



CHIPPEWA OF THE THAMES
BENTHIC WATER QUALITY
REPORT FALL 2019

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Executive Summary

Due to the high water levels and lack of access only nine sites were done this fall. All sites were sampled on the 25th of October. Only one site on the Thames River was sampled, the UWO site and the results came back as **good quality water (4.93)**. Hogg Creek at Sutherland Road had the worst results of the whole watershed with a score of **7.90, VERY POOR WATER QUALITY**. The best score was at Dawson Creek on Middlemiss Road downstream of the sewage treatment plant with a score of **4.91 (good quality water)** and a huge improvement over the Deer Dowden site (**6.35 fairly poor**). Hogg Creek at Side Road 4 also came back with a rating of **4.92 (good water quality)** also a huge improvement over the Sutherland Road site. Big Munday remained steady with a rating of fairly poor ranging from 6.19 – 6.40 fairly poor.

Hogg Creek at Sutherland Road is severely polluted this fall and must be the result of the farmers upstream. This site contained **94% aquatic worms**, these thrive in organic pollution. Possible causes maybe from the farmer spreading Manure over the field and/or septic system issues.

The average score for the Chippewa watershed was **5.99 (Fairly poor with substancial pollution likely)**, an improvement over the spring results however all sites could not be sampled in the fall.

TABLE 1: LOCATION OF BENTHIC SAMPLING SITES

SITE CODE	UTM east	UTM north	DESCRIPTION
FN1-07	464935	4739425	Thames River at the water pump
FN1-06	467680	4744856	Thames River at the UWO Site
FN1-05	465264	4738615	Thames River 500 meters Upstream of Turtle Spot
FN1-04	464501	4740695	Thames River 100 meters Upstream of Oneida bridge.
FN1-03	465344	4737832	Thames River downstream of the water pumping station.
FN1-02	464641	4735998	East River Road east of Techumseh St.
FN1-01	460252	4736382	Thames River at Hogg Creek
FN2-01	462268	4737694	Dawson Creek, 150 meters downstream of the culvert on Jubilee Road. W/Chippewa Rd.
FN2-02	461676	4739824	Dawson Creek, Middlemiss Rd. West of Chippewa Rd.
FN2-03	461504	4740495	Dawson Creek, 75 meters downstream of the culvert by the school on Chippewa Rd.
FN2-05	461197	4742562	Dawson Creek, Deer Doden, 1.5km east of Chippewa Rd.
FN3-01	460252	4736382	Hogg Creek, Jubilee Road
FN3-02	459871	4738654	Hogg Creek, Side Road 4, 500m north of Middlemiss Rd.
FN3-03	459727	4741741	Hogg Creek, Deer Doden Rd. 500m west of Chippewa Rd.
FN3-04	458978	4743136	Hogg Creek, Sutherland Rd. north of Switzer Road
FN4-01	457508	4737620	Big Munday Creek, Melbourne Rd. north of Range 3
FN4-02	458269	4740152	Big Munday Creek, Deer Doden Rd. 100 meters downstream of the culvert. W/Rd.4
FN4-03	457049	4741603	Glen Oak Rd. 900m south of Longwoods Road

Bold areas were not done due to no access and or high water levels

Sample Processing

Benthic macroinvertebrate samples were processed by Antler River Research. Our lab received the samples and examined the submission sheet to match the number of jars for each sample and confirmed the samples received. Our taxonomists ensured that the correct number of jars and labels matched the submission sheets. The samples were washed free of the ethanol through a 500µm sieve prior to sorting and identification.

Subsampling

Subsampling the samples was accomplished by evenly distributing the sample on a 25cm by 25cm tray consisting of one hundred 2.5cm squares. The random number system was used to pick a square. The square of material was examined under a microscope, taxonomic identification and numbers were recorded. This step was repeated until a 300 count was reached.

Quality Assurance and Quality Control Measures

Antler River Research incorporates a list of QA/QC procedures for all of its benthic projects to ensure the accuracy of all data:

- Samples were inspected, enumerated and logged upon arrival
- Taxonomic identifications are based on the most updated taxonomic keys
- Sorted specimens are preserved in 70% ethanol, labelled and stored at Antler River Research laboratory indefinitely
- Sediments and debris are preserved with 70% ethanol, labelled and stored for up to 3 months
- To ensure the accuracy of the data entry, the spreadsheets are compared to the field and bench sheets by a second person

Hilsenhoff's Modified Family Level Biotic Index (Bode et al.,1991,1996; Mandaville 2002)

This index was developed by Hilsenhoff (1988). Each taxa has a tolerance to organic pollution value ranging from 0 (intolerant) to 10 (tolerant), (Table 2.2). Its intent is for rapid field assessment of organic pollution. Tolerance values used are from the New York index by Mandaville and is the same index that is used by various Conservation Authorities across Southwestern Ontario including the UTRCA. (Section 5.0)

The Modified Family Biotic Index is calculated as follows:

$$(\sum x_i t_i) \div n$$

where,

- x_i is the number of individuals within a taxon
- t_i is the tolerance value of the taxon
- n is the total number of organisms in the sample

