

**Aquatic Fauna Survey and Baseline Fish Status Survey
of Kelley Creek,
Williamson County, Tennessee**

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INTRODUCTION

On 8 May 1997 a preliminary survey of the ichthyofauna and aquatic macroinvertebrates of Kelley Creek and adjacent spring seeps was performed by members of Conservation Fisheries, Inc. (CFI) with Dr. David Etnier of the University of Tennessee (UT), Knoxville, for The Nature Conservancy, Tennessee Field Office. The purpose of the survey was to sample the aquatic fauna to determine if any rare or unusual species occurred and to evaluate the overall diversity and health of the system in the face of a proposed highway construction project. As far as was known, no previous surveys of this nature have ever been conducted in any streams in the area prior to this work. The presence of a number of rare flora in the seeps adjacent to the creek indicated the potential for finding similarly rare aquatic fauna.

The survey was conducted throughout an approximately 1.0 km reach of Kelley Creek centered on the mouth of White Oak Creek, including adjacent spring seeps and pools within that reach and the lower 30-40 m of White Oak Creek. This locality is about 1.0 km SE of Pewitt Chapel, 20.5 km WSW of Franklin, Williamson County, Tennessee. Kelley Creek is a tributary to South Harpeth Creek, tributary to the South Harpeth River.

A total of 15 fish taxa and 69 macroinvertebrate taxa were collected, and while no new or unusual or rare taxa were discovered, the overall diversity was surprisingly high for such a low order stream. The richness of the ephemeropteran (mayflies), plecopteran (stoneflies), and trichopteran (caddisflies) aquatic insect fauna was especially notable and indicative of high water quality and the relative absence of siltation probably as a result of intact riparian and watershed vegetation.

The purpose of the survey described below was to further expand the area sampled in the event that any unique or significant habitats or associated species were missed in the 1997 work, and to establish a quantitative sample of the fish community for comparison with similar watersheds and as a baseline for future monitoring.

METHODS

Field Methods

On 30 September and 1 October 1998 fish and macroinvertebrates were collected from a broad multi-stream reach that began at a downstream site on Kelley Creek east of Taylor Cemetery, approximately 0.75 km below the mouth of Copperas Branch up into the headwaters of Kelley Creek, White Oak Branch, and Copperas Branch (see Figure 1). Upstream limits of sampling were designated where flow was reduced to a trickle and/or fish species diversity was reduced to only one to three species. Macroinvertebrates were sampled from the streams throughout these reaches as well as any adjacent seeps.

Fish were collected using a 1.25 m x 3 m or 2.5 m x 6 m seine with 4.8 mm fine mesh and large, 0.5 m square dipnets with 4.8 mm fine mesh, using a variety of methods to exhaustively sample all habitat types. Macroinvertebrates were collected with the dipnets and seine as well as with 2 mm mesh screens and by hand-picking rocks and other substrates to ensure sampling of all habitat types. Representatives of each invertebrate taxon were preserved in either alcohol or formalin for later identification.

Nearly all fish were released, but individuals whose identifications were questionable were preserved in formalin for later verification.

On 27 October fish were again sampled at three sites. The first two sites were delineated in length and average width using a 50 m field tape. The first site (UKC--upper Kelley Creek) consisted of the lowermost 70 m of White Oak Branch plus 70 m of Kelley Creek above the mouth of White Oak Branch. The second site (LKC--lower Kelley Creek) consisted of the 135 m of Kelley Creek below Copperas Branch. These sites were quantitatively sampled by making downstream hauls with the 6 m seine in 3-5 m sections continuously from the top to the bottom of the sampled reaches. Workers stirred up a plume of turbid water to pull the seine through and walked ahead of the seine kicking the shoreline and undercut banks and disturbing or lifting woody debris and rocks to dislodge hiding fish. All fish were temporarily held in buckets until the entire reach was seined and then the fish were identified, counted, and examined for parasites or any abnormalities prior to release. The area sampled was calculated and used to determine the catch per unit of effort (CPUE) or number of fish collected per unit area. The fish community at each of these sites was also evaluated by calculating an Index of Biotic Integrity (IBI), discussed in more detail below.

