# River Raisin Adopt-A-Stream
# 2005 Report and Analyses

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## Table of Contents

# Background

Volunteer teams of 4 to 10 individuals collected macroinvertebrates from 14 River Raisin and tributary sites (Table 1) on April 30, 2005. Stream captains sampled the site with D-nets throughout available habitat within a 300 ft reach. Volunteers on the streambank selected several representative individuals of each unique family for quality analysis. Macroinvertebrates were stored in alcohol for identification two weeks after collection on May 14, 2005. Identification was completed by several biologists with varying experience in taxonomy. Identification accuracy was verified by Jill Kelley during September, 2005. Verification results can be found in River Raisin Adopt-a-Stream Macroinvertebrate Id Verification, November 10, 2005.

***Table 1. River Raisin Adopt-a-Stream Volunteer Monitoring Sites***

| Site | Water Body | Location | Cross Road |
|---|---|---|---|
| E1 | Evans Creek | Tecumseh | Maumee St. |
| G1 | Goose Creek | Brooklyn | M-50 |
| LRR1 | Little River Raisin | Petersburg | Brewer Rd. |
| RR1 | River Raisin | Monroe | Telegraph Rd. |
| RR2 | River Raisin | Monroe | Ida-Maybee Rd. |
| RR3 | River Raisin | Dundee | M-50 |
| RR5 | River Raisin | Manchester | Sharon Valley Rd. |
| RR6 | River Raisin | Tecumseh | Blood Rd. |
| RR7 | River Raisin | Clinton | M-52 |
| S2 | Saline River | Milan | Wilson Park |
| S3 | Saline River | Saline | Millpond Park |
| SBM1 | Macon Creek | Dundee | Petersburg Rd |
| SBR1 | South Branch River Raisin | Adrian | Heritage Park |
| SBR2 | South Branch River Raisin | Cadmus | Benner Rd. |

Thirty-eight families were collected in the River Raisin and its tributaries. The most frequently occurring families were Heptageniidae and Hydropsychidae occurring at 13 of 14 sites (Table 2). Calopterygidae and Coenagrionidae were the next most frequent with 8 and 7 sites respectively. Tipulidae, Corixidae, Limnephilidae and Polycentropodidae all occurred at half the sites or less.

## *Table 2. Frequency of family occurrences*

| 2005 macros | Frequency |
|---|---|
| Coleoptera | |
| Elmidae (L&A) | 4 |
| Gyrinidae | 2 |
| Haliplidae | 2 |
| Psephenidae | 1 |
| Chrysomelidae | 1 |
| | |
| Diptera | |
| Chironomidae | 12 |
| Tipulidae | 6 |
| Simuliidae | 3 |
| | |
| Ephemeroptera | |
| Heptageniidae | 13 |
| Baetidae | 4 |
| Baetiscidae | 3 |
| Caenidae | 2 |
| Ephemeridae | 2 |
| Isonychiidae | 2 |
| Ephemerellidae | 1 |
| Siphlonuridae | 1 |
| | |
| Heteroptera | |
| Corixidae | 6 |
| Belostomatidae | 2 |
| Gerridae | 1 |
| Nepidae | 1 |
| | |
| Megaloptera | |
| Corydalidae | 1 |
| | |
| Odonata | |
| Calopterygidae | 8 |
| Coenagrionidae | 7 |
| Aeshnidae | 4 |
| Gomphidae | 4 |
| Libellulidae | 1 |
| Macromiidae | 1 |
| | |
| Plecoptera | |
| Perlodidae | 2 |
| Capniidae | 1 |
| Pteronarcyidae | 1 |
| | |
| Trichoptera | |
| Hydropsychidae | 13 |
| Limnephilidae | 5 |
| Polycentropodidae | 5 |
| Philopotamidae | 2 |
| Brachycentridae | 1 |
| Phryganeidae | 1 |
| Psychomyiidae | 1 |
| Uenoidae | 1 |

## 2005 Individual Sites

The insect richness found among the sites in 2005 ranged from 6 to 16 (mean = 9.07 s.d. = 3.1). EPT families ranged from 0 to 8 (mean = 4.3 s.d. = 2.1). Two sites RR5 and RR7 were the most diverse sites and had the highest EPT (Table 3). RR5 had 15 insect families and RR7 had 16 which are at least a third higher than any other site and EPT was 60% higher than any other sites. They are located closer to the top of the watershed situated in a rural watershed sub-basin with riparian forests. RR3 and SBR1 had the lowest insect diversity with 6 families each. However they did not have the lowest EPT. The two lowest EPT sites were LRR1, where no EPT families were collected and E1 had only 2 EPT families.

