BIOASSESSMENT REPORT

RAPID BIOASSESSMENT OF

HOG RUN AND MIDDLE FORK OF WILDCAT CREEK

USING BENTHIC MACROINVERTEBRATES

2004

For the
Soil and Water Conservation District of
Clinton County

Study Conducted By:

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EXECUTIVE SUMMARY

A rapid bioassessment technique was used to determine the ecological health of Hog Run and the Middle Fork of Wildcat Creek after implementation of various land treatments in the watersheds. The benthic communities of five sites, including a reference site, were sampled during April and October 2004 to provide information on "after treatment" conditions.

Water quality has significantly improved in Hog Run since 1994. Many of the biological measurements used to assess ecological health (the percentage of sediment-intolerant animals, the proportion of “shredding” animals, the proportion of “scraping” animals, and the proportion of pollution sensitive animals) have increased dramatically at both Hog Run sites since the first survey.

In contrast, the Middle Fork of Wildcat Creek downstream from Hog Run remains moderately impaired, especially at the most downstream site. Other tributaries may be contributing to this impairment.

INTRODUCTION

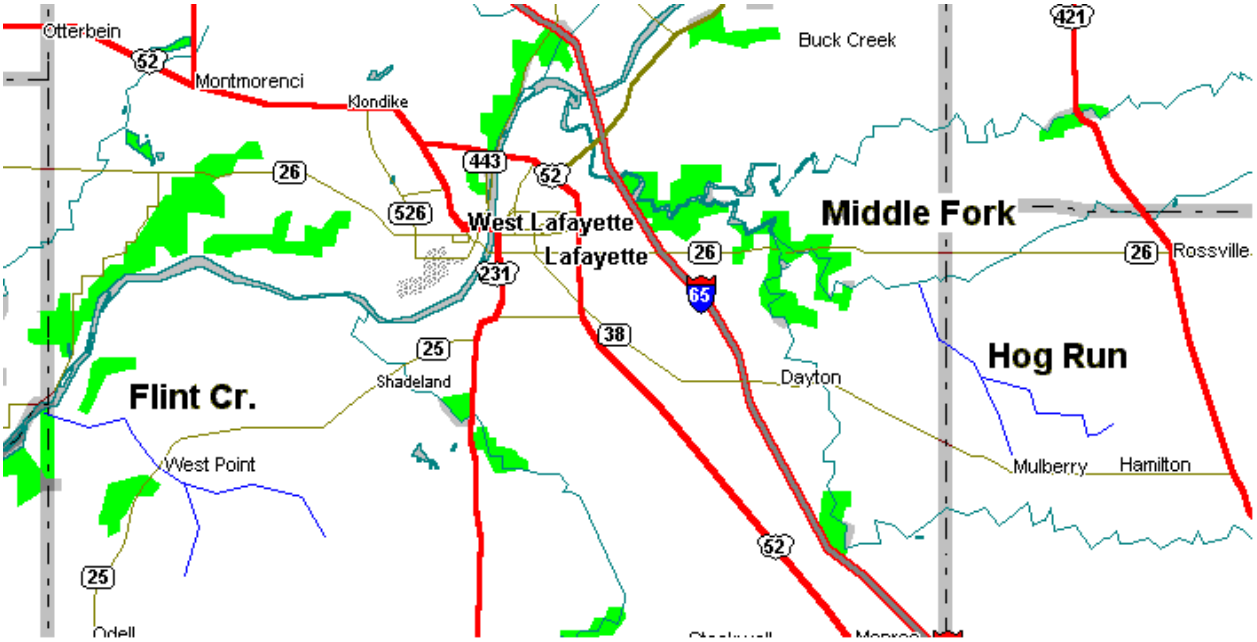
This study was conducted to measure the "biological integrity" of Hog Run and the Middle Fork of Wildcat Creek in central Indiana. A previous bioassessment conducted in 1994 showed that the macroinvertebrate communities of the streams were slightly to moderately degraded by excessive nutrient and sediment inputs. In 1989, Wildcat Creek was identified by the Indiana Department of Environmental Management as having seriously degraded water quality due to nonpoint sources of pollution [1].

Between 1994 and 2004, the Clinton County Soil and Water Conservation District worked with local farmers to implement best management practices such as conservation tillage, livestock exclusion, buffer strips and grassed waterways in the watershed. The current study was designed to determine whether conditions in Hog Run and the Middle Fork of Wildcat Creek have improved since 1994.

Local Setting

Both streams are located in the “Eastern Corn Belt Plain" ecoregion of the Central U.S. [2]. The land in the watershed was molded by glacier activity and is relatively flat. The original forests were dominated by beech, maple, oak, and hickory trees but row crop agriculture and livestock grazing are the most common land uses today. In fact, about 95% of the watershed is devoted to agricultural uses. Only about 5% remains forested [15]. A small urban area (Mulberry) is present in the upper reaches of Hog Run (Figure 1).

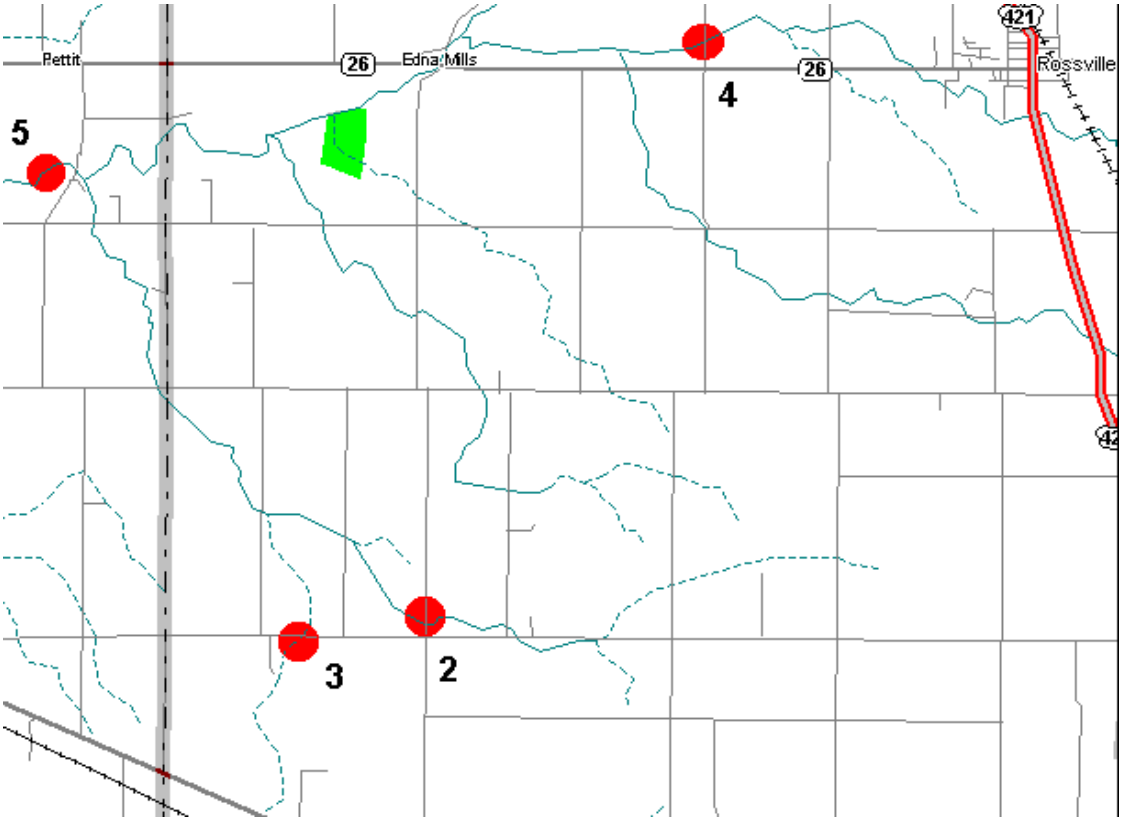
Figure 1. Local setting of the study.