The final site collected was South Harpeth Creek at South Harpeth Road just below the mouth of Arkansas Creek. Fish were collected with the 6 m seine using a variety of methods from the bridge to approximately 100 m downstream. All fish were identified and released and relative numbers noted. Substrates and shorelines were searched for the presence of mussel shells.

Index of Biotic Integrity

The Index of Biotic Integrity was first proposed and developed by Karr (1981) as a method for determining the impact of anthropogenic disturbance on fish communities in midwestern streams. Since its introduction as a stream fisheries assessment tool, it has been adapted and modified for several different physiographic provinces in North America (Miller et al., 1988). The initial IBI has been tweaked and altered by most researchers because the faunal composition measures (metrics) that compose the index, species richness and relative abundance, vary naturally among watersheds and geographic regions.

Kelley Creek lies within the Western Highland Rim physiographic province (Etnier and Starnes, 1993) that is encompassed by the Interior Plateau ecoregion (Griffith et al., 1997). Usually IBI metric scores are calculated relative to samples from undisturbed sites within the same ecoregion and watershed. Unfortunately, we were unable to find any published information on IBI development for this portion of the Cumberland River system. However, the Tennessee Valley Authority (TVA) has sampled hundreds of streams throughout ecoregions in the Tennessee River system to establish appropriate IBI criteria. TVA metrics and scoring criteria for portions of the Duck River system in the Interior Plateau (Table 1) were applied to the Kelley Creek IBI's because it flows through, and is adjacent to the watershed we sampled.

Table 1. Interior Plateau metrics used by TVA for the Duck River system and those used by CFI for Kelley Creek.

| Watershed Area | | | |
|----------------------------|----------------------------|----------------------------|----------------------------|
| Smallest | | Small | |
| TVA | CFI | TVA | CFI |
| Metrics | | | |
| # Native Species | # Native Species | # Native Species | # Native Species |
| # Riffle Species | # Darter Species | # Darter Species | # Darter Species |
| # Pool Species | # Pool Species | # Sunfish Species | # Pool Species |
| # Intolerant Species | # Intolerant Species | # Intolerant Species | # Intolerant Species |
| # Tolerant Species | # Tolerant Species | # Tolerant Species | # Tolerant Species |
| % 2 Predominant Species | % 2 Predominant Species | # Sucker Species | # Sucker Species |
| % Omnivores & Stonerollers | % Omnivores & Stonerollers | % Omnivores & Stonerollers | % Omnivores & Stonerollers |
| % Specialist Insectivores | % Specialist Insectivores | % Specialist Insectivores | % Specialist Insectivores |
| % Piscivores | Deleted | % Piscivores | Deleted |
| % Lithophilic Spawners | % Lithophilic Spawners | % Hybrids | % Hybrids |
| % Anomalies | % Anomalies | % Anomalies | % Anomalies |
| Catch Rate | Catch Rate | Catch Rate | Catch Rate |
| | | Not used | % Lithophilic Spawners |

Only a few of the metrics used for Kelley Creek fish assemblages were altered. Species habitat affinities, reproductive and feeding guilds, and tolerances used in assigning metrics are listed in Table 2. All substitutions or changes in metric selection were employed to better reflect the relatively unique habitat in the creek system. Percent of the assemblage as piscivores was deleted for both stream size classes sampled, because it is unlikely that the small, spring-fed, bedrock-bottomed streams have ever harbored very large populations of fish in this feeding guild. The predominantly bedrock substrate in the creek results in a lack of riffle habitat and contributes very little to the structure favored by sunfishes for refugia. Therefore, number of darter species was substituted for number of riffle species in the two smallest streams sampled and number of pool species was substituted for the sunfish metric at the larger Kelley creek site. The proportion of lithophilus spawners, individuals that deposit eggs freely over clean gravel (Berkman and Rabeni, 1987), was included in our analysis of the larger Kelley Creek site to obtain better resolution in measuring potential impacts on the stream, both presently and in the future. Given the creek's unvarying habitat, it is unlikely that the distribution of spawning guilds differs significantly between the watershed areas sampled.