The "Mi" abbreviation refers to the Stream Quality Score metric developed by MiCorps. This metric is based on pollution sensitivity of insect families.

Scoring is completed through a weighted tiered approach from the most pollution sensitive to tolerant families. A range of scores then determines which of four categories the site is given excellent, good, fair and poor. The Stream Quality Score Sheet can be downloaded at http://www.micorps.net/forms.html. This metric was revised in September, 2005 so year to year analysis would not apply. The Stream Quality Scores were all fair with the exception of two sites, G1 and RR7 which were good.

### *Table 3. Site Biometrics.*

| Site | Macro families | Insect Families | EPT | MiCorps |
|---|---|---|---|---|
| E1 | 6 | 7 | 2 | 2 |
| G1 | 15 | 11 | 5 | 3 |
| LRR1 | 11 | 7 | 0 | 2 |
| RR1 | 11 | 8 | 4 | 2 |
| RR2 | 12 | 7 | 4 | 2 |
| RR3 | 10 | 6 | 3 | 2 |
| RR5 | 17 | 15 | 8 | 2 |
| RR6 | 11 | 9 | 5 | 2 |
| RR7 | 19 | 16 | 8 | 3 |
| S2 | 10 | 7 | 4 | 2 |
| S3 | 11 | 11 | 5 | 2 |
| SBM1 | 10 | 8 | 3 | 2 |
| SBR1 | 9 | 6 | 4 | 2 |
| SBR2 | 11 | 9 | 5 | 2 |
| Mean | 11.6 | 9.1 | 4.3 | |
| Stand. Dev. | 3.3 | 3.2 | 2.1 | |

The adjacent land use varied while most had multiple land use few have a single land use such as forest or cropland (Table 4). Temperature varied from 6 C to 20 C with mean = 11.8. Physical data was not collected at all sites. At this point in the program development emphasis is being placed on macroinvertebrate sampling. Future efforts should incorporate physical data with the biological data.

## Data analysis from 2002 through 2005

Overall the years from 2002 through 2005 RR5 had the highest macroinvertebrate diversity (mean = 15 sd = 3.6) and the highest EPT scores (mean = 6.5 s.d. = 2.4) (Table 5). S2 had the lowest macroinvertebrate diversity (mean = 4.5 s.d. = 2.9). LRR1 had the lowest EPT scores (mean = 2.25 s.d. = 2.9) RR3 had the most stable macroinvertebrate community (mean = 6.3 s.d. = 1.5). Two sites had the most stable EPT metrics G1 (mean = 5.8 s.d. = .96) and SBR1 (mean = 3.3 s.d. = .96).

## *Table 4. Site Physical data*

| Site | Adjacent land use | Other Wildlife | temp | Vel ft/s | Depth | Dominant substrate |
|---|---|---|---|---|---|---|
| E1 | Forest/ residential lawns,parks | Crayfish | 10 C | 1.1 | 1 ft | Sand |
| G1 | Shrub or old field/impervious surfaces | Fish, crayfish | | 1 | 3 ft | Sand |
| LRR1 | Row crop/ residential lawns | Suckers | 10 C | 1.4 | | Sand |
| RR1 | Shrub or old field/ residential lawn, park/ impervious surfaces | ** | 10 C | 0.5 | ** | Sand & hard pan |
| RR2 | Wetland/ shrub or old field/ residential lawns, parks | Crayfish | 20 C | 3 | ** | Hardpan |
| RR3 | Park/ impervious surface/ disturbed ground | ** | 10 C | 2.5 | ** | Cobble/ gravel & hardpan |
| RR5 | Impervious surface/ forest/ shrub or old field/ wetlands | Crayfish | 10 C | ** | 3 ft | ** |
| RR6 | Shrub or old field/ forest/ disturbed ground | Fish | 13 C | ** | 2.5 ft | Sand |
| RR7 | Wetlands/ shrub or old field/ forest | Crayfish,evidence of deer, raccoon, geese | 10.5 C | ** | 3.33 ft | Sand |
| S2 | Forest | Green darter | 6 C | 2.4 | ** | ** |
| S3 | Forest | Green darter, sculpin | 6 C | 1.4 | ** | ** |
| SBM1 | Cropland | Minnow | 10 C | 1.3 | 2 ft | sand |
| SBR1 | Residential lawn, parks/ shrub or old field | woodpecker, tracks of coon & deer | 18 C | ** | 2.5 ft | ** |
| SBR2 | Shrub or old field/ pasture cropland | pheasant, frogs, swallows, dead deer | 20 C | ** | 1.5 ft | ** |
| Mean<br>S.D. | | | 11.8<br>4.7 | | | |