TABLE 2.2: HILSENHOFF'S FAMILY LEVEL BIOTIC INDEX

Family Biotic Index	Water Quality	Degree of Organic Pollution
0.00-3.50	Excellent	No apparent organic pollution
3.51-4.25	Very good	Possible slight organic pollution
4.26-5.00	Good	Some organic pollution probable
5.01-5.75	Fair	Fairly substantial pollution likely
5.76-6.50	Fairly poor	Substantial pollution likely
6.51-7.25	Poor	Very substantial pollution likely
7.26-10.00	Very poor	Severe organic pollution likely

(Hilsenhoff, 1988)

Table 3.0: SUMMARY OF THE PHYSICAL DATA

Reach	Boulder %	Cobble %	Gravel %	Sand %	Silt %	Clay %
FN1-06	0	55	30	5	0	10
FN2-02	0	25	10	60	5	0
FN2-05	0	0	20	40	40	0
FN3-02	25	25	25	25	0	0
FN3-03	0	25	5	35	30	5
FN3-04	0	0	5	10	60	25
FN4-01	0	0	0	10	15	75
FN4-02	0	0	50	50	0	0
FN4-03	0	25	75	0	0	0
Reach	Riffle (%)	Run (%)	Pool (%)			
FN1-06	75	25	0			
FN2-02	100	0	0			
FN2-05	0	100	0			
FN3-02	50	50	0			
FN3-03	0	100	0			
FN3-04	10	80	10			
FN4-01	0	100	0			
FN4-02	0	100	0			
FN4-03	20	75	5			
	Wetted Width (m)	Depth (cm)	Velocity (cm/s)			
FN1-06						
Centre point		52	100			
Downstream		50	100			
Upstream		50	100			
FN2-02						
• Centre point	1.5	23	30			

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• Downstream	1	28	30
• Upstream	1	22	30
FN2-05			
• Centre point	4	50	10
• Downstream	4	49	10
• Upstream	4	45	10
FN3-02			
• Centre point	2.5	42	20
• Downstream	3	34	20
• Upstream	2.3	28	40
FN3-03			
• Centre point	3	43	20
• Downstream	2.4	41	20
• Upstream	2.5	42	20
FN3-04			
• Centre point	3	37	20
• Downstream	2	39	20
• Upstream	2.1	18	20
FN4-01			
• Centre point	6	110	0
• Downstream	6	100	0
• Upstream	6	100	0
FN4-02			
• Centre point	3	45	0
• Downstream	3	45	0
• Upstream	3.2	45	0
FN4-03			
• Centre point	1	27	20
• Downstream	1.8	13	20
• Upstream	1.5	15	10

WATER CHEMISTRY:

Reach	Temp.(C)	TDS	Salinity	Conductivity (us/cm)	Dissolved Oxygen	pH	Turbidity
Fn1-06	5.12	0.466	0.35	445	12.10	7.88	Turbid
FN2-02	2.48	0.443	0.33	388	9.84	7.79	Turbid
FN2-05	4.03	0.519	0.39	478	11.18	7.68	Turbid
FN3-02	2.32	0.439	0.33	383	9.29	7.95	Turbid
FN3-03	4.79	0.468	0.35	442	11.59	7.72	Turbid
FN3-04	5.34	0.464	0.35	446	11.34	7.73	Turbid
FN4-01	2.64	0.480	0.36	424	11.55	7.83	Turbid
FN4-02	3.43	0.472	0.35	427	12.12	7.75	Turbid
FN4-03	3.83	0.464	0.35	425	11.39	7.70	Turbid

Reach	Canopy cover (%)	Algae	Rip zone left bank 1.5-10m	Rip zone left bank 10-30m	Rip zone left bank 30-100m	Rip zone right bank 1.5-10m	Rip zone right bank 10-30m	Rip zone right bank 30-100m
FN1-06	<5	present	deciduous	forest	forest	scrubland	scrubland	scrubland
FN2-01	>75	present	deciduous	deciduous	deciduous	deciduous	deciduous	Deciduous
FN2-02	>25	present	coniferous	coniferous	coniferous	coniferous	coniferous	Cultivated
FN2-05	<5	present	meadow	scrubland	deciduous	meadow	cultivated	cultivated
FN3-02	<5	present	scrub	deciduous	cultivated	deciduous	deciduous	cultivated
FN3-03	<5	present	scrub	scrub	deciduous	meadow	cultivated	cultivated
FN4-01	>50	present	deciduous	deciduous	deciduous	scrub	scrub	cultivated
FN4-02	>50	abundant	meadow	scrub	scrub	scrub	scrub	cultivated
FN4-03	<5	present	none	none	none	none	cultivated	cultivated

RESULTS:

Site reach	Family Biotic Index	Water quality	Degree of organic pollution
FN1-06	4.93	Good	Some organic pollution probable
FN2-02	4.91	Good	Some organic pollution probable
FN2-05	6.35	Fairly poor	Substantial pollution likely
FN3-02	4.92	Good	Some organic pollution probable
FN3-03	6.09	Fairly poor	Substantial pollution likely
FN3-04	7.90	Very poor	Severe Organic Pollution
FN4-01	6.19	Fairly Poor	substantial pollution likely
FN4-02	6.40	Fairly Poor	substantial pollution likely
FN4-03	6.24	Fairly poor	substantial pollution likely
Average	5.99	Fairly poor	Substantial pollution likely

Bold entries represent good water quality, Highlighted entry represents the worst results