Each metric was scored as a 1, 3, or 5 depending on how much its value deviates from criteria based on ecoregion reference streams. These values were unaltered from TVA Interior Plateau data (see Results). A score of 5 was assigned to metric values that match that expected for an undisturbed stream, whereas a value of 1 indicated the most substantial deviation from expectations. Eleven and twelve metrics were used to calculate scores for the two smallest sites sampled, White Oak Creek and Kelley Creek above the confluence, and the larger site, Kelley Creek at Copperas Branch, respectively. Thus, scores could range from 11-55 for the smaller sites, and 12-60 for the larger one. Scores

within 90 %, 80%, 70%, 60%, and less than 50% of the maximum IBI attainable were assigned qualitative rankings of excellent, good, fair, poor, and very poor, respectively.

Table 2. Feeding guild, spawning guild, habitat affinity, and tolerance of species collected in Kelley Creek (Modified from TVA database). H = herbivore, I = insectivore, SP = specialized insectivore, O = omnivore; N = nester, CN = complex nester, C = crevice spawner, SL= simple lithophilus (require silt free substrates), S = simple (variety of substrates); M = moderately tolerant, T = tolerant, I = intolerant.

| Scientific Name | Common Name | Feeding | Spawning | Habitat | Tolerance |
|---------------------------------|------------------------|---------|----------|---------|-----------|
| <i>Camptostoma anomalum</i> | central stoneroller | H | N | P | M |
| <i>Cyprinella galactura</i> | whitetail shiner | I | C | P | M |
| <i>Luxilus chrysocephalus</i> | striped shiner | O | S | P | T |
| <i>Lythrurus fasciolaris</i> | rosefin shiner | SP | SL | P | M |
| <i>Nocomis effusus</i> | redtail chub | O | N | P | M |
| <i>Notropis leuciodus</i> | tennessee shiner | SP | SL | P | I |
| <i>Phoxinus erythrogaster</i> | southern redbelly dace | H | SL | P | M |
| <i>Pimephales notatus</i> | buntnose minnow | O | S | P | T |
| <i>Rhynchithys atratulus</i> | blacknose dace | I | S | P | M |
| <i>Semotilus atromaculatus</i> | creek chub | O | N | P | T |
| <i>Noturus exilis</i> | slender madtom | SP | CN | P | I |
| <i>Fundulus catenatus</i> | northern studfish | SP | SL | P | M |
| <i>Cottus carolinae</i> | banded sculpin | I | S | P | M |
| <i>Lepomis macrochirus</i> | bluegill | I | N | P | M |
| <i>Micropterus dolomieu</i> | smallmouth bass | P | N | P | M |
| <i>Micropterus salmoides</i> | largemouth bass | P | N | P | T |
| <i>Etheostoma caeruleum</i> | rainbow darter | SP | SL | R | M |
| <i>Etheostoma crossopeterum</i> | fringed darter | SP | CN | P | M |
| <i>Etheostoma flabellare</i> | fantail darter | SP | CN | R | I |
| <i>Etheostoma flavum</i> | saffron darter | SP | SL | P | M |
| <i>Etheostoma simoterum</i> | snubnose darter | SP | SL | P | M |
| <i>Etheostoma virgatum</i> | striped darter | SP | CN | R | M |

RESULTS & DISCUSSION

Fish Fauna

A total of 32 fish taxa (Table 3) were collected when all sites and samples were combined. This is twice the number collected in 1997 and is due primarily to the greater diversity encountered in a larger stream such as the reaches below where Copperas Branch joins Kelley Creek. Examples of fishes found there include the sunfish species, the sculpin, the suckers, and various minnows (see Table 3). For several fish species, the mouth of Copperas Branch and Kelley Creek marked a significant transition zone, with southern redbelly dace found almost exclusively above this point and snubnose darters found only here and downstream. Creek chubs and fantail darters were also common above, but rare below this point. Similar transitions were noted in the headwaters of all the streams-- in all of them, the same five species tended to persist into the upper reaches: southern redbelly dace, blacknose dace, creek chubs, fringed darters, and fantail darters. At somewhat higher, smaller reaches, both dace dropped out, leaving the chub and

darters as far up as there was permanent, moving water. Although we did not survey above this point, creek chubs would likely have been the last fish to persist into the headwaters.

