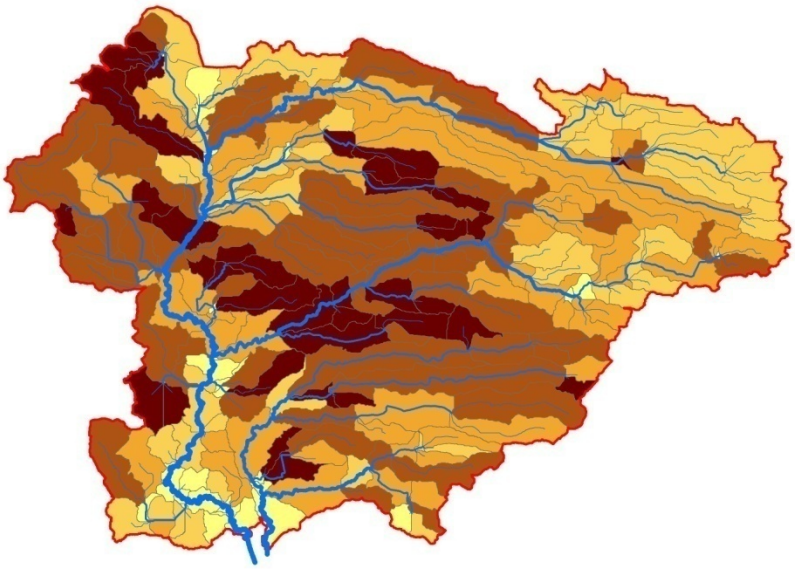
Little Rock Creek Biological Survey, Habitat Evaluation, and GIS Analysis



In support of the Little Rock Creek TMDL study

Prepared for
Benton County Soil and Water Conservation District

By

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Introduction

Little Rock Creek was listed as a Minnesota 303(d) impaired water in 2004, resulting in a TMDL (total maximum daily load) study for aquatic life due to the lack of a cold water fish assemblage. Data presented in this report provide biological survey summary information on the stream community associated with Little Rock Creek (LRC), local habitat measurements, and land use/land cover characteristics of the watershed in an effort to identify causes of impairment. This report will describe the biotic stream community and quantify potential relationships among landuse characteristics, local habitat conditions, and biotic assemblages including fish, and macroinvertebrates. This report will focus on trends in the macroinvertebrate and fish communities (abundance and functional traits), physicochemical, and local habitat conditions from five sample locations within the Little Rock Creek watershed (Fig. 1a,b). Additional data is provided by the Minnesota Pollution Control Agency (MPCA), and an earlier Natural Resources Research Institute (NRRI) study, for the purpose of regional comparisons (hereafter referred to as 'MPCA and/or NRRI regional comparison sites;' Figs. 2,3). Data collected by the MPCA between 1996-2006 includes 16 streams in the same area as the TMDL sites. A 1998 sampling efforts at 18 streams (c.f., Hutchens et al. 2009) in southeastern Minnesota were conducted in a heavily agricultural area to determine landuse/landscape interactions with macroinvertebrate and fish communities.

Methods

Sampling methods described below pertain to the Little Rock Creek TMDL assessment only. For previous MPCA and NRRI sampling efforts, refer to MPCA biological monitoring protocols and Hutchens et al. 2009, respectively, for specific details.

Study Sites

Little Rock Creek TMDL study sites were selected based on access, location of Benton County Soil and Water Conservation District (SWCD) routine sample sites, or proximity to MPCA defined 'pour points,' which allow contributing watersheds to be isolated at a sub-basin level. Sample locations were also considered if established SWCD and MPCA gauging stations were in operation. Sites were sampled in August 2006 at locations near five road-stream crossings. Four sites were distributed longitudinally on Little Rock Creek (Fig. 1b). Zuleger Creek represented the fifth TMDL sample site and was located in an adjacent drainage that flows into Little Rock Creek Lake in close proximity to Little Rock Creek. Three additional sites (e.g., Bunker Hill, Sucker, and a second upstream Zuleger Creek location) experienced such low flows in 2006 and 2007 that comparable sample efforts were not possible.

Habitat Characteristics

Habitat data for the Little Rock Creek TMDL sites were collected both from transects established across the channel perpendicular to flow and from whole-reach observations (Fig. 4).

A minimum of 10 transects were placed at 10 m intervals (100 m minimum reach length) to evaluate substrate characteristics, stream features, bank conditions, and available habitats. A schematic stream reach diagram noting habitat characteristics, and a cross-section diagram at each transect, were completed for all sites.

Transect points - Point estimates were used to evaluate stream features, discharge rates, substrate type and proportional coverage, substrate embeddedness by fine particles, in-stream habitat cover, bank and riparian condition, and riparian corridor extent. Five points evenly spaced along each transect were used to quantify substrate size categories and composition (percent coverage).

Substrate - Within each grid (25 cm^2), the extent (in percent surface area covered) and types of substrate particles were estimated. Classification schemes adhered to standardized particle size categories (e.g., Brusven and Prather 1974, Friedman and Sanders 1978, Gee and Bauder 1986). The extent of embeddedness of large substrate particles by fine particles (sand, silt, and clay) was also estimated (as percent embedded) at one point within each grid. An additional sediment depth measurement along each transect was recorded to determine the maximum depth of fine particle deposition using a sediment rod (Brady et al. 2004). Depositional areas within the stream were targeted, and fine particle accumulation was measured by inserting a sediment rod to a depth of maximum resistance. This measurement was repeated to obtain a maximum sediment depth per transect. Finally, fine sediments were collected using a 7.62 cm diameter core from three locations along the stream reach and returned to the laboratory for particle size analysis.

Flow - Stream discharge was estimated from flow recordings at 15-20 points on a single transect that provided the most laminar flow. Water depth was recorded at each transect point and flow rates were recorded from a point equivalent to 60% of the total water depth. Instructions for flow-weighted averaging (FWA) are provided in the Marsch-McBirney Flow-mate operators' manual (Marsch-McBirney 1990).

In-stream cover - Where transect lines intersected in-stream habitat cover, the type, size, and stability were described. Schematic diagrams of the size, shape, and dimensions of habitat cover, such as large boulders, islands, etc., were also recorded. Large wood pieces (greater than 1 m in length and 10 cm diameter), debris dams, roots wads, etc., that intersected each transect were recorded in detail, noting length or surface area, stability, and position along each transect. Total amount of large wood per reach was also estimated by counting the number of intact units that occurred within transects, and then summing together transect counts. A reach survey qualitative habitat evaluation index (Ohio EPA 1987) to rank overall stream condition was also completed for each site following the sampling event. QHEI categories include substrate, cover, channel type, riparian zone, width/depth ratio, and riffle/run quality; the gradient metric was not calculated or included in the final score due to the lack of GIS elevation data and watershed area estimate for a particular stream reach.

Bank structure - Bank or shoreline structure and condition (stable or unstable) were evaluated on all transects by noting bank substrate type and the presence or absence of undercut banks. Bank-full width was recorded, as well as high water marks or indicators of flood extent.

*Riparian corrido*r – Densiometer readings at a mid-stream point on each transect were used to

estimate stream shading. Riparian width and vegetation type within 10 m were described using predetermined land cover categories. Additional notes were also recorded for adjacent riparian and landuse characteristics from 10-30 m.

Physicochemical parameters - Water chemistry parameters at each location were recorded with a YSI 556 multi-probe meter to establish baseline information on water temperature, dissolved oxygen, conductivity, and pH during the sampling effort. Water clarity observations were completed in triplicate using a 120 cm transparency tube.

Macroinvertebrate Community

Benthic samples were collected using a multi-habitat sampling approach (c.f., Lenat 1988) during baseflow conditions. Quantitative samples were collected in triplicate from run, riffle, and pool habitats using either a modified Hess (0.086 m^2) in riffles or a sediment core tube (0.0045 m^2) in shallow depositional areas. All quantitative samples were washed on-site through a 254-µm mesh net or sieve. Where available, qualitative samples were collected from habitats beneath bank or over-hanging vegetation, woody debris dams, boulder piles or rip-rap, or from sediments and aquatic vegetation in run and pool habitats using a D-frame kick net (mesh size: 500 µm; Appendix 1). The D-net effort was timed and measured (approx. 30 seconds per sample and a 10 m distance). Extensive herbaceous bank vegetation and instream aquatic vegetation were swept, while wood dams and boulder piles were jabbed (*sensu* Barbour et al. 1999) to dislodge invertebrates. All invertebrates from each sample type were preserved in the field using Kahle's preservative, 10% formalin, or 70% ethyl alcohol.

Fish Community

Fish surveys were conducted by the Minnesota DNR at the Little Rock Creek TMDL sample locations in July 2006. Data for regional comparison sites were collected over several years (e.g., 1998 to 2007) and were provided by the MPCA. Refer to agency standard operating procedures for details describing methodologies (http://www.pca.state.mn.us/publications/sf-sop-fish.pdf). Number of individual taxa per sampling effort was used to generate a series of variables describing fish assemblage structure and function. Trait characteristics for fish taxa were derived from a database compiled by NRRI researchers incorporating a variety of sources (Scott and Crossman 1973, Becker 1983, Page and Burr 1991), including US EPA and USGS resources. Trait characteristics and other biological metrics consist of habitat preferences, spawning strategy, functional feeding group classifications, trophic level designations, body shape, and other variables which help define fish assemblage interactions within their environment (Appendix 2).

Sample Processing

Benthic macroinvertebrates – Samples were processed in the laboratory by washing materials through two sieve sizes (4 mm and 254-µm) to separate contents into large and small size fractions. The large size fraction (>4 mm) was completely picked ('whole picked') for invertebrates. The amount of sample processed between 4 mm and the 254-µm fraction was

determined on an individual sample basis based on time expired to complete a sub-sample and the volume of material. All samples were either ¼, ½, or whole picked. Invertebrates were removed from organic and inorganic sample materials under a dissecting microscope or a 2x magnification lens. Each completed sample was subject to quality assurance/quality control (QA/QC) inspection (100% inspection). Rejected samples were re-processed until QA/QC guidelines were passed. A subsample of the Chironomidae (Diptera), consisting of 30-100 individuals per sample was permanently mounted on slides for identification to genus. Other macroinvertebrates were identified to the lowest practical taxonomic level using appropriate keys (Hilsenhoff 1981, Wiederholm 1983, Brinkhurst 1986, Thorp and Covich 1991, Merritt and Cummins 1996; Appendix 3). A reference collection was also established for macroinvertebrates, and specimens were subject to a rigorous QA/QC inspection (further details available in Breneman 1999).

Benthic sample organics – Quantitative benthic invertebrate samples were used to provide an estimate of habitat-specific organic content after the invertebrate assemblage was removed. Sample remnants were placed in labeled pans and dried (105°C) to a constant weight determined with a standard balance. Dried samples were ignited for 1 h at 500°C. After samples cooled, reagent-grade water was added to re-wet ash and compensate for water weight not driven off from clay particles during the drying period (APHA 1992). Samples were dried to a constant weight at 105°C and re-weighed to determine the ash-free dry weight of each sample.

Sediment processing – Fine sediments were collected from 4 to 6 transects (approximately 1200-2000 cm^3 per site), labeled, and stored on ice and/or frozen prior to analysis. In the lab, sub-samples from each field container were thawed, extracted in triplicate (approximately 300 cm^3), and homogenized for 1 minute. Water was added to each sample to facilitate thorough mixing when required. Homogenized sediment in the mixing container was tamped to settle material uniformly. Sediment was sub-sampled in triplicate by extracting 250 cm^3 using a 5 cm (dia.) sediment core. Sub-samples were then processed in accordance with ASTM (1985) standards described above (see Benthic Sample Organics).

Substrate particle size analysis – Ashed substrate samples were separated with a set of six sieves (4, 2, 0.5, 0.25, and 0.0625 mm) for 1 minute using a row-tap machine to obtain particle size fractions of: 1) > 4 mm, 2) 4-2 mm, 3) 2-0.5 mm, 4) 0.5-0.25 mm, 5) 0.25-0.0625 mm, and 6) < 0.0625 mm (Gordon et al. 1992). Sediment retained in each size fraction was weighed using a standard balance, and the proportion of total sample weight was calculated.

Watershed Delineation and Landscape Analysis

To quantify spatially explicit relationships among landscape, habitat, and biotic assemblages, sub-watersheds were delineated using second order stream segments. Detailed watersheds were delineated using ArcHydro (Maidment and Djokic 2000). ArcHydro is a data model for processing elevation data and delineating watershed and sub-catchment polygons. We used 10 m elevation data for the Little Rock Creek watershed and 30 m elevation for the more extensive MPCA regional comparison sites (National Elevation Data Set USGS). In both cases, elevation data were preprocessed to remove sinks and to enforce drainage (using 1:24,000 stream line work). Flow direction and flow accumulation were then derived from the processed elevation

data. A flow accumulation threshold (> 50 ha) was set to delineate the stream network, the stream network was converted to a vector (line) format, and stream links (stream reaches) between stream confluences were identified. ArcHydro then delineates sub-catchments for each stream reach, adds unique IDs (Hydro-ID) to each, and determines the identity of the next catchment downstream (Fig. 5). These attributes are also applied to the corresponding stream segments. This database structure allows for network traces up and down the hydrologic network. The ArcHydro data model was used to delineate specific watersheds based on GPS plotted sample point locations for the 21 sites (TMDL and MPCA regional comparison sites). USDA National Agricultural Statistics Service (NASS) Minnesota cropland data (56 m resolution) from 2007 were then summarized for each watershed. Agricultural, forest, developed (urban), and wetland classes were aggregated from the original classes and summarized as proportions of the total watershed.

Ten meter elevation data was used with ArcHydro to delineate the Little Rock Creek and Zuleger Creek hydrologic networks. Two hundred forty-two sub-catchments and stream segments were delineated for this system. Cropland data (NASS) were also summarized for each sub-catchment (Fig 6). Because these sub-catchments each have a unique "hydro-id" and a "next-down-id," we were also able to calculate accumulated values representing land cover proportions upstream from each stream confluence or link. Comparing specific sub-catchment land cover summaries with accumulated land cover summaries provides an opportunity to identify local impacts and to quantify cumulative impacts across the watershed network. The alternative approach, in which land use is summarized for an entire watershed, does not provide a spatially explicit measure of potential land use impacts.

To quantify riparian land cover within each sub-catchment, we buffered the derived stream network at 50 and 100 m (one and two land cover pixel) to each side (Fig. 7a). (While the 50 m buffer is more closely representative of the actual size of the riparian zone in this region, accuracy of these estimates is relatively low due to the minimum mapping unit (56 m), therefore, we also applied a 100 m buffer. Summaries of 100 m buffer land cover data were used for statistical analysis.) This buffer was intersected with the NASS land cover data to derive the total proportion of land cover within each stream buffer within each sub-catchment. "Hydro-id" and "nextdown-id" were used to accumulate these values down the stream network (Fig. 7b). Accumulated values versus specific sub-catchment values were again used to compare local versus cumulative riparian forest cover across the watershed network.

Because these values exist across the whole watershed, we can also use them to identify the least impacted sub-catchments and areas potentially the most impacted. To this end, a combined score was calculated by subtracting the proportion of riparian forest in each sub-catchment from the proportion of agriculture in that sub-catchment (for sub-catchment specific and accumulated values), to represent an approximation of the ameliorating effects of forest cover with respect to agricultural impacts. Scores were ranked and depicted in relative terms in Figure 8.

Data Analysis

Trait characteristics for each invertebrate taxon were derived from a database compiled by NRRI

researchers incorporating a variety of sources (Merritt and Cummins 1996, Thorp and Covich 1991, Weiderholm 1983), and US EPA and USGS resources. Biological traits consist of functional feeding group classifications, trophic level designations, locomotion methods, preferred habitats, and other characteristics which help define aquatic invertebrate interactions within their environment (e.g., Richards et al. 1996, 1997). Invertebrate community metrics were generated based on known taxonomic sensitivities to environmental degradation (e.g., Ephemeroptera, Plecoptera, and Trichoptera [EPT] taxa) and on traits that identify select groups as more or less sensitive (e.g., scraper-grazer feeders, burrowers, etc.) to disturbance. Invertebrate metrics were compared among Little Rock Creek TMDL sites using a one-way ANOVA when data met appropriate assumptions (SAS 1988). Substrate, habitat, primary production estimates, and water quality parameters were compared among sites in a similar fashion.

In addition to Hilsenhoff biotic index (HBI) scores (Hilsenhoff 1981) and Hilsenhoff improved biotic index (HIBI) scores (Hilsenhoff 1987), each invertebrate taxon was also assigned a tolerance value (0 to 10, where 0 represents the least tolerant and 10 the most tolerant). Tolerance values indicate an overall ability to function and adapt at specified stress levels; Hilsenhoff's values were supplemented with U.S. EPA scores (Barbour et al. 1999). We defined sensitive individuals as those with a value of 3 or less, and tolerant taxa as those with a tolerance value of 7 or higher. Tolerance scores for entire sites were calculated by multiplying the tolerance value for each taxon by the abundance of that taxon per sample, then summing the product, and dividing by the total number of invertebrates per sample.

Traits information and the HBI/HIBI metrics were used to calculate a Minnesota index of biotic integrity (MIBI) according to MPCA scoring criteria (Genet and Chirhart 2004) for each site. Using the MIBI allows for comparisons among streams by incorporating data generated using standardized metric calculations. Macroinvertebrate data from the TMDL study were also manipulated to roughly match the MPCA D-net all-habitat data by averaging sample replicates for each gear type and habitat at a site, converting these mean abundances to proportions, summing the proportions across all habitats and gear types to create an all-habitat whole-site sample, and then re-standardizing the numbers to sum to 1. The MPCA data columns of "count" and "large-rare-count" were summed and then converted to proportions for each sampling event on each stream.

Relationships between environmental factors (local habitat characterization observations and GIS landuse/landcover calculations) and fish community structure (using species and trait information) were examined using redundancy analysis (RDA, CANOCO Version 4.02), in which a set of predictor variables (environmental data) are used to determine the variability in the response variables (biological data). This technique has been used in a variety of systems to determine landscape influences on stream assemblages (c.f., Richards et al. 1996, Breneman et al. 2000, Hutchens et al. 2009), and ter Braak and Prentice (1988) provide more detail on this canonical extension of principal component analysis.

Relationships between environmental factors (local habitat characterization observations and GIS landuse/landcover calculations) and benthic macroinvertebrate community structure (using species and trait information) were examined using Spearman rank correlation, multiple

regression (SAS 1988) and nonmetric multidimensional scaling (NMS), a multivariate procedure. Other types of ordinations (redundancy analysis [RDA] and canonical correspondence analysis [CCA]) were attempted, but no significant solutions were found due to high levels of collinearity). For the comparison with MPCA regional sites, the only NMS ordination with a three-dimensional solution was obtained after using a "relativize by the maximum" transformation across taxa. This transformation relativizes each column (taxa) in the dataset to 1 so that all taxa in the dataset are equally weighted, removing the pull of extremely abundant and extremely rare taxa (Faith and Norris 1989). For all other ordinations, more common transformations were performed: proportional data were arcsin square root transformed. NMS ordinations were performed using PC-ORD 5.17 (MjM Software, Gleneden Beach, Oregon, USA). Monte-Carlo permutation tests (250 runs) were run on the ordination to determine the level of significance of the solution and verify that it was most likely non-random. Finally, transformed macroinvertebrate data from the regional comparison datasets were compared to the LRC transformed data using the multi-response permutation procedure (MRPP; PC-ORD 5.17), which is similar to a nonparametric ANOVA and determines whether or not two or more categories of data are significantly different from one another.

Results and Discussion

Stream habitat and biological sampling was completed in August 2006 at four Little Rock Creek locations and one site on Zuleger Creek (Table 1). Low water conditions in both 2006 and 2007 prevented proposed sampling on Bunker Hill, Sucker, and a second Zuleger Creek location. A combination of sampling gear at available habitats resulted in 8-12 invertebrate samples being processed per site, as well as periphyton rock scrubs and a variety of habitat characterization observations. Water quality instrumentation used prior to sampling showed that conditions were similar among locations. Water temperatures during sampling periods ranged between 18 and 22°C (Table 2). Given normal daily fluctuations and one-time measurements taken while sampling biota, water quality parameters did not vary significantly from Benton SWCD gauge information (August mean of 18.9°C).

Watershed Landuse/Land Cover Characteristics

Landuse in the Little Rock Creek basin was predominantly agricultural (Fig. 1b), ranging from 56% at the most downstream sample site, LRC1, to 41% at the most upstream site, LRC4. Zuleger Creek, similar in size to LRC4, but located near the confluence of Little Rock Lake, had 54% agricultural land use in its watershed. (These percentages represent cumulative values for the watershed delineated from each sample site). Developed land was approximately 6% of each of the watersheds, forest land was approximately 14%, and herbaceous wetlands ranged from 16 – 22%. Other land cover (e.g., shrubland, surface water) made up the remaining portion of the land use/land cover (NLCD 2006; Table 3). Within a 100 m buffer, the proportion of forest cover increased to around 20%, while agricultural and developed land uses decreased. Herbaceous wetlands were a significant component of the buffer (25-35%)

Study Site Summary

Local habitat conditions - Glacial moraine deposits consisting of sandy soils dominate the Little Rock Creek watershed. Stream habitat was characterized at base flow conditions, and channel structure at all sites was incised, although bank structures were shallow (~1 m in depth, unpublished data). Minimal differences between wetted-width and bank-full width measurements at most transects (Table 4) resulted in step-bank structure (59% of bank observations along transects approaching a 90° slope). Bank structure typically showed signs of eroding or slumping. Undercut banks exposing root wad structures were recorded at approximately 33% of the transect bank descriptions and were common at all sites except LRC2. At base flow conditions, the Little Rock Creek TMDL sites followed a typical up-stream to down-stream trend, with mean depth and flow increasing further downstream (Table 4). The riparian zone at all TMDL sample sites was mixed vegetation including grass, shrubs, and mixed forest. Landcover adjacent to the riparian zone (beyond ~30 m) was mainly mixed vegetation (grass, shrub, and deciduous and coniferous trees), with the exception of LRC3, where the land cover beyond the riparian zone was predominantly agricultural rowcrop (Table 5).

Large wood (LWD) is an important invertebrate habitat and fish refuge (Wallace et al. 1993), and can serve as the only source of stable substrate in some settings (c.f., Johnson et al. 2003). Occurrence of large wood (as a proportion of transect surface area) from the four Little Rock Creek sample sites followed an upstream to downstream trend, with LWD increasing downstream (Tables 4, 5). Zuleger Creek and LRC1 contained the largest accumulation of large wood, both across transects and within a reach (Tables 4, 5). Canopy cover values measured with a densitometer typically decrease in the downstream direction as systems generally become wider further downstream. However, stream shading is often site-specific and heavily influenced by local landuse characteristics and stream width. Sample sites in this study were more shaded at sites LRC2 and LRC3, with the upper site and the furthest downstream site containing the least amount of stream shade (Table 4). Zuleger Creek was intermediate in extent of shade with respect to LRC sites.

In-stream stable refugia in the form of hard substrates larger than gravel was not readily available throughout the sample locations visited. Cobble and gravel riffle/run areas were periodically exposed, and those reaches received a concentrated sampling effort. The substrate at Little Rock Creek sites was heavily dominated by fine substrates (sands, silts, and clay), with the exception of LRC3, which contained a substantial deposit of cobble-size particles (Table 6). Most sample locations contained cobble and gravel-size particles that were buried by a substantial layer of sand and silt. These particles were detected while probing along transects for fine sediment depth. Where larger substrates were uncovered, substrate embeddedness was 20 to 25% at upstream sites and 50% at LRC1, the most downstream site in Little Rock Creek; substrate embeddedness averaged 30% on Zuleger Creek (Table 6).

Sample site LRC3 contained significantly greater amounts of >4 mm, 4-2 mm, and 2-1 mm particle size fractions than were found at all other TMDL sample locations (Table 7). This was the only site with substrate not dominated by sand. Within the 1-0.5 mm and smaller fractions, all sites except LRC3 contained significantly more fine sediments than other size classes. LRC3 had only one quarter the amount of fine sand (<0.25 mm size fraction) as the other sites.

Sediment organic content displayed a longitudinal upstream-downstream gradient, with decreasing organic matter availability as one moves downstream (Table 7). Mean organic content (measured in grams AFDW) was significantly greater at site LRC4 than at LRC3. LRC3 and was significantly greater than sites LRC2, LRC1, and Z4, which were not different from one another.

Macroinvertebrates - Total number of invertebrate taxa per site for all habitats was highest (109 taxa) at the furthest downstream Little Rock Creek site (LRC1). The fewest taxa per site (61 taxa) were recorded at the most upstream sample location (LRC4, Fig. 9a), significantly fewer taxa than collected at LRC1 ($p = 0.02$). Sample locations LRC2 and LRC3 included 93 and 99 total taxa, respectively. Mean number of macroinvertebrate taxa per gear-type followed a similar pattern, with LRC1 having the highest average taxa richness. Again, the lowest average number of taxa occurred at the upstream site, LRC4, and was similar to that associated with the Zuleger Creek site. Zulegar Creek (Z4), a third order stream located near the confluence with Little Rock Creek Lake, is in closer proximity to LRC1, but similar to the LRC4 upstream site in terms of watershed size (Table 3).

Individual taxa counts from quantitative gear types (Hess and sediment cores) were standardized by surface area to compare abundance values by habitat and sites. Total abundance (in mean number per m^2) was highest at sites LRC1 and LRC3, and significantly greater than LRC2 (Fig. 9b). Site LRC2 contained the lowest abundance. Mean abundances associated with LRC4 and Z4 sites were not significantly different from other sample locations.

Traits descriptions are a composite measure of taxa behaviors or characteristics that help smooth out the variability of taxa interactions, and help interpret the broader community's response to the environment. Dominant behaviors and life history characteristics can be used to infer mechanistic relationships between stressors and responses in stream ecosystems (Richards et al. 1997). For example, one species of macroinvertebrate that scrapes substrate surfaces to obtain food (typically periphyton) may not provide a robust picture of stream condition, but in combination with other grazers, a shift from one dominant feeding process to another can be identified.

A strong association exists between the Little Rock Creek invertebrate community and the relative abundance of cobble or gravel substrate at sites. Grazer-scraper numbers were highest at the LRC3 location, the only site with substantial rocky substrate, and were very low at the remaining sites (Fig. 10). A close association between stream substrate and the macroinvertebrate community can be seen in both mayfly and riffle beetle numbers. Mayflies (Ephemeroptera) responded to the hard substrate associated with LRC3 with significantly greater numbers than were found at LRC2 and LRC4 (Fig. 11a). Mean abundances of mayflies at the remaining sites, LRC1 and Z4, were not significantly different than sites LRC2 and LRC4. Although larval riffle beetles (Elmidae: Coleoptera) function efficiently in a variety of habitats including fine sediments, adult beetles have been shown to select for particular substrates (c.f., Minshall 1984). Both adult and larval numbers were significantly greater at the LRC3 location than at any other sample site (Fig. 11b). These data suggest that riffle beetle numbers are also responding to the dominate cobble substrate at LRC3. There was little difference in riffle beetle abundances among the remaining sites, although the abundance of beetles at LRC2 was

significantly lower than at sites LRC1 and LRC4. Beetle abundance in Zuleger Z4 was not significantly different than any site except LRC3.

Burrowing invertebrates are often associated with habitats dominated by fine, organic and inorganic sediments, and thus their abundance and taxonomic diversity are indicative of invertebrate community responses to substrate type at these sites (Table 6). Modifications to body structures include spade-shaped legs or tusks to better move sediment or cover plates over fragile gill appendages to reduce abrasion; these structures enable this group of organisms to more effectively utilize soft sand and silt. Burrower abundance was lowest at LRC2, the only site dominated by rocky substrate, significantly increased at LRC3, and then significantly increased again at LRC4 (Fig. 12). Burrower abundances observed at LRC1 were not significantly different than at sites LRC4 or Z4. Climbing invertebrates were also lowest in number at LRC2, and significantly lower that LRC1 and LRC4. All Little Rock Creek sites had climber abundances significantly lower than the Z4 sample location (data not shown).

Summary of TMDL site conditions and biota;

- All sample locations are within watersheds with approximately 50% agricultural row crops; riparian corridors were relatively intact at all sample sites.
- The riparian corridor at site LRC3 was the narrowest of all the sites, but the stream reach associated with LRC3 was heavily shaded, with scattered amounts of LWD.
- The LRC3 reach contained more cobble substrate (55%), less fine sediment, and was less embedded (19.7%) than any other TMDL site sampled.
- The macroinvertebrate assemblage responded positively to local habitat characteristics, particularly the rocky substrate, at LRC3, resulting in a more heterogeneous community there than was present at other sample locations.
- HBI scores ranked LRC3 as ‘Fair’ and the other TMDL sites as ‘Poor’ condition.

TMDL Sites Compared to MPCA and NRRI Regional Comparison Datasets

Stream data from sixteen watersheds with relatively similar geologies and in close proximity to Little Rock Creek were provided by the MPCA Surface Water Monitoring Division (Fig. 2). Sampling protocols varied between efforts, but the comparisons provided below were generated based on combining macroinvertebrate samples from all habitat types so that TMDL data could be directly compared to the MPCA data. In most cases, data were collected during different years (1999-2006), but were relatively consistent in terms of seasonality (late August through early October). The NRRI regional comparison samples (n=18 sites) were collected in 1998 from a heavily agricultural area in southeastern Minnesota (Fig. 3). Sampling methods were very similar to those used for the LRC TMDL samples, thus reducing methodological issues with the data comparison. These samples were collected from streams covering a wide variety of substrate types that were located in a predominantly agricultural setting, making them a good comparison dataset for the TMDL samples. All data were transformed prior to analysis or standardized as percent of total numbers, if necessary, when making direct comparisons.

Watershed landuse/land cover - Landuse among the MPCA regional comparison site watersheds was less dominated by agriculture compared to the TMDL sites for all but the tributary of the

Sauk River and Mayhew; agriculture was 62% and 43%, respectively in those systems, and ranged from 0 to 31% in the other regional comparison sites (Table 3, Fig. 13). The Little Rock Creek site sampled by MPCA in 1999 (LRC-99) was located in a watershed with 38% agricultural land use. Across the MPCA regional comparison watersheds, urban development ranged from 0.5 to 10%; forest land cover ranged from 6 to 89%. Land use within a 100 m buffer surrounding the stream was also summarized. In general, these data paralleled the results for each watershed with the exception that herbaceous wetlands were a prominent feature of the 100 m buffers, ranging from 11 to 49% (Table 3). The TMDL sites had watersheds comprised of at least 50% agricultural land use (Table 3). NRRI regional comparison sites, in contrast, had even higher amounts of agriculture in their watersheds, making the TMDL sites among the least agricultural of the watersheds sampled (Fig. 14). NRRI sites had watersheds with >80% agricultural land use.

Local habitat conditions - Low water levels over the course of the study likely affected width-depth ratios for Little Rock Creek, because reaches sampled in this study are clearly different from both regional comparison datasets sampled in earlier years (Fig. 15a, b). Wetted widths were not a major contributor to the intense difference, but water depths at the TMDL sample locations were typically only 20 cm deep, while both regional comparison dataset streams had low flow depths of 20-60 cm. With a few exceptions, low flow rate and water temperatures were fairly similar among all sites, as were estimated proportions of woody debris per reach (Table 4). Stream shade (percent canopy cover) is often site-specific and was highly variable (range 0 to > 80%) among sites, with no strong relationships apparent.

About half of the sites from the regional comparison datasets contained discernable amounts of large rock substrate (e.g., > 50% of boulder, cobble, and gravel; Table 6, Figs. 16, 17). However, with the exception of hard substrate associated with LRC3, TMDL sites had among the highest amounts of total fine sediment accumulation (summed percent of sand, silt, and clay; Figs. 16,17). TMDL sites had on average nearly 20% greater amounts of fine sediments than did sites associated with the 16 MPCA regional comparison streams (Table 6). With LRC3 included, TMDL study sites still contained 10% more total fines than were found in the MPCA comparison streams. Five of the NRRI regional comparison sites contained comparable amounts of fine sediment to the TMDL sites (Fig. 17). Mean total depth of fine sediments was similar for all sites, but the extent hard substrates was embedded by fine particle was variable. This was in part due to the embeddedness observation, which requires that hard substrate particles be visible for an embeddedness estimate to be made.

Embeddedness is a characteristic used to evaluate condition at a site due to the important associations that exist between stream substrate and biotic assemblages; in particular, the habitat refugia created by interstitial spaces among rocky substrate. However, interpreting this measurement requires the consideration of other key stream parameters, such as underlying geological features or local substrate characteristics. Embeddedness in stream reaches naturally dominated by coarse sand may not place the same adaptive pressures on a biological community as sites with intense pulses of fine sediment filling in hard substrate and quickly altering condition. For example, LRC4 and Z4 were 26 and 32% embedded, respectively (Table 6), but no substrate particles larger than sand were recorded. Thus, the embedded variable in this case represents sediment deposits around large woody debris. Wood deposits were sometimes the

only hard substrate in a reach, so comparisons to sites with traditional hard substrate would be very difficult. The dominant substrate particles at LRC3 (cobbles) were estimated to be 19% embedded, on average, with all five TMDL sites containing substrates that were, on average, 30% embedded. Extent of embedded substrate at comparison sites ranged from 20 to 94%.

Fish assemblage - In addition to LRC1-4 sample locations, fish assemblages were also collected during the TMDL study (Table 8) at Bunker Hill (BH2) and Zuleger Creeks (Z1 and Z2). Total fish taxa varied among TMDL sites (6-14 taxa at LRC1 and Z2, respectively), with a wider range of taxa found at the regional comparison sites (e.g., 6-30 taxa). Average number of fish taxa among the TMDL sample locations was somewhat lower than the regional comparison sites, with means of 10.1 and 14.4, respectively. Taxa richness at comparison sites with a similar proportion of agricultural landuse in the watershed (previously described as Briggs, LRC-99, Mayhew, and Sauk River Tributary) were more similar, with a mean of 12.5 taxa at those sites.

EPA tolerance rankings of 'tolerant taxa' (Table 8) as a percent of total taxa were, on average, 30.9 at the MPCA sites and 32.9 at the TMDL sample locations. Fish species classified as omnivores are also an indicator of tolerance, and the MPCA sites had a mean percent abundance of 58% compared to a mean of 46% at the TMDL sample locations.

A multivariate procedure exploring the relationships between fish assemblage traits and local habitat variables indicated a significant relationship ($p = 0.04$). The first ordination axis was most highly correlated with shade (percent) and cobble (percent), and was negatively associated with water depth (Fig 18). The second axis was positively correlated with wetted width, and negatively correlated with low flow. The ordination clustered TMDL sites LRC1 and LRC2 with respect to channel characteristics associated with increasing shade (percent) and cobble substrate, while the other TMDL sites were most associated with decreasing flow. The regional comparison sites with the highest proportion of agricultural landuse in the watershed (Briggs, LRC-99, Mayhew, Sauk River Tributary) were associated with deeper, more turbid sites, with more wood, and decreasing flow (Fig. 18)

Ordination of fish species traits and summary metrics suggests that abundance of intolerant and exotic taxa was associated with cobble substrate, higher percent shade, and embedded substrates (data not shown). Sites with these characteristics were TMDL sites LRC1 and LRC2. In contrast, tolerant taxa abundance was associated with deeper, more turbid sites with large wood (i.e., regional comparison sites with relatively high levels of agricultural land use). The presence of exotic fish species in conjunction with intolerant taxa in an environment with embedded cobble substrates is suggestive of conditions that are either beginning to degrade or are undergoing recovery. The fact that these sites are segregated from the regional comparison sites with similar land use patterns suggests that habitat conditions are fundamentally different between the two sets of sites, either due to a local disturbance or landform differences that we have not accounted for in our analyses. Potential factors include differences in landform and/or quaternary sediments. Such factors have been found to play a large role in controlling hydrologic regime and water chemistry (Richards et al. 1996, 1997, Johnson et al. 1997, Hutchens et al. 2009).

Macroinvertebrates - Macroinvertebrate data from TMDL sites incorporated all habitats sampled to better match the MPCA regional comparison dataset (see Methods). Despite this, we found

large differences in taxa richness between the two studies, suggesting that sample processing procedures created systematic differences in the data. For example, MPCA protocols include a multi-habitat composite D-net sampling effort per stream reach, followed by a 300-individual count. TMDL survey sample methods involved collecting macroinvertebrates from all dominant stream habitats using several gear (D-nets, Hess samplers, and core tubes), and much larger quantities of the sample were processed (typically at least 25% of each sample). Metrics including mean number of taxa and percent EPT taxa (Fig. 19) were much lower for MPCA-sampled sites than for the TMDL study sites (Table 9). An example of the result of this difference in processing can be seen by comparing the taxa richness and taxa metrics for MPCA Little Rock Creek (LRC-99) and TMDL sites LRC1 through LRC4 (Table 9). Richness was much lower at LRC-99, and the metrics typically would be interpreted as the site having poorer condition. Large differences in taxa richness seem likely to be caused by the differences in sample processing, and not field collection. Both field methods target multiple habitats and the MPCA field method should result in a greater number of samples collected prior to the composite step. In addition, taxonomic resolution appears comparable between datasets (for example, Chironomidae: Diptera are identified to genus in both datasets).

Such methodological differences should not be a concern with the NRRI regional comparison dataset because sampling methods were very similar to those used at LRC TMDL sites. However, to keep the analyses similar to those done with the MPCA regional comparison dataset, we combined all sample (habitat) types for invertebrate analyses because rocky habitats were not common among the sites. In comparison with the NRRI sites, several of the TMDL sites had the highest percent composition of EPT invertebrates (Fig. 20). The other two TMDL sites were intermediate among NRRI sites in this respect. EPT abundance and taxa richness are often indicative of higher amounts of habitat space among rockier substrates in streams, but invertebrates may also cling to woody substrate, and a few are adapted to sandy conditions. As is typical for many streams with large amounts of fine substrate or higher amounts of organic material, Diptera (particularly the Chironomidae) dominated sample abundances for almost all NRRI and TMDL sites (Fig. 20).

Data conversion to summary indices appears to have reduced the differences created by the two protocols. For example, both Hilsenhoff index scores were similar between datasets, as were other metrics, including the tolerance score and overall MIBI (Table 9). Although a correction factor for early fall sampling was applied (Hilsenhoff 1981), HBI scores ranked LRC3 as “Fair” and the other TMDL sites as in ‘Poor’ conditions. MPCA comparison streams had HBI rankings ranging from ‘Excellent’ at the Groundhouse River (HBI 1.43) to ‘Very Poor’ at the Skunk River (HBI 4.85). MPCA regional comparison sites that were similar to the TMDL sites in terms of percent agricultural land use (e.g., Briggs, LRC-99, Mayhew, and trib to Sauk River) had similar average HIBI’87 values. Averages of HIBI’87 scores for these four regional comparison sites and the five TMDL sites were 4.52 and 4.04, respectively. In general, MIBI scores were similar among sites and, with the exception of Brown’s Creek, other metrics, including sensitive taxa and percent of tolerant taxa, were also similar between TMDL and MPCA regional comparison sites (Table 9).

Comparing MIBI scores and metrics between LRC TMDL sites and NRRI regional comparison sites both reduced the variability due to methodological differences and highlighted the impact

of high amounts of agricultural land use in the watershed (Table 10). In general, the LRC TMDL sites appear to be in better condition according to these metrics than most of the NRRI regional comparison sites. MIBI scores calculated using all gear types and habitat types are higher, sometimes much higher, than MIBI scores calculated using only D-net samples (Table 10). This is partly because D-nets were used in this methodology only to sample habitats that could not be sampled with one of the other gear types (e.g., undercut banks, overhanging vegetation, wood, leaf packs, etc.). This example helps illustrate why it is important to understand exactly how macroinvertebrate samples were collected and processed when attempting to compare sites that were sampled by different crews and/or methods. Overall, the LRC TMDL sites LRC1-3 generated higher MIBI scores than LRC4 and Z4 or any of the NRRI sites.

Based on Ephemeroptera-Plecoptera-Trichoptera percent abundance (EPT; a metric associated with "healthy" streams), TMDL sites were interspersed among MPCA regional comparison sites, with sites LRC4 and Z4 on the 'Poor" condition end and site LRC2 on the 'Good' condition end (Fig. 19). The MPCA Little Rock Creek study site (LRC-99) was upstream of the TMDL LRC4 site and had similar EPT abundance to LRC2, although the distribution of taxa within the EPT metric differed. LRC-99 was dominated by Ephemeroptera, while LRC2 contained mostly Trichoptera (Fig. 19). However, in the context of the more heavily agricultural-area NRRI streams, LRC sites 1-3 are among the best with respect to EPT abundance, with site Z4 the only site described on the "Impaired" end of this relative comparison (Fig. 20).

TMDL site LRC2 was among very few sites in either dataset to contain Plecoptera, most likely due to the lack of rocky substrate at the other sites. The abundance of EPT at LRC3 was substantially lower than at LRC-99 and LRC2. Study sites LRC1, LRC4, and Z4 contained even lower EPT numbers. As EPT abundance declined, midge larvae (Chironomidae: Diptera) tended to increase, along with other taxa (Figs. 19, 20). Several of the MPCA regional comparison sites had a large proportion of their community represented by "other" taxa. For example, amphipods represented a large percent of MPCA Briggs and Mayhew Creeks (41 and 56%, respectively). Non-insects also comprised over 30, 40, and 80% of the macroinvertebrate population at West Fork Crooked Creek, Mike Drew, and Groundhouse River, respectively.