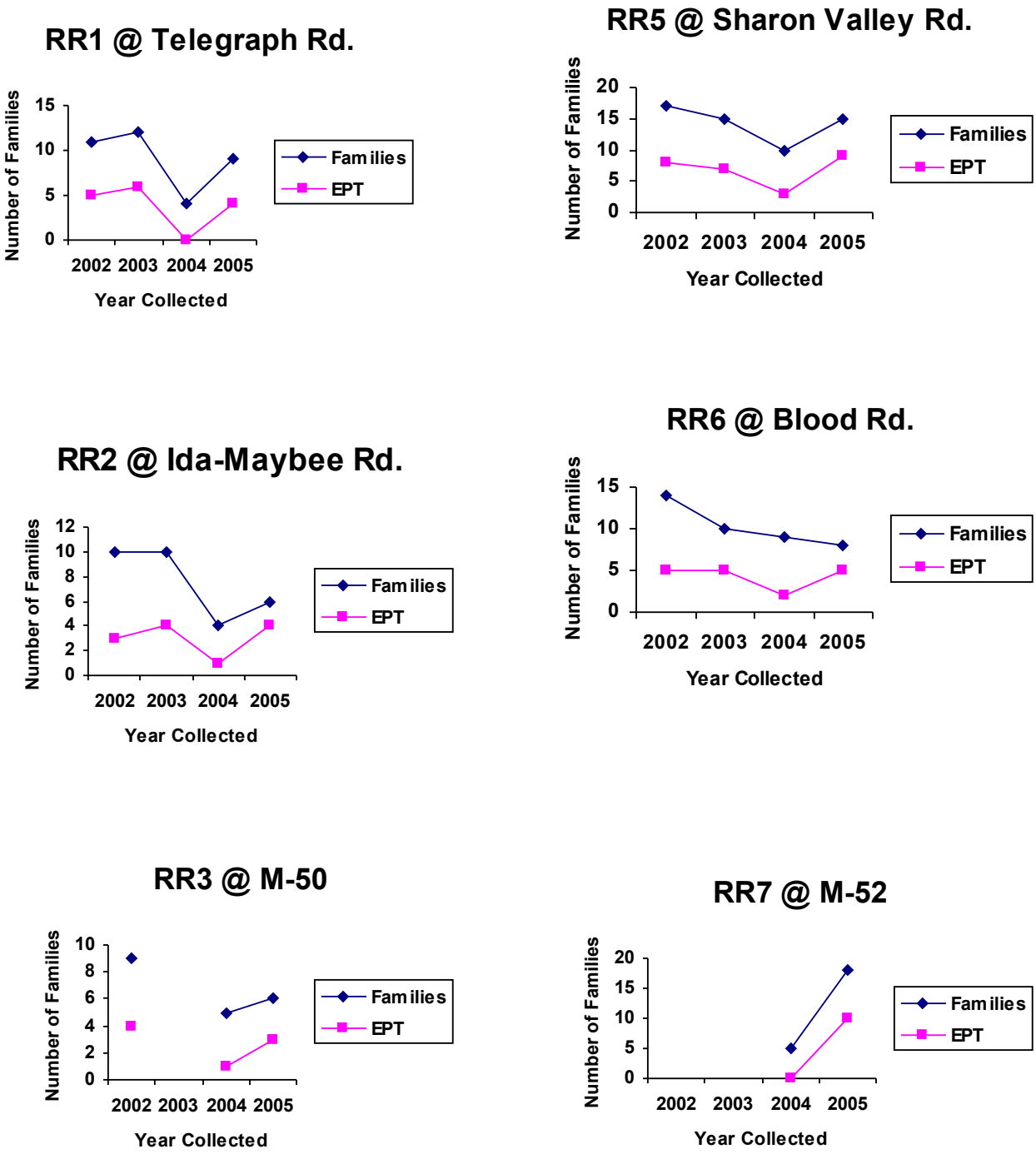
** = Data not reported

## *Table 5. Site EPT and Richness Statistics for 2002- 2005*

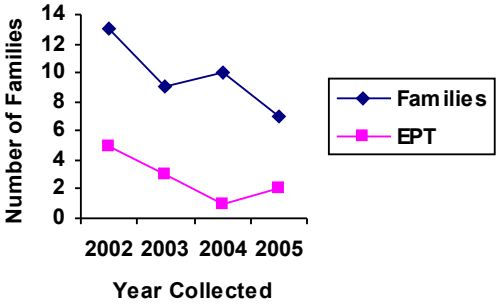
***A stable rating is given to the sites with the smallest Standard Deviation.***

| | N | Minimum | Maximum | Mean | Std. Deviation | Rating |
|---|---|---|---|---|---|---|
| E1FAM | 4 | 6.00 | 13.00 | 9.5000 | 2.88675 | |
| G1FAM | 4 | 13.00 | 17.00 | 14.7500 | 1.70783 | |
| LRR1FAM | 4 | 8.00 | 16.00 | 11.5000 | 3.31662 | |
| RR1FAM | 4 | 4.00 | 15.00 | 10.2500 | 4.57347 | |
| RR2FAM | 4 | 4.00 | 12.00 | 9.2500 | 3.59398 | |
| RR3FAM | 3 | 5.00 | 10.00 | 7.6667 | 2.51661 | |
| RR5FAM | 4 | 10.00 | 18.00 | 15.5000 | 3.69685 | Highest |
| RR6FAM | 4 | 9.00 | 14.00 | 12.0000 | 2.44949 | |
| RR7FAM | 2 | 4.00 | 19.00 | 11.5000 | 10.60660 | |
| S2FAM | 4 | 2.00 | 10.00 | 5.2500 | 3.94757 | Lowest |
| S3FAM | 4 | 6.00 | 11.00 | 8.2500 | 2.21736 | |
| SBM1FAM | 4 | 3.00 | 13.00 | 9.7500 | 4.71699 | |
| SBR1FAM | 4 | 9.00 | 13.00 | 10.2500 | 1.89297 | |
