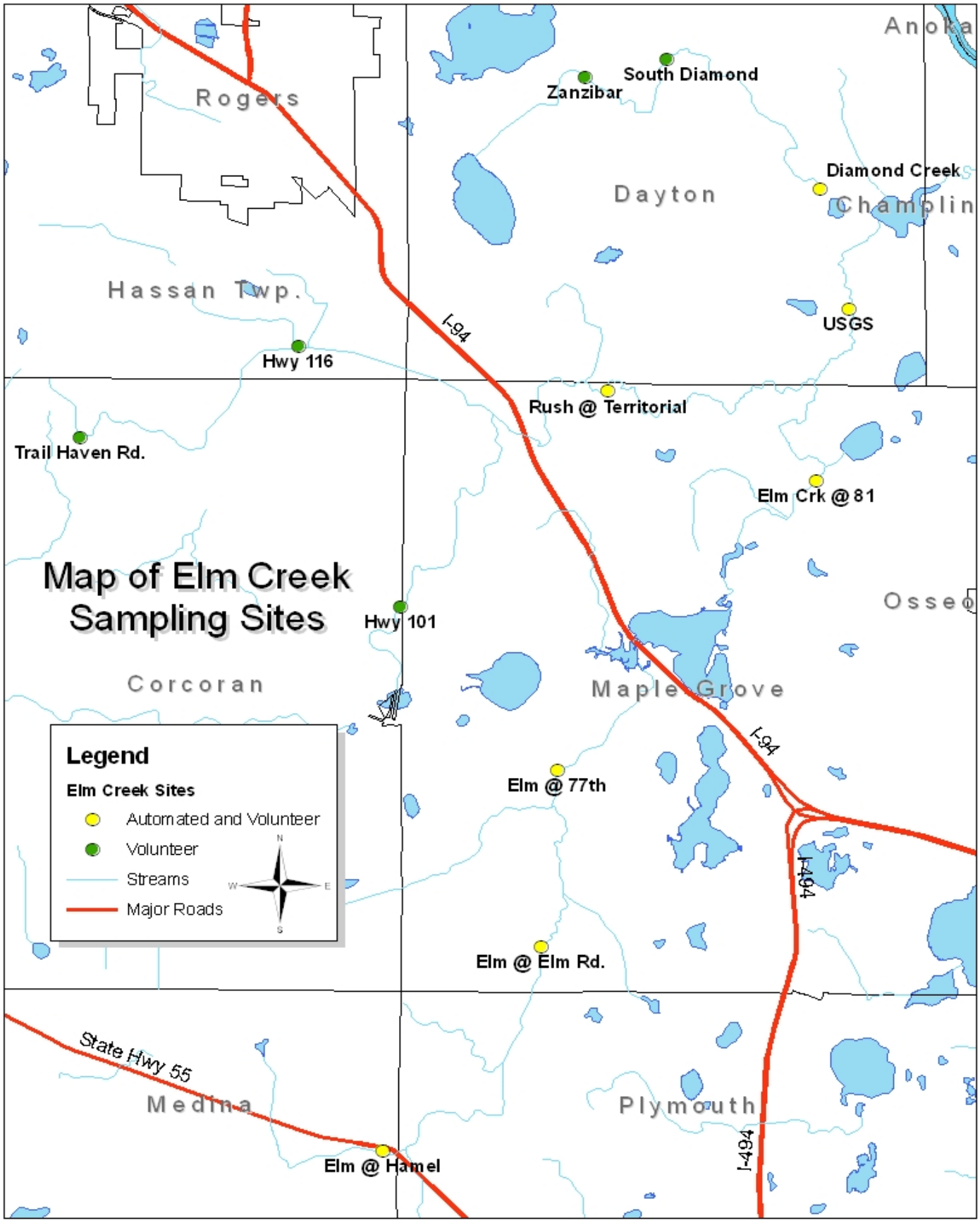
Stream Health Evaluation Program
Elm Creek
2010


