	2	144 m upstream of private driveway bridge at Dust farm, off of Joos Valley Road; T20N R11W S14 NE1/16 NW1/4; Buffalo County	6.5	85
Joos Creek	3	At top of first riffle above ford at Ratz farm, off of Joos Valley Road; T20N R11W S11 SE1/16 SE1/4; Buffalo County	11	139
Joos Creek	4	58 m upstream of ford at Slaby farm, off Joos Hollow Road; T20N R11W S1 SW1/16 SE1/4; Buffalo County	8.5	106
Joos Creek	5	205 m downstream from the farm road at where the Joos Valley Road turns to the right; T20N R10W S6 SE1/16 NW ¼; Buffalo County	9	155
Bohris Creek	1	200 m downstream of County Highway P bridge at Field Road; T19N R10W S5 NE1/16 SE1/4; Buffalo County	10	130
Bohris Creek	2	128 m upstream of Brandhorst Road bridge; T19N R10W S6 SE/16 SE1/4; Buffalo County	6.5	88
Trout Run Creek	1	130 m downstream of County Highway J bridge; T20N R10W S15 NW1/16 NW1/4; Trempealeau County	8	100
Trout Run Creek	2	30 m upstream of the farm road off Trout Run road; T20N R10W S15 SW1/16 NE1/4; Trempealeau County	9	117
Timber Coulee Creek	1	18 m upstream of confluence with Rullands Coulee Creek, 257 m downstream of County Highway P bridge; T14N R4W S6 NE1/16 NW1/4; Vernon County	14	175
Timber Coulee Creek	2	106 m upstream from the bridge at County Highway T; T14N R4W S8 NW1/16 NE1/4; Vernon County	21	274
Cady Creek	1	95 m downstream of path that leads to camp off 850th Ave.; T27N R15W S11 NW1/16 NW1/4; Pierce County	15	185
Cady Creek	2	243 m downstream from 850th Ave. bridge; T27N R15W S11 NW1/16 NW1/4; Pierce County	15	171

Table A1.1 continued.

Stream	Site	Start Location	Transect Spacing (m)	Station Length (m)
Milwaukee River South Priority Watershed Study Area				
Lincoln Creek	1	184 m downstream of West Cameron Avenue; T8N R21E S36 SE1/16 SE1/4; Milwaukee County	12	144
Lincoln Creek	4	At intersection of West Congress and North 47th Streets, just above grade control structure; T7N R21E S2 SW1/16 NE1/4; Milwaukee County	23	300
Lincoln Creek	5	184 m downstream from the walkway bridge off of Stark Road (65 m upstream from Hampton Avenue); T8N R21E S34 SE1/16 SE1/4; Milwaukee County	12	144
Lincoln Creek	6	210 m downstream from Silver Spring Road bridge; T8N R21E S35 NW1/16 SW1/4; Milwaukee County	12	144
Lincoln Creek	7	233 m downstream from railroad bridge by the fence of the military base inside of the park; T8N R21E S26 NE1/16 SW1/4; Milwaukee County	13	176
Lincoln Creek	8	119 m downstream from railroad crossing inside of the park; T8N R21E S26 SE1/16 NW1/4; Milwaukee County	12	144
Lincoln Creek	9	184 m downstream from bridge at Green Tree Road; T8N R21E S23 NE1/16 SW1/4; Milwaukee County	12	146
Lincoln Creek	10	400 m downstream from Hwy 181; T8N R21E S15 SW1/16 SW ¼, Milwaukee County	9	116
Little Menomonee River	1	181 m downstream from bridge at Donges Bay Road; T9N R21E S32 NW1/16 NW1/4; Ozaukee County	8	100
Little Menomonee River	2	10 m upstream from bridge at Donges Bay Road; T9N R21E S29 SE1/16 SW1/4; Ozaukee County	12	144
Underwood Creek	2	60 m upstream from bridge at 115th Street; T7N R21E S30 NW1/16 NE1/4; Waukesha County	18	216
Underwood Creek	4	266 m downstream of North Avenue bridge, along Underwood Creek Parkway; T7N R20E S23 NE1/16 NE1/4; Waukesha County	9	101
Underwood Creek	5	165 m downstream of North Avenue bridge, along Underwood Creek Parkway; T7N R20E S23 NE1/16 NE1/4; Waukesha County	9	120
East Branch Milwaukee River	2	470 m downstream of County Highway SS in New Prospect; T13N R19E S11 NE1/16 NE1/4; Fond du Lac County	24	283
East Branch Milwaukee River	3	50 m upstream of horse trail bridge off of dirt road that heads north for about 1.5 km off of Highway SS about 600 m east of the highway crossing of the river; T14N R19E S36 NE1/16 SW1/4; Fond du Lac County	30	380
Oconomowoc River	1	73 m upstream of St. Augustine Road bridge; T9N R19E S30 NW1/16 NW1/4; Washington County	24	304
Oconomowoc River	2	340 m downstream of Elmwood Road bridge; T9N R19E S30 NW1/16 NE1/4; Washington County	24	279

Figure A1.1. Waumandee Creek Priority Watershed Study Area, Buffalo County (approximate watershed boundary indicated by dashed line). Solid circles indicate Treatment sites on Eagle Creek and Joos Creek (a tributary of Eagle Creek), and Paired Reference sites on Trout Run Creek, Bohris Creek. All Reference Sites are part of the Lower Trempealeau River Watershed, Buffalo and Trempealeau Counties.

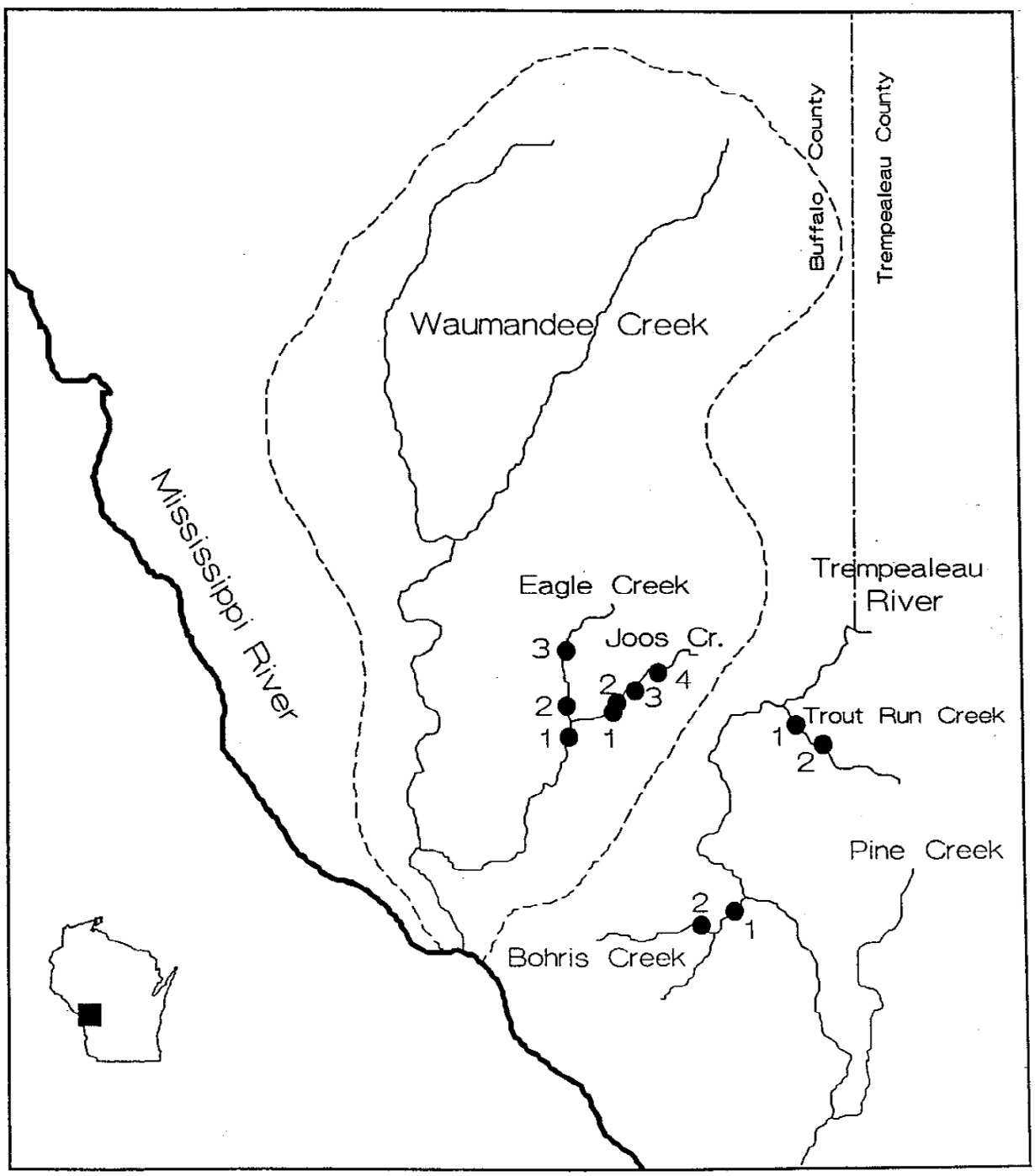
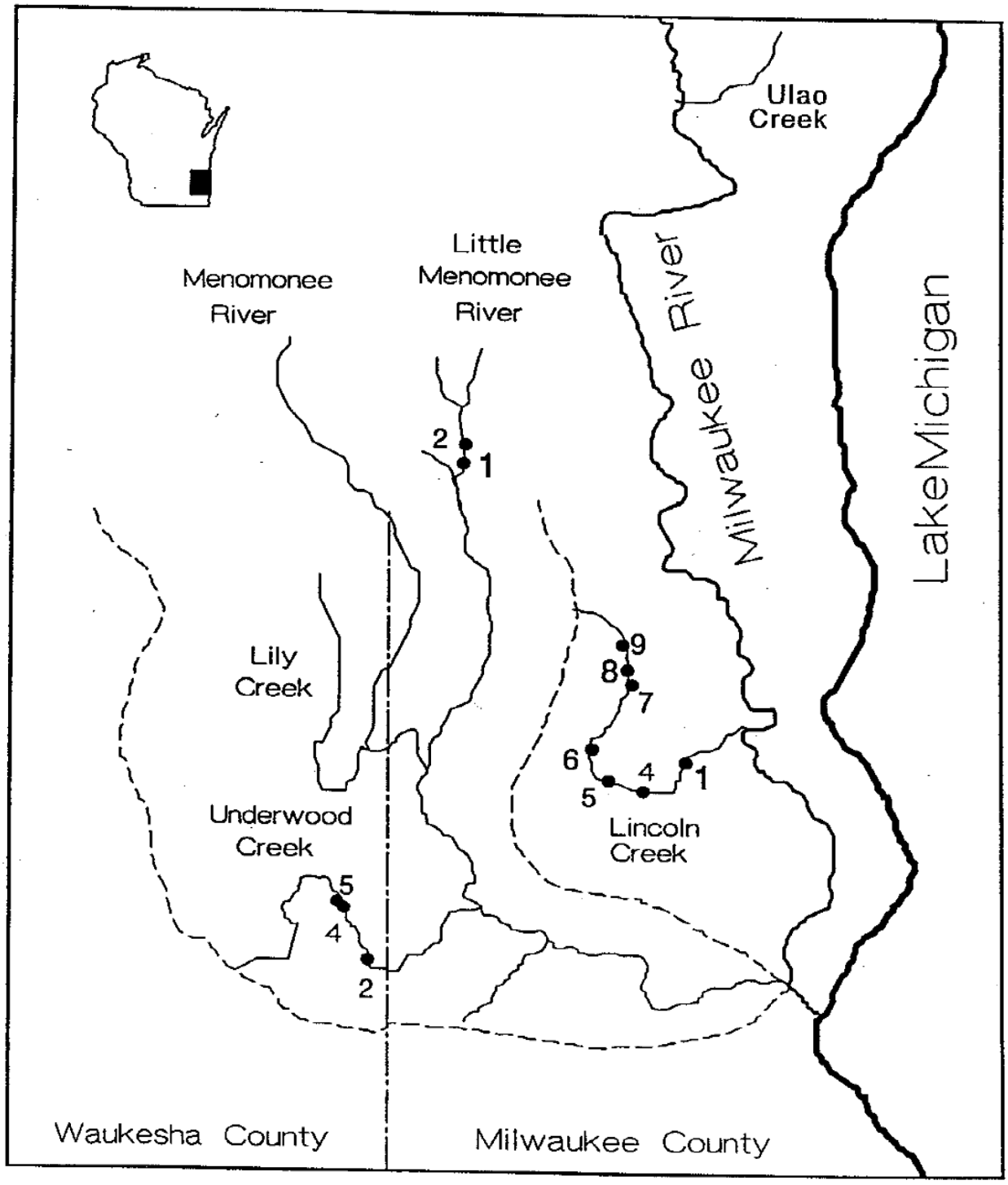


Figure A1.2. Milwaukee River South Priority Watershed Study Area, Milwaukee and Waukesha Counties (approximate watershed boundary indicated by dashed line). Solid circles indicate Treatment sites located on Lincoln Creek and Paired Reference sites located on Underwood Creek and Little Menomonee River.



APPENDIX 2 -- HABITAT DATA SUMMARIES

Table A2.1. Summary of selected site-level characteristics for sites sampled.

Stream	Waterbody Identification Code	Site	Type[1]	County	Site Mile	Gradient (m km^{-1})	Stream Order	Basin Area (km^2)	Site Length (m)
Waumandee Creek Priority Watershed Study Area									
Eagle Creek	1808400	1	TRT	Buffalo	9.0	3.0	4	37.0	105
Eagle Creek	1808400	2	TRT	Buffalo	9.7	5.1	3	17.6	90
Eagle Creek	1808400	3	TRT	Buffalo	11.4	9.9	2	13.7	86
Eagle Creek	1808400	4	REF	Buffalo	15.3	14.9	2	2.7	110
Joos Creek	1808900	1	TRT	Buffalo	0.6	5.8	3	15.6	100
Joos Creek	1808900	2	TRT	Buffalo	0.8	5.8	3	15.2	85
Joos Creek	1808900	3	TRT	Buffalo	1.3	5.9	3	13.9	139
Joos Creek	1808900	4	TRT	Buffalo	3.1	6.3	3	9.5	106
Joos Creek	1808900	5	REF	Buffalo	4.3	10.1	2	8.4	155
Bohris Creek	1774200	1	PRR	Buffalo	0.7	4.1	3	24.0	130
Bohris Creek	1774200	2	PRR	Buffalo	2.1	6.1	3	11.8	87
Trout Run Creek	1775000	1	PRR	Trempealeau	0.4	4.1	3	19.3	100
Trout Run Creek	1775000	2	PRR	Trempealeau	1.3	4.3	3	16.2	117
Timber Coulee Creek	1646300	1	REG	Vernon	4.7	5.0	3	35.2	175
Timber Coulee Creek	1646300	2	REG	Vernon	6.8	8.6	3	21.3	274
Cady Creek	0205800	1	REG	Pierce	6.0	8.2	3	36.4	185
Cady Creek	0205800	2	REG	Pierce	6.2	7.4	3	35.9	171
Milwaukee River South Priority Watershed Study Area									
Lincoln Creek	0025800	1	TRT	Milwaukee	1.4	4.7	2[2]	53.1	144
Lincoln Creek	0025800	4	TRT	Milwaukee	3.3	1.1	2[2]	39.6	245
Lincoln Creek	0025800	5	TRT	Milwaukee	4.5	2.0	2[2]	31.1	144
Lincoln Creek	0025800	6	TRT	Milwaukee	5.6	3.0	1[2]	23.3	144
Lincoln Creek	0025800	7	TRT	Milwaukee	6.3	2.7	1[2]	18.1	176
Lincoln Creek	0025800	8	TRT	Milwaukee	6.7	2.7	1[2]	15.3	144
Lincoln Creek	0025800	9	TRT	Milwaukee	7.3	2.2	1[2]	11.1	146
Underwood Creek	0016700	2	PRR	Milwaukee	1.9	2.4	3	44.9	216
Underwood Creek	0016700	4	PRR	Waukesha	4.9	0.3	3	18.1	91
Underwood Creek	0016700	5	PRR	Waukesha	5.0	0.3	3	18.6	96
Little Menomonee River	0017600	1	PRR	Ozaukee	7.9	0.5	2	20.7	154
Little Menomonee River	0017600	2	PRR	Ozaukee	8.0	0.5	2	20.7	180
East Br. Milwaukee R.	0036900	2	REG	Waukesha	12.7	0.9	3	44.4	283
East Br. Milwaukee R.	0036900	3	REG	Fond du Lac	14.6	0.4	3	85.2	380
Oconomowoc River	0848200	1	REG	Washington	33.5	1.3	3	51.6	304
Oconomowoc River	0848200	2	REG	Washington	34.0	1.3	3	59.9	279

[1] TRT = treatment site; PRR = paired reference site with varied environmental quality; REG = regional least-impacted reference site; REF = reference site sampled one time.

[2] Stream order for these stations are artificially low because many or all former tributaries have been eliminated or routed through underground pipes and thus do not appear on current 1:24000 topographic maps.

Table A2.2. Instantaneous physical and chemical measurements from sites sampled. An "-" indicates that no data were collected.

Stream Station	Year	Month	Day	Time (24 hrs)	Air Temperature (°C)	Water Temperature (°C)	Conductivity (μmhos cm^{-1})	Turbidity (NTU)	Dissolved Oxygen (mg l^{-1})	Discharge (m^3 sec^{-1})
Waumandee Creek Priority Watershed Study Area										
Eagle Creek										
1	1992	7	30	1310	22	16	522	13.5	9.4	0.22
1	1993	7	22	1210	27	15	527	-	-	0.41
1	1994	7	26	0755	18	14	540	16.0	10.2	0.23
1	1995	7	26	0952	25	17	510	7.0	8.0	0.21
1	1996	7	23	1330	27	20	505	4.3	.	0.12
1	1997	7	7	1127	24	15	515	-	-	0.2
1	2002	7	16	1122	30	18	555	-	11.8	0.26
1	2003	7	30	1030	28	16	520	-	8.6	0.15
1	2004	7	27	1051	27	15	520	-	10.0	0.24
1	2005	8	2	936	25	17	517	-	7.0	0.14
1	2006	7	26	1106	29	18	527	-	7.9	0.14
2	1990	8	9	1000	26	15	555	-	-	0.09
2	1991	7	29	1227	22	15	493	7.5	12.6	0.14
2	1992	7	21	0907	22	15	519	-	10.2	0.12
2	1993	7	22	0915	20	11	528	17.0	10.3	0.18
2	1994	7	26	1020	19	15	540	7.5	10.5	0.14
2	1995	7	26	1308	26	21	510	4.5	9.8	0.14
2	1996	7	23	1330	27	20	505	4.3	.	0.12
2	1997	7	8	0900	17	14	522	-	-	0.12
2	2002	7	16	1231	32	19	550	-	12.5	0.14
2	2003	7	30	1135	28	17	520	-	10.2	0.13
2	2004	7	27	1328	27	18	515	-	10.3	0.12
2	2005	8	1	1530	28	20	507	-	7.4	0.10
2	2006	7	26	1232	32	19	518	-	9.3	0.08
3	1992	8	6	1000	24	14	544	12.4	8.4	0.06
3	1993	7	21	1330	23	19	530	13.0	-	0.09
3	1994	7	26	1300	21	18	523	12.0	9.8	0.06
3	1995	7	27	943	22	17	527	17.5	8.5	0.06
3	1996	7	24	1330	27	20	505	4.3	.	0.08
3	1997	7	8	1130	20	15	525	-	-	0.08
3	2002	7	16	1447	32	22	549	-	10.8	0.06
3	2003	7	30	1330	27	19	537	-	9.0	0.05
3	2004	7	27	1540	30	20	516	-	9.6	0.05
3	2005	8	2	1200	26	19	530	-	6.6	0.04
3	2006	7	26	1409	36	22	541	-	7.3	0.04
4	1997	7	8	1025	19	13	540	-	-	0.01

Table A2.2 continued on next page.

Table A2.2 continued.