Table 3. Summary of fish species collected in Kelley Creek and South Harpeth Creek system.

| Scientific Name | Common name | Number Collected/Location | | | | | | |
|--------------------------------|------------------------|---------------------------|-----|-----|-----|-----|-----|-----|
| | | UKC | WOC | CB | LKC | KC1 | KC2 | SHC |
| <i>Campostoma anomalum</i> | central stoneroller | 2* | | 3-4 | C | 3 | 16 | C |
| <i>Cyprinella galactura</i> | whitetail shiner | | | 3-4 | C | 10 | 29 | C |
| <i>Hybopsis amblops</i> | bigeye chub | | | | 2 | | | C |
| <i>Luxilus chrysocephalus</i> | striped shiner | A | | 3-4 | C | 2 | 21 | C |
| <i>Lythrurus fasciolaris</i> | rosefin shiner | A | 1 | C | A | 21 | 83 | S |
| <i>Nocomis effusus</i> | orange fin chub | ~20 | | | C | 3 | 9 | |
| <i>Notropis boops</i> | bigeye shiner | | | | | | | S |
| <i>N. leuciodus</i> | Tennessee shiner | | | | >20 | 3 | 9 | C |
| <i>N. serrulatus</i> | sawfin shiner | | | | | | | S |
| <i>N. telescopus</i> | telescope shiner | | | | ~10 | | | S |
| <i>Phoxinus erythrogaster</i> | southern redbelly dace | A | A | A | C | 223 | | |
| <i>Pimephales notatus</i> | bluntnose minnow | | | | | | 4 | |
| <i>Rhinichthys atratulus</i> | blacknose dace | A | A | A | C | 81 | 28 | |
| <i>Semotilus atromaculatus</i> | creek chub | A | A | C | C | 16 | 2 | |
| <i>Hypentelium nigricans</i> | northern hogsucker | | | | | | | 1-2 |
| <i>Moxostoma cf. duquesnei</i> | black redhorse | | | | | | | 1-2 |
| <i>Noturus exilis</i> | slender madtom | 7 | | | 3 | 1 | | |
| <i>Fundulus catenatus</i> | northern studfish | C | 1 | 2-3 | C | 3 | 7 | C |
| <i>Cottus carolinae</i> | banded sculpin | | | | | | 1 | |
| <i>Ambloplites rupestris</i> | rockbass | | | | 1 | | | |
| <i>Lepomis auritus</i> | redbreast sunfish | | | | 3 | | | |
| <i>L. cyanellus</i> | green sunfish | | | | 1 | | | |
| <i>L. macrochirus</i> | bluegill | | | 2-3 | 3-4 | | 1 | S |
| <i>Micropterus dolomieu</i> | smallmouth bass | | | | | | 1 | 2 |
| <i>M. salmoides</i> | largemouth bass | | | 1 | 1 | | 1 | |
| <i>Etheostoma caeruleum</i> | rainbow darter | 1 | | | 5 | | 1 | 2-3 |
| <i>E. crossopterum</i> | fringed darter | A | S | C | C | 33 | 25 | |
| <i>E. flabellare</i> | fantail darter | C | S | C | C | 29 | 3 | |
| <i>E. flavum</i> | saffron darter | >30 | | 2-3 | C | 15 | 50 | S |
| <i>E. rufilineatum</i> | redline darter | | | | 2 | | | 2-3 |
| <i>E. simoterum</i> | snubnose darter | | | | >30 | | 12 | |
| <i>E. virgatum</i> | striped darter | C | 3 | 1 | 1 | 32 | 42 | 2-3 |

Locations: UKC-upper Kelley Cr above Copperas 9/30; WOC-White Oak Cr 9/30; CB-Copperas Br 10/1; LKC-lower Kelley Cr below Copperas 10/1; KC1-Kelley Cr/White Oak Br 10/27; KC2-Kelley Cr below Copperas Br 10/27; SHC-South Harpeth Cr

*A=abundant; C=common; S=several (5-10)

As noted in the 1997 survey, the presence of *Rhinichthys atratulus*, the blacknose dace, in Kelley Creek is the only known occurrence of this species in the entire Harpeth River system. Although the species is common and widespread in the Cumberland, Tennessee, and Ohio River systems, if it has been reproductively isolated long enough,

this newly discovered Harpeth system population could potentially be determined to be a distinctive or unique taxon in future studies. A similar argument would be valid for the southern redbelly dace-- only two other populations of this species are known from the Harpeth River system and the species appears to be polytypic (Etnier and Starnes, 1993).