Map of Elm Creek Sampling Sites
Anoka
Rogers
South Diamond
Zanzibar
Diamond Creek
Dayton
Champlin
Hassan Twp.
USGS
I-94
Hwy 116
Rush @ Territorial
Trail Haven Rd.
Elm Crk @ 81
Osseo
Hwy 101
Corcoran
Maple Grove
I-94
Elm @ 77th
I-494
Elm @ Elm Rd.
State Hwy 55
Medina
Plymouth
Elm @ Hamel
I-494
Legend
Elm Creek Sites
Automated and Volunteer
Volunteer
Streams
Major Roads
N
W
E
S

INTRODUCTION

In 2008, Hennepin County Environmental Services (HCES) partnered with the Elm Creek Watershed Management Commission to initiate a new stream monitoring program. Hennepin County Environmental Services has been coordinating successful monitoring programs for several years. River Watch focuses on stream monitoring using High School students in their classroom setting to gather data. The Wetland Health Evaluation Program (WHEP) recruits adult volunteers to monitor biological health of wetlands throughout the County. Using the same parameters as WHEP, the Stream Health Evaluation Program (SHEP) started monitoring streams in the fall of 2008. The pilot program consisted of one team of adult volunteers monitoring seven sites in the Elm Creek Watershed.

SITE SELECTION

Staff from HCES partnered with Three Rivers Parks District staff to chose sites for monitoring within the Elm Creek Watershed. The sites chosen were at one time part of the River Watch program and also within the Park district boundaries. Seven sites total were monitored by the SHEP team.

PROTOCOL

The protocol used in SHEP was the 'multi-habitat" method which has been adapted for volunteer use by the United States Environmental Protection Agency. To download the manual visit:

www.epa.gov/volunteer/stream

All samples are collected by the SHEP team and processed using EPA methods. Identification was to the Family level and 100% of the samples are checked by Hennepin County Environmental Services staff for accuracy. Data is entered into an excel spreadsheet and appropriate indices are calculated. Evaluation is performed using the multi-metric approach.

"NEW" PROTOCOL

The Hennepin County SHEP team also participated in using a new protocol for volunteers monitoring the cast skins of Chironomidae. Along with the traditional macroinvertebrate sample, the team used a technique developed by UM Entomologist Dr. Len Ferrington. Dr. Ferrington spent an afternoon with the team training them on sampling protocols. The samples were preserved and analysis will be performed in conjunction with Dr. Ferrington's lab. HCDES plans to develop with Dr. Ferrington an identification key for volunteer use to identify these samples to the Genus/ Species level for a finer assessment of water quality. The team continues to collect midge skins along with regular macroinvertebrate assemblages.

Stream Grading Scale					
Family Biotic Index	Grade	EPT	Grade	Number of Families	Grade
0.00—4.00	A	9-12	A	12 - 15	A
4.01—5.75	B	6.0 - 8.9	B	9.1 - 11.9	B
5.76—6.50	C	3 - 5.9	C	6 - 9	C
> 6.50	D	< 3	D	< 6	D

Letter Grading Scale	
3.83 - 4.00	A
3.50 - 3.82	A-
3.17 - 3.49	B+
2.83 - 3.16	B
2.50 - 2.82	B-
2.17 - 2.49	C+
1.83 - 2.16	C
1.50 - 1.82	C-
1.17 - 1.49	D+
0.83 - 1.16	D
0.50 - 0.82	D-
0.00 - 0.49	F

The grading scale used in SHEP takes into account three major biotic indices used routinely in biological monitoring programs. The first component is the Family Biotic Index which measures the overall community of invertebrates and their tolerance to pollution levels. The scale ranges from 0 to 10 with the lower values indicating high sensitivity and good water quality if present.

EPT stands for Ephemeroptera, Plecoptera, and Trichoptera or mayflies, stoneflies, and caddisflies. These three families include the most sensitive individuals and is looked at for indications of presence or absence. Higher scores indicate better water quality.