Stream Station	Year	Month	Day	Time (24 hrs)	Air Temperature (°C)	Water Temperature (°C)	Conductivity (μmhos cm^{-1})	Turbidity (NTU)	Dissolved Oxygen (mg l^{-1})	Discharge (m^3 sec^{-1})
Waumandee Creek Priority Watershed Study Area (Continued)										
Joos Creek										
1	1992	8	5	1320	27	22	501	16.4	9.4	0.08
1	1994	7	26	0830	17	15	529	3.0	10.2	0.08
1	1995	7	26	1015	24	20	469	17.5	12.1	0.08
1	1996	7	23	1039	24	18	470	8.4	9.2	0.04
1	1997	7	15	1115	28	21	407	2.7	-	0.05
1	2002	7	17	1340	34	23	534	-	12.1	0.10
1	2003	7	29	1047	24	18	521	-	5.6	0.08
1	2004	8	4	1227	27	18	529	-	9.6	0.11
1	2005	8	2	1337	31	25	505	-	8.5	0.07
1	2006	7	26	1550	31	24	524	-	7.3	0.05
2	1990	8	7	1725	27	27	529	-	-	0.07
2	1991	7	30	1245	26	21	488	5.9	17.0	0.07
2	1992	7	21	1220	25	21	486	5.1	11.0	0.08
2	1993	7	21	0930	21	14	542	12.5	11.2	0.15
2	1994	7	26	0830	17	15	529	3.0	10.2	0.08
2	1995	7	27	1500	24	20	469	17.5	12.1	0.08
2	1996	7	23	1437	24	23	440	6.3	8.5	0.07
2	1997	7	22	1426	21	18	510	4.6	-	0.05
2	2002	7	17	1340	34	23	534	-	12.1	0.10
2	2003	7	29	1047	24	18	521	-	5.6	0.08
2	2004	8	4	1227	27	18	529	-	9.6	0.11
2	2005	8	2	1337	31	23	505	-	8.5	0.07
2	2006	8	1	1550	31	24	524	-	7.3	0.05
3	1992	8	6	1330	21	16	532	3.8	10.5	0.07
3	1993	7	20	1300	25	18	533	17.0	11.0	0.15
3	1994	7	26	1433	23	17	500	6.1	11.8	0.08
3	1995	7	27	0936	27	19	490	2.9	-	0.08
3	1996	7	23	1200	21	22	475	7.9	9.7	0.12
3	1997	7	15	1100	30	20	540	2.5	10.7	0.05
3	2002	7	17	1129	30	21	549	-	13.9	0.09
3	2003	7	29	1520	29	23	504	-	3.8	0.10
3	2004	8	4	1430	26	19	523	-	10.6	0.08
3	2005	8	3	0947	32	20	527	-	10.4	0.06
3	2006	8	2	1420	24	20	486	-	3.5	0.07

Table A2.2 continued on next page.

Table A2.2 continued.

Stream Station	Year	Month	Day	Time (24 hrs)	Air Temperature (^oC)	Water Temperature (^oC)	Conductivity ($\mu mhos\ cm^{-1}$)	Turbidity (NTU)	Dissolved Oxygen ($mg\ l^{-1}$)	Discharge ($m^3\ sec^{-1}$)
Waumandee Creek Priority Watershed Study Area (Continued)										
Joos Creek										
4	1992	7	31	0840	22	13	537	4.6	9.2	0.05
4	1993	7	20	0922	23	13	524	6.5	11.0	0.10
4	1994	7	26	1630	24	18	486	11.0	10.2	0.05
4	1995	8	1	1508	29	22	495	6.0	-	0.06
4	1996	7	23	1000	19	15	493	3.6	11	0.08
4	1997	7	22	0945	17	14	572	5.4	8.5	0.04
4	2002	7	24	1445	22	15	565	-	10.9	0.06
4	2003	7	29	1030	33	22	519	-	4.5	0.04
4	2004	8	4	1617	28	19	527	-	9.2	0.05
4	2005	8	3	1417	28	18	526	-	7.8	0.00
4	2006	8	2	1000	24	17	479	-	4.1	0.08
5	1997	8	4	1400	21	18	580	3.1	7.7	0.03
Bohris Creek										
1	1990	8	20	0950	27	20	552	-	-	0.07
1	1991	8	5	1705	23	20	505	10.5	12.0	0.13
1	1992	7	29	1155	27	16	527	8.6	9.2	0.12
1	1993	7	28	0920	23	15	520	121.0	9.4	0.23
1	1994	8	2	1315	29	19	540	12.5	12.5	-
1	1995	8	2	0958	21	16	500	9.8	-	0.12
1	1996	7	30	1000	21	14	505	7.6	9.2	0.10
1	1997	8	5	0830	17	13	562	12	10.6	0.16
1	2002	7	18	1132	27	18	554	-	10.7	0.12
1	2003	7	28	1612	28.8	21	522	-	8.1	0.11
1	2004	7	28	1047	25	15	514	-	10.5	0.10
1	2005	8	4	1210	22	19	524	-	8.8	0.10
1	2006	7	31	1745	33	25	521	-	4.4	0.07
2	1990	8	14	1120	26	16	530	-	-	0.04
2	1991	8	5	1424	23	18	498	6.0	12.8	0.07
2	1992	7	29	0820	19	14	442	7.5	6.3	0.05
2	1993	7	27	1045	24	14	530	11.0	9.5	0.12
2	1994	8	2	0915	22	14	485	27.0	10.2	-
2	1995	8	1	1100	24	17	520	10.8	-	0.06
2	1996	7	30	1123	24	15	499	4.6	8.6	0.04
2	1997	7	22	1450	24	17	562	12	8.1	0.03
2	2002	7	23	1217	25	17	551	-	10.6	0.06
2	2003	7	28	1652	24	19	496	-	5.0	0.01
2	2004	7	28	1215	30	16	507	-	9.6	0.06

2	2005	8	4	0930	26	18	513	-	7.3	0.06
2	2006	7	31	1835	32	21	505	-	3.9	0.04

Table A2.2 continued on next page.

Table A2.2 continued.

Stream Station	Year	Month	Day	Time (24 hrs)	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µmhos cm^{-1})	Turbidity (NTU)	Dissolved Oxygen (mg l^{-1})	Discharge (m^3 sec^{-1})
Waumandee Creek Priority Watershed Study Area (Continued)										
Trout Run Creek										
1	1990	8	30	1600	26	17	575	-	-	0.09
1	1991	7	31	0940	23	15	575	72.0	10.0	0.09
1	1992	7	30	0840	21	13	580	32.2	10.4	0.09
1	1993	7	26	1330	32	18	591	27.0	9.5	0.16
1	1994	8	2	1000	24	16	561	52.0	-	0.14
1	1995	8	2	1007	29	15	530	43.9	9.6	0.10
1	1996	7	25	1115	20	17	540	42	9.8	0.01
1	1997	7	21	1515	29	19	629	52.5	7.8	0.09
1	2002	7	23	1400	30	20	619	-	10.6	0.11
1	2003	7	28	1400	28	20	588	-	5.0	0.09
1	2004	7	28	1430	28	19	579	-	9.3	0.11
1	2005	8	5	0940	29	15	574	-	8.8	0.08
1	2006	7	31	1530	39	26	575	-	3.6	0.07
2	1994	8	2	1240	-	16	570	28.0	10.4	0.11
2	1995	8	2	1340	28	16	560	47.0	10.0	0.10
2	1996	7	25	1057	21	14	577	49.1	8.1	0.15
2	1997	8	5	1200	25	16	575	46.0	8.5	0.12
2	2002	7	23	1600	38	17	618	-	10.7	0.11
2	2003	7	28	1426	27	17	575	-	8.3	0.08
2	2004	7	28	1547	27	16	582	-	8.4	0.09
2	2005	8	4	1600	27	18	584	-	6.5	0.08
2	2006	7	31	1620	37	22	585	-	3.7	0.06
Timber Coulee Creek										
1	1993	8	11	0830	23	12	483	3.0	10.0	0.37
1	1994	7	27	1020	23	14	470	1.5	11.0	0.31
1	1995	7	24	1238	32	17	440	6.8	9.9	0.24
1	1996	7	22	1230	29	12	422	2.7	12.4	0.53
1	1997	7	14	1220	27	18	471	1.6	8.0	0.21
1	2002	7	15	1415	31	19	464	-	11.0	0.24
1	2003	8	7	1010	29	15	462	-	11.6	0.18
1	2004	7	26	1741	28	19	441	-	8.7	0.16
1	2005	7	28	1048	26	14	468	-	9.6	0.18
1	2006	7	27	1005	36	17	471	-	8.5	0.18

Table A2.2 continued on next page.

Table A2.2 continued.

Stream Station	Year	Month	Day	Time (24 hrs)	Air Temperature (°C)	Water Temperature (°C)	Conductivity (μmhos cm^{-1})	Turbidity (NTU)	Dissolved Oxygen (mg l^{-1})	Discharge (m^3 sec^{-1})
Waumandee Creek Priority Watershed Study Area (Continued)										
Timber Coulee Creek										
2	1994	7	27	1030	24	13	450	1.5	15.2	0.19
2	1995	7	24	1142	31	16	405	1.8	14.8	0.25
2	1996	7	22	1155	24	15	431	0.65	11	0.16
2	1997	7	14	1240	27	18	388	1.1	-	0.09
2	2002	7	22	1350	32	20	456	-	14.8	0.19
2	2003	8	4	1410	32	16	418	-	14.3	0.14
2	2004	7	29	1408	25	16	446	-	12.6	0.13
2	2005	7	25	1430	24	16.8	439	-	10.2	0.15
2	2006	7	27	1405	32	19	466	-	7.6	0.10
Cady Creek										
1	1995	8	1	0817	17	12	460	1.0	10.9	0.11
1	1996	7	24	1130	21	14	436	1	10.2	0.11
1	1997	7	16	1100	30	17	413	1.8	10.7	0.12
1	2002	7	24	1445	22	17	506	-	12.7	0.14
1	2003	7	23	1024	20	12	478	-	13.9	0.16
1	2004	8	3	1445	18	15	480	-	10.9	0.08
1	2005	8	8	0930	23	14	492	-	7.5	0.05
1	2006	7	25	1600	26	21	452	-	9.8	-
2	1995	7	31	1322	24	17	395	1.1	11.0	0.10
2	1996	7	24	1125	20	14	470	0.85	10.7	0.08
2	1997	7	16	1119	30	17	413	1.8	10.7	0.12
2	2002	7	24	1350	22	17	506	-	12.7	0.14
2	2003	7	23	1404	18	18	479	-	14.8	0.15
2	2004	8	3	1445	18	15	480	-	10.9	0.08
2	2005	8	9	0930	23	14	492	-	7.5	0.05
2	2006	7	25	1600	26	21	452	-	9.8	-

Table A2.2 continued on next page.

Table A2.2 continued.

Stream Station	Year	Month	Day	Time (24 hrs)	Air Temperature (^{o}C)	Water Temperature (^{o}C)	Conductivity (μmhos cm^{-1})	Turbidity (NTU)	Dissolved Oxygen (mg l^{-1})	Discharge (m^3 sec^{-1})
Milwaukee River South Priority Watershed Study Area										
Lincoln Creek										
1	1994	6	2	1240	21	19	730	6.0	-	0.31
1	1995	6	5	1337	28	21	885	8.0	-	0.18
1	1996	6	4	1500	21	14	1106	4.8	10.7	0.36
1	1997	5	27	1045	13	14	-	4.4	9.4	0.12
1	1998	5	27	1420	28	18.5	810	-	11.4	0.14
1	2004	5	27	0923	16	14	1584	-	13.6	0.43
1	2005	5	25	1323	22	21	1215	-	20	0.11
1	2006	5	23	1400	24	21	1405	-	15.9	0.14
1	2007	5	24	0918	25	18	1549	-	11.8	0.14
1	2008	5	28	1630	-	21	1627	-	14.0	0.92
4	1992	6	3	0835	24	18	738	5.5	2.2	0.11
4	1993	6	3	1400	19	13	635	12.7	9.3	0.13
4	1994	6	1	1000	17	16	768	10.0	10.0	0.09
4	1995	5	31	1000	25	16	1061	14.3	6.2	0.07
4	1996	5	27	1100	23	9	1381	7.5	10.6	0.08
4	1997	5	27	1350	16	15	-	5.4	9.2	0.05
4	1998	5	26	1300	27	20	1260	-	8	0.08
4	2004	5	26	1645	19	20	1485	-	-	0.31
4	2005	5	25	0952	18	16	1436	-	10.2	0.09
4	2006	5	23	0915	19	13	1621	-	9.5	0.09
4	2007	5	24	1110	30	21	1758	-	10.9	0.08
4	2008	5	28	1249	22	17	1808	-	3.4	0.05
5	1994	6	1	0940	16	17	820	2.1	15.2	0.06
5	1995	5	31	1350	26	23	1050	6.1	-	0.10
5	1996	5	28	1040	16	15	1450	3.5	12.1	0.10
5	1997	5	27	1105	14	16	1500	3.0	13.3	0.04
5	1998	5	26	1100	23	21	723	-	9.7	0.01
5	2004	5	26	1216	17	14	1484	-	15.5	0.23
5	2005	5	31	1200	28	19	1530	-	9.8	0.05
5	2006	5	22	1550	19	19	1678	-	14.1	0.09
5	2007	5	23	1550	31	21	1613	-	18.8	0.07
5	2008	5	29	1115	19	14	1620	-	10.5	0.05

Table A2.2 continued on next page.

Table A2.2 continued.

Stream Station	Year	Month	Day	Time (24 hrs)	Air Temperature (°C)	Water Temperature (°C)	Conductivity (µmhos cm^{-1})	Turbidity (NTU)	Dissolved Oxygen (mg l^{-1})	Discharge (m^3 sec^{-1})
Milwaukee River South Priority Watershed Study Area (Continued)										
Lincoln Creek										
6	1994	6	1	1120	22	19	540	1.7	10.2	0.07
6	1995	5	31	1525	27	18	750	2.9	-	0.06
6	1996	5	28	1300	14	12	870	4.3	12.3	0.05
6	1997	5	27	1327	19	15	1500	3.1	10.3	0.01
6	1998	5	26	1315	24	18	778	-	11.4	0.01
6	2004	5	26	1030	13	13	1260	-	13.0	0.20
6	2005	5	31	1725	21	18	868	-	8.0	0.01
6	2006	5	22	1319	16	17	1112	-	10.7	0.04
6	2007	5	23	1115	30	17	1205	-	10.9	0.05
6	2008	5	27	1445	16	15	1188	-	13.1	0.03
7	1994	6	2	1035	18	13	815	6.0	6.6	0.02
7	1995	6	7	0810	24	19	405	26.2	10.1	0.13
7	1996	5	31	853	13	10	1320	7.0	7.3	0.02
7	1997	5	29	1530	20	12	1381	11.5	8.2	0.01
7	1998	5	27	0900	21	14.5	1170	-	5	0.02
7	2004	5	19	1342	21	18	1151	-	-	0.11
7	2005	6	1	1200	35	18	1410	-	10.1	0.01
7	2006	5	30	1120	26	21.4	724	-	11.8	0.11
7	2007	5	15	1215	23	17	1646	-	10.2	0.19
7	2008	5	29	1620	19	14	1755	-	9.5	0.01
8	1994	6	2	0930	18	12	920	5.0	8.1	0.02
8	1995	6	6	0923	26	17	1111	32.0	8.6	0.02
8	1996	6	3	1100	20	17	745	7.3	8.6	0.07
8	1997	5	28	1300	15	12	1131	3.4	9.0	0.01
8	1998	5	27	0934	17	15	1111	-	7.3	0.02
8	2004	5	25	1513	26	16	1005	-	16.0	0.18
8	2005	5	25	1015	26	22	1391	-	15.6	0.00
8	2006	5	16	1320	19	15	1030	-	11.7	0.14
8	2007	5	22	1100	31	20	1019	-	18.1	0.02
8	2008	6	2	1702	21	23	1758	-	11.3	0.00

Table A2.2 continued on next page.

Table A2.2 continued.

Stream Station	Year	Month	Day	Time (24 hrs)	Air Temperature (^oC)	Water Temperature (^oC)	Conductivity ($\mu mhos\ cm^{-1}$)	Turbidity (NTU)	Dissolved Oxygen ($mg\ l^{-1}$)	Discharge ($m^3\ sec^{-1}$)
Milwaukee River South Priority Watershed Study Area (Continued)										
Lincoln Creek										
9	1994	6	2	1319	17	26	950	7.5	11.1	0.01
9	1995	6	2	0815	21	15	980	7.5	8.2	0.01
9	1996	5	29	1115	15	16	1343	3.8	7.1	0.01
9	1997	5	28	0850	12	11	983	5.9	7.4	0.01
9	1998	5	26	1500	23	26	490	-	11.7	0.01
9	2004	5	25	1324	26	16	922	-	16.2	0.14
9	2005	5	24	1542	25	24	842	-	19.3	0.01
9	2006	5	16	1022	17	13	964	-	11.1	0.14
9	2007	5	15	0840	13	16	890	-	6.9	0.00
9	2008	5	19	1538	17	17	2335	-	14.7	0.01
10	1997	6	2	1100	18	21	1550	3.5	17.9	0.01
10	1998	5	27	1100	26	25	620	-	-	0.01
10	2004	5	25	1148	24	16	1675	-	12.4	0.02
10	2005	5	24	1400	26	25	1087	-	15.1	0.00
10	2006	5	16	0850	11	11	693	-	8.6	0.06
10	2007	5	14	1330	34	28	3025	-	-	0.00
10	2008	5	29	1715	18	16	1101	-	15.6	0.00
Underwood Creek										
2	1994	6	6	1430	20	25	1040	-	-	0.12
2	1995	5	31	1030	26	22	1183	4.7	6.2	0.20
2	1996	5	28	1423	15	15	1150	3.2	11	0.15
2	1997	5	27	1430	20	18	1185	4.3	-	0.11
2	1998	5	27	1248	25	23	1191	-	-	0.15
2	2004	5	18	1607	16	16	1081	-	12.7	1.06
2	2005	5	25	1600	22	20	1576	-	20	0.13
2	2006	5	15	1717	15	13	1134	-	10.7	2.07
2	2007	5	16	0930	15	15	1318	-	12.3	0.60
2	2008	6	2	1230	28	22	1936	-	-	0.12

Table A2.2 continued on next page.

Table A2.2 continued.

Stream Station	Year	Month	Day	Time (24 hrs)	Air Temperature (°C)	Water Temperature (°C)	Conductivity (μmhos cm^{-1})	Turbidity (NTU)	Dissolved Oxygen (mg l^{-1})	Discharge (m^3 sec^{-1})
Milwaukee River South Priority Watershed Study Area (Continued)										
Underwood Creek										
4	1991	6	19	1455	28	21	1208	57.0	6.7	0.05
4	1992	6	2	1245	31	17	1225	20.9	7.5	0.03
4	1993	6	1	1450	22	13	1020	6.4	9.4	0.15
4	1994	6	8	0810	15	11	1500	11.5	8.5	0.03
4	1995	6	1	0832	22	16	1135	12.0	6.2	0.07
4	1996	5	31	0845	13	9.0	1232	7.3	10.8	0.07
4	1997	5	29	1430	14	13	1232	7.3	6.9	0.21
4	1998	6	1	1533	20	18.5	1307	-	6.8	0.05
4	2004	5	19	0855	12	12	1029	-	9.0	0.44
4	2005	5	26	1145	18	17	1462	-	6.1	0.03
4	2006	5	15	1130	16	12	1200	-	8.0	0.83
4	2007	5	21	1200	19	16	1528	-	10.2	0.09
4	2008	5	13	1310	-	19	1765	-	7.9	0.12
5	1991	6	19	1455	28	21	1208	57.0	6.7	0.05
5	1992	6	1	1400	31	17	1225	20.9	7.5	-
5	1994	6	8	0810	15	11	1500	11.5	8.5	0.01
5	1995	6	1	0832	22	16	1135	12.0	6.2	0.07
5	1996	5	31	0845	13	9.0	1232	7.3	10.8	0.05
5	1997	5	27	1430	14	14	1232	7.3	6.9	0.21
5	1998	6	1	1533	20	18.5	1307	-	6.8	0.05
5	2004	5	19	0855	12	12	1029	-	9.0	0.44
5	2005	5	26	1145	18	17	1462	-	6.1	0.04
5	2006	5	15	1130	16	12	1200	-	8.0	0.83
5	2007	5	21	1200	19	16	1528	-	10.2	0.09
5	2008	5	13	1310	-	19	1765	-	7.9	0.12
Little Menomonee River										
1	1995	6	1	0845	17	16	800	4.5	7.1	0.08
1	1996	5	29	0820	17	8.0	820	4.4	10.7	0.11
1	1997	5	30	0930	14	12	830	-	6.8	0.10
1	1998	5	28	1100	24	16	700	-	6.5	0.11
1	2004	6	7	1230	26	18	765	-	8.2	0.22

1	2005	6	3	1515	25	17	777	-	5.9	0.02
1	2006	5	24	1411	19	14	827	-	7.9	0.10
1	2007	5	31	1000	-	18	850	-	9.2	0.06
1	2008	6	3	1635	15	14	839	-	8.5	0.07

Table A2.2 continued on next page.