Five sites were sampled during this study. Watershed areas [14] and GPS coordinates of each site are shown below:

		Area	Latitude	Longitude
Site 1	Flint Creek at CR 1100 S	15 mi^2	40.20.44	87.04.00
Site 2	Hog Run at CR 850 W	5 mi^2	40.22.08	86.39.92
Site 3	Hog Run at CR 550 N	3 mi^2	40.22.00	86.40.76
Site 4	Middle Fork @ CR 680 W	59 mi^2	40.25.15	86.38.00
Site 5	Middle Fork @ CR 1100 S	107 mi^2	40.24.47	86.42.34

Figure 2
Study Sites on Hog Run and Middle Fork of Wildcat Creek



METHODS

Because they are considered to be more sensitive to local conditions and respond relatively rapidly to environmental change [3], benthic (bottom-dwelling) organisms were used to document the biological condition of each stream. The U.S. Environmental Protection Agency (EPA) has recently developed a "rapid bioassessment" protocol [4] which has been shown to produce highly reproducible results that accurately reflect changes in water quality. We used EPA's Protocol III to conduct this study. Protocol III requires a standardized collection technique, a standardized subsampling technique, and identification of at least 100 animals from each site to the genus or species level from both "study sites" and a "reference site." CPOM (Coarse Particulate Organic Matter) samples were collected and analyzed to determine the percentage of shredder organisms.

Reference Site

The aquatic community of a reference site is compared to that of each study site to determine how much impact has occurred. The reference site should be in the same "ecoregion" as the study sites and be approximately the same size. It should be as pristine as possible, representing the best conditions possible for that area.

Flint Creek in western Tippecanoe County has one of the best fish communities and habitat values in the area [5]. A fisheries survey done in 1994 [6] showed 23 species at 3 sites, including five darter species. It also has a drainage area which is similar to the study sites and is nearby in the same ecoregion. Therefore, Flint Creek (Site 1) was used as the basis of comparison for all other sites in the study.

Habitat Analysis

Habitat analysis was conducted according to Ohio EPA methods [16]. In this technique, various characteristics of a stream and its watershed are assigned numeric values. All assigned values are added together to obtain a "Qualitative Habitat Evaluation Index." The highest value possible with this habitat assessment technique is 100.

Water Chemistry

Water chemistry measurements were made at each study site on the same day that macroinvertebrate samples were collected. Dissolved oxygen was measured by the membrane electrode method. The pH and temperature measurements were made with an Oakton pH/temp. probe. Conductivity was measured with a Hanna Instruments meter. All instruments were calibrated in the field prior to measurements.

Macroinvertebrate Sample Collection

Samples in this study were collected by kicknet from riffle habitat where current speed was 20-30 cm/sec. Riffles were used because they typically support the most diverse benthic community in streams. The kicknet was placed immediately downstream from the riffle while the sampler used a hand to dislodge all attached benthic organisms from rocks upstream from the net. The organisms were swept by the current into the kicknet and subsequently transferred to a white pan. Each sample was examined in the field to assure that at least 100 organisms were collected at each site. In addition, each site was sampled for organisms in CPOM (coarse particulate organic matter, usually consisting of leaf packs from fast-current areas). All samples were preserved in the field with 70% isopropanol.

Laboratory Analysis

In the laboratory, a 100 organism subsample was prepared from each site by evenly distributing the whole sample in a white, gridded pan. Grids were randomly selected and all organisms within grids were removed until 100 organisms had been selected from the entire sample.

Each animal was identified to the lowest practical taxon (usually genus or species) using standard taxonomic references[7, 8, 17]. Representative specimens were preserved as "vouchers." All voucher specimens have been deposited in the Purdue University Department of Entomology collection.

Data Analysis

Following identification of the animals in the sample, eight “metrics” are calculated for each site. These metrics are bases on knowledge about the sensitivity of each species to changes in environmental conditions and how the

benthic communities of unimpacted streams are usually organized. For example, EPT animals consist of those in the insect orders Ephemeroptera, Plecoptera, and Trichoptera, which are knows to be more sensitive than most other benthic animals to degradation of environmental conditions. Feeding behaviors such as "scrapers", "filterers" and "shredders" change predictably under different conditions. The sum of all eight metrics provides an individual "biotic score" for each site.

RESULTS

Aquatic Habitat Analysis

When the Ohio EPA habitat scoring technique was used, the following aquatic habitat values were obtained for each site in the study:

	QHEI	Area	Substrate	Cover	Channel	Riparian	Pool/ Riffle	Gradient	Percent of Reference
Maximum Points	**100**	**15**	**15**	**15**	**15**	**15**	**15**	**10**	**100**
Flint Creek Site 1	79	8	12	10	14	16	13	6	100
Hog Run Site 2	56	5	10	5	10	9	11	6	71
Hog Run Site 3	62	6	10	8	12	9	11	6	78
Middle Fork. Site 4	67	11	10	8	10	8	10	10	85
Middle Fork Site 5	76	12	10	10	12	8	14	10	96

The maximum value obtainable by this scoring technique is 100, with higher values indicating better habitat. Sites with lower habitat values normally have lower biotic index values as well.

The lowest habitat value in this study was at Site 2 on Hog Run. Habitat was hampered by a paucity of instream "cover" and by the small size of the drainage area.