Also noted previously as significant and unusual for Kelley Creek's fish fauna is the presence of three species of darters in the subgenus *Catonotus* (*Etheostoma crossopterum*, *flabellare*, and *virgatum*). This is very unusual in a stream this size, and again reflects on the excellent water quality and the unique habitat characteristics of Kelley Creek, particularly the dominance of bedrock bottom, shelves, and slab rocks. Darters in this species group all spawn by attaching their eggs to the underside of any substrate providing a horizontal ceiling over a small cavity; for example, logs, bedrock shelves, and especially slab rocks. As a result, these species are sensitive to sediment runoff and siltation which fills and buries such spawning sites. Our surveys indicate that, while all three species occur together in some reaches, the fringed darter occurs throughout the watershed, whereas striped darters inhabit predominantly the lower stream reaches and fantail darters predominantly the upper reaches. The co-occurrence of these three species with such similar ecological requirements would provide an excellent opportunity for further studies of competition and habitat partitioning.

The Index of Biotic Integrity results for each sample area are presented in Tables 4-6. IBI scores reflected habitat differences among sites, but, because they were based primarily on criteria set for the Duck River in the Interior Plateau, they probably underestimated stream and habitat quality. The significantly lower score calculated from the White Oak Creek fish assemblage can be attributed to the sampled segments containing an almost uniformly bedrock creek bottom that is virtually devoid of gravel, slab-rocks, or other substrates. Although higher scores obtained from samples taken at the two Kelley Creek stations equate with a good qualitative rating and reflect habitat variety in contrast to White Oak Creek, these scores should probably be even higher. Scores at all sites were likely biased by the relatively low catch per unit effort metric. Further sampling is needed in the Harpeth/Cumberland system to obtain appropriate baseline values for accurate scoring.

Despite the slightly lower than expected IBI scores generated from fish samples collected in the Kelly Creek system, two of the three sites sampled were within the "good" range as described in the Methods section, and also corresponding with our field observations. Our failure to collect any suckers or madtom catfishes at the most downstream locality and corresponding deflation of the IBI, is likely a result of inefficient sampling. Sampling error and variability in IBI scores may be reduced by increasing effort and the number of individuals captured (Fore et al., 1993). Sampling the same reach twice instead of once, as we did, might yield more consistent scores through time. Any future detrimental land use effects in the Kelley Creek watershed will likely be detected by decreases in IBI scores if the same sampling effort is employed within the same season.

Table 4. White Oak Creek above Kelley Creek confluence, 27 October 1998.
Reach Length = 70 m, Mean Width = 3.5 m, Area = 245 m²

| Metric Description | Scoring Criteria | | | Observed | Score | |
|----------------------------------|------------------|---------|-----|----------|-----------|------|
| Number | 1 | 3 | 5 | | | |
| Native Species | <7 | 7-13 | >13 | 10 | 3 | |
| Darter Species | <2 | 2 | >2 | 3 | 5 | |
| Pool species | <5 | 5-9 | >9 | 9 | 3 | |
| Intolerant Species | <2 | 2 | >2 | 1 | 1 | |
| Percent | | | | | | |
| Tolerant Species | >40 | 20-40 | <20 | 3.1 | 5 | |
| 2 Predominant Species | >80 | 60-80 | <60 | 78 | 3 | |
| Omnivores & Stonerollers | >50 | 25-50 | <25 | 5.5 | 5 | |
| Specialist Insectivores | <22 | 22-44 | >44 | 15.4 | 1 | |
| Simple Lithophilus Spawners | <24 | 24-46 | >46 | 66.5 | 5 | |
| Diseased and/or with Anomalies | >5 | 2-5 | <2 | 0 | 5 | |
| CPUE (Fish/300 ft ²) | <32.6 | 32.6-65 | >65 | 22 | 1 | |
| | | | | | 37 | 55 |
| | | | | | Score | Pos. |
| Quality | | | | | Poor/Fair | |