Table A2.2 continued.

Stream Station	Year	Month	Day	Time (24 hrs)	Air Temperature (^oC)	Water Temperature (^oC)	Conductivity ($\mu mhos\ cm^{-1}$)	Turbidity (NTU)	Dissolved Oxygen ($mg\ l^{-1}$)	Discharge ($m^3\ sec^{-1}$)
Milwaukee River South Priority Watershed Study Area (Continued)										
Little Menomonee River										
2	1995	6	2	0845	17	16	800	4.5	7.1	0.08
2	1996	5	29	0830	17	8	829	4.4	9.2	0.08
2	1997	5	30	0930	14	12	830	-	6.8	0.10
2	1998	5	28	1200	24	16	700	-	6.5	0.11
2	2004	6	7	1230	26	18	765	-	8.2	0.22
2	2005	6	2	1515	25	17	777	-	5.9	0.02
2	2006	5	24	1411	19	14	827	-	7.9	0.10
2	2007	5	24	1000	-	18	850	-	9.2	0.06
2	2008	6	3	1635	15	14	839	-	8.5	0.07
East Branch Milwaukee River										
2	1994	6	7	0900	18	21	408	-	-	0.46
2	1995	6	6	1243	30	24	325	4.9	9.5	0.27
2	1996	5	30	0910	12	11	450	1.4	8.5	0.32
2	1997	5	29	1400	17	14	452	2.7	7.3	0.94
2	1998	6	2	0918	18	16	500	-	8.6	0.23
2	2004	6	8	0930	27	22	458	-	5.4	1.05
2	2005	6	7	1510	32	26	508	-	8.6	0.10
2	2006	6	1	1527	26	24	470	-	8.7	0.69
2	2007	6	5	1035	14	15	416	-	5.5	1.45
2	2008	6	4	1745	17	17	560	-	10.8	0.38
3	1993	6	23	1000	23	19	460	3.2	6.1	1.05
3	1994	6	6	1130	26	22	487	-	-	0.40
3	1995	6	7	1315	29	26	480	4.8	6.7	0.21
3	1996	6	4	1000	17	16	463	1.5	6.6	1.02
3	1997	5	29	1000	14	14	465	2.0	6.0	0.25
3	1998	6	2	0900	24	19	460	-	7	0.20
3	2004	6	8	1400	29	26	455	-	7.4	0.97
3	2005	6	8	1418	37	29	496	-	8.7	0.06
3	2006	6	1	1020	26	19	465	-	6.3	0.59
3	2007	6	5	1330	14	16	418	-	4.3	1.85

3	2008	6	5	1320	23	16	420	-	4.8	0.76

Table A2.2 continued on next page.

Table A2.2 continued.

Stream Station	Year	Month	Day	Time (24 hrs)	Air Temperature (^oC)	Water Temperature (^oC)	Conductivity ($\mu mhos\ cm^{-1}$)	Turbidity (NTU)	Dissolved Oxygen ($mg\ l^{-1}$)	Discharge ($m^3\ sec^{-1}$)
Oconomowoc River										
1	1993	6	24	0950	29	21	611	10.5	-	0.57
1	1994	6	6	1100	26	21	645	3.0	-	0.22
1	1995	6	7	0852	19	17	-	6.3	-	0.26
1	1996	5	30	0830	12	10	670	2.7	11.4	0.14
1	1997	5	28	1500	15	15	605	3.5	8.9	0.35
1	1998	6	3	1500	22	20	575	-	8.8	0.31
1	2004	5	17	1243	23	19	648	-	10.5	0.87
1	2005	5	23	1400	38	18	625	-	10.7	0.32
1	2006	5	30	1430	23	22	660	-	6.4	0.29
1	2007	5	30	1600	28	24	675	-	10.7	0.27
1	2008	5	20	1517	18	18	650	-	12.8	0.49
2	1995	6	5	1042	25	22	621	4.5	8.8	0.18
2	1996	6	3	1010	17	18	615	7.5	9.3	0.41
2	1997	5	28	0845	13	12	629	3.7	8.7	0.15
2	1998	6	3	0915	14	16	639	-	8.0	0.26
2	2004	5	18	1040	14	17	642	-	7.9	0.75
2	2005	6	3	1315	30	26	627	-	9.5	0.11
2	2006	5	31	1550	25	26	649	-	10.0	0.42
2	2007	5	31	1200	25	24	666	-	10.9	0.31
2	2008	5	22	1308	24	18	637	-	14.1	0.36

Table A2.3. Summary of selected mean habitat characteristics from sites sampled. In 1990, some measurements were based on reach or transect measurements spaced one channel width apart. Estimates from 1991-2008 were based on transect measurements spaced three channel widths apart. An "-" indicates that no data were collected.

Stream Site	Year	Width (m)	Depth (m)	Habitat types (%)			Cover (%)	Shading (%)	Bank Erodibility (%)	Predominant Bank Land-Use (%)
				Riffle	Pool	Run				
Waumandee Creek Priority Watershed Study Area										
Eagle Creek										
1	1992	3.0	0.29	0	8	92	3	0	1	Meadow (89)
1	1993	3.4	0.57	0	33	67	9	0	7	Meadow (100)
1	1994	3.2	0.35	0	0	100	9	0	4	Meadow (100)
1	1995	3.5	0.38	0	7	93	24	0	42	Meadow (100)
1	1996	3.1	0.39	0	5	95	8	0	4	Meadow (100)
1	1997	2.8	0.32	0	18	82	11	0	2	Meadow (100)
1	2002	3.1	0.50	0	10	90	10	2	3	Meadow (100)
1	2003	2.8	0.36	0	0	100	17	0	4	Meadow (99)
1	2004	3.1	0.61	0	10	90	27	2	1	Meadow (100)
1	2005	3.2	0.60	0	31	69	44	2	0	Meadow (99)
1	2006	2.9	0.42	0	0	100	33	1	0	Meadow (100)
2	1990	3.0	0.18	0	14	86	2	0	68	Pasture (100)
2	1991	3.1	0.20	14	14	72	0	0	46	Pasture (100)
2	1992	2.7	0.25	8	8	84	1	0	1	Meadow (100)
2	1993	3.2	0.31	16	15	69	7	0	38	Meadow (100)
2	1994	2.9	0.22	25	8	67	2	0	7	Meadow (100)
2	1995	3.1	0.22	16	10	74	10	0	2	Meadow (98)
2	1996	2.9	0.28	12	3	85	2	0	5	Meadow (100)
2	1997	2.8	0.23	23	6	71	4	0	5	Meadow (99)
2	2002	2.7	0.39	0	13	87	6	9	7	Meadow (93)
2	2003	2.5	0.39	8	7	86	28	9	3	Meadow (92)
2	2004	2.5	0.43	12	13	75	21	8	5	Meadow (73)
2	2005	2.7	0.44	8	13	80	34	14	3	Meadow (76)
2	2006	2.7	0.41	0	16	84	31	16	0	Meadow (80)
3	1992	2.3	0.19	21	14	64	0	0	1	Shrubs (100)
3	1993	3.0	0.22	13	2	85	4	16	36	Meadow (71)
3	1994	2.9	0.17	25	8	67	0	26	35	Meadow (50)
3	1995	2.7	0.17	28	0	72	0	23	73	Meadow (58)
3	1996	3.0	0.23	38	0	62	0	18	25	Woods (53)
3	1997	2.6	0.29	32	0	68	0	26	16	Woods (80)
3	2002	2.6	0.24	60	14	26	1	25	6	Meadow (42)
3	2003	2.4	0.18	46	0	54	0	34	7	Shrub (35)
3	2004	2.7	0.21	47	20	33	2	36	20	Woods (45)

3	2005	2.6	0.20	58	0	42	0	57	21	Meadow (68)
3	2006	2.6	0.15	54	0	46	0	42	13	Woods (58)
4	1997	3.9	0.19	52	18	30	0	44	46	Pasture (100)

Table A2.3 continued on next page.

Table A2.3 continued.

Stream	Site	Year	Width (m)	Depth (m)	Habitat types (%)			Cover (%)	Shading (%)	Erodibility (%)	Bank Bank Land-Use (%)
					Riffle	Pool	Run				
Waumandee Creek Priority Watershed Study Area (Continued)											
Joos Creek											
	1	1992	2.1	0.23	0	8	92	2	12	1	Meadow (100)
	1	1994	2.4	0.18	0	8	92	0	7	50	Meadow (100)
	1	1995	2.5	0.17	5	5	90	0	6	31	Meadow (100)
	1	1996	3.6	0.75	0	7	93	28	10	23	Meadow (100)
	1	1997	2.7	0.19	17	8	75	0	7	20	Meadow (100)
	1	2002	2.3	0.27	18	16	66	7	22	9	Meadow (81)
	1	2003	2.1	0.24	16	8	76	6	22	4	Meadow (75)
	1	2004	2.3	0.29	12	17	72	11	23	13	Meadow (74)
	1	2005	2.7	0.28	18	25	57	9	43	17	Meadow (73)
	1	2006	2.6	0.25	18	15	68	9	44	6	Meadow (65)
	2	1990	1.8	0.20	26	34	40	1	0	52	Pasture (78)
	2	1991	2.3	0.22	14	14	72	1	0	27	Pasture (100)
	2	1992	2.0	0.24	7	7	86	3	0	1	Meadow (100)
	2	1993	2.4	0.28	27	18	55	4	0	6	Meadow (93)
	2	1994	2.3	0.21	6	6	88	1	0	11	Meadow (93)
	2	1995	2.4	0.20	22	15	63	3	0	12	Meadow (93)
	2	1996	2.7	0.26	24	11	65	4	2	22	Meadow (100)
	2	1997	2.4	0.19	28	24	48	0	0	10	Meadow (100)
	2	2002	2.3	0.26	27	18	55	4	9	3	Meadow (95)
	2	2003	2.0	0.24	30	16	54	8	11	4	Meadow (94)
	2	2004	2.3	0.33	34	38	27	14	13	3	Meadow (94)
	2	2005	2.1	0.27	37	27	37	9	11	4	Meadow (95)
	2	2006	2.0	0.25	36	21	43	5	21	3	Meadow (91)
	3	1992	3.1	0.19	13	7	80	0	0	1	Pasture (100)
	3	1993	3.9	0.30	14	20	66	1	0	45	Pasture (100)
	3	1994	3.8	0.25	14	14	72	0	0	16	Pasture (100)
	3	1995	3.5	0.24	18	21	61	0	0	24	Meadow (91)
	3	1996	3.5	0.33	8	40	52	3	0	34	Meadow (52)
	3	1997	3.8	0.32	3	6	91	4	0	14	Meadow (57)
	3	2002	2.5	0.36	10	5	85	9	0	8	Pasture (92)
	3	2003	2.0	0.37	14	0	86	27	0	5	Meadow (56)
	3	2004	2.2	0.40	10	0	90	17	0	1	Meadow (64)
	3	2005	2.1	0.33	17	18	66	12	0	1	Pasture (100)
	3	2006	2.0	0.38	12	2	85	28	0	2	Pasture (100)

4	1992	2.4	0.21	20	20	60	0	0	6	Meadow (100)
4	1993	2.5	0.29	49	27	24	3	2	8	Meadow (88)
4	1994	2.4	0.24	43	14	43	1	11	14	Meadow (78)
4	1995	2.6	0.89	34	20	46	0	1	18	Meadow (87)
4	1996	2.8	0.27	11	25	64	4	6	30	Meadow (96)
4	1997	2.5	0.26	14	13	73	7	19	16	Meadow (70)
4	2002	3.1	0.28	33	24	43	7	21	5	Meadow (57)
4	2003	2.8	0.27	8	5	87	14	8	2	Meadow (68)
4	2004	2.9	0.35	12	46	42	13	12	2	Meadow (62)
4	2005	2.9	0.32	16	60	24	20	20	1	Meadow (69)
4	2006	2.9	0.33	9	46	45	24	24	0	Meadow (85)
5	1997	3.4	0.36	21	51	28	8	1	23	Pasture (100)

Table A2.3 continued on next page.

Table A2.3 continued.

Stream	Site	Year	Width (m)	Depth (m)	Habitat types (%)			Cover (%)	Shading (%)	Erodibility (%)	Bank Bank Land-Use (%)
					Riffle	Pool	Run				
Waumandee Creek Priority Watershed Study Area (Continued)											
Bohris Creek											
	1	1990	3.4	0.16	14	8	80	2	53	27	Woods (47)
	1	1991	3.3	0.20	0	25	75	0	24	11	Shrubs (96)
	1	1992	3.8	0.25	33	17	50	3	16	3	Shrubs (100)
	1	1993	3.9	0.30	19	18	63	6	36	29	Shrubs (40)
	1	1994	3.6	0.27	25	17	58	0	33	47	Meadow (61)
	1	1995	3.9	0.22	20	7	73	1	41	23	Woods (56)
	1	1996	4.1	0.19	18	6	76	0	32	24	Woods (55)
	1	1997	3.7	0.18	17	0	83	3	48	29	Meadow (53)
	1	2002	3.6	0.22	23	3	74	0	65	11	Woods (53)
	1	2003	3.3	0.19	17	6	77	1	63	14	Woods (56)
	1	2004	3.7	0.16	10	0	90	1	72	27	Woods (53)
	1	2005	3.8	0.20	32	5	63	1	71	61	Woods (52)
	1	2006	3.4	0.13	31	1	68	0	72	27	Woods (63)
	2	1990	3.0	0.27	30	43	27	3	0	36	Pasture (86)
	2	1991	3.3	0.44	17	50	33	5	0	28	Pasture (100)
	2	1992	3.0	0.21	15	8	77	1	0	2	Pasture (100)
	2	1993	2.9	0.37	29	26	45	5	0	15	Pasture (100)
	2	1994	2.3	0.17	54	8	38	6	0	32	Pasture (100)
	2	1995	2.5	0.19	42	3	55	3	0	27	Pasture (100)
	2	1996	1.9	0.20	29	15	56	4	0	25	Pasture (100)
	2	1997	1.8	0.20	37	7	56	0	0	27	Pasture (100)
	2	2002	1.9	0.29	23	25	52	10	0	6	Pasture (100)
	2	2003	1.6	0.20	19	9	72	8	0	8	Pasture (100)
	2	2004	2.0	0.32	20	24	56	10	2	8	Pasture (100)
	2	2005	1.8	0.37	22	41	38	22	2	12	Pasture (100)
	2	2006	1.6	0.26	22	3	75	23	0	5	Pasture (100)
Trout Run Creek											
	1	1990	2.5	0.21	18	29	53	1	0	62	Pasture (95)
	1	1991	2.4	0.24	7	29	64	0	0	4	Pasture (100)
	1	1992	2.4	0.24	0	0	100	1	0	15	Pasture (100)
	1	1993	2.8	0.24	13	11	76	2	0	23	Pasture (100)
	1	1994	2.6	0.21	0	8	92	1	0	18	Pasture (91)
	1	1995	2.5	0.19	10	3	87	0	0	23	Meadow (93)
	1	1996	2.7	0.19	10	2	88	0	0	44	Pasture (100)
	1	1997	2.8	0.19	13	0	87	1	0	43	Pasture (100)

1	2002	2.1	0.24	13	9	79	4	0	9	Pasture (100)
1	2003	1.9	0.21	14	10	76	1	0	11	Pasture (100)
1	2004	2.1	0.22	8	0	92	1	0	9	Pasture (100)
1	2005	1.9	0.27	12	0	88	11	0	10	Pasture (100)
1	2006	2.0	0.24	6	2	92	6	7	7	Pasture (95)

Table A2.3 continued on next page.

Table A2.3 continued.

Stream Site	Year	Width (m)	Depth (m)	Habitat types (%)			Cover (%)	Shading (%)	Bank Erodibility (%)	Predominant Bank Land-Use (%)
				Riffle	Pool	Run				
Waumandee Creek Priority Watershed Study Area (Continued)										
Trout Run Creek										
2	1994	2.6	0.25	0	0	100	0	2.3	40	Pasture (100)
2	1995	2.7	0.23	0	0	100	1	0	32	Pasture (100)
2	1996	2.4	0.18	0	4	96	0	8	47	Pasture (100)
2	1997	2.5	0.22	0	0	100	5	1	64	Pasture (100)
2	2002	2.3	0.24	0	0	100	5	3	28	Pasture (100)
2	2003	2.1	0.23	0	0	100	7	1	28	Pasture (100)
2	2004	2.2	0.29	0	0	100	2	2	37	Pasture (100)
2	2005	2.4	0.27	0	0	100	2	3	41	Pasture (100)
2	2006	2.8	0.21	0	0	100	0	6	25	Pasture (100)
Timber Coulee Creek										
1	1993	5.1	0.32	16	24	60	4	56	0	Meadow (52)
1	1994	4.9	0.31	17	17	66	0	51	15	Developed (44)
1	1995	4.9	0.28	16	18	66	8	39	9	Developed (53)
1	1996	4.3	0.27	5	18	77	8	51	6	Developed (34)
1	1997	4.1	0.26	7	5	88	9	45	7	Developed (45)
1	2002	4.4	0.29	26	0	74	8	39	3	Developed (42)
1	2003	4.2	0.27	27	0	73	10	44	3	Meadow (43)
1	2004	4.4	0.30	23	6	71	9	42	2	Developed (36)
1	2005	4.7	0.31	12	0	88	20	51	6	Developed (40)
1	2006	4.2	0.26	19	0	81	16	47	2	Developed (44)
2	1994	6.9	0.33	31	31	38	25	11	3	Pasture (100)
2	1995	6.5	0.31	32	28	40	10	9	2	Pasture (78)
2	1996	6.7	0.32	0	4	96	7	11	8	Pasture (78)
2	1997	5.4	0.30	38	9	53	2	10	0	Pasture (61)
2	2002	6.1	0.36	32	0	68	18	10	0	Meadow (80)
2	2003	6.0	0.32	33	27	39	14	12	0	Meadow (77)
2	2004	7.2	0.35	39	26	35	14	13	0	Meadow (85)
2	2005	5.7	0.34	36	37	27	23	23	0	Meadow (74)
2	2006	5.4	0.35	39	36	25	17	17	0	Meadow (83)
Cady Creek										
1	1995	5.7	0.23	30	9	61	8	30	34	Woods (92)
1	1996	4.6	0.21	31	10	58	7	29	17	Woods (100)
1	1997	5.2	0.22	37	7	56	4	43	27	Woods (69)
1	2002	5.7	0.25	29	12	58	4	55	38	Woods (82)

1	2003	5.0	0.20	48	10	42	4	56	41	Woods (82)
1	2004	4.5	0.25	34	0	66	8	57	27	Woods (87)
1	2005	4.5	0.23	35	0	65	5	63	30	Woods (100)
1	2006	4.7	0.21	37	0	63	5	61	33	Woods (100)
2	1995	5.7	0.24	38	25	37	4	48	33	Woods (91)
2	1996	5.6	0.24	40	20	40	1	50	25	Woods (100)
2	1997	6.0	0.26	48	12	40	2	52	24	Woods (100)
2	2002	5.7	0.26	56	20	24	7	63	34	Woods (81)
2	2003	5.9	0.26	66	17	18	3	70	42	Woods (90)
2	2004	5.6	0.27	55	29	16	7	70	29	Woods (94)
2	2005	5.5	0.26	53	16	31	11	68	34	Woods (100)
2	2006	5.6	0.21	65	11	24	4	68	27	Woods (100)

Table A2.3 continued on next page.

Table A2.3 continued.