Water Chemistry Measurements

	April 2004				October 2004			
	D.O. mg/l	pH SU	Cond uS	Temp C	D.O mg/l	pH SU	Cond uS	Temp C
Flint Creek Site 1	11.2	8.2	440	10.7	9.8	7.3	500	10.0
Hog Run Site 2	10.9	8.0	490	13.4	8.2	7.3	600	12.0
Hog Run . Site 3	11.2	8.3	480	12.7	7.8	7.3	600	11.5
Middle Fork Site 4	10.5	8.1	460	16.3	11.8	7.8	500	13.5
Middle Fork Site 5	11.2	8.4	480	15.6	13.9	7.9	500	13.5

D.O. = Dissolved Oxygen
Cond. = Conductivity

Table 1.
Rapid Bioassessment Results
April 2004

Site Number	1	2	3	4	5
Chironomidae (midges)					
Orthocladinae spp.	2		2		
Cricotopus trifascia	8			20	47
C. tremulus				3	
C. bicinctus	2	2		3	
Cardiocladius spp.	14		6		
Brillia spp.				5	
Orthocladius obumbratus		10	12	28	7
O. annectens	2				
Ablabesmyia mallochi	7	6	8	2	2
Polypedilum convictum	2			2	
Endochironomus spp.			2		
Paratanytarsus spp.			2		
Tabanidae (horse & deerflies)	1				1
Ephydridae (shore flies)	1		1		
Empididae (aquatic dance flies)					
Hemerodromia spp.					2
Simuliidae (black flies)					
Simulium spp.	35	46	56	26	29
Odonata (Dragon and Damselflies)					
Argia spp.				1	
Trichoptera (caddisflies)					
Chimarra obscura		1			
Hydropsyche betteni	3	21	4	1	2
Cheumatopsyche spp.	1	2	2	2	
Ceratopsyche sparna		3			1
Ephemeroptera (mayflies)					
Rhyacophila spp.			1		
Isonychia spp.	3				
Stenonema femoratum	1				
S. vicarium	3				
S. pulchellum	1				1
Baetis amplus	12				1
Baetis flavistriga	1			5	
Baetis intercalaris			1		
Plecoptera (stoneflies)					
Taenopteryx spp.	1				
Elmidae (riffle beetles)					
Stenelmis larvae		5	3	2	7
Optioservus larvae		4			
Total	100	100	100	100	100

Table 2. Data Analysis for 4/04 Samples

METRICS

	1	2	3	4	5
# of Taxa	19	10	13	13	11
HBI	5.4	5.7	5.9	6.4	6.8
Scrapers/Filterers	0.1	0.1	0.1	0.1	0.2
EPT/Chironomids	0.7	1.5	0.3	0.1	0.1
% Dominant Taxon	35	46	56	28	47
EPT Index	9	4	4	3	4
Community Loss Index	0	1.4	0.9	0.9	1.1
% Shredders	+	+	+	-	+

SCORING

	1	2	3	4	5
# of Taxa	6	2	4	4	2
HBI	6	6	6	4	4
Scrapers/Filterers	6	6	4	6	6
EPT/Chironomids	6	6	2	0	0
% Dominant Taxon	2	0	0	4	0
EPT Index	6	0	0	0	0
Community Loss Index	6	4	4	4	4
% Shredders	6	6	6	3	6
TOTAL	44	30	23	28	22
% of Reference	100	68	52	64	50
Impairment Category	N	S	S	S	M

N = NONE S = SLIGHT M = MODERATE Sv = SEVERE

Table 3.
Rapid Bioassessment Results
October 2004

Site Number	1	2	3	4	5
Chironomidae (midges)					
Nanocladius spp.	3	2	2		
Cricotopus trifascia					4
Thienemanniella xena			1		
Parametriocnemus spp.			2		
Cardiocladius spp.					1
Rheocricotopus spp.	1			1	
Orthocladius obumbratus					3
Eukiefferiella bavarica		4			
Ablabesmyia mallochi	1	4			
Polypedilum convictum		6	2	1	
P. illonense			1		
Microspectra polita		2			
Tipulidae (crane flies)					
Tipula spp.	1		3	3	
Hexatoma spp.	1				
Simuliidae (black flies)					
Simulium spp.			2	28	2
Odonata (Dragon and Damselflies)					
Hetaerina spp.	1				
Trichoptera (caddisflies)					
Chimarra obscura	25			1	1
Hydropsyche betteni	9	15	12	11	2
Cheumatopsyche spp.	31	16	43	19	13
Ceratopsyche sparna	5	35	9	14	2
C. bifida	1			11	60
Ephemeroptera (mayflies)					
Tricorythodes spp.					2
Isonychia spp.	4		1		5
Stenonema terminatum	1				
S. vicarium	9			1	
S. pulchellum	2				
Heptagenia spp.				1	
Baetis flavistriga	1	2	1	9	5
Psephenidae (water pennies)					
Psephenus herricki	1				
Elmidae (riffle beetles)					
Stenelmis larvae	1	2			
Optioservus larvae	1	12	21		
Turbellaria (planarians)	1				
Total	100	100	100	100	100

Table 4. Data Analysis for 10/04 Samples

METRICS

	1	2	3	4	5
# of Taxa	20	11	13	12	12
HBI	4.3	4.2	5.0	5.3	5.5
Scrapers/Filterers	0.2	0.2	0.3	0.0	0.0
EPT/Chironomids	18	3.8	8.2	33	11
% Dominant Taxon	31	35	43	28	60
EPT Index	10	4	5	8	8
Community Loss Index	0	1.1	0.9	0.9	1.2
% Shredders	1	1	12	14	0

SCORING

	1	2	3	4	5
# of Taxa	6	2	4	4	4
HBI	6	6	4	4	4
Scrapers/Filterers	6	6	6	0	0
EPT/Chironomids	6	0	2	6	4
% Dominant Taxon	2	2	0	4	0
EPT Index	6	0	0	4	4
Community Loss Index	6	4	4	4	4
% Shredders	6	6	6	6	0
TOTAL	44	26	26	32	20
% of Reference	100	59	59	73	45
Impairment Category	N	S	S	S	M

N = NONE S = SLIGHT M = MODERATE Sv = SEVERE

DISCUSSION

Chemical parameters measured at each site indicate that dissolved oxygen (D.O.), pH, temperature, and conductivity fell within acceptable ranges for most forms of aquatic life. Cooler water temperatures and permanent flow at the two Hog Run watershed sites indicate this stream may have a substantial groundwater input.

A total of 25 macroinvertebrate genera were collected at the five sites in April, while 27 genera were collected in October. The most commonly collected invertebrates in the spring were blackfly and midge larvae, while caddisflies were most common in the fall collections.