Table 5. Kelley Creek above White Oak Creek confluence, 27 October 1998.
Reach Length = 70 m, Mean Width = 4.1 m, Area = 294 m²

| Metric Description | Scoring Criteria | | | Observed | Score | |
|----------------------------------|------------------|---------|-----|----------|-------|------|
| Number | 1 | 3 | 5 | | | |
| Native Species | <7 | 7-13 | >13 | 15 | 5 | |
| Darter Species | <2 | 2 | >2 | 4 | 5 | |
| Pool species | <5 | 5-9 | >9 | 13 | 5 | |
| Intolerant Species | <2 | 2 | >2 | 2 | 3 | |
| Percent | | | | | | |
| Tolerant Species | >40 | 20-40 | <20 | 3.8 | 5 | |
| 2 Predominant Species | >80 | 60-80 | <60 | 55.1 | 5 | |
| Omnivores & Stonerollers | >50 | 25-50 | <25 | 4.8 | 5 | |
| Specialist Insectivores | <22 | 22-44 | >44 | 37.3 | 3 | |
| Simple Lithophilus Spawners | <24 | 24-46 | >46 | 62.3 | 5 | |
| Diseased and/or with Anomalies | >5 | 2-5 | <2 | 0 | 5 | |
| CPUE (Fish/300 ft ²) | <32.6 | 32.6-65 | >65 | 22 | 1 | |
| | | | | | 47 | 55 |
| | | | | | Score | Pos. |
| Quality | | | | | Good | |

Table 6. Kelley Creek below Copperas Branch confluence, 27 October 1998.
Reach Length = 135 m, Mean Width = 8.1 m, Area = 1093.5 m²

| Metric Description | Scoring Criteria | | | Observed | Score |
|--------------------|------------------|------|-----|----------|-------|
| Number | 1 | 3 | 5 | | |
| Native Species | <9 | 9-17 | >17 | 20 | 5 |

| | | | | | | |
|----------------------------------|-------|---------|-----|------|-----------|------|
| Darter Species | <2 | 2 | >2 | 6 | 5 | |
| Pool species | <5 | 5-9 | >9 | 15 | 5 | |
| Sucker species | <1 | 1 | >1 | 0 | 1 | |
| Intolerant Species | <2 | 2 | >2 | 2 | 3 | |
| Percent | | | | | | |
| Tolerant Species | >37 | 19-37 | <19 | 14.9 | 5 | |
| Omnivores & Stonerollers | >45 | 23-45 | <23 | 16.3 | 5 | |
| Specialist Insectivores | <22 | 22-44 | >44 | 65.3 | 5 | |
| Simple Lithophilus Spawners | <24 | 24-46 | >46 | 43.6 | 3 | |
| Hybrids | >1 | TR-1 | 0 | 0 | 5 | |
| Diseased and/or with Anomalies | >5 | 2-5 | <2 | 0 | 5 | |
| CPUE (Fish/300 ft ²) | <32.6 | 32.6-65 | >65 | 12 | 1 | |
| | | | | | 48 | 60 |
| | | | | | Score | Pos. |
| Quality | | | | | Fair/Good | |

Macroinvertebrate Fauna

A total of nearly 100 aquatic macroinvertebrate taxa were collected from the Kelley Creek watershed in 1997 and 1998. Data from both years are presented in Table 7. Differences between the two years are likely the result both of sampling intensity as well as natural seasonal variation (spring vs. fall) and stochastic variation. Numbers of individuals reported are not indicative of abundance.

Nearly all the invertebrates identified were relatively widespread, common taxa. Exceptions include the Tennessee snaketail dragonfly, *Ophiogomphus acuminatus*, and a newly discovered and currently undescribed species of uenoidid caddisfly (*Neophylax* sp. nov.). Light trap sampling at various seasons of the year would likely collect additional taxa of caddisflies and other insects.

Crayfish identification was somewhat problematic. Specimens of *Cambarus* were not sufficiently mature to resolve as either *graysoni* or *striatus*. The *Orconectes durelli* individuals were very similar (in pleopod shape, the primary identifying characteristic) to *O. miurus*, but only the former species is reported as an associate of *O. placidus* (Bouchard and Bouchard, 1995) which was also present in Kelley Creek. Further studies would be desirable to resolve this question. Finally, the casts and entrances of burrowing crayfish were noted at several sites along Kelley Creek and Copperas Branch, but soils were too hard to excavate at the time of the surveys. Burrowing species are often highly localized and/or taxonomically unique. Efforts should be made to collect and identify these during wet soil conditions.