Stream Site	Year	Width (m)	Depth (m)	Habitat types (%)			Cover (%)	Shading (%)	Bank Erodibility (%)	Predominant Bank Land-Use (%)
				Riffle	Pool	Run				
Milwaukee River South Priority Watershed Study Area										
Lincoln Creek										
1	1994	3.7	0.25	0	0	100	0	0	0	Developed (96)
1	1995	3.7	0.16	0	0	100	0	0	0	Developed (96)
1	1996	3.7	0.22	0	0	100	0	1	0	Developed (96)
1	1997	3.7	0.16	4	0	96	0	3	0	Developed (91)
1	1998	3.7	0.19	19	0	81	0	2	0	Developed (94)
1	2004	12.5	0.25	16	5	79	0	0	8	Developed (97)
1	2005	12.1	0.19	24	4	71	1	0	38	Meadow (100)
1	2006	11.8	0.24	13	9	5	0	0	9	Meadow (93)
1	2007	11.8	0.25	8	16	86	1	0	16	Meadow (92)
1	2008	11.8	0.24	3	7	89	1	2	0	Meadow (85)
4	1992	11.1	0.54	0	15	85	4	19	1	Urban Park (100)
4	1993	11.4	0.52	0	14	86	2	41	53	Urban Park (100)
4	1994	11.1	0.52	0	15	85	1	41	19	Urban Park (100)
4	1995	11.3	0.52	0	21	79	0	41	75	Urban Park (70)
4	1996	11.2	0.52	0	0	100	2	37	42	Urban Park (52)
4	1997	11.4	0.52	0	0	100	2	40	57	Urban Park (53)
4	1998	11.1	0.52	0	0	100	9	49	63	Urban Park (75)
4	2004	13.7	0.29	16	18	66	7	0	1	Developed (85)
4	2005	10.8	0.26	10	22	69	5	0	7	Meadow (100)
4	2006	8.9	0.33	23	17	60	8	0	1	Meadow (67)
4	2007	7.2	0.30	10	37	54	8	0	9	Meadow (62)
4	2008	8.7	0.30	11	25	63	0	0	0	Meadow (79)
5	1994	3.8	0.10	0	0	100	0	0	0	Developed (100)
5	1995	3.8	0.08	0	0	100	0	3	0	Developed (100)
5	1996	3.6	0.09	0	0	100	0	0	0	Developed (100)
5	1997	3.0	0.07	0	0	100	0	0	0	Developed (100)
5	1998	3.5	0.09	0	0	100	0	4	0	Developed (100)
5	2004	7.2	0.54	14	41	46	13	0	0	Rock (53)
5	2005	7.1	0.44	4	38	58	6	1	0	Meadow (60)
5	2006	6.0	0.47	4	44	51	9	1	0	Rock (60)
5	2007	6.7	0.52	3	49	47	0	0	49	Rock (60)
5	2008	6.6	0.38	4	51	44	7	1	0	Meadow (56)
6	1994	3.3	0.07	0	0	100	0	0	0	Developed (100)
6	1995	3.4	0.17	0	0	100	0	1	0	Developed (100)
6	1996	3.3	0.08	0	0	100	0	0	0	Developed (100)
6	1997	3.0	0.06	0	0	100	0	0	0	Developed (100)
6	1998	3.0	0.07	0	0	100	0	6	0	Developed (100)
6	2004	6.9	0.45	13	54	33	17	4	54	Rock (66)
6	2005	6.3	0.39	13	52	36	2	18	0	Rock (70)
6	2006	6.1	0.40	14	52	34	8	20	2	Rock (72)
6	2007	6.4	0.40	13	53	34	10	18	0	Rock (80)
6	2008	6.3	0.43	14	54	32	5	16	0	Rock (80)

Table A2.3 continued on next page.

Table A2.3 continued.

Stream Site	Year	Width (m)	Depth (m)	Habitat types (%)			Cover (%)	Shading (%)	Bank Erodibility (%)	Predominant Bank Land-Use (%)
				Riffle	Pool	Run				
Milwaukee River South Priority Watershed Study Area (Continued)										
Lincoln Creek										
7	1994	4.5	0.41	0	15	85	2	86	87	Urban Park (91)
7	1995	5.1	0.49	3	15	82	19	80	36	Urban Park (99)
7	1996	3.7	0.23	5	3	92	0	68	74	Urban Park (100)
7	1997	5.1	0.46	5	14	82	1	72	48	Urban Park (100)
7	1998	4.2	0.26	7	7	86	2	86	69	Urban Park (44)
7	2004	2.8	0.20	69	0	31	0	5	0	Meadow (89)
7	2005	2.8	0.17	54	6	40	0	13	26	Meadow (76)
7	2006	2.6	0.15	38	16	46	0	27	25	Meadow (84)
7	2007	2.8	0.22	16	17	68	2	19	33	Meadow (73)
7	2008	2.7	0.15	29	22	49	0	38	19	Meadow (88)
8	1994	3.1	0.14	17	0	83	0	91	100	Urban Park (100
8	1995	3.0	0.08	51	0	49	0	82	66	Urban Park (100)
8	1996	3.3	0.16	8	0	92	0	83	56	Urban Park (80)
8	1997	3.1	0.08	36	0	64	0	48	61	Urban Park (100)
8	1998	3.8	0.09	48	5	47	0	73	67	Urban Park (100)
8	2004	4.4	0.27	67	0	33	1	0	11	Meadow (100)
8	2005	4.0	0.14	26	4	70	0	0	17	Meadow (100)
8	2006	4.2	0.19	15	0	85	0	2	9	Meadow (100)
8	2007	4.0	0.15	4	11	85	1	0	6	Meadow (98)
8	2008	4.0	0.13	25	14	61	0	8	4	Meadow (94)
9	1994	3.0	0.13	17	17	66	0	1	46	Developed (54)
9	1995	3.0	0.12	9	13	78	0	3	29	Developed (88)
9	1996	3.3	0.13	0	4	96	0	2	26	Developed (100)
9	1997	3.4	0.15	4	7	89	0	1	25	Developed (70)
9	1998	3.3	0.13	5	12	83	0	9	32	Developed (58)
9	2004	3.0	0.33	38	1	60	1	8	10	Meadow (92)
9	2005	2.8	0.16	31	10	60	1	17	44	Meadow (88)
9	2006	2.9	0.19	14	13	73	1	16	22	Meadow (86)
9	2007	2.5	0.16	2	20	78	2	30	55	Meadow (84)
9	2008	2.5	0.16	32	25	43	3	22	43	Meadow (84)
10	1997	2.2	0.06	0	0	100	0	0	0	Developed (100)
10	1998	2.4	0.05	0	0	100	0	0	0	Developed (100)
10	2004	2.9	0.07	0	0	100	0	0	0	Developed (100)
10	2005	1.9	0.06	0	0	100	0	0	0	Concrete (60)
10	2006	2.7	0.08	4	0	96	0	0	0	Concrete (60)
10	2007	2.2	0.05	0	0	100	0	0	0	Concrete (60)
10	2008	2.2	0.06	0	0	100	0	0	0	Concrete (60)

Table A2.3 continued on next page.

Table A2.3 continued.

Stream Site	Year	Width (m)	Depth (m)	Habitat types (%)			Cover (%)	Shading (%)	Bank Erodibility (%)	Predominant Bank Land-Use (%)
				Riffle	Pool	Run				
Milwaukee River South Priority Watershed Study Area (Continued)										
Little Menomonee River										
1	1995	4.3	0.30	0	0	100	0	70	43	Woods (88)
1	1996	4.1	0.32	0	0	100	2	67	15	Woods (96)
1	1997	4.5	0.21	0	0	100	1	22	26	Woods (81)
1	1998	4.3	0.28	0	0	100	1	85	64	Woods (77)
1	2004	4.9	0.36	1	0	99	4	96	63	Woods (88)
1	2005	4.4	0.24	2	0	98	0	90	16	Woods (85)
1	2006	4.7	0.29	2	0	98	3	88	50	Woods (86)
1	2007	4.3	0.24	9	0	91	0	94	32	Woods (92)
1	2008	4.4	0.25	9	0	91	0	86	20	Woods (91)
2	1995	7.9	0.32	0	0	100	0	70	33	Woods (100)
2	1996	5.1	0.33	0	0	100	1	75	27	Woods (100)
2	1997	5.5	0.36	0	0	100	5	71	43	Woods (100)
2	1998	5.3	0.35	0	0	100	7	92	48	Woods (100)
2	2004	5.7	0.42	2	4	94	3	88	53	Woods (98)
2	2005	5.0	0.32	0	1	99	3	95	23	Woods (100)
2	2006	5.5	0.36	0	2	98	10	95	45	Woods (100)
2	2007	5.6	0.41	0	0	100	1	95	32	Woods (100)
2	2008	5.5	0.32	0	0	100	7	90	24	Woods (100)
Underwood Creek										
2	1994	11.9	0.11	0	0	100	0	3	0	Developed (58)
2	1995	10.3	0.08	0	0	100	0	0	0	Developed (78)
2	1996	11.1	0.10	0	0	100	0	1	0	Developed (90)
2	1997	10.7	0.09	0	0	100	0	0	0	Developed (65)
2	1998	11.5	0.08	0	0	100	0	5	0	Developed (60)
2	2004	12.4	0.16	0	0	100	0	3	0	Developed (60)
2	2005	11.6	0.10	0	0	100	0	6	0	Developed (60)
2	2006	12.2	0.13	0	0	100	0	5	0	Developed (60)
2	2007	12.3	0.14	0	0	100	0	3	0	Developed (60)
2	2008	9.5	0.06	0	0	100	0	13	0	Developed (61)
4	1991	3.0	0.18	0	27	73	0	85	38	Woods (45)
4	1992	2.6	0.24	0	0	100	5	19	0	Meadow (50)
4	1993	3.7	0.22	32	18	50	2	96	39	Meadow (38)
4	1994	2.7	0.21	0	9	91	2	59	59	Meadow (38)
4	1995	3.0	0.22	0	8	92	5	57	42	Woods (51)
4	1996	3.2	0.23	0	5	95	0	50	16	Shrubs (45)
4	1997	3.4	0.36	0	12	88	0	47	27	Developed (40)
4	1998	3.3	0.21	0	20	80	1	60	47	Woods (49)
4	2004	4.1	0.42	0	12	88	7	46	44	Developed (39)
4	2005	3.9	0.27	5	18	77	2	54	41	Woods (50)
4	2006	3.9	0.35	12	13	75	5	58	21	Meadow (50)
4	2007	3.8	0.26	7	24	69	0	65	32	Shrubs (48)
4	2008	3.8	0.33	14	21	64	6	44	44	Woods (29)

Table A2.3 continued on next page.

Table A2.3 continued.

Stream Site	Year	Width (m)	Depth (m)	Habitat types (%)			Cover (%)	Shading (%)	Bank Erodibility (%)	Predominant Bank Land-Use (%)
				Riffle	Pool	Run				
Milwaukee River South Priority Watershed Study Area (Continued)										
Underwood Creek										
5	1991	2.6	0.30	0	42	58	9	26	1	Meadow (69)
5	1992	3.0	0.16	16	42	42	0	39	5	Meadow (100)
5	1994	3.0	0.14	23	23	54	0	76	66	Meadow (40)
5	1995	3.4	0.17	43	22	35	3	79	47	Woods (48)
5	1996	3.4	0.12	33	12	56	0	75	15	Meadow (45)
5	1997	2.2	0.15	38	22	40	2	73	28	Woods (34)
5	1998	3.2	0.20	29	13	58	0	84	68	Meadow (47)
5	2004	4.0	0.36	16	4	80	1	53	24	Woods (36)
5	2005	3.2	0.22	29	21	50	1	65	36	Woods (51)
5	2006	4.1	0.37	32	28	39	9	69	20	Woods (48)
5	2007	3.7	0.34	23	40	38	0	63	38	Meadow (31)
5	2008	4.1	0.36	27	40	33	13	44	34	Meadow (31)
East Branch Milwaukee River										
2	1994	8.2	0.44	0	8	92	4	68	68	Shrubs (60)
2	1995	6.2	0.37	0	13	87	2	68	22	Woods (54)
2	1996	7.1	0.34	0	13	87	3	61	52	Woods (61)
2	1997	8.7	0.56	0	5	95	8	70	6	Woods (45)
2	1998	7.2	0.42	0	0	100	7	62	33	Woods (92)
2	2004	10.0	0.68	0	0	100	23	54	3	Woods (93)
2	2005	7.0	0.28	0	2	98	6	71	2	Woods (76)
2	2006	8.8	0.50	0	0	100	21	70	4	Woods (78)
2	2007	11.0	0.71	0	0	100	8	60	0	Woods (73)
2	2008	8.6	0.37	0	0	100	13	70	3	Woods (60)
3	1993	11.0	0.62	0	0	100	9	5	0	Shrubs (61)
3	1994	10.6	0.35	0	0	100	3	5	29	Shrubs (58)
3	1995	10.8	0.33	0	0	100	1	3	11	Shrubs (73)
3	1996	11.8	0.60	0	0	100	4	3	0	Shrubs (62)
3	1997	10.9	0.33	0	0	100	6	3	7	Shrubs (51)
3	1998	10.3	0.32	0	0	100	9	5	4	Meadow (55)
3	2004	12.2	0.64	0	0	100	28	5	0	Wetland (95)
3	2005	9.5	0.34	0	0	100	49	6	1	Shrub (50)
3	2006	11.2	0.48	0	0	100	29	14	2	Wetland (65)
3	2007	12.5	0.76	0	0	100	34	3	0	Shrub (52)
3	2008	12.5	0.62	0	0	100	48	10	0	Shrub (65)

Table A2.3 continued on next page.

Table A2.3 continued.

Stream Site	Year	Width (m)	Depth (m)	Habitat types (%)			Cover (%)	Shading (%)	Bank Erodibility (%)	Predominant Bank Land-Use (%)
				Riffle	Pool	Run				
Milwaukee River South Priority Watershed Study Area (Continued)										
Oconomowoc River										
1	1993	8.4	0.40	8	23	69	19	42	29	Shrubs (55)
1	1994	7.9	0.29	42	0	58	6	31	5	Woods (42)
1	1995	7.9	0.31	15	17	68	0	25	7	Shrubs (49)
1	1996	7.2	0.23	19	10	71	4	27	16	Meadow (43)
1	1997	7.8	0.32	19	8	73	8	27	6	Shrubs (48)
1	1998	8.7	0.28	15	18	67	24	37	7	Shrubs (45)
1	2004	9.1	0.45	12	4	84	16	27	2	Shrubs (54)
1	2005	9.0	0.32	20	8	73	5	39	14	Shrubs (38)
1	2006	8.2	0.30	8	7	85	7	47	3	Shrubs (44)
1	2007	8.3	0.25	6	3	91	3	37	4	Shrubs (43)
1	2008	9.7	0.40	14	21	65	23	25	5	Shrubs (45)
2	1995	8.5	0.33	0	24	76	3	9	8	Woods (76)
2	1996	10.6	0.35	0	8	92	2	12	1	Shrubs (75)
2	1997	9.1	0.32	0	6	94	10	15	5	Shrubs (70)
2	1998	9.4	0.38	0	6	94	3	21	19	Woods (42)
2	2004	11.6	0.49	0	0	100	9	21	0	Wetland (51)
2	2005	9.7	0.36	0	0	100	5	28	1	Wetland (44)
2	2006	9.9	0.46	0	6	94	16	52	0	Woods (49)
2	2007	9.3	0.36	0	0	100	7	35	3	Shrubs (45)
2	2008	10.5	0.41	0	0	100	23	26	0	Wetland (54)

Table A2.4. Bottom substrate composition (%) of sites sampled. Estimates from 1990 were based on reach measurements spaced one channel width apart. Estimates from 1991-2008 were based on transect measurements spaced three channel widths apart. An "-" indicates that no data were collected.

Stream Station	Year	Silt	Sand	Gravel	Rubble/ Cobble	Boulder	Bedrock	Clay	Detritus	Other
Waumandee Creek Priority Watershed Study Area										
Eagle Creek										
1	1992	4	87	2	0	0	0	0	0	7
1	1993	19	36	7	0	0	0	33	5	0
1	1994	8	86	1	0	0	0	3	1	1
1	1995	38	53	3	0	0	0	6	1	0
1	1996	52	29	5	0	0	0	11	4	0
1	1997	36	52	1	0	0	0	8	3	0
1	2002	28	52	2	0	0	0	14	0	3
1	2003	56	40	0	0	0	0	2	2	0
1	2004	26	13	2	0	0	0	59	0	0
1	2005	28	43	0	0	0	0	12	0	18
1	2006	46	44	0	0	0	0	7	3	0
2	1990	13	78	4	0	0	0	4	0	0
2	1991	1	65	11	1	0	0	3	0	19
2	1992	10	79	10	0	0	0	0	0	0
2	1993	7	50	23	3	0	0	15	2	0
2	1994	13	46	28	1	0	0	11	1	0
2	1995	28	39	25	1	0	0	7	1	0
2	1996	31	10	11	7	0	0	40	1	0
2	1997	49	21	12	10	0	0	5	3	0
2	2002	19	39	15	2	0	0	19	1	5
2	2003	26	40	8	3	1	0	19	4	0
2	2004	11	26	20	4	4	0	34	1	0
2	2005	19	30	21	3	5	0	2	0	21
2	2006	36	43	11	0	0	0	4	0	5
3	1992	9	54	10	23	0	0	1	1	1
3	1993	45	26	9	12	3	0	1	6	0
3	1994	24	22	21	20	3	0	5	3	2
3	1995	26	29	23	13	4	0	2	1	1
3	1996	41	9	20	23	0	0	7	0	0
3	1997	47	7	7	25	8	0	5	1	0
3	2002	10	10	40	28	3	0	8	0	1
3	2003	30	11	23	26	3	0	4	1	0
3	2004	9	13	38	27	3	0	10	0	0
3	2005	9	30	24	28	0	0	6	1	3
3	2006	23	9	33	24	9	0	1	0	0
4	1997	37	21	21	18	4	0	0	1	0

Table A2.4 continued on next page.
Table A2.4 continued.

Stream Station	Year	Silt	Sand	Gravel	Rubble/ Cobble	Boulder	Bedrock	Clay	Detritus	Other
Waumandee Creek Priority Watershed Study Area (Continued)										
Joos Creek										
1	1992	12	44	25	13	3	0	1	2	0
1	1994	18	75	2	0	0	0	2	3	0
1	1995	16	60	12	0	0	0	8	2	0
1	1996	64	25	0	1	3	0	3	3	0
1	1997	64	17	13	4	1	0	0	0	0
1	2002	8	31	36	7	0	0	18	0	0
1	2003	30	39	23	5	0	0	0	2	0
1	2004	14	16	47	12	2	0	8	0	0
1	2005	15	28	48	6	1	0	0	0	2
1	2006	18	24	54	3	0	0	0	1	0
2	1990	11	39	39	5	0	0	6	0	0
2	1991	19	28	23	16	0	0	13	1	0
2	1992	20	35	20	14	10	0	0	0	0
2	1993	1	69	2	0	0	0	0	21	6
2	1994	10	46	16	25	0	0	4	0	0
2	1995	24	20	31	16	4	0	4	1	0
2	1996	15	31	25	18	5	0	1	1	4
2	1997	20	32	24	22	2	0	0	0	0
2	2002	3	23	35	26	7	0	6	0	0
2	2003	14	15	32	28	11	0	0	0	0
2	2004	7	11	33	27	8	0	14	0	0
2	2005	4	14	50	27	2	0	1	0	2
2	2006	27	12	23	29	3	0	0	4	1
3	1992	4	1	3	7	2	0	84	0	0
3	1993	47	17	14	12	6	0	3	0	0
3	1994	63	23	6	8	0	0	0	0	0
3	1995	47	11	26	12	1	0	2	0	0
3	1996	40	9	5	27	0	0	18	0	0
3	1997	80	5	4	7	3	0	2	0	0
3	2002	19	37	17	7	6	0	15	0	0
3	2003	34	14	14	23	5	0	9	1	0
3	2004	26	10	26	13	10	0	15	0	0
3	2005	34	18	19	16	7	0	6	0	0
3	2006	54	15	16	7	5	0	3	1	0

Table A2.4 continued on next page.

Table A2.4 continued.