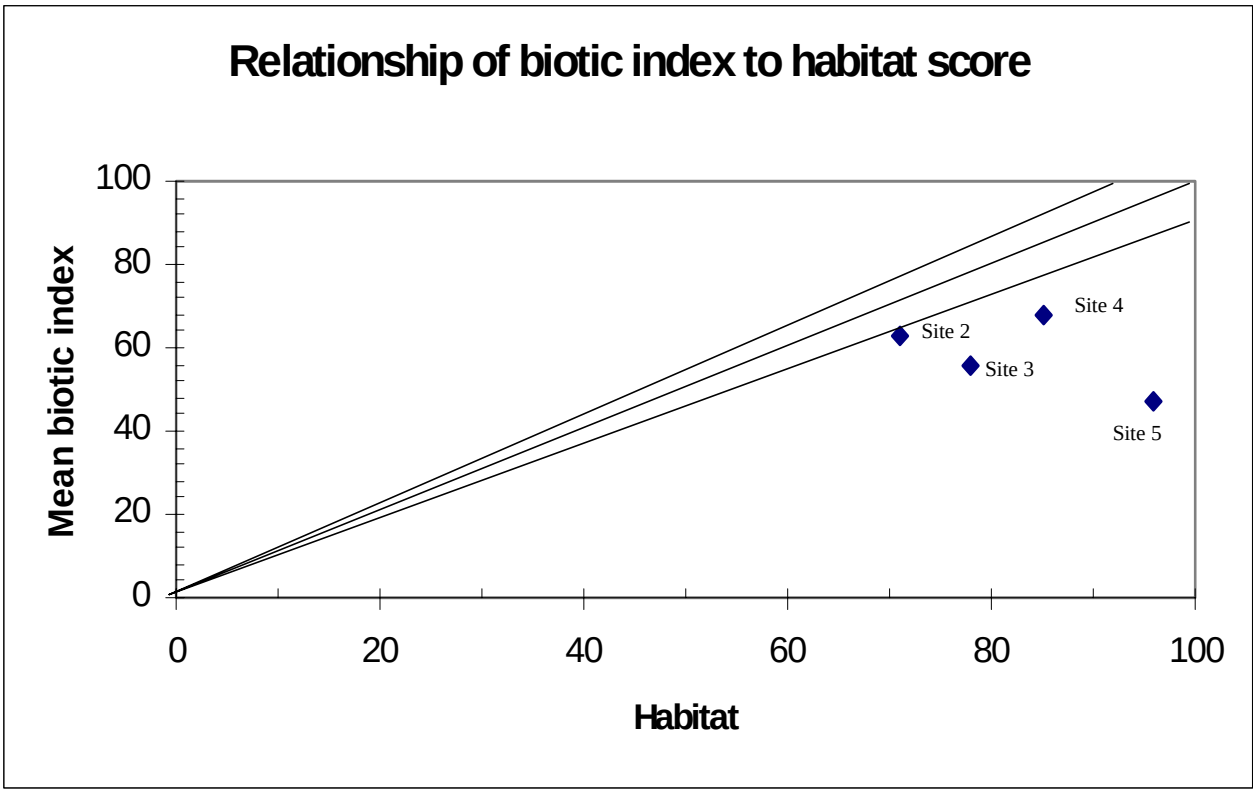
Tables 2 and 4 show how the aquatic communities of the study streams compared to that of the reference site. Figure 3 shows the normal relationship of biotic index scores to habitat values (a linear relationship according to [4]). The figure also shows a range of plus or minus 10% to account for a certain amount of measurement variability. When biotic index values fall outside this range, the site typically has degraded water quality. Figure 3 shows the mean value of spring and fall biotic index values and indicates that all sites had a least some water quality degradation. Site 5 (Wildcat Creek downstream from Hog Run) was the most impacted.

An examination of those metrics showing the greatest difference from the reference stream my provide an important clue about causes of biological impairment. The study sites had less diversity of mayflies, caddisflies, and stoneflies (EPT taxa). For the two Wildcat Creek sites, the spring collections had an increased abundance of midges (Chironomidae) at the expense of environmentally intolerant EPT taxa. The fall collections at the two Wildcat Creek sites had few "scraper" animals in comparison to the much larger number of "filtering" animals. The Wildcat Creek sites had Hilsenhoff Biotic Index (HBI) values significantly higher than the reference stream. All of these metrics are indicative of nutrient enrichment.

Sedimentation also seems to be responsible for some of the observed water quality degradation. Tables 5 and 6 list macroinvertebrates known to be tolerant and intolerant to sediment deposition. For the spring collections, the proportion of sediment-tolerant organisms was higher at the study sites than at the reference sites. This difference is not apparent for the fall collections. This indicates that increases sedimentation is especially a problem in the spring.

In contrast to sites on Hog Run, Site 5 on the Middle Fork of Wildcat Creek (the downstream site) scored the lowest in biotic integrity for both spring and fall collections despite having the best habitat score. It's biotic integrity was indicative of "moderate" impact. The upstream site (site 4) was only slightly impaired. This site had evidence of two freshwater mussel species (Lasmigona complanata and Lampsilis cardium), which is also an indicator of a relatively healthy stream.

Figure 3. The normal relationship between habitat and biotic index score is a one-to-one linear relationship. Sites falling outside the normal relationship (plus or minus 10%) are probably affected by degraded water quality. The middle line shows the normal relationship; the outside lines show plus or minus 10%.



Tables 5 and 6 show sediment-tolerance values for many of the commonly collected animals in these streams.

Table 5. Sediment -Tolerant Species Observed (References shown in brackets)

Cheumatopsyche spp.	**[10]**
Hydropsyche betteni	**[10]**
Baetis intercalaris (close to B. flavistriga)	**[10]**
Tricorythodes spp.	**[10, 11]**
Polypedilum convictum	**[10]**
Orthocladius obumbratus	**[10]**

April samples

% Sediment-tolerant Organisms at the Reference	**7 %**
% Sediment-tolerant Organisms at the Study Sites	
Site 2	**33 %**
Site 3	**19 %**
Site 4	**38 %**
Site 5	**9 %**

October samples

% Sediment-tolerant Organisms at the Reference	**41 %**
% Sediment-tolerant Organisms at the Study Sites	
Site 2	**39 %**
Site 3	**44 %**
Site 4	**40 %**
Site 5	**24 %**

Table 6 shows sediment-tolerance values for many of the commonly collected animals in these streams.

Table 6. Sediment-Intolerant Species Observed
(Literature references to the species as an indicator are shown in brackets)

Stenonema vicarium	**[10, 12]**
Ceratopsyche spp.	**[10]**
Tipula spp.	**[10]**
Plecoptera	**[10]**
Brillia spp.	**[10]**

April samples
% Sediment-Intolerant Organisms at the Reference 4%
% Sediment-Intolerant Organisms at the Study Sites

Site 2	**3%**
Site 3	**0%**
Site 4	**5%**
Site 5	**1 %**

October samples
% Sediment-Intolerant Organisms at the Reference 16%
% Sediment-Intolerant Organisms at the Study Sites

Site 2	**35%**
Site 3	**12%**
Site 4	**29%**
Site 5	**62%**

Comparison to Previous Studies

A bioassessment study of the same sites was conducted by Commonwealth Biomonitoring in August and October 1994. During that study, all sites were determined to be slightly impaired. The present study indicates that the study sites are still slightly impaired. However, conditions on Hog Run have measurably improved since the earlier study. For example, Hog Run has a ten-fold increase in the abundance of the intolerant caddisfly *Ceratopsyche sparna* compared to 1994. One collection in Hog Run during 2004 included an unusual, intolerant [13] mayfly (*Rhyacophila* spp.). Several metrics used to calculate the index of biotic integrity have improved significantly. These include the proportion of sediment-intolerant animals (from 1% to 20%), the proportion of "shredders" (from 1% to as much as 10%), the Hilsenhoff Biotic Index Value (which is a measure of sewage pollution), the proportion of EPT to midges (from 3 to 8), and the proportion of "scrapers" to "filterers" (from 10% to 20%).

In contrast, the biotic integrity at Site 5 on the Middle Fork of Wildcat Creek is worse than in 1994. Several tributary streams between sites 4 and 5 (Campbells Run, Cripe Run, Dunk Creek) may be contributing to this decline.