Table 7. Summary of macroinvertebrate species collected in Kelley Creek system.

| TAXON | 8 May 1997 | 30 September, 1 & 27 October 1998 |
|--------------------|---------------|--------------------------------------|
| PLATYHELMINTHES | | |
| (black planarians) | many in seeps | |
| MOLLUSCA | | |

| | | |
|---|----|----|
| Gastropoda | | |
| Pleuroceridae | 8 | |
| CRUSTACEA | | |
| Amphipoda | | |
| <i>Gammarus</i> sp.? | 1 | |
| Decapoda | | |
| <i>Cambarus graysoni/striatus</i> (FII) | | 1 |
| <i>Cambarus rusticiformis</i> | | 1 |
| <i>Orconectes durelli</i> | | 5 |
| <i>O. placidus</i> | | 1 |
| Isopoda | | |
| <i>Lirceus</i> sp. | 1 | |
| INSECTA | | |
| Plecoptera | | |
| Leuctridae | | |
| <i>Leuctra</i> sp. | 3 | 1 |
| Nemouridae | | |
| <i>Amphinemura nigratta</i> | 5 | 7 |
| Perlidae | | |
| <i>Acroneuria abnormis</i> | 8 | 17 |
| <i>Beloneuria</i> sp. | 3 | |
| <i>Neoperla</i> sp. | 1 | |
| <i>Perlesta</i> sp. | 1 | |
| Perlidae sp. (early instar) | | 1 |
| Ephemeroptera | | |
| Baetidae | | |
| <i>Acentrella</i> sp. | 4 | |
| <i>Baetis</i> sp. cf. <i>intercalaris</i> | 3 | |
| <i>Baetis tricaudatus/brunneicolor</i> | 3 | |
| <i>Baetis</i> sp. | | 10 |
| Caenidae | | |
| <i>Caenis</i> sp. | 2 | |
| Ephemerellidae | | |
| <i>Ephemerella</i> sp. (early instar) | | 2 |
| <i>Eurylophella verisimilis</i> | 7 | |
| <i>Serratella deficiens</i> | 2 | |
| Ephemeridae | | |
| <i>Ephemera</i> sp. | | 6 |
| Heptageniidae | | |
| <i>Epeorus dispar</i> | 1 | 1 |
| <i>Epeorus rubidus/subpallidus</i> | 11 | |
| <i>Heptagenia</i> sp. | | 5 |
| <i>Leucrocuta aphrodite</i> | 1 | |
| <i>Stenacron carolina</i> | 7 | |
| <i>Stenonema ithaca</i> | 7 | |
| <i>S. vicarium</i> | | 10 |
| <i>Stenonema</i> sp. (early instar) | | 13 |
| Isonychiidae | | |
| <i>Isonychia</i> sp. | | 10 |
| Leptophlebiidae | | |

| | | |
|--|----|----|
| <i>Habrophlebiodes</i> sp. | 3 | |
| <i>Paraleptophlebia</i> sp. | 2 | |
| Odonata | | |
| Aeshnidae | | |
| <i>Boyeria vinosa</i> | | 2 |
| Calopterygidae | | |
| <i>Calopteryx maculata/dimidiata</i> | 2 | 1 |
| Coenagrionidae | | |
| <i>Argia</i> sp. | 2 | 8 |
| Gomphidae | | |
| <i>Gomphus</i> sp. | 1 | |
| <i>Lanthus vernalis</i> | | 1 |
| <i>Ophiogomphus acuminatus</i> | 2 | 2 |
| <i>Ophiogomphus incurvatus</i> | | 6 |
| <i>Stylogomphus albistylus</i> | | 17 |
| Heteroptera | | |
| Gerridae | | |
| <i>Gerris remigis</i> | 2 | 1 |
| Veliidae | | |
| <i>Microvelia</i> sp. | 2 | |
| <i>Rhagovelia obesa</i> | | 11 |
| Veliidae sp. (nymph) | | 2 |
| Notonectidae | | |
| <i>Notonecta</i> sp. | | 1 |
| Megaloptera | | |
| Corydalidae | | |
| <i>Corydalis cornutus</i> | 1 | 13 |
| <i>Nigronia fasciata</i> | 1 | |
| <i>N. serricornis</i> | | 2 |
| Sialidae | | |
| <i>Sialis</i> sp. | 1 | |
| Trichoptera | | |
| Brachycentridae | | |
| <i>Micrasema charonis</i> (males) | 14 | |
| <i>M. rusticum</i> | | 20 |
| Goeridae | | |
| <i>Goera</i> sp. (pupa) | | 1 |
| Glossosomatidae | | |
| <i>Glossosoma nigrior</i> | 2 | |
| Helicopsychidae | | |
| <i>Helicopsyche borealis</i> (all forms) | 12 | 29 |
| Hydropsychidae | | |
| <i>Ceratopsyche cheilonis</i> | | 1 |
| <i>Ceratopsyche sparna</i> | 5 | 26 |
| <i>Cheumatopsyche</i> sp. | | 6 |
| <i>Diplectrona modesta</i> | 1 | 7 |
| <i>Diplectrona</i> sp. cf. <i>modesta</i> (black head) | 3 | |
| <i>Hydropsyche betteni/depravata</i> | 4 | 16 |
| Hydropsychidae sp. (early instar) | | 4 |
| Lepidostomatidae | | |