When comparing metrics generated using tolerance rankings for individual taxa, a site tolerance score using US EPA criteria places the TMDL sites generally in the middle of MPCA regional comparison sites (Fig. 21a). A similar value quantifying the percent abundance of individuals with an elevated tolerance score ($\geq$ 7 on a scale of 0 to 10) spreads TMDL sites evenly among MPCA regional comparison sites. Abundance of tolerant insects identified at both downstream locations (LRC1 and Z4) indicates a community more tolerant of disturbance (Fig. 21b). This observation may be an artifact of the downstream locations both being dominated by fine substrates (which tends to favor burrowing invertebrates), and being influenced by Little Rock Creek Lake. Both of these conditions promote transitional communities that are adapted to deeper water and depositional sediments. Generalist taxa are better adapted to these habitats, and because they are highly adaptable, generalists are often more tolerant of disturbance.

Generalist taxa are typically collector-gatherers in their manner of obtaining food (functional feeding groups or FFGs). Because these feeding habit allows adaptation to many different conditions, stream ecologists often consider communities dominated by gatherers, as opposed to

more highly specialized predators or more delicate filterers (for example), as more tolerant of adverse conditions. TMDL sites had low to moderate percentages of collector-gatherers compared to most NRRI sites (Fig. 22). But the TMDL sites also had few grazers and shredders. In this case, this occurrence is probably due to the lack of stable grazing surfaces and interstitial spaces that capture and hold leaves, and minimal accumulation of larger organic detritus favored by shredders. Filter-feeding taxa are relatively abundant, however, which is a bit surprising due to the amount of shifting sediment and constant scour activity occurring in these streams (Fig. 22). It seems probable that filterers were utilizing woody debris as their stable point of attachment.

Taxa behavioral traits can also indicate the types of conditions to which invertebrates of any particular system are adapted. In the case of streams with high amounts of fine sediments, burrowers may become more dominant, but only if the sediments are relatively stable. Large amounts of shifting sand tend to favor invertebrates that can swim well, sprawl on top of the shifting substrate, or climb on wood or overhanging vegetation. TMDL sites contain low to moderate amounts of burrowers (greatest at LRC1 and LRC4), with moderate amounts of sprawlers (Fig. 23). Climber and swimmer relative abundances are quite low. Clinger invertebrates, which cling to rocks and sometimes wood, make up a large proportion of the invertebrate assemblages at sites LRC2 and LRC3, indicating a fair number of surfaces for attachment.

Summary of LRC-TMDL sites in the context of regional comparison sites:

- MPCA regional comparison site habitat characteristics encompass a range of conditions. Little Rock Creek sites tended to fall in the center of that range, with one important exception being the much shallower water depths at the time of sampling for this study.
- Although multi-metric invertebrate indices used to identify biotic health tended to dampen assemblage differences between LRC-TMDL and MPCA regional comparison sites, certain variables used to generate those metrics were substantially different between data sets. Sample processing procedures appear to be the primary cause of these differences.
- LRC-TMDL sites were generally in the middle of the MPCA regional comparison sites in terms of biotic condition according to the multi-metric and summary indices for macroinvertebrates.
- Fish assemblages appear to be responding to local conditions more so than landscape conditions.
- A greater percent of intolerant taxa were found at the lower Little Rock Creek site (LRC) corresponding to areas with extensive riparian forest and wetland.
- Although TMDL sites are at the high end of amount of fine substrate relative to the NRRI comparison sites, the TMDL invertebrate indicators and metrics suggest that the invertebrate communities are in better condition than most of the NRRI sites. This is probably due to the amount of agriculture in the NRRI stream watersheds and the relatively intact buffer along many of the TMDL sites.

Landuse Influence on Biological Community and Habitat

Macroinvertebrates - As was seen with the macroinvertebrate metrics, the differences in sample

processing between the NRRI-collected samples and those collected by MPCA left a methods signature on the macroinvertebrate multivariate ordinations. Depending on the transformation used, methods differences appear to account for at least 43% of the variability in the entire combined macroinvertebrate dataset of TMDL and MPCA regional comparison sites (e.g., Fig. 24). Most of the environmental and habitat variables and macroinvertebrate metrics are correlated with this primary axis separating the two datasets, and seem to indicate major differences among the datasets. It is also possible, however, that the TMDL LRC sites are themselves quite different and unique relative to the MPCA's sampled sites.

To better differentiate between sampling method differences or environmental condition at these sites, we used a data transformation (relativize by the maximum) to standardizes each taxa from 0-1 across all sites, greatly down-weighting the significance of highly abundant and highly rare taxa. By using this transformation, a significant non-metric multidimensional scaling (NMS) ordination was obtained. This technique allowed for analysis of watershed landuse/landcover and habitat influences on macroinvertebrate community assemblages from the TMDL and MPCA comparison sites (Fig. 25). The ordination was highly significant ($p = 0.004$), and captured 75% of the dataset variability in the first 3 axes (46% on axis 3, 16% on axis 2, and 13% on axis 1). Axis 3 primarily separated TMDL sites from all other sites so a clear difference caused by sampling methods or an environmental influence between the sets of sites could not be determined. However, axes 2 and 1 separated sites based on other macroinvertebrate community characteristics (Fig. 25).

Axis 2 separates sites with higher amounts of watershed development (positive on axis 2) from those that have higher amounts of watershed forest (negative on axis 2) (Fig. 25, red metrics). The sites in developed watersheds had some habitat characteristics that may moderate the effects of development. The positive direction on axis 2 is also correlated with higher stream flow, higher amounts of pebble (gravel) substrate, and greater stream shading (all $r \geq 0.45$) (see also Table 10). Axis 1 had no habitat characteristics correlating with it at $r \geq 0.45$, and only one land use characteristic, proportion herbaceous wetland within the 100 m buffer (TMDL sites had quite high amounts of wetland in their stream buffers). Significantly, watershed area did not correlate strongly with any axis, indicating that the size of the watershed did not create significant macroinvertebrate community differences.

Overlaying macroinvertebrate metrics (Fig. 25, brown metrics) on the base ordination shows which traits are correlated with the communities that are driving the solution. Only the number of Trichoptera taxa is correlated with the sites that have higher amounts of forest in the watershed . Perhaps because of the buffering effects of in-stream rocky substrate and riparian zone habitat, sites with more watershed urbanization also have greater EPT taxa richness, scraper-grazer richness, and proportions of Trichoptera. Filterers, particularly Hydropsychidae: Trichoptera, are also abundant, which indicates a steady supply of water column particulates for them to filter and consume (as organic inputs to streams increase, filterers may increase to take advantage of the additional nutrients). On Axis 1, the separation is between sites with higher MIBI scores, more omnivores, Diptera taxa, and predators that engulf their prey vs. sites with more noninsect invertebrates.

In order to eliminate methods signature as a source of high variability in the dataset, we found

that the TMDL LRC sites also had quite different communities from the NRRI regional comparison sites (Figs. 26, 27). Ordinating macroinvertebrate community proportion data again produced a highly significant ordination between the two datasets (MRPP p=0.00005). However, only about 15% of the variability in the dataset seemed to be primarily related to separating the two datasets. NRRI sites were all located in watersheds with more agriculture than all of the TMDL LRC sites. This indicates that there may be a true environmental difference between the LRC sites and both of the regional comparison datasets since neither dataset has watersheds with a truly comparable landscape setting.

LRC TMDL sites tend to be warmer, but contain more shade, and are in watersheds with less agriculture and more wetlands near the stream compared to the NRRI sites (Fig. 26). LRC sites also have less residential, commercial, and industrial development in their watersheds. Almost all the macroinvertebrate metrics that correlated strongly with the first 2 axes of the ordination are pointing toward the LRC sites, indicating higher values for the LRC sites than for the NRRI sites. These include nearly all taxonomic count metrics (e.g., number of EPT taxa, number of mobile taxa, filterer taxa, scraper taxa, etc; Fig. 26).

Ordination axes 2 and 3 capture the majority of the variability (Fig. 27). Unfortunately, none of the environmental or habitat variables that we measured or calculated correlate well with either of these axes, making their interpretation difficult. There are a few macroinvertebrate metrics that correlate with the axes, however. In general, sites with more burrowers and tolerant taxa are in the upper left quadrant, while sites with more scrapers, grazers, clingers, and filterers are in the lower right quadrant (Fig. 27).

A final way to investigate sites using ordinations is to ordinate sites based on community metrics, rather than on the communities themselves. This greatly simplifies the comparison by forcing all the community data into a few similar metrics. An ordination on the macroinvertebrate metrics and traits based on counts of taxa still shows most LRC TMDL sites as quite different from the NRRI sites, although sites LRC4 and Z4 are least different (Fig. 28). Agricultural land use again shows up as a dominant correlate on this axis, but the macroinvertebrate metrics (shown as overlays in Fig. 28) highlight the diversity of these communities. None of the macroinvertebrate metrics points in the direction of the LRC sites, and instead the metrics are spread relatively evenly around the graph's origin. The ordination done on macroinvertebrate traits (Fig. 29) is somewhat easier to interpret. Again the ordination captures a very high amount of the variability in the datasets (92%), and the two datasets still test as significantly different (MRPP p=0.0002). Clingers and filterers are two traits that make up a greater proportion of the community at LRC sites, while sprawlers and burrowers are more dominant at some of the NRRI sites.

Few significant correlations were observed among the assemblage data and land use characteristics using multiple regressions. Among the many taxa and metrics, the mobility trait and percent Ephemeroptera were found to be predicted by percent agriculture at the watershed scale at the 0.05 level. Despite the small range of developed land use within these watersheds, a number of significant correlations were observed, including percent Trichoptera ($p = 0.027$), percent Mollusca ($p = 0.0007$), percent MIBI non-insect taxa ($p = 0.008$), and percent burrowing taxa ($p = 0.055$). A Spearman rank correlation performed with land use, percent intolerant taxa,

MIBI, and HIBI87 found that watershed percent agriculture was negatively correlated with percent intolerant taxa ($r = -0.47$); and percent forest and percent developed land use in the 100 m buffer were both correlated with HIBI ($r = 0.45$, $r = 0.48$, respectively; $p < 0.05$). Percent intolerant and tolerant taxa were significantly different between the TMDL and MPCA regional comparison sites ($p = 0.04$, $p = 0.03$, respectively).

Local habitat characteristics - We performed a one-way ANOVA to assess whether the MPCA regional comparison sites were inherently different from the TMDL sites in terms of their local habitat conditions. Significant differences were observed with respect to embeddedness ($p = 0.02$), turbidity ($p = 0.04$), depth ($p = 0.0014$), and percent shade ($p = 0.0011$). These findings suggest that regional comparison sites were inherently different (in some important ways?), although differences in substrate were not significant. Thus, surficial geology may be similar among sites, but flow regime and channel characteristics potentially from Little Rock Creek.

Only modest correlations were observed between land use and in-stream characteristics. Significant Spearman rank correlations were observed between conductivity and percent agriculture, percent forest (negatively), and percent developed land use at the whole watershed scale ($r = 0.59$, -0.55, and 0.49, respectively), and for percent agriculture within the buffer ($r = 0.57$). Depth was also negatively correlated with percent agriculture ($r = -0.47$) and positively correlated with percent forest ($r = 0.51$) at the watershed and 100 m buffer scale ($r = -0.59$). Percent shade at the sample site was negatively correlated with percent forest in the watershed and the buffer ($r = -0.64$ and -0.62, respectively). While the negative correlation with percent forest seems counterintuitive, inspection of aerial photographs revealed that many sample sites were located within herbaceous wetlands, and thus had open canopy cover at the location where densitometer measurements were taken. Percent shade measures are largely dependent upon local scale conditions including buffer land cover and stream width (wider streams have less canopy cover), despite being correlated with land cover measures at larger spatial scales.

Land use gradient - A preliminary measure of landscape-based stress was quantified by accumulating the proportion of agricultural land use within the 247 subcatchments of the Little Rock Creek watershed. Because agricultural land use impacts are moderated by riparian vegetation, we subtracted out the proportion of forested land within the buffer. Figure 7 depicts the distribution of subcatchments, ranked from “least” to “most” agriculture. The general trend is that headwater catchments show relatively low amounts of agriculture in the eastern part of the basin, while those in the western portion of the basin are more intensively cropped. Furthermore, there is an increase in the amount of forested land cover in the floodplain and vicinity of the main stem of the river beginning upstream of LRC2 (Fig 1). Thus, the riparian buffer is likely moderating the impacts of the agricultural land use occurring upstream. This is apparent at sites LRC1 and Z4, in particular. LRC3 and LRC4 have the greatest potential to experience the localized effects of agricultural activities, since each of those sample locations are in the vicinity of intensively cropped subcatchments. Local habitat observations confirm the proximity of cropped land at LRC3, but not at LRC4.

Summary and Conclusions

At most Little Rock Creek TMDL sites, the macroinvertebrate community is characterized by taxa that can utilize sandy habitat or substrate such as wood, and may cause a reduction, substantial at some sites, in the number of invertebrates considered sensitive to stress, such as the EPT taxa. Little Rock Creek communities differ substantially from those characteristic of rocky habitats. These differences are evident in the macroinvertebrate community ordination, with sites having more flow and more exposed rocky substrate, especially pebbles, showing an association in the ordination with macroinvertebrate metrics associated with rockier substrates (e.g., Trichoptera, scrapers, EPT taxa).

TMDL sites were sampled in 2006, a drought year, in which we found very low flows and areas with low dissolved oxygen that also undoubtedly affected the macroinvertebrate community. The low flows may have exacerbated the amount of fine sediments in the stream due to the lower stream power to move sediment through the system. At several sites we found indications of rocky substrate buried beneath the fine substrates. This suggests that more rocky substrate was exposed at these sites in the past. Historic land use change, which is associated with altered hydrology, may have both contributed to the amount of sediment in the stream while also reducing stream power to move the sediment through the channel (e.g., Fitzpatrick et al. 2006) Sand-bottomed stream reaches on Wisconsin's Bayfield peninsula have been shown by the Wisconsin DNR to be able to move enough sand through the reach to re-expose buried rocky substrate when stream power is increased by removing sand-trapping woody debris (Dennis Pratt, WDNR, pers. comm.).

Fundamental differences among TMDL and MPCA sites were observed with respect to the local habitat characteristics such as the amount of shade, channel depth, and amount of fine sediments. Biological communities appear to be responding to these features. We believe land use at the watershed scale is ameliorated by extensive riparian wetlands and forest cover in the flood plain. This becomes particularly clear when the TMDL sites are compared to the NRRI sites In those comparisons, LRC sites are in better condition than the NRRI sites which are more heavily agricultural, and contain less stream buffering by wetlands and forests. Had stream flows not been so extremely low during the sampling period for the TMDL sites, the macroinvertebrate communities might have been in even better condition than they appear in this analysis. These results indicate either the TMDL sites are truly degraded compared to site containing hard substrate, or that the EPT metric is not a robust measure of condition in streams that are naturally sandy. However, the small distance separating TMDL sample sites suggests differences in local condition, over changes in geologic condition, favor the former as the prevailing explanation.

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Table 1. Little Rock Creek 2006 TMDL sampling site locations and macroinvertebrate sampling effort.

Site	Date	Reach (m)	UTM coordinates X	UTM coordinates Y	Habitat	Gear type (n) Core	Gear type (n) D-net	Gear type (n) Hess
LRC1	9-Aug	110	5068656.73	406191.75	Run			3
					Pool	3		
					Wood		2	
LRC2	8-Aug	110	5073608.04	406934.58	Riffle			3
					Run	3		
					Wood		2	
LRC3	8-Aug	110	5075829.85	406676.86	Riffle			3
					Run			3
					Pool	3		
					Wood		2	
LRC4	8-Aug	110	5078440.74	407407.52	Run	3		
					Pool	3		
					Wood		2	
Z4	9-Aug	110	5067028.80	409324.44	Run	3		
					Pool	3		
					Wood		2	
Total						**21**	**10**	**12**

Table 2. Little Rock Creek TMDL site water chemistry measurements. Missing parameters are due to a unit malfunction (-).

Site	Temp [C]	Scond (us/s)	DO (%)	DO (mg/L)	pH	Clarity (cm)
LRC1	19.5	375	87	7.98	7.81	>120
LRC2	19.5	343	100	10.0	7.16	>120
LRC3	18.8	345	60	5.54	7.45	>120
LRC4	22.1	357	-	-	7.69	>120
Z4	18.7	334	61	5.67	-	>120

Table 3. Land use/ land cover characteristics of watersheds, 50 m, and 100 m buffers along Little Rock Creek TMDL study stream and MPCA comparison stream sites. See text for a full description of the calculation of these coverages.

Site	Wshed area (ha)	Wshed Agr	Wshed Forest	Wshed Dev	Wshed Wetland	50 m Agr	50 m Forest	50 m Dev	50 m Wetland	100 m Agr	100 m Forest	100 m Dev	100 m Wetland
Bogus	2535	0.071	0.341	0.080	0.268	0.032	0.402	0.046	0.377	0.030	0.397	0.055	0.362
Briggs	2839	0.316	0.316	0.080	0.194	0.127	0.377	0.053	0.379	0.140	0.410	0.053	0.325
Browns	7126	0.100	0.277	0.103	0.174	0.049	0.324	0.082	0.237	0.050	0.322	0.088	0.218
Ditch12	4016	0.187	0.390	0.055	0.210	0.059	0.471	0.023	0.380	0.069	0.472	0.027	0.350
Ground	7542	0.006	0.745	0.019	0.182	0.009	0.557	0.011	0.369	0.006	0.585	0.014	0.338
HayCrk	4552	0.147	0.235	0.097	0.161	0.077	0.182	0.140	0.171	0.095	0.181	0.110	0.179
Knife	3266	0.043	0.412	0.071	0.291	0.016	0.338	0.058	0.514	0.014	0.346	0.059	0.489
LRC1	18231	0.526	0.126	0.060	0.180	0.259	0.237	0.043	0.341	0.322	0.204	0.050	0.303
LRC2	11664	0.508	0.131	0.061	0.195	0.240	0.234	0.046	0.370	0.306	0.201	0.053	0.328
LRC3	9559	0.485	0.135	0.060	0.202	0.253	0.218	0.047	0.363	0.317	0.188	0.054	0.321
LRC4	5356	0.405	0.151	0.058	0.228	0.191	0.204	0.043	0.393	0.253	0.179	0.048	0.351
LRC99	3559	0.381	0.135	0.059	0.218	0.176	0.166	0.046	0.399	0.241	0.147	0.053	0.346
Mayhew	11591	0.435	0.119	0.074	0.246	0.176	0.182	0.051	0.468	0.228	0.175	0.057	0.416
MikeDrew	2482	0.020	0.571	0.038	0.191	0.004	0.607	0.022	0.295	0.007	0.616	0.023	0.274
MooseHorn	5665	0.005	0.772	0.040	0.093	0.000	0.728	0.031	0.124	0.000	0.740	0.036	0.109
SaukTrib	1575	0.616	0.053	0.059	0.158	0.552	0.058	0.022	0.268	0.591	0.061	0.028	0.221
SFWatab	12672	0.169	0.363	0.099	0.175	0.098	0.322	0.079	0.306	0.117	0.316	0.087	0.279
Skunk	941	0.009	0.536	0.033	0.314	0.000	0.324	0.034	0.545	0.000	0.391	0.027	0.473
WFCrooked	3400	0.000	0.891	0.006	0.068	0.000	0.760	0.016	0.175	0.000	0.775	0.020	0.158
WFGround	3272	0.003	0.744	0.015	0.192	0.006	0.532	0.010	0.417	0.005	0.574	0.012	0.373
Z4	4833	0.537	0.154	0.066	0.163	0.350	0.256	0.049	0.277	0.402	0.215	0.056	0.253

Table 4. Physical characteristics of Little Rock Creek, MPCA, and NRRI regional comparison streams. Data are presented as mean values. Stream name and site abbreviation (for Little Rock Creek sites) correspond to Figure 1b. Sites from the current study (LRC-TMDL) are in blue. "Shade (%)"is expressed as a mean percentage of canopy cover at the center of the stream channel. Woody debris is the proportion of a sample transect covered by wood material suitable as fish habitat (see MPCA protocols). Little Rock Creek TMDL woody debris is expressed as a mean proportion of transect surface area covered with large wood.

Stream-site	Wetted width (m)	Depth (m)	Flow (m/s)	Temp [C]	Shade (%)	Woody debris (%)
TMDL Sites						
LRC1	7.04	0.16	0.151	19.5	29.6	3.7
LRC2	3.60	0.13	0.148	19.5	71.7	1.5
LRC3	5.17	0.11	0.054	18.8	79.6	1.5
LRC4	2.85	0.12	0.051	22.1	50.4	0.6
Z4	3.13	0.15	0.056	18.7	60.8	4.5
MPCA regional comparison sites						
Bogus Brook	6.3	0.449	0.15	21.5	20.36	6.9
Briggs Creek	6.05	0.376	0.12	17.4	3.05	4.6
Browns Creek	3.12	0.204	0.05	17.5	78.85	8.9
County Ditch # Twelve	3.19	0.274	0.06	22.6	51.24	0
Groundhouse River	4.70	0.305	0	18.0	12.10	4.3
Hay Creek	4.40	0.219	0.23	16.8	54.20	3.5
Knife River (Dry Run)	8.14	0.402	0	21.8	0	0
Little Rock Creek-99	3.07	0.465	0.07	20.9	81.11	23.5
Mayhew Creek	4.41	0.424	0.10	20.0	4.19	0
Mike Drew Brook	2.82	0.564	0.02	27.0	1.47	3.1
Moose Horn River	4.20	0.477	0.01	19.8	3.05	8.6
Skunk River	3.36	0.541	0.16	21.4	0.68	3.6
South Fork Watab River	4.31	0.483	0.23	22.4	22.85	2.7
trib. to Sauk River	2.81	0.406	0.04	18.5	31.00	1.5
West Fork Crooked Creek	5.70	0.476	0.12	22.4	1.26	1.1
West Fork Groundhouse River	7.24	0.397	0	30.08	2.26	7.1
NRRI regional comparison sites						
Crane Creek A	3.80	0.28	0.01	10.00	0	0.00
Crane Creek B	3.95	0.36	0.03	11.11	0	0.00
Fall Creek	3.60	0.45	0.05	10.00	91.6	3.47
Headwaters North	4.61	0.43	0.13	7.78	34.2	0.13
Headwaters South	6.28	0.25	0.10	10.00	0	0.00
Lesuer River A	4.97	0.27	0.05	10.00	0	0.12
Lesuer River B	4.08	0.26	0.00	10.00	58.8	1.32
Little Lesuer River	3.44	0.39	0.07	10.00	10.8	0.17
Maple Creek	7.52	0.50	0.01	7.78	0	0.45
McKenzie Creek	5.17	0.22	0.07	10.00	89.4	0.19
Medford Creek	3.24	0.37	0.10	6.67	73.6	0.59
Mud Creek	4.33	0.40	0.03	12.22	0	0.95
North Zumbro A	4.43	0.22	0.15	10.00	4.2	0.00
North Zumbro B	4.49	0.26	0.05	10.00	5.8	0.00
Rush Creek B	9.98	0.46	0.06	10.00	18.2	0.39
Straight River East	4.92	0.21	0.15	7.78	0	0.00
Straight River West	4.50	0.35	0.12	8.89	0	0.00
Turtle Creek	5.64	0.39	0.05		0	0.00

Table 5. Little Rock Creek study site riparian habitats for the TMDL sampling locations. Riparian observations include a buffer from 0-30 m from the stream bank. Entries divided by a "/" indicate dominant conditions separately for each bank; otherwise the banks are similar. Riparian zones defined as 'MixFor' include a deciduous/conifer mixture. Bank substrate and substrate percent are the percent of the dominant substrate as total bank surface area along transects. Adjacent landuse is that adjacent to the riparian zone. QHEI score was calculated without including the gradient component, worth 10 pts. Undercut bank is the percent occurrence of undercut banks on transects. Amount of organic matter in sediments is expressed as grams dry weight after ashing (Organic). Large woody debris (LWD) are expressed as meter length counts per reach.

Site	Bank substr	Substr %	Ripn zone	Ripn width (m)	Adj landuse	QHEI score*	Under bank (%)	Organic (g)	LWD
LRC1	Sand	74	Grass/Mix For	>50	Forest	46	45	1.9	261
LRC2	Silt	49	Grass/Mix For	>50	Forest	42	0	2.0	53
LRC3	Sand	45	Grass/Mix For	25/40	Agr	53	65	3.9	74
LRC4	Sand	55	Grass/Mix For	>50	Forest	47	10	8.0	17
Z4	Sand	78	Grass/Mix For	>50	Forest	45	55	1.2	144

Table 6. Substrate characteristics of TMDL and MPCA regional comparison stream sites. Measurements from the TMDL study are shown in blue. Substrates were characterized as bedrock (bed), boulder (bldr), cobble (cbl), pebble (pbl), sand, and silt and clay (st/cl) and are expressed as percents. Total fines (Tfines) is the sum of percents of sand, silt, and clay. Depth of fines is the depth of fine sediments in slow current areas. Embeddedness is the extent to which large substrates (boulders to pebbles or wood) are surrounded by fine substrates.

Site	Bed (%)	Bldr (%)	Cbl (%)	Pbl (%)	Sand (%)	St/cl (%)	Tfines (%)	Depth fines (m)	Embed (%)
TMDL sites									
LRC1	0	0	3	0	72	25	97	0.36	50
LRC2	0	3	7	0	50	40	90	0.2	25
LRC3	0	0	**55**	**8**	**30**	**7**	**37**	**0.07**	**19.7**
LRC4	0	0	0	0	44	56	100	0.23	26.8
Z4	0	0	0	0	78	22	100	0.35	32.1
MPCA regional comparison sites									
Bogus Brook	0	2	17	6	6	62	68	0.11	53.8
Briggs Creek	0	0	0	0	27	52	79	0.32	-
Browns Creek	0	0	0	31	48	21	69	0.15	24
County Ditch # Twelve	0	10	4	23	31	33	64	0.09	51.3
Groundhouse River	0	4	14	4	59	18	77	0.09	25
Hay Creek	0	0	0	16	78	5	83	0.12	94.4
Knife River (Dry Run)	0	0	0	0	0	100	100	0.16	-
Little Rock Creek-99	0	0	13	2	62	12	74	0.1	20
Mayhew Creek	0	2	2	2	79	15	94	0.22	75
Mike Drew Brook	0	0	0	0	38	47	85	0.17	-
Moose Horn River	0	0	0	0	37	23	60	0.29	-
Skunk River	0	0	0	0	41	10	51	0.26	87.5
South Fork Watab River	0	0	0	13	35	33	68	0.22	35.7
trib. to Sauk River	0	0	10	10	33	46	79	0.14	75
West Fork Crooked Creek	0	0	0	0	27	73	100	1.45	-
West Fork Groundhouse River	0	2	0	2	40	44	84	0.2	62.5
NRRI regional comparison sites									
Crane Creek A	0	20	4	50	26	76	0		0.0
Crane Creek B	4	41	15	39	2	41	4		6.7
Fall Creek	0	34	26	6	34	40	0		44.6
Headwaters North	0	62	10	2	26	28	0		0.0
Headwaters South	6	84	0	2	8	10	6		0.0
Lesuer River A	0	54	4	14	28	42	0		24.0
Lesuer River B	4	92	0	2	2	4	4		42.0
Little Lesuer River	0	0	0	0	100	100	0		0.0
Maple Creek	0	8	0	8	84	92	0		0.0
McKenzie Creek	20	64	0	16	0	16	20		10.0
Medford Creek	0	0	0	92	8	100	0		16.0
Mud Creek	6	70	0	8	16	24	6		46.0
North Zumbro A	0	78	10	8	4	12	0		72.0
North Zumbro B	0	0	74	4	22	26	0		30.3
Rush Creek B	0	42	4	0	54	54	0		38.0
Straight River East	2	64	0	12	22	34	2		2.0
Straight River West	0	0	0	92	8	100	0		42.0
Turtle Creek	4	40	19	23	6	29	4		0.0

Table 7. Little Rock Creek fine substrate particle distribution and organic content at TMDL sample sites. Values are means followed by 1 standard error. Sediment organic content is measured as AFDW = ash free dry weight in grams.

Site	Substrate AFDW (g)	> 4 mm	4-2 mm	2-1 mm	1-0.5 mm	0.5-0.25 mm	0.25-0.063 mm	< 0.063 mm
LRC1	1.9 (0.12)	101.9 (6.93)	7.3 (0.12)	3.4 (0.18)	14.3 (0.17)	197.8 (5.41)	113.4 (3.52)	0.9 (0.13)
LRC2	2.0 (0.01)	146.2 (34.2)	35.5 (2.31)	20.5 (0.69)	31.7 (2.67)	116.0 (11.40)	116.6 (11.40)	1.9 (0.26)
LRC3	3.9 (1.38)	264.7 (15.1)	56.4 (6.11)	35.1 (2.56)	23.8 (0.92)	63.6 (1.86)	29.6 (2.18)	0.7 (0.01)
LRC4	8.0 (1.25)	0.4 (0.06)	1.17 (0.15)	3.5 (0.40)	22.5 (3.74)	149.0 (21.80)	111.7 (8.59)	5.1 (0.81)
Z4	1.2 (0.06)	3.03 (0.06)	21.5 (1.21)	39.9 (0.56)	82.9 (1.54)	182.0 (1.28)	102.7 (1.22)	2.4 (0.23)

Table 8. Fish community traits from Little Rock Creek TMDL sample locations and MPCA regional comparison streams. Bunker Hill (BH2) and Zuleger Creek (Z1 and Z2) were additional Minnesota DNR fish sampling locations for the TMDL study, and data for regional comparison sites were provided by the MPCA. Tolerant taxa are based on an EPA tolerance score and ranked as 'tolerant,' 'intolerant,' or 'intermediate.'

Site	Total taxa	Native taxa (%)	Tolerant taxa (%)	Total abundance	Omnivore abundance (%)
TMDL Sites					
BH2	10	60	30	205	72
LRC1	6	66	33	60	33
LRC2	9	77	33	253	41
LRC3	13	84	30	341	52
LRC4	10	90	30	466	81
Z1	9	66	44	378	44
Z2	14	71	28	565	68
MPCA regional comparison sites					
Bogus Brook	14	78	35	195	56
Briggs Creek	9	55	33	167	64
Browns Creek	22	81	50	1054	99
County Ditch # Twelve	16	75	25	427	43
Groundhouse River	18	61	22	1116	34
Hay Creek	30	76	26	317	49
Knife River (Dry Run)	14	50	28	1866	86
Little Rock Creek-99	16	81	43	752	88
Mayhew Creek	14	57	21	277	46
Mike Drew Brook	6	50	33	313	53
Moose Horn River	9	55	22	252	37
Skunk River	21	66	42	38	42
South Fork Watab River	9	77	11	206	47
trib. to Sauk River	11	81	45	131	81
West Fork Crooked Creek	10	60	20	122	54
West Fork Groundhouse River	12	58	33	371	43

Table 9. Macroinvertebrate metrics calculated from all macroinvertebrate sample types collected from TMDL and NRRI regional comparison sites. MPCA regional comparison streams consist of D-net data gathered from all-habitat types. See Methods for complete description. TMDL study sites are in blue. "# Taxa" indicates total richness count, as does insect and EPT taxa categories. Relative abundance of EPT taxonomic orders is expressed as "%EPT". "Tol score" is site tolerance score. "#Sensit" is number of sensitive taxa. "% Tol" is percentage of tolerant insects in samples (EPA tolerance values ≥7). "%Hydropsych" is proportion of Trichoptera from the family Hydropsychidae. Hilsenhoff biotic index (1982), Hilsenhoff improved biotic index (1987), and Minnesota index of biotic integrity (MIBI) site scores are calculated according to published criteria (Hilsenhoff 1982, Hilsenhoff 1987, Genet and Chirhart 2004).

Stream-site	#Taxa	#Insect taxa	#EPT taxa	% EPT	Tol score	# sensit	% tol	% Hydro-psych	HBI'82	HIBI'87	MIBI
TMDL Sites											
LRC1	84	70	19	4.96	6.33	20	57.41	0.52	4.07	4.95	22
LRC2	78	63	16	37.47	4.94	15	31.47	0.5	4.43	2.79	22
LRC3	90	75	19	17.19	5.06	22	37.67	0.1	3.65	4.41	26
LRC4	85	72	13	2.25	6.39	25	43.74	0.7	5.01	2.97	19
Z4	72	57	14	1.69	5.99	18	52.55	0.17	4.88	4.44	26
MPCA regional comparison sites											
Bogus Brook	49	38	15	52.19	5.42	16	24.64	0.89	3.39	3.6	24
Briggs Creek	52	44	18	15.41	5.81	18	15.06	0.11	2.42	4.73	22
Browns Creek	66	48	16	35.04	4.79	33	30.67	0.32	2.91	3.43	24
County Ditch # Twelve	52	42	13	25.97	5.75	18	35.66	0.08	3.47	1.98	24
Groundhouse River	33	21	3	4.84	7.17	15	9.69	0	1.43	1.15	16
Hay Creek	60	50	15	22.04	5.25	27	39.06	0.81	4.37	3.93	22
Knife River (dry run)	32	24	5	17.35	6.57	17	68.82	0	4.23	6.01	14
Little Rock Creek-99	41	34	11	49.82	5.69	12	22.34	0.81	1.86	4.19	16
Mayhew Creek	19	14	5	4.14	6.42	8	5.52	0	2.91	5.77	12
Mike Drew Brook	41	30	5	9.45	6.28	19	26.71	0.5	3.53	2.29	18
Moose Horn River	51	41	10	6.69	6.17	18	49.36	0	2.89	5.01	24
Skunk River	39	31	5	5.50	5.99	15	79.13	0	4.85	1.6	20
South Fork Watab River	55	46	17	32.37	5.33	17	29.81	0.43	4.35	2.85	26
trib. to Sauk River	33	28	7	28.14	6.12	4	31.66	1	3.23	3.41	20
West Fork Crooked Creek	45	34	12	11.92	5.43	21	47.67	0.25	3.06	3.41	28
West Fork Groundhouse River	51	42	4	27.46	6.81	18	46.78	0.75	1.68	5.12	22

Table 9. (cont).

Stream-site	#Taxa	#Insect taxa	#EPT taxa	% EPT	Tol score	# sensit	% tol	% Hydro-psych	HBI'82	HIBI'87	MIBI
NRRI regional comparison sites											
Crane Creek A	57	51	2	0.96	3.29	23	31.02	0.00	2.43	6.34	36
Crane Creek B	40	34	3	4.54	4.07	11	23.99	0.00	3.71	6.08	38
Fall Creek	72	68	13	14.72	4.90	21	30.74	6.40	2.14	4.99	38
Headwaters North	71	67	13	12.85	5.31	19	25.43	0.00	4.24	5.58	32
Headwaters South	52	47	5	0.86	4.89	14	41.88	0.00	3.22	6.10	20
Lesuer River A	49	47	10	23.40	2.70	15	31.60	0.00	2.72	6.85	20
Lesuer River B	44	42	7	1.07	5.44	11	73.29	0.00	4.45	5.01	30
Little Lesuer River	56	54	13	5.06	4.82	12	42.34	1.13	3.99	5.67	30
Maple Creek	67	60	6	0.00	4.58	24	21.05	0.00	3.08	5.00	24
McKenzie Creek	48	45	8	16.90	4.11	14	27.35	2.82	2.41	4.18	24
Medford Creek	61	57	12	13.05	5.86	14	37.30	4.66	3.38	5.48	30
Mud Creek	49	43	6	0.59	2.85	12	79.28	0.10	1.48	6.64	24
North Zumbro A	48	44	7	11.68	5.00	11	56.71	4.71	3.94	5.78	22
North Zumbro B	50	44	10	16.54	4.87	15	58.09	12.08	1.99	4.81	28
Rush Creek B	68	62	16	20.98	4.82	20	49.54	14.71	1.58	4.80	32
Straight River East	57	54	10	7.24	5.25	19	64.85	0.00	2.55	5.95	26
Straight River West	53	49	8	1.82	5.07	19	33.55	0.76	3.98	5.64	22
Turtle Creek	55	49	12	13.27	5.25	18	66.87	1.01	3.37	6.00	28

Table 10. MIBI total scores for LRC TMDL sites (in blue) and NRRI regional comparison sites, calculated from D-net samples only and from all gear types to illustrate the difference in the calculations.

	MIBI Score	
SITE	**D-net Only**	**All gear-types**
Crane Creek A	24	20
Crane Creek B	24	20
Fall Creek	32	30
Headwaters North	16	30
Headwaters South	20	22
Lesuer River A	10	24
Lesuer River B	na	26
Little Lesuer River	22	30
Maple Creek	22	24
McKenzie Creek	18	24
Medford Creek	28	30
Mud Creek	30	24
North Zumbro A	18	22
North Zumbro B	32	28
Rush Creek B	28	32
Straight River East	22	26
Straight River West	18	22
Turtle Creek	20	28
LRC1	22	36
LRC2	22	38
LRC3	26	38
LRC4	19	32
Z4	26	28

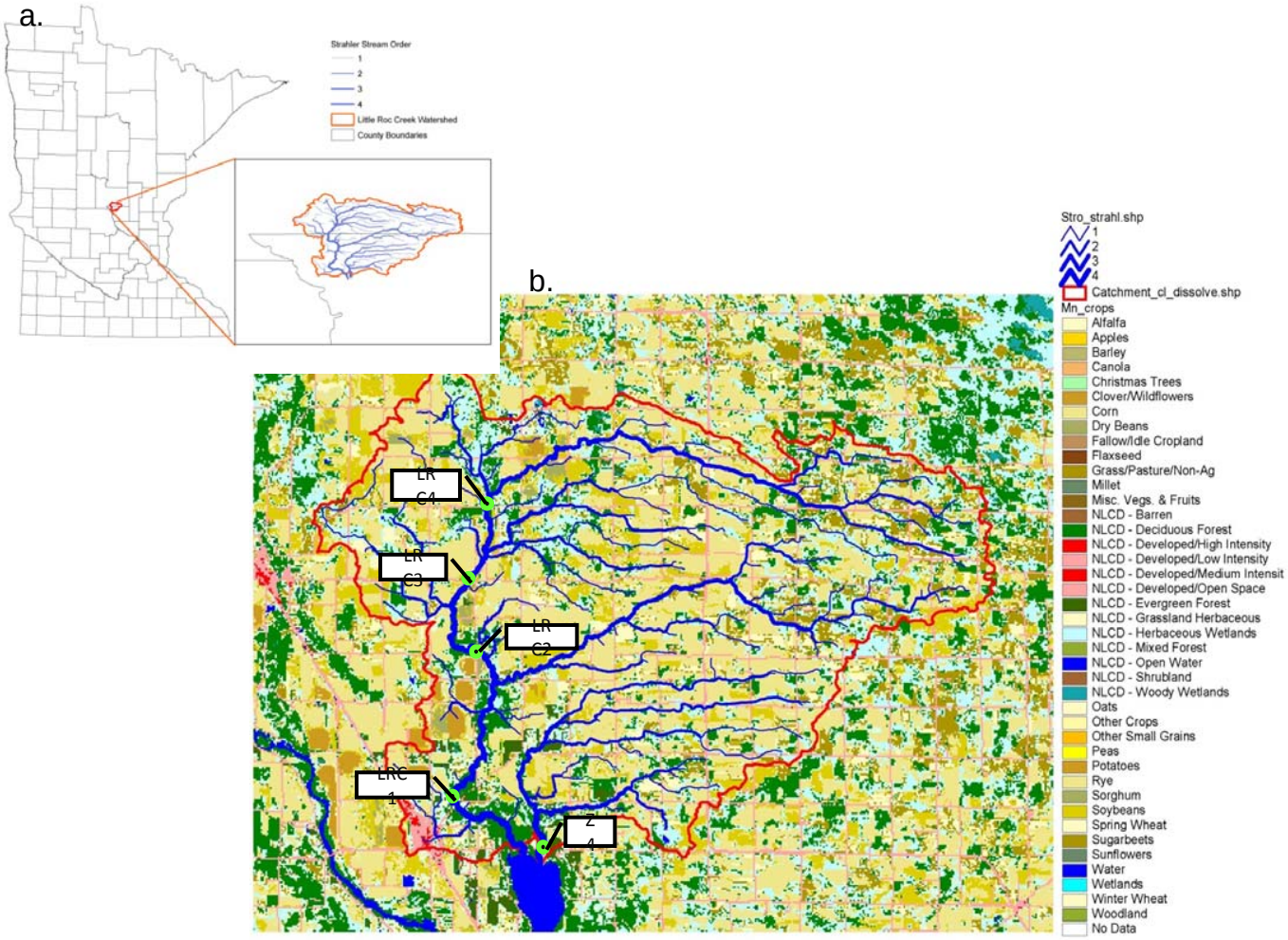


Figure1. Little Rock Creek watershed. a. The watershed set within county boundaries of Minnesota and showing stream order. b. Land cover classifications for the watershed, with TMDL sampling locations plotted along Little Rock and Zuleger Creeks.