Stream Station	Year	Silt	Sand	Gravel	Rubble/ Cobble	Boulder	Bedrock	Clay	Detritus	Other
Waumandee Creek Priority Watershed Study Area (Continued)										
Joos Creek										
4	1992	30	26	6	27	7	0	4	1	0
4	1993	14	14	24	34	7	0	5	0	1
4	1994	25	16	24	33	1	0	0	1	0
4	1995	30	9	18	35	2	0	3	2	0
4	1996	20	17	11	41	1	0	11	1	0
4	1997	28	10	17	36	4	0	3	3	0
4	2002	9	4	18	31	10	0	27	0	1
4	2003	39	15	6	26	10	0	2	1	2
4	2004	7	3	25	34	18	0	14	0	0
4	2005	14	14	24	40	7	0	2	0	0
4	2006	38	6	13	33	4	0	0	5	0
5	1997	43	24	12	18	2	0	1	0	0
Bohris Creek										
1	1990	3	84	6	3	0	0	3	0	0
1	1991	3	64	26	5	0	0	0	0	1
1	1992	3	47	16	20	2	0	10	2	0
1	1993	9	26	19	13	4	0	25	4	0
1	1994	5	42	21	4	3	0	21	2	2
1	1995	26	23	33	10	0	0	3	1	3
1	1996	16	68	6	9	0	0	1	1	0
1	1997	0	83	8	5	0	0	4	0	0
1	2002	1	61	25	8	1	0	4	1	0
1	2003	5	68	19	7	0	0	1	0	0
1	2004	0	87	9	3	1	0	0	0	0
1	2005	0	71	21	3	3	0	1	0	0
1	2006	9	65	22	2	0	0	1	1	0
2	1990	28	34	20	18	0	0	0	0	0
2	1991	36	25	16	11	0	0	1	0	11
2	1992	12	63	11	3	3	0	8	0	1
2	1993	36	17	23	16	1	0	3	2	4
2	1994	16	38	24	21	0	0	0	0	1
2	1995	31	28	21	15	0	0	4	0	1
2	1996	18	29	22	28	3	0	0	0	0
2	1997	24	26	29	19	0	0	0	1	0
2	2002	5	42	29	16	3	0	2	1	2
2	2003	25	38	17	14	2	0	3	0	0
2	2004	18	28	32	14	5	0	3	0	0
2	2005	3	36	38	15	0	0	4	0	4
2	2006	40	20	18	22	0	0	0	0	0

Table A2.4 continued on next page.

Table A2.4 continued.

Stream Station	Year	Silt	Sand	Gravel	Rubble/ Cobble	Boulder	Bedrock	Clay	Detritus	Other
Waumandee Creek Priority Watershed Study Area (Continued)										
Trout Run Creek										
1	1990	26	41	24	6	0	0	3	0	0
1	1991	12	63	16	3	0	0	4	3	0
1	1992	10	57	10	14	0	0	10	0	0
1	1993	8	47	31	3	0	0	7	4	0
1	1994	3	22	43	26	6	0	0	0	0
1	1995	17	44	22	7	6	0	4	0	0
1	1996	11	62	6	18	2	0	1	0	0
1	1997	8	59	13	16	2	0	2	0	0
1	2002	3	65	19	8	4	0	1	0	0
1	2003	2	65	14	16	2	0	0	2	0
1	2004	1	58	31	8	2	0	0	0	0
1	2005	2	53	21	17	3	0	3	1	0
1	2006	21	42	16	16	3	0	0	3	0
2	1994	4	52	22	4	0	0	2	16	0
2	1995	25	72	0	0	0	0	1	2	0
2	1996	2	89	0	0	0	0	2	3	3
2	1997	1	97	0	0	0	0	1	0	0
2	2002	10	89	0	0	0	0	1	0	0
2	2003	8	79	2	0	0	0	11	0	0
2	2004	15	81	1	0	0	0	3	0	0
2	2005	31	68	0	0	0	0	0	1	0
2	2006	84	13	0	0	0	0	0	3	0
Timber Coulee Creek										
1	1993	19	10	29	19	3	18	0	1	0
1	1994	13	16	38	12	2	18	0	1	0
1	1995	23	10	30	18	6	12	0	0	0
1	1996	13	11	29	29	1	15	0	2	0
1	1997	30	15	26	14	0	14	0	1	0
1	2002	13	18	27	20	3	18	0	1	0
1	2003	15	12	31	28	0	14	0	0	0
1	2004	5	31	28	18	2	15	0	1	0
1	2005	10	16	25	28	3	19	0	0	0
1	2006	6	15	33	23	6	18	0	0	0

Table A2.4 continued on next page.

Table A2.4 continued.

Stream Station	Year	Silt	Sand	Gravel	Rubble/ Cobble	Boulder	Bedrock	Clay	Detritus	Other
Waumandee Creek Priority Watershed Study Area (Continued)										
Timber Coulee Creek										
2	1994	20	15	6	34	24	0	1	0	0
2	1995	23	16	14	21	21	0	2	0	0
2	1996	27	19	16	26	11	0	1	0	0
2	1997	29	19	20	28	4	0	0	0	0
2	2002	14	16	21	25	23	0	0	0	0
2	2003	26	10	14	34	16	0	0	0	0
2	2004	9	24	16	35	16	0	0	0	0
2	2005	12	15	7	55	11	0	0	0	0
2	2006	20	9	9	30	31	1	0	0	0
Cady Creek										
1	1995	6	6	29	42	13	0	2	0	1
1	1996	10	2	18	65	4	0	0	0	0
1	1997	3	6	36	46	10	0	0	0	0
1	2002	0	6	31	45	18	0	0	0	0
1	2003	0	26	13	46	15	0	1	0	0
1	2004	0	8	31	39	22	0	0	0	0
1	2005	0	3	30	44	23	0	0	0	0
1	2006	1	3	32	46	19	0	0	0	0
2	1995	15	4	35	32	14	0	0	0	0
2	1996	17	14	22	29	16	0	0	1	0
2	1997	2	11	40	25	21	0	0	0	0
2	2002	0	4	20	46	29	0	0	0	0
2	2003	0	11	21	41	28	0	0	0	0
2	2004	0	10	18	39	32	1	0	0	0
2	2005	0	2	25	37	37	0	0	0	0
2	2006	0	0	20	60	19	0	0	0	0

Table A2.4 continued on next page.

Table A2.4 continued.

Stream Station	Year	Silt	Sand	Gravel	Rubble/ Cobble	Boulder	Bedrock	Clay	Detritus	Other
Milwaukee River South Priority Watershed Study Area										
Lincoln Creek										
1	1994	0	0	21	0	0	0	0	0	79
1	1995	1	9	10	0	0	0	0	0	80
1	1996	0	2	6	0	0	0	0	0	92
1	1997	0	0	8	1	0	0	0	0	91
1	1998	0	3	11	2	0	0	0	0	84
1	2004	0	0	3	83	14	0	0	0	0
1	2005	0	0	1	97	2	0	0	0	0
1	2006	1	1	0	93	4	0	0	1	0
1	2007	0	0	0	86	11	0	0	3	0
1	2008	3	0	1	86	5	0	0	5	0
4	1992	74	5	4	1	2	0	10	3	0
4	1993	36	11	25	2	2	0	17	0	7
4	1994	5	41	23	3	3	0	25	0	0
4	1995	17	41	18	2	0	2	19	1	0
4	1996	8	48	25	2	1	0	11	3	2
4	1997	0	31	34	5	2	0	13	15	0
4	1998	8	37	32	2	2	0	14	5	0
4	2004	0	4	27	47	22	0	0	1	0
4	2005	1	7	28	46	18	0	0	0	0
4	2006	3	4	19	52	21	0	0	2	0
4	2007	1	2	21	42	32	0	0	2	0
4	2008	7	1	30	41	22	0	0	0	0
5	1994	0	0	3	0	0	0	0	0	97
5	1995	0	0	0	0	0	0	0	0	100
5	1996	0	0	0	0	0	0	0	0	100
5	1997	0	0	0	0	0	0	0	0	100
5	1998	0	1	0	0	0	0	0	0	99
5	2004	0	2	4	51	44	0	0	0	7
5	2005	1	2	3	56	37	0	0	0	0
5	2006	1	4	2	59	34	0	0	0	0
5	2007	0	2	1	35	60	0	0	3	0
5	2008	10	1	0	52	36	0	0	0	0

Table A2.4 continued on next page.

Table A2.4 continued.

Stream Station	Year	Silt	Sand	Gravel	Rubble/ Cobble	Boulder	Bedrock	Clay	Detritus	Other
Milwaukee River South Priority Watershed Study Area (Continued)										
Lincoln Creek										
6	1994	0	0	0	0	0	0	0	0	100
6	1995	0	0	0	0	0	0	0	0	100
6	1996	0	0	0	0	0	0	0	0	100
6	1997	0	0	0	0	0	0	0	0	100
6	1998	0	0	1	0	0	0	0	0	99
6	2004	0	4	8	31	57	0	0	0	0
6	2005	7	3	2	65	19	0	0	5	0
6	2006	0	11	1	49	32	0	0	6	0
6	2007	2	11	1	50	34	0	0	1	0
6	2008	8	11	6	59	15	0	0	1	0
7	1994	27	4	14	8	6	0	2	38	1
7	1995	33	13	12	9	10	0	5	17	0
7	1996	26	28	19	10	11	0	4	2	0
7	1997	18	13	26	9	9	0	10	3	10
7	1998	9	33	27	9	9	0	3	8	2
7	2004	0	0	28	65	4	0	0	0	3
7	2005	1	0	21	70	7	0	0	0	0
7	2006	0	1	20	71	6	0	0	0	2
7	2007	2	1	21	64	10	0	0	1	0
7	2008	3	0	22	75	0	0	0	0	0
8	1994	27	8	42	18	1	0	1	4	0
8	1995	26	19	46	7	0	0	0	2	0
8	1996	8	41	44	6	0	0	1	1	0
8	1997	9	28	54	8	0	0	0	1	0
8	1998	10	27	38	23	1	0	0	1	0
8	2004	0	0	4	87	10	0	0	0	0
8	2005	3	0	8	85	2	0	2	0	0
8	2006	3	1	2	94	1	0	0	0	0
8	2007	5	0	14	77	4	0	0	0	0
8	2008	12	0	7	81	0	0	0	1	0

Table A2.4 continued on next page.

Table A2.4 continued.

Stream Station	Year	Silt	Sand	Gravel	Rubble/ Cobble	Boulder	Bedrock	Clay	Detritus	Other
Milwaukee River South Priority Watershed Study Area (Continued)										
Lincoln Creek										
9	1994	47	6	31	9	1	0	2	4	0
9	1995	17	24	42	11	1	0	4	1	0
9	1996	31	33	22	11	2	0	0	1	0
9	1997	27	14	41	11	0	0	2	5	0
9	1998	45	26	17	4	0	0	0	8	0
9	2004	0	1	53	43	2	0	0	0	0
9	2005	5	3	27	62	3	0	0	0	0
9	2006	6	4	30	54	0	0	0	6	0
9	2007	17	4	32	34	3	0	0	10	0
9	2008	12	1	19	51	0	0	0	16	0
10	1997	0	13	16	0	0	0	0	0	70
10	1998	5	8	14	0	0	0	0	0	73
10	2004	0	6	12	0	0	0	0	1	81
10	2005	0	6	13	1	0	0	0	0	80
10	2006	0	5	9	1	0	0	0	0	85
10	2007	7	14	12	1	0	0	0	0	66
10	2008	11	6	3	0	0	0	0	0	80
Little Menomonee River										
1	1995	38	15	17	16	0	0	0	6	0
1	1996	22	26	19	24	0	0	0	9	0
1	1997	17	21	28	31	1	0	0	2	0
1	1998	9	24	22	41	0	0	1	3	0
1	2004	2	12	35	41	8	0	2	1	0
1	2005	9	20	29	30	3	0	0	8	0
1	2006	9	24	25	32	3	0	0	7	0
1	2007	9	31	35	20	1	0	0	3	0
1	2008	13	32	29	21	1	0	0	4	0
2	1995	57	20	1	3	0	0	1	18	0
2	1996	51	20	6	6	0	0	0	18	0
2	1997	40	47	6	4	0	0	0	3	0
2	1998	30	40	5	7	0	0	7	11	0
2	2004	38	33	9	6	0	0	5	8	0
2	2005	16	26	16	6	1	0	17	18	0
2	2006	17	33	8	9	0	0	14	19	0
2	2007	27	29	9	10	0	0	15	11	0
2	2008	34	19	14	8	0	0	15	11	0

Table A2.4 continued on next page.

Table A2.4 continued.

Stream Station	Year	Silt	Sand	Gravel	Rubble/ Cobble	Boulder	Bedrock	Clay	Detritus	Other
Milwaukee River South Priority Watershed Study Area (Continued)										
Underwood Creek										
2	1994	0	0	0	0	0	0	0	0	100
2	1995	0	0	1	0	0	0	0	0	99
2	1996	0	0	0	0	0	0	0	0	100
2	1997	0	0	0	0	0	0	0	0	100
2	1998	0	0	0	0	0	0	0	0	100
2	2004	0	0	0	0	0	0	0	0	100
2	2005	0	0	0	0	0	0	0	0	100
2	2006	0	0	1	0	1	0	0	0	100
2	2007	0	2	5	1	0	0	0	0	93
2	2008	9	0	1	0	0	0	0	0	89
4	1991	28	46	13	2	0	0	4	7	0
4	1992	78	8	0	0	0	0	0	14	0
4	1993	7	24	62	0	0	0	1	5	1
4	1994	53	25	8	1	0	0	2	10	1
4	1995	39	35	6	0	0	0	0	19	0
4	1996	27	42	18	0	0	0	0	12	0
4	1997	19	50	17	0	0	0	9	4	0
4	1998	25	41	25	0	0	0	4	4	1
4	2004	4	45	39	1	0	0	10	1	0
4	2005	30	21	33	3	3	0	1	9	0
4	2006	8	38	37	6	0	0	5	5	0
4	2007	18	38	32	2	2	0	6	4	0
4	2008	6	25	40	7	1	0	19	1	0
5	1991	38	41	8	1	0	0	6	8	0
5	1992	37	9	41	0	0	0	1	12	0
5	1994	22	16	52	0	0	0	0	10	0
5	1995	12	15	71	0	0	0	0	2	0
5	1996	5	25	64	1	0	0	2	4	0
5	1997	26	20	48	2	0	0	0	3	0
5	1998	12	25	52	2	3	0	2	4	0
5	2004	3	31	61	3	0	0	1	0	0
5	2005	8	22	57	0	0	0	3	7	4
5	2006	5	28	46	8	0	0	8	5	0
5	2007	11	36	43	3	0	0	4	4	0
5	2008	4	24	53	0	0	0	17	3	0

Table A2.4 continued on next page.

Table A2.4 continued.

Stream Station	Year	Silt	Sand	Gravel	Rubble/ Cobble	Boulder	Bedrock	Clay	Detritus	Other
Milwaukee River South Priority Watershed Study Area (Continued)										
East Branch Milwaukee River										
2	1994	26	45	11	3	0	0	0	15	0
2	1995	33	33	6	7	0	0	0	22	0
2	1996	36	34	10	6	0	0	0	14	0
2	1997	22	46	12	7	0	0	0	13	0
2	1998	23	41	14	3	0	0	0	19	0
2	2004	11	43	18	4	0	0	0	24	0
2	2005	21	36	19	6	0	0	0	19	0
2	2006	17	31	17	7	0	0	0	28	0
2	2007	32	27	19	3	0	0	0	19	0
2	2008	29	36	11	2	0	0	5	16	0
3	1993	20	61	16	2	0	0	0	2	0
3	1994	32	32	27	1	0	0	0	8	0
3	1995	63	17	12	3	0	0	0	5	0
3	1996	52	34	13	1	0	0	0	0	0
3	1997	60	19	17	3	0	0	0	1	0
3	1998	57	22	16	4	0	0	0	1	0
3	2004	20	50	26	2	0	0	0	3	0
3	2005	27	49	22	1	0	0	0	1	0
3	2006	36	33	13	2	1	0	0	16	0
3	2007	42	34	21	1	0	0	0	3	0
3	2008	42	36	17	3	0	0	0	2	0
Oconomowoc River										
1	1993	16	36	11	16	15	0	0	5	0
1	1994	17	35	20	16	11	0	0	0	0
1	1995	39	25	17	10	2	0	0	4	0
1	1996	12	27	21	18	14	0	0	6	2
1	1997	28	26	15	15	10	0	0	7	0
1	1998	14	34	24	16	10	0	0	2	0
1	2004	29	30	20	10	6	0	0	5	0
1	2005	19	27	27	10	13	0	0	3	0
1	2006	16	34	24	12	4	0	0	11	0
1	2007	17	36	24	11	5	0	0	7	0
1	2008	28	30	15	15	11	0	0	1	0

Table A2.4 continued on next page.

Table A2.4 continued.

Stream Station	Year	Silt	Sand	Gravel	Rubble/ Cobble	Boulder	Bedrock	Clay	Detritus	Other
Milwaukee River South Priority Watershed Study Area (Continued)										
Oconomowoc River										
2	1995	57	25	4	3	6	0	0	4	0
2	1996	47	28	5	6	8	0	0	6	0
2	1997	38	32	12	5	7	0	1	6	0
2	1998	57	26	5	7	5	0	0	0	0
2	2004	46	33	3	4	8	0	0	5	0
2	2005	40	31	6	4	5	0	0	13	0
2	2006	43	28	8	10	3	0	0	9	0
2	2007	38	31	9	6	4	0	4	9	0
2	2008	32	48	9	3	6	0	0	3	0

Table A2.5. Summary of selected temperature (°C) parameters in the Waumandee Creek Priority Watershed.

Stream Station	Year	Summer Mean Temperature	July Mean Temperature	Summer Maximum Temperature
Waumandee Creek Priority Watershed Study Area				
Eagle Creek				
1	1993	15.8	16.3	18.8
1	1994	17.1	17.3	20.7
1	1995	18.9	18.8	22.3
1	2004	15.6	16.8	18.0
1	2005	17.1	17.8	19.5
1	2006	17.4	18.6	20.1
2	1994	15.2	15.6	18.2
2	1996	16.0	16.4	17.5
2	2004	14.8	15.9	17.7
2	2005	15.9	16.4	18.2
2	2006	16.5	17.6	19.6
3	1995	18.5	18.4	22.6
3	1996	16.6	17.1	20.1
3	2004	15.4	16.8	17.9
3	2005	17.0	17.7	19.4
3	2006	17.5	18.8	20.5
4	2004	12.2	12.8	13.7
4	2005	12.0	12.0	13.5
4	2006	12.2	12.4	13.7
Joos Creek				
2	1993	16.9	17.3	20.7
2	1994	18.5	18.8	22.9
2	1995	20.2	20.3	24.3
2	2004	16.4	17.7	18.9
2	2005	18.1	18.9	20.8
2	2006	18.2	19.6	21.4
3	1995	19.4	19.5	23.7
3	1996	17.0	17.4	18.9
3	2004	16.4	17.7	18.9

3	2005	18.0	18.8	20.6
3	2006	18.1	19.4	20.9

Table A2.5 continued on next page.

Table A2.5 continued.

Stream Station	Year	Summer Mean Temperature	July Mean Temperature	Summer Maximum Temperature
Waumandee Creek Priority Watershed Study Area				
Joos Creek				
4	1994	14.7	15.1	18.4
4	1995	17.2	17.1	21.3
4	1996	17.1	17.4	20.5
4	2004	14.9	16.0	18.2
4	2005	16.2	16.7	19.1
4	2006	15.9	17.0	18.7
5	2005	13.4	13.8	15.6
Bohris Creek				
1	1993	14.1	13.5	17.3
1	1994	16.2	16.4	20.1
1	1995	17.2	17.3	20.6
1	1996	16.1	16.8	19.6
1	2004	15.2	16.2	18.2
1	2006	17.1	18.3	20.2
2	1993	13.9	14.1	16.6
2	1994	11.2	11.2	18.9
2	1995	17.4	18.2	20.9
2	1996	15.6	17.1	17.2
2	2004	14.5	15.3	17.9
2	2005	15.6	15.2	18.2
2	2006	15.9	17.0	18.6
Trout Run Creek				
1	1993	14.5	14.8	16.2
1	1994	15.1	15.3	17.6
1	1996	16.0	16.6	18.2
1	2004	14.6	15.5	17.6
1	2005	16.3	16.9	19.9
1	2006	16.7	17.8	20.6
2	1995	15.1	15.3	17.6

2	1996	14.0	14.2	16.1
2	2004	13.5	14.1	15.4
2	2005	14.7	15.2	17.0
2	2006	14.9	15.8	17.4

Table A2.5 continued on next page.
Table A2.5 continued.

Stream Station	Year	Summer Mean Temperature	July Mean Temperature	Summer Maximum Temperature
Waumandee Creek Priority Watershed Study Area				
Timber Coulee Creek				
1	1994	14.4	15.1	16.6
1	1995	15.5	15.7	18.3
1	1996	14.7	15.0	17.4
1	2005	16.9	17.6	19.5
1	2006	17.0	18.3	19.7
2	1995	14.3	14.4	17.8
2	1996	13.6	13.8	17.1
2	2004	13.6	14.3	16.9
2	2005	14.8	15.3	17.9
2	2006	15.0	15.9	18.5
Cady Creek				
1	1995	15.0	15.0	18.1
1	1996	13.4	13.9	16.5
1	2004	13.0	13.8	15.5
1	2005	14.7	15.3	17.2
1	2006	14.9	15.7	17.6
2	1995	15.1	15.1	18.6
2	2004	13.5	14.3	16.5
2	2005	13.9	14.4	16.5
2	2006	14.8	15.5	17.9

APPENDIX 3 -- CATCH AND ABUNDANCE OF FISH

A3.1. Fishes collected in Eagle Creek 1 by CPUE method in the Waumandee Creek Priority Watershed study area. For this and subsequent tables, scientific names of fishes are given in Appendix 4.