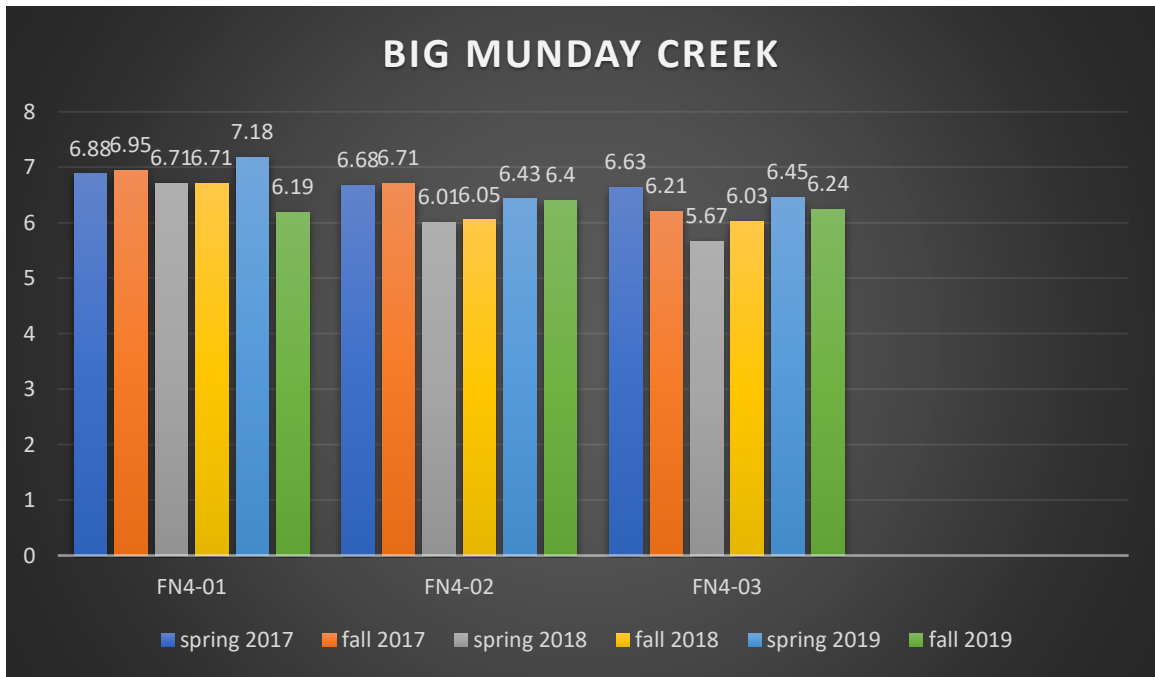
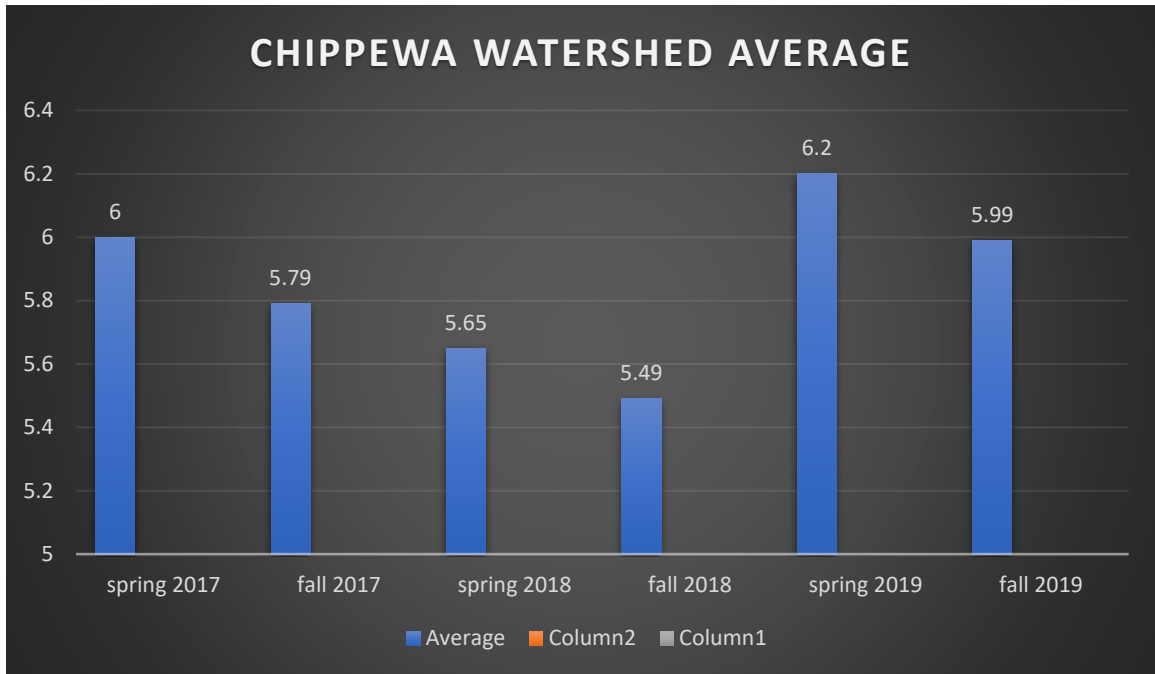
Water course	Average FBI	Rating	Degree of organic pollution
Thames River	4.93	Good	Some organic pollution probable
Dawson Creek	5.63	Fair	Fairly substantial pollution likely
Hogg Creek	6.30	Fairly Poor	substantial pollution likely
Big Munday Creek	6.28	Fairly Poor	substantial pollution likely