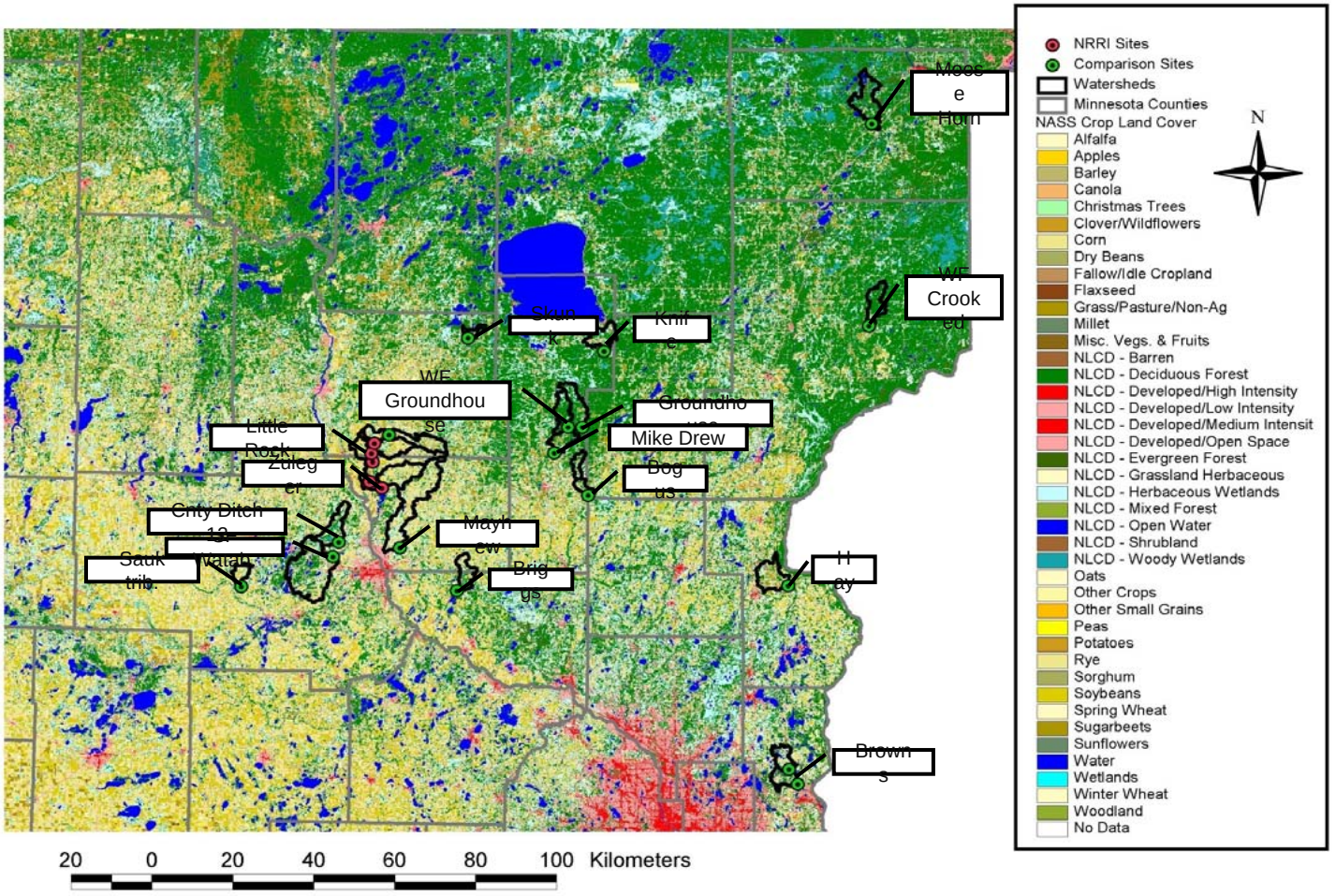


Figure 2. Minnesota Pollution Control Agency regional comparison stream sites and TMDL study sites plotted on a land cover map.

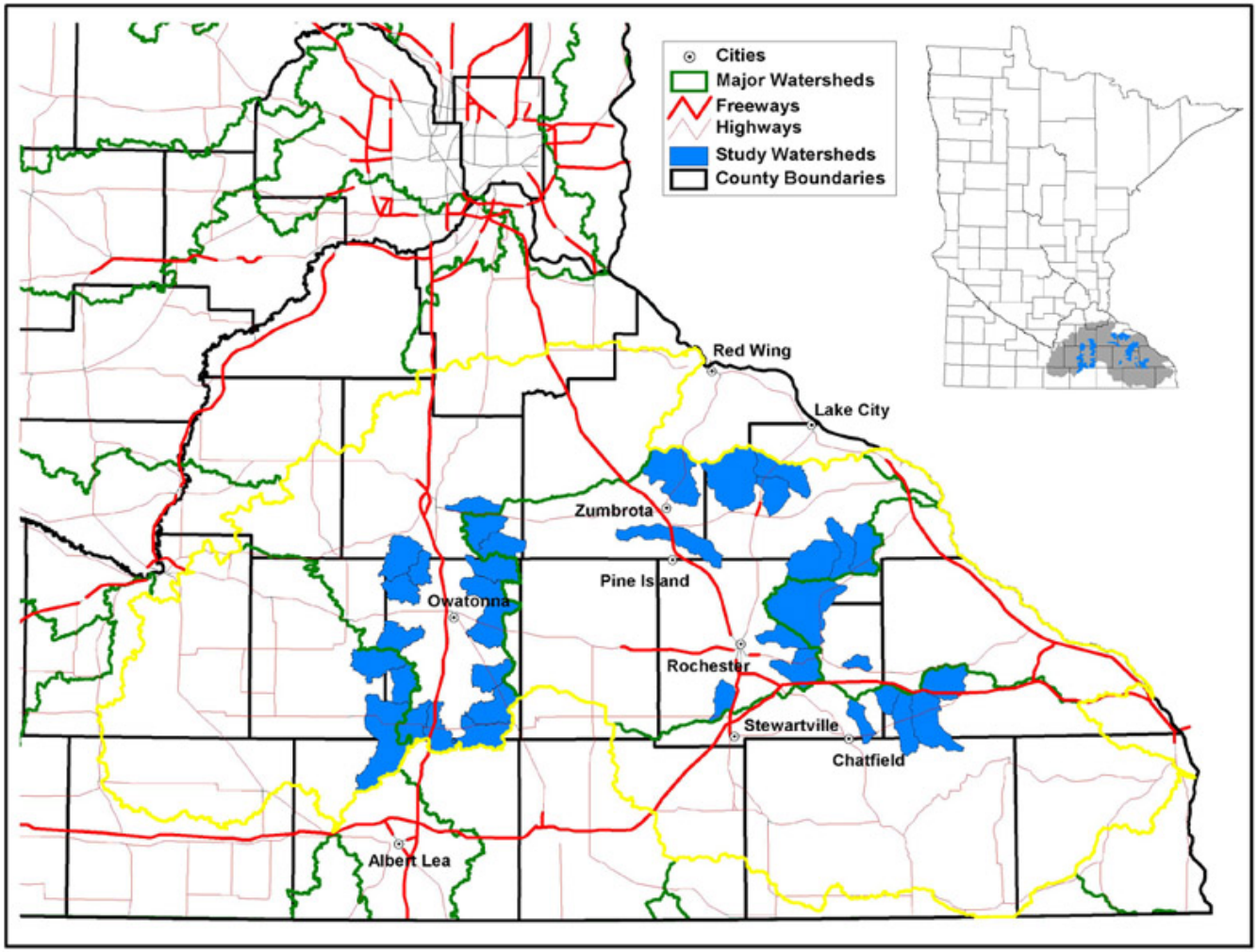


Figure 3. Natural Resources Research Institute regional comparison sites in a heavily agricultural region of southeastern Minnesota.

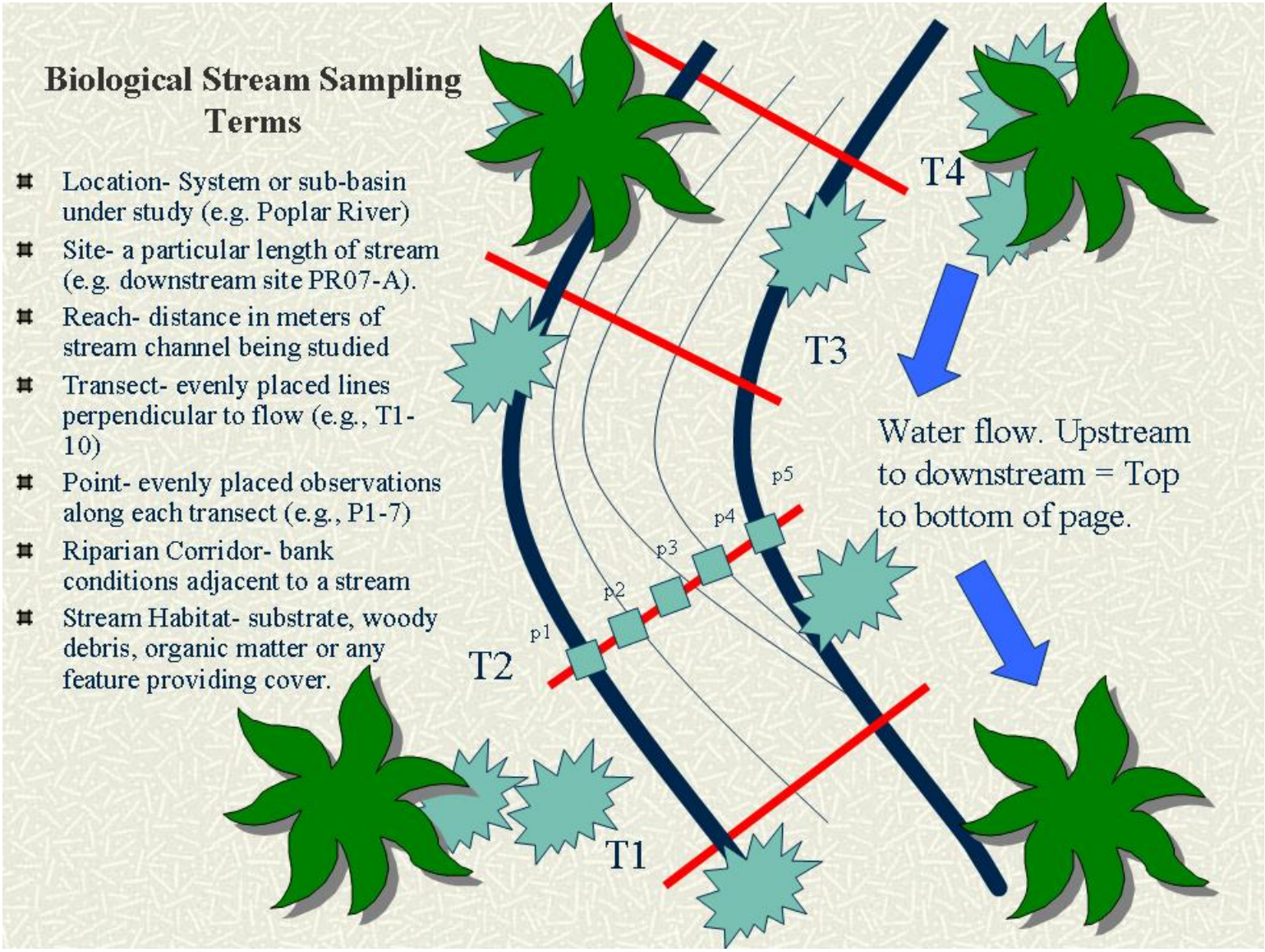


Figure 4. Schematic diagram showing local habitat sampling protocols used at Little Rock Creek TMDL sites.

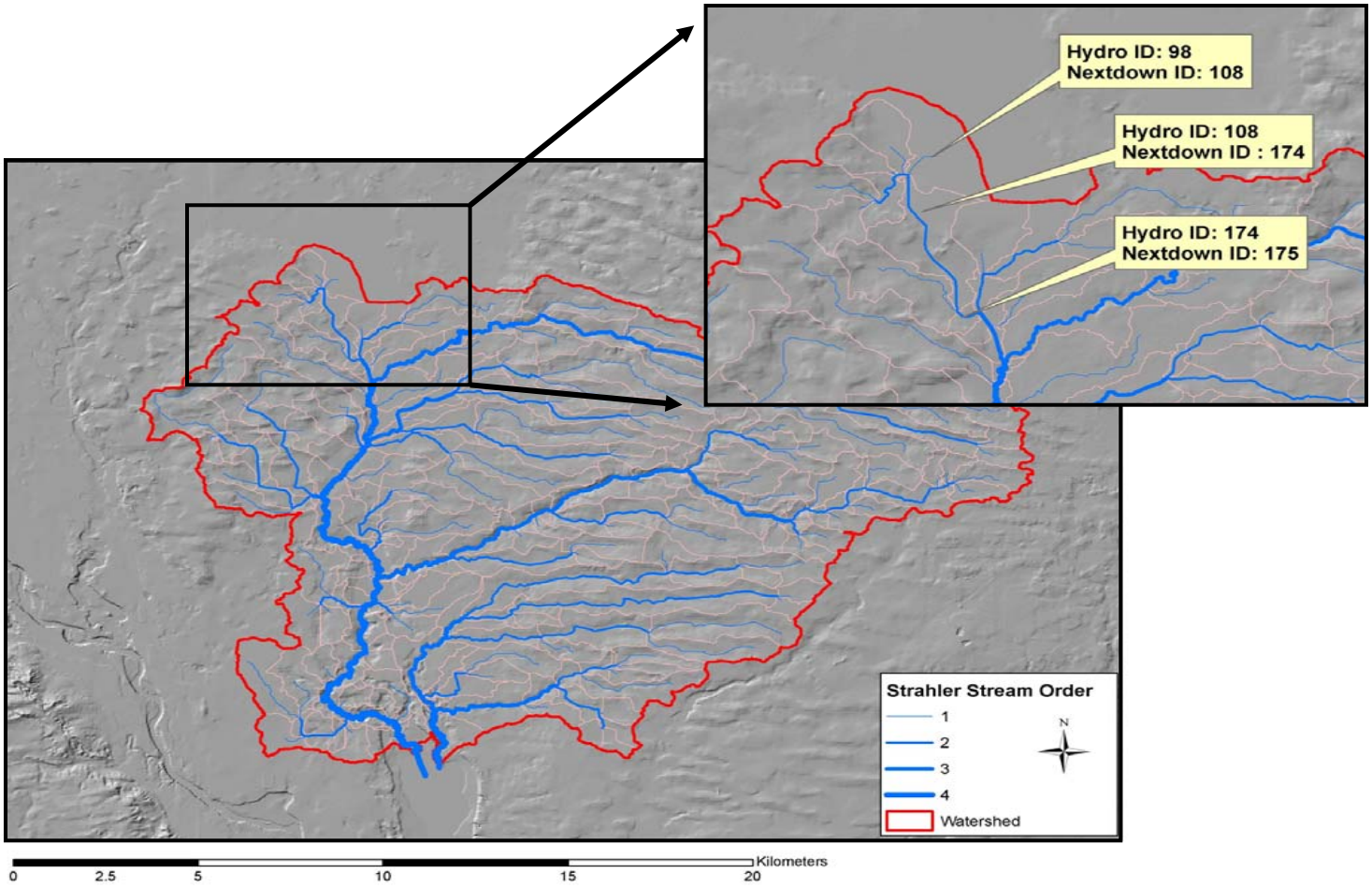


Figure 5. Process of delineating and identifying ArcHydro subcatchments for the Little Rock Creek watershed so that landscape influences could be summarized within each sub-basin.

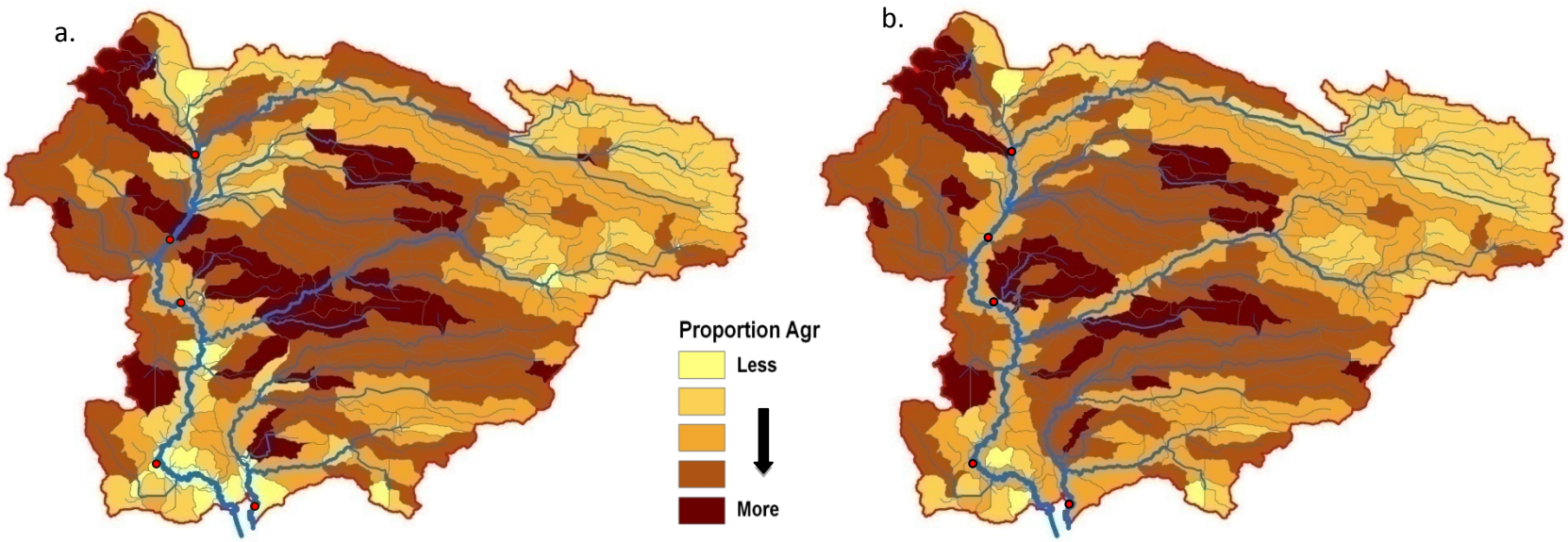


Figure 6. Proportion of agricultural land (the dominant land use in the watershed) covering 242 sub-basins and stream reaches within the Little Rock Creek watershed (a) and the accumulative influence of agricultural land use along the stream network (b). TMDL study sites shown as red dots.

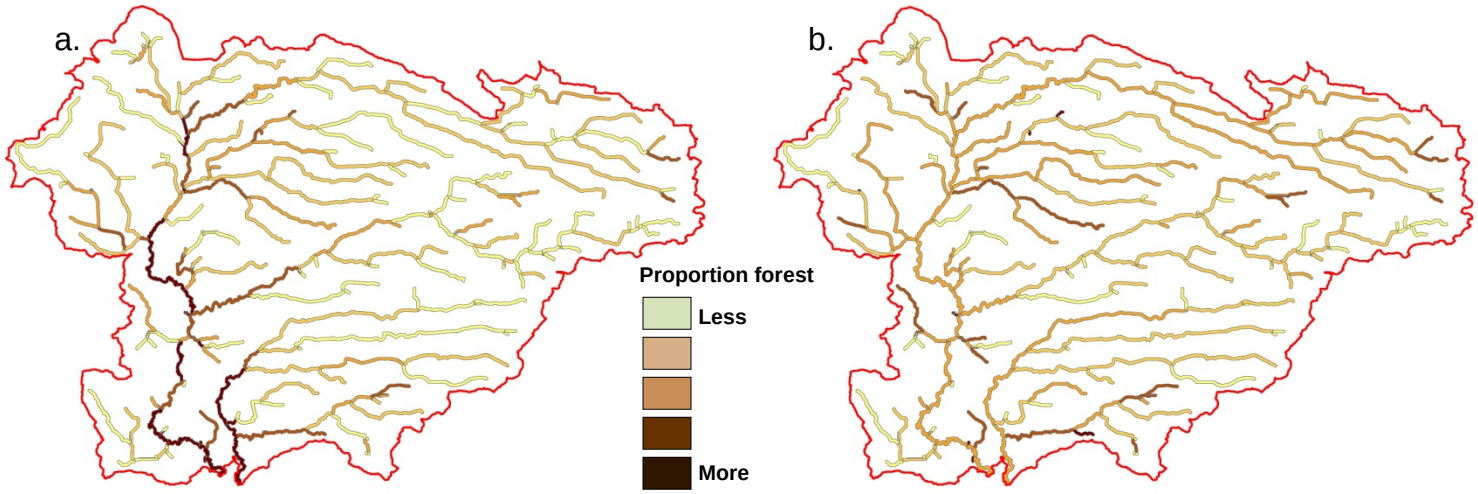


Figure 7. Proportion of forest cover associated with a 50 m stream buffer within the Little Rock Creek watershed (a) and the accumulated forest cover influence using the 50 m forest cover-type along the stream network (b).

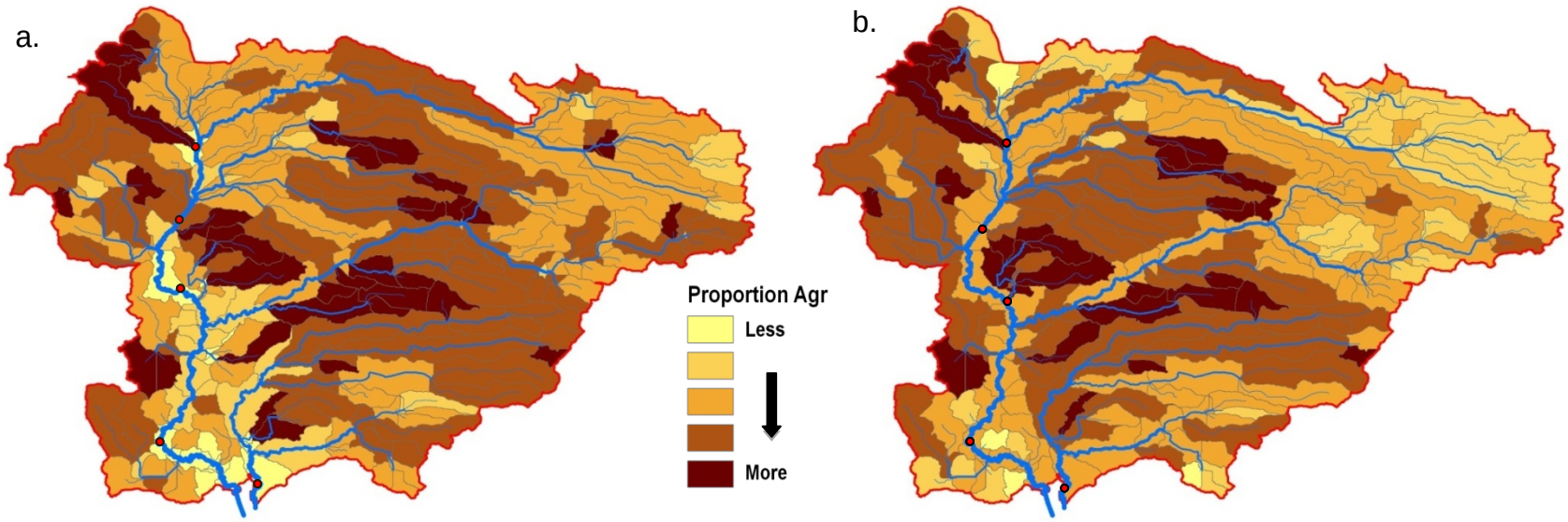


Figure 8. Proportion of agricultural land within the Little Rock Creek watershed with the influence of a 50 m forested buffer removed (a), and the accumulative influence of the agricultural land when the riparian buffer has been removed (b). Subtracting the forest buffer from the proportion of agriculture in the subcatchments helps to account for the ameliorating effect of the trees along the stream. TMDL study sites shown as red dots.

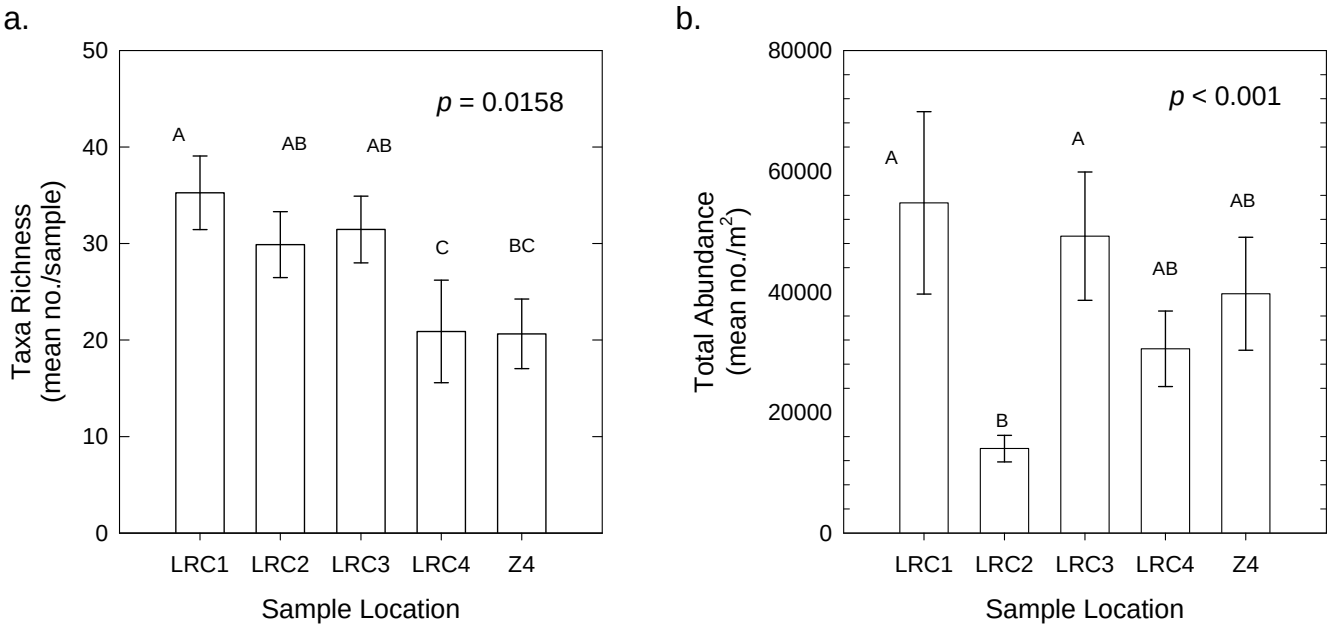


Figure 9. Macroinvertebrate taxa richness (a) associated with TMDL sample locations (combining all gear types), and the mean total abundance (#/m2) of individuals (b) within the Little Rock Creek watershed (from quantitative core and Hess devices). Value *p* is from the overall ANOVA. Sample locations with the same letter are not significantly different.

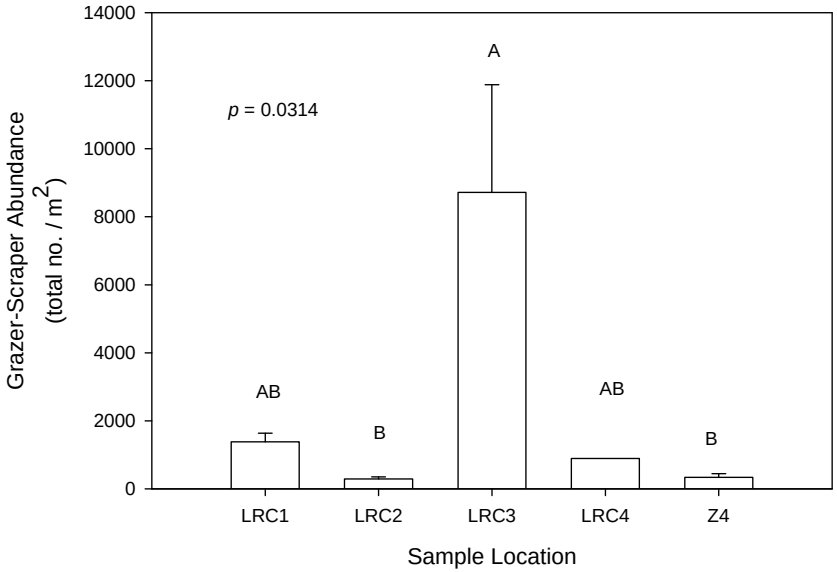


Figure 10. Total abundance (#/m2) of macroinvertebrates classified as grazer-scraper feeders associated with Little Rock Creek TMDL sample locations (from quantitative core and Hess devices). Value *p* is from the overall ANOVA. Sample locations with the same letter are not significantly different.

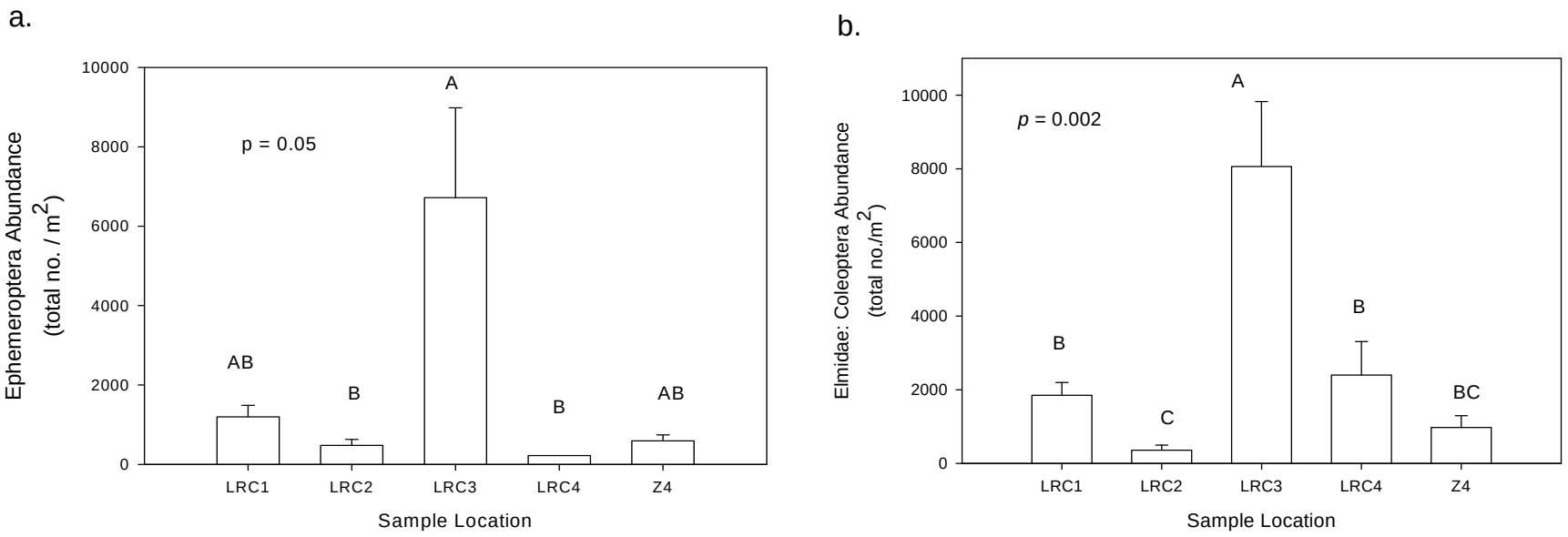


Figure 11. Total abundance (#/m2) of Ephemeroptera (a) and Elmidae (Coleoptera) (b) associated with Little Rock Creek TMDL sample locations (from quantitative core and Hess devices). Value *p* is from the overall ANOVA. Sample locations with the same letter are not significantly different.

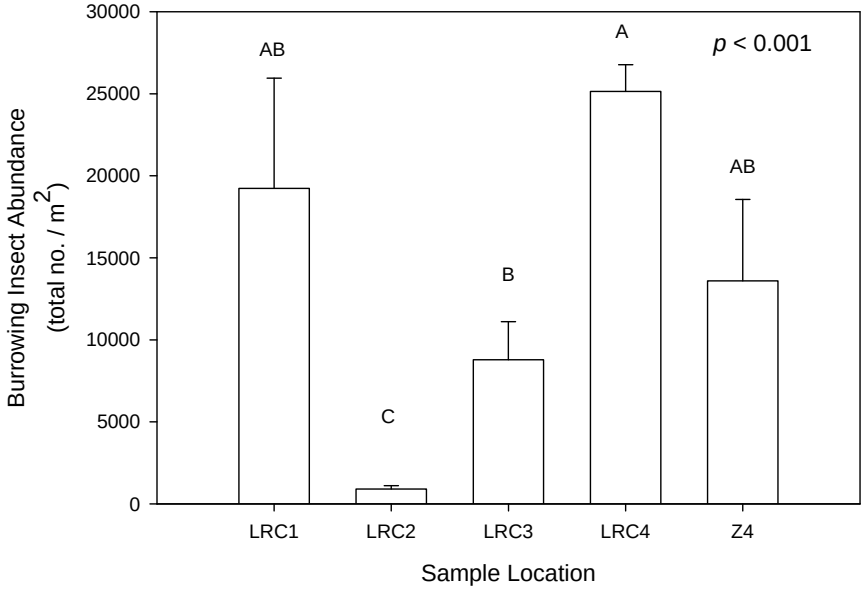


Figure 12. Total abundance (#/m2) of macroinvertebrates classified as burrowers associated with Little Rock Creek TMDL sample locations (from quantitative core and Hess devices). Value *p* is from the overall ANOVA. Sample locations with the same letter are not significantly different.

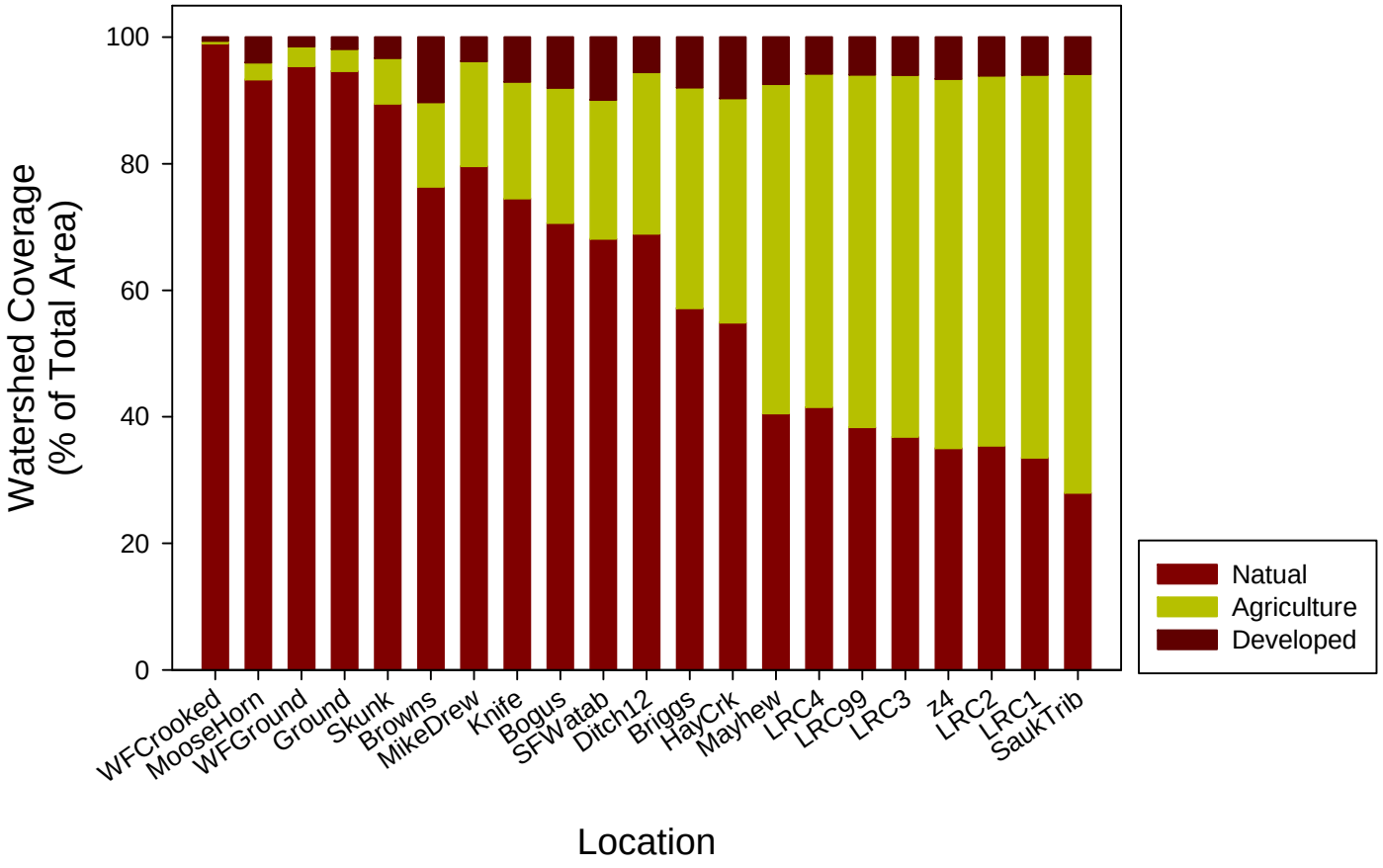


Figure 13. Landuse characteristics of watersheds delineated to the sampling location of the TMDL sites and those in the MPCA regional comparison dataset. Locations are sorted so that drainage areas with the highest percentages of “natural” land are on the left. TMDL sites are highlighted with red arrows.

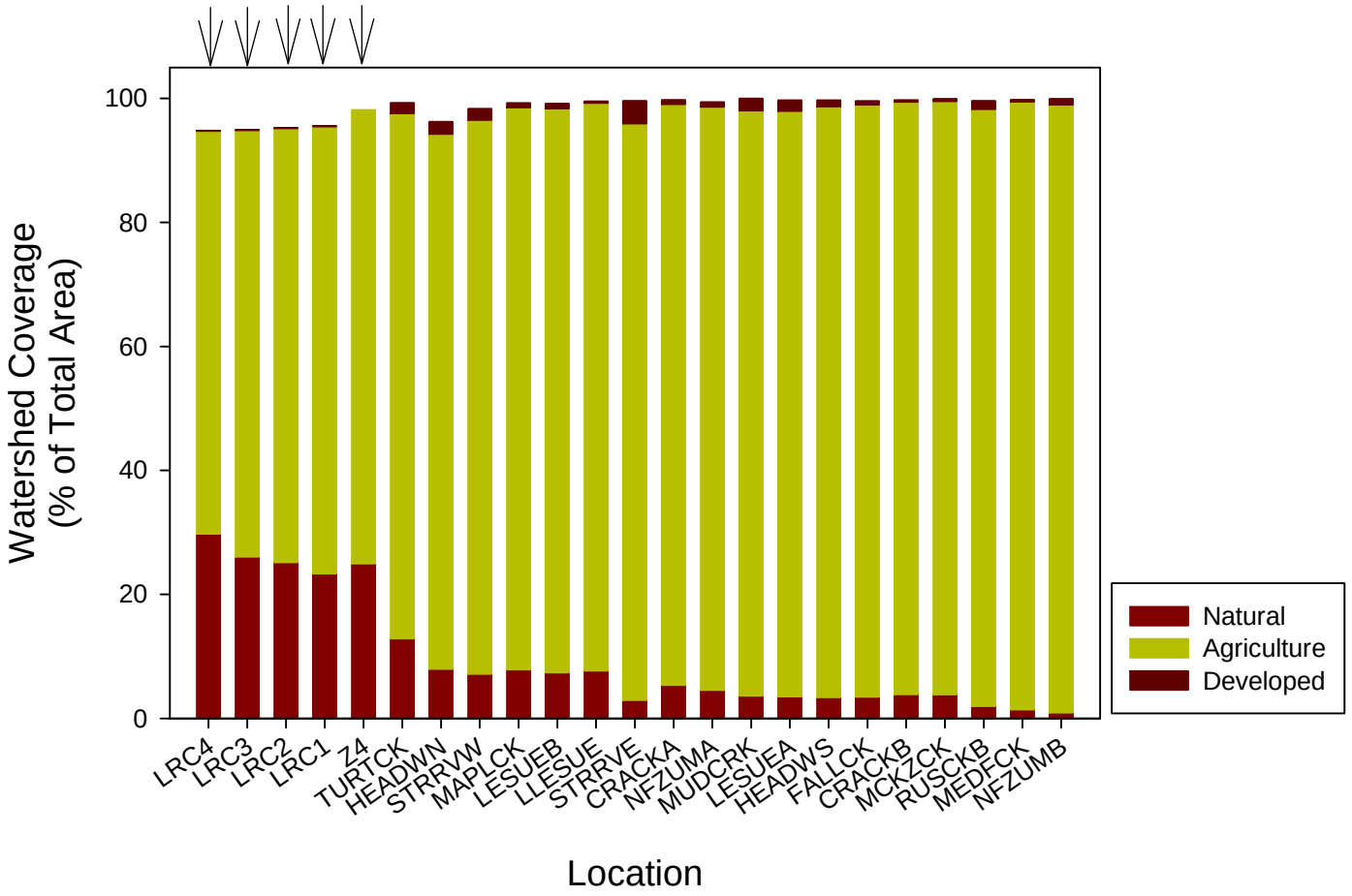
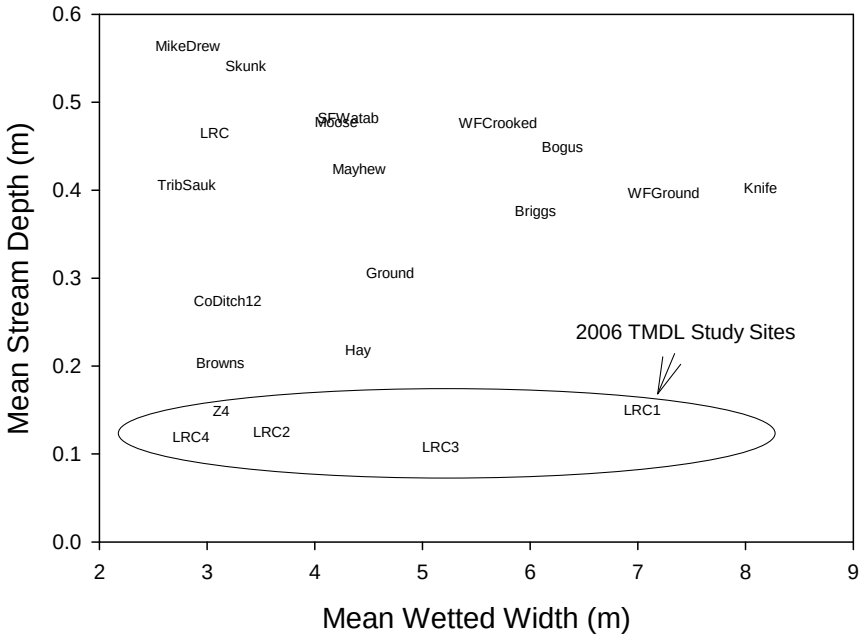
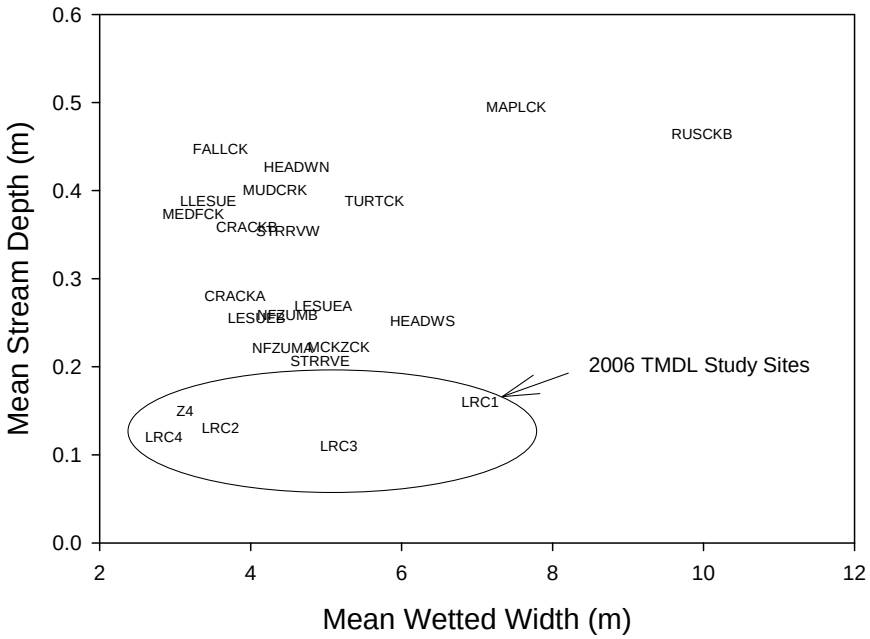


Figure 14. Landuse characteristics of watersheds delineated to the sampling location of the TMDL sites and those in the NRRI regional comparison dataset. Locations are sorted so that drainage areas with the highest percentages of “natural” land are on the left. TMDL sites are highlighted with red arrows.



a.



b.