Species	Eagle Creek 1 21-Jul 1992	Eagle Creek 1 22-Jul 1993	Eagle Creek 1 26-Jul 1994	Eagle Creek 1 26-Jul 1995	Eagle Creek 1 23-Jul 1996	Eagle Creek 1 07-Jul 1997	Eagle Creek 1 16-Jul 2002	Eagle Creek 1 30-Jul 2003	Eagle Creek 1 27-Jul 2004	Eagle Creek 1 02-Aug 2005	Eagle Creek 1 26-Jul 2006
Brown Trout	0	0	0	0	0	1	0	2	1	1	0
Brook trout	0	0	0	0	0	0	0	2	0	8	7
Burbot	0	0	0	0	0	1	0	0	0	0	0
Bigmouth shiner	21	0	0	1	0	0	0	0	0	0	0
Southern redbelly dace	0	0	0	8	0	0	0	0	0	0	0
Fathead minnow	0	0	0	0	0	0	1	0	16	3	1
Blacknose dace	16	8	1	0	0	0	9	29	32	3	4
Longnose dace	50	22	7	29	7	10	0	0	0	0	0
Creek chub	79	47	17	15	7	5	4	12	10	27	10
White sucker	24	32	21	65	46	53	16	53	113	75	25
Brook stickleback	0	2	1	1	5	0	7	0	3	4	2
Johnny darter	29	2	9	29	10	43	1	7	17	2	9
Total Fish Species	6	6	6	7	5	6	6	6	7	8	7
Total Fish Individuals	219	113	56	148	75	113	38	105	192	123	58

A3.2. Fishes collected in Eagle Creek 2 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Eagle Creek 2 16-Aug 1990	Eagle Creek 2 29-Jul 1991	Eagle Creek 2 21-Jul 1992	Eagle Creek 2 22-Jul 1993	Eagle Creek 2 26-Jul 1994	Eagle Creek 2 26-Jul 1995	Eagle Creek 2 23-Jul 1996	Eagle Creek 2 08-Jul 1997	Eagle Creek 2 16-Jul 2002	Eagle Creek 2 30-Jul 2003	Eagle Creek 2 27-Jul 2004	Eagle Creek 2 1-Aug 2005	Eagle Creek 2 26-Jul 2006
Brook trout	0	0	0	0	5	0	0	0	22	25	31	36	32
Central stoneroller	2	0	10	1	13	2	0	0	0	0	0	0	0
Bigmouth shiner	2	8	72	10	0	0	0	0	0	0	0	0	0
Southern redbelly dace	0	0	0	0	0	16	0	0	0	0	0	0	0
Fathead minnow	0	0	0	0	0	0	0	0	2	0	5	1	0
Blacknose dace	6	4	7	21	17	15	9	5	15	34	32	12	14
Longnose dace	14	22	20	31	19	28	23	21	7	8	5	7	2
Creek chub	31	28	55	17	37	11	5	34	42	22	8	8	3
White sucker	11	14	20	4	11	52	60	61	10	5	18	23	10
Brook stickleback	2	0	0	2	4	15	35	16	2	9	6	15	2
Johnny darter	50	23	30	14	12	92	24	91	29	28	50	29	39
Total Fish Species	8	6	7	8	8	8	6	6	8	7	8	8	7
Total Fish Individuals	118	99	214	100	118	231	156	228	129	131	155	131	102

A3.3. Fishes collected in Eagle Creek 3 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Eagle Creek 3 05-Aug 1992	Eagle Creek 3 20-Jul 1993	Eagle Creek 3 26-Jul 1994	Eagle Creek 3 27-Jul 1995	Eagle Creek 3 24-Jul 1996	Eagle Creek 3 08-Jul 1997	Eagle Creek 3 16-Jul 2002	Eagle Creek 3 30-Jul 2003	Eagle Creek 3 27-Jul 2004	Eagle Creek 3 02-Aug 2005	Eagle Creek 3 26-Jul 2006
Brook trout	0	0	0	0	0	0	2	0	10	4	7
Central stoneroller	22	0	4	0	0	5	0	0	0	0	0
Bigmouth shiner	0	1	0	0	0	0	0	0	0	0	0
Blacknose dace	28	2	16	25	11	1	30	13	6	1	0
Longnose dace	44	29	55	96	54	101	57	103	48	47	42
Creek chub	38	36	29	14	15	21	36	15	10	7	3
White sucker	11	18	66	16	33	104	27	31	6	25	2
Brook stickleback	0	1	1	1	7	3	0	2	0	2	0
Johnny darter	39	36	107	265	24	310	124	127	228	127	73
Total Fish Species	6	7	7	6	6	7	6	6	6	7	5
Total Fish Individuals	182	123	278	417	144	545	276	291	308	213	127

A3.4. Fishes collected in Eagle Creek 4 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Eagle Creek 4 22-Jul 1997
Brook trout	15
Blacknose dace	1
Longnose dace	32
White sucker	28
Brook stickleback	21
Johnny darter	55
Total fish species	6
Total fish individuals	152

A3.5. Fishes collected in Joos Creek 1 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Joos Creek 1 05-Aug 1992	Joos Creek 1 26-Jul 1994	Joos Creek 1 26-Jul 1995	Joos Creek 1 23-Jul 1996	Joos Creek 1 15-Jul 1997	Joos Creek 1 17-Jul 2002	Joos Creek 1 29-Jul 2003	Joos Creek 1 04-Aug 2004	Joos Creek 1 02-Aug 2005	Joos Creek 1 26-Jul 2006
Brook trout	0	0	0	0	0	0	0	0	1	0
Central mudminnow	0	1	0	0	0	0	0	0	0	0
Central stoneroller	43	0	2	25	0	0	0	10	1	0
Largescale stoneroller	0	0	0	0	0	12	0	0	0	0
Brassy minnow	0	0	0	2	0	0	0	26	8	0
Bigmouth shiner	42	62	108	2	14	52	3	10	3	0
Bluntnose minnow	0	0	0	0	0	1	0	0	0	0
Fathead minnow	7	49	3	9	8	208	9	346	25	5
Blacknose dace	78	59	52	53	27	161	97	58	73	48
Longnose dace	33	8	8	0	3	19	5	6	10	7
Creek chub	131	25	50	14	45	61	29	36	64	66
Minnow hybrid	0	0	0	0	0	0	0	1	0	0
White sucker	22	64	46	129	34	18	5	39	35	36
Brook stickleback	0	17	1	4	29	6	0	0	0	0
Johnny darter	21	85	75	14	178	31	8	31	27	33
Total Fish Species	8	9	9	9	8	10	7	10	10	6
Total Fish Individuals	377	370	345	251	338	569	156	563	247	195

A3.6. Fishes collected in Joos Creek 2 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Joos Creek 2 08-Aug 1990	Joos Creek 2 30-Jul 1991	Joos Creek 2 05-Aug 1992	Joos Creek 2 21-Jul 1993	Joos Creek 2 27-Jul 1994	Joos Creek 2 26-Jul 1995	Joos Creek 2 23-Jul 1996	Joos Creek 2 22-Jul 1997	Joos Creek 2 17-Jul 2002	Joos Creek 2 29-Jul 2003	Joos Creek 2 04-Aug 2004	Joos Creek 2 02-Aug 2005	Joos Creek 2 02-Aug 2006
Brook Trout	0	0	0	0	0	0	0	0	0	0	0	0	0
Central stoneroller	48	39	43	51	31	11	11	28	0	1	5	1	0
Largescale stoneroller	0	0	0	0	0	0	0	0	18	0	0	0	0
Brassy minnow	0	1	0	0	2	0	0	0	0	0	1	0	0
Bigmouth shiner	176	103	42	79	16	33	1	0	2	0	0	0	0
Fathead minnow	21	4	7	2	10	2	1	0	41	0	25	23	7
Blacknose dace	64	30	78	129	66	124	63	71	186	80	65	64	41
Longnose dace	43	68	33	44	32	21	92	82	92	23	49	32	14
Creek chub	135	69	131	94	79	54	60	72	59	25	19	68	66
Minnow hybrid	0	0	0	1	0	0	0	0	0	0	0	0	0
White sucker	9	23	22	10	23	30	61	63	15	11	47	59	63
Brook stickleback	3	0	0	0	1	0	5	13	0	0	0	1	1
Johnny darter	51	30	21	13	5	18	51	156	17	9	39	22	42
Total Fish Species	9	9	8	9	10	8	9	7	8	6	8	8	7
Total Fish Individuals	550	367	377	423	265	293	345	485	430	149	250	270	234

A3.7. Fishes collected in Joos Creek 3 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Joos Creek 3 06-Aug 1992	Joos Creek 3 20-Jul 1993	Joos Creek 3 27-Jul 1994	Joos Creek 3 27-Jul 1995	Joos Creek 3 23-Jul 1996	Joos Creek 3 15-Jul 1997	Joos Creek 3 17-Jul 2002	Joos Creek 3 29-Jul 2003	Joos Creek 3 04-Aug 2004	Joos Creek 3 03-Aug 2005	Joos Creek 3 02-Aug 2006
Brook trout	0	0	0	0	0	0	0	0	0	0	8
Central stoneroller	4	38	2	7	17	111	0	23	12	2	2
Largescale stoneroller	0	0	0	0	0	0	24	0	0	0	0
Brassy minnow	0	0	0	0	1	0	0	0	2	0	0
Bigmouth shiner	650	668	445	142	66	60	43	3	2	2	1
Fathead minnow	0	60	23	0	0	2	29	0	10	15	2
Blacknose dace	18	76	82	89	73	50	203	130	55	108	40
Longnose dace	56	31	23	27	94	91	137	36	51	91	41
Creek chub	64	227	120	0	67	112	102	31	28	59	60
Minnow hybrid	0	1	0	0	0	0	0	0	0	0	0
White sucker	8	32	219	0	157	181	55	34	163	239	91
Brook stickleback	0	0	1	161	31	148	10	2	1	84	9
Johnny darter	45	43	705	172	90	1024	186	27	119	485	182
Total Fish Species	7	9	9	6	9	9	9	8	10	9	10
Total Fish Individuals	845	1176	1620	598	596	1779	789	286	443	1085	436

A3.8. Fishes collected in Joos Creek 4 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Joos Creek 4 31-Jul 1992	Joos Creek 4 20-Jul 1993	Joos Creek 4 27-Jul 1994	Joos Creek 4 02-Aug 1995	Joos Creek 4 29-Jul 1996	Joos Creek 4 22-Jul 1997	Joos Creek 4 25-Jul 2002	Joos Creek 4 29-Jul 2003	Joos Creek 4 04-Aug 2004	Joos Creek 4 04-Aug 2005	Joos Creek 4 02-Aug 2006
Brook Trout	0	1	0	0	0	0	0	0	1	4	1
Central stoneroller	53	50	15	9	7	3	39	0	1	0	2
Bigmouth shiner	24	4	0	3	0	0	0	0	0	0	0
Fathead minnow	26	7	0	0	0	1	2	0	8	9	8
Blacknose dace	154	74	64	120	53	50	12	16	22	25	14
Longnose dace	76	45	45	154	140	97	11	3	8	15	17
Creek chub	167	59	83	57	34	55	58	45	8	43	41
Minnow hybrid	0	0	0	0	0	0	1	0	0	0	0
White sucker	124	30	82	107	88	228	107	40	50	95	116
Brook stickleback	0	4	4	6	26	44	1	2	0	15	6
Johnny darter	77	111	97	172	106	205	55	31	49	115	44
Total Fish Species	8	10	7	8	7	8	9	6	8	8	9
Total Fish Individuals	701	385	390	628	454	683	286	137	147	321	249

A3.9. Fishes collected in Joos Creek 4 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Joos 5 08-Aug 1997
Brook trout	87
Central stoneroller	1
Blacknose dace	6
Longnose dace	11
Creek chub	10
Minnow hybrid	1
White sucker	69
Brook stickleback	10
Johnny darter	182
Total fish species	9
Total fish individuals	377

A3.10. Fishes collected in Bohris Creek 1 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Bohris Creek 1 22-Aug 1990	Bohris Creek 1 07-Aug 1991	Bohris Creek 1 29-Jul 1992	Bohris Creek 1 28-Jul 1993	Bohris Creek 1 02-Aug 1994	Bohris Creek 1 02-Aug 1995	Bohris Creek 1 30-Jul 1996	Bohris Creek 1 05-Aug 1997	Bohris Creek 1 18-Jul 2002	Bohris Creek 1 28-Jul 2003	Bohris Creek 1 28-Jul 2004	Bohris Creek 1 04-Aug 2005	Bohris Creek 1 01-Aug 2006
American brook lamprey	50	27	18	7	0	1	1	4	3	2	9	0	4
Brown trout	0	0	1	0	0	0	0	0	0	0	0	0	0
Brook trout	0	0	0	0	2	0	0	0	0	0	0	0	0
Central mudminnow	1	0	3	1	7	18	2	24	18	4	5	5	0
Northern pike	0	0	8	17	3	10	9	3	0	2	1	1	1
Common carp	1	0	0	0	1	0	0	1	0	0	2	0	0
Brassy minnow	6	2	2	47	1	0	0	0	0	0	3	8	0
Emerald shiner	10	4	0	0	0	0	0	69	103	0	0	0	1
Common shiner	0	1	8	0	5	0	1	0	3	1	0	2	3
Bigmouth shiner	4	6	15	1	0	0	2	0	0	0	3	9	4
Blackchin shiner	0	0	0	0	0	0	0	0	2	0	0	0	0
Blacknose shiner	0	0	0	4	0	0	6	1	0	3	0	1	0
Spotfin shiner	63	19	0	0	0	0	0	0	1	0	0	0	0
Suckermouth minnow	0	1	0	1	2	0	0	0	0	0	0	0	0
Bluntnose minnow	44	7	0	7	1	0	1	6	4	1	0	20	1
Fathead minnow	0	4	0	2	2	2	0	13	3	0	2	0	0
Blacknose dace	91	61	35	16	6	22	9	4	22	12	8	2	0
Longnose dace	85	80	142	85	87	38	149	62	12	24	20	17	9
Creek chub	128	36	90	27	22	10	10	1	0	4	3	6	4
White sucker	1	0	10	18	15	53	31	8	26	18	8	6	14
Black bullhead	0	0	0	0	0	0	1	0	0	0	0	0	0
Tadpole madtom	0	0	0	0	0	0	0	0	1	0	0	0	0
Spotted sucker	0	0	0	0	0	1	0	0	0	0	0	0	0
Brook stickleback	29	2	3	24	1	0	7	6	3	2	17	12	0
Green sunfish	0	0	0	1	0	0	0	0	0	0	0	0	1
Bluegill	0	0	1	0	0	0	0	0	0	0	0	0	0
Largemouth bass	0	0	0	0	0	0	0	0	0	0	0	1	0
Fantail darter	0	0	0	0	0	0	1	0	0	0	0	0	0
Iowa darter	0	0	0	3	11	0	0	0	0	0	0	0	0
Johnny darter	88	34	124	23	80	117	113	144	52	15	63	25	57
Blackside darter	0	0	0	0	0	0	2	0	0	0	0	2	0
Total Fish Species	14	14	14	17	17	10	16	14	14	12	13	15	11
Total Fish Individuals	601	284	460	284	252	272	348	346	253	88	144	117	99

A3.11. Fishes collected in Bohris Creek 2 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Bohris Creek 2 14-Aug 1990	Bohris Creek 2 06-Aug 1991	Bohris Creek 2 29-Jul 1992	Bohris Creek 2 27-Jul 1993	Bohris Creek 2 02-Aug 1994	Bohris Creek 2 01-Aug 1995	Bohris Creek 2 31-Jul 1996	Bohris Creek 2 22-Jul 1997	Bohris Creek 2 23-Jul 2002	Bohris Creek 2 28-Jul 2003	Bohris Creek 2 28-Jul 2004	Bohris Creek 2 04-Aug 2005	Bohris Creek 2 01-Aug 2006
Central mudminnow	2	0	0	0	0	0	1	0	0	0	1	2	1
Brassy minnow	10	0	0	26	0	0	0	0	0	0	0	15	0
Common shiner	0	0	0	0	0	0	0	0	0	0	0	0	1
Bigmouth shiner	0	0	0	0	0	0	0	1	0	0	0	0	0
Unidentified minnow	0	0	0	0	0	2	0	0	0	0	0	0	0
Spotfin shiner	0	1	0	0	0	0	0	0	0	0	0	0	0
Bluntnose minnow	0	1	0	1	0	0	0	0	0	0	0	2	0
Fathead minnow	4	0	0	5	5	0	0	0	0	0	4	0	0
Blacknose dace	97	50	20	9	3	4	2	0	3	3	7	7	9
Longnose dace	84	25	11	26	30	53	66	52	1	0	3	6	0
Creek chub	79	110	39	50	26	43	20	28	4	3	2	5	15
White sucker	11	10	14	29	10	2	22	20	6	11	7	28	34
Brook stickleback	53	25	420	53	13	83	87	20	29	11	30	12	15
Green Sunfish	0	0	0	0	0	0	0	0	0	0	0	1	0
Iowa darter	0	0	0	0	0	0	0	1	0	0	0	0	0
Johnny darter	17	4	8	20	21	88	54	41	8	6	20	9	54
Total Fish Species	9	8	6	9	7	7	7	7	6	5	8	10	7
Total Fish Individuals	357	226	512	219	108	275	252	210	51	34	74	87	129

A3.12. Fishes collected in Trout Run Creek 1 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Trout Run Creek 1 23-Aug 1990	Trout Run Creek 1 31-Jul 1991	Trout Run Creek 1 30-Jul 1992	Trout Run Creek 1 26-Jul 1993	Trout Run Creek 1 02-Aug 1994	Trout Run Creek 1 02-Aug 1995	Trout Run Creek 1 25-Jul 1996	Trout Run Creek 1 05-Aug 1997	Trout Run Creek 1 23-Jul 2002	Trout Run Creek 1 28-Jul 2003	Trout Run Creek 1 28-Jul 2004	Trout Run Creek 1 05-Aug 2005	Trout Run Creek 1 01-Aug 2006
American brook lamprey	10	0	3	0	0	0	0	0	2	0	1	0	0
Brown trout	0	0	0	1	0	0	0	0	4	1	2	0	3
Brook trout	0	0	0	0	0	0	0	1	0	0	1	0	0
Central mudminnow	2	1	2	11	2	4	5	0	15	1	0	16	4
Northern pike	0	0	2	9	0	1	1	0	1	3	2	2	1
Common carp	3	14	0	0	0	0	0	0	0	0	5	0	0
Brassy minnow	67	84	22	1	1	0	0	0	0	0	0	0	0
Emerald shiner	5	16	0	0	0	0	0	0	1	0	0	0	1
Common shiner	0	0	0	0	0	0	1	0	0	0	0	0	2
Bigmouth shiner	19	19	3	0	0	0	0	0	0	0	0	0	0
Blacknose shiner	0	8	15	0	0	2	2	0	0	0	0	0	0
Spotfin shiner	237	40	0	0	0	0	0	0	0	0	0	0	0
Bluntnose minnow	778	181	25	0	1	0	0	0	0	0	0	0	0
Fathead minnow	8	1	0	0	0	0	0	0	0	0	0	1	0
Blacknose dace	1	2	4	3	2	0	1	0	3	1	0	0	1
Longnose dace	34	27	38	12	19	48	24	0	18	8	17	56	8
Creek chub	59	85	31	0	1	2	1	0	0	0	0	1	3
White sucker	11	35	42	7	25	45	46	1	28	7	12	24	26
Brook stickleback	0	0	0	45	0	0	0	0	0	0	1	0	0
Green Sunfish	3	0	0	0	0	0	0	0	0	0	0	2	7
Iowa darter	0	0	0	3	0	0	0	0	1	0	0	0	0
Fantail darter	0	0	0	0	0	0	0	0	0	0	0	1	42
Johnny darter	188	33	47	53	8	70	35	2	61	6	8	139	0
Blackside darter	0	0	0	0	0	6	0	0	0	0	1	6	0
Total Fish Species	15	14	12	10	8	8	9	3	10	7	10	10	11
Total Fish Individuals	1425	546	234	145	59	178	116	4	134	27	50	248	98