| SBR2FAM | 4 | 11.00 | 13.00 | 12.0000 | .81650 | Stable |
| E1EPT | 4 | 1.00 | 5.00 | 2.7500 | 1.70783 | |
| G1EPT | 4 | 5.00 | 7.00 | 5.7500 | .95743 | Stable |
| LRR1EPT | 4 | .00 | 6.00 | 2.2500 | 2.87228 | Lowest |
| RR1EPT | 4 | .00 | 6.00 | 3.7500 | 2.62996 | |
| RR2EPT | 4 | 1.00 | 4.00 | 3.0000 | 1.41421 | |
| RR3EPT | 3 | 1.00 | 4.00 | 2.6667 | 1.52753 | |
| RR5EPT | 4 | 3.00 | 8.00 | 6.5000 | 2.38048 | Highest |
| RR6EPT | 4 | 2.00 | 5.00 | 4.2500 | 1.50000 | |
| RR7EPT | 2 | .00 | 8.00 | 4.0000 | 5.65685 | |
| S2EPT | 4 | 1.00 | 4.00 | 2.7500 | 1.50000 | |
| S3EPT | 4 | 2.00 | 5.00 | 3.5000 | 1.29099 | |
| SBM1EPT | 4 | .00 | 5.00 | 3.2500 | 2.36291 | |
| SBR1EPT | 4 | 2.00 | 4.00 | 3.2500 | .95743 | Stable |
| SBR2EPT | 4 | 1.00 | 7.00 | 4.5000 | 2.51661 | |
| Valid N (listwise) | 2 | | | | | |

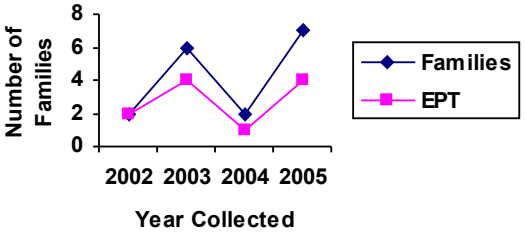
*Figure 1. Site EPT and Insect Families from Years 2002 – 2005.*



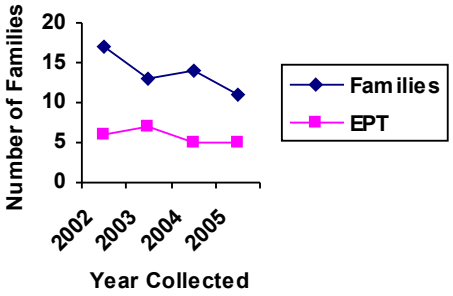
## E1 @ Maumee St.