Figure 15. Ratio of stream width to water depth for Little Rock Creek TMDL sample locations (coded as text) compared to (a) MPCA regional comparison stream sites and (b) NRRI regional comparison sites.

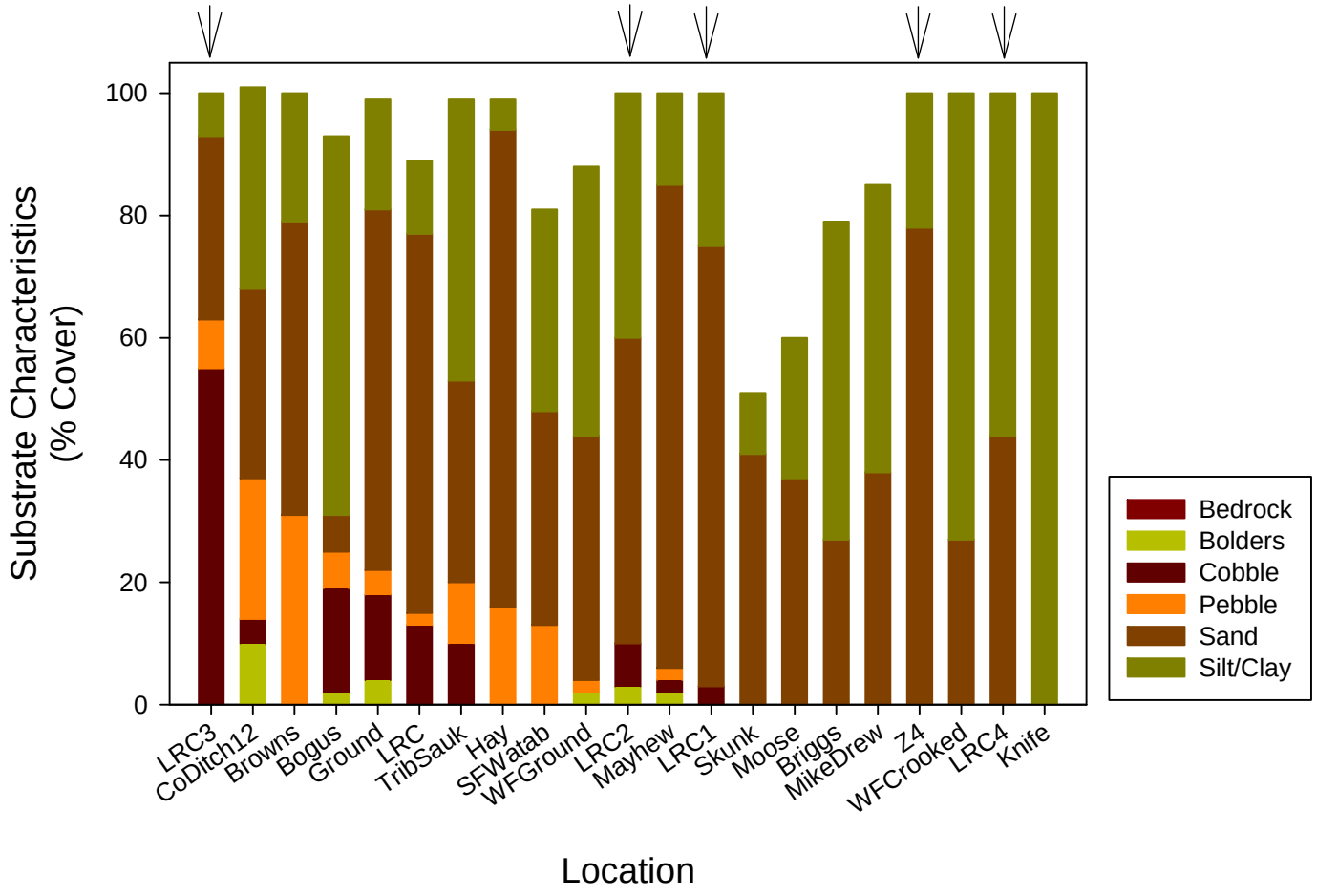


Figure 16. Mean stream substrate composition for Little Rock Creek TMDL sites and MPCA regional comparison sites. Sites are sorted so that locations with the greatest amounts of rocky substrate (boulder, cobble, pebble) are on the left with increasing amounts of fine substrates (sand, silt, clay) are to the right. TMDL sites are highlighted with red arrows.

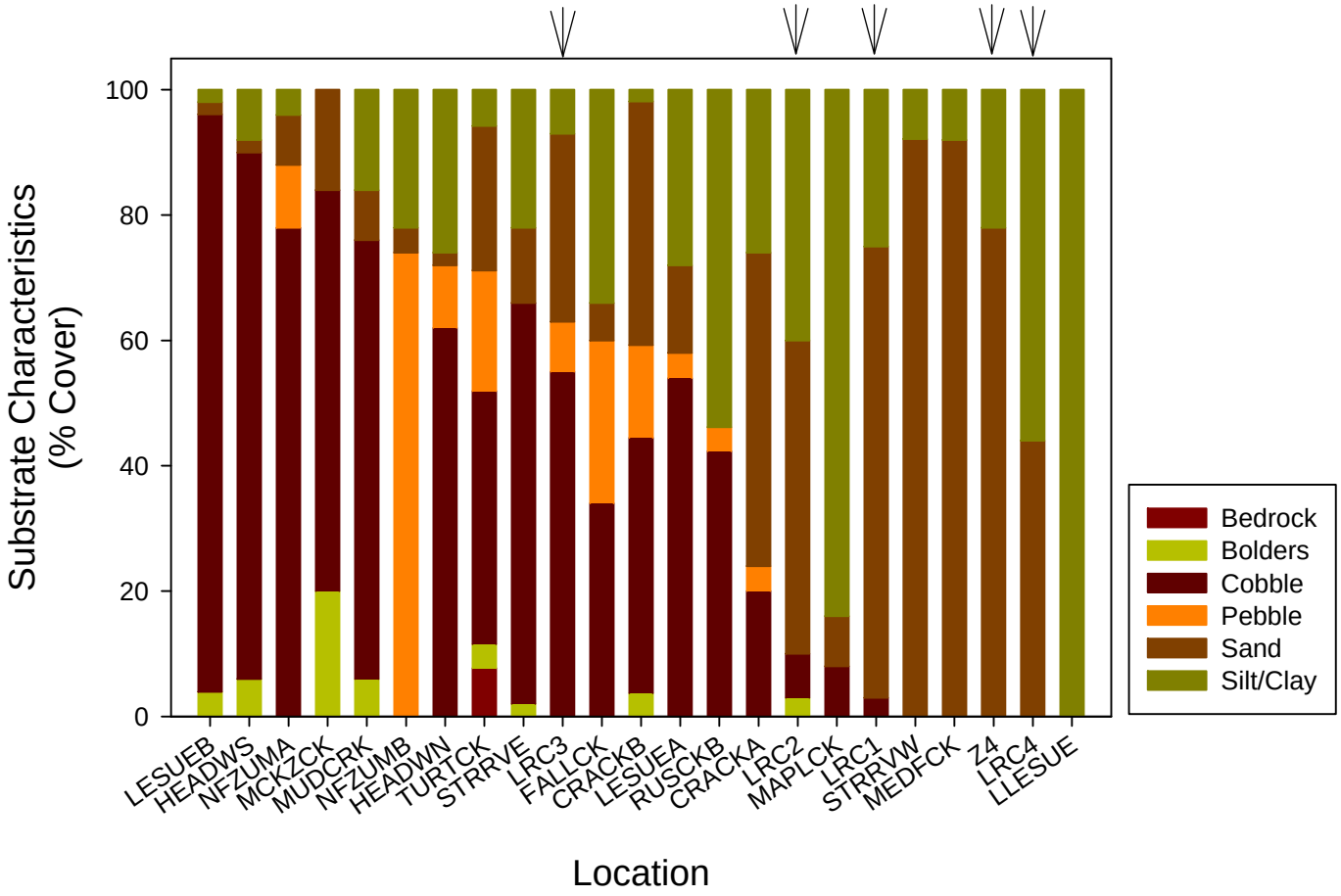


Figure 17. Mean stream substrate composition for Little Rock Creek TMDL sites and NRRI regional comparison sites. Sites are sorted so that locations with the greatest amounts of rocky substrate (boulder, cobble, pebble) are on the left with increasing amounts of fine substrates (sand, silt, clay) are to the right. TMDL sites are highlighted with red arrows.

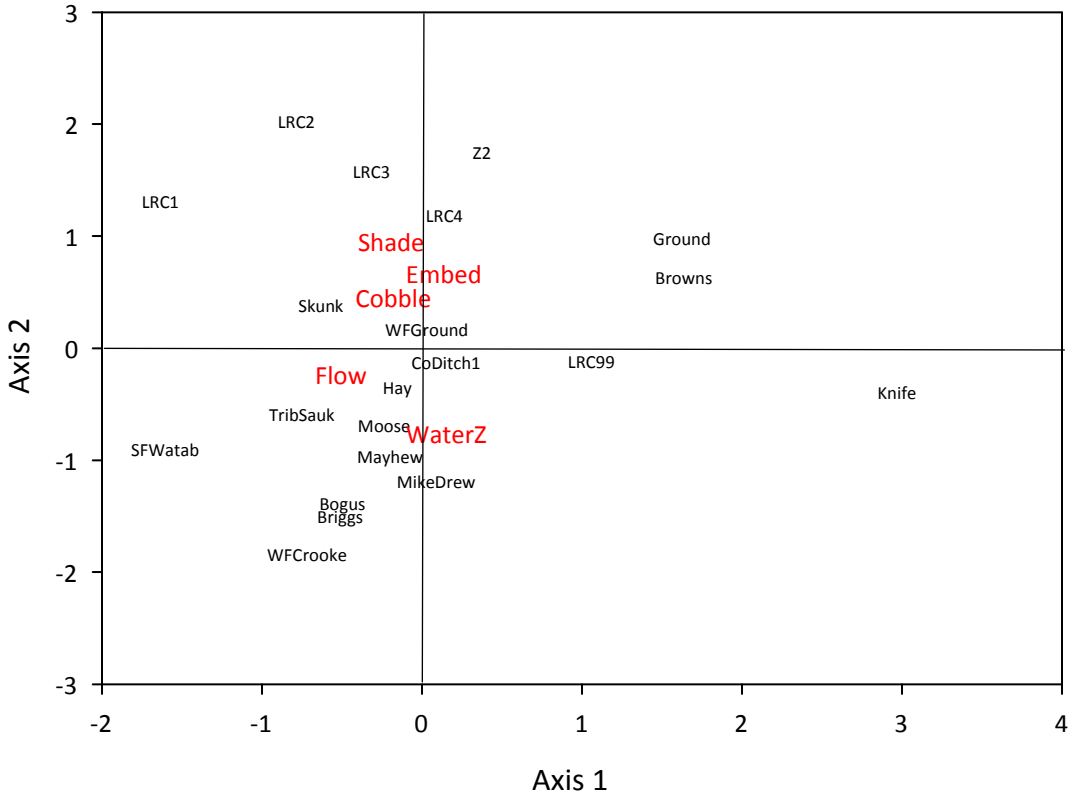


Figure 18. Multivariate bi-plot of fish community metrics with vectors from local habitat variables for Little Rock Creek TMDL sample locations and regional stream sites. Relationships are significant (redundancy analysis using a Monte Carlo permutation *p*=0.0400 in CANOCO), with the relative influence of local habitat characteristics explained on the first two ordination axes (Axis 1 = 58.3% var.).

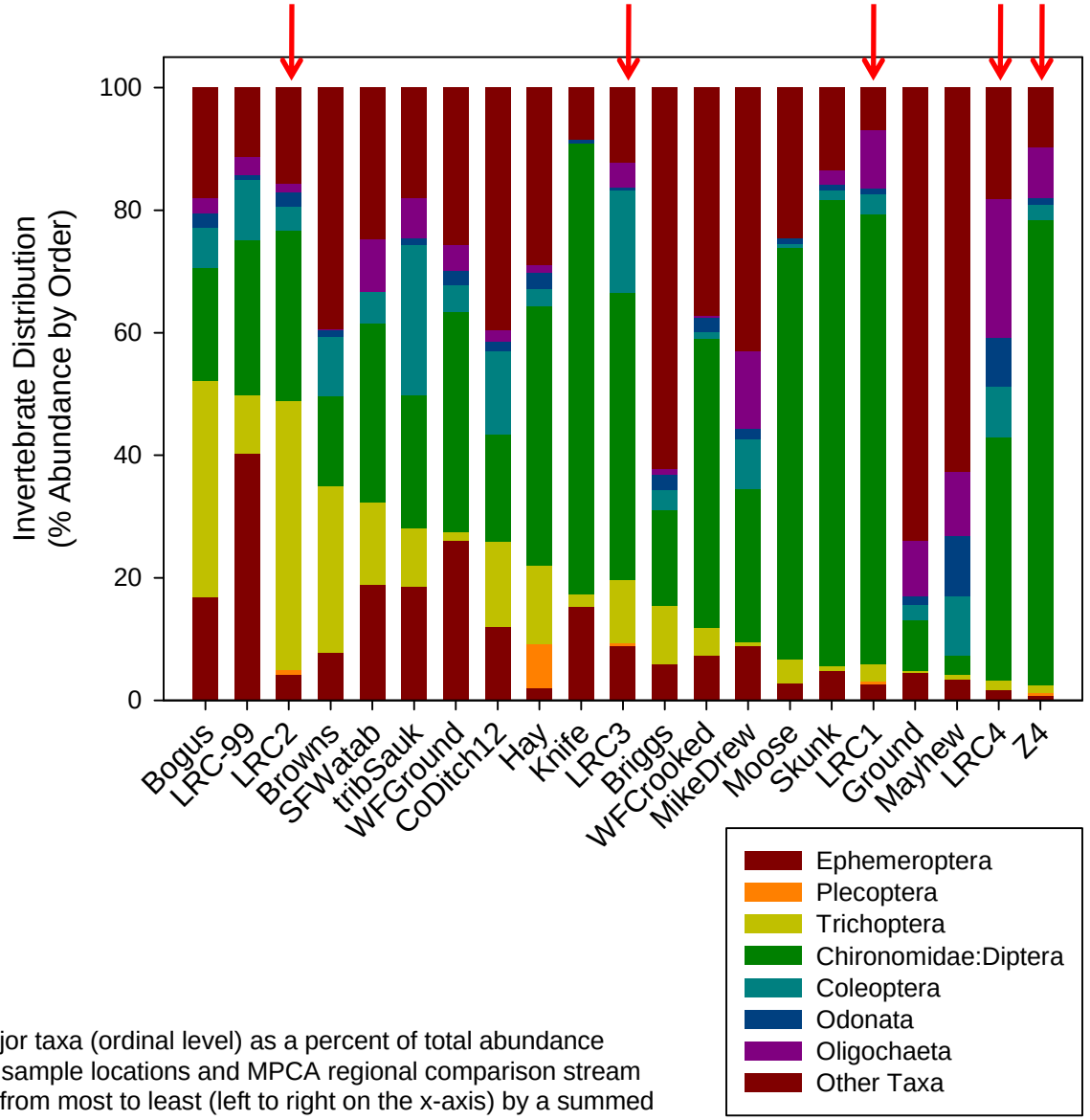


Figure 19. Distribution of major taxa (ordinal level) as a percent of total abundance for Little Rock Creek TMDL sample locations and MPCA regional comparison stream sites. Site values are sorted from most to least (left to right on the x-axis) by a summed proportion of EPT taxa (Ephereoptera, Plecoptera, and Trichoptera). TMDL sites are indicated by arrows.

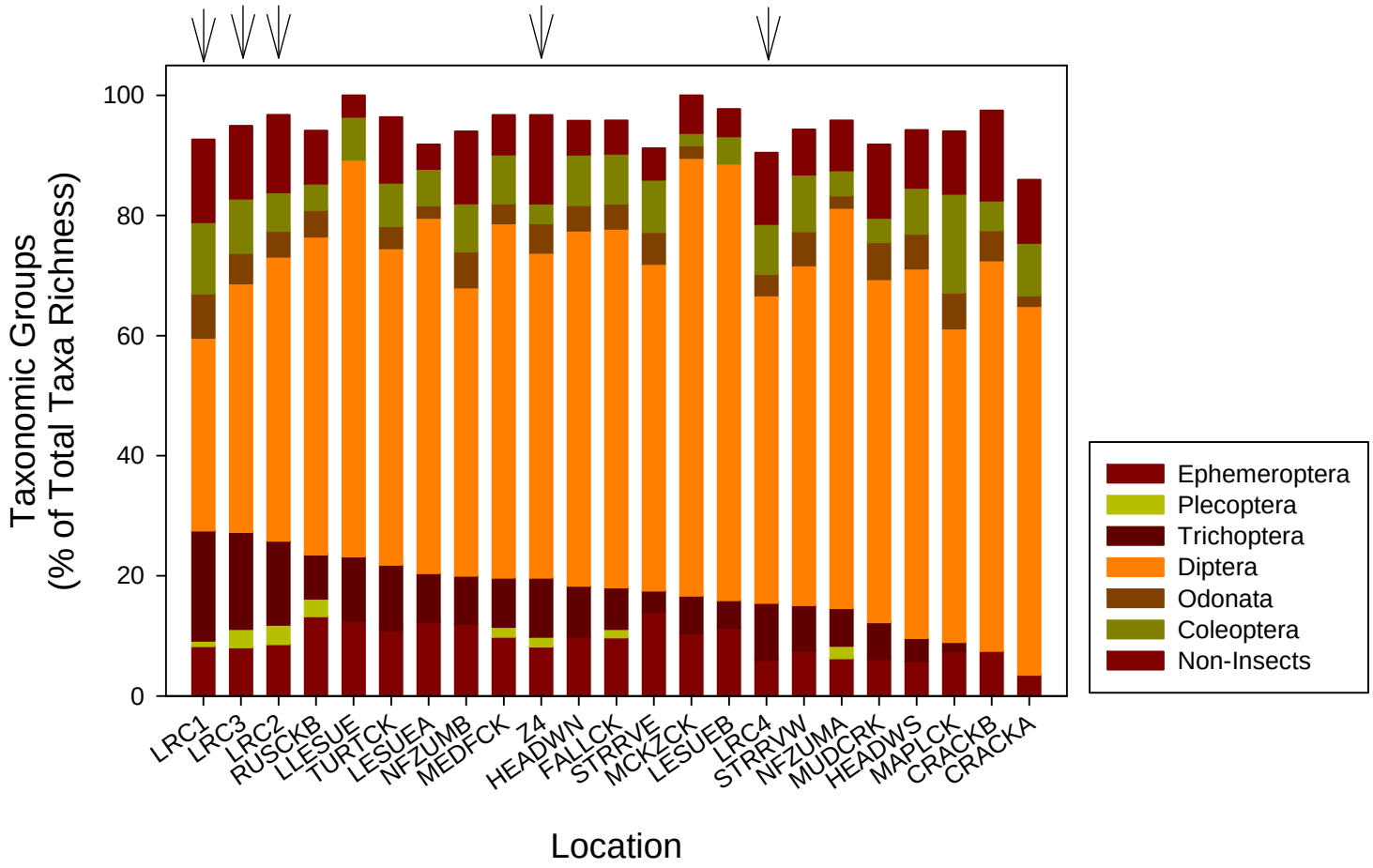


Figure 20. Distribution of major taxa (ordinal level) as a percent of total abundance for Little Rock Creek TMDL sample locations and NRRI regional comparison stream sites. Site values are sorted from most to least (left to right on the x-axis) by a summed proportion of EPT taxa (Ephereoptera, Plecoptera, and Trichoptera). TMDL sites are indicated by arrows.

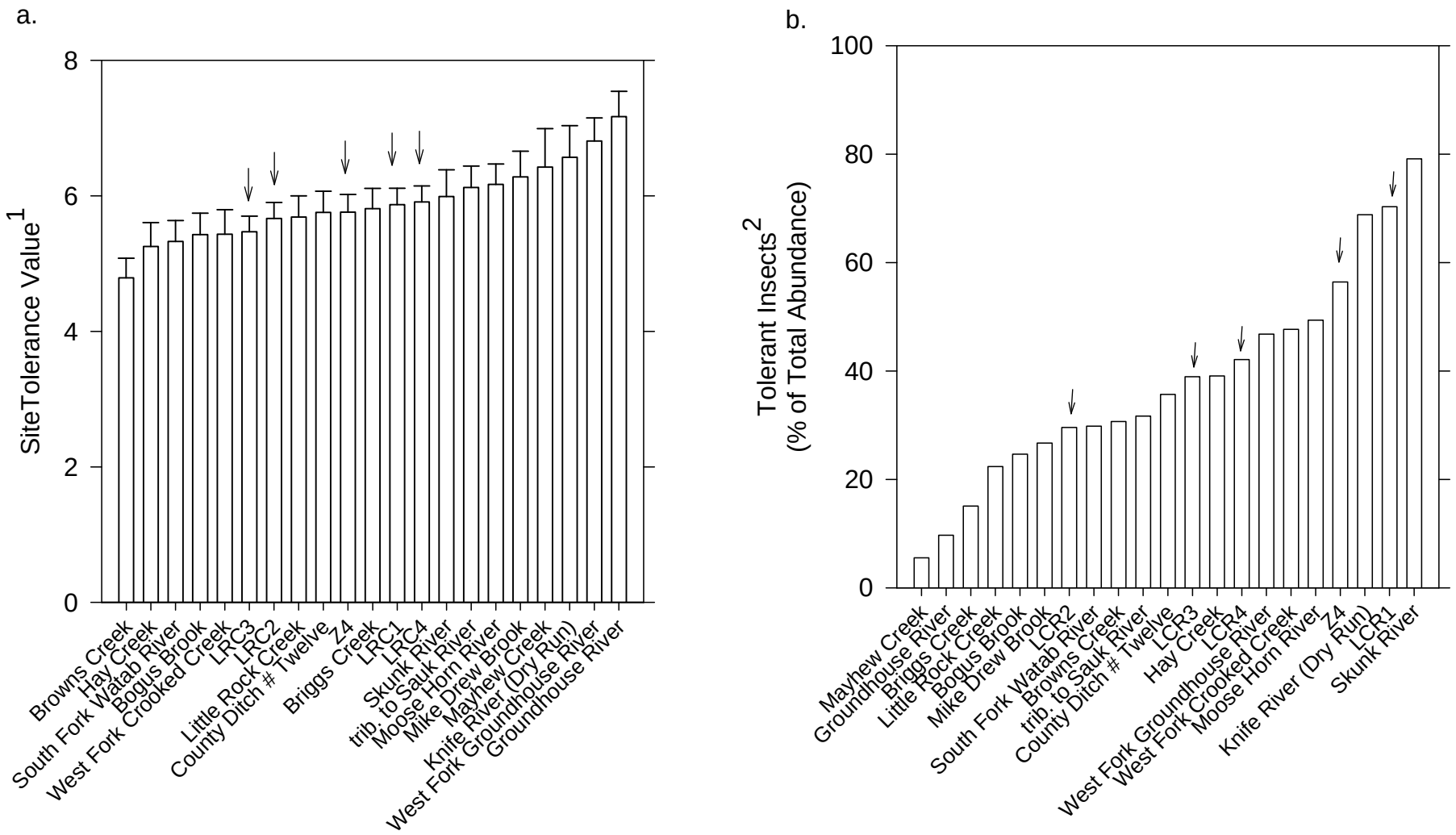


Figure 21. Distribution of Little Rock Creek TMDL sample locations and MPCA regional comparison stream sites sorted from least to most (left to right on the x-axis) by (a) macroinvertebrate mean tolerance values per site (1values are mean EPA tolerance scores for individual insect taxa collected from all combined samples) and, (b) the percent of total abundance of those taxa described as tolerant (2Tolerant Insects are individual taxa ranked as having an EPA tolerance score > 7). TMDL sites are indicated by arrows.

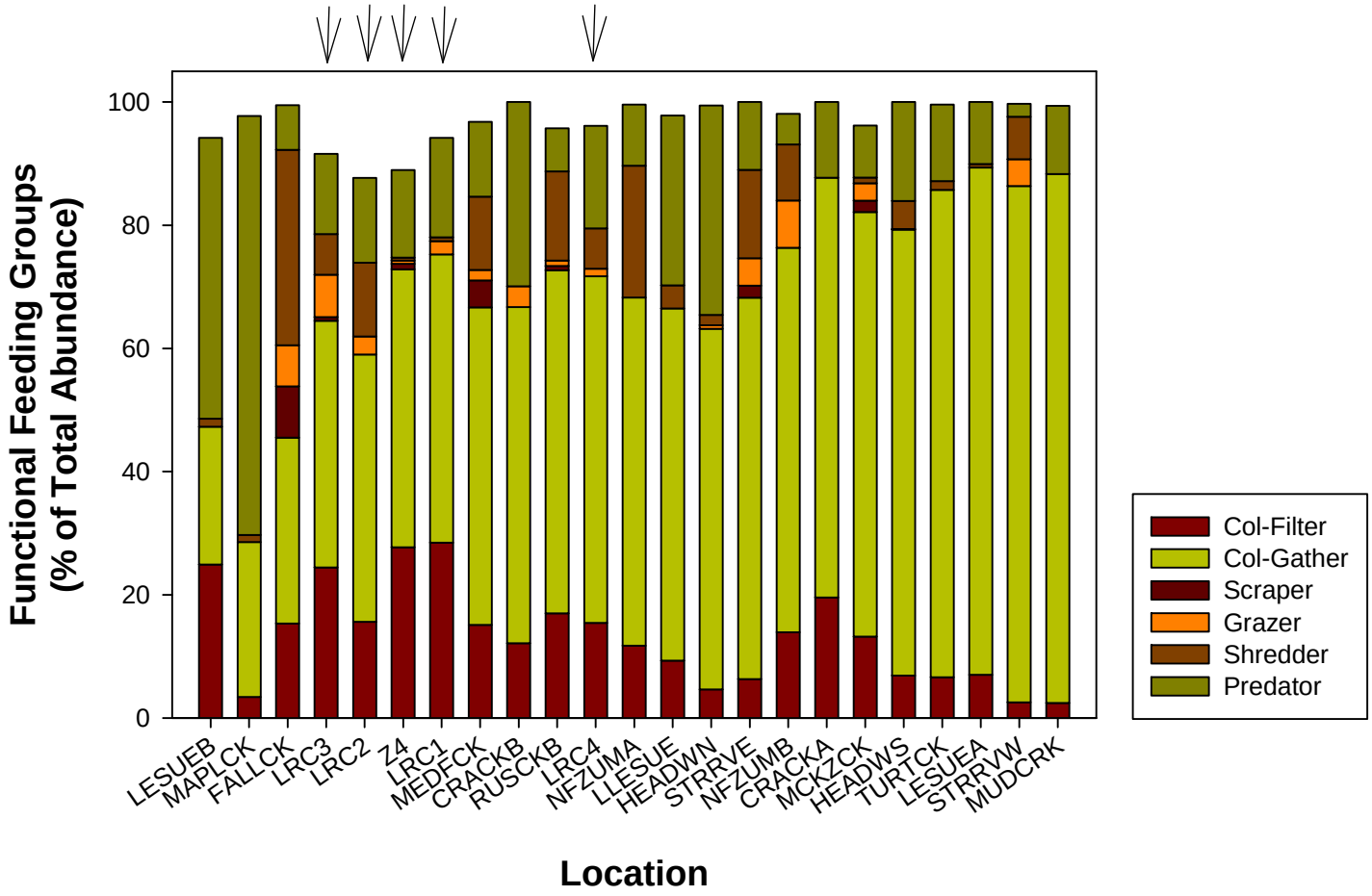


Figure 22. Macroinvertebrate community composition by proportion functional feeding groups for TMDL and NRRI regional comparison sites. Sites are sorted so that sites with the greatest proportion of collector-gatherers are on the right. TMDL sites are indicated by arrows.

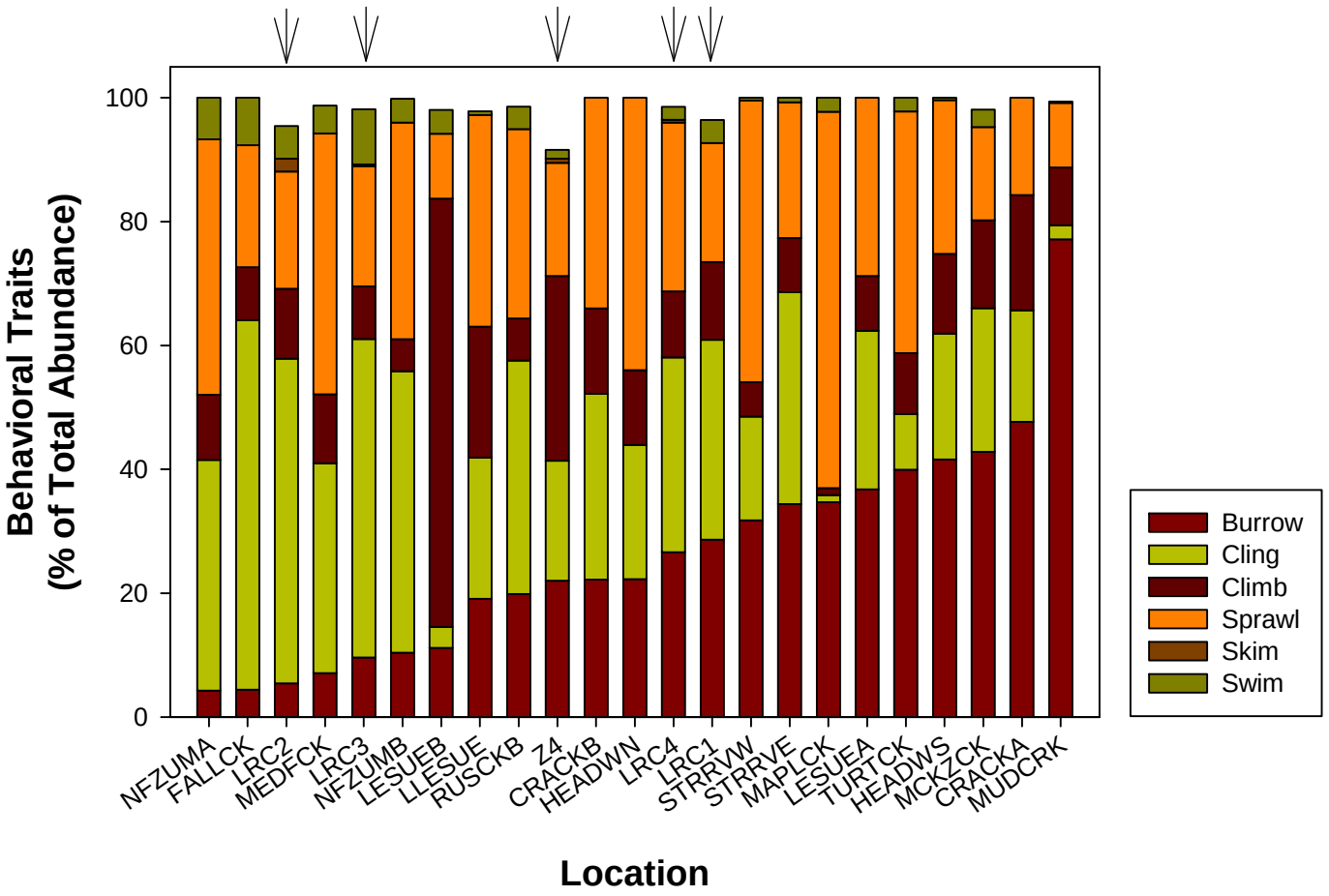


Figure 23. Macroinvertebrate community composition by proportion behavioral traits for TMDL LRC and NRRI regional comparison sites. Sites are sorted so that sites with the greatest proportion of burrowers are on the right. TMDL sites are indicated by arrows.

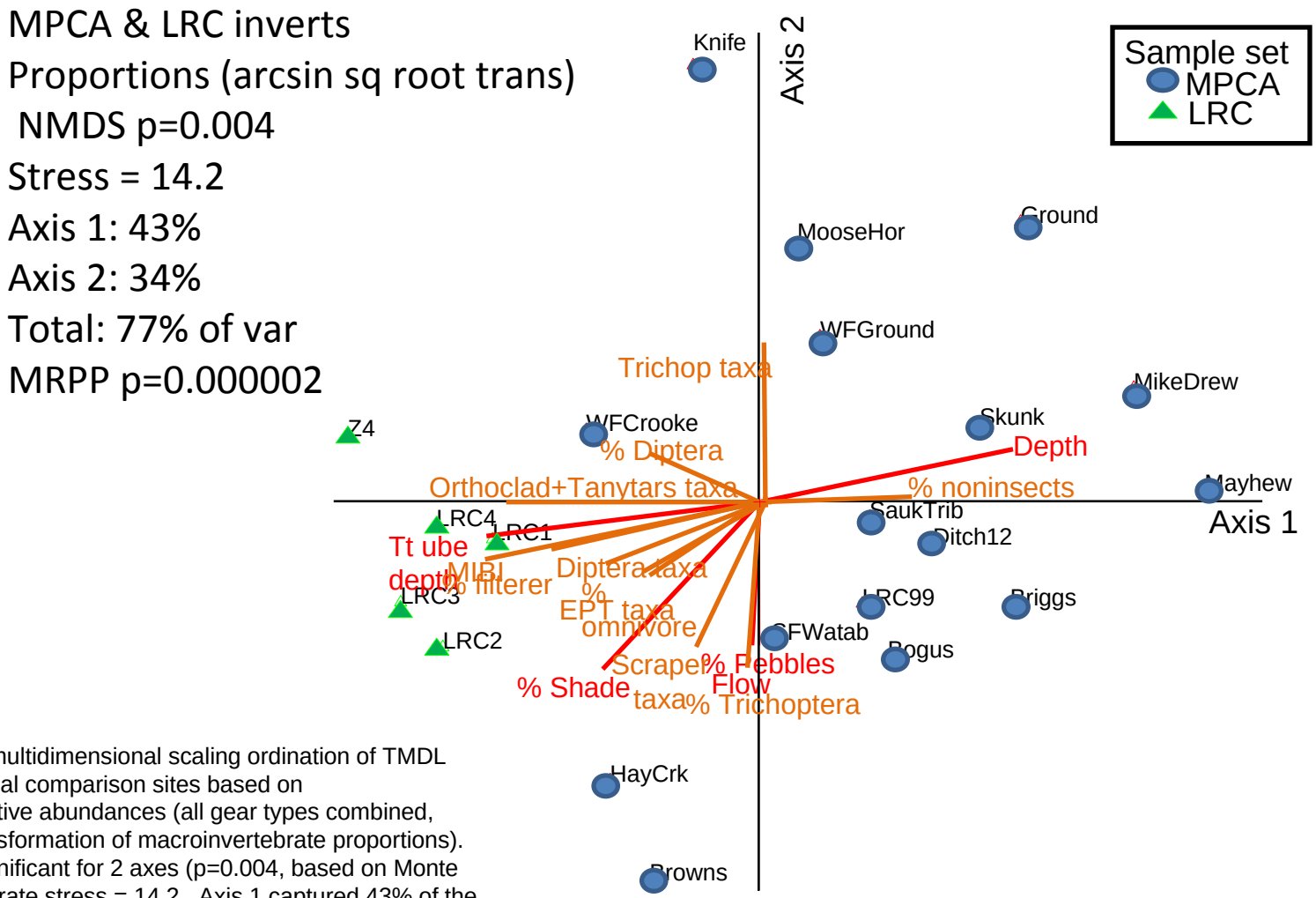


Figure 24. Nonmetric multidimensional scaling ordination of TMDL LRC and MPCA regional comparison sites based on macroinvertebrate relative abundances (all gear types combined, arcsin square root transformation of macroinvertebrate proportions). The ordination was significant for 2 axes (p=0.004, based on Monte Carlo runs), with moderate stress = 14.2. Axis 1 captured 43% of the variation and axis 2 captured 34%, for 77% of the total variability captured. Overlays of landscape and habitat characteristics (red) and macroinvertebrate metrics (brown) have correlations of r = 0.5 or greater. Multiresponse permutation procedure (MRPP) was highly significant (p=0.000002) for differences between the two datasets, TMDL LRC and MPCA.

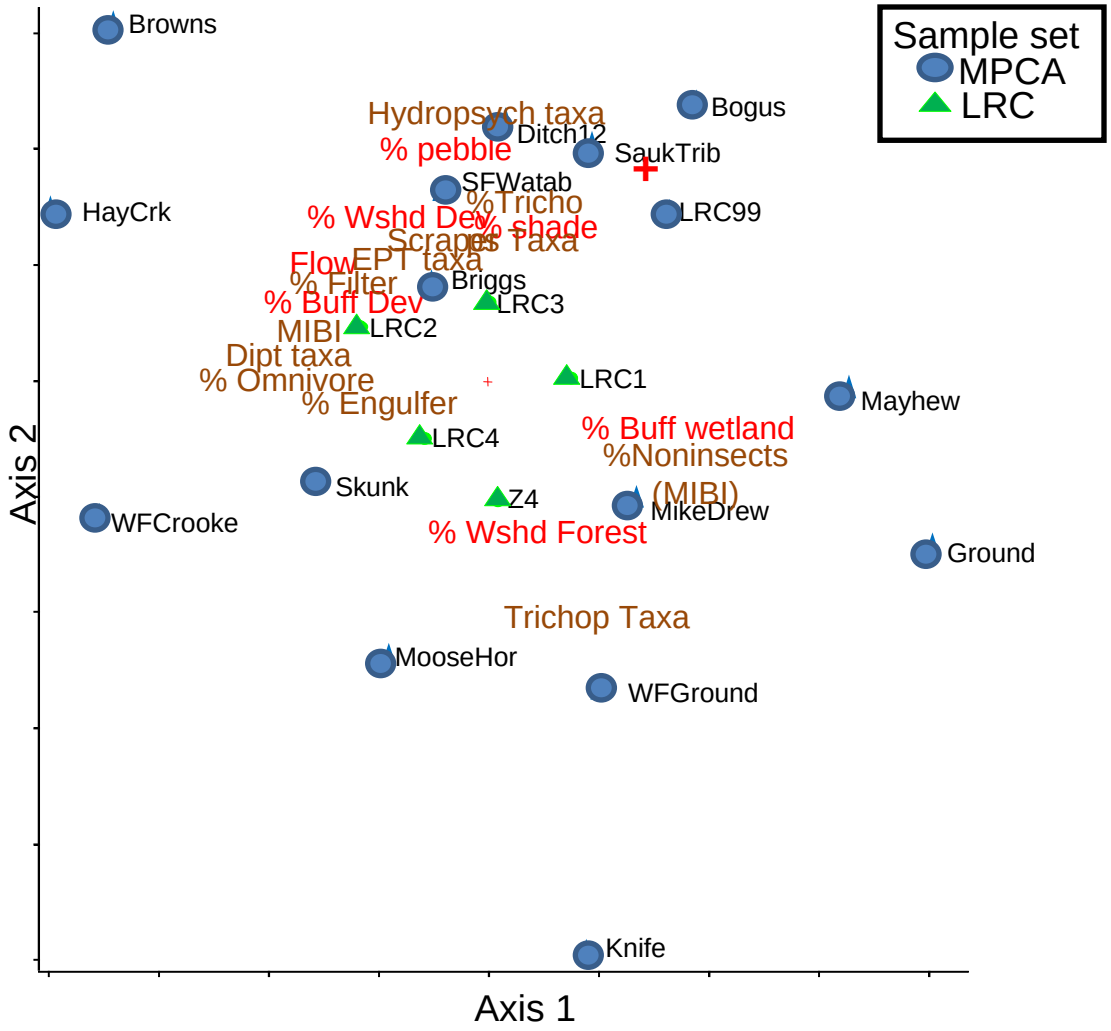


Figure 25. Nonmetric multidimensional scaling ordination of TMDL and MPCA regional comparison sites based on macroinvertebrate relative abundances (all gear types combined; 'relativize by the maximum' transformation). The ordination was significant (p=0.004, based on Monte Carlo runs). Axis 2 captured 17% of the variability in the dataset, and axis 1 captured 13%. (An additional 45% of the variability was captured on axis 3 (not shown) which separated TMDL sites from MPCA comparison sites). Overlays of landscape and habitat characteristics (red) and macroinvertebrate metrics (brown) have correlations of r = 0.45 or greater. The centroid is indicated with a red plus symbol. See Methods and Results for more complete explanation.