Finally, number of families measures the overall abundance of families or total diversity of family units. Again, with this index, the higher the number the better.

Elm Creek Results 2010				
Site	Total Number of organisms	Number of Families	EPT	FBI
EC#1 Elm Creek at Territorial	240 (241)	10 (11)	0 (0)	7.8 (7.8)
EC#2 Elm Creek at Hayden Lake Road	225 (243)	11 (13)	1 (1)	6.1 (6.3)
EC#3 Diamond Creek at Zanzibar	109 (113)	4 (5)	0 (0)	6.5 (6.5)
EC#5 Rush Creek at Territorial	314 (315)	13 (13)	1 (1)	6.9 (6.9)
EC#6 Elm Creek at 77th Avenue	172 (175)	9 (11)	1 (1)	7.2 (7.2)

NOTE: 2009 results are in (RED)

Elm Creek Grading 2010			
Site	Grade in 2008	Grade in 2009	Grade in 2010
EC#1 Elm Creek at Territorial	D+	C-	C-
EC#2 Elm Creek at Hayden Lake Road	C	C+	C
EC#3 Diamond Creek at Zanzibar	No sample taken; no water	D+	D+
EC#4 Rush Creek at 116	C+	No sample taken; no water	No sample taken; no water
EC#5 Rush Creek at Territorial	C-	C	C
EC#6 Elm Creek at 77th Avenue	C+	C-	D

Results of Citizen Volunteer Collections
of Surface-Floating Pupal Exuviae of Chironomidae
2011

Collections of surface-floating pupal exuviae (SFPE) were taken by Citizen Volunteers at ten sample sites in 2010. This report summarizes the results of the sampling effort. All taxa were identified to genus and a series of metrics were calculated. Results are provided in tabular form (next two pages), and a discussion of their significance is provided. Recommendations are included for consideration as plans for future biological monitoring activities are refined.

RESULTS: Surface-floating pupal exuviae were present and relatively in all samples. The range of specimens varied from 91 specimens per sample to 160 specimens per sample. A total of 1172 specimens were present in all ten samples. The average number of specimens per sample was 117.2 specimens/sample.

The taxonomic composition and abundances of genera are given in Tables 1 and 2. A total of 24 genera were encountered across all sample sites. The number of genera detected at individual sites was less, and ranged from ten to sixteen genera per site. This pattern of variation across sample sites is common, and is measured by calculating coefficients of similarity for all pairs of samples. A table of all pairwise coefficients in included later in this report.

The genera detected at the sample sites are common and widespread in streams in the metro area and, with a few exceptions, all are moderately to strongly tolerant to organic enrichment and/or reduced concentrations of dissolved oxygen. Taxa that are less tolerant of organic enrichment and/or reduced concentrations of dissolved oxygen are *Eukiefferiella, Hydrobaenus, Orthocladius, Parakiefferiella* and *Tvetenia*. None of these genera were very common in a given sample, but can often be numerically abundant in samples from streams that have very good water quality. Thus, their presence at very low levels in the samples does not strongly indicate good water quality conditions

Generic richness is low compared to values obtained at sample sites in past studies of Minnehaha Creek. Other than the genera mentioned above, there is a conspicuous reduction in species that are intolerant to organic enrichment and lowered dissolved oxygen. There is also not a large number of specimens of genera that are common in riffle areas of faster flowing streams. Consequently, it appears that sample sites may not have well-developed and/or extensive riffle habitat, which could result in natural levels of reduced dissolved oxygen. If well-developed riffles are present at the sites, then the lack of these genera would most likely indicate some form of stress that is contributing to low dissolved oxygen, which could possibly be elevated levels of organic enrichment