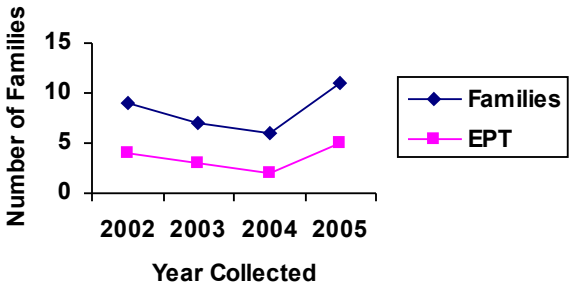

## S2 @ Wilson Park



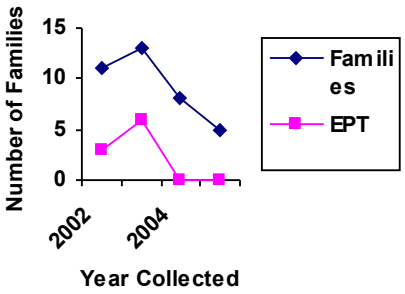

## G1 @ M-50



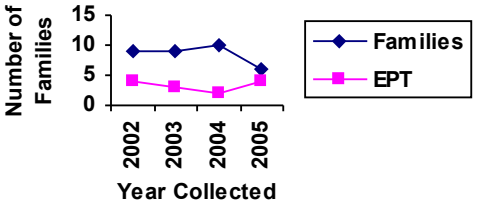

## S3 @ Millpond Park



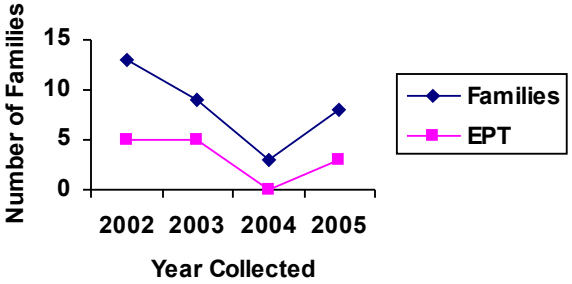

## LRR1 @ Brewer Rd.



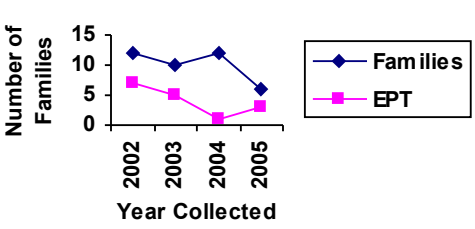

## SBR1 @ Heritage Park




## SBM1 @ Petersburg Rd.



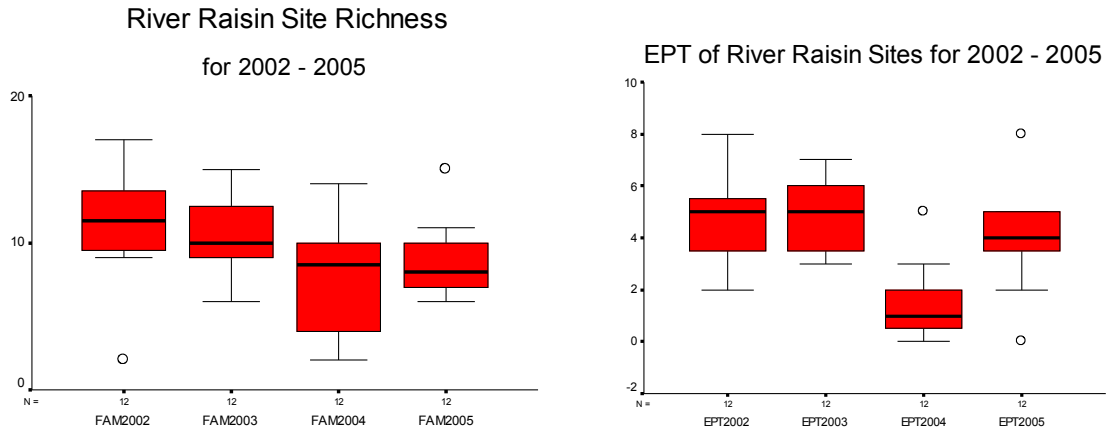

## SBR2 @ Brenner Rd.



## Data Quality

Since the program is still in its infancy stage, data quality is critical to establish. While the program has four years of sampling data, the program director has changed almost every year and the organization administering it has changed once. This makes it very difficult for a program to develop consistency. 2004 sampling overall had the lowest diversity and EPT (Figure 2). This is also the first year River Raisin Watershed Council has administered the program. 2005 samples were more reflective of the previous years of 2002 and 2003. 2004 may have been a year of lower diversity but as well or in conjunction the year that Adopt-a-Stream changed agency administration. Program quality is as important as the ecological trends that we are studying. The past sampling should not be considered wasted, but a time for developing experienced volunteer, sampling protocol and identifying program and training needs.

***Figure 2. Boxplots of Site Richness and EPT for the years 2002 though 2005.***




RR5 and RR7 were the two highest producing sites in 2005. Their position in the upper part of the watershed, riparian forest vegetation and rural sub-basin are usual factors to support high diversity. However there are several other similar sites which did not have nearly the diversity. Sampling methods may be a factor. The sampling was completed by a small team of one second year captain, one first year captain, one new