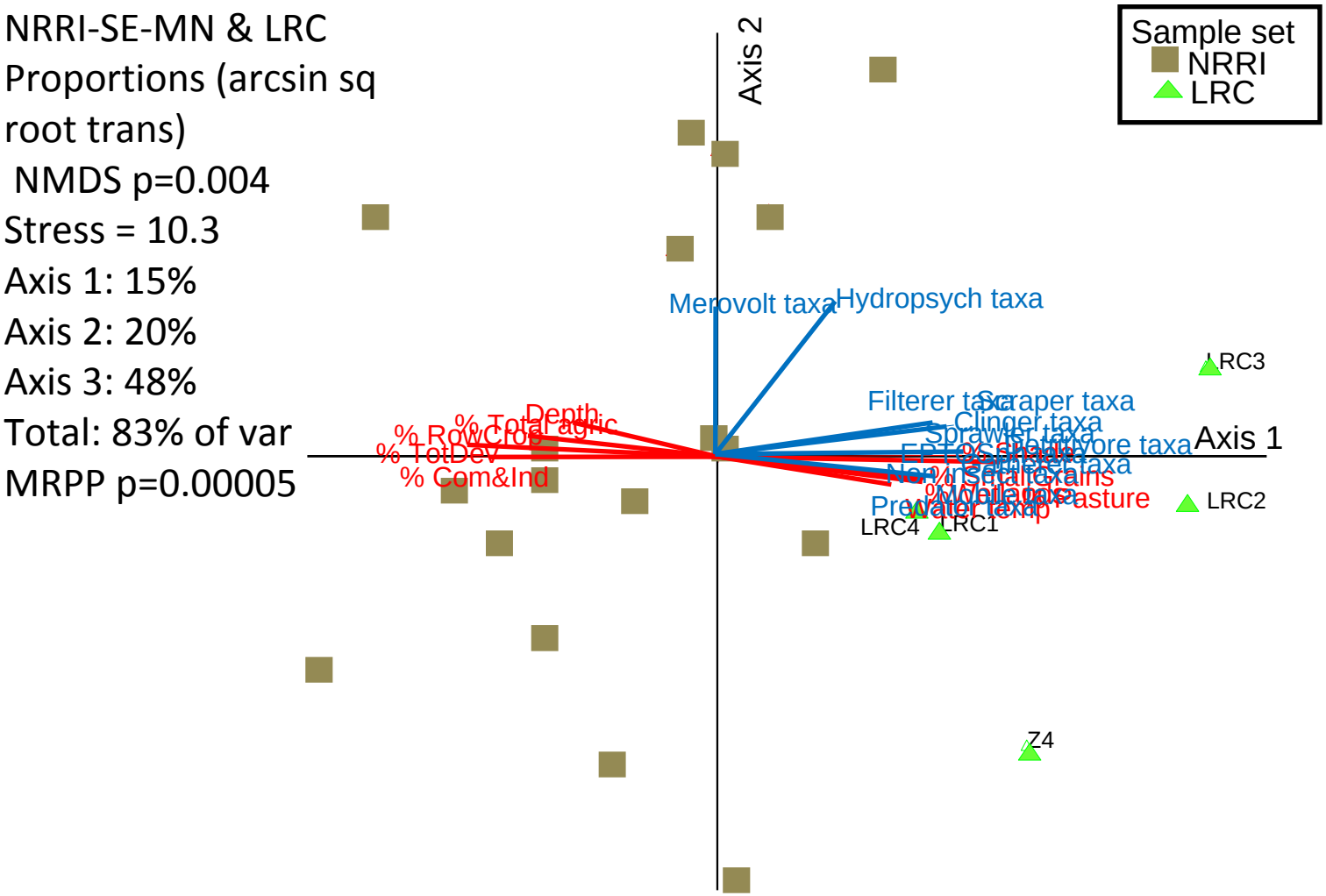


Figure 26. Nonmetric multidimensional scaling ordination of TMDL and NRRI regional comparison sites based on macroinvertebrate relative abundances (all gear types combined, arcsin square root transformation of proportions). The ordination was significant (p=0.004, based on Monte Carlo runs), with moderately low stress = 10.3. Axes 1 and 2 are shown. Axis 1 captured 15% of the variation, axis 2 captured 20%, and axis 3 captured 48%, for 83% of the total variability captured. Overlays of landscape and habitat characteristics (red) and macroinvertebrate metrics (blue) have correlations of r = 0.5 or greater. Macroinvertebrate metrics are offset from origin for ease of viewing. Multiresponse permutation procedure (MRPP) was highly significant (p=0.00006) for differences between the two datasets, TMDL LRC and NRRI.

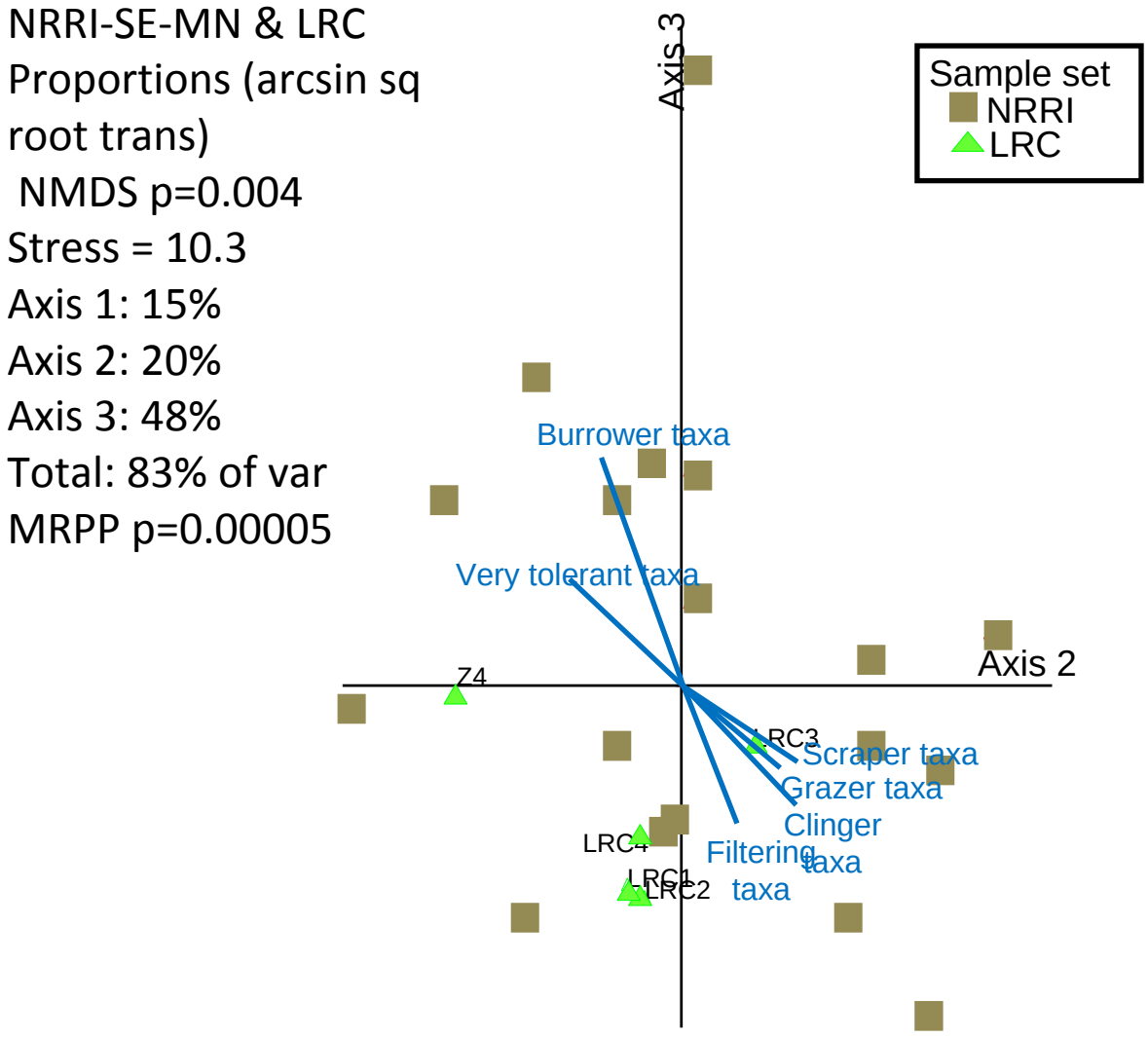


Figure 27. Nonmetric multidimensional scaling ordination of TMDL and NRRI regional comparison sites based on macroinvertebrate relative abundances (all gear types combined, arcsin square root transformation of proportions). The same ordination as Figure 26, this time showing axes 2 and 3. The ordination was significant (p=0.004, based on Monte Carlo runs), with moderately low stress = 10.3. No landscape or habitat variables correlated with either axis at r > 0.5. Axis 1 captured 15% of the variation, axis 2 captured 20%, and axis 3 captured 48%, for 83% of the total variability captured. Macroinvertebrate metrics are shown in blue (correlation r > 0.5). Multiresponse permutation procedure (MRPP) was highly significant (p=0.00006) for differences between the two datasets.

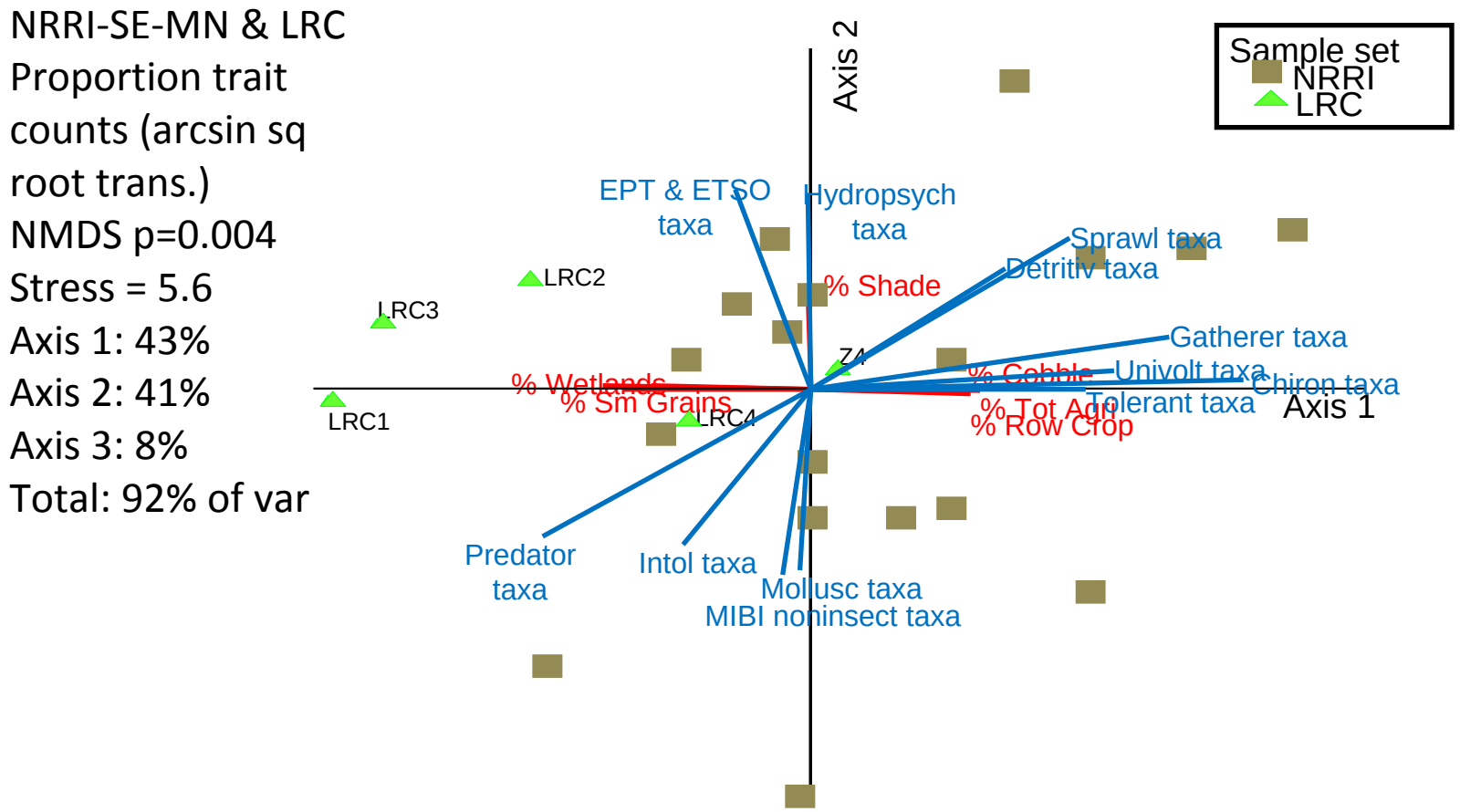


Figure 28. Nonmetric multidimensional scaling ordination of TMDL and NRRI regional comparison sites based on trait taxonomic counts calculated from all gear types combined (no transformation). This 2-dimensional ordination was significant (p=0.004, based on Monte Carlo runs), with moderately low stress = 9.4. Axis 1 captured 0.2% of the variation and axis 2 captured 98%, for 98% of the total variability captured. Overlays of landscape and habitat characteristics (red) and macroinvertebrate metrics (blue) have correlations of r = 0.5 or greater. Macroinvertebrate metrics are offset from origin for ease of viewing.

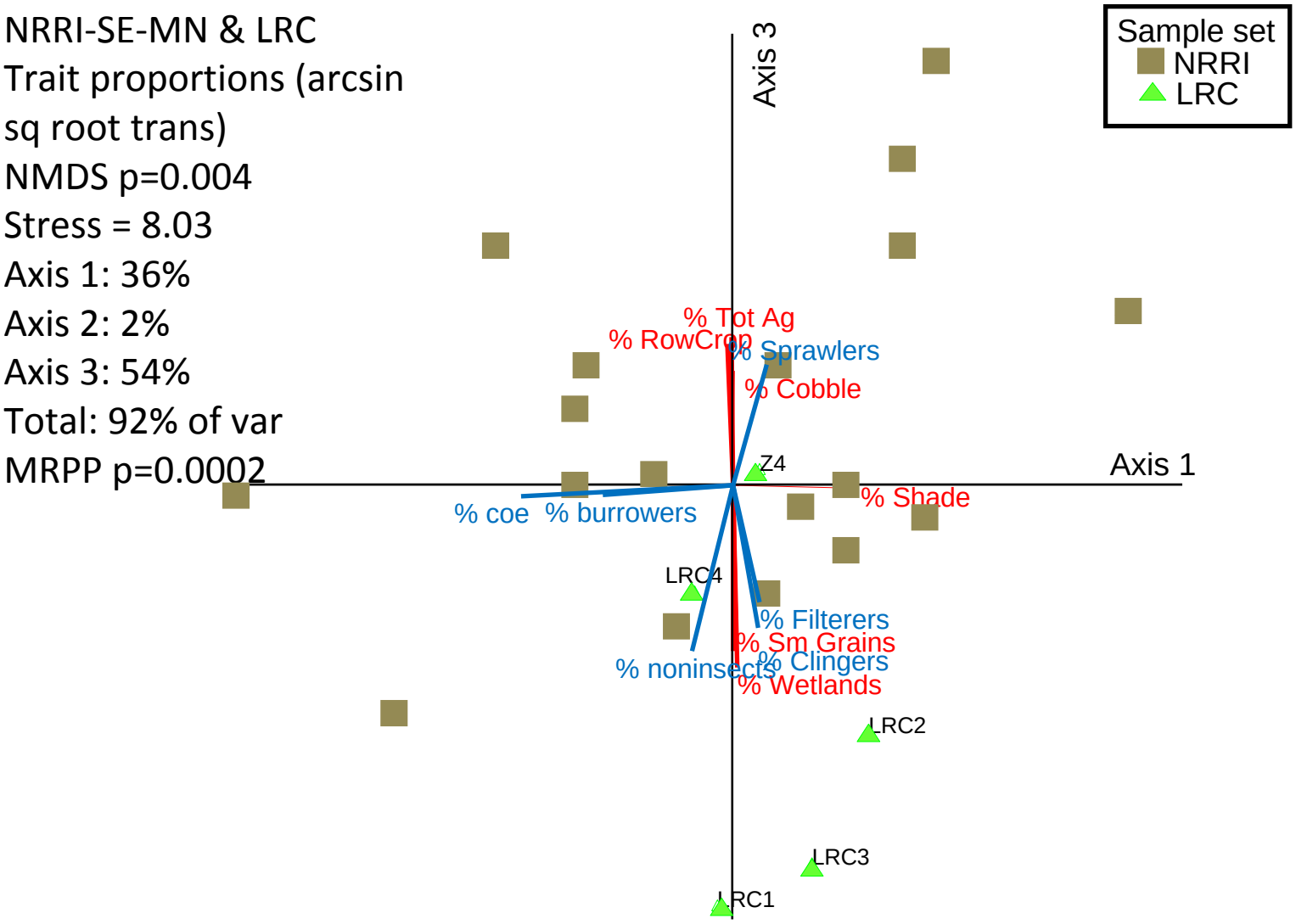


Figure 29. Nonmetric multidimensional scaling ordination of TMDL and NRRI regional comparison sites based on trait proportional metrics calculated from all gear types combined (arcsin square root transformation of proportions). The ordination was significant (p=0.004, based on Monte Carlo runs), with low stress = 8.03. MRPP p=0.0002 Only axes 1 and 3 are shown. Axis 1 captured 36% of the variation, axis 2 captured 2%, and axis 3 captured 54%, for 92% of the total variability captured. Overlays of landscape and habitat characteristics (red) and macroinvertebrate metrics (blue) have correlations of r = 0.5 or greater. Multiresponse permutation procedure (MRPP) was very significant (p=0.0002) for differences between the two datasets, TMDL LRC and NRRI.

DATE	LOCATN	SITE	TRNSCT	TOTWDT	CUMWDT	Z(cm)	V(cm/S)	FEATUR	br	bd	cb	gv	pb	sd	st	cl	embed%	COVER
38938	Little Rock Creek	LRC1	1	920	0	0	0	bank	0	0	0	0	0	100	0	0	0	un
38938	Little Rock Creek	LRC1	1	920	125	28	19	run	0	0	0	0	0	40	60	0	50	
38938	Little Rock Creek	LRC1	1	920	250	15	17	run	0	0	0	0	0	60	40	0	50	
38938	Little Rock Creek	LRC1	1	920	375	12	12	run	0	0	0	40	0	60	0	0	50	vg
38938	Little Rock Creek	LRC1	1	920	500	18	15	run	0	0	0	40	0	60	0	0	50	
38938	Little Rock Creek	LRC1	1	920	625	17	19	run	0	0	0	40	0	60	0	0	50	
38938	Little Rock Creek	LRC1	1	920	720	0	0	bank	0	0	0	0	0	0	100	0	0	uc
38938	Little Rock Creek	LRC1	2	730	0	0	0	bank	0	0	0	0	0	100	0	0		un
38938	Little Rock Creek	LRC1	2	730	100	15	8	pool	0	0	0	0	0	60	40	0		
38938	Little Rock Creek	LRC1	2	730	200	20	12	pool	0	0	0	0	0	60	40	0		
38938	Little Rock Creek	LRC1	2	730	300	26	13	pool	0	0	0	0	0	60	40	0		
38938	Little Rock Creek	LRC1	2	730	400	30	15	pool	0	0	0	0	0	60	40	0		
38938	Little Rock Creek	LRC1	2	730	500	36	12	pool	0	0	0	0	0	60	40	0		
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38938	Little Rock Creek	LRC1	3	840	0	0	0	bank	0	0	0	0	0	100	0	0		uc
38938	Little Rock Creek	LRC1	3	840	100	32	8	pool	0	0	0	0	0	40	60	0		
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38938	Little Rock Creek	LRC1	3	840	500	45	0	pool	0	0	0	0	0	100	0	0		vg
38938	Little Rock Creek	LRC1	3	840	650	0	0	bank	0	0	0	0	0	40	60	0		wd
38938	Little Rock Creek	LRC1	4	950	0	0	0	bank	0	0	0	0	0	100	0	0	0	uc
38938	Little Rock Creek	LRC1	4	950	125	44	23	run	0	0	0	0	0	60	40	0	50	wd
38938	Little Rock Creek	LRC1	4	950	250	14	20	run	0	0	0	0	0	100	0	0	50	wd
38938	Little Rock Creek	LRC1	4	950	375	5	18	run	0	0	0	0	0	60	40	0	50	
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38938	Little Rock Creek	LRC1	5	790	0	0	0	bank	0	0	0	0	0	60	40	0		uc
38938	Little Rock Creek	LRC1	5	790	125	18	24	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	5	790	250	15	26	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	5	790	375	16	17	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	5	790	500	18	12	run	0	0	0	0	0	60	40	0		
38938	Little Rock Creek	LRC1	5	790	625	14	0	run	0	0	0	40	0	60	0	0		
38938	Little Rock Creek	LRC1	5	790	720	0	0	bank	0	0	0	0	0	60	40	0		uc
38938	Little Rock Creek	LRC1	6	970	0	0	0	bank	0	0	0	0	0	100	0	0		uc

Little Rock Creek TMDL Appendix 1

DATE	LOCATN	SITE	TRNSCT	TOTWDT	CUMWDT	Z(cm)	V(cm/S)	FEATUR	br	bd	cb	gv	pb	sd	st	cl	embed%	COVER
38938	Little Rock Creek	LRC1	6	970	100	22	24	run	0	0	0	40	0	60	0	0		
38938	Little Rock Creek	LRC1	6	970	200	16	16	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	6	970	300	15	16	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	6	970	400	14	21	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	6	970	500	10	12	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	6	970	570	0	0	bank	0	0	0	0	0	60	40	0		wd
38938	Little Rock Creek	LRC1	7	870	0	0	0	bank	0	0	0	0	0	100	0	0		wd
38938	Little Rock Creek	LRC1	7	870	125	8	7	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	7	870	250	4	4	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	7	870	375	15	11	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	7	870	500	15	16	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	7	870	625	38	20	run	0	0	0	0	0	60	40	0		
38938	Little Rock Creek	LRC1	7	870	760	0	0	bank	0	0	0	0	0	60	40	0		wd
38938	Little Rock Creek	LRC1	8	1100	0	0	0	bank	0	0	0	0	0	100	0	0		wd
38938	Little Rock Creek	LRC1	8	1100	125	12	27	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	8	1100	250	14	28	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	8	1100	375	12	24	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	8	1100	500	10	16	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	8	1100	625	8	12	run	0	0	0	0	0	100	0	0		
38938	Little Rock Creek	LRC1	8	1100	850	0	0	bank	0	0	0	0	0	60	40	0		sb
38938	Little Rock Creek	LRC1	9	830	0	0	0	bank	0	0	0	0	0	60	40	0		uc
38938	Little Rock Creek	LRC1	9	830	125	16	9	run	0	0	0	0	0	40	60	0		
38938	Little Rock Creek	LRC1	9	830	250	20	12	run	0	0	0	0	0	60	40	0		
38938	Little Rock Creek	LRC1	9	830	375	26	12	run	0	0	0	0	0	60	40	0		
38938	Little Rock Creek	LRC1	9	830	500	34	13	run	0	0	0	0	0	60	40	0		
38938	Little Rock Creek	LRC1	9	830	625	36	7	run	0	0	0	0	0	40	60	0		
38938	Little Rock Creek	LRC1	9	830	700	0	0	bank	0	0	0	0	0	60	40	0		sb
38938	Little Rock Creek	LRC1	10	760	0	0	0	bank	0	0	0	0	0	60	40	0		wd
38938	Little Rock Creek	LRC1	10	760	125	36	6	run	0	0	0	0	0	40	60	0		
38938	Little Rock Creek	LRC1	10	760	250	41	9	run	0	0	0	0	0	40	60	0		
38938	Little Rock Creek	LRC1	10	760	375	38	9	run	0	0	0	0	0	60	40	0		
38938	Little Rock Creek	LRC1	10	760	500	30	9	run	0	0	0	0	0	40	60	0		
38938	Little Rock Creek	LRC1	10	760	625	24	5	run	0	0	0	0	0	40	60	0		
38938	Little Rock Creek	LRC1	10	760	710	0	0	bank	0	0	0	0	0	60	40	0		uc
38937	Little Rock Creek	LRC2	1	640	0	0	0	bank	0	0	0	0	0	60	40	0	0	un
38937	Little Rock Creek	LRC2	1	640	50	10	4	run	0	0	0	0	0	60	40	0	25	bd

Little Rock Creek TMDL Appendix 1

DATE	LOCATN	SITE	TRNSCT	TOTWDT	CUMWDT	Z(cm)	V(cm/S)	FEATUR	br	bd	cb	gv	pb	sd	st	cl	embed%	COVER
38937	Little Rock Creek	LRC2	1	640	100	12	16	run	0	0	0	0	0	60	40	0	25	
38937	Little Rock Creek	LRC2	1	640	150	11	12	run	0	0	0	0	0	60	40	0	25	
38937	Little Rock Creek	LRC2	1	640	200	10	10	run	0	0	0	0	0	0	0	0	25	
38937	Little Rock Creek	LRC2	1	640	250	6	1	run	0	0	0	0	0	60	40	0	25	
38937	Little Rock Creek	LRC2	1	640	380	0	0	bank	0	0	0	0	0	0	100	0	0	sb
38937	Little Rock Creek	LRC2	2	540	0		0	bank	0	40	30	0	0	0	10	0	0	sb
38937	Little Rock Creek	LRC2	2	540	50	14	2	pool	0	0	0	0	0	60	40	0	50	bd
38937	Little Rock Creek	LRC2	2	540	100	20	14	pool	0	0	0	0	0	60	40	0	50	
38937	Little Rock Creek	LRC2	2	540	150	18	4	pool	0	0	0	0	0	60	40	0	50	wd
38937	Little Rock Creek	LRC2	2	540	200	28	5	pool	0	0	0	0	0	60	40	0	50	bd
38937	Little Rock Creek	LRC2	2	540	250	16	0	pool	0	0	0	0	0	60	40	0	25	bd
38937	Little Rock Creek	LRC2	2	540	420	0	0	bank	0	0	0	0	0	0	100	0	0	sb
38937	Little Rock Creek	LRC2	3	620	0	0	0	bank	0	0	0	0	0	0	0	0	0	sb
38937	Little Rock Creek	LRC2	3	620	50	16	2	pool	0	0	0	0	0	60	40	0	50	wd
38937	Little Rock Creek	LRC2	3	620	100	22	5	pool	0	0	0	0	0	60	40	0	50	
38937	Little Rock Creek	LRC2	3	620	150	14	6	pool	0	0	0	0	0	60	40	0	50	
38937	Little Rock Creek	LRC2	3	620	200	8	9	pool	0	0	0	0	0	100	0	0	50	
38937	Little Rock Creek	LRC2	3	620	250	7	1	pool	0	0	0	0	0	60	40	0	50	wd
38937	Little Rock Creek	LRC2	3	620	380	0	0	bank	0	0	0	0	0	0	100	0	0	un
38937	Little Rock Creek	LRC2	4	510	0	0	0	bank	0	70	0	0	0	20	10	0	0	sb
38937	Little Rock Creek	LRC2	4	510	3	0	0	bank	0	0	0	0	0	0	100	0	0	sb
38937	Little Rock Creek	LRC2	4	510	50	14	4	run	0	0	0	0	0	100	0	0	50	bd
38937	Little Rock Creek	LRC2	4	510	100	23	11	run	0	0	0	0	0	100	0	0	50	bd
38937	Little Rock Creek	LRC2	4	510	150	19	12	run	0	0	0	0	0	60	40	0	50	wd
38937	Little Rock Creek	LRC2	4	510	200	18	8	run	0	0	0	0	0	60	40	0	50	wd
38937	Little Rock Creek	LRC2	4	510	250	9	0	run	0	0	0	0	0	60	40	0	50	wd
38937	Little Rock Creek	LRC2	5	520	0	0	0	bank	0	40	30	0	0	20	10	0	0	sb
38937	Little Rock Creek	LRC2	5	520	50	20	0	run	0	0	0	0	0	60	40	0	50	bd
38937	Little Rock Creek	LRC2	5	520	100	30	6	run	0	0	0	0	0	60	40	0	75	bd
38937	Little Rock Creek	LRC2	5	520	150	38	5	run	0	0	0	0	0	60	40	0	50	wd
38937	Little Rock Creek	LRC2	5	520	200	23	4	run	0	0	0	0	0	60	40	0	50	wd
38937	Little Rock Creek	LRC2	5	520	250	18	2	run	0	0	0	0	0	60	40	0	50	sb
38937	Little Rock Creek	LRC2	5	520	320	0	0	bank	0	0	0	0	0	60	40	0	0	sb
38937	Little Rock Creek	LRC2	6	550	0	0	0	bank	0	40	0	0	0	30	30	0	0	sb
38937	Little Rock Creek	LRC2	6	550	50	30	1	run	0	0	0	0	0	60	40	0	25	bd
38937	Little Rock Creek	LRC2	6	550	100	32	2	run	0	0	0	0	0	60	40	0	25	

DATE	LOCATN	SITE	TRNSCT	TOTWDT	CUMWDT	Z(cm)	V(cm/S)	FEATUR	br	bd	cb	gv	pb	sd	st	cl	embed%	COVER
38937	Little Rock Creek	LRC2	6	550	150	24	6	run	0	0	0	0	0	60	40	0	25	
38937	Little Rock Creek	LRC2	6	550	200	16	11	run	0	0	0	0	0	60	40	0	25	
38937	Little Rock Creek	LRC2	6	550	250	12	10	run	0	0	0	0	0	60	40	0	25	
38937	Little Rock Creek	LRC2	6	550	320	0	0	bank	0	0	0	0	0	60	40	0	0	un
38937	Little Rock Creek	LRC2	7	770	0	0	0	bank	0	0	0	0	0	60	40	0	0	un
38937	Little Rock Creek	LRC2	7	770	50	38	0	run	0	0	0	0	0	60	40	0	25	wd
38937	Little Rock Creek	LRC2	7	770	100	36	0	run	0	0	0	0	0	60	40	0	25	
38937	Little Rock Creek	LRC2	7	770	150	22	6	run	0	0	0	0	0	60	40	0	25	
38937	Little Rock Creek	LRC2	7	770	200	12	8	run	0	0	0	0	0	60	40	0	25	
38937	Little Rock Creek	LRC2	7	770	250	10	11	run	0	0	0	0	0	60	40	0	25	
38937	Little Rock Creek	LRC2	7	770	350	0	0	bank	0	0	0	0	0	60	40	0	0	un
38937	Little Rock Creek	LRC2	8	470	0	0	0	bank	0	0	0	0	0	60	40	0	0	sb
38937	Little Rock Creek	LRC2	8	470	50	12	2	run	0	0	0	0	0	60	40	0	25	
38937	Little Rock Creek	LRC2	8	470	100	14	4	run	0	0	0	0	0	60	40	0	25	
38937	Little Rock Creek	LRC2	8	470	150	20	7	run	0	0	0	0	0	60	40	0	25	wd
38937	Little Rock Creek	LRC2	8	470	200	28	6	run	0	0	0	0	0	60	40	0	25	wd
38937	Little Rock Creek	LRC2	8	470	250	34	8	run	0	0	0	0	0	60	40	0	25	wd
38937	Little Rock Creek	LRC2	8	470	290	0	0	bank	0	0	0	0	0	60	40	0	0	un
38937	Little Rock Creek	LRC2	9	690	0	0	0	bank	0	0	0	60	0	40	0	0	0	un
38937	Little Rock Creek	LRC2	9	690	50	4	27	riffle	0	0	0	60	0	40	0	0	25	
38937	Little Rock Creek	LRC2	9	690	100	4	15	riffle	0	0	0	60	0	40	0	0	25	
38937	Little Rock Creek	LRC2	9	690	150	8	16	riffle	0	0	0	60	0	40	0	0	25	
38937	Little Rock Creek	LRC2	9	690	200	4	12	riffle	0	0	0	60	0	40	0	0	25	
38937	Little Rock Creek	LRC2	9	690	250	7	4	riffle	0	0	0	60	0	40	0	0	25	
38937	Little Rock Creek	LRC2	9	690	340	0	0	bank	0	0	0	60	0	40	0	0	0	sb
38937	Little Rock Creek	LRC2	10	710	0	0	0	bank	0	0	0	0	0	0	100	0	0	un
38937	Little Rock Creek	LRC2	10	710	100	20	0	run	0	0	0	0	0	0	100	0	25	wd
38937	Little Rock Creek	LRC2	10	710	200	10	1	run	0	0	0	0	0	0	100	0	25	
38937	Little Rock Creek	LRC2	10	710	300	9	5	run	0	0	0	0	0	40	60	0	25	
38937	Little Rock Creek	LRC2	10	710	400	16	15	run	0	0	0	0	0	40	60	0	25	
38937	Little Rock Creek	LRC2	10	710	500	16	0	run	0	0	0	0	0	40	60	0	25	
38937	Little Rock Creek	LRC2	10	710	550	0	0	bank	0	0	0	0	0	40	60	0	0	sb
38938	Little Rock Creek	LRC3	1	600	0	0	0	bank	0	0	0	0	0	60	40	0		rw
38938	Little Rock Creek	LRC3	1	600	75	23	4	pool	0	0	60	0	0	0	40	0	50	wd
38938	Little Rock Creek	LRC3	1	600	150	23	3	pool	0	0	60	0	0	0	40	0	50	
38938	Little Rock Creek	LRC3	1	600	225	18	2	pool	0	0	60	0	0	0	40	0	25	

DATE	LOCATN	SITE	TRNSCT	TOTWDT	CUMWDT	Z(cm)	V(cm/S)	FEATUR	br	bd	cb	gv	pb	sd	st	cl	embed%	COVER
38938	Little Rock Creek	LRC3	1	600	300	15	1	pool	0	0	40	0	0	0	60	0	25	
38938	Little Rock Creek	LRC3	1	600	375	10	0	pool	0	0	60	0	0	40	0	0	25	
38938	Little Rock Creek	LRC3	1	600	430	0	0	bank	0	0	0	0	0	100	0	0		sb
38938	Little Rock Creek	LRC3	2	620	0	0	0	bank	0	0	60	0	0	40	0	0		uc
38938	Little Rock Creek	LRC3	2	620	50	6	1	riffle	0	0	60	0	0	0	40	0	25	
38938	Little Rock Creek	LRC3	2	620	100	9	0	riffle	0	0	60	0	30	10	0	0	10	
38938	Little Rock Creek	LRC3	2	620	150	12	8	riffle	0	0	60	0	30	10	0	0	10	
38938	Little Rock Creek	LRC3	2	620	200	12	13	riffle	0	0	60	0	30	10	0	0	10	
38938	Little Rock Creek	LRC3	2	620	250	8	3	riffle	0	0	60	0	30	10	0	0	25	
38938	Little Rock Creek	LRC3	2	620	310	0	0	bank	0	0	60	30	0	10	0	0		sb
38938	Little Rock Creek	LRC3	3	570	0	0	0	bank	0	0	0	60	0	40	0	0		uc
38938	Little Rock Creek	LRC3	3	570	50	8	2	run	0	0	60	0	30	10	0	0	25	
38938	Little Rock Creek	LRC3	3	570	100	12	6	run	0	0	60	0	30	10	0	0	25	
38938	Little Rock Creek	LRC3	3	570	150	14	7	run	0	0	60	0	30	10	0	0	25	
38938	Little Rock Creek	LRC3	3	570	200	13	5	run	0	0	60	0	30	10	0	0	25	wd
38938	Little Rock Creek	LRC3	3	570	225	10	4	run	0	0	60	0	30	10	0	0	25	wd
38938	Little Rock Creek	LRC3	3	570	250	0	0	bank	0	0	60	30	0	10	0	0		wd
38938	Little Rock Creek	LRC3	4	570	0	0	0	bank	0	0	0	40	0	60	0	0		uc
38938	Little Rock Creek	LRC3	4	570	150	12	0	pool	0	0	0	0	40	60	0	0	25	
38938	Little Rock Creek	LRC3	4	570	300	20	0	pool	0	0	40	0	0	60	0	0	25	
38938	Little Rock Creek	LRC3	4	570	450	22	0	pool	0	0	40	0	0	60	0	0	25	
38938	Little Rock Creek	LRC3	4	570	600	25	3	pool	0	0	60	0	0	40	0	0	25	
38938	Little Rock Creek	LRC3	4	570	750	18	2	pool	0	0	0	0	0	60	40	0	25	wd
38938	Little Rock Creek	LRC3	4	570	830	0	0	bank	0	0	0	0	40	60	0	0		uc
38938	Little Rock Creek	LRC3	5	660	0	0	0	bank	0	0	60	30	0	10	0	0		uc
38938	Little Rock Creek	LRC3	5	660	50	5	0	riffle	0	0	60	0	30	10	0	0	25	
38938	Little Rock Creek	LRC3	5	660	100	8	16	riffle	0	0	60	0	30	10	0	0	25	
38938	Little Rock Creek	LRC3	5	660	150	11	10	riffle	0	0	60	0	30	10	0	0	25	
38938	Little Rock Creek	LRC3	5	660	200	13	3	riffle	0	0	60	0	0	40	0	0	25	bd
38938	Little Rock Creek	LRC3	5	660	250	8	0	riffle	0	0	60	0	0	40	0	0	25	bd
38938	Little Rock Creek	LRC3	5	660	360	0	0	bank	0	0	60	0	0	40	0	0		sb
38938	Little Rock Creek	LRC3	6	580	0	0	0	bank	0	0	0	0	60	40	0	0		wd
38938	Little Rock Creek	LRC3	6	580	75	4	5	run	0	0	60	0	30	10	0	0	25	
38938	Little Rock Creek	LRC3	6	580	150	10	12	run	0	0	60	0	30	10	0	0	25	
38938	Little Rock Creek	LRC3	6	580	225	14	13	run	0	0	40	0	0	60	0	0	25	
38938	Little Rock Creek	LRC3	6	580	300	16	5	run	0	0	0	0	0	100	0	0	25	

DATE	LOCATN	SITE	TRNSCT	TOTWDT	CUMWDT	Z(cm)	V(cm/S)	FEATUR	br	bd	cb	gv	pb	sd	st	cl	embed%	COVER
38938	Little Rock Creek	LRC3	6	580	375	14	0	run	0	0	60	0	0	40	0	0	25	
38938	Little Rock Creek	LRC3	6	580	560	0	0	bank	0	0	60	30	0	10	0	0		uc
38938	Little Rock Creek	LRC3	7	570	0	0	0	bank	0	0	60	0	0	40	0	0		sb
38938	Little Rock Creek	LRC3	7	570	75	6	4	run	0	0	60	0	30	10	0	0	25	
38938	Little Rock Creek	LRC3	7	570	150	11	8	run	0	0	60	30	0	10	0	0	25	
38938	Little Rock Creek	LRC3	7	570	225	10	6	run	0	0	0	60	0	40	0	0	25	
38938	Little Rock Creek	LRC3	7	570	300	6	1	run	0	0	30	60	0	10	0	0	25	
38938	Little Rock Creek	LRC3	7	570	375	5	0	run	0	0	60	30	0	10	0	0	25	
38938	Little Rock Creek	LRC3	7	570	470	0	0	bank	0	0	60	0	0	40	0	0		uc
38938	Little Rock Creek	LRC3	8	580	0	0	0	bank	0	0	60	0	0	40	0	0		uc
38938	Little Rock Creek	LRC3	8	580	50	2	1	run	0	0	60	30	0	10	0	0	25	
38938	Little Rock Creek	LRC3	8	580	100	5	15	run	0	0	60	30	0	10	0	0	25	
38938	Little Rock Creek	LRC3	8	580	150	7	19	run	0	0	60	30	0	10	0	0	25	
38938	Little Rock Creek	LRC3	8	580	200	7	15	run	0	0	60	30	0	10	0	0	25	
38938	Little Rock Creek	LRC3	8	580	250	4	8	run	0	0	60	30	0	10	0	0	25	
38938	Little Rock Creek	LRC3	8	580	380	0	0	bank	0	0	60	30	0	10	0	0		uc
38938	Little Rock Creek	LRC3	9	800	0	0	0	bank	0	0	0	0	0	100	0	0		uc
38938	Little Rock Creek	LRC3	9	800	125	28	2	pool	0	0	40	0	0	60	0	0	50	
38938	Little Rock Creek	LRC3	9	800	250	30	1	pool	0	0	40	0	0	60	0	0	50	
38938	Little Rock Creek	LRC3	9	800	375	30	1	pool	0	0	60	30	0	10	0	0	50	
38938	Little Rock Creek	LRC3	9	800	500	22	0	pool	0	0	60	30	0	10	0	0	50	
38938	Little Rock Creek	LRC3	9	800	625	0	0	pool	0	0	30	60	0	10	0	0	50	
38938	Little Rock Creek	LRC3	9	800	760	0	0	bank	0	0	60	0	0	40	0	0		uc
38938	Little Rock Creek	LRC3	10	900	0	0	0	bank	0	0	0	0	0	60	40	0		uc
38938	Little Rock Creek	LRC3	10	900	125	34	0	pool	0	0	0	0	0	0	100	0	25	
38938	Little Rock Creek	LRC3	10	900	250	42	0	pool	0	0	60	0	0	40	0	0	25	
38938	Little Rock Creek	LRC3	10	900	375	42	0	pool	0	0	60	0	0	40	0	0	25	
38938	Little Rock Creek	LRC3	10	900	500	42	0	pool	0	0	0	0	0	60	40	0	25	
38938	Little Rock Creek	LRC3	10	900	625	30	0	pool	0	0	60	0	0	40	0	0	25	
38938	Little Rock Creek	LRC3	10	900	820	0	0	bank	0	0	0	0	0	100	0	0		uc
38937	Little Rock Creek	LRC4	1	350	0	0	0	bank	0	0	0	0	0	0	100	0		uc
38937	Little Rock Creek	LRC4	1	350	50	14	0	pool	0	0	0	0	0	0	100	0		
38937	Little Rock Creek	LRC4	1	350	100	30	1	pool	0	0	0	0	0	0	100	0		
38937	Little Rock Creek	LRC4	1	350	150	44	1	pool	0	0	0	0	0	0	100	0		
38937	Little Rock Creek	LRC4	1	350	200	38	0	pool	0	0	0	0	0	0	100	0		
38937	Little Rock Creek	LRC4	1	350	250	18	3	pool	0	0	0	0	0	0	100	0		