TABLE 1: Results for Citizen Volunteer Monitoring					
Sampling Coordinated by Mary Karius					
Samples collected in 2010					
	Sample Site	**Sample Site**	**Sample Site**	**Sample Site**	**Sample Site**
Taxon	**9/2/10**	**10/4/10**	**9/9/10**	**9/30/10**	**9/7/10**
Orthocladiinae					
Corynoneura	51	20	16	12	23
Cricotopus	27	32	40	18	29
Eukiefferiella	0	0	1	3	7
Hydrobaenus	0	2	0	0	0
Limnophyes	0	0	1	0	0
Nanocladius	14	9	22	11	19
Orthocladius	0	12	0	5	0
Parakiefferiella	0	1	0	0	0
Parametriocnemus	1	1	6	9	2
Thienemanniella	4	12	7	11	15
Tvetenia	0	0	1	1	2
Chironomini					
Chironomus	1	1	0	0	0
Cryptochironomus	1	3	1	2	1
Dicrotendipes	15	12	2	0	6
Glyptotendipes	1	3	0	0	0
Microtendipes	1	0	4	1	2
Parachironomus	0	1	0	0	0
Paratendipes	0	0	0	0	1
Polypedilum	4	11	5	2	7
Tanytarsini					
Micropsectra	0	0	1	15	2
Paratanytarsus	15	4	0	0	0
Tanytarsus	22	7	2	11	8
Tanypodinae					
Conchapelopia	0	0	2	0	1
Procladius	3	0	0	0	1
Total Specimens	**160**	**131**	**111**	**101**	**126**
Total Taxa	**14**	**16**	**15**	**13**	**16**

TABLE 2: Results for Citizen Volunteer Monitoring						
Sampling Coordinated by Mary Karius						
Samples collected in 2010						
	Sample Site	**Sample Site**	**Sample Site**	**Sample Site**	**Sample Site**	
	Elm @ 77th	**Elm Creek Golf Course**	**Elm @ 81st**	**Elm Creek**	**RW 26**	**Project Totals**
Taxon	**9/13/10**	**9/22/10**	**8/30/10**	**9/27/10**	**8/26/10**	
Orthocladiinae						
Corynoneura	13	2	8	1	0	**146**
Cricotopus	36	24	43	26	28	**303**
Eukiefferiella	2	1	1	0	0	**15**
Hydrobaenus	0	1	0	0	0	**3**
Limnophyes	0	0	0	0	1	**2**
Nanocladius	23	12	16	31	11	**168**
Orthocladius	0	1	0	2	3	**23**
Parakiefferiella	0	0	4	0	0	**5**
Parametriocnemus	1	4	6	1	0	**31**
Thienemanniella	1	17	10	12	28	**117**
Tvetenia	3	0	0	0	0	**7**
Chironomini						
Chironomus	0	0	0	0	5	**7**
Cryptochironomus	0	0	0	0	1	**9**
Dicrotendipes	1	2	4	1	8	**51**
Glyptotendipes	0	0	0	0	3	**7**
Microtendipes	0	0	0	0	1	**9**
Parachironomus	0	0	0	0	0	**1**
Paratendipes	0	0	3	0	5	**9**
Polypedilum	2	6	11	1	14	**63**
Tanytarsini						
Micropsectra	0	1	0	2	0	**21**
Paratanytarsus	0	0	2	0	2	**23**
Tanytarsus	15	20	9	22	23	**139**
Tanypodinae						
Conchapelopia	0	0	2	0	1	**6**
Procladius	0	0	0	0	3	**7**
Total Specimens	**97**	**91**	**119**	**99**	**137**	**1172**
Total Taxa	**10**	**12**	**13**	**10**	**16**	**24**

Table 3 summarizes the similarities of for all combinations of the sample sites based on Jaccard's Coefficient of Similarity. This coefficient is one of the most commonly reported similarity value in the scientific literature. With ten sample sites the number of two-sample comparisons is 45. In the table the diagonal is indicated by ----. The 45 values below the diagonal are the calculated similarities.