| | | |
|---|----|----|
| <i>Lepidostoma</i> sp. | 5 | |
| Limnephilidae | | |
| <i>Pycnopsyche lepida</i> | 1 | |
| <i>P. luculenta</i> grp. | 1 | 4 |
| Odontoceridae | | |
| <i>Psilotreta frontalis</i> | | 43 |
| <i>P. labida</i> | 4 | |
| <i>P. rufa</i> | 2 | |
| Philopotamidae | | |
| <i>Chimarra</i> sp. | 5 | 30 |
| <i>Dolophilodes distinctus</i> | 30 | |
| <i>Wormaldia</i> sp. | 2 | |
| Polycentropodidae | | |
| <i>Nyctiophylax</i> sp. | | 4 |
| <i>Polycentropus</i> sp. | 2 | |
| Psychomyiidae | | |
| <i>Psychomyia nomada</i> (all forms) | 10 | |
| Rhyacophilidae | | |
| <i>Rhyacophila carolinae</i> | 8 | |
| <i>R. parantra?</i> | 2 | |
| <i>Rhyacophila</i> sp. (female pupa) | | 1 |
| Uenoidae | | |
| <i>Neophylax consimilis</i> | 12 | |
| <i>Neophylax fuscus</i> (MMT male) | 15 | 5 |
| <i>Neophylax</i> sp. nov. (MMT male) | | 5 |
| Coleoptera | | |
| Elmidae | | |
| <i>Macronychus glabrata</i> (adults) | 2 | |
| <i>Optioservus</i> sp. | | 4 |
| <i>Promoresia elegans</i> (larvae & adults) | 13 | |
| <i>Stenelmis</i> sp. (larvae & adults) | 7 | |
| Eubridae | | |
| <i>Ectopria nervosa</i> | 2 | 11 |
| Psephenidae | | |
| <i>Psephenus herricki</i> | 3 | 16 |
| Stratiomyidae | | |
| <i>Oxycera</i> sp. | 2 | |
| Diptera | | |
| Athericidae | | |
| <i>Atherix lantha</i> | | 1 |
| Chironomidae | | |
| Tribe Chironomini | | 2 |
| Dixidae | | |
| <i>Dixa</i> sp. | 1 | |
| Empididae | | |
| Empididae sp. | 1 | |
| Simuliidae | | |
| <i>Cnephia/Simulium</i> | | 15 |
| <i>Prosimulium</i> sp. | | 2 |
| Stratiomyidae | | |

| | | |
|--------------------------------------|---|---|
| <i>Stratiomys</i> sp. | | 4 |
| Tabanidae | | |
| <i>Tabanus</i> sp. | | 1 |
| Tipulidae | | |
| <i>Limonia</i> sp. | 5 | |
| <i>Tipula</i> “ <i>abdominalis</i> ” | 1 | |
| <i>Tipula</i> sp. | | 6 |

CONCLUSIONS

The results of our surveys indicate that the Kelley Creek system contains a complex, relatively high diversity fish and aquatic macroinvertebrate community. Population densities of many taxa were surprisingly high given the relative habitat homogeneity of much of the areas surveyed. These characteristics are indicative of the stability and high quality of the system resulting from the lack of anthropogenic impacts and intact riparian zones and watersheds. Although none of the taxa that were collected are sufficiently rare to justify protection of the system for their benefit alone, the intactness of this whole community is a rarity, and therefore valuable and worthy of protection.

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