DATE	LOCATN	SITE	TRNSCT	TOTWDT	CUMWDT	Z(cm)	V(cm/S)	FEATUR	br	bd	cb	gv	pb	sd	st	cl	embed%	COVER
38937	Little Rock Creek	LRC4	1	350	330	0	0	bank	0	0	0	0	0	0	100	0		sb
38937	Little Rock Creek	LRC4	2	520	0	0	0	bank	0	0	0	0	0	60	40	0		sb
38937	Little Rock Creek	LRC4	2	520	40	8	2	pool	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	2	520	80	17	9	pool	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	2	520	120	18	8	pool	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	2	520	160	14	6	pool	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	2	520	200	4	0	pool	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	2	520	230	0	0	bank	0	0	0	0	0	60	40	0		sb
38937	Little Rock Creek	LRC4	3	430	0	0	0	bank	0	0	0	0	0	0	100	0		sb
38937	Little Rock Creek	LRC4	3	430	40	14	3	pool	0	0	0	0	0	0	100	0	75	
38937	Little Rock Creek	LRC4	3	430	80	20	4	pool	0	0	0	0	0	0	100	0	75	
38937	Little Rock Creek	LRC4	3	430	120	16	4	pool	0	0	0	0	0	0	100	0	75	wd
38937	Little Rock Creek	LRC4	3	430	160	14	6	pool	0	0	0	0	0	0	100	0	75	
38937	Little Rock Creek	LRC4	3	430	200	8	0	pool	0	0	0	0	0	0	100	0	75	
38937	Little Rock Creek	LRC4	3	430	290	0	0	bank	0	0	0	0	0	0	100	0		sb
38937	Little Rock Creek	LRC4	4	430	0	0	0	bank	0	0	0	0	0	60	40	0		uc
38937	Little Rock Creek	LRC4	4	430	50	6	0	pool	0	0	0	0	0	60	40	0	75	wd
38937	Little Rock Creek	LRC4	4	430	100	32	1	pool	0	0	0	0	0	60	40	0	75	wd
38937	Little Rock Creek	LRC4	4	430	150	44	0	pool	0	0	0	0	0	60	40	0	75	
38937	Little Rock Creek	LRC4	4	430	200	40	1	pool	0	0	0	0	0	60	40	0	75	
38937	Little Rock Creek	LRC4	4	430	250	22	2	pool	0	0	0	0	0	60	40	0	75	
38937	Little Rock Creek	LRC4	4	430	430	0	0	bank	0	0	0	0	0	60	40	0		sb
38937	Little Rock Creek	LRC4	5	510	0	0	0	bank	0	0	0	0	0	60	40	0		sb
38937	Little Rock Creek	LRC4	5	510	50	10	0	pool	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	5	510	100	14	0	pool	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	5	510	150	14	2	pool	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	5	510	200	16	5	pool	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	5	510	250	8	1	pool	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	5	510	330	0	0	bank	0	0	0	0	0	60	40	0		sb
38937	Little Rock Creek	LRC4	6	430	0	0	0	bank	0	0	0	0	0	60	40	0		sb
38937	Little Rock Creek	LRC4	6	430	50	12	3	run	0	0	0	0	0	60	40	0	75	wd
38937	Little Rock Creek	LRC4	6	430	100	18	3	run	0	0	0	0	0	60	40	0	75	
38937	Little Rock Creek	LRC4	6	430	150	18	4	run	0	0	0	0	0	60	40	0	75	
38937	Little Rock Creek	LRC4	6	430	200	18	6	run	0	0	0	0	0	60	40	0	75	
38937	Little Rock Creek	LRC4	6	430	250	8	2	run	0	0	0	0	0	60	40	0	75	
38937	Little Rock Creek	LRC4	6	430	260	0	0	bank	0	0	0	0	0	60	40	0		sb

DATE	LOCATN	SITE	TRNSCT	TOTWDT	CUMWDT	Z(cm)	V(cm/S)	FEATUR	br	bd	cb	gv	pb	sd	st	cl	embed%	COVER
38937	Little Rock Creek	LRC4	7	510	0	0	0	bank	0	0	0	0	0	60	40	0		sb
38937	Little Rock Creek	LRC4	7	510	50	20	0	pool	0	0	0	0	0	60	40	0	75	wd
38937	Little Rock Creek	LRC4	7	510	100	35	4	pool	0	0	0	0	0	60	40	0	75	wd
38937	Little Rock Creek	LRC4	7	510	150	30	3	pool	0	0	0	0	0	60	40	0	75	wd
38937	Little Rock Creek	LRC4	7	510	200	28	0	pool	0	0	0	0	0	60	40	0	75	wd
38937	Little Rock Creek	LRC4	7	510	250	16	0	pool	0	0	0	0	0	60	40	0	75	
38937	Little Rock Creek	LRC4	7	510	280	0	0	bank	0	0	0	0	0	60	40	0		sb
38937	Little Rock Creek	LRC4	8	430	0	0	0	bank	0	0	0	0	0	60	40	0		sb
38937	Little Rock Creek	LRC4	8	430	40	8	4	run	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	8	430	80	4	0	run	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	8	430	120	8	1	run	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	8	430	160	10	5	run	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	8	430	200	7	10	run	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	8	430	230	0	0	bank	0	0	0	0	0	60	40	0		sb
38937	Little Rock Creek	LRC4	9	420	0	0	0	bank	0	0	0	0	0	60	40	0		sb
38937	Little Rock Creek	LRC4	9	420	40	8	3	run	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	9	420	80	7	5	run	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	9	420	120	12	7	run	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	9	420	160	15	6	run	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	9	420	200	15	6	run	0	0	0	0	0	60	40	0		
38937	Little Rock Creek	LRC4	9	420	250	0	0	bank	0	0	0	0	0	60	40	0		sb
38937	Little Rock Creek	LRC4	10	520	0	0	0	bank	0	0	0	0	0	60	40	0		sb
38937	Little Rock Creek	LRC4	10	520	40	10	7	run	0	0	0	0	0	60	40	0	75	
38937	Little Rock Creek	LRC4	10	520	80	14	10	run	0	0	0	0	0	60	40	0	75	
38937	Little Rock Creek	LRC4	10	520	120	10	9	run	0	0	0	0	0	0	100	0	75	
38937	Little Rock Creek	LRC4	10	520	160	12	8	run	0	0	0	0	0	0	100	0	75	wd
38937	Little Rock Creek	LRC4	10	520	200	12	4	run	0	0	0	0	0	0	100	0	75	
38937	Little Rock Creek	LRC4	10	520	220	0	0	bank	0	0	0	0	0	0	100	0		sb
38938	Zuleger	Z4	1	640	0	0	0	bank	0	0	0	0	0	60	40	0		uc
38938	Zuleger	Z4	1	640	50	30	0	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	1	640	100	58	0	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	1	640	150	64	0	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	1	640	200	50	0	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	1	640	250	22	0	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	1	640	360	0	0	bank	0	0	0	0	0	60	40	0		sb
38938	Zuleger	Z4	2	640	0	0	0	bank	0	0	0	0	0	100	0	0		uc

Little Rock Creek TMDL Appendix 1

DATE	LOCATN	SITE	TRNSCT	TOTWDT	CUMWDT	Z(cm)	V(cm/S)	FEATUR	br	bd	cb	gv	pb	sd	st	cl	embed%	COVER
38938	Zuleger	Z4	2	640	30	4	7	run	0	0	0	0	0	100	0	0	75	wd
38938	Zuleger	Z4	2	640	60	2	4	run	0	0	0	0	0	100	0	0	75	
38938	Zuleger	Z4	2	640	90	7	10	run	0	0	0	0	0	100	0	0	75	
38938	Zuleger	Z4	2	640	120	8	14	run	0	0	0	0	0	100	0	0	75	
38938	Zuleger	Z4	2	640	150	8	17	run	0	0	0	0	0	100	0	0	75	wd
38938	Zuleger	Z4	2	640	200	0	0	bank	0	0	0	0	0	100	0	0		
38938	Zuleger	Z4	3	600	0	0	0	bank	0	0	0	0	0	100	0	0		uc
38938	Zuleger	Z4	3	600	40	12	4	run	0	0	0	0	0	100	0	0		uc
38938	Zuleger	Z4	3	600	80	10	6	run	0	0	0	0	0	100	0	0		
38938	Zuleger	Z4	3	600	120	10	6	run	0	0	0	0	0	100	0	0		
38938	Zuleger	Z4	3	600	160	6	3	run	0	0	0	0	0	100	0	0		
38938	Zuleger	Z4	3	600	200	4	0	run	0	0	0	0	0	100	0	0		
38938	Zuleger	Z4	3	600	300	0	0	bank	0	0	0	0	0	100	0	0		uc
38938	Zuleger	Z4	4	650	0	0	0	bank	0	0	0	0	0	40	60	0		uc
38938	Zuleger	Z4	4	650	40	60	1	pool	0	0	0	0	0	40	60	0	75	wd
38938	Zuleger	Z4	4	650	80	56	0	pool	0	0	0	0	0	40	60	0	75	
38938	Zuleger	Z4	4	650	120	54	1	pool	0	0	0	0	0	40	60	0	75	
38938	Zuleger	Z4	4	650	160	36	0	pool	0	0	0	0	0	40	60	0	75	
38938	Zuleger	Z4	4	650	200	25	1	pool	0	0	0	0	0	40	60	0	75	
38938	Zuleger	Z4	4	650	250	0	0	bank	0	0	0	0	0	40	60	0		sb
38938	Zuleger	Z4	5	560	0	0	0	bank	0	0	0	0	0	60	40	0		sb
38938	Zuleger	Z4	5	560	50	23	3	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	5	560	100	38	2	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	5	560	150	46	0	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	5	560	200	37	0	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	5	560	250	28	0	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	5	560	330	0	0	bank	0	0	0	0	0	60	40	0		sb
38938	Zuleger	Z4	6	460	0	0	0	bank	0	0	0	0	0	100	0	0		uc
38938	Zuleger	Z4	6	460	50	8	4	run	0	0	0	0	0	100	0	0	75	wd
38938	Zuleger	Z4	6	460	100	6	9	run	0	0	0	0	0	100	0	0	75	
38938	Zuleger	Z4	6	460	150	2	5	run	0	0	0	0	0	100	0	0	75	
38938	Zuleger	Z4	6	460	200	1	0	run	0	0	0	0	0	100	0	0	75	
38938	Zuleger	Z4	6	460	250	2	6	run	0	0	0	0	0	100	0	0	75	
38938	Zuleger	Z4	6	460	310	0	0	bank	0	0	0	0	0	100	0	0		sb
38938	Zuleger	Z4	7	740	0	0	0	bank	0	0	0	0	0	100	0	0		sb
38938	Zuleger	Z4	7	740	75	4	0	run	0	0	0	0	0	100	0	0	75	

DATE	LOCATN	SITE	TRNSCT	TOTWDT	CUMWDT	Z(cm)	V(cm/S)	FEATUR	br	bd	cb	gv	pb	sd	st	cl	embed%	COVER
38938	Zuleger	Z4	7	740	150	2	5	run	0	0	0	0	0	100	0	0	75	
38938	Zuleger	Z4	7	740	225	5	13	run	0	0	0	0	0	100	0	0	75	
38938	Zuleger	Z4	7	740	300	5	7	run	0	0	0	0	0	100	0	0	75	
38938	Zuleger	Z4	7	740	375	10	15	run	0	0	0	0	0	100	0	0	75	wd
38938	Zuleger	Z4	7	740	490	0	0	bank	0	0	0	0	0	100	0	0		uc
38938	Zuleger	Z4	8	710	0	0	0	bank	0	0	0	0	0	60	40	0		uc
38938	Zuleger	Z4	8	710	50	6	0	run	0	0	0	0	0	60	40	0	75	
38938	Zuleger	Z4	8	710	100	8	1	run	0	0	0	0	0	60	40	0	75	
38938	Zuleger	Z4	8	710	150	10	2	run	0	0	0	0	0	60	40	0	75	
38938	Zuleger	Z4	8	710	200	16	6	run	0	0	0	0	0	60	40	0	75	
38938	Zuleger	Z4	8	710	250	16	0	run	0	0	0	0	0	60	40	0	75	wd
38938	Zuleger	Z4	8	710	300	0	0	bank	0	0	0	0	0	60	40	0		sb
38938	Zuleger	Z4	9	880	0	0	0	bank	0	0	0	0	0	60	40	0		uc
38938	Zuleger	Z4	9	880	40	62	1	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	9	880	80	58	2	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	9	880	120	42	1	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	9	880	160	24	0	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	9	880	200	22	0	pool	0	0	0	0	0	60	40	0		
38938	Zuleger	Z4	9	880	270	0	0	bank	0	0	0	0	0	60	40	0		sb
38938	Zuleger	Z4	10	570	0	0	0	bank	0	0	0	0	0	100	0	0		uc
38938	Zuleger	Z4	10	570	50	12	9	run	0	0	0	0	0	100	0	0	75	wd
38938	Zuleger	Z4	10	570	100	8	0	run	0	0	0	0	0	100	0	0	75	
38938	Zuleger	Z4	10	570	150	4	4	run	0	0	0	0	0	100	0	0	75	
38938	Zuleger	Z4	10	570	200	4	12	run	0	0	0	0	0	100	0	0	75	
38938	Zuleger	Z4	10	570	250	5	0	run	0	0	0	0	0	100	0	0	75	
38938	Zuleger	Z4	10	570	320	0	0	bank	0	0	0	0	0	100	0	0		sb

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	1	LRC1	Core	Pool	1	38938	Ceratopogonidae	Probezzia	7	1555.56
Little Rock	1	LRC1	Core	Pool	1	38938	Chironomidae	Chironomus	2.98	662.04
Little Rock	1	LRC1	Core	Pool	1	38938	Chironomidae	Cladotanytarsus	20.85	4634.26
Little Rock	1	LRC1	Core	Pool	1	38938	Chironomidae	Cryptochironomus	5.96	1324.07
Little Rock	1	LRC1	Core	Pool	1	38938	Chironomidae	Cryptotendipes	5.96	1324.07
Little Rock	1	LRC1	Core	Pool	1	38938	Chironomidae	Microcricotopus	2.98	662.04
Little Rock	1	LRC1	Core	Pool	1	38938	Chironomidae	Paracladopelma	2.98	662.04
Little Rock	1	LRC1	Core	Pool	1	38938	Chironomidae	Paralauterborniella	11.92	2648.15
Little Rock	1	LRC1	Core	Pool	1	38938	Chironomidae	Polypedilum	17.88	3972.22
Little Rock	1	LRC1	Core	Pool	1	38938	Chironomidae	Pseudochironomus	2.98	662.04
Little Rock	1	LRC1	Core	Pool	1	38938	Chironomidae	Rheotanytarsus	2.98	662.04
Little Rock	1	LRC1	Core	Pool	1	38938	Chironomidae	Stempellinella	17.88	3972.22
Little Rock	1	LRC1	Core	Pool	1	38938	Chironomidae	Tanytarsus	44.69	9930.56
Little Rock	1	LRC1	Core	Pool	1	38938	Chironomidae	Thienemanniella	2.98	662.04
Little Rock	1	LRC1	Core	Pool	1	38938	Elmidae	Dubiraphia	6	1333.33
Little Rock	1	LRC1	Core	Pool	1	38938	Elmidae	Macronychus	1	222.22
Little Rock	1	LRC1	Core	Pool	1	38938	Hyalellidae	Hyalella	1	222.22
Little Rock	1	LRC1	Core	Pool	1	38938	Leptoceridae	Oecetis	2	444.44
Little Rock	1	LRC1	Core	Pool	1	38938	Tabanidae	Chrysops	4	888.89
Little Rock	1	LRC1	Core	Pool	1	38938		Acari	1	222.22
Little Rock	1	LRC1	Core	Pool	1	38938		Nematoda	1	222.22
Little Rock	1	LRC1	Core	Pool	1	38938		Oligochaeta	39	8666.67
Little Rock	1	LRC1	Core	Pool	2	38938	Ceratopogonidae	Probezzia	2	444.44
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Chironomus	1.00	222.22
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Cladotanytarsus	4.00	888.89
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Cryptochironomus	4.00	888.89
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Cryptotendipes	8.00	1777.78
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Larsia	4.00	888.89
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Microtendipes	4.00	888.89
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Paracladopelma	4.00	888.89
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Paralauterborniella	8.00	1777.78
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Paratanytarsus	16.00	3555.56
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Paratendipes	8.00	1777.78
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Polypedilum	54.00	12000.00
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Psectrocladius	4.00	888.89
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Stempellinella	20.00	4444.44
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Tanytarsus	29.00	6444.44
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Thienemanniella	4.00	888.89
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Thienemannimyia	4.00	888.89
Little Rock	1	LRC1	Core	Pool	2	38938	Chironomidae	Zavrelimyia	4.00	888.89
Little Rock	1	LRC1	Core	Pool	2	38938	Elmidae	Dubiraphia	2	444.44
Little Rock	1	LRC1	Core	Pool	2	38938	Elmidae	Elmidae	3	666.67
Little Rock	1	LRC1	Core	Pool	2	38938	Glossiphoniidae	Glossiphoniidae	1	222.22
Little Rock	1	LRC1	Core	Pool	2	38938	Hydridae	Hydra	1	222.22
Little Rock	1	LRC1	Core	Pool	2	38938	Leptoceridae	Leptoceridae	1	222.22
Little Rock	1	LRC1	Core	Pool	2	38938	Polycentropodidae	Polycentropus	1	222.22
Little Rock	1	LRC1	Core	Pool	2	38938	Sphaeriidae	Sphaeriidae	1	222.22
Little Rock	1	LRC1	Core	Pool	2	38938		Nematoda	11	2444.44
Little Rock	1	LRC1	Core	Pool	2	38938		Oligochaeta	67	14888.89
Little Rock	1	LRC1	Core	Pool	3	38938	Asellidae	Caecidotea	1	222.22
Little Rock	1	LRC1	Core	Pool	3	38938	Baetidae	Baetidae	2	444.44

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	1	LRC1	Core	Pool	3	38938	Chironomidae	Cladotanytarsus	2.06	458.78
Little Rock	1	LRC1	Core	Pool	3	38938	Chironomidae	Cryptochironomus	1.03	229.39
Little Rock	1	LRC1	Core	Pool	3	38938	Chironomidae	Microcricotopus	1.03	229.39
Little Rock	1	LRC1	Core	Pool	3	38938	Chironomidae	Microtendipes	1.03	229.39
Little Rock	1	LRC1	Core	Pool	3	38938	Chironomidae	Parachironomus	1.03	229.39
Little Rock	1	LRC1	Core	Pool	3	38938	Chironomidae	Paralauterborniella	1.03	229.39
Little Rock	1	LRC1	Core	Pool	3	38938	Chironomidae	Paratanytarsus	4.13	917.56
Little Rock	1	LRC1	Core	Pool	3	38938	Chironomidae	Polypedilum	8.26	1835.13
Little Rock	1	LRC1	Core	Pool	3	38938	Chironomidae	Stempellinella	3.10	688.17
Little Rock	1	LRC1	Core	Pool	3	38938	Chironomidae	Tanytarsus	8.26	1835.13
Little Rock	1	LRC1	Core	Pool	3	38938	Chironomidae	Zavrelimyia	1.03	229.39
Little Rock	1	LRC1	Core	Pool	3	38938	Dytiscidae	Agabus	1	222.22
Little Rock	1	LRC1	Core	Pool	3	38938	Hydropsychidae	Cheumatopsyche	1	222.22
Little Rock	1	LRC1	Core	Pool	3	38938	Physidae	Physella	3	666.67
Little Rock	1	LRC1	Core	Pool	3	38938	Polycentropodidae	Polycentropus	1	222.22
Little Rock	1	LRC1	Core	Pool	3	38938	Sialidae	Sialis	1	222.22
Little Rock	1	LRC1	Core	Pool	3	38938		Oligochaeta	5	1111.11
Little Rock	1	LRC1	Dnet	Bank	1	38938	Aeshnidae	Aeshna	3	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Aeshnidae	Boyeria	3	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Asellidae	Caecidotea	18	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Baetidae	Baetis	30	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Belostomatidae	Belostoma	1	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Brachycentridae	Brachycentrus	4	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Calopterygidae	Calopteryx	30	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Ceratopogonidae	Culicoides	4	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Chironomidae	Cladotanytarsus	9.38	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Chironomidae	Microtendipes	16.45	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Chironomidae	Paracladopelma	9.38	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Chironomidae	Paratanytarsus	115.15	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Chironomidae	Paratendipes	32.90	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Chironomidae	Polypedilum	75.18	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Chironomidae	Rheotanytarsus	298.40	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Chironomidae	Tanytarsus	115.15	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Chironomidae	Thienemannimyia	44.58	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Chironomidae	Zavrelimyia	16.45	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Coenagrionidae	Enallagma	39	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Corixidae	Corixidae	6	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Dytiscidae	Hydroporus	2	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Elmidae	Dubiraphia	10	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Elmidae	Macronychus	2	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Empididae	Hemerodromia	5	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Gammaridae	Gammarus	1	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Haliplidae	Haliplidae	4	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Heptageniidae	Stenonema	3	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Hyalellidae	Hyalella	160	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Hydraenidae	Hydraena	2	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Hydrobiidae	Hydrobiidae	26	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Hydrophilidae	Hydrophilidae	8	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Hydropsychidae	Cheumatopsyche	2	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Leptoceridae	Triaenodes	2	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Libellulidae	Libellula	2	

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	1	LRC1	Dnet	Bank	1	38938	Libellulidae	Libellulidae	8	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Nepidae	Ranatra	1	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Phryganeidae	Ptilostomis	1	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Physidae	Physella	110	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Pleidae	Neoplea	3	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Sialidae	Sialis	5	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Sphaeriidae	Sphaeriidae	6	
Little Rock	1	LRC1	Dnet	Bank	1	38938	Tabanidae	Chrysops	6	
Little Rock	1	LRC1	Dnet	Bank	1	38938		Oligochaeta	84	
Little Rock	1	LRC1	Dnet	Bank	1	38938		Turbellaria	24	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Asellidae	Caecidotea	10	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Athericidae	Atherix	1	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Baetidae	Baetidae	1	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Baetidae	Baetis	2	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Brachycentridae	Brachycentrus	4	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Caenidae	Caenis	2	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Calopterygidae	Calopteryx	2	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Chironomidae	Microtendipes	17.63	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Chironomidae	Paratanytarsus	64.13	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Chironomidae	Paratendipes	106.13	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Chironomidae	Phaenopsectra	21.38	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Chironomidae	Polypedilum	35.63	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Chironomidae	Procladius	6.75	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Chironomidae	Rheotanytarsus	28.50	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Chironomidae	Tanytarsus	21.38	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Chironomidae	Thienemannimyia	10.50	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Coenagrionidae	Coenagrionidae	3	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Coenagrionidae	Enallagma	3	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Corduliidae	Corduliidae	1	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Elmidae	Ancyronyx	5	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Elmidae	Dubiraphia	10	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Elmidae	Macronychus	41	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Gerridae	Aquarius	1	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Gyrinidae	Dineutus	8	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Helicopsychidae	Helicopsyche	1	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Heptageniidae	Stenonema	3	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Hyalellidae	Hyalella	14	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Hydropsychidae	Hydropsychidae	4	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Leptophlebiidae	Leptophlebiidae	1	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Limnephilidae	Limnephilidae	2	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Limnephilidae	Pycnopsyche	3	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Physidae	Physella	31	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Pleidae	Neoplea	1	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Polycentropodidae	Nyctiophylax	5	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Polycentropodidae	Polycentropodidae	2	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Polycentropodidae	Polycentropus	1	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Sialidae	Sialis	3	
Little Rock	1	LRC1	Dnet	Wood	2	38938	Sphaeriidae	Sphaeriidae	11	
Little Rock	1	LRC1	Dnet	Wood	2	38938		Nematoda	2	
Little Rock	1	LRC1	Dnet	Wood	2	38938		Oligochaeta	38	
Little Rock	1	LRC1	Hess	Run	1	38938	Aeshnidae	Boyeria	2	23.26

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	1	LRC1	Hess	Run	1	38938	Ancylidae	Ferrissia	26	302.33
Little Rock	1	LRC1	Hess	Run	1	38938	Asellidae	Caecidotea	6	69.77
Little Rock	1	LRC1	Hess	Run	1	38938	Athericidae	Atherix	5	58.14
Little Rock	1	LRC1	Hess	Run	1	38938	Baetidae	Baetidae	73	848.84
Little Rock	1	LRC1	Hess	Run	1	38938	Baetiscidae	Baetisca	2	23.26
Little Rock	1	LRC1	Hess	Run	1	38938	Brachycentridae	Brachycentrus	12	139.53
Little Rock	1	LRC1	Hess	Run	1	38938	Brachycentridae	Micrasema	49	569.77
Little Rock	1	LRC1	Hess	Run	1	38968	Chironomidae	Cladotanytarsus	565.65	6577.33
Little Rock	1	LRC1	Hess	Run	1	38968	Chironomidae	Parametriocnemus	62.85	730.81
Little Rock	1	LRC1	Hess	Run	1	38968	Chironomidae	Paratanytarsus	125.70	1461.63
Little Rock	1	LRC1	Hess	Run	1	38968	Chironomidae	Polypedilum	190.55	2215.70
Little Rock	1	LRC1	Hess	Run	1	38968	Chironomidae	Psectrocladius	62.85	730.81
Little Rock	1	LRC1	Hess	Run	1	38968	Chironomidae	Rheotanytarsus	1206.15	14025.00
Little Rock	1	LRC1	Hess	Run	1	38968	Chironomidae	Tanytarsus	253.40	2946.51
Little Rock	1	LRC1	Hess	Run	1	38968	Chironomidae	Thienemanniella	62.85	730.81
Little Rock	1	LRC1	Hess	Run	1	38938	Corixidae	Sigara	24	279.07
Little Rock	1	LRC1	Hess	Run	1	38938	Elmidae	Dubiraphia	49	569.77
Little Rock	1	LRC1	Hess	Run	1	38938	Elmidae	Optioservus	38	441.86
Little Rock	1	LRC1	Hess	Run	1	38938	Elmidae	Stenelmis	18	209.30
Little Rock	1	LRC1	Hess	Run	1	38938	Empididae	Hemerodromia	18	209.30
Little Rock	1	LRC1	Hess	Run	1	38938	Gammaridae	Gammarus	1	11.63
Little Rock	1	LRC1	Hess	Run	1	38938	Heptageniidae	Stenonema	14	162.79
Little Rock	1	LRC1	Hess	Run	1	38938	Hyalellidae	Hyalella	144	1674.42
Little Rock	1	LRC1	Hess	Run	1	38938	Hydridae	Hydra	6	69.77
Little Rock	1	LRC1	Hess	Run	1	38938	Hydropsychidae	Cheumatopsyche	30	348.84
Little Rock	1	LRC1	Hess	Run	1	38938	Hydropsychidae	Hydropsyche	29	337.21
Little Rock	1	LRC1	Hess	Run	1	38938	Hydropsychidae	Hydropsychidae	20	232.56
Little Rock	1	LRC1	Hess	Run	1	38938	Hydroptilidae	Hydroptila	4	46.51
Little Rock	1	LRC1	Hess	Run	1	38938	Leptoceridae	Leptoceridae	1	11.63
Little Rock	1	LRC1	Hess	Run	1	38938	Leptoceridae	Oecetis	2	23.26
Little Rock	1	LRC1	Hess	Run	1	38938	Leptophlebiidae	Leptophlebiidae	4	46.51
Little Rock	1	LRC1	Hess	Run	1	38938	Perlodidae	Perlodidae	2	23.26
Little Rock	1	LRC1	Hess	Run	1	38938	Physidae	Physella	64	744.19
Little Rock	1	LRC1	Hess	Run	1	38938	Polycentropodidae	Neureclipsis	42	488.37
Little Rock	1	LRC1	Hess	Run	1	38938	Simuliidae	Simulium	2	23.26
Little Rock	1	LRC1	Hess	Run	1	38938	Tipulidae	Antocha	10	116.28
Little Rock	1	LRC1	Hess	Run	1	38938	Tipulidae	Dicranota	9	104.65
Little Rock	1	LRC1	Hess	Run	1	38938	Tipulidae	Tipula	4	46.51
Little Rock	1	LRC1	Hess	Run	1	38938		Acari	82	953.49
Little Rock	1	LRC1	Hess	Run	1	38938		Nematoda	66	767.44
Little Rock	1	LRC1	Hess	Run	1	38938		Oligochaeta	184	2139.53
Little Rock	1	LRC1	Hess	Run	1	38938		Turbellaria	28	325.58
Little Rock	1	LRC1	Hess	Run	2	38938	Aeshnidae	Boyeria	2	23.26
Little Rock	1	LRC1	Hess	Run	2	38938	Ancylidae	Ferrissia	4	46.51
Little Rock	1	LRC1	Hess	Run	2	38938	Baetidae	Baetidae	64	744.19
Little Rock	1	LRC1	Hess	Run	2	38938	Baetiscidae	Baetisca	12	139.53
Little Rock	1	LRC1	Hess	Run	2	38938	Brachycentridae	Brachycentrus	74	860.47
Little Rock	1	LRC1	Hess	Run	2	38938	Brachycentridae	Micrasema	32	372.09
Little Rock	1	LRC1	Hess	Run	2	38938	Caenidae	Caenis	24	279.07
Little Rock	1	LRC1	Hess	Run	2	38938	Ceratopogonidae	Culicoides	8	93.02
Little Rock	1	LRC1	Hess	Run	2	38938	Chironomidae	Cladotanytarsus	2558.40	29748.84

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	1	LRC1	Hess	Run	2	38938	Chironomidae	Microtendipes	55.75	648.26
Little Rock	1	LRC1	Hess	Run	2	38938	Chironomidae	Paratanytarsus	393.60	4576.74
Little Rock	1	LRC1	Hess	Run	2	38938	Chironomidae	Paratendipes	196.80	2288.37
Little Rock	1	LRC1	Hess	Run	2	38938	Chironomidae	Polypedilum	393.60	4576.74
Little Rock	1	LRC1	Hess	Run	2	38938	Chironomidae	Rheotanytarsus	3148.80	36613.95
Little Rock	1	LRC1	Hess	Run	2	38938	Chironomidae	Saetheria	196.80	2288.37
Little Rock	1	LRC1	Hess	Run	2	38938	Chironomidae	Tanytarsus	590.40	6865.12
Little Rock	1	LRC1	Hess	Run	2	38938	Chironomidae	Thienemannimyia	783.85	9114.53
Little Rock	1	LRC1	Hess	Run	2	38938	Coenagrionidae	Coenagrionidae	8	93.02
Little Rock	1	LRC1	Hess	Run	2	38938	Corixidae	Corixidae	4	46.51
Little Rock	1	LRC1	Hess	Run	2	38938	Elmidae	Dubiraphia	107	1244.19
Little Rock	1	LRC1	Hess	Run	2	38938	Elmidae	Optioservus	48	558.14
Little Rock	1	LRC1	Hess	Run	2	38938	Elmidae	Stenelmis	61	709.30
Little Rock	1	LRC1	Hess	Run	2	38938	Empididae	Hemerodromia	16	186.05
Little Rock	1	LRC1	Hess	Run	2	38938	Glossosomatidae	Protoptila	16	186.05
Little Rock	1	LRC1	Hess	Run	2	38938	Heptageniidae	Heptageniidae	4	46.51
Little Rock	1	LRC1	Hess	Run	2	38938	Hyalellidae	Hyalella	84	976.74
Little Rock	1	LRC1	Hess	Run	2	38938	Hydropsychidae	Cheumatopsyche	1	11.63
Little Rock	1	LRC1	Hess	Run	2	38938	Hydropsychidae	Hydropsychidae	24	279.07
Little Rock	1	LRC1	Hess	Run	2	38938	Leptoceridae	Leptoceridae	13	151.16
Little Rock	1	LRC1	Hess	Run	2	38938	Leptoceridae	Nectopsyche	3	34.88
Little Rock	1	LRC1	Hess	Run	2	38938	Leptoceridae	Oecetis	8	93.02
Little Rock	1	LRC1	Hess	Run	2	38938	Leptophlebiidae	Leptophlebiidae	4	46.51
Little Rock	1	LRC1	Hess	Run	2	38938	Perlodidae	Perlodidae	24	279.07
Little Rock	1	LRC1	Hess	Run	2	38938	Physidae	Physella	69	802.33
Little Rock	1	LRC1	Hess	Run	2	38938	Simuliidae	Simulium	4	46.51
Little Rock	1	LRC1	Hess	Run	2	38938	Sphaeriidae	Sphaeriidae	16	186.05
Little Rock	1	LRC1	Hess	Run	2	38938	Tabanidae	Chrysops	16	186.05
Little Rock	1	LRC1	Hess	Run	2	38938	Tipulidae	Antocha	4	46.51
Little Rock	1	LRC1	Hess	Run	2	38938	Tipulidae	Dicranota	5	58.14
Little Rock	1	LRC1	Hess	Run	2	38938	Tipulidae	Tipula	3	34.88
Little Rock	1	LRC1	Hess	Run	2	38938	Viviparidae	Viviparidae	4	46.51
Little Rock	1	LRC1	Hess	Run	2	38938		Acari	113	1313.95
Little Rock	1	LRC1	Hess	Run	2	38938		Ephemeroptera	16	186.05
Little Rock	1	LRC1	Hess	Run	2	38938		Nematoda	70	813.95
Little Rock	1	LRC1	Hess	Run	2	38938		Oligochaeta	1239	14406.98
Little Rock	1	LRC1	Hess	Run	2	38938		Turbellaria	4	46.51
Little Rock	1	LRC1	Hess	Run	3	38938	Aeshnidae	Boyeria	2	23.26
Little Rock	1	LRC1	Hess	Run	3	38938	Ancylidae	Ferrissia	5	58.14
Little Rock	1	LRC1	Hess	Run	3	38938	Athericidae	Atherix	8	93.02
Little Rock	1	LRC1	Hess	Run	3	38938	Baetidae	Baetis	105	1220.93
Little Rock	1	LRC1	Hess	Run	3	38938	Baetiscidae	Baetisca	8	93.02
Little Rock	1	LRC1	Hess	Run	3	38938	Brachycentridae	Brachycentrus	30	348.84
Little Rock	1	LRC1	Hess	Run	3	38938	Brachycentridae	Micrasema	30	348.84
Little Rock	1	LRC1	Hess	Run	3	38938	Caenidae	Caenidae	8	93.02
Little Rock	1	LRC1	Hess	Run	3	38938	Ceratopogonidae	Probezzia	6	69.77
Little Rock	1	LRC1	Hess	Run	3	38937	Chironomidae	Cladotanytarsus	1099.88	12789.24
Little Rock	1	LRC1	Hess	Run	3	38937	Chironomidae	Parametriocnemus	69.15	804.07
Little Rock	1	LRC1	Hess	Run	3	38937	Chironomidae	Polypedilum	90.03	1046.80
Little Rock	1	LRC1	Hess	Run	3	38937	Chironomidae	Rheocricotopus	69.15	804.07
Little Rock	1	LRC1	Hess	Run	3	38937	Chironomidae	Rheotanytarsus	1328.20	15444.19

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	1	LRC1	Hess	Run	3	38937	Chironomidae	Tanytarsus	138.30	1608.14
Little Rock	1	LRC1	Hess	Run	3	38937	Chironomidae	Thienemannimyia	138.30	1608.14
Little Rock	1	LRC1	Hess	Run	3	38938	Crambidae	Paraponyx	2	23.26
Little Rock	1	LRC1	Hess	Run	3	38938	Elmidae	Dubiraphia	18	209.30
Little Rock	1	LRC1	Hess	Run	3	38938	Elmidae	Optioservus	150	1744.19
Little Rock	1	LRC1	Hess	Run	3	38938	Elmidae	Stenelmis	77	895.35
Little Rock	1	LRC1	Hess	Run	3	38938	Empididae	Hemerodromia	46	534.88
Little Rock	1	LRC1	Hess	Run	3	38938	Erpobdellidae	Erpobdellidae	2	23.26
Little Rock	1	LRC1	Hess	Run	3	38938	Glossosomatidae	Protoptila	2	23.26
Little Rock	1	LRC1	Hess	Run	3	38938	Heptageniidae	Stenonema	31	360.47
Little Rock	1	LRC1	Hess	Run	3	38938	Hyalellidae	Hyalella	10	116.28
Little Rock	1	LRC1	Hess	Run	3	38938	Hydropsychidae	Cheumatopsyche	54	627.91
Little Rock	1	LRC1	Hess	Run	3	38938	Hydropsychidae	Hydropsyche	56	651.16
Little Rock	1	LRC1	Hess	Run	3	38938	Leptophlebiidae	Leptophlebiidae	4	46.51
Little Rock	1	LRC1	Hess	Run	3	38938	Perlodidae	Perlodidae	11	127.91
Little Rock	1	LRC1	Hess	Run	3	38938	Physidae	Physella	22	255.81
Little Rock	1	LRC1	Hess	Run	3	38938	Sphaeriidae	Sphaeriidae	6	69.77
Little Rock	1	LRC1	Hess	Run	3	38938	Tabanidae	Chrysops	1	11.63
Little Rock	1	LRC1	Hess	Run	3	38938	Tipulidae	Antocha	3	34.88
Little Rock	1	LRC1	Hess	Run	3	38938	Tipulidae	Dicranota	4	46.51
Little Rock	1	LRC1	Hess	Run	3	38938	Tipulidae	Tipula	3	34.88
Little Rock	1	LRC1	Hess	Run	3	38938	Uenoidae	Neophylax	1	11.63
Little Rock	1	LRC1	Hess	Run	3	38938		Acari	152	1767.44
Little Rock	1	LRC1	Hess	Run	3	38938		Coleoptera	2	23.26
Little Rock	1	LRC1	Hess	Run	3	38938		Nematoda	27	313.95
Little Rock	1	LRC1	Hess	Run	3	38938		Oligochaeta	314	3651.16
Little Rock	1	LRC1	Hess	Run	3	38938		Turbellaria	5	58.14
Little Rock	2	LRC2	Core	Run	1	38937	Ceratopogonidae	Probezzia	1	222.22
Little Rock	2	LRC2	Core	Run	1	38937	Chironomidae	Cladotanytarsus	3.63	805.56
Little Rock	2	LRC2	Core	Run	1	38937	Chironomidae	Cricotopus	1.21	268.52
Little Rock	2	LRC2	Core	Run	1	38937	Chironomidae	Cryptochironomus	1.21	268.52
Little Rock	2	LRC2	Core	Run	1	38937	Chironomidae	Larsia	1.21	268.52
Little Rock	2	LRC2	Core	Run	1	38937	Chironomidae	Microcricotopus	1.21	268.52
Little Rock	2	LRC2	Core	Run	1	38937	Chironomidae	Microtendipes	2.42	537.04
Little Rock	2	LRC2	Core	Run	1	38937	Chironomidae	Parachironomus	1.21	268.52
Little Rock	2	LRC2	Core	Run	1	38937	Chironomidae	Paracladopelma	3.63	805.56
Little Rock	2	LRC2	Core	Run	1	38937	Chironomidae	Paralauterborniella	32.63	7250.00
Little Rock	2	LRC2	Core	Run	1	38937	Chironomidae	Stempellinella	9.67	2148.15
Little Rock	2	LRC2	Core	Run	1	38937	Corixidae	Corixidae	1	222.22
Little Rock	2	LRC2	Core	Run	1	38937	Dixidae	Dixella	1	222.22
Little Rock	2	LRC2	Core	Run	1	38937	Empididae	Hemerodromia	1	222.22
Little Rock	2	LRC2	Core	Run	1	38937	Glossosomatidae	Protoptila	1	222.22
Little Rock	2	LRC2	Core	Run	1	38937	Heptageniidae	Heptageniidae	1	222.22
Little Rock	2	LRC2	Core	Run	1	38937	Hydropsychidae	Hydropsyche	2	444.44
Little Rock	2	LRC2	Core	Run	1	38937		Acari	3	666.67
Little Rock	2	LRC2	Core	Run	1	38937		Collembola	3	666.67
Little Rock	2	LRC2	Core	Run	1	38937		Nematoda	1	222.22
Little Rock	2	LRC2	Core	Run	1	38937		Oligochaeta	2	444.44
Little Rock	2	LRC2	Core	Run	2	38937	Baetidae	Baetis	1	222.22
Little Rock	2	LRC2	Core	Run	2	38937	Caenidae	Caenis	1	222.22
Little Rock	2	LRC2	Core	Run	2	38937	Chironomidae	Cladotanytarsus	1.06	235.69