adult volunteer, one 9 year old child and Jill Kelley, aquatic ecologist. Well balanced teams are important in ensuring data quality.

## *Site comparison Adopt-A-Stream vs. Michigan Department of Environmental Quality*

Five of the AAS sites were compared with relatively recent DEQ macroinvertebrate surveys. While the 1998 DEQ sampling did not occur during the Adopt-A-Stream Program years DEQ data provides a baseline for the macroinvertebrate community that was present prior to Adopt-A-Stream sampling efforts.

Total number of families from DEQ mean = 17 are higher than AAS mean = 8.6. EPT is also higher for DEQ 1998 mean = 6.8 AAS = 4.8 (Table 6). The two surveys are related geographically, but not temporally. These differences are expected. Since all five sites were higher when DEQ sampled, AAS Sampling efforts need to be reviewed.

The combined families of the orders Heteroptera and Coleoptera are considerably higher with DEQ sampling (mean = 5.6) (AAS mean = 0.4). Several possibilities exist. These orders may not have been in the stream at the time of sampling in 2005 or the Coleoptera and Heteroptera habitat may not have been sampled. Many of these families spend much time near the surface. In the volunteers' effort to collect from the substrate, the surface may have been overlooked. These families are also very good swimmers and possibly just avoided an inexperienced collector. Future collection training should address the surface habitat and bring attention to surface swimmers.