RECOMMENDATIONS

1. **Despite their small watershed areas, the two sites on Hog Run have more-or-less permanent flow and appear to be spring-fed. Aquatic habitat could be improved by restoring bank vegetation in places.**

2. **Continue to work with landowners to encourage best management practices. Erosion control in the spring could improve some of the "slight" water quality impairment observed.**

3. **Consider monitoring efforts on other tributaries to determine the source of the "moderate" impairment at the downstream (Site 5) Middle Fork Wildcat Creek site.**

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Appendices

Photographs of Study Sites
Macroinvertebrate Data
QHEI Data Sheets
Macroinvertebrate Identification Literature

Photographs of the Study Sites
April 2004

Site 1 - Flint Creek (reference)

Site 2 - Hog Run - CR 550 N

Site 3 - Hog Run - CR 850 W

Site 4 - Middle Fork of Wildcat Creek - Upstream from Hog Run

Site 5 - Middle Fork of Wildcat Creek Downstream from Hog Run

Macroinvertebrate data from sampling of April 28, 2004.

Site Number	1	2	3	4	5
Chironomidae (midges)					
Orthocladinae spp.	2		2		
Cricotopus trifascia	8			20	47
C. tremulus				3	
C. bicinctus	2	2		3	
Cardiocladius spp.	14		6		
Brillia spp.				5	
Orthocladius obumbratus		10	12	28	7
O. annectens	2				
Ablabesmyia mallochi	7	6	8	2	2
Polypedilum convictum	2			2	
Endochironomus spp.			2		
Paratanytarsus spp.			2		
Tabanidae (horse & deerflies)	1				1
Ephydridae (shore flies)	1		1		
Empididae (aquatic dance flies)					
Hemerodromia spp.					2
Simuliidae (black flies)					
Simulium spp.	35	46	56	26	29
Odonata (Dragon and Damselflies)					
Argia spp.				1	
Trichoptera (caddisflies)					
Chimarra obscura		1			
Hydropsyche betteni	3	21	4	1	2
Cheumatopsyche spp.	1	2	2	2	
Ceratopsyche sparna		3			1
Ephemeroptera (mayflies)					
Rhyacophila spp.			1		
Isonychia spp.	3				
Stenonema femoratum	1				
S. vicarium	3				
S. pulchellum	1				1
Baetis amplus	12				1
Baetis flavistriga	1			5	
Baetis intercalaris			1		
Plecoptera (stoneflies)					
Taenopteryx spp.	1				
Elmidae (riffle beetles)					
Stenelmis larvae		5	3	2	7
Optioservus larvae		4			
Total	100	100	100	100	100

Macroinvertebrate data from sampling of October 7, 2004.

Site Number	1	2	3	4	5
Chironomidae (midges)					
Nanocladius spp.	3	2	2		
Cricotopus trifascia					4
Thienemanniella xena			1		
Parametriocnemus spp.			2		
Cardiocladius spp.					1
Rheocricotopus spp.	1			1	
Orthocladius obumbratus					3
Eukiefferiella bavarica		4			
Ablabesmyia mallochi	1	4			
Polypedilum convictum		6	2	1	
P. illonense			1		
Microspectra polita		2			
Tipulidae (crane flies)					
Tipula spp.	1		3	3	
Hexatoma spp.	1				
Simuliidae (black flies)					
Simulium spp.			2	28	2
Odonata (Dragon and Damselflies)					
Hetaerina spp.	1				
Trichoptera (caddisflies)					
Chimarra obscura	25			1	1
Hydropsyche betteni	9	15	12	11	2
Cheumatopsyche spp.	31	16	43	19	13
Ceratopsyche sparna	5	35	9	14	2
C. bifida	1			11	60
Ephemeroptera (mayflies)					
Tricorythodes spp.					2
Isonychia spp.	4		1		5
Stenonema terminatum	1				
S. vicarium	9			1	
S. pulchellum	2				
Heptagenia spp.				1	
Baetis flavistriga	1	2	1	9	5
Psephenidae (water pennies)					
Psephenus herricki	1				
Elmidae (riffle beetles)					
Stenelmis larvae	1	2			
Optioservus larvae	1	12	21		
Turbellaria (planarians)	1				
Total	100	100	100	100	100

Procedure No. WQMA-SWS-3 Date Issued 10/1/87
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Figure V-4-1. Front side of the Ohio EPA Site Description Sheet for evaluating the geographical and physical characteristics of fish sampling locations. This is used to record information for the calculation of the Qualitative Habitat Evaluation Index (QHEI).

10:30 am
mp 10.7C
H 8.2
ond 440
.O. 22.0%
(11.2)

Site 1

Ohio EPA Site Description Sheet - Fish

Stream: Flint Creek RM: Date: 4/28/04 River Code:
Location: CR 700 W, West Point, IN USGS Quad:
Township: Section: Lat/R./Long/R: /
Crew: MMK GRB County: Tippecanoe

79 TOTAL QHEI

1] SUBSTRATE (Check ONLY Two Substrate TYPES); POOL/RIFFLE SUBSTRATES OPTIONAL

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	QUALITY
☐-BOULDER [7]			☐-GRAVEL [5]	X		Check ALL That Apply:
☐-COBBLE [6]	X		☐-SAND [4]			☐-SILT COVERED [-1]
☐-HARDPAN [5]			☐-BEDROCK[3]			X-SILT FREE [1]
☐-SILT [3]			☐-DETRITUS[2]			☐-BOULDERS AS SLABS [1]
☐-MUCK [2]			☐-SLUDGE[1]			☐-EMBEDDED [-2]

COMMENTS:

12 SUBSTRATE

2] INSTREAM COVER

TYPE (Check ALL That Apply)		AMOUNT (Check ONLY One)
X- UNDERCUT BANKS [1]	X- DEEP POOLS [1]	☐- EXTENSIVE [7]
X- OVERHANGING VEGETATION [1]	☐- CHOKE [1]	X- MODERATE [5]
X- SHALLOWS (IN SLOW WATER) [1]	☐- BOULDERS [1]	☐- SPARSE [3]
X- LOGS OR WOODY DEBRIS [1]	☐- AQUATIC MACROPHYTES [1]	☐- NEARLY ABSENT [1]

COMMENTS:

10 COVER

3] CHANNEL MORPHOLOGY: (Check ONLY One Under Each Category)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	OTHER
☐- HIGH [4]	X- EXCELLENT [4]	X- NONE [4]	X- HIGH [3]	☐- POUND.
X- MODERATE [3]	☐- GOOD [3]	☐- RECOVERED [3]	☐- MODERATE [2]	☐- ISLANDS
☐- LOW [2]	☐- FAIR [2]	☐- RECOVERING [2]	☐- LOW [1]	☐- LEVEED
☐- NONE [1]	☐- POOR [1]	☐- RECENT OR NO RECOVERY [1]		

COMMENTS:

14 CHANNEL

4] RIPARIAN ZONE AND BANK EROSION *River Right Looking Downstream*

RIPARIAN WIDTH (L R (Per Bank))	FLOOD PLAIN QUALITY (Check 2 Most Predominant)		BANK EROSION (L R (Per Bank))
☐ ☐-EXTENSIVE >100m [5]	X-FOREST, SWAMP [5]	☐-URBAN [1]	X-NONE [5]
☐ ☐-WIDE 50-100m [4]	X-OPEN PASTURE [1]	☐-ROWCROP[1]	☐-LITTLE [4]
☐ X-MODERATE 10-50m [3]	X-OLD FIELD [3]	☐-SHRUB [4]	☐-MODER.[3]
☐ X-NARROW 5-10m [2]	☐-RESIDENTIAL,PARK [2]		☐-HEAVY [2]
☐ ☐-VERY NARROW 1-5m [1]	☐-CONSERV. TILLAGE [2]		☐-SEVERE [1]
☐ ☐-NONE [0]	☐-FENCED PASTURE [2]		