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	2	LRC2	Core	Run	2	38937	Chironomidae	Corynoneura	1.06	235.69
Little Rock	2	LRC2	Core	Run	2	38937	Chironomidae	Microcricotopus	3.18	707.07
Little Rock	2	LRC2	Core	Run	2	38937	Chironomidae	Nanocladius	1.06	235.69
Little Rock	2	LRC2	Core	Run	2	38937	Chironomidae	Paracladopelma	2.12	471.38
Little Rock	2	LRC2	Core	Run	2	38937	Chironomidae	Paralauterborniella	13.79	3063.97
Little Rock	2	LRC2	Core	Run	2	38937	Chironomidae	Polypedilum	5.30	1178.45
Little Rock	2	LRC2	Core	Run	2	38937	Chironomidae	Psectrocladius	1.06	235.69
Little Rock	2	LRC2	Core	Run	2	38937	Chironomidae	Rheotanytarsus	1.06	235.69
Little Rock	2	LRC2	Core	Run	2	38937	Chironomidae	Stempellinella	1.06	235.69
Little Rock	2	LRC2	Core	Run	2	38937	Chironomidae	Tanytarsus	2.12	471.38
Little Rock	2	LRC2	Core	Run	2	38937	Chironomidae	Thienemannimyia	2.12	471.38
Little Rock	2	LRC2	Core	Run	2	38937	Dixidae	Dixella	1	222.22
Little Rock	2	LRC2	Core	Run	2	38937	Empididae	Chelifera	1	222.22
Little Rock	2	LRC2	Core	Run	2	38937	Physidae	Physella	1	222.22
Little Rock	2	LRC2	Core	Run	2	38937	Tabanidae	Chrysops	1	222.22
Little Rock	2	LRC2	Core	Run	2	38937		Acari	5	1111.11
Little Rock	2	LRC2	Core	Run	2	38937		Ephemeroptera	1	222.22
Little Rock	2	LRC2	Core	Run	2	38937		Nematoda	1	222.22
Little Rock	2	LRC2	Core	Run	2	38937		Oligochaeta	1	222.22
Little Rock	2	LRC2	Core	Run	3	38937	Chironomidae	Cladotanytarsus	1.00	222.22
Little Rock	2	LRC2	Core	Run	3	38937	Chironomidae	Corynoneura	1.00	222.22
Little Rock	2	LRC2	Core	Run	3	38937	Chironomidae	Cryptochironomus	1.00	222.22
Little Rock	2	LRC2	Core	Run	3	38937	Chironomidae	Eukiefferiella	1.00	222.22
Little Rock	2	LRC2	Core	Run	3	38937	Chironomidae	Paracladopelma	2.00	444.44
Little Rock	2	LRC2	Core	Run	3	38937	Chironomidae	Paralauterborniella	16.00	3555.56
Little Rock	2	LRC2	Core	Run	3	38937	Chironomidae	Polypedilum	5.00	1111.11
Little Rock	2	LRC2	Core	Run	3	38937	Chironomidae	Stempellina	1.00	222.22
Little Rock	2	LRC2	Core	Run	3	38937	Chironomidae	Stempellinella	16.00	3555.56
Little Rock	2	LRC2	Core	Run	3	38937	Chironomidae	Tanytarsus	2.00	444.44
Little Rock	2	LRC2	Core	Run	3	38937	Elmidae	Elmidae	2	444.44
Little Rock	2	LRC2	Core	Run	3	38937	Elmidae	Macronychus	1	222.22
Little Rock	2	LRC2	Core	Run	3	38937	Ephemerellidae	Ephemerellidae	1	222.22
Little Rock	2	LRC2	Core	Run	3	38937		Acari	4	888.89
Little Rock	2	LRC2	Core	Run	3	38937		Collembola	2	444.44
Little Rock	2	LRC2	Dnet	Bank	1	38937	Aeshnidae	Aeshna	1	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Athericidae	Atherix	2	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Baetidae	Baetis	2	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Brachycentridae	Micrasema	2	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Caenidae	Caenis	12	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Calopterygidae	Calopteryx	21	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Chironomidae	Cryptochironomus	2.05	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Chironomidae	Endochironomus	1.00	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Chironomidae	Microtendipes	4.11	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Chironomidae	Parametriocnemus	4.11	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Chironomidae	Paratanytarsus	4.11	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Chironomidae	Phaenopsectra	1.00	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Chironomidae	Polypedilum	16.42	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Chironomidae	Rheotanytarsus	18.47	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Chironomidae	Stempellinella	4.11	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Chironomidae	Tanytarsus	16.42	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Chironomidae	Thienemannimyia	4.11	

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	2	LRC2	Dnet	Bank	1	38937	Chironomidae	Zavrelimyia	4.11	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Corixidae	Corixidae	121	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Corixidae	Hesperocorixa	4	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Corixidae	Sigara	28	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Dixidae	Dixella	2	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Dryopidae	Helichus	2	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Elmidae	Dubiraphia	4	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Elmidae	Elmidae	8	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Elmidae	Macronychus	2	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Empididae	Hemerodromia	4	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Ephydridae	Ephydridae	2	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Gammaridae	Gammarus	63	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Hyalellidae	Hyalella	2	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Hydridae	Hydra	2	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Hydropsychidae	Cheumatopsyche	6	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Leptoceridae	Oecetis	6	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Leptophlebiidae	Leptophlebiidae	4	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Limnephilidae	Limnephilidae	2	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Limnephilidae	Pycnopsyche	1	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Physidae	Physella	30	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Planorbidae	Planorbidae	2	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Sphaeriidae	Sphaeriidae	8	
Little Rock	2	LRC2	Dnet	Bank	1	38937	Tabanidae	Chrysops	2	
Little Rock	2	LRC2	Dnet	Bank	1	38937		Acari	6	
Little Rock	2	LRC2	Dnet	Bank	1	38937		Decapoda	1	
Little Rock	2	LRC2	Dnet	Bank	1	38937		Oligochaeta	26	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Aeshnidae	Boyeria	1	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Ancylidae	Ferrissia	1	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Athericidae	Atherix	1	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Baetidae	Baetis	10	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Brachycentridae	Micrasema	1	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Caenidae	Caenis	6	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Calopterygidae	Calopteryx	2	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Chironomidae	Microcricotopus	2.85	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Chironomidae	Microtendipes	14.25	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Chironomidae	Parametriocnemus	14.25	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Chironomidae	Phaenopsectra	3.85	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Chironomidae	Polypedilum	38.05	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Chironomidae	Rheotanytarsus	22.80	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Chironomidae	Tanytarsus	2.85	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Chironomidae	Thienemannimyia	23.10	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Coenagrionidae	Coenagrionidae	3	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Corixidae	Corixidae	3	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Corixidae	Sigara	8	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Culicidae	Culicidae	1	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Elmidae	Dubiraphia	1	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Elmidae	Elmidae	38	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Elmidae	Macronychus	4	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Elmidae	Optioservus	1	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Empididae	Chelifera	3	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Empididae	Hemerodromia	9	

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	2	LRC2	Dnet	Wood	2	38937	Gammaridae	Gammarus	36	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Heptageniidae	Stenonema	7	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Hydropsychidae	Cheumatopsyche	2	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Hydropsychidae	Hydropsyche	4	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Leptoceridae	Mystacides	1	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Leptoceridae	Oecetis	2	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Physidae	Physella	9	
Little Rock	2	LRC2	Dnet	Wood	2	38937	Sphaeriidae	Sphaeriidae	1	
Little Rock	2	LRC2	Dnet	Wood	2	38937		Nematoda	1	
Little Rock	2	LRC2	Dnet	Wood	2	38937		Oligochaeta	12	
Little Rock	2	LRC2	Hess	Riffle	1	38937	Baetidae	Baetidae	5	58.14
Little Rock	2	LRC2	Hess	Riffle	1	38937	Brachycentridae	Micrasema	80	930.23
Little Rock	2	LRC2	Hess	Riffle	1	38937	Caenidae	Caenis	1	11.63
Little Rock	2	LRC2	Hess	Riffle	1	38968	Chironomidae	Cladotanytarsus	37.00	430.23
Little Rock	2	LRC2	Hess	Riffle	1	38968	Chironomidae	Cricotopus	13.88	161.34
Little Rock	2	LRC2	Hess	Riffle	1	38968	Chironomidae	Eukiefferiella	4.63	53.78
Little Rock	2	LRC2	Hess	Riffle	1	38968	Chironomidae	Odontomesa	4.63	53.78
Little Rock	2	LRC2	Hess	Riffle	1	38968	Chironomidae	Parametriocnemus	9.25	107.56
Little Rock	2	LRC2	Hess	Riffle	1	38968	Chironomidae	Paratendipes	4.63	53.78
Little Rock	2	LRC2	Hess	Riffle	1	38968	Chironomidae	Polypedilum	27.75	322.67
Little Rock	2	LRC2	Hess	Riffle	1	38968	Chironomidae	Psectrocladius	4.63	53.78
Little Rock	2	LRC2	Hess	Riffle	1	38968	Chironomidae	Rheocricotopus	4.63	53.78
Little Rock	2	LRC2	Hess	Riffle	1	38968	Chironomidae	Rheotanytarsus	23.13	268.90
Little Rock	2	LRC2	Hess	Riffle	1	38968	Chironomidae	Stempellinella	13.88	161.34
Little Rock	2	LRC2	Hess	Riffle	1	38968	Chironomidae	Tanytarsus	74.00	860.47
Little Rock	2	LRC2	Hess	Riffle	1	38937	Dryopidae	Helichus	1	11.63
Little Rock	2	LRC2	Hess	Riffle	1	38937	Elmidae	Dubiraphia	5	58.14
Little Rock	2	LRC2	Hess	Riffle	1	38937	Elmidae	Optioservus	5	58.14
Little Rock	2	LRC2	Hess	Riffle	1	38937	Empididae	Chelifera	2	23.26
Little Rock	2	LRC2	Hess	Riffle	1	38937	Empididae	Hemerodromia	27	313.95
Little Rock	2	LRC2	Hess	Riffle	1	38937	Gammaridae	Gammarus	15	174.42
Little Rock	2	LRC2	Hess	Riffle	1	38937	Heptageniidae	Stenonema	4	46.51
Little Rock	2	LRC2	Hess	Riffle	1	38937	Hydropsychidae	Cheumatopsyche	17	197.67
Little Rock	2	LRC2	Hess	Riffle	1	38937	Hydropsychidae	Hydropsyche	12	139.53
Little Rock	2	LRC2	Hess	Riffle	1	38937	Hydropsychidae	Hydropsychidae	10	116.28
Little Rock	2	LRC2	Hess	Riffle	1	38937	Perlidae	Perlidae	3	34.88
Little Rock	2	LRC2	Hess	Riffle	1	38937	Perlodidae	Perlodidae	1	11.63
Little Rock	2	LRC2	Hess	Riffle	1	38937	Physidae	Physella	4	46.51
Little Rock	2	LRC2	Hess	Riffle	1	38937	Simuliidae	Simuliidae	3	34.88
Little Rock	2	LRC2	Hess	Riffle	1	38937	Tipulidae	Tipula	1	11.63
Little Rock	2	LRC2	Hess	Riffle	1	38937		Acari	45	523.26
Little Rock	2	LRC2	Hess	Riffle	1	38937		Nematoda	10	116.28
Little Rock	2	LRC2	Hess	Riffle	1	38937		Oligochaeta	6	69.77
Little Rock	2	LRC2	Hess	Riffle	2	38937	Ancylidae	Ferrissia	2	23.26
Little Rock	2	LRC2	Hess	Riffle	2	38937	Athericidae	Atherix	30	348.84
Little Rock	2	LRC2	Hess	Riffle	2	38937	Baetidae	Baetis	72	837.21
Little Rock	2	LRC2	Hess	Riffle	2	38937	Brachycentridae	Brachycentrus	3	34.88
Little Rock	2	LRC2	Hess	Riffle	2	38937	Brachycentridae	Micrasema	136	1581.40
Little Rock	2	LRC2	Hess	Riffle	2	38937	Caenidae	Caenis	6	69.77
Little Rock	2	LRC2	Hess	Riffle	2	38937	Ceratopogonidae	Atrichopogon	2	23.26
Little Rock	2	LRC2	Hess	Riffle	2	38937	Chironomidae	Brillia	11.00	127.91

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	2	LRC2	Hess	Riffle	2	38937	Chironomidae	Cladotanytarsus	77.00	895.35
Little Rock	2	LRC2	Hess	Riffle	2	38937	Chironomidae	Cricotopus	33.00	383.72
Little Rock	2	LRC2	Hess	Riffle	2	38937	Chironomidae	Eukiefferiella	33.00	383.72
Little Rock	2	LRC2	Hess	Riffle	2	38937	Chironomidae	Microtendipes	2.00	23.26
Little Rock	2	LRC2	Hess	Riffle	2	38937	Chironomidae	Parametriocnemus	66.00	767.44
Little Rock	2	LRC2	Hess	Riffle	2	38937	Chironomidae	Polypedilum	66.00	767.44
Little Rock	2	LRC2	Hess	Riffle	2	38937	Chironomidae	Rheotanytarsus	165.00	1918.60
Little Rock	2	LRC2	Hess	Riffle	2	38937	Chironomidae	Saetheria	11.00	127.91
Little Rock	2	LRC2	Hess	Riffle	2	38937	Chironomidae	Tanytarsus	44.00	511.63
Little Rock	2	LRC2	Hess	Riffle	2	38937	Dryopidae	Helichus	5	58.14
Little Rock	2	LRC2	Hess	Riffle	2	38937	Elmidae	Optioservus	9	104.65
Little Rock	2	LRC2	Hess	Riffle	2	38937	Elmidae	Stenelmis	4	46.51
Little Rock	2	LRC2	Hess	Riffle	2	38937	Empididae	Hemerodromia	100	1162.79
Little Rock	2	LRC2	Hess	Riffle	2	38937	Gammaridae	Gammarus	24	279.07
Little Rock	2	LRC2	Hess	Riffle	2	38937	Glossosomatidae	Glossosoma	2	23.26
Little Rock	2	LRC2	Hess	Riffle	2	38937	Heptageniidae	Stenonema	16	186.05
Little Rock	2	LRC2	Hess	Riffle	2	38937	Hydridae	Hydra	2	23.26
Little Rock	2	LRC2	Hess	Riffle	2	38937	Hydropsychidae	Cheumatopsyche	88	1023.26
Little Rock	2	LRC2	Hess	Riffle	2	38937	Hydropsychidae	Hydropsyche	245	2848.84
Little Rock	2	LRC2	Hess	Riffle	2	38937	Hydropsychidae	Hydropsychidae	132	1534.88
Little Rock	2	LRC2	Hess	Riffle	2	38937	Leptoceridae	Oecetis	2	23.26
Little Rock	2	LRC2	Hess	Riffle	2	38937	Perlidae	Acroneuria	2	23.26
Little Rock	2	LRC2	Hess	Riffle	2	38937	Perlodidae	Perlodidae	6	69.77
Little Rock	2	LRC2	Hess	Riffle	2	38937	Philopotamidae	Dolophilodes	2	23.26
Little Rock	2	LRC2	Hess	Riffle	2	38937	Physidae	Physella	4	46.51
Little Rock	2	LRC2	Hess	Riffle	2	38937	Simuliidae	Simulium	2	23.26
Little Rock	2	LRC2	Hess	Riffle	2	38937	Tipulidae	Antocha	2	23.26
Little Rock	2	LRC2	Hess	Riffle	2	38937	Tipulidae	Tipula	2	23.26
Little Rock	2	LRC2	Hess	Riffle	2	38937		Acari	292	3395.35
Little Rock	2	LRC2	Hess	Riffle	2	38937		Nematoda	2	23.26
Little Rock	2	LRC2	Hess	Riffle	2	38937		Oligochaeta	1	11.63
Little Rock	2	LRC2	Hess	Riffle	3	38937	Athericidae	Atherix	7	81.40
Little Rock	2	LRC2	Hess	Riffle	3	38937	Baetidae	Baetidae	36	418.60
Little Rock	2	LRC2	Hess	Riffle	3	38937	Brachycentridae	Brachycentrus	2	23.26
Little Rock	2	LRC2	Hess	Riffle	3	38937	Brachycentridae	Micrasema	528	6139.53
Little Rock	2	LRC2	Hess	Riffle	3	38968	Chironomidae	Cladotanytarsus	19.74	229.59
Little Rock	2	LRC2	Hess	Riffle	3	38968	Chironomidae	Cricotopus	4.94	57.40
Little Rock	2	LRC2	Hess	Riffle	3	38968	Chironomidae	Eukiefferiella	14.81	172.19
Little Rock	2	LRC2	Hess	Riffle	3	38968	Chironomidae	Nilotanypus	4.94	57.40
Little Rock	2	LRC2	Hess	Riffle	3	38968	Chironomidae	Parametriocnemus	44.43	516.58
Little Rock	2	LRC2	Hess	Riffle	3	38968	Chironomidae	Polypedilum	49.36	573.97
Little Rock	2	LRC2	Hess	Riffle	3	38968	Chironomidae	Rheotanytarsus	64.17	746.17
Little Rock	2	LRC2	Hess	Riffle	3	38968	Chironomidae	Saetheria	4.94	57.40
Little Rock	2	LRC2	Hess	Riffle	3	38968	Chironomidae	Stempellinella	4.94	57.40
Little Rock	2	LRC2	Hess	Riffle	3	38968	Chironomidae	Tanytarsus	19.74	229.59
Little Rock	2	LRC2	Hess	Riffle	3	38968	Chironomidae	Thienemannimyia	1.00	11.63
Little Rock	2	LRC2	Hess	Riffle	3	38937	Dryopidae	Helichus	3	34.88
Little Rock	2	LRC2	Hess	Riffle	3	38937	Elmidae	Optioservus	42	488.37
Little Rock	2	LRC2	Hess	Riffle	3	38937	Elmidae	Stenelmis	2	23.26
Little Rock	2	LRC2	Hess	Riffle	3	38937	Empididae	Hemerodromia	153	1779.07
Little Rock	2	LRC2	Hess	Riffle	3	38937	Heptageniidae	Stenonema	12	139.53

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	2	LRC2	Hess	Riffle	3	38937	Hyalellidae	Hyalella	16	186.05
Little Rock	2	LRC2	Hess	Riffle	3	38937	Hydropsychidae	Cheumatopsyche	70	813.95
Little Rock	2	LRC2	Hess	Riffle	3	38937	Hydropsychidae	Hydropsyche	118	1372.09
Little Rock	2	LRC2	Hess	Riffle	3	38937	Hydropsychidae	Hydropsychidae	71	825.58
Little Rock	2	LRC2	Hess	Riffle	3	38937	Perlidae	Acroneuria	2	23.26
Little Rock	2	LRC2	Hess	Riffle	3	38937	Physidae	Physella	8	93.02
Little Rock	2	LRC2	Hess	Riffle	3	38937	Polycentropodidae	Polycentropodidae	4	46.51
Little Rock	2	LRC2	Hess	Riffle	3	38937	Sphaeriidae	Sphaeriidae	6	69.77
Little Rock	2	LRC2	Hess	Riffle	3	38937	Tipulidae	Dicranota	4	46.51
Little Rock	2	LRC2	Hess	Riffle	3	38937		Acari	230	2674.42
Little Rock	2	LRC2	Hess	Riffle	3	38937		Nematoda	51	593.02
Little Rock	3	LRC3	Core	Pool	1	38938	Ceratopogonidae	Probezzia	2	444.44
Little Rock	3	LRC3	Core	Pool	1	38938	Chironomidae	Cricotopus	1.05	233.92
Little Rock	3	LRC3	Core	Pool	1	38938	Chironomidae	Cryptochironomus	1.05	233.92
Little Rock	3	LRC3	Core	Pool	1	38938	Chironomidae	Parachironomus	1.05	233.92
Little Rock	3	LRC3	Core	Pool	1	38938	Chironomidae	Paralauterborniella	8.42	1871.35
Little Rock	3	LRC3	Core	Pool	1	38938	Chironomidae	Paratendipes	1.05	233.92
Little Rock	3	LRC3	Core	Pool	1	38938	Chironomidae	Polypedilum	2.11	467.84
Little Rock	3	LRC3	Core	Pool	1	38938	Chironomidae	Tanypus	2.11	467.84
Little Rock	3	LRC3	Core	Pool	1	38938	Chironomidae	Tanytarsus	3.16	701.75
Little Rock	3	LRC3	Core	Pool	1	38938	Corixidae	Corixidae	1	222.22
Little Rock	3	LRC3	Core	Pool	1	38938	Corixidae	Sigara	1	222.22
Little Rock	3	LRC3	Core	Pool	1	38938	Culicidae	Culicidae	1	222.22
Little Rock	3	LRC3	Core	Pool	1	38938	Elmidae	Dubiraphia	14	3111.11
Little Rock	3	LRC3	Core	Pool	1	38938	Elmidae	Elmidae	1	222.22
Little Rock	3	LRC3	Core	Pool	1	38938	Empididae	Chelifera	1	222.22
Little Rock	3	LRC3	Core	Pool	1	38938	Helicopsychidae	Helicopsyche	1	222.22
Little Rock	3	LRC3	Core	Pool	1	38938	Leptophlebiidae	Leptophlebiidae	1	222.22
Little Rock	3	LRC3	Core	Pool	1	38938	Sphaeriidae	Sphaeriidae	2	444.44
Little Rock	3	LRC3	Core	Pool	1	38938		Acari	2	444.44
Little Rock	3	LRC3	Core	Pool	1	38938		Collembola	1	222.22
Little Rock	3	LRC3	Core	Pool	1	38938		Oligochaeta	5	1111.11
Little Rock	3	LRC3	Core	Pool	2	38938	Brachycentridae	Micrasema	1	222.22
Little Rock	3	LRC3	Core	Pool	2	38938	Ceratopogonidae	Culicoides	1	222.22
Little Rock	3	LRC3	Core	Pool	2	38938	Chironomidae	Cladotanytarsus	7.92	1759.26
Little Rock	3	LRC3	Core	Pool	2	38938	Chironomidae	Cryptochironomus	25.33	5629.63
Little Rock	3	LRC3	Core	Pool	2	38938	Chironomidae	Paracladopelma	3.17	703.70
Little Rock	3	LRC3	Core	Pool	2	38938	Chironomidae	Paralauterborniella	11.08	2462.96
Little Rock	3	LRC3	Core	Pool	2	38938	Chironomidae	Polypedilum	26.92	5981.48
Little Rock	3	LRC3	Core	Pool	2	38938	Chironomidae	Tanytarsus	1.58	351.85
Little Rock	3	LRC3	Core	Pool	2	38938	Elmidae	Dubiraphia	7	1555.56
Little Rock	3	LRC3	Core	Pool	2	38938	Leptoceridae	Leptoceridae	1	222.22
Little Rock	3	LRC3	Core	Pool	2	38938	Sphaeriidae	Sphaeriidae	7	1555.56
Little Rock	3	LRC3	Core	Pool	2	38938		Acari	18	4000.00
Little Rock	3	LRC3	Core	Pool	2	38938		Nematoda	2	444.44
Little Rock	3	LRC3	Core	Pool	2	38938		Oligochaeta	20	4444.44
Little Rock	3	LRC3	Core	Pool	2	38938		Turbellaria	1	222.22
Little Rock	3	LRC3	Core	Pool	3	38938	Brachycentridae	Micrasema	1	222.22
Little Rock	3	LRC3	Core	Pool	3	38938	Ceratopogonidae	Probezzia	2	444.44
Little Rock	3	LRC3	Core	Pool	3	38938	Chironomidae	Cladotanytarsus	4.00	888.89
Little Rock	3	LRC3	Core	Pool	3	38938	Chironomidae	Cryptochironomus	3.00	666.67

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	3	LRC3	Core	Pool	3	38938	Chironomidae	Parachironomus	1.00	222.22
Little Rock	3	LRC3	Core	Pool	3	38938	Chironomidae	Paralauterborniella	11.00	2444.44
Little Rock	3	LRC3	Core	Pool	3	38938	Chironomidae	Polypedilum	2.00	444.44
Little Rock	3	LRC3	Core	Pool	3	38938	Chironomidae	Procladius	1.00	222.22
Little Rock	3	LRC3	Core	Pool	3	38938	Chironomidae	Stempellinella	1.00	222.22
Little Rock	3	LRC3	Core	Pool	3	38938	Corixidae	Corixidae	3	666.67
Little Rock	3	LRC3	Core	Pool	3	38938	Elmidae	Dubiraphia	5	1111.11
Little Rock	3	LRC3	Core	Pool	3	38938		Acari	2	444.44
Little Rock	3	LRC3	Core	Pool	3	38938		Nematoda	2	444.44
Little Rock	3	LRC3	Core	Pool	3	38938		Oligochaeta	6	1333.33
Little Rock	3	LRC3	Dnet	Bank	1	38938	Aeshnidae	Aeshna	1	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Aeshnidae	Boyeria	1	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Athericidae	Atherix	6	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Baetidae	Baetis	2	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Brachycentridae	Micrasema	8	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Calopterygidae	Calopteryx	59	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Chironomidae	Ablabesmyia	7.30	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Chironomidae	Cladotanytarsus	7.30	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Chironomidae	Dicrotendipes	7.30	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Chironomidae	Microtendipes	9.30	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Chironomidae	Parachironomus	7.30	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Chironomidae	Parametriocnemus	7.30	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Chironomidae	Paratendipes	14.60	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Chironomidae	Phaenopsectra	9.30	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Chironomidae	Polypedilum	65.72	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Chironomidae	Rheotanytarsus	58.42	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Chironomidae	Stempellinella	7.30	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Chironomidae	Tanytarsus	117.84	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Corixidae	Corixidae	113	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Corixidae	Sigara	36	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Culicidae	Culicidae	2	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Elmidae	Dubiraphia	60	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Elmidae	Macronychus	3	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Elmidae	Optioservus	44	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Elmidae	Stenelmis	17	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Empididae	Chelifera	2	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Empididae	Empididae	2	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Empididae	Hemerodromia	4	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Gammaridae	Gammarus	2	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Glossosomatidae	Protoptila	2	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Helicopsychidae	Helicopsyche	36	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Heptageniidae	Stenacron	1	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Heptageniidae	Stenonema	7	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Hyalellidae	Hyalella	8	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Hydridae	Hydra	4	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Leptoceridae	Ceraclea	2	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Leptoceridae	Mystacides	3	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Leptoceridae	Oecetis	6	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Limnephilidae	Pycnopsyche	4	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Physidae	Physella	19	
Little Rock	3	LRC3	Dnet	Bank	1	38938	Sphaeriidae	Sphaeriidae	57	

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	3	LRC3	Dnet	Bank	1	38938	Tabanidae	Chrysops	2	
Little Rock	3	LRC3	Dnet	Bank	1	38938		Acari	8	
Little Rock	3	LRC3	Dnet	Bank	1	38938		Nematoda	2	
Little Rock	3	LRC3	Dnet	Bank	1	38938		Oligochaeta	14	
Little Rock	3	LRC3	Dnet	Bank	1	38938		Turbellaria	66	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Athericidae	Atherix	14	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Baetidae	Baetis	28	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Brachycentridae	Brachycentrus	7	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Calopterygidae	Calopteryx	10	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Chironomidae	Brillia	10.98	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Chironomidae	Microtendipes	21.96	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Chironomidae	Parametriocnemus	10.98	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Chironomidae	Paratendipes	10.98	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Chironomidae	Polypedilum	109.78	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Chironomidae	Rheotanytarsus	309.38	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Chironomidae	Tanytarsus	21.96	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Chironomidae	Thienemannimyia	1.00	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Coenagrionidae	Coenagrionidae	2	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Corixidae	Corixidae	1	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Culicidae	Culicidae	3	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Dixidae	Dixella	1	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Elmidae	Dubiraphia	4	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Elmidae	Elmidae	8	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Elmidae	Macronychus	36	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Elmidae	Optioservus	2	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Elmidae	Stenelmis	1	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Empididae	Chelifera	1	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Empididae	Hemerodromia	2	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Gerridae	Aquarius	1	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Gerridae	Gerridae	1	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Gyrinidae	Gyrinus	1	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Helicopsychidae	Helicopsyche	5	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Heptageniidae	Stenonema	17	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Hydraenidae	Hydraena	1	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Hydropsychidae	Hydropsyche	1	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Leptoceridae	Oecetis	3	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Leptophlebiidae	Leptophlebiidae	1	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Limnephilidae	Pycnopsyche	1	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Physidae	Physella	2	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Psychomyiidae	Lype	2	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Scirtidae	Scirtidae	1	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Simuliidae	Simuliidae	1	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Sphaeriidae	Sphaeriidae	2	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Tabanidae	Chrysops	1	
Little Rock	3	LRC3	Dnet	Wood	2	38938	Tipulidae	Tipula	2	
Little Rock	3	LRC3	Dnet	Wood	2	38938		Acari	3	
Little Rock	3	LRC3	Dnet	Wood	2	38938		Collembola	3	
Little Rock	3	LRC3	Dnet	Wood	2	38938		Oligochaeta	11	
Little Rock	3	LRC3	Dnet	Wood	2	38938		Turbellaria	8	
Little Rock	3	LRC3	Hess	Run	1	38938	Ancylidae	Ferrissia	10	116.28
Little Rock	3	LRC3	Hess	Run	1	38938	Athericidae	Atherix	20	232.56

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	3	LRC3	Hess	Riffle	1	38938	Athericidae	Atherix	188	2186.05
Little Rock	3	LRC3	Hess	Riffle	1	38938	Baetidae	Baetidae	1	11.63
Little Rock	3	LRC3	Hess	Riffle	1	38938	Baetidae	Baetis	104	1209.30
Little Rock	3	LRC3	Hess	Run	1	38938	Brachycentridae	Micrasema	88	1023.26
Little Rock	3	LRC3	Hess	Riffle	1	38938	Brachycentridae	Micrasema	694	8069.77
Little Rock	3	LRC3	Hess	Run	1	38938	Caenidae	Caenidae	4	46.51
Little Rock	3	LRC3	Hess	Run	1	38938	Ceratopogonidae	Culicoides	8	93.02
Little Rock	3	LRC3	Hess	Run	1	38938	Chironomidae	Ablabesmyia	1.38	15.99
Little Rock	3	LRC3	Hess	Run	1	38938	Chironomidae	Cladotanytarsus	46.90	545.35
Little Rock	3	LRC3	Hess	Riffle	1	38938	Chironomidae	Corynoneura	118.10	1373.26
Little Rock	3	LRC3	Hess	Riffle	1	38938	Chironomidae	Eukiefferiella	354.30	4119.77
Little Rock	3	LRC3	Hess	Run	1	38938	Chironomidae	Micropsectra	23.45	272.67
Little Rock	3	LRC3	Hess	Riffle	1	38938	Chironomidae	Microtendipes	4.25	49.42
Little Rock	3	LRC3	Hess	Run	1	38938	Chironomidae	Microtendipes	144.83	1684.01
Little Rock	3	LRC3	Hess	Run	1	38938	Chironomidae	Nilotanypus	70.35	818.02
Little Rock	3	LRC3	Hess	Riffle	1	38938	Chironomidae	Parametriocnemus	590.50	6866.28
Little Rock	3	LRC3	Hess	Run	1	38938	Chironomidae	Phaenopsectra	23.45	272.67
Little Rock	3	LRC3	Hess	Run	1	38938	Chironomidae	Polypedilum	23.45	272.67
Little Rock	3	LRC3	Hess	Riffle	1	38938	Chironomidae	Polypedilum	122.35	1422.67
Little Rock	3	LRC3	Hess	Riffle	1	38938	Chironomidae	Psectrotanypus	118.10	1373.26
Little Rock	3	LRC3	Hess	Run	1	38938	Chironomidae	Rheotanytarsus	140.70	1636.05
Little Rock	3	LRC3	Hess	Riffle	1	38938	Chironomidae	Rheotanytarsus	3450.40	40120.93
Little Rock	3	LRC3	Hess	Run	1	38938	Chironomidae	Stempellinella	70.35	818.02
Little Rock	3	LRC3	Hess	Run	1	38938	Chironomidae	Tanytarsus	380.70	4426.74
Little Rock	3	LRC3	Hess	Run	1	38938	Chironomidae	Thienemannimyia	23.45	272.67
Little Rock	3	LRC3	Hess	Riffle	1	38938	Elmidae	Dubiraphia	4	46.51
Little Rock	3	LRC3	Hess	Run	1	38938	Elmidae	Dubiraphia	4	46.51
Little Rock	3	LRC3	Hess	Riffle	1	38938	Elmidae	Macronychus	5	58.14
Little Rock	3	LRC3	Hess	Run	1	38938	Elmidae	Optioservus	278	3232.56
Little Rock	3	LRC3	Hess	Riffle	1	38938	Elmidae	Optioservus	804	9348.84
Little Rock	3	LRC3	Hess	Run	1	38938	Elmidae	Stenelmis	144	1674.42
Little Rock	3	LRC3	Hess	Riffle	1	38938	Elmidae	Stenelmis	207	2406.98
Little Rock	3	LRC3	Hess	Run	1	38938	Empididae	Hemerodromia	4	46.51
Little Rock	3	LRC3	Hess	Riffle	1	38938	Empididae	Hemerodromia	48	558.14
Little Rock	3	LRC3	Hess	Run	1	38938	Gammaridae	Gammarus	8	93.02
Little Rock	3	LRC3	Hess	Riffle	1	38938	Glossosomatidae	Protoptila	68	790.70
Little Rock	3	LRC3	Hess	Run	1	38938	Glossosomatidae	Protoptila	95	1104.65
Little Rock	3	LRC3	Hess	Run	1	38938	Gomphidae	Gomphidae	2	23.26
Little Rock	3	LRC3	Hess	Riffle	1	38938	Helicopsychidae	Helicopsyche	44	511.63
Little Rock	3	LRC3	Hess	Run	1	38938	Helicopsychidae	Helicopsyche	56	651.16
Little Rock	3	LRC3	Hess	Run	1	38938	Heptageniidae	Stenacron	4	46.51
Little Rock	3	LRC3	Hess	Run	1	38938	Heptageniidae	Stenonema	102	1186.05
Little Rock	3	LRC3	Hess	Riffle	1	38938	Heptageniidae	Stenonema	271	3151.16
Little Rock	3	LRC3	Hess	Riffle	1	38938	Hydropsychidae	Cheumatopsyche	1	11.63
Little Rock	3	LRC3	Hess	Riffle	1	38938	Hydropsychidae	Hydropsyche	62	720.93
Little Rock	3	LRC3	Hess	Riffle	1	38938	Hydropsychidae	Hydropsychidae	40	465.12
Little Rock	3	LRC3	Hess	Run	1	38938	Leptoceridae	Mystacides	2	23.26
Little Rock	3	LRC3	Hess	Run	1	38938	Leptoceridae	Oecetis	9	104.65
Little Rock	3	LRC3	Hess	Run	1	38938	Leptophlebiidae	Leptophlebiidae	396	4604.65
Little Rock	3	LRC3	Hess	Riffle	1	38938	Perlidae	Acroneuria	1	11.63
Little Rock	3	LRC3	Hess	Run	1	38938	Physidae	Physella	4	46.51

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	3	LRC3	Hess	Run	1	38938	Polycentropodidae	Polycentropus	4	46.51
Little Rock	3	LRC3	Hess	Run	1	38938	Psychomyiidae	Psychomyia	15	174.42
Little Rock	3	LRC3	Hess	Run	1	38938	Sialidae	Sialis	2	23.26
Little Rock	3	LRC3	Hess	Run	1	38938	Sphaeriidae	Sphaeriidae	31	360.47
Little Rock	3	LRC3	Hess	Riffle	1	38938	Sphaeriidae	Sphaeriidae	183	2127.91
Little Rock	3	LRC3	Hess	Run	1	38938	Tipulidae	Dicranota	22	255.81
Little Rock	3	LRC3	Hess	Riffle	1	38938	Tipulidae	Dicranota	110	1279.07
Little Rock	3	LRC3	Hess	Riffle	1	38938	Tipulidae	Tipula	1	11.63
Little Rock	3	LRC3	Hess	Riffle	1	38938	Uenoidae	Neophylax	4	46.51
Little Rock	3	LRC3	Hess	Run	1	38938		Acari	22	255.81
Little Rock	3	LRC3	Hess	Riffle	1	38938		Acari	313	3639.53
Little Rock	3	LRC3	Hess	Run	1	38938		Decapoda	2	23.26
Little Rock	3	LRC3	Hess	Riffle	1	38938		Nematoda	9	104.65
Little Rock	3	LRC3	Hess	Run	1	38938		Nematoda	108	1255.81
Little Rock	3	LRC3	Hess	Run	1	38938		Oligochaeta	116	1348.84
Little Rock	3	LRC3	Hess	Riffle	1	38938		Oligochaeta	368	4279.07
Little Rock	3	LRC3	Hess	Run	1	38938		Plecoptera	6	69.77
Little Rock	3	LRC3	Hess	Run	1	38938		Turbellaria	42	488.37
Little Rock	3	LRC3	Hess	Riffle	1	38938		Turbellaria	141	1639.53
Little Rock	3	LRC3	Hess	Run	2	38938	Ancylidae	Ferrissia	4	46.51
Little Rock	3	LRC3	Hess	Run	2	38938	Athericidae	Atherix	103	1197.67
Little Rock	3	LRC3	Hess	Riffle	2	38938	Athericidae	Atherix	308	3581.40
Little Rock	3	LRC3	Hess	Riffle	2	38938	Baetidae	Baetis	282	3279.07
Little Rock	3	LRC3	Hess	Riffle	2	38938	Brachycentridae	Brachycentrus	4	46.51
Little Rock	3	LRC3	Hess	Riffle	2	38938	Brachycentridae	Micrasema	21	244.19
Little Rock	3	LRC3	Hess	Run	2	38938	Brachycentridae	Micrasema	120	1395.35
Little Rock	3	LRC3	Hess	Riffle	2	38938	Chironomidae	Cladotanytarsus	60.50	703.49
Little Rock	3	LRC3	Hess	Run	2	38938	Chironomidae	Cricotopus	36.80	427.91
Little Rock	3	LRC3	Hess	Riffle	2	38938	Chironomidae	Eukiefferiella	242.00	2813.95
Little Rock	3	LRC3	Hess	Run	2	38938	Chironomidae	Microtendipes	483.40	5620.93
Little Rock	3	LRC3	Hess	Run	2	38938	Chironomidae	Nilotanypus	147.20	1711.63
Little Rock	3	LRC3	Hess	Run	2	38938	Chironomidae	Parametriocnemus	73.60	855.81
Little Rock	3	LRC3	Hess	Riffle	2	38938	Chironomidae	Parametriocnemus	130.00	1511.63
Little Rock	3	LRC3	Hess	Run	2	38938	Chironomidae	Phaenopsectra	36.80	427.91
Little Rock	3	LRC3	Hess	Run	2	38938	Chironomidae	Polypedilum	36.80	427.91
Little Rock	3	LRC3	Hess	Riffle	2	38938	Chironomidae	Polypedilum	242.00	2813.95
Little Rock	3	LRC3	Hess	Run	2	38938	Chironomidae	Rheotanytarsus	220.80	2567.44
Little Rock	3	LRC3	Hess	Riffle	2	38938	Chironomidae	Rheotanytarsus	1781.50	20715.12
Little Rock	3	LRC3	Hess	Run	2	38938	Chironomidae	Stempellinella	73.60	855.81
Little Rock	3	LRC3	Hess	Riffle	2	38938	Chironomidae	Tanytarsus	36.00	418.60
Little Rock	3	LRC3	Hess	Run	2	38938	Chironomidae	Tanytarsus	515.20	5990.70
Little Rock	3	LRC3	Hess	Run	2	38938	Chironomidae	Thienemannimyia	36.80	427.91
Little Rock	3	LRC3	Hess	Riffle	2	38938	Dryopidae	Helichus	1	11.63
Little Rock	3	LRC3	Hess	Run	2	38938	Elmidae	Dubiraphia	4	46.51
Little Rock	3	LRC3	Hess	Run	2	38938	Elmidae	Optioservus	608	7069.77
Little Rock	3	LRC3	Hess	Riffle	2	38938	Elmidae	Optioservus	1126	13093.02
Little Rock	3	LRC3	Hess	Riffle	2	38938	Elmidae	Stenelmis	57	662.79
Little Rock	3	LRC3	Hess	Run	2	38938	Elmidae	Stenelmis	248	2883.72
Little Rock	3	LRC3	Hess	Run	2	38938	Empididae	Hemerodromia	32	372.09
Little Rock	3	LRC3	Hess	Riffle	2	38938	Empididae	Hemerodromia	89	1034.88
Little Rock	3	LRC3	Hess	Riffle	2	38938	Glossosomatidae	Protoptila	16	186.05