TABLE 3: Similarities based on Jaccard's Coefficient of Similarity									
Sampling Coordinated by Mary Karius									
Samples Collected in 2010									
SITES	**Zanzibar**	**Pioneer**	**Rush @ Terr**	**Rush @ Tempe**	**Rush @ 116**	**Elm @ 77th**	**Elm Creek @ GC**	**Elm @ 81st**	**Elm Creek**
Pioneer	**0.667**	**----------**							
Rush @ Terr	**0.526**	**0.409**	**----------**						
Rush @ Tempe	**0.500**	**0.450**	**0.750**	**----------**					
Rush @ 116	**0.579**	**0.391**	**0.824**	**0.706**	**----------**				
Elm @ 77th	**0.500**	**0.444**	**0.667**	**0.643**	**0.625**	**----------**			
Elm Creek @ GC	**0.444**	**0.556**	**0.588**	**0.667**	**0.556**	**0.692**	**----------**		
Elm @ 81st	**0.500**	**0.526**	**0.556**	**0.444**	**0.611**	**0.643**	**0.563**	**----------**	
Elm Creek	**0.500**	**0.529**	**0.563**	**0.643**	**0.529**	**0.667**	**0.833**	**0.533**	**--------**
RW 26	**0.667**	**0.524**	**0.476**	**0.381**	**0.524**	**0.300**	**0.333**	**0.450**	**0.368**

Based on Jaccard's coefficient of Similarity, sample sites called *Elm Creek @ Golf Course* and *Elm Creek* are most similar. The coefficent value is high, but in the upper range of what normally obtained for samples from sites that are close to each other and not experiencing substantial changes in habitat conditions, water quality or other type of stresses. Sample sites called *Rush Creek @ Terre* and *Rush Creek @ 116* also have high similarity for sites adjacent to each other, or close to each other but located on the same stream. Two other sample sites, *Rush Creek @ Terre* and *Rush Creek @ Tempe* also have high similarity. Sample sites called *Elm @ 77th* and *RW 26* are the least similar, and indicate very different water quality and/or habitat quality among these two sample sites

Two different approaches were taken to calculate Hilsenhoff's Biotic Index. The first method is to treat the results as presence/absence data and calculate the average tolerance value (see Table 4). The second approach is to calculate a weighted value based on the abundances of specimens for each genus that is present in the sample. The second approach is most commonly reported in the scientific literature. However, because of low numbers of specimens, the first approach also can often provide informative results.The Biotic Index values based on the presence/absence approach range from 5.08 to 6.86. Based on criteria provided by Hilsenhoff for interpreting the value, all sites would be judged as having fair to fairly poor water quality, with fairly significant to significant organic pollution.

The Biotic Index values based on the weighting by specimen abundance approach range show very similar results, and range from 5.28 to 6.45. Based on criteria provided by Hilsenhoff for interpreting the value, all sites would again be judged as having water quality that is fair to fairly poor, with fairly significant to significant organic pollution. Results for both calculations of the index show that has the poorest conditions.

TABLE 4: Biotic Index Values

Sampling Coordinated by Mary Karius

Samples Collected in 2010

Biotic Index Calculation Based on:	Zanzi-bar	Pioneer	Rush @ Terr	Rush @ Tempe	Rush @ 116	Elm @ 77th	Elm Creek @ GC	Elm @ 81st	Elm Creek	RW 26
Presence/ Absence	6.86	6.18	5.67	5.54	5.94	5.50	5.08	5.37	5.70	6.13
Weighting by Specimens	6.45	6.09	5.89	5.77	5.86	5.70	5.81	5.96	5.28	6.20

RECOMMENDATIONS:

The number of specimens per sample was close to or exceeded the 100 specimens per sample target level that is considered ideal for biological monitoring with SFPE for collections from seven of the sample site. Other target figures in the literature range from 100 specimens per sample to 300 per sample. Occasionally samples that are collected may have many more specimens, even ranging to more than 1000 specimens per sample. If samples are large, then subsampling to 300 specimens is recommended. In order to reach the recommended number of specimens per sample at all sample sites it is recommended that the time spent sampling and the area sampled at each sample site be increased by about 50%. Care should be taken to expend the same amount of effort at each sample site. If large numbers of specimens are collected in samples, they can effectively be subsampled.

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