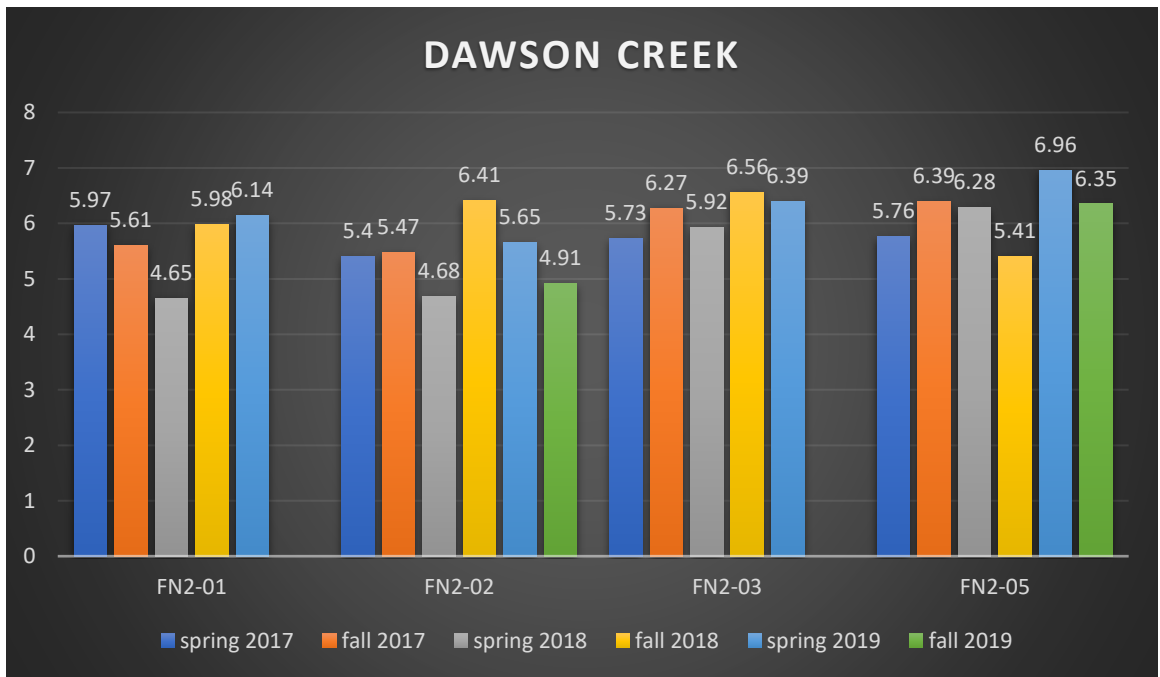
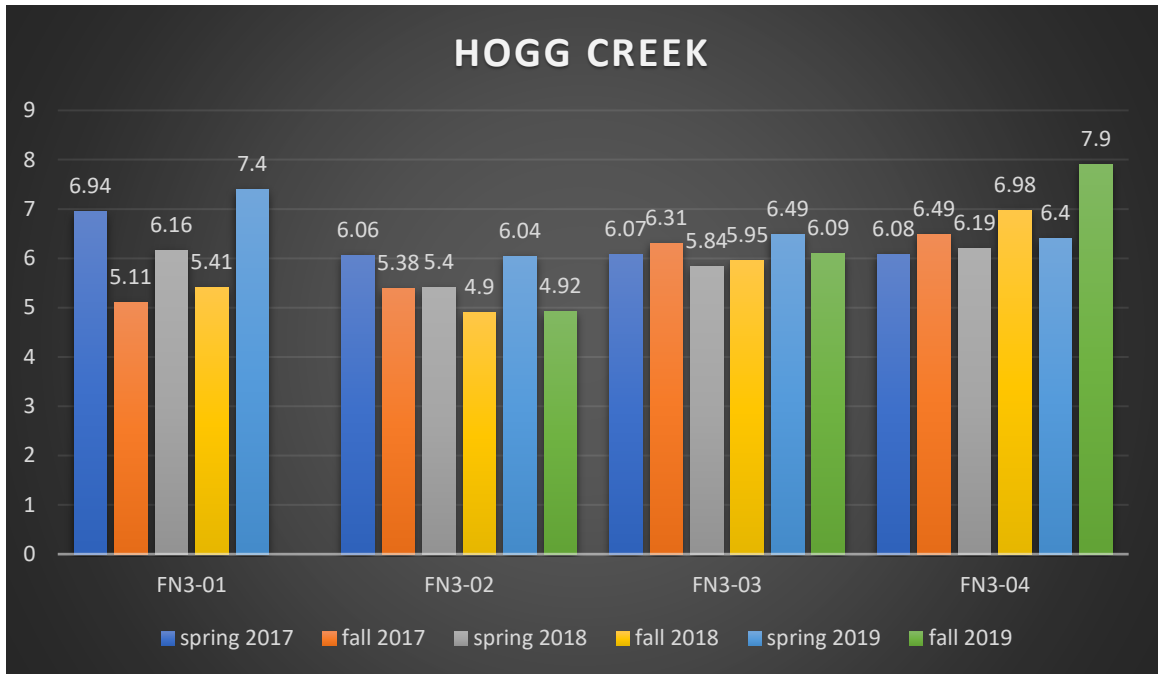
Comparison:

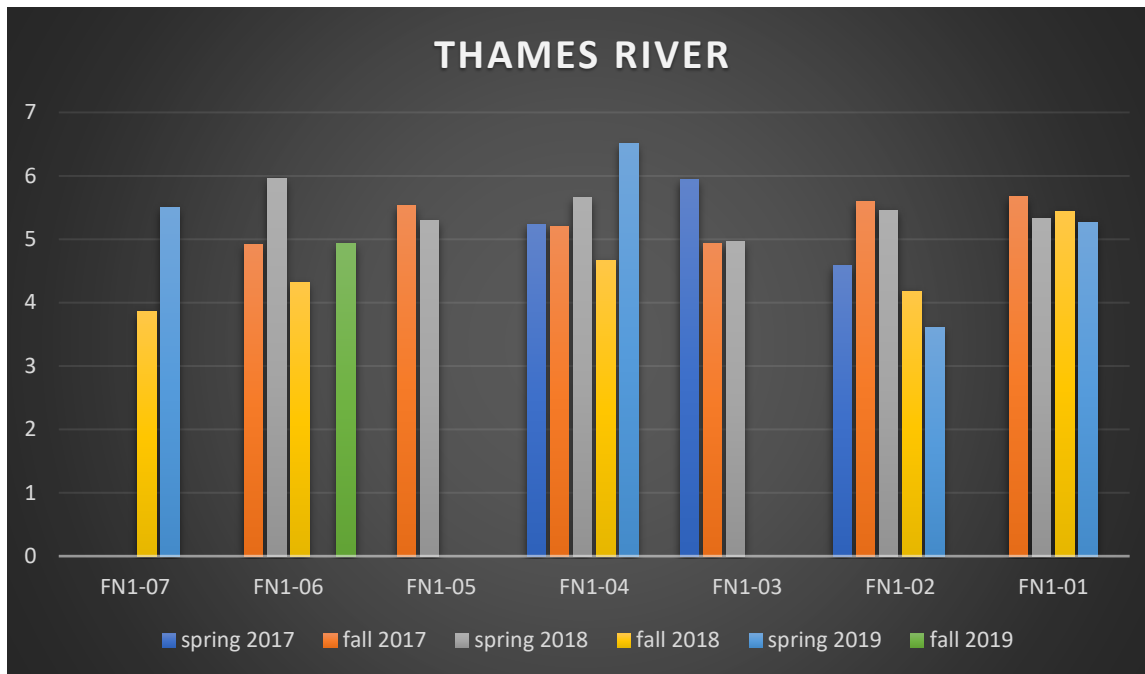
Site	Spring 2017	Fall 2017	Spring 2018	Fall 2018	Spring 2019	Fall 2019
FN1-07				3.86	5.50	
FN1-06		4.92	5.96	4.31		4.93
FN1-05		5.53	5.29			
FN1-04	5.23	5.20	5.65	4.67	6.50	
FN1-03	5.94	4.93	4.96			
FN1-02	4.58	5.59	5.46	4.18	3.61	
FN1-01		5.67	5.32	5.43	5.27	
FN2-01	5.97	5.61	4.65	4.36	6.14	
FN2-02	5.40	5.47	4.68	5.98	5.65	4.91
FN2-03	5.73	6.27	5.92	6.41	6.39	
FN2-05	5.76	6.39	6.28	6.56	6.96	6.35
FN3-01	6.94	5.11	6.16	5.41	7.40	
FN3-02	6.06	5.38	5.40	4.90	6.04	4.92
FN3-03	6.07	6.31	5.84	5.95	6.49	6.09
FN3-04	6.08	6.49	6.19	6.98	6.40	7.90
FN4-01	6.88	6.95	6.71	6.71	7.18	6.19
FN4-02	6.68	6.71	6.01	6.05	6.43	6.40
FN4-03	6.63	6.21	5.67	6.03	6.45	6.24
Average	6.00	5.79	5.65	5.49	6.20	5.99

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Site	FN1-06	FN2-02	FN2-05	FN3-02	FN3-03	FN3-04	FN4-01	FN4-02	FN4-03
total sum	374	306	300	329	304	362	318	297	213
fbi rate	4.93	4.908	6.347	4.918	6.092	7.895	6.189	6.404	6.239
Simpsons index (D)	0.104	0.104	0.212	0.143	0.319	0.879	0.197	0.209	0.173
Simpsons index of diversity(1-D)	0.896	0.896	0.788	0.857	0.681	0.121	0.803	0.791	0.827
Simpsons reciprocal (1/D)	9.570	9.624	4.707	7.008	3.136	1.138	5.08	4.774	5.774
% Flatworms	3.209	3.268	0	7.599	0	0	0	0	2.817
% Worms	1.872	0.980	37.333	5.471	20.395	93.646	13.208	27.273	26.761
%Leeches	0.267	0	0.667	0	0	0.552	0	0	0
% Acarnia	0.267	10.784	0	0.304	5.921	0	1.887	9.091	9.859
% Water Scuds	1.069	1.634	2	0	0.658	0	24.528	4.040	1.408
% Sow Bugs	0.535	0	0	0	0	0	0	1.010	0
% Crayfish	0	0	0	0	0	0	0	0	0
% Beetles	25.134	13.399	0	24.620	6.579	0	3.774	2.020	22.535
% Mayflies	27.540	10.458	2	5.775	9.868	0	20.755	5.051	0
% Alderflies	0	0	0	0	0	0	0	0	0
% Damselflies	1.070	0	0	0	0	0	0	1.01	0
% Dragonflies	0	0	0	0	0	0	0	0	0
% True Bugs	0	0	2.667	0	0	0	3.774	2.02	0
% Caddisflies	8.556	28.431	18	4.559	0.658	0	0	2.02	1.408
% Midges	9.893	14.379	5.333	21.884	51.316	4.144	26.415	34.343	16.90
% Blackflies	2.139	0	0	0.304	0	0	0	0	0
% Other Flies									
% Snails	2.139	0.654	22.667	0.608	0	1.657	0	6.061	5.634
% Clams	12.299	0.327	2.667	0.304	0.658	0	0	1.01	5.634
% Stoneflies	2.406	4.575	0.667	20.061	0.658	0	0	0	0
%EPT	38.503	43.464	20.667	30.395	11.184	0	20.755	7.071	1.408