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	3	LRC3	Hess	Run	2	38938	Glossosomatidae	Protoptila	116	1348.84
Little Rock	3	LRC3	Hess	Run	2	38938	Helicopsychidae	Helicopsyche	40	465.12
Little Rock	3	LRC3	Hess	Run	2	38938	Heptageniidae	Stenonema	34	395.35
Little Rock	3	LRC3	Hess	Riffle	2	38938	Heptageniidae	Stenonema	171	1988.37
Little Rock	3	LRC3	Hess	Riffle	2	38938	Hydropsychidae	Cheumatopsyche	1	11.63
Little Rock	3	LRC3	Hess	Riffle	2	38938	Hydropsychidae	Hydropsyche	8	93.02
Little Rock	3	LRC3	Hess	Riffle	2	38938	Hydropsychidae	Hydropsychidae	28	325.58
Little Rock	3	LRC3	Hess	Run	2	38938	Leptoceridae	Oecetis	4	46.51
Little Rock	3	LRC3	Hess	Run	2	38938	Leptophlebiidae	Leptophlebiidae	124	1441.86
Little Rock	3	LRC3	Hess	Run	2	38938	Limnephilidae	Pycnopsyche	1	11.63
Little Rock	3	LRC3	Hess	Riffle	2	38938	Perlidae	Acroneuria	4	46.51
Little Rock	3	LRC3	Hess	Riffle	2	38938	Perlodidae	Perlodidae	32	372.09
Little Rock	3	LRC3	Hess	Run	2	38938	Psychomyiidae	Psychomyia	8	93.02
Little Rock	3	LRC3	Hess	Riffle	2	38938	Sphaeriidae	Sphaeriidae	14	162.79
Little Rock	3	LRC3	Hess	Run	2	38938	Sphaeriidae	Sphaeriidae	254	2953.49
Little Rock	3	LRC3	Hess	Riffle	2	38938	Tipulidae	Antocha	4	46.51
Little Rock	3	LRC3	Hess	Run	2	38938	Tipulidae	Dicranota	1	11.63
Little Rock	3	LRC3	Hess	Riffle	2	38938	Tipulidae	Dicranota	20	232.56
Little Rock	3	LRC3	Hess	Run	2	38938	Tipulidae	Hexatoma	16	186.05
Little Rock	3	LRC3	Hess	Riffle	2	38938	Tipulidae	Tipula	1	11.63
Little Rock	3	LRC3	Hess	Run	2	38938	Tipulidae	Tipula	8	93.02
Little Rock	3	LRC3	Hess	Run	2	38938		Acari	76	883.72
Little Rock	3	LRC3	Hess	Riffle	2	38938		Acari	108	1255.81
Little Rock	3	LRC3	Hess	Riffle	2	38938		Nematoda	18	209.30
Little Rock	3	LRC3	Hess	Run	2	38938		Nematoda	168	1953.49
Little Rock	3	LRC3	Hess	Run	2	38938		Oligochaeta	16	186.05
Little Rock	3	LRC3	Hess	Riffle	2	38938		Oligochaeta	407	4732.56
Little Rock	3	LRC3	Hess	Riffle	2	38938		Turbellaria	39	453.49
Little Rock	3	LRC3	Hess	Run	2	38938		Turbellaria	72	837.21
Little Rock	3	LRC3	Hess	Run	3	38938	Aeshnidae	Boyeria	1	11.63
Little Rock	3	LRC3	Hess	Run	3	38938	Ancylidae	Ferrissia	4	46.51
Little Rock	3	LRC3	Hess	Run	3	38938	Athericidae	Atherix	141	1639.53
Little Rock	3	LRC3	Hess	Riffle	3	38938	Athericidae	Atherix	243	2825.58
Little Rock	3	LRC3	Hess	Riffle	3	38938	Baetidae	Baetidae	76	883.72
Little Rock	3	LRC3	Hess	Run	3	38938	Brachycentridae	Micrasema	200	2325.58
Little Rock	3	LRC3	Hess	Riffle	3	38938	Brachycentridae	Micrasema	1349	15686.05
Little Rock	3	LRC3	Hess	Run	3	38938	Caenidae	Caenis	4	46.51
Little Rock	3	LRC3	Hess	Run	3	38938	Chironomidae	Cladotanytarsus	71.15	827.31
Little Rock	3	LRC3	Hess	Run	3	38938	Chironomidae	Cricotopus	71.15	827.31
Little Rock	3	LRC3	Hess	Run	3	38938	Chironomidae	Cryptochironomus	142.30	1654.63
Little Rock	3	LRC3	Hess	Run	3	38938	Chironomidae	Endochironomus	71.15	827.31
Little Rock	3	LRC3	Hess	Riffle	3	38938	Chironomidae	Eukiefferiella	58.33	678.20
Little Rock	3	LRC3	Hess	Riffle	3	38938	Chironomidae	Glyptotendipes	58.33	678.20
Little Rock	3	LRC3	Hess	Riffle	3	38938	Chironomidae	Microtendipes	58.33	678.20
Little Rock	3	LRC3	Hess	Run	3	38938	Chironomidae	Microtendipes	998.09	11605.64
Little Rock	3	LRC3	Hess	Run	3	38938	Chironomidae	Nilotanypus	142.30	1654.63
Little Rock	3	LRC3	Hess	Run	3	38938	Chironomidae	Parametriocnemus	142.30	1654.63
Little Rock	3	LRC3	Hess	Riffle	3	38938	Chironomidae	Parametriocnemus	174.98	2034.61
Little Rock	3	LRC3	Hess	Run	3	38938	Chironomidae	Paratendipes	71.15	827.31
Little Rock	3	LRC3	Hess	Run	3	38938	Chironomidae	Phaenopsectra	71.15	827.31
Little Rock	3	LRC3	Hess	Run	3	38938	Chironomidae	Polypedilum	213.45	2481.94

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	3	LRC3	Hess	Run	3	38938	Chironomidae	Rheotanytarsus	142.30	1654.63
Little Rock	3	LRC3	Hess	Riffle	3	38938	Chironomidae	Rheotanytarsus	2046.40	23795.29
Little Rock	3	LRC3	Hess	Run	3	38938	Chironomidae	Stempellinella	355.74	4136.57
Little Rock	3	LRC3	Hess	Riffle	3	38938	Chironomidae	Tanytarsus	116.65	1356.41
Little Rock	3	LRC3	Hess	Run	3	38938	Chironomidae	Tanytarsus	711.49	8273.13
Little Rock	3	LRC3	Hess	Run	3	38938	Chironomidae	Thienemannimyia	142.30	1654.63
Little Rock	3	LRC3	Hess	Riffle	3	38938	Corixidae	Corixidae	4	46.51
Little Rock	3	LRC3	Hess	Run	3	38938	Dryopidae	Helichus	4	46.51
Little Rock	3	LRC3	Hess	Run	3	38938	Elmidae	Dubiraphia	12	139.53
Little Rock	3	LRC3	Hess	Run	3	38938	Elmidae	Macronychus	8	93.02
Little Rock	3	LRC3	Hess	Riffle	3	38938	Elmidae	Optioservus	755	8779.07
Little Rock	3	LRC3	Hess	Run	3	38938	Elmidae	Optioservus	898	10441.86
Little Rock	3	LRC3	Hess	Run	3	38938	Elmidae	Stenelmis	280	3255.81
Little Rock	3	LRC3	Hess	Riffle	3	38938	Elmidae	Stenelmis	284	3302.33
Little Rock	3	LRC3	Hess	Riffle	3	38938	Empididae	Chelifera	4	46.51
Little Rock	3	LRC3	Hess	Run	3	38938	Empididae	Hemerodromia	24	279.07
Little Rock	3	LRC3	Hess	Riffle	3	38938	Empididae	Hemerodromia	36	418.60
Little Rock	3	LRC3	Hess	Riffle	3	38938	Glossosomatidae	Protoptila	68	790.70
Little Rock	3	LRC3	Hess	Run	3	38938	Glossosomatidae	Protoptila	100	1162.79
Little Rock	3	LRC3	Hess	Run	3	38938	Helicopsychidae	Helicopsyche	9	104.65
Little Rock	3	LRC3	Hess	Riffle	3	38938	Helicopsychidae	Helicopsyche	262	3046.51
Little Rock	3	LRC3	Hess	Riffle	3	38938	Heptageniidae	Stenonema	104	1209.30
Little Rock	3	LRC3	Hess	Run	3	38938	Heptageniidae	Stenonema	155	1802.33
Little Rock	3	LRC3	Hess	Run	3	38938	Hydridae	Hydra	4	46.51
Little Rock	3	LRC3	Hess	Riffle	3	38938	Hydropsychidae	Hydropsyche	36	418.60
Little Rock	3	LRC3	Hess	Run	3	38938	Leptoceridae	Oecetis	8	93.02
Little Rock	3	LRC3	Hess	Run	3	38938	Leptophlebiidae	Leptophlebiidae	428	4976.74
Little Rock	3	LRC3	Hess	Run	3	38938	Perlidae	Acroneuria	1	11.63
Little Rock	3	LRC3	Hess	Riffle	3	38938	Physidae	Physella	9	104.65
Little Rock	3	LRC3	Hess	Run	3	38938	Psychomyiidae	Psychomyia	24	279.07
Little Rock	3	LRC3	Hess	Run	3	38938	Sialidae	Sialis	4	46.51
Little Rock	3	LRC3	Hess	Run	3	38938	Sphaeriidae	Sphaeriidae	122	1418.60
Little Rock	3	LRC3	Hess	Riffle	3	38938	Sphaeriidae	Sphaeriidae	450	5232.56
Little Rock	3	LRC3	Hess	Run	3	38938	Tabanidae	Chrysops	1	11.63
Little Rock	3	LRC3	Hess	Riffle	3	38938	Tipulidae	Antocha	4	46.51
Little Rock	3	LRC3	Hess	Run	3	38938	Tipulidae	Dicranota	12	139.53
Little Rock	3	LRC3	Hess	Riffle	3	38938	Tipulidae	Dicranota	26	302.33
Little Rock	3	LRC3	Hess	Run	3	38938	Tipulidae	Tipula	2	23.26
Little Rock	3	LRC3	Hess	Run	3	38938	Uenoidae	Neophylax	3	34.88
Little Rock	3	LRC3	Hess	Riffle	3	38938	Uenoidae	Neophylax	4	46.51
Little Rock	3	LRC3	Hess	Run	3	38938		Acari	132	1534.88
Little Rock	3	LRC3	Hess	Riffle	3	38938		Acari	445	5174.42
Little Rock	3	LRC3	Hess	Riffle	3	38938		Ephemeroptera	32	372.09
Little Rock	3	LRC3	Hess	Riffle	3	38938		Nematoda	30	348.84
Little Rock	3	LRC3	Hess	Run	3	38938		Nematoda	232	2697.67
Little Rock	3	LRC3	Hess	Riffle	3	38938		Oligochaeta	153	1779.07
Little Rock	3	LRC3	Hess	Run	3	38938		Oligochaeta	320	3720.93
Little Rock	3	LRC3	Hess	Riffle	3	38938		Plecoptera	8	93.02
Little Rock	3	LRC3	Hess	Run	3	38938		Plecoptera	8	93.02
Little Rock	3	LRC3	Hess	Run	3	38938		Turbellaria	140	1627.91
Little Rock	3	LRC3	Hess	Riffle	3	38938		Turbellaria	192	2232.56

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	4	LRC4	Core	Run	1	38937	Ceratopogonidae	Probezzia	1	222.22
Little Rock	4	LRC4	Core	Pool	1	38937	Ceratopogonidae	Probezzia	4	888.89
Little Rock	4	LRC4	Core	Run	1	38937	Chironomidae	Cladotanytarsus	70.48	15662.04
Little Rock	4	LRC4	Core	Run	1	38937	Chironomidae	Microcricotopus	4.15	921.30
Little Rock	4	LRC4	Core	Run	1	38937	Chironomidae	Paralauterborniella	41.46	9212.96
Little Rock	4	LRC4	Core	Pool	1	38937	Chironomidae	Polypedilum	2.67	592.59
Little Rock	4	LRC4	Core	Run	1	38937	Chironomidae	Polypedilum	70.48	15662.04
Little Rock	4	LRC4	Core	Pool	1	38937	Chironomidae	Psectrotanypus	2.67	592.59
Little Rock	4	LRC4	Core	Pool	1	38937	Chironomidae	Stictochironomus	2.67	592.59
Little Rock	4	LRC4	Core	Run	1	38937	Chironomidae	Tanytarsus	12.44	2763.89
Little Rock	4	LRC4	Core	Pool	1	38937	Corixidae	Corixidae	4	888.89
Little Rock	4	LRC4	Core	Run	1	38937	Elmidae	Dubiraphia	7	1555.56
Little Rock	4	LRC4	Core	Pool	1	38937	Elmidae	Dubiraphia	24	5333.33
Little Rock	4	LRC4	Core	Pool	1	38937	Gammaridae	Gammarus	4	888.89
Little Rock	4	LRC4	Core	Run	1	38937	Limnephilidae	Pycnopsyche	1	222.22
Little Rock	4	LRC4	Core	Run	1	38937	Sphaeriidae	Sphaeriidae	8	1777.78
Little Rock	4	LRC4	Core	Run	1	38937	Tabanidae	Chrysops	1	222.22
Little Rock	4	LRC4	Core	Pool	1	38937	Tabanidae	Chrysops	8	1777.78
Little Rock	4	LRC4	Core	Run	1	38937		Acari	3	666.67
Little Rock	4	LRC4	Core	Run	1	38937		Collembola	1	222.22
Little Rock	4	LRC4	Core	Run	1	38937		Nematoda	3	666.67
Little Rock	4	LRC4	Core	Run	1	38937		Oligochaeta	3	666.67
Little Rock	4	LRC4	Core	Pool	1	38937		Oligochaeta	29	6444.44
Little Rock	4	LRC4	Core	Run	2	38938	Chironomidae	Ablabesmyia	2.00	444.44
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Brillia	4.25	944.44
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Chironomus	4.25	944.44
Little Rock	4	LRC4	Core	Run	2	38938	Chironomidae	Cladotanytarsus	2.00	444.44
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Cladotanytarsus	4.25	944.44
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Cricotopus	4.25	944.44
Little Rock	4	LRC4	Core	Run	2	38938	Chironomidae	Cryptochironomus	2.00	444.44
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Endochironomus	4.25	944.44
Little Rock	4	LRC4	Core	Run	2	38938	Chironomidae	Microtendipes	2.00	444.44
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Microtendipes	4.25	944.44
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Nilotanypus	4.25	944.44
Little Rock	4	LRC4	Core	Run	2	38938	Chironomidae	Parametriocnemus	2.00	444.44
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Parametriocnemus	4.25	944.44
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Paratanytarsus	38.25	8500.00
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Polypedilum	8.50	1888.89
Little Rock	4	LRC4	Core	Run	2	38938	Chironomidae	Procladius	2.00	444.44
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Rheotanytarsus	76.50	17000.00
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Stempellinella	8.50	1888.89
Little Rock	4	LRC4	Core	Run	2	38938	Chironomidae	Tanytarsus	2.00	444.44
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Tanytarsus	21.25	4722.22
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Thienemanniella	8.50	1888.89
Little Rock	4	LRC4	Core	Pool	2	38937	Chironomidae	Thienemannimyia	8.50	1888.89
Little Rock	4	LRC4	Core	Pool	2	38937	Corixidae	Sigara	1	222.22
Little Rock	4	LRC4	Core	Pool	2	38937	Elmidae	Dubiraphia	1	222.22
Little Rock	4	LRC4	Core	Run	2	38938	Elmidae	Dubiraphia	6	1333.33
Little Rock	4	LRC4	Core	Pool	2	38937	Empididae	Hemerodromia	1	222.22
Little Rock	4	LRC4	Core	Run	2	38938	Hyalellidae	Hyalella	2	444.44
Little Rock	4	LRC4	Core	Pool	2	38937	Leptophlebiidae	Leptophlebiidae	1	222.22

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	4	LRC4	Core	Pool	2	38937	Sphaeriidae	Sphaeriidae	1	222.22
Little Rock	4	LRC4	Core	Run	2	38938	Sphaeriidae	Sphaeriidae	2	444.44
Little Rock	4	LRC4	Core	Run	2	38938	Tabanidae	Chrysops	2	444.44
Little Rock	4	LRC4	Core	Pool	2	38937	Tipulidae	Antocha	1	222.22
Little Rock	4	LRC4	Core	Run	2	38938		Collembola	2	444.44
Little Rock	4	LRC4	Core	Pool	2	38937		Oligochaeta	3	666.67
Little Rock	4	LRC4	Core	Run	2	38938		Oligochaeta	99	22000.00
Little Rock	4	LRC4	Core	Pool	3	38937	Brachycentridae	Micrasema	4	888.89
Little Rock	4	LRC4	Core	Run	3	38937	Chironomidae	Cladotanytarsus	16.33	3629.63
Little Rock	4	LRC4	Core	Run	3	38937	Chironomidae	Microcricotopus	1.17	259.26
Little Rock	4	LRC4	Core	Run	3	38937	Chironomidae	Odontomesa	1.17	259.26
Little Rock	4	LRC4	Core	Run	3	38937	Chironomidae	Paracladopelma	8.17	1814.81
Little Rock	4	LRC4	Core	Run	3	38937	Chironomidae	Paralauterborniella	8.17	1814.81
Little Rock	4	LRC4	Core	Run	3	38937	Chironomidae	Polypedilum	11.67	2592.59
Little Rock	4	LRC4	Core	Pool	3	38937	Chironomidae	Psectrocladius	4.00	888.89
Little Rock	4	LRC4	Core	Run	3	38937	Chironomidae	Rheotanytarsus	1.17	259.26
Little Rock	4	LRC4	Core	Run	3	38937	Chironomidae	Saetheria	1.17	259.26
Little Rock	4	LRC4	Core	Run	3	38937	Chironomidae	Stempellinella	1.17	259.26
Little Rock	4	LRC4	Core	Pool	3	38937	Chironomidae	Stictochironomus	8.00	1777.78
Little Rock	4	LRC4	Core	Pool	3	38937	Chironomidae	Tanytarsus	4.00	888.89
Little Rock	4	LRC4	Core	Run	3	38937	Chironomidae	Tanytarsus	5.83	1296.30
Little Rock	4	LRC4	Core	Pool	3	38937	Chironomidae	Thienemannimyia	1.00	222.22
Little Rock	4	LRC4	Core	Pool	3	38937	Elmidae	Dubiraphia	12	2666.67
Little Rock	4	LRC4	Core	Pool	3	38937	Elmidae	Stenelmis	4	888.89
Little Rock	4	LRC4	Core	Pool	3	38937	Empididae	Hemerodromia	4	888.89
Little Rock	4	LRC4	Core	Pool	3	38937	Glossiphoniidae	Glossiphoniidae	1	222.22
Little Rock	4	LRC4	Core	Run	3	38937	Sphaeriidae	Sphaeriidae	1	222.22
Little Rock	4	LRC4	Core	Pool	3	38937	Sphaeriidae	Sphaeriidae	4	888.89
Little Rock	4	LRC4	Core	Pool	3	38937	Tabanidae	Chrysops	2	444.44
Little Rock	4	LRC4	Core	Pool	3	38937		Nematoda	8	1777.78
Little Rock	4	LRC4	Core	Pool	3	38937		Oligochaeta	60	13333.33
Little Rock	4	LRC4	Core	Pool	3	38937		Trichoptera	4	888.89
Little Rock	4	LRC4	Dnet	Bank	1	38938	Aeshnidae	Boyeria	2	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Athericidae	Atherix	2	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Caenidae	Caenis	2	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Calopterygidae	Calopteryx	50	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Ablabesmyia	4.82	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Brillia	10.64	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Chironomus	9.64	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Cladotanytarsus	9.64	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Corynoneura	9.64	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Cricotopus	4.82	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Cryptotendipes	14.45	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Microtendipes	4.82	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Nanocladius	4.82	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Parachironomus	4.82	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Paralauterborniella	9.64	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Phaenopsectra	4.82	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Polypedilum	46.36	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Procladius	4.82	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Psectrotanypus	4.82	

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Rheotanytarsus	4.82	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Stempellinella	9.64	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Tanytarsus	43.36	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Thienemannimyia	4.82	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Chironomidae	Zavrelimyia	4.82	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Corixidae	Corixidae	156	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Corixidae	Hesperocorixa	26	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Corixidae	Palmacorixa	2	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Corixidae	Sigara	4	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Culicidae	Culicidae	18	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Dixidae	Dixella	4	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Dytiscidae	Hydroporus	4	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Elmidae	Dubiraphia	76	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Ephydridae	Ephydridae	4	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Gammaridae	Gammarus	6	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Gerridae	Aquarius	2	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Gyrinidae	Gyrinus	12	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Heptageniidae	Stenacron	2	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Heptageniidae	Stenonema	6	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Hyalellidae	Hyalella	20	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Hydraenidae	Hydraena	2	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Hydridae	Hydra	4	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Hydrophilidae	Hydrophilidae	6	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Hydropsychidae	Hydropsychidae	4	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Leptoceridae	Ceraclea	2	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Leptophlebiidae	Leptophlebiidae	2	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Limnephilidae	Limnephilidae	2	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Nepidae	Ranatra	1	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Physidae	Physella	14	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Polycentropodidae	Polycentropodidae	4	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Sphaeriidae	Sphaeriidae	44	
Little Rock	4	LRC4	Dnet	Bank	1	38938	Tabanidae	Chrysops	12	
Little Rock	4	LRC4	Dnet	Bank	1	38938		Acari	4	
Little Rock	4	LRC4	Dnet	Bank	1	38938		Collembola	22	
Little Rock	4	LRC4	Dnet	Bank	1	38938		Oligochaeta	234	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Aeshnidae	Aeshna	1	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Aeshnidae	Boyeria	1	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Caenidae	Caenis	1	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Calopterygidae	Calopteryx	8	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Chironomidae	Brillia	4.44	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Chironomidae	Dicrotendipes	1.11	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Chironomidae	Monodiamesa	1.11	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Chironomidae	Paralauterborniella	1.11	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Chironomidae	Phaenopsectra	1.11	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Chironomidae	Polypedilum	15.44	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Chironomidae	Rheotanytarsus	8.89	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Chironomidae	Stenochironomus	1.11	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Chironomidae	Tanytarsus	2.22	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Chironomidae	Thienemannimyia	4.44	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Corixidae	Corixidae	11	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Corixidae	Hesperocorixa	1	

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Little Rock	4	LRC4	Dnet	Wood	2	38937	Corixidae	Palmacorixa	2	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Culicidae	Culicidae	12	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Dixidae	Dixella	2	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Elmidae	Macronychus	4	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Gammaridae	Gammarus	8	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Heptageniidae	Heptageniidae	4	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Heptageniidae	Stenonema	2	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Hyalellidae	Hyalella	3	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Limnephilidae	Limnephilidae	1	
Little Rock	4	LRC4	Dnet	Wood	2	38937	Psychomyiidae	Lype	1	
Little Rock	4	LRC4	Dnet	Wood	2	38937		Collembola	1	
Little Rock	4	LRC4	Dnet	Wood	2	38937		Lepidoptera	2	
Little Rock	4	LRC4	Dnet	Wood	2	38937		Nematoda	1	
Little Rock	4	LRC4	Dnet	Wood	2	38937		Oligochaeta	2	
Zuleger	4	Z4	Core	Run	1	38938	Asellidae	Caecidotea	1	222.22
Zuleger	4	Z4	Core	Pool	1	38938	Asellidae	Caecidotea	11	2444.44
Zuleger	4	Z4	Core	Run	1	38938	Ceratopogonidae	Probezzia	6	1333.33
Zuleger	4	Z4	Core	Run	1	38938	Chironomidae	Cladotanytarsus	4.40	976.85
Zuleger	4	Z4	Core	Pool	1	38938	Chironomidae	Cricotopus	1.36	302.60
Zuleger	4	Z4	Core	Run	1	38938	Chironomidae	Cryptochironomus	4.40	976.85
Zuleger	4	Z4	Core	Pool	1	38938	Chironomidae	Microcricotopus	1.36	302.60
Zuleger	4	Z4	Core	Run	1	38938	Chironomidae	Microcricotopus	4.40	976.85
Zuleger	4	Z4	Core	Pool	1	38938	Chironomidae	Nanocladius	1.36	302.60
Zuleger	4	Z4	Core	Run	1	38938	Chironomidae	Parachironomus	26.38	5861.11
Zuleger	4	Z4	Core	Run	1	38938	Chironomidae	Paralauterborniella	30.77	6837.96
Zuleger	4	Z4	Core	Pool	1	38938	Chironomidae	Paratanytarsus	8.17	1815.60
Zuleger	4	Z4	Core	Pool	1	38938	Chironomidae	Paratendipes	21.43	4761.23
Zuleger	4	Z4	Core	Pool	1	38938	Chironomidae	Procladius	1.36	302.60
Zuleger	4	Z4	Core	Pool	1	38938	Chironomidae	Rheotanytarsus	1.36	302.60
Zuleger	4	Z4	Core	Pool	1	38938	Chironomidae	Stempellinella	2.72	605.20
Zuleger	4	Z4	Core	Run	1	38938	Chironomidae	Stempellinella	43.96	9768.52
Zuleger	4	Z4	Core	Run	1	38938	Chironomidae	Stictochironomus	8.79	1953.70
Zuleger	4	Z4	Core	Pool	1	38938	Chironomidae	Tanytarsus	25.87	5749.41
Zuleger	4	Z4	Core	Run	1	38938	Chironomidae	Tanytarsus	87.92	19537.04
Zuleger	4	Z4	Core	Pool	1	38938	Elmidae	Dubiraphia	2	444.44
Zuleger	4	Z4	Core	Run	1	38938	Elmidae	Dubiraphia	6	1333.33
Zuleger	4	Z4	Core	Pool	1	38938	Hydridae	Hydra	5	1111.11
Zuleger	4	Z4	Core	Pool	1	38938	Leptophlebiidae	Leptophlebiidae	4	888.89
Zuleger	4	Z4	Core	Run	1	38938	Physidae	Physella	2	444.44
Zuleger	4	Z4	Core	Run	1	38938	Sialidae	Sialis	1	222.22
Zuleger	4	Z4	Core	Pool	1	38938		Acari	2	444.44
Zuleger	4	Z4	Core	Run	1	38938		Acari	12	2666.67
Zuleger	4	Z4	Core	Run	1	38938		Nematoda	1	222.22
Zuleger	4	Z4	Core	Pool	1	38938		Nematoda	2	444.44
Zuleger	4	Z4	Core	Pool	1	38938		Oligochaeta	5	1111.11
Zuleger	4	Z4	Core	Run	1	38938		Oligochaeta	8	1777.78
Zuleger	4	Z4	Core	Pool	2	38938	Aeshnidae	Boyeria	1	222.22
Zuleger	4	Z4	Core	Run	2	38938	Chironomidae	Cladotanytarsus	4.25	944.44
Zuleger	4	Z4	Core	Run	2	38938	Chironomidae	Cryptochironomus	8.50	1888.89
Zuleger	4	Z4	Core	Pool	2	38938	Chironomidae	Microcricotopus	1.00	222.22
Zuleger	4	Z4	Core	Run	2	38938	Chironomidae	Microcricotopus	12.75	2833.33

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Zuleger	4	Z4	Core	Run	2	38938	Chironomidae	Microtendipes	4.25	944.44
Zuleger	4	Z4	Core	Run	2	38938	Chironomidae	Parachironomus	4.25	944.44
Zuleger	4	Z4	Core	Pool	2	38938	Chironomidae	Paralauterborniella	3.00	666.67
Zuleger	4	Z4	Core	Run	2	38938	Chironomidae	Paralauterborniella	21.25	4722.22
Zuleger	4	Z4	Core	Pool	2	38938	Chironomidae	Paratanytarsus	1.00	222.22
Zuleger	4	Z4	Core	Run	2	38938	Chironomidae	Paratanytarsus	8.50	1888.89
Zuleger	4	Z4	Core	Pool	2	38938	Chironomidae	Paratendipes	9.00	2000.00
Zuleger	4	Z4	Core	Pool	2	38938	Chironomidae	Polypedilum	1.00	222.22
Zuleger	4	Z4	Core	Pool	2	38938	Chironomidae	Rheotanytarsus	1.00	222.22
Zuleger	4	Z4	Core	Run	2	38938	Chironomidae	Rheotanytarsus	4.25	944.44
Zuleger	4	Z4	Core	Run	2	38938	Chironomidae	Stempellinella	25.50	5666.67
Zuleger	4	Z4	Core	Pool	2	38938	Chironomidae	Stictochironomus	1.00	222.22
Zuleger	4	Z4	Core	Run	2	38938	Chironomidae	Tanytarsus	110.50	24555.56
Zuleger	4	Z4	Core	Pool	2	38938	Chironomidae	Thienemanniella	1.00	222.22
Zuleger	4	Z4	Core	Run	2	38938	Elmidae	Dubiraphia	4	888.89
Zuleger	4	Z4	Core	Run	2	38938	Hydridae	Hydra	2	444.44
Zuleger	4	Z4	Core	Pool	2	38938	Hydropsychidae	Hydropsyche	1	222.22
Zuleger	4	Z4	Core	Run	2	38938	Sialidae	Sialis	2	444.44
Zuleger	4	Z4	Core	Run	2	38938		Acari	6	1333.33
Zuleger	4	Z4	Core	Run	2	38938		Collembola	2	444.44
Zuleger	4	Z4	Core	Run	2	38938		Ephemeroptera	2	444.44
Zuleger	4	Z4	Core	Run	2	38938		Oligochaeta	8	1777.78
Zuleger	4	Z4	Core	Pool	3	38938	Asellidae	Caecidotea	5	1111.11
Zuleger	4	Z4	Core	Run	3	38938	Ceratopogonidae	Probezzia	8	1777.78
Zuleger	4	Z4	Core	Pool	3	38938	Chironomidae	Chironomus	7.76	1724.64
Zuleger	4	Z4	Core	Pool	3	38938	Chironomidae	Cryptochironomus	2.59	574.88
Zuleger	4	Z4	Core	Run	3	38938	Chironomidae	Eukiefferiella	5.35	1188.41
Zuleger	4	Z4	Core	Pool	3	38938	Chironomidae	Microcricotopus	5.17	1149.76
Zuleger	4	Z4	Core	Run	3	38938	Chironomidae	Microcricotopus	21.39	4753.62
Zuleger	4	Z4	Core	Pool	3	38938	Chironomidae	Microtendipes	3.59	797.10
Zuleger	4	Z4	Core	Pool	3	38938	Chironomidae	Paralauterborniella	2.59	574.88
Zuleger	4	Z4	Core	Run	3	38938	Chironomidae	Paralauterborniella	106.96	23768.12
Zuleger	4	Z4	Core	Run	3	38938	Chironomidae	Paratanytarsus	5.35	1188.41
Zuleger	4	Z4	Core	Pool	3	38938	Chironomidae	Paratanytarsus	7.76	1724.64
Zuleger	4	Z4	Core	Pool	3	38938	Chironomidae	Paratendipes	25.87	5748.79
Zuleger	4	Z4	Core	Pool	3	38938	Chironomidae	Phaenopsectra	2.59	574.88
Zuleger	4	Z4	Core	Run	3	38938	Chironomidae	Procladius	5.35	1188.41
Zuleger	4	Z4	Core	Pool	3	38938	Chironomidae	Pseudochironomus	2.59	574.88
Zuleger	4	Z4	Core	Pool	3	38938	Chironomidae	Rheotanytarsus	2.59	574.88
Zuleger	4	Z4	Core	Run	3	38938	Chironomidae	Stictochironomus	7.35	1632.85
Zuleger	4	Z4	Core	Pool	3	38938	Chironomidae	Tanytarsus	57.91	12869.57
Zuleger	4	Z4	Core	Run	3	38938	Chironomidae	Tanytarsus	96.26	21391.30
Zuleger	4	Z4	Core	Pool	3	38938	Elmidae	Dubiraphia	1	222.22
Zuleger	4	Z4	Core	Run	3	38938	Elmidae	Dubiraphia	9	2000.00
Zuleger	4	Z4	Core	Run	3	38938	Empididae	Empididae	1	222.22
Zuleger	4	Z4	Core	Run	3	38938	Hydridae	Hydra	1	222.22
Zuleger	4	Z4	Core	Pool	3	38938	Hydridae	Hydra	13	2888.89
Zuleger	4	Z4	Core	Pool	3	38938	Leptophlebiidae	Leptophlebiidae	1	222.22
Zuleger	4	Z4	Core	Run	3	38938	Leptophlebiidae	Leptophlebiidae	1	222.22
Zuleger	4	Z4	Core	Pool	3	38938	Physidae	Physella	1	222.22
Zuleger	4	Z4	Core	Pool	3	38938		Acari	3	666.67

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Zuleger	4	Z4	Core	Run	3	38938		Acari	14	3111.11
Zuleger	4	Z4	Core	Pool	3	38938		Nematoda	2	444.44
Zuleger	4	Z4	Core	Run	3	38938		Nematoda	2	444.44
Zuleger	4	Z4	Core	Run	3	38938		Oligochaeta	12	2666.67
Zuleger	4	Z4	Core	Pool	3	38938		Oligochaeta	34	7555.56
Zuleger	4	Z4	Dnet	Bank	1	38938	Aeshnidae	Aeshna	6	
Zuleger	4	Z4	Dnet	Bank	1	38938	Aeshnidae	Boyeria	6	
Zuleger	4	Z4	Dnet	Bank	1	38938	Asellidae	Caecidotea	4	
Zuleger	4	Z4	Dnet	Bank	1	38938	Baetidae	Baetis	4	
Zuleger	4	Z4	Dnet	Bank	1	38938	Baetiscidae	Baetisca	4	
Zuleger	4	Z4	Dnet	Bank	1	38938	Brachycentridae	Micrasema	2	
Zuleger	4	Z4	Dnet	Bank	1	38938	Calopterygidae	Calopteryx	8	
Zuleger	4	Z4	Dnet	Bank	1	38938	Chironomidae	Cladotanytarsus	58.56	
Zuleger	4	Z4	Dnet	Bank	1	38938	Chironomidae	Cryptochironomus	29.28	
Zuleger	4	Z4	Dnet	Bank	1	38938	Chironomidae	Microcricotopus	29.28	
Zuleger	4	Z4	Dnet	Bank	1	38938	Chironomidae	Microtendipes	1.56	
Zuleger	4	Z4	Dnet	Bank	1	38938	Chironomidae	Paracladopelma	29.28	
Zuleger	4	Z4	Dnet	Bank	1	38938	Chironomidae	Parametriocnemus	58.56	
Zuleger	4	Z4	Dnet	Bank	1	38938	Chironomidae	Paratanytarsus	269.76	
Zuleger	4	Z4	Dnet	Bank	1	38938	Chironomidae	Polypedilum	147.97	
Zuleger	4	Z4	Dnet	Bank	1	38938	Chironomidae	Rheotanytarsus	29.28	
Zuleger	4	Z4	Dnet	Bank	1	38938	Chironomidae	Stempellinella	29.28	
Zuleger	4	Z4	Dnet	Bank	1	38938	Chironomidae	Tanytarsus	414.62	
Zuleger	4	Z4	Dnet	Bank	1	38938	Chironomidae	Thienemannimyia	58.56	
Zuleger	4	Z4	Dnet	Bank	1	38938	Dixidae	Dixella	24	
Zuleger	4	Z4	Dnet	Bank	1	38938	Dryopidae	Helichus	3	
Zuleger	4	Z4	Dnet	Bank	1	38938	Elmidae	Dubiraphia	40	
Zuleger	4	Z4	Dnet	Bank	1	38938	Empididae	Chelifera	4	
Zuleger	4	Z4	Dnet	Bank	1	38938	Ephemeridae	Hexagenia	1	
Zuleger	4	Z4	Dnet	Bank	1	38938	Erpobdellidae	Erpobdellidae	1	
Zuleger	4	Z4	Dnet	Bank	1	38938	Gerridae	Aquarius	1	
Zuleger	4	Z4	Dnet	Bank	1	38938	Hydridae	Hydra	2	
Zuleger	4	Z4	Dnet	Bank	1	38938	Hydropsychidae	Hydropsyche	2	
Zuleger	4	Z4	Dnet	Bank	1	38938	Leptophlebiidae	Leptophlebiidae	6	
Zuleger	4	Z4	Dnet	Bank	1	38938	Phryganeidae	Ptilostomis	12	
Zuleger	4	Z4	Dnet	Bank	1	38938	Physidae	Physella	86	
Zuleger	4	Z4	Dnet	Bank	1	38938	Polycentropodidae	Polycentropus	2	
Zuleger	4	Z4	Dnet	Bank	1	38938	Psychomyiidae	Lype	2	
Zuleger	4	Z4	Dnet	Bank	1	38938	Sialidae	Sialis	8	
Zuleger	4	Z4	Dnet	Bank	1	38938	Sphaeriidae	Sphaeriidae	2	
Zuleger	4	Z4	Dnet	Bank	1	38938	Stratiomyidae	Odontomyia	2	
Zuleger	4	Z4	Dnet	Bank	1	38938	Tabanidae	Chrysops	4	
Zuleger	4	Z4	Dnet	Bank	1	38938		Acari	18	
Zuleger	4	Z4	Dnet	Bank	1	38938		Collembola	6	
Zuleger	4	Z4	Dnet	Bank	1	38938		Oligochaeta	144	
Zuleger	4	Z4	Dnet	Bank	1	38938		Plecoptera	2	
Zuleger	4	Z4	Dnet	Wood	2	38938	Aeshnidae	Boyeria	1	
Zuleger	4	Z4	Dnet	Wood	2	38938	Asellidae	Caecidotea	1	
Zuleger	4	Z4	Dnet	Wood	2	38938	Chironomidae	Cladotanytarsus	4.81	
Zuleger	4	Z4	Dnet	Wood	2	38938	Chironomidae	Microcricotopus	4.81	
Zuleger	4	Z4	Dnet	Wood	2	38938	Chironomidae	Microtendipes	6.81	

LOCATION	SITEno	site	gear	habitat	SAMPLE	DATE	FAMILY	TAXA	count	No./m2
Zuleger	4	Z4	Dnet	Wood	2	38938	Chironomidae	Odontomesa	4.81	
Zuleger	4	Z4	Dnet	Wood	2	38938	Chironomidae	Paracladopelma	4.81	
Zuleger	4	Z4	Dnet	Wood	2	38938	Chironomidae	Paratanytarsus	14.43	
Zuleger	4	Z4	Dnet	Wood	2	38938	Chironomidae	Polypedilum	9.62	
Zuleger	4	Z4	Dnet	Wood	2	38938	Chironomidae	Rheotanytarsus	14.43	
Zuleger	4	Z4	Dnet	Wood	2	38938	Chironomidae	Stempellinella	4.81	
Zuleger	4	Z4	Dnet	Wood	2	38938	Chironomidae	Tanytarsus	149.06	
Zuleger	4	Z4	Dnet	Wood	2	38938	Chironomidae	Thienemannimyia	9.62	
Zuleger	4	Z4	Dnet	Wood	2	38938	Culicidae	Culicidae	1	
Zuleger	4	Z4	Dnet	Wood	2	38938	Dixidae	Dixella	1	
Zuleger	4	Z4	Dnet	Wood	2	38938	Dryopidae	Helichus	1	
Zuleger	4	Z4	Dnet	Wood	2	38938	Elmidae	Dubiraphia	4	
Zuleger	4	Z4	Dnet	Wood	2	38938	Empididae	Chelifera	2	
Zuleger	4	Z4	Dnet	Wood	2	38938	Empididae	Hemerodromia	1	
Zuleger	4	Z4	Dnet	Wood	2	38938	Hydropsychidae	Hydropsyche	1	
Zuleger	4	Z4	Dnet	Wood	2	38938	Leptoceridae	Leptoceridae	1	
Zuleger	4	Z4	Dnet	Wood	2	38938	Leptophlebiidae	Leptophlebiidae	1	
Zuleger	4	Z4	Dnet	Wood	2	38938	Physidae	Physella	5	
Zuleger	4	Z4	Dnet	Wood	2	38938	Psychomyiidae	Lype	1	
Zuleger	4	Z4	Dnet	Wood	2	38938	Sialidae	Sialis	2	
Zuleger	4	Z4	Dnet	Wood	2	38938	Sphaeriidae	Sphaeriidae	3	
Zuleger	4	Z4	Dnet	Wood	2	38938	Tabanidae	Chrysops	3	
Zuleger	4	Z4	Dnet	Wood	2	38938		Acari	37	
Zuleger	4	Z4	Dnet	Wood	2	38938		Collembola	3	
Zuleger	4	Z4	Dnet	Wood	2	38938		Nematoda	2	
Zuleger	4	Z4	Dnet	Wood	2	38938		Oligochaeta	32	

Invertebrate Trait Descriptions

Major Taxonomic Levels	Structural and Functional Attributes
Ephemeroptera	Burrower
Plecoptera	Chewer
Trichoptera	Climber
Oligochaeta	Clinger
Polychaeta	Grazer
Mollusca	Predator
Chironomidae	Scraper
Tanypodinae	Shredder
Diptera	Collector-Gatherer
Crustacean	Collector-Filterer
Amphipoda	
Hemiptera	**Voltinism**
Odonata	Multivoltine
Coleoptera	Univoltine
Sphaeriidae	Merovoltine
Dytiscidae	
Corixidae	**Mobility**
Coenanigrionidae	Mobile
Non-Insects	Non-Mobile

Trophic Status	Metrics
Omnivore	EPT
Detritivore	HBI'82
Herbivore	HIBI'87
Carnivore	MIBI
	EPA Tolerance
	Native
	Exotic