COMMENTS:

16 RIPARIAN

5] POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1)	POOL COVER (Check 1)	OVERALL CURRENT VELOCITY (Check ALL That Apply)		MORPHOLOGY (Check 1)
X- >1m [3]	☐-EXTENSIVE [3]	☐-TORRENTIAL[-1]	☐-EDDIES[1]	X-POOL WIDTH > RIFFLE WIDTH [2]
☐- 0.7-1m [2]	X-MODERATE [2]	X-FAST[1]	☐-INTERSTITIAL[-1]	☐-POOL WIDTH = RIFFLE WIDTH [1]
☐- 0.4-0.7m [1]	☐-SPARSE [1]	X-MODERATE [1]		☐-POOL WIDTH < RIFFLE W. [0]
☐- <0.4m [0]	☐-NEARLY ABSENT [0]	X-SLOW [1]		
		☐-INTERMITTENT[-2]		

☐-NO POOL[0] COMMENTS:

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN SUBSTRATE QUALITY
☐- GENERALLY <10 cm [1]	X- STABLE (Cobble, Boulder) [1]	☐-EMBEDD [0]
X- GENERALLY >10 cm,MAX<50 [2]	☐- UNSTABLE (Gravel, Sand) [0]	X- NOT EMBED. [1]
☐- GENERALLY >10 cm,MAX>50 [3]		6] Gradient (ft/mi): _____
☐- NO RIFFLE[0]		7] Drainage area (sq.mi.): _____

33'/mi 6 GRADIENT

15 mi² 8 DRAINAGE AREA

Figure V-4-1. Front side of the Ohio EPA Site Description Sheet for evaluating the geographical and physical characteristics of fish sampling locations. This is used to record information for the calculation of the Qualitative Habitat Evaluation Index (QHEI).

2 photos

Site 2

:3 p.m.
).0 10.9
H 8.0
ond 490
temp 13.4c

Ohio EPA Site Description Sheet - Fish

Stream Hog Run RM Date 4/28/04 River Code
Location CR 550 N, Mulberry IN USGS Quad
Township Section Lat/Long
Crew: MMK GRB County Clinton

TOTAL QHEI: 56

1] SUBSTRATE (Check ONLY Two Substrate TYPES); POOL/RIFFLE SUBSTRATES OPTIONAL

TYPE	POOL	RIFFLE		POOL	RIFFLE	QUALITY
☐-BOULDER [7]			☒-GRAVEL [5]			Check ALL That Apply:
☐-COBBLE [6]			☒-SAND [4]			☐-SILT COVERED [-1]
☐-HARDPAN [3]			☐-BEDROCK[3]			☒-SILT FREE [1]
☐-SILT [3]			☐-DETRITUS[2]			☐-BOULDERS AS SLABS [1]
☐-MUCK [2]			☐-SLUDGE[1]			☐-EMBEDDED [-2]

COMMENTS:

SUBSTRATE: 10

2] INSTREAM COVER

TYPE (Check ALL That Apply)		AMOUNT (Check ONLY One)
☐- UNDERCUT BANKS [1]	☐- DEEP POOLS [1]	☐- EXTENSIVE [7]
☒- OVERHANGING VEGETATION [1]	☐- OXBOWS [1]	☐- MODERATE [5]
☒- SHALLOWS (IN SLOW WATER) [1]	☐- BOULDERS [1]	☒- SPARSE [3]
☐- LOGS OR WOODY DEBRIS [1]	☐- AQUATIC MACROPHYTES [1]	☐- NEARLY ABSENT [1]

COMMENTS:

COVER: 5

3] CHANNEL MORPHOLOGY: (Check ONLY One Under Each Category)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	OTHER
☐-HIGH [4]	☐-EXCELLENT [4]	☒-NONE [4]	☐-HIGH [3]	☐-IMPOUND.
☐-MODERATE [3]	☐-GOOD [3]	☐-RECOVERED [3]	☒-MODERATE [2]	☐-ISLANDS
☒-LOW [2]	☒-FAIR [2]	☐-RECOVERING [2]	☐-LOW [1]	☐-LEVEED
☐-NONE [1]	☐-POOR [1]	☐-RECENT OR NO RECOVERY [1]		

COMMENTS:

CHANNEL: 10

4] RIPARIAN ZONE AND BANK EROSION *River Right Looking Downstream*

RIPARIAN WIDTH L R (Per Bank)	FLOOD PLAIN QUALITY (Check 2 Most Predominant)	BANK EROSION L R (Per Bank)
☐ ☐-EXTENSIVE >100m [3]	☐ ☐-FOREST, SWAMP [3] ☐ ☐-URBAN [1]	☐ ☐-NONE [3]
☐ ☐-WIDE 50-100m [4]	☐ ☐-OPEN PASTURE [1] ☐ ☐-ROWCROP[1]	☐ ☐-LITTLE [4]
☐ ☐-MODERATE 10-50m [3]	☐ ☐-OLD FIELD [3] ☐ ☐-SHRUB [4]	☒ ☒-MODER.[3]
☐ ☒-NARROW 5-10m [2]	☐ ☐-RESIDENTIAL, PARK [2]	☐ ☐-HEAVY [2]
☒ ☐-VERY NARROW 1-5m [1]	☒ ☒-CONSERV. TILLAGE [2]	☐ ☐-SEVERE [1]
☐ ☐-NONE [0]	☒ ☒-FENCED PASTURE [2]	

COMMENTS:

RIPARIAN: 9

5] POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1)	POOL COVER (Check 1)	OVERALL CURRENT VELOCITY (Check ALL That Apply)	MORPHOLOGY (Check 1)
☐- >1m [3]	☐-EXTENSIVE [3]	☐-TORRENTIAL[-1] ☐-EDDIES[1]	☒-POOL WIDTH > RIFFLE WIDTH [2]
☒- 0.7-1m [2]	☒-MODERATE [2]	☐-FAST[1] ☐-INTERSTITIAL[-1]	☐-POOL WIDTH = RIFFLE WIDTH [1]
☐- 0.4-0.7m [1]	☐-SPARSE [1]	☒-MODERATE [1]	☐-POOL WIDTH < RIFFLE W. [0]
☐- <0.4m [0]	☐-NEARLY ABSENT [0]	☒-SLOW [1]	
		☐-INTERMITTENT[-2]	

☐-NO POOL[0] COMMENTS:

POOL/RIFFLE: 11

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN SUBSTRATE QUALITY
☒- GENERALLY <10 cm [1]	☒- STABLE (Cobble, Boulder) [1]	☐- EMBEDDED [0]
☐- GENERALLY >10 cm, MAX<50 [2]	☐- UNSTABLE (Gravel, Sand) [0]	☒- NOT EMBED. [1]
☐- GENERALLY >10 cm, MAX>50 [3]		6] Gradient (ft./mi):
☐- NO RIFFLE[0]		7] Drainage area (sq.mi.):

30'/mi GRADIENT: 6

3/5 mi² DRAINAGE AREA: 5

Figure V-4-1. Front side of the Ohio EPA Site Description Sheet for evaluating the geographical and physical characteristics of fish sampling locations. This is used to record information for the calculation of the Qualitative Habitat Evaluation Index (QHEI).