BENTHIC DATA SHEETS:

FN4-01, Fall 2019			
family	count	Hilsehoff biotic Index	score
ELMIDAE:	12	5	60
<i>Corixidae:</i>	12	5	60
<i>Caenidae:</i>	66	6	396
TRUE FLIES:			0
Ceratopogonidae	18	6	108
Chironomidae:	84	6	504
ACARIFORMES	6	6	36
Hyalellidae:	78	6	468
WORMS: Oligochaeta	42	8	336
Platyhelminthes:			0
FLATWORMS:	0	6	0
total sum	318		1968
fbi rate	6.188679245		
Simpsons index (D)	0.196867213		
Simpsons index of diversity(1-D)	0.803132787		
Simpsons reciprocal (1/D)	5.079566004		
% Flatworms	0		
% Worms	13.20754717		
%Leeches	0		
% Acarnia	1.886792453		
% Water Scuds	24.52830189		
% Sow Bugs	0		
% Crayfish	0		
% Beetles	3.773584906		
% Mayflies	20.75471698		
% Alderflies	0		
% Damselflies	0		
% Dragonflies	0		
% True Bugs	3.773584906		
% Caddisflies	0		
% Midges	26.41509434		
% Blackflies	0		
% Other Flies			
% Snails	0		
% Clams	0		
% Stoneflies	0		
%EPT	20.75471698		

FN4-02, Fall 2019			
family	count	Hilsehoff biotic Index	score
Insects:			
BEETLES:			0
<i>DYTISCIDAE:</i>	3	5	15
<i>ELMIDAE:</i>	3	5	15
BUGS:			0
<i>Corixidae:</i>	6	5	30
<i>Limnephilidae:</i>	3	4	12
<i>Phryganeidae:</i>	3	4	12
DAMSELFIES:			0
<i>Coenagrionidae:</i>	3	8	24
<i>Caenidae:</i>	3	6	18
<i>Ephemereilidae:</i>	12	2	24
TRUE FLIES:			0
<i>Athericidae:</i>	0	4	0
Atherix		4	0
Ceratopogonidae	15	6	90
<i>Chaoboridae:</i>	0	8	0

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Chaoborus			0
Chironomidae:	102	6	612
AMPHIPODS:			0
ACARIFORMES	27	6	162
Hyalellidae:	12	6	72
ISOPODS:			0
Asellidae:	3	8	24
Sphaeriidae:	3	6	18
Physidae:	9	8	72
Planorbidae:	9	6	54
WORMS: Oligochaeta	81	8	648
total sum	297		1902
fbi rate	6.404040404		
Simpsons index (D)	0.209468422		
Simpsons index of diversity(1-D)	0.790531578		
Simpsons reciprocal (1/D)	4.773989284		
% Flatworms	0		
% Worms	27.27272727		
%Leeches	0		
% Acarnia	9.090909091		
% Water Scuds	4.04040404		
% Sow Bugs	1.01010101		
% Crayfish	0		
% Beetles	2.02020202		
% Mayflies	5.050505051		
% Alderflies	0		
% Damselflies	1.01010101		
% Dragonflies	0		
% True Bugs	2.02020202		
% Caddisflies	2.02020202		
% Midges	34.34343434		
% Blackflies	0		
% Other Flies			
% Snails	6.060606061		
% Clams	1.01010101		
% Stoneflies	0		
%EPT	7.070707071		

FN4-03, Fall 2019	count	Hilsehoff biotic Index	score
family			
ELMIDAE:	48	5	240
Rhyacophilidae:	3	1	3
TRUE FLIES:			0
Ceratopogonidae	15	6	90
Chironomidae:	36	6	216
AMPHIPODS:			0
ACARIFORMES	21	6	126
Hyalellidae:	3	6	18
Sphaeriidae:	12	6	72
Planorbidae:	12	6	72
WORMS: Oligochaeta	57	8	456
Platyhelminthes:			0
FLATWORMS:	6	6	36
total sum	213		1329
fbi rate	6.23943662		
Simpsons index (D)	0.173179925		
Simpsons index of diversity(1-D)	0.826820075		
Simpsons reciprocal (1/D)	5.774341352		
% Flatworms	2.816901408		
% Worms	26.76056338		
%Leeches	0		
% Acarnia	9.85915493		