A3.13. Fishes collected in Trout Run Creek 2 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Trout Run Creek 2 02-Aug 1994	Trout Run Creek 2 02-Aug 1995	Trout Run Creek 2 25-Jul 1996	Trout Run Creek 2 21-Jul 1997	Trout Run Creek 2 23-Jul 2002	Trout Run Creek 2 28-Jul 2003	Trout Run Creek 2 28-Jul 2004	Trout Run Creek 2 04-Aug 2005	Trout Run Creek 2 01-Aug 2006
American brook lamprey	0	0	0	1	0	0	0	0	0
Brown trout	2	0	0	0	0	0	0	0	1
Brook trout	1	0	0	0	1	1	2	6	2
Central mudminnow	0	0	0	5	1	0	0	0	0
Northern pike	0	0	0	1	0	0	1	0	0
Mississippi silvery minnow	0	0	0	2	0	0	0	0	0
Emerald shiner	0	0	0	18	0	0	0	0	0
Common shiner	0	2	0	0	0	0	0	0	2
Bigmouth shiner	0	0	0	10	0	0	0	0	0
Spotfin shiner	0	0	0	1	0	0	0	0	0
Fathead minnow	0	1	0	0	0	0	0	0	0
Blacknose dace	0	3	0	2	0	0	0	0	0
Longnose dace	0	6	0	54	0	0	1	0	0
Creek chub	0	43	0	5	2	0	0	0	3
White sucker	13	10	1	11	11	7	1	1	18
Brook stickleback	0	0	0	2	7	6	0	2	0
Johnny darter	0	5	6	61	4	4	2	1	2
Blackside darter	0	0	0	6	0	0	0	0	0
Total Fish Species	3	7	2	14	6	4	5	4	6
Total Fish Individuals	16	70	7	179	26	18	7	10	28

A3.14. Fishes collected in Timber Coulee Creek 1 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Timber Coulee Creek 1 11-Aug 1993	Timber Coulee Creek 1 27-Jul 1994	Timber Coulee Creek 1 24-Jul 1995	Timber Coulee Creek 1 22-Jul 1996	Timber Coulee Creek 1 14-Jul 1997	Timber Coulee Creek 1 15-Jul 2002	Timber Coulee Creek 1 07-Aug 2003	Timber Coulee Creek 1 26-Jul 2004	Timber Coulee Creek 1 28-Jul 2005	Timber Coulee Creek 1 27-Jul 2006
American brook lamprey	2	5	0	0	0	0	0	11	0	2
Brown trout	752	456	225	242	329	426	141	156	282	211
Longnose dace	0	0	0	0	0	0	0	1	0	0
White sucker	18	15	32	24	6	53	45	13	44	22
Brook stickleback	4	27	0	2	0	7	18	4	21	8
Fantail darter	90	19	15	27	5	15	8	120	89	32
Johnny darter	0	0	0	0	0	0	1	0	0	0
Slimy sculpin	12	5	25	76	29	10	27	33	48	69
Total Fish Species	6	6	4	5	4	5	6	7	5	6
Total Fish Individuals	878	527	297	371	369	511	240	338	484	344

A3.15. Fishes collected in Timber Coulee Creek 2 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Timber Coulee Creek 2 01-Aug 1994	Timber Coulee Creek 2 24-Jul 1995	Timber Coulee Creek 2 22-Jul 1996	Timber Coulee Creek 2 14-Jul 1997	Timber Coulee Creek 2 22-Jul 2002	Timber Coulee Creek 2 04-Aug 2003	Timber Coulee Creek 2 29-Jul 2004	Timber Coulee Creek 2 25-Jul 2005	Timber Coulee Creek 2 27-Jul 2006
Brown trout	248	194	192	208	513	265	191	207	183
White sucker	10	3	1	0	0	5	13	0	0
Brook stickleback	4	3	32	22	41	38	13	82	18
Fantail darter	0	0	0	1	0	0	0	0	0
Slimy sculpin	176	271	231	52	217	561	455	222	355
Total Fish Species	4	4	4	4	3	4	4	3	3
Total Fish Individuals	438	471	456	283	771	869	672	511	556

A3.16. Fishes collected in Cady Creek 1 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Cady Creek 1 01-Aug 1995	Cady Creek 1 24-Jul 1996	Cady Creek 1 16-Jul 1997	Cady Creek 1 24-Jul 2002	Cady Creek 1 23-Jul 2003	Cady Creek 1 03-Aug 2004	Cady Creek 1 08-Aug 2005	Cady Creek 1 25-Jul 2006
Brook trout	220	306	149	391	263	101	77	385
Fathead minnow	0	0	0	0	0	1	0	0
Blacknose dace	0	20	4	1	1	0	0	0
Longnose dace	17	30	44	19	37	6	12	7
White sucker	0	0	1	0	0	0	0	0
Brook stickleback	4	5	5	4	2	3	0	1
Rainbow darter	0	1	1	0	0	0	0	0
Mottled sculpin	334	427	275	278	196	172	444	436
Slimy sculpin	0	0	0	0	0	0	0	0
Total Fish Species	4	6	7	5	5	5	3	4
Total Fish Individuals	575	789	479	693	499	283	533	829

A3.17. Fishes collected in Cady Creek 2 by CPUE method in the Waumandee Creek Priority Watershed study area.

Species	Cady Creek 2 31-Jul 1995	Cady Creek 2 24-Jul 1996	Cady Creek 2 16-Jul 1997	Cady Creek 2 24-Jul 2002	Cady Creek 2 24-Jul 2003	Cady Creek 2 03-Aug 2004	Cady Creek 2 09-Aug 2005	Cady Creek 2 24-Jul 2006
Brown trout	1	0	0	0	0	0	1	0
Brook trout	196	409	66	251	271	227	113	189
Blacknose dace	0	0	10	0	2	0	0	0
Longnose dace	20	9	0	3	66	13	9	2
White sucker	0	3	0	0	0	0	0	0
Brook stickleback	4	0	2	1	0	4	1	0
Rainbow darter	0	0	1	0	0	0	0	0
Mottled sculpin	272	274	122	136	118	162	285	167
Slimy sculpin	0	0	0	0	0	0	0	0
Total Fish Species	5	3	5	4	4	4	5	3
Total Fish Individuals	493	692	201	391	457	406	409	358

A3.18. Fishes collected in Lincoln Creek 1 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	Lincoln Creek 1 03-Jun 1994	Lincoln Creek 1 05-Jun 1995	Lincoln Creek 1 04-Jun 1996	Lincoln Creek 1 27-May 1997	Lincoln Creek 1 27-May 1998	Lincoln Creek 1 27-May 2004	Lincoln Creek 1 25-May 2005	Lincoln Creek 1 23-May 2006	Lincoln Creek 1 24-May 2007	Lincoln Creek 1 28-May 2008
Central stoneroller	0	19	0	0	0	0	0	0	0	0
Goldfish	0	0	0	0	0	0	0	0	0	1
Largescale stoneroller	0	0	0	0	0	1	0	0	0	0
Common carp	0	0	0	0	0	8	0	7	0	0
Golden shiner	1	0	0	0	0	0	0	1	0	0
Common shiner	0	3	0	0	0	28	20	5	1	4
Spottail shiner	0	0	0	0	0	18	0	0	0	0
Spotfin shiner	0	0	0	0	0	0	0	1	0	0
Sand shiner	1	66	2	0	4	13	9	29	0	0
Mimic shiner	0	0	0	0	0	0	1	0	0	0
Redfin shiner	0	0	0	0	0	2	0	0	0	0
Bluntnose minnow	0	0	0	0	0	13	0	1	5	5
Fathead minnow	0	19	0	0	0	37	1	2	1	1
White sucker	37	1	0	0	0	33	27	14	9	15
Black bullhead	0	0	0	0	0	7	21	9	4	10
Yellow bullhead	0	0	0	0	0	4	0	0	0	0
Brook stickleback	0	0	0	0	1	2	0	1	0	1
Rock bass	0	0	0	0	0	1	0	0	0	0
Green sunfish	1	3	0	0	0	6	3	4	3	4
Pumpkinseed	0	0	0	0	0	0	0	9	3	13
Smallmouth bass	0	0	0	0	0	3	2	7	1	0
Largemouth bass	0	0	0	0	0	1	0	0	0	0
Total fish species	4	6	1	0	2	16	8	13	8	9

Total fish individuals	40	111	2	0	5	177	84	90	27	54		

A3.19. Fishes collected in Lincoln Creek 4 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	Lincoln Creek 4 03-Jun 1992	Lincoln Creek 4 03-Jun 1993	Lincoln Creek 4 01-Jun 1994	Lincoln Creek 4 31-May 1995	Lincoln Creek 4 27-May 1996	Lincoln Creek 4 27-May 1997	Lincoln Creek 4 26-May 1998	Lincoln Creek 4 26-May 2004	Lincoln Creek 4 25-May 2005	Lincoln Creek 4 23-May 2006	Lincoln Creek 4 24-May 2007	Lincoln Creek 4 28-May 2008
Goldfish	0	1	2	1	0	0	0	0	2	0	0	7
Common carp	0	0	0	0	0	0	0	14	7	15	3	0
Golden shiner	0	0	0	0	0	0	0	2	0	0	0	0
Common shiner	0	0	0	0	0	0	0	32	5	22	3	1
Spotfin shiner	0	0	0	0	0	0	0	4	0	0	0	0
Fathead minnow	45	121	93	16	3	5	21	26	0	2	0	3
White sucker	0	15	15	1	1	0	3	37	14	39	3	6
Black bullhead	0	0	1	0	0	0	0	4	0	12	1	2
Yellow bullhead	0	0	0	1	0	0	0	0	20	1	0	0
Brook stickleback	0	0	0	0	0	0	3	0	2	1	0	3
Green sunfish	478	97	183	71	12	1	4	4	17	30	27	6
Pumpkinseed	0	1	5	0	0	0	0	1	0	17	2	1
Bluegill	0	0	0	0	0	0	0	1	0	0	3	0
Smallmouth bass	0	0	0	0	0	0	0	23	7	57	0	0
Largemouth bass	0	0	0	0	0	0	0	1	0	0	0	0
Total fish species	2	5	6	5	3	2	4	12	8	10	7	8
Total fish individuals	523	235	299	90	16	6	31	149	74	196	42	29

A3.20. Fishes collected in Lincoln Creek 5 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	Lincoln Creek 5 01-Jun 1994	Lincoln Creek 5 31-May 1995	Lincoln Creek 5 28-May 1996	Lincoln Creek 5 27-May 1997	Lincoln Creek 5 26-May 1998	Lincoln Creek 5 26-May 2004	Lincoln Creek 5 31-May 2005	Lincoln Creek 5 22-May 2006	Lincoln Creek 5 23-May 2007	Lincoln Creek 5 29-May 2008
Common carp	0	0	0	0	0	7	3	9	0	0
Common shiner	0	0	0	0	0	0	0	7	0	23
Fathead minnow	0	0	0	0	0	4	0	0	0	5
White sucker	0	0	0	0	0	12	4	5	0	9
Black bullhead	0	0	0	0	0	5	5	2	2	2
Brook stickleback	0	0	0	0	2	5	0	0	0	10
Green sunfish	1	0	0	0	0	10	25	27	31	20
Pumpkinseed	0	0	0	0	0	1	0	8	0	5
Bluegill	0	0	0	0	0	2	0	1	2	1
Smallmouth bass	0	0	0	0	0	3	2	5	0	1
Total fish species	1	0	0	0	1	9	5	8	3	9
Total fish individuals	1	0	0	0	2	49	39	64	35	76

A3.21. Fishes collected in Lincoln Creek 6 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	Lincoln Creek 6 01-Jun 1994	Lincoln Creek 6 31-May 1995	Lincoln Creek 6 28-May 1996	Lincoln Creek 6 27-May 1997	Lincoln Creek 6 26-May 1998	Lincoln Creek 6 26-May 2004	Lincoln Creek 6 31-May 2005	Lincoln Creek 6 22-May 2006	Lincoln Creek 6 23-May 2007	Lincoln Creek 6 27-May 2008
Goldfish	0	0	0	0	0	0	0	1	0	0
Common carp	0	0	0	0	0	2	3	5	1	0
Golden shiner	0	0	0	0	0	3	0	0	0	0
Common shiner	0	0	0	0	0	0	0	1	2	76
Fathead minnow	0	0	0	0	0	23	5	1	0	6
White sucker	0	0	0	0	0	15	17	24	6	60
Black bullhead	0	0	0	0	0	11	13	4	3	2
Brook stickleback	0	0	0	0	1	1	8	0	6	25
Green sunfish	0	0	0	0	0	111	236	112	127	45
Pumpkinseed	0	0	0	0	0	0	0	27	3	11
Bluegill	0	0	0	0	0	2	5	11	1	1
Smallmouth bass	0	0	0	0	0	2	0	0	0	0
Total fish species	0	0	0	0	1	9	7	9	8	8
Total fish individuals	0	0	0	0	1	170	287	186	149	226

A3.22. Fishes collected in Lincoln Creek 7 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	Lincoln Creek 7 02-Jun 1994	Lincoln Creek 7 07-Jun 1995	Lincoln Creek 7 31-May 1996	Lincoln Creek 7 29-May 1997	Lincoln Creek 7 27-May 1998	Lincoln Creek 7 19-May 2004	Lincoln Creek 7 01-Jun 2005	Lincoln Creek 7 30-May 2006	Lincoln Creek 7 15-May 2007	Lincoln Creek 7 29-May 2008
Goldfish	13	3	7	0	0	0	0	0	0	0
Golden shiner	0	0	0	0	0	1	1	0	0	0
Common shiner	0	0	0	0	0	11	0	0	0	0
Fathead minnow	31	30	91	25	31	157	39	3	2	2
White sucker	0	0	0	0	0	1	0	3	0	1
Black bullhead	0	0	0	0	0	15	0	3	0	1
Brook stickleback	0	0	0	2	70	29	22	1	12	26
Green sunfish	22	13	0	0	0	15	22	59	33	3
Bluegill	0	0	0	0	0	2	0	3	1	0
Total fish species	3	3	2	2	2	8	4	6	4	5
Total fish individuals	66	46	98	27	101	228	84	72	48	33

A3.23. Fishes collected in Lincoln Creek 8 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	Lincoln Creek 8 02-Jun 1994	Lincoln Creek 8 06-Jun 1995	Lincoln Creek 8 05-Jun 1996	Lincoln Creek 8 28-May 1997	Lincoln Creek 8 26-May 1998	Lincoln Creek 8 25-May 2004	Lincoln Creek 8 25-May 2005	Lincoln Creek 8 16-May 2006	Lincoln Creek 8 22-May 2007	Lincoln Creek 8 02-Jun 2008
Golden shiner	0	0	0	0	0	0	2	0	0	0
Fathead minnow	2	0	0	6	3	194	12	4	3	2
White sucker	0	0	0	0	0	1	0	3	0	0
Black bullhead	0	0	0	0	0	9	1	2	1	4
Brook stickleback	0	0	0	1	5	13	23	11	24	4
Green sunfish	1	0	0	0	0	60	70	83	82	14
Pumpkinseed	0	0	0	0	0	0	0	0	0	1
Total fish species	2	0	0	2	2	5	5	5	4	5
Total fish individuals	3	0	0	7	8	277	108	103	110	25

A3.24. Fishes collected in Lincoln Creek 9 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	Lincoln Creek 9 02-Jun 1994	Lincoln Creek 9 05-Jun 1995	Lincoln Creek 9 29-May 1996	Lincoln Creek 9 28-May 1997	Lincoln Creek 9 26-May 1998	Lincoln Creek 9 25-May 2004	Lincoln Creek 9 24-May 2005	Lincoln Creek 9 16-May 2006	Lincoln Creek 9 15-May 2007	Lincoln Creek 9 19-May 2008
Goldfish	7	2	0	3	15	0	0	0	0	0
Golden shiner	0	0	0	0	0	1	0	0	0	0
Common shiner	0	0	0	0	0	1	0	0	0	0
Fathead minnow	51	132	66	38	119	80	34	0	1	4
Creek chub	0	0	0	64	0	0	0	0	0	0
White sucker	0	0	0	0	0	1	0	0	0	0
Black bullhead	0	0	1	0	0	1	1	0	0	1
Brook stickleback	0	0	0	21	46	50	78	48	39	95
Green sunfish	24	25	6	5	0	0	0	14	6	3
Total fish species	3	3	3	5	3	6	3	2	3	4
Total fish individuals	82	159	73	131	180	134	113	62	46	103

A3.25. Fishes collected in Lincoln Creek 10 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	Lincoln Creek 10 02-Jun 1997	Lincoln Creek 10 27-May 1998	Lincoln Creek 10 25-May 2004	Lincoln Creek 10 24-May 2005	Lincoln Creek 10 16-May 2006	Lincoln Creek 10 14-May 2007	Lincoln Creek 10 19-May 2008
Total fish species	0	0	0	0	0	0	0
Total fish individuals	0	0	0	0	0	0	0

A3.26. Fishes collected in Little Menomonee River 1 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	Little Menomonee River 1 01-Jun 1995	Little Menomonee River 1 29-May 1996	Little Menomonee River 1 30-May 1997	Little Menomonee River 1 28-May 1998	Little Menomonee River 1 07-Jun 2004	Little Menomonee River 1 03-Jun 2005	Little Menomonee River 1 25-May 2006	Little Menomonee River 1 31-May 2007	Little Menomonee River 1 03-Jun 2008
Central mudminnow	1	0	5	4	3	2	0	0	0
Grass pickerel	0	0	0	0	0	1	0	0	0
Northern pike	0	0	0	2	0	0	1	0	0
Central stoneroller	0	0	0	0	0	0	1	1	0
Fathead minnow	4	1	0	2	0	0	2	0	0
Blacknose dace	3	1	7	3	0	0	0	0	0
Creek chub	9	3	0	11	1	3	4	3	4
White sucker	6	8	0	9	2	2	7	3	4
Black bullhead	0	0	1	0	2	0	0	0	0
Brook stickleback	2	0	0	0	0	0	0	0	0
Green sunfish	1	6	3	14	9	2	1	7	20
Pumpkinseed	0	0	1	0	4	0	3	0	0
Bluegill	0	0	2	0	0	0	33	3	0
Largemouth bass	0	0	0	1	3	0	0	1	0
Black crappie	0	0	0	0	0	0	6	0	0
Green sunfish x pumpkinseed	0	0	0	2	0	0	0	0	0
Pumpkinseed x bluegill	0	0	0	0	0	0	16	4	0
Fantail darter	14	8	1	1	6	7	3	3	10
Johnny darter	42	65	14	32	6	4	0	2	40
Total fish species	9	7	8	11	9	7	11	9	5
Total fish individuals	82	92	34	81	36	21	77	27	78

A3.27. Fishes collected in Little Menomonee River 2 by CPUE method in the Milwaukee River South Priority Watershed study area.