1 photo

Ohio EPA Site Description Sheet – Fish

Stream: Hog Run RM: Date: 4/28/04 River Code:
Location: CR 850 W, Mulberry IN USGS Quad:
Township: Section: Left/Right:
Crew: MMK GRB County: Clinton

TOTAL QHEI: 62

1] SUBSTRATE (Check *ONLY* Two Substrate *TYPES*); 2 POOL/RIFFLE SUBSTRATES OPTIONAL

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	QUALITY
☐-BOULDER [7]			☐-GRAVEL [5]	X		Check *ALL* That Apply:
☐-COBBLE [6]			☐-SAND [4]	X		☐-SLT COVERED [-1]
☐-HARDPAN [3]			☐-BEDROCK [3]			☒-SLT FREE [1]
☐-SLT [3]			☐-DETRITUS [2]			☐-BOULDERS AS SLABS [1]
☐-MUCK [2]			☐-SLUDGE [1]			☐-☐-BEDDED [-2]

COMMENTS:

SUBSTRATE: 10

2] INSTREAM COVER

TYPE (Check *ALL* That Apply)		AMOUNT (Check *ONLY* One)
☐- UNDERCUT BANKS [1]	☐- DEEP POOLS [1]	☐- EXTENSIVE [7]
☒- OVERHANGING VEGETATION [1]	☐- GROOVS [1]	☒- MODERATE [5]
☒- SHALLOWS (IN SLOW WATER) [1]	☐- BOULDERS [1]	☐- SPARSE [3]
☒- LOGS OR WOODY DEBRIS [1]	☐- AQUATIC MACROPHYTES [1]	☐- NEARLY ABSENT [1]

COMMENTS:

COVER: 8

Site 3

3] CHANNEL MORPHOLOGY: (Check *ONLY* One Under Each Category)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	OTHER
☐- HIGH [4]	☐- EXCELLENT [4]	☒- NONE [4]	☐- HIGH [3]	☐- POOND.
☒- MODERATE [3]	☒- GOOD [3]	☐- RECOVERED [3]	☒- MODERATE [2]	☐- ISLANDS
☐- LOW [2]	☐- FAIR [2]	☐- RECOVERING [2]	☐- LOW [1]	☐- LEVEED
☐- NONE [1]	☐- POOR [1]	☐- RECENT OR NO RECOVERY [1]		

COMMENTS:

CHANNEL: 12

1 pm

DO 11.2
H 8.3
cond 480
temp. 12.7c

4] RIPARIAN ZONE AND BANK EROSION *River Right Looking Downstream*

RIPARIAN WIDTH (L R (Per Bank))	FLOOD PLAIN QUALITY (Check 2 Most Predominant)	BANK EROSION (L R (Per Bank))
☐ ☐-EXTENSIVE >100m [5]	☐-☐-FOREST, SWAMP [5]	☐-☐-URBAN [1]
☐ ☐-WIDE 50-100m [4]	☐-☐-OPEN PASTURE [3]	☐-☐-ROWCROP [1]
☐ ☐-MODERATE 10-50m [3]	☐-☐-OLD FIELD [3]	☐-☐-SHRUB [4]
☐ ☒-NARROW 5-10m [2]	☐-☐-RESIDENTIAL, PARK [2]	☐-☐-NONE [5]
☐ ☐-VERY NARROW 1-5m [1]	☒-☒-CONSERV. TILLAGE [2]	☐-☐-LITTLE [4]
☐ ☐-NONE [0]	☒-☒-FENCED PASTURE [2]	☒-☒-MODER. [3]
		☐-☐-HEAVY [2]
		☐-☐-SEVERE [1]

COMMENTS:

RIPARIAN: 9

5] POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1)	POOL COVER (Check 1)	OVERALL CURRENT VELOCITY (Check *ALL* That Apply)		MORPHOLOGY (Check 1)
☐- >1m [3]	☐-EXTENSIVE [3]	☐-TORRENTIAL [-1]	☐-EDDIES [1]	☒-POOL WIDTH > RIFFLE WIDTH [2]
☒- 0.7-1m [2]	☒-MODERATE [2]	☒-FAST [1]	☐-INTERSTITIAL [-1]	☐-POOL WIDTH = RIFFLE WIDTH [1]
☐- 0.4-0.7m [1]	☐-SPARSE [1]	☒-MODERATE [1]		☐-POOL WIDTH < RIFFLE W. [0]
☐- <0.4m [0]	☐-NEARLY ABSENT [0]	☒-SLOW [1]		
		☐-INTERMITTENT [-2]		

☐-NO POOL [0] COMMENTS:

POOL/RIFFLE: 11

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN SUBSTRATE QUALITY
☒- GENERALLY <10 cm [1]	☒- STABLE (Cobble, Boulder) [1]	☐- BEDDED [0]
☐- GENERALLY >10 cm, MAX<50 [2]	☐- UNSTABLE (Gravel, Sand) [0]	☒- NOT EMBED. [1]
☐- GENERALLY >10 cm, MAX>50 [3]		
☐- NO RIFFLE [0]		

6] Gradient (ft/mi): 30 ft/mi
7] Drainage area (sq.mi.): 5 mi²

GRADIENT: 6 DRAINAGE AREA: 6

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Figure V-4-1. Front side of the Ohio EPA Site Description Sheet for evaluating the geographical and physical characteristics of fish sampling locations. This is used to record information for the calculation of the Qualitative Habitat Evaluation Index (QHEI).

1 photo

U/S Hog Run

Ohio EPA Site Description Sheet - Fish

Stream: Middle Fork Wildcat RM: Date: 4/28/04 River Code:
Location: CR 680 W, Rossville IN USGS Quad:
Township: Section: Left/Length: /
Crew: MMK GRB County: Clinton

67 TOTAL QHEI

1] SUBSTRATE (Check ONLY Two Substrate TYPES); 5 POOL/RIFFLE SUBSTRATES OPTIONAL

TYPE	POOL	RIFFLE		POOL	RIFFLE	QUALITY
☐☐-BOULDER [7]			☐☐-GRAVEL [3]	X		Check ALL That Apply:
☐☐-COBBLE [6]			☐☐-SAND [4]	X		☐-SILT COVERED [-1]
☐☐-HARDPAN [3]			☐☐-BEDROCK[3]			X-SILT FREE [1]
☐☐-SILT [3]			☐☐-DETRITUS[2]			☐-BOULDERS AS SLABS [1]
☐☐-MUCK [2]			☐☐-SLUDGE[1]			☐-☐-EMBEDED [-2]

COMMENTS:

10 SUBSTRATE

2] INSTREAM COVER

Site 4

TYPE (Check ALL That Apply)		AMOUNT (Check ONLY One)
☐- UNDERCUT BANKS [1]	☐- DEEP POOLS [1]	☐- EXTENSIVE [7]
X- OVERHANGING VEGETATION [1]	☐- CHOKES [1]	X- MODERATE [5]
X- SHALLOWS (IN SLOW WATER) [1]	☐- BOULDERS [1]	☐- SPARSE [3]
X- LOGS OR WOODY DEBRIS [1]	☐- AQUATIC MACROPHYTES [1]	☐- NEARLY ABSENT [1]

COMMENTS:

8 COVER

3] CHANNEL MORPHOLOGY: (Check ONLY One Under Each Category)

2:30 p.m

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	OTHER
☐-HIGH [4]	☐-EXCELLENT [4]	X-NONE [4]	☐-HIGH [3]	☐-IMPOUND.
X-MODERATE [3]	X-GOOD [3]	☐-RECOVERED [3]	X-MODERATE [2]	☐-ISLANDS
☐-LOW [2]	X-FAIR [2]	☐-RECOVERING [2]	X-LOW [1]	☐-LEVEED
☐-NONE [1]	☐-POOR [1]	☐-RECENT OR NO RECOVERY [1]		

D.O. 10.5 mg/l
pH 8.1
cond. 460
temp. 16.3C

COMMENTS:

10 CHANNEL

4] RIPARIAN ZONE AND BANK EROSION *River Right Looking Downstream*

RIPARIAN WIDTH (L R (Per Bank))	FLOOD PLAIN QUALITY (Check 2 Most Predominant)	BANK EROSION (L R (Per Bank))
☐ ☐-EXTENSIVE >100m [5]	☐☐-FOREST, SWAMP [5] ☐☐-URBAN [1]	☐☐-NONE [5]
☐ ☐-WIDE 50-100m [4]	☐☐-OPEN PASTURE [3] ☐☐-ROWCROP [1]	☐☐-LITTLE [4]
☐ ☐-MODERATE 10-50m [3]	☐☐-OLD FIELD [3] ☐☐-SHRUB [4]	X☐-MODER.[3]
☐ ☐-NARROW 5-10m [2]	☐☐-RESIDENTIAL, PARK [2]	☐☐-HEAVY [2]
X☐-VERY NARROW 1-5m [1]	X☐-CONSERV. TILLAGE [2]	☐☐-SEVERE [1]
☐ ☐-NONE [0]	X☐-FENCED PASTURE [2]	

COMMENTS:

8 RIPARIAN

5] POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1)	POOL COVER (Check 1)	OVERALL CURRENT VELOCITY (Check ALL That Apply)		MORPHOLOGY (Check 1)
☐->1m [3]	☐-EXTENSIVE [3]	☐-TORRENTIAL[-1]	☐-EDDIES[1]	X-POOL WIDTH > RIFFLE WIDTH [2]
X-0.7-1m [2]	X-MODERATE [2]	☐-FAST[1]	☐-INTERSTITIAL[-1]	X-POOL WIDTH = RIFFLE WIDTH [1]
☐-0.4-0.7m [1]	☐-SPARSE [1]	X-MODERATE [1]		☐-POOL WIDTH < RIFFLE W. [0]
☐-<0.4m [0]	☐-NEARLY ABSENT [0]	X-SLOW [1]		
		☐-INTERMITTENT[-2]		

☐-NO POOL[0] COMMENTS:

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN SUBSTRATE QUALITY
X-GENERALLY <10 cm [1]	☐-STABLE (Cobble, Boulder) [1]	☐-EMBEDED [0]
☐-GENERALLY >10 cm, MAX<50 [2]	X-UNSTABLE (Gravel, Sand) [0]	X-NOT EMBED. [1]
☐-GENERALLY >10 cm, MAX>50 [3]		6] Gradient (ft/mi): 10'/mi
☐-NO RIFFLE[0]		7] Drainage area (sq.mi.): .59 mi²

10 POOL/RIFFLE

10 GRADIENT

11 DRAINAGE AREA

Procedure No. WQMA-SWS-3 Date Issued 10/1/87
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Figure V-4-1. Front side of the Ohio EPA Site Description Sheet for evaluating the geographical and physical characteristics of fish sampling locations. This is used to record information for the calculation of the Qualitative Habitat Evaluation Index (QHEI).

D/S Hog Run

Ohio EPA Site Description Sheet – Fish

Stream: Middle Fork Wildcat RM: Date: 4/28/04 River Code:
Location: CR 1050 E, Edna Mills, IN USGS Quad:
Township: Section: Lat/R /Long/T
Crew: MMK GRB County: ~~Clinton~~ Tippecanoe

76 TOTAL QHEI

1] SUBSTRATE (Check ONLY Two Substrate TYPES); SI POOL/RIFFLE SUBSTRATES OPTIONAL

TYPE	POOL	RIFFLE				QUALITY
☐ ☐-BOULDER [7]			☐ ☐-GRAVEL [3]			Check ALL That Apply:
☐ ☐-COBBLE [6]	X		☐ ☐-SAND [4]			☒-SILT COVERED [-1]
☐ ☐-HARDPAN [3]			☐ ☐-BEDROCK [3]			☐-SILT FREE [1]
☐ ☐-SILT [3]			☐ ☐-DETRITUS [2]			☐-BOULDERS AS SLABS [1]
☐ ☐-MUCK [2]			☐ ☐-SLUDGE [1]			☐-☐-BEDDED [-2]

COMMENTS:

10 SUBSTRATE

2] INSTREAM COVER

TYPE (Check ALL That Apply)			AMOUNT (Check ONLY One)
☒- UNDERCUT BANKS [1]	☒- DEEP POOLS [1]		☐- EXTENSIVE [7]
☒- OVERHANGING VEGETATION [1]	☐- ONBOWS [1]		☒- MODERATE [5]
☒- SHALLOWS (IN SLOW WATER) [1]	☐- BOULDERS [1]		☐- SPARSE [3]
☒- LOGS OR WOODY DEBRIS [1]	☐- AQUATIC MACROPHYTES [1]		☐- NEARLY ABSENT [1]

COMMENTS:

10 COVER

3] CHANNEL MORPHOLOGY: (Check ONLY One Under Each Category)

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	OTHER
☐ - HIGH [4]	☐ - EXCELLENT [4]	☒ - NONE [4]	☐ - HIGH [3]	☐ - IMPOUND.
☒ - MODERATE [3]	☒ - GOOD [3]	☐ - RECOVERED [3]	☒ - MODERATE [2]	☐ - ISLANDS
☐ - LOW [2]	☐ - FAIR [2]	☐ - RECOVERING [2]	☐ - LOW [1]	☐ - LEVEED
☐ - NONE [1]	☐ - POOR [1]	☐ - RECENT OR NO RECOVERY [1]		

COMMENTS:

12 CHANNEL

Site 5

4] RIPARIAN ZONE AND BANK EROSION *River Right Looking Downstream*

RIPARIAN WIDTH L R (Per Bank)	FLOOD PLAIN QUALITY (Check 2 Most Predominant)	BANK EROSION