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% Water Scuds	1.408450704		
% Sow Bugs	0		
% Crayfish	0		
% Beetles	22.53521127		
% Mayflies	0		
% Alderflies	0		
% Damselflies	0		
% Dragonflies	0		
% True Bugs	0		
% Caddisflies	1.408450704		
% Midges	16.90140845		
% Blackflies	0		
% Other Flies			
% Snails	5.633802817		
% Clams	5.633802817		
% Stoneflies	0		
%EPT	1.408450704		

FN3-04, Fall 2019			
family	count	Hilsehoff biotic Index	score
Chironomidae:	15	6	90
Physidae:	2	8	16
Planorbidae:	4	6	24
Glossiphoniidae:	2	8	16
WORMS: Oligochaeta	339	8	2712
total sum	362		2858
fbi rate	7.895027624		
Simpsons index (D)	0.878865114		
Simpsons index of diversity(1-D)	0.121134886		
Simpsons reciprocal (1/D)	1.137831032		
% Flatworms	0		
% Worms	93.64640884		
%Leeches	0.552486188		
% Acarnia	0		
% Water Scuds	0		
% Sow Bugs	0		
% Crayfish	0		
% Beetles	0		
% Mayflies	0		
% Alderflies	0		
% Damselflies	0		
% Dragonflies	0		
% True Bugs	0		
% Caddisflies	0		
% Midges	4.143646409		
% Blackflies	0		
% Other Flies			
% Snails	1.657458564		
% Clams	0		
% Stoneflies	0		
%EPT	0		

FN3-03, Fall 2019			
family	count	Hilsehoff biotic Index	score
ELMIDAE:	20	5	100
Limnephilidae:	2	4	8
MAYFLIES:			0
Caenidae:	14	6	84
Ephemerellidae:	16	2	32
STONEFLIES:			0
Perlodidae:	2	2	4

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Ceratopogonidae	10	6	60
Chironomidae:	156	6	936
AMPHIPODS:			0
ACARIFORMES	18	6	108
Hyalellidae:	2	6	12
Sphaeriidae:	2	6	12
WORMS: Oligochaeta	62	8	496
total sum	304		1852
fbi rate	6.092105263		
Simpsons index (D)	0.318905817		
Simpsons index of diversity(1-D)	0.681094183		
Simpsons reciprocal (1/D)	3.135722041		
% Flatworms	0		
% Worms	20.39473684		
%Leeches	0		
% Acarnia	5.921052632		
% Water Scuds	0.657894737		
% Sow Bugs	0		
% Crayfish	0		
% Beetles	6.578947368		
% Mayflies	9.868421053		
% Alderflies	0		
% Damselflies	0		
% Dragonflies	0		
% True Bugs	0		
% Caddisflies	0.657894737		
% Midges	51.31578947		
% Blackflies	0		
% Other Flies			
% Snails	0		
% Clams	0.657894737		
% Stoneflies	0.657894737		
%EPT	11.18421053		

FN3-02, Fall 2019			
family	count	Hilsehoff biotic Index	score
ELMIDAE:	81	5	405
Hydropsychidae:	6	5	30
Limnephilidae:	3	4	12
Rhyacophilidae:	6	1	6
Caenidae:	13	6	78
Heptageniidae:	5	3	15
Leptophlebiidae:	1	4	4
STONEFLIES:			0
Capniidae:	17	3	51
Perlodidae:	43	2	86
Ceratopogonidae	16	6	96
Chironomidae:	72	6	432
Empididae	3	6	18
Psychodidae	1	10	10
Simuliidae	1	5	5
Tabanidae:	2	5	10
Tipulidae:	5	4	20
ACARIFORMES	1	6	6
Gammaridae:	1	8	8
Sphaeriidae:	1	6	6
Lymnaeidae:	1	6	6
Physidae:	1	8	8
WORMS: Oligochaeta	18	8	144
Platyhelminthes:			0
FLATWORMS:	25	6	150
total sum	329		1618

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fbi rate	4.917933131		
Simpsons index (D)	0.142690847		
Simpsons index of diversity(1-D)	0.857309153		
Simpsons reciprocal (1/D)	7.00815798		
% Flatworms	7.598784195		
% Worms	5.47112462		
%Leeches	0		
% Acarnia	0.303951368		
% Water Scuds	0.303951368		
% Sow Bugs	0		
% Crayfish	0		
% Beetles	24.62006079		
% Mayflies	5.775075988		
% Alderflies	0		
% Damselflies	0		
% Dragonflies	0		
% True Bugs	0		
% Caddisflies	4.559270517		
% Midges	21.88449848		
% Blackflies	0.303951368		
% Other Flies			
% Snails	0.607902736		
% Clams	0.303951368		
% Stoneflies	20.06079027		
%EPT	30.39513678		

FN1-06, Fall 2019			
family	count	Hilsehoff biotic Index	score
PYRALIDAE:	2	5	10
ELMIDAE:	80	5	400
HYDROPHILIDAE:	1	5	5
Limnichidae:	0		0
Lutrochus			0
Psephenidae:	13	4	52
Brachycentridae:	1	2	2
Glossosomatidae:	1	1	1
Helicopsychidae:	3	3	9
Helicopsyche			0
Hydropsychidae:	14	5	70
Hydroptilidae:	3	6	18
Limnephilidae:	1	4	4
Philopotamidae:	8	4	32
Psychomyiidae:	1	2	2
Coenagrionidae:	4	8	32
Heptageniidae:	20	3	60
Leptohyphidae:	55	4	220
Tricorythodes		4	0
Leptophlebiidae:	7	4	28
Potamanthidae:	21	4	84
Nemouridae:	4	2	8
Taeniopterygidae:	5	2	10
Ceratopogonidae	1	6	6
Chironomidae:	37	6	222
Empididae	1	6	6
Simuliidae	8	5	40
Tabanidae:	1	5	5
Tipulidae:	1	4	4
ACARIFORMES	1	6	6
Gammaridae:	4	6	24
Asellidae:	2	8	16
Sphaeriidae:	46	6	276
Ancylidae:	1	6	6