### Table 6. Comparison of Insect Communities from AAS data vs. DEQ data.

| Location | Ida-Maybee Rd. | | Dundee | | Sharon Valley Rd. | | Heritage Park | | Carlton Rd. | |
|---|---|---|---|---|---|---|---|---|---|---|
| DEQ site name | | R-13 | | R-11 | | R-3 | | SB-4 | | SB1 |
| AAS site name | RR2 | | RR3 | | RR5 | | SBR1 | | SBR2 | |
| **Coleoptera** | | | | | | | | | | |
| Chrysomelidae | | | 1 | | | | | | | |
| Elmidae (L&A) | | 2 | | 4 | | 4 | | 4 | | 8 |
| Gyrinidae | | | | | 2 | 1 | | | | |
| Haliplidae | | 2 | | | | 1 | | | | 3 |
| Hydrophilidae (L&A) | | | | 1 | | 2 | | | | 3 |
| **Diptera** | | | | | | | | | | |
| Ceratopogonidae | | | | | | | | 1 | | 1 |
| Chironomidae | 1 | 10 | 7 | 18 | 6 | 15 | 8 | 15 | 4 | 15 |
| Culicidae | | | | | | 1 | | | | |
| Simuliidae | | 8 | | 1 | | 10 | | 14 | | |
| Tipulidae | | | | | | | 1 | | 4 | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Ephemeroptera** | | | | | | | | | | |
| Baetidae | | 7 | 1 | | 4 | 5 | | 5 | 1 | 3 |
| Baetiscidae | | | | | 1 | 2 | 3 | | | |
| Ephemeridae | 3 | | | 2 | | | | | | |
| Ephemerellidae | | | | | 1 | | | | | |
| Heptageniidae | 5 | 7 | 7 | 10 | 11 | 8 | 4 | 7 | 4 | 4 |
| Isonychiidae | | 4 | | | | | | | | |
| Potamanthidae | | | | 5 | | | | | | |
| Tricorythidae | | 3 | | | | | | | | |
| | | | | | | | | | | |
| **Heteroptera** | | | | | | | | | | |
| Belostomatidae | | | | | | 1 | | | | |
| Corixidae | | 5 | | 3 | | 3 | | 3 | | 8 |
| Gerridae | | 7 | | | | 6 | | 6 | | 10 |
| Mesoveliidae | | | | | | 2 | | 3 | | 3 |
| Veliidae | | 3 | | | | | | 3 | | 3 |
| | | | | | | | | | | |
| **Megaloptera** | | | | | | | | | | |
| Corydalidae | | | | | | 3 | | | | |
| | | | | | | | | | | |
| **Odonata** | | | | | | | | | | |
| Aeshnidae | | 2 | | | 2 | 2 | | | | |
| Calopterygidae | 2 | 4 | | 2 | 7 | 2 | | 3 | 4 | 3 |
| Coenagrionidae | 1 | 3 | 1 | 1 | 1 | 4 | | | 1 | |
| Gomphidae | | | | | 1 | | | | | |
| Macromiidae | | | | | 1 | | | | | |
| | | | | | | | | | | |
| **Plecoptera** | | | | | | | | | | |
| Capniidae | | | | | 1 | | | | | |
| Perlodidae | | | | | | | | 2 | 1 | |
| | | | | | | | | | | |
| **Trichoptera** | | | | | | | | | | |
| Hydropsychidae | 1 | 8 | 13 | 10 | 1 | 5 | 5 | 5 | 3 | 4 |
| Limnephilidae | | 1 | | 3 | 4 | 1 | | 2 | 1 | 3 |
| Molannidae | | 6 | | | | | | | | |
| Philopotamidae | 1 | 2 | | | | 5 | | | | |
| Polycentropodidae | | 3 | | | 4 | 2 | 1 | | | 2 |
| Psychomyiidae | | 3 | | 2 | | 2 | | | | |
| | | | | | | | | | | |
| **Families** | 7 | 20 | 6 | 13 | 15 | 23 | 6 | 14 | 9 | 15 |
| **EPT** | 4 | 10 | 3 | 6 | 8 | 8 | 4 | 5 | 5 | 5 |

## Recommendations:

Minimize the amount of physical data collected during the stream search collection. This will utilize volunteer time more efficiently and avoid voids in physical data.

Volunteer database to identify coordinate experienced captains with collectors and volunteers

Acquire microscope to allow for spontaneous verification and training of macroinvertebrate identification

Develop macroinvertebrate database in access. Excel spreadsheets are becoming cumbersome and inefficient in analyses.

Acquire digital watershed map for site location, analyses and education.

Adopt-a-Stream Program Director visit all sites to photograph entry point and record latitude and longitude. This will avoid volunteer confusion on actual sampling location.

## Glossary of Terms

Diversity = another term to refer to the total number of families found at a site.

EPT = the total number of Ephemeroptera (mayfly), Plecoptera (stonefly) and Trichoptera (caddis fly) families found at a site.

MiCorps = The Michigan Clean Water Corps (MiCorps) is a network of volunteer monitoring programs in Michigan.

macroinvertebrates = living organisms without a back bone large enough to be seen with the naked eye, typically worms, clams, crayfish, and insects

metric = a measurement of the biology in the stream.

reach = section of a flowing body of water

Richness = another term to refer to the total number of families found at a site.

taxonomy = the science dealing with the description, identification, naming, and classification of organisms.

## Bibliography

Staff Report: A Biological Survey of the River Raisin Watershed, Jackson, Hillsdale, Lenawee, Monroe, and Washtenaw Counties, Michigan June, August, and September 1998 and July and September 2000. Michigan Department of Environmental Quality, Surface Water Quality Division January 2002.

River Raisin Adopt-a-Stream Macroinvertebrate Id Verification, November 10, 2005. Jill Kelley