	Little Menomonee River 2	Little Menomonee River 2	Little Menomonee River 2	Little Menomonee River 2	Little Menomonee River 2	Little Menomonee River 2	Little Menomonee River 2	Little Menomonee River 2	Little Menomonee River 2
	01-Jun	29-May	30-May	28-May	07-Jun	02-Jun	25-May	01-Jun	03-Jun
Species	1995	1996	1997	1998	2004	2005	2006	2007	2008
Central mudminnow	0	0	2	4	2	0	0	1	15
Northern pike	1	0	0	4	0	0	1	2	0
Common carp	0	0	0	0	0	0	1	1	0
Common shiner	0	0	0	0	0	0	0	0	3
Fathead minnow	0	0	0	0	1	0	1	0	1
Blacknose dace	1	0	0	0	0	0	0	0	0
Creek chub	7	6	15	5	6	6	2	13	33
White sucker	35	20	16	38	15	13	18	36	37
Black bullhead	0	2	2	0	1	2	2	0	0
Brook stickleback	0	0	0	0	1	1	0	0	0
Green sunfish	5	15	11	30	14	0	0	6	49
Pumpkinseed	0	0	4	0	18	1	1	2	0
Bluegill	0	0	0	47	2	0	19	20	2
Largemouth bass	0	1	0	4	0	0	0	0	0
Black crappie	0	0	0	0	0	0	1	2	1
Unknown centrarchidae hybrid	0	0	0	11	0	0	0	0	0
Pumpkinseed x bluegill	0	0	0	0	0	0	4	12	0
Johnny darter	13	44	17	4	4	4	2	1	15
Total fish species	6	6	7	9	10	6	11	11	9
Total fish individuals	62	88	67	147	64	27	52	96	156

A3.28. Fishes collected in Underwood Creek 2 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	Underwood Creek 2 09-Jun 1994	Underwood Creek 2 31-May 1995	Underwood Creek 2 29-May 1996	Underwood Creek 2 27-May 1997	Underwood Creek 2 27-May 1998	Underwood Creek 2 18-May 2004	Underwood Creek 2 25-May 2005	Underwood Creek 2 15-May 2006	Underwood Creek 2 16-May 2007	Underwood Creek 2 02-Jun 2008
Central stoneroller	0	0	0	0	0	0	0	0	12	0
Golden shiner	0	0	0	0	0	3	0	0	0	0
Common shiner	0	0	0	0	0	0	0	0	1	0
Fathead minnow	0	0	1	0	0	0	0	0	0	0
Blacknose dace	0	0	0	8	0	2	0	0	0	0
Creek chub	0	0	0	0	0	0	0	0	1	0
White sucker	0	0	0	0	0	1	0	0	0	0
Green sunfish	0	1	0	0	0	0	0	0	0	0
Largemouth bass	0	0	0	0	0	0	2	0	0	0
Total fish species	0	1	1	1	0	3	1	0	3	0
Total fish individuals	0	1	1	8	0	6	2	0	14	0

A3.29. Fishes collected in Underwood Creek 4 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	Underwood Creek 4 19-Jun 1991	Underwood Creek 4 01-Jun 1992	Underwood Creek 4 01-Jun 1993	Underwood Creek 4 09-Jun 1994	Underwood Creek 4 01-Jun 1995	Underwood Creek 4 31-May 1996	Underwood Creek 4 27-May 1997	Underwood Creek 4 01-Jun 1998	Underwood Creek 4 19-May 2004	Underwood Creek 4 15-May 2006	Underwood Creek 4 21-May 2007	Underwood Creek 4 13-May 2008
Central mudminnow	1	0	1	20	3	15	1	7	0	0	0	0
Northern pike	2	0	0	1	1	1	0	4	0	0	0	0
Central stoneroller	0	0	0	14	0	0	0	0	0	0	0	0
Golden shiner	0	0	0	27	0	0	0	0	1	0	0	0
Fathead minnow	1	0	0	0	1	1	0	0	0	8	0	0
Blacknose dace	0	0	18	0	7	20	5	0	0	2	21	42
Creek chub	2	6	22	0	35	6	5	1	15	15	29	170
White sucker	16	20	10	0	28	5	4	6	18	31	5	40
Black bullhead	0	0	0	0	0	0	0	0	7	0	1	0
Brook stickleback	0	2	1	0	1	1	0	0	0	0	0	0
Green sunfish	13	7	3	6	14	38	0	7	4	0	0	1
Pumpkinseed	0	2	2	0	0	0	0	0	0	5	0	0
Bluegill	6	0	2	1	5	5	0	4	3	5	0	0
Green sunfish x pumpkinseed	0	0	0	0	0	0	0	0	1	0	0	0
Green sunfish x bluegill	0	0	0	0	1	0	0	0	0	0	0	0
Largemouth bass	0	0	0	0	0	0	0	0	0	0	0	0
Johnny darter	0	1	0	4	3	2	0	3	0	1	15	50
Total fish species	7	6	8	7	11	10	4	7	7	7	5	5
Total fish individuals	41	38	59	73	99	94	15	32	49	67	71	303

A3.30. Fishes collected in Underwood Creek 5 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	Underwood Creek 5 06-Jun 1994	Underwood Creek 5 01-Jun 1995	Underwood Creek 5 31-May 1996	Underwood Creek 5 27-May 1997	Underwood Creek 5 01-Jun 1998	Underwood Creek 5 19-May 2004	Underwood Creek 5 26-May 2005	Underwood Creek 5 15-May 2006	Underwood Creek 5 22-May 2007	Underwood Creek 5 13-May 2008
Central mudminnow	13	0	6	0	1	0	4	0	1	0
Northern pike	0	0	0	0	1	0	0	0	0	0
Golden shiner	0	1	0	0	0	1	0	0	0	0
Fathead minnow	0	0	0	0	0	1	2	0	0	2
Blacknose dace	31	92	82	16	54	12	65	9	27	49
Creek chub	48	29	20	8	1	16	30	14	56	117
White sucker	20	11	6	1	6	8	20	16	5	42
Black bullhead	0	0	0	0	0	6	7	1	0	0
Brook stickleback	0	1	0	0	0	0	0	0	0	0
Green sunfish	2	4	12	2	3	13	2	0	0	0
Pumpkinseed	0	0	0	0	0	0	1	5	0	0
Bluegill	0	2	0	0	4	2	0	3	0	1
Largemouth bass	0	0	0	0	0	0	13	0	0	0
Black crappie	0	0	0	0	0	1	0	0	0	0
Unknown centrarchidae hybrid	0	0	0	0	0	0	0	1	0	0
Green sunfish x pumpkinseed	0	0	0	0	0	0	1	0	0	0
Johnny darter	11	0	0	0	0	0	10	0	3	14
Total fish species	6	7	5	4	7	9	11	7	5	6
Total fish individuals	125	140	126	27	70	60	155	49	92	225

A3.31. Fishes collected in East Branch Milwaukee River 2 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	East Branch Milwaukee River 2 07-Jun 1994	East Branch Milwaukee River 2 06-Jun 1995	East Branch Milwaukee River 2 30-May 1996	East Branch Milwaukee River 2 29-May 1997	East Branch Milwaukee River 2 02-Jun 1998	East Branch Milwaukee River 2 08-Jun 2004	East Branch Milwaukee River 2 07-Jun 2005	East Branch Milwaukee River 2 02-Jun 2006	East Branch Milwaukee River 2 06-Jun 2007	East Branch Milwaukee River 2 04-Jun 2008
Central mudminnow	11	0	1	0	0	0	1	0	0	0
Northern pike	3	0	0	0	0	0	0	0	0	0
Common carp	0	0	1	0	0	0	0	0	0	0
Hornyhead chub	11	63	99	23	38	21	1	60	28	51
Common shiner	17	60	302	13	49	10	1	38	40	22
Bluntnose minnow	1	14	142	11	11	0	3	17	12	7
Creek chub	1	39	74	9	60	7	2	18	11	7
White sucker	54	0	110	9	45	2	17	8	11	15
Yellow bullhead	2	0	0	2	1	0	0	4	0	2
Tadpole madtom	0	0	1	0	0	0	2	1	0	1
Brook stickleback	0	0	0	0	0	0	46	0	0	0
Rock bass	75	0	12	15	24	7	0	25	9	38
Green sunfish	6	0	0	0	5	5	0	2	1	4
Pumpkinseed	5	0	5	0	0	0	2	10	15	25
Bluegill	85	0	65	13	31	32	89	48	45	488
Largemouth bass	23	0	0	0	0	3	19	2	1	25
White crappie	0	0	1	0	0	0	0	0	0	0
Black crappie	1	0	0	1	1	3	0	8	2	0
Green sunfish x bluegill	0	0	0	0	0	0	0	1	0	0
Pumpkinseed x bluegill	0	0	0	0	0	0	0	0	0	2
Iowa darter	1	1	1	0	0	0	0	0	0	0
Fantail darter	60	30	70	16	29	1	27	18	0	34
Johnny darter	14	10	37	12	35	3	14	7	2	14
Yellow perch	2	0	65	9	24	9	16	18	5	48
Logperch	0	7	37	6	20	4	5	5	1	30
Mottled sculpin	1	0	0	0	0	0	0	0	0	0
Total fish species	19	8	17	13	14	13	15	18	14	17
Total fish individuals	373	224	1023	139	373	107	245	290	183	813

A3.32. Fishes collected in East Branch Milwaukke River 3 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	East Branch Milwaukee River 3 23-Jun 1993	East Branch Milwaukee River 3 07-Jun 1994	East Branch Milwaukee River 3 07-Jun 1995	East Branch Milwaukee River 3 04-Jun 1996	East Branch Milwaukee River 3 29-May 1997	East Branch Milwaukee River 3 02-Jun 1998	East Branch Milwaukee River 3 08-Jun 2004	East Branch Milwaukee River 3 08-Jun 2005	East Branch Milwaukee River 3 01-Jun 2006	East Branch Milwaukee River 3 06-Jun 2007	East Branch Milwaukee River 3 06-Jun 2008
Central mudminnow	0	24	5	9	52	9	0	3	1	0	0
Northern pike	2	1	5	0	1	5	0	0	0	0	1
Minnows and carps unsp.	0	0	0	0	0	0	0	39	0	0	0
Central stoneroller	1	0	1	0	0	9	0	3	10	0	0
Common carp	0	0	0	0	1	2	0	26	0	1	0
Hornyhead chub	76	6	28	51	41	127	28	112	57	39	183
Common shiner	136	1	576	370	100	378	42	186	175	30	103
Bluntnose minnow	26	5	19	17	23	15	0	1	6	1	2
Fathead minnow	1	0	0	0	0	0	0	0	0	0	0
Creek chub	13	0	7	6	15	48	3	46	13	2	10
White sucker	72	46	46	34	17	50	4	34	60	50	39
Lake chubsucker	0	0	0	0	0	0	0	1	0	0	6
Black bullhead	5	6	34	23	30	11	2	9	8	5	9
Yellow bullhead	0	0	7	0	2	5	0	6	2	0	8
Brown bullhead	0	0	0	0	3	0	0	0	0	0	0
Tadpole madtom	0	5	10	1	120	13	1	21	4	2	9
Brook stickleback	1	0	0	0	0	0	0	7	0	0	0
Rock bass	35	30	56	13	14	39	8	19	16	14	24
Green sunfish	3	3	0	1	0	13	0	9	0	0	0
Pumpkinseed	3	2	0	0	1	0	0	0	1	10	1
Bluegill	66	8	12	6	1	18	32	7	25	8	16
Largemouth bass	0	0	1	0	0	0	0	0	0	0	2
Black crappie	0	0	0	0	0	0	0	0	1	0	0
Green sunfish x bluegill	0	1	0	0	0	0	0	0	0	0	0
Iowa darter	7	3	4	0	2	4	0	0	2	0	0
Fantail darter	26	8	22	3	25	26	5	40	7	2	7
Least darter	0	0	0	0	0	1	0	0	0	0	0
Johnny darter	29	3	9	5	3	5	3	16	4	2	2
Yellow perch	11	2	31	160	51	177	26	26	75	24	29
Logperch	1	0	17	10	1	60	1	1	4	2	2
Mottled sculpin	0	0	0	0	0	0	0	1	0	0	0

Total fish species	19	17	19	15	20	21	12	22	19	15	18
Total fish individuals	514	154	890	709	503	1015	155	612	471	192	453

A3.33. Fishes collected in Oconomowoc River 1 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	Oconomowoc River 1 24-Jun 1993	Oconomowoc River 1 07-Jun 1994	Oconomowoc River 1 02-Jun 1995	Oconomowoc River 1 30-May 1996	Oconomowoc River 1 28-May 1997	Oconomowoc River 1 03-Jun 1998	Oconomowoc River 1 17-May 2004	Oconomowoc River 1 23-May 2005	Oconomowoc River 1 31-May 2006	Oconomowoc River 1 30-May 2007	Oconomowoc River 1 20-May 2008
Central mudminnow	0	1	0	1	0	1	0	0	0	0	0
Central stoneroller	3	1	2	1	0	1	0	1	0	4	0
Hornyhead chub	182	410	160	271	31	157	58	172	47	101	139
Emerald shiner	2	0	0	22	20	44	1	9	77	0	0
Common shiner	210	761	279	214	75	117	86	415	23	196	192
Bigmouth shiner	0	0	0	0	0	0	0	11	0	1	0
Spotfin shiner	0	0	0	2	0	0	0	0	0	0	0
Mimic shiner	0	0	0	1	0	0	2	0	0	0	0
Bluntnose minnow	5	20	106	363	66	47	32	54	0	89	102
Fathead minnow	1	0	0	6	2	0	1	2	0	11	8
Creek chub	22	62	23	69	17	41	73	143	33	183	121
White sucker	16	72	79	98	30	46	47	186	66	34	22
Black bullhead	4	1	1	0	0	1	0	0	0	0	1
Yellow bullhead	0	0	0	4	2	6	9	4	2	2	5
Slender madtom	2	11	0	18	13	10	0	0	4	0	19
Stonecat	0	0	0	0	0	0	6	16	0	0	0
Tadpole madtom	0	0	41	0	0	0	0	0	0	5	1
Blackstripe topminnow	0	0	0	4	0	4	0	0	0	0	0
Rock bass	44	71	39	21	12	13	11	16	18	24	54
Green sunfish	2	1	3	0	2	0	1	0	1	0	0
Pumpkinseed	0	0	7	8	0	0	0	0	0	0	5
Bluegill	0	0	26	4	0	0	1	0	1	4	40
Largemouth bass	0	1	20	0	0	0	0	1	7	8	1
Black crappie	0	0	1	0	5	14	0	4	3	0	4
Rainbow darter	14	33	57	100	73	241	181	182	160	176	114
Iowa darter	1	0	2	1	0	19	9	0	1	0	0
Fantail darter	137	138	99	88	78	113	14	34	9	70	103
Johnny darter	3	3	2	6	9	23	25	16	1	4	22
Yellow perch	25	57	39	28	18	30	10	61	19	14	48
Total fish species	17	16	19	22	16	19	19	18	17	17	19
Total fish individuals	673	1643	986	1330	453	928	562	1327	472	926	1001

A3.34. Fishes collected in Oconomowoc River 2 by CPUE method in the Milwaukee River South Priority Watershed study area.

Species	Oconomowoc River 2 07-Jun 1995	Oconomowoc River 2 04-Jun 1996	Oconomowoc River 2 28-May 1997	Oconomowoc River 2 03-Jun 1998	Oconomowoc River 2 18-May 2004	Oconomowoc River 2 06-Jun 2005	Oconomowoc River 2 02-Jun 2006	Oconomowoc River 2 31-May 2007	Oconomowoc River 2 22-May 2008
Central mudminnow	2	0	0	2	0	31	0	7	2
Northern Pike	0	0	0	0	0	0	0	0	2
Central stoneroller	1	0	0	0	0	0	0	0	0
Common carp	0	1	0	0	0	0	0	0	0
Hornyhead chub	147	60	85	63	27	52	9	11	12
Golden shiner	1	0	0	0	0	0	0	0	0
Emerald shiner	0	4	0	8	2	0	0	0	0
Common shiner	165	115	14	103	36	188	37	7	115
Mimic shiner	0	1	0	0	1	0	0	0	0
Bluntnose minnow	223	36	12	78	14	79	1	14	88
Fathead minnow	0	4	1	2	0	9	0	0	1
Creek chub	6	10	8	32	45	56	7	12	44
White sucker	43	38	26	38	72	41	45	45	43
Black bullhead	0	0	1	4	0	5	0	0	4
Yellow bullhead	13	15	13	12	22	17	3	5	19
Slender madtom	0	2	0	0	0	3	0	0	1
Blackstripe topminnow	0	0	1	3	1	2	0	1	0
Brook stickleback	0	0	0	1	0	1	0	0	0
Rock bass	94	63	26	38	37	47	19	41	41
Green sunfish	4	2	1	0	1	1	0	1	1
Pumpkinseed	11	1	2	0	1	0	1	0	2
Orangespotted sunfish	0	0	0	0	0	0	0	0	1
Bluegill	5	5	0	1	8	3	1	11	8
Largemouth bass	13	7	0	0	1	7	1	4	0
Black crappie	0	1	0	77	1	5	23	1	4
Rainbow darter	1	3	0	21	18	11	1	3	4
Iowa darter	0	0	0	1	4	0	0	1	0
Fantail darter	1	3	3	11	27	34	0	5	19
Johnny darter	2	16	19	53	41	23	0	1	9
Yellow perch	32	22	6	45	24	82	38	30	15
Walleye	0	0	0	3	0	0	0	0	0
Total fish species	18	21	15	21	20	21	13	18	21

Total fish individuals	764	409	218	596	383	697	186	200	435

APPENDIX 4 -- SCIENTIFIC NAMES OF FISHES

Table A4.1. Common and scientific names of fishes captured during this evaluation study. "Code" refers to the Wisconsin Department of Natural Resources computer designation for each species. An asterisk after the code indicates a species not originally native to Wisconsin.

Common Name	Scientific Name	Code
LAMPREYS	PETROMYZONTIDAE	
American Brook Lamprey	Lampetra appendix	A05
TROUTS	SALMONIDAE	
Rainbow Trout	Salmo gairdneri	I19*
Brown Trout	Salmo trutta	I21*
Brook Trout	Salvelinus fontinalis	I22
MUDMINNOWS	UMBRIDAE	
Central Mudminnow	Umbra limi	K01
PIKES	ESOCIDAE	
Northern Pike	Esox lucius	L02
MINNOWS	CYPRINIDAE	
Central Stoneroller	Campostoma anomalum	M06
Largescale Stoneroller	Campostoma oligolepis	M07
Goldfish	Carassius auratus	M08*
Redside Dace	Clinostomus elongatus	M09
Common Carp	Cyprinus carpio	M12*
Brassy Minnow	Hybognathus hankinsoni	M14
Hornyhead Chub	Nocomis biguttatus	M19
Golden Shiner	Notemigonus crysoleucas	M20
Emerald Shiner	Notropis atherinoides	M23
River Shiner	Notropis blennius	M66
Common Shiner	Luxilus cornutus	M28
Bigmouth Shiner	Notropis dorsalis	M29
Blackchin Shiner	Notropis heterodon	M31
Blacknose Shiner	Notropis heterolepis	M32
Ozark Minnow	Notropis nubilus	M34
Rosyface Shiner	Notropis rubellus	M35
Spotfin Shiner	Notropis spilopterus	M36
Sand Shiner	Notropis stramineus	M37
Suckermouth Minnow	Phenacobius mirabilis	M41
Northern Redbelly Dace	Phoxinus eos	M42
Southern Redbelly Dace	Phoxinus erythrogaster	M43
Bluntnose Minnow	Pimephales notatus	M45
Fathead Minnow	Pimephales promelas	M46
Blacknose Dace	Rhinichthys atratulus	M48
Longnose Dace	Rhinichthys cataractae	M49
Creek Chub	Semotilus atromaculatus	M50
Pearl Dace	Margariscus margarita	M51
SUCKERS	CATOSTOMIDAE	
White Sucker	Catostomus commersoni	N09
Quillback	Carpiodes cyprinus	N06
Northern Hog Sucker	Hypentelium nigricans	N13
Spotted Sucker	Minytrema melanops	N17
Silver Redhorse	Moxostoma carinatum	N19
Golden Redhorse	Moxostoma erythrurum	N21
Shorthead Redhorse	Moxostoma macrolepidotum	N22

Table A4.1 continued on next page.

Table A4.1 continued.

Common Name	Scientific Name	Code
BULLHEAD CATFISHES	ICTALURIDAE	
Black Bullhead	Ameiurus melas	O05
Yellow Bullhead	Ameiurus natalis	O06
Slender Madtom	Noturus exilis	O09
Stonecat	Noturus flavus	O10
Tadpole Madtom	Noturus gyrinus	O11
CODFISHES	GADIDAE	
Burbot	Lota Lota	R01
KILLIFISHES	CYPRINODONTIDAE	
Blackstripe Topminnow	Fundulus notatus	S02
STICKLEBACKS	GASTEROSTEIDAE	
Brook Stickleback	Culaea inconstans	U01
SUNFISHES	CENTRARCHIDAE	
Rock Bass	Ambloplites rupestris	W04
Green Sunfish	Lepomis cyanellus	W05
Pumpkinseed	Lepomis gibbosus	W06
Bluegill	Lepomis macrochirus	W09
Smallmouth Bass	Micropterus dolomieu	W11
Largemouth Bass	Micropterus salmoides	W12
Black Crappie	Pomoxis nigromaculatus	W14
Undetermined Centrarchidae hybrid		W18
Green Sunfish x Pumpkinseed		W20
PERCHES	PERCIDAE	
Rainbow Darter	Etheostoma caeruleum	X07
Iowa Darter	Etheostoma exile	X09
Fantail Darter	Etheostoma flabellare	X10
Least Darter	Etheostoma microperca	X11
Johnny Darter	Etheostoma nigrum	X12
Banded Darter	Etheostoma zonale	X14
Yellow Perch	Perca flavescens	X15
Logperch	Percina caprodes	X16
Blackside Darter	Percina maculata	X18
Slenderhead Darter	Percina phoxocephala	X19
Walleye	Stizostedion vitreum vitreum	X22
SCULPINS	COTTIDAE	
Mottled Sculpin	Cottus bairdi	Z01
Slimy Sculpin	Cottus cognatus	Z02