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Hydrobiidae:	3	8	24
Lymnaeidae:	1	6	6
Pleuroceridae:	3	6	18
LEECHES:			0
Erpobdellidae:	1	8	8
WORMS: Oligochaeta	7	8	56
Platyhelminthes:			0
FLATWORMS:	12	6	72
total sum	374		1842
fbi rate	4.92513369		
Simpsons index (D)	0.104492551		
Simpsons index of diversity(1-D)	0.895507449		
Simpsons reciprocal (1/D)	9.570060208		
% Flatworms	3.20855615		
% Worms	1.871657754		
%Leeches	0.267379679		
% Acarnia	0.267379679		
% Water Scuds	1.069518717		
% Sow Bugs	0.534759358		
% Crayfish	0		
% Beetles	25.13368984		
% Mayflies	27.54010695		
% Alderflies	0		
% Damselflies	1.069518717		
% Dragonflies	0		
% True Bugs	0		
% Caddisflies	8.556149733		
% Midges	9.893048128		
% Blackflies	2.139037433		
% Other Flies			
% Snails	2.139037433		
% Clams	12.29946524		
% Stoneflies	2.406417112		
%EPT	38.5026738		

FN2-02, Fall 2019			
family	count	Hilsehoff biotic Index	score
PYRALIDAE:	1	5	5
ELMIDAE:	41	5	205
Psephenidae:	1	4	4
Glossosomatidae:	3	1	3
Hydropsychidae:	5	5	25
Leptoceridae:	2	4	8
Limnephilidae:	47	4	188
Phryganeidae:	5	4	20
Rhyacophilidae:	25	1	25
Caenidae:	29	6	174
Leptophlebiidae:	3	4	12
STONEFLIES:			0
Capniidae:	13	3	39
Nemouridae:	1	2	2
Ceratopogonidae	31	6	186
Chironomidae:	44	6	264
Tipulidae:	2	4	8
AMPHIPODS:			0
ACARIFORMES	33	6	198
Sphaeriidae:	1	6	6
Physidae:	2	8	16
WORMS: Oligochaeta	3	8	24
Platyhelminthes:			0
FLATWORMS:	10	6	60
total sum	306		1502

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fbi rate	4.908496732		
Simpsons index (D)	0.103902345		
Simpsons index of diversity(1-D)	0.896097655		
Simpsons reciprocal (1/D)	9.624421832		
% Flatworms	3.267973856		
% Worms	0.980392157		
%Leeches	0		
% Acarnia	10.78431373		
% Water Scuds	1.633986928		
% Sow Bugs	0		
% Crayfish	0		
% Beetles	13.39869281		
% Mayflies	10.45751634		
% Alderflies	0		
% Damselflies	0		
% Dragonflies	0		
% True Bugs	0		
% Caddisflies	28.43137255		
% Midges	14.37908497		
% Blackflies	0		
% Other Flies			
% Snails	0.653594771		
% Clams	0.326797386		
% Stoneflies	4.575163399		
%EPT	43.46405229		

FN2-05 Fall 2019			
family	count	Hilsehoff biotic Index	score
Corixidae:	8	5	40
Hydropsychidae:	2	5	10
Limnephilidae:	46	4	184
Phryganeidae:	2	4	8
Rhyacophilidae:	4	1	4
Baetidae:	4	6	24
Caenidae:	2	6	12
Perlodidae:	2	2	4
Ceratopogonidae	10	6	60
Chaoboridae:	0	8	0
Chaoborus			0
Chironomidae:	16	6	96
Ablabesmyia		8	0
Psychodidae	2	10	20
Stratiomyidae	2	7	14
Syrphidae	0	10	0
Tabanidae:	4	5	20
Hyalellidae:	6	6	36
Sphaeriidae:	8	6	48
Lymnaeidae:	62	6	372
Physidae:	2	8	16
Physella		8	0
Planorbidae:	4	6	24
Glossiphoniidae:	2	8	16
WORMS: Oligochaeta	112	8	896
total sum	300		1904
fbi rate	6.346666667		
Simpsons index (D)	0.212444444		
Simpsons index of diversity(1-D)	0.787555556		
Simpsons reciprocal (1/D)	4.707112971		
% Flatworms	0		
% Worms	37.33333333		
%Leeches	0.666666667		
% Acarnia	0		

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% Water Scuds	2		
% Sow Bugs	0		
% Crayfish	0		
% Beetles	0		
% Mayflies	2		
% Alderflies	0		
% Damselflies	0		
% Dragonflies	0		
% True Bugs	2.666666667		
% Caddisflies	18		
% Midge	5.333333333		
% Blackflies	0		
% Other Flies			
% Snails	22.666666667		
% Clams	2.666666667		
% Stoneflies	0.666666667		
%EPT	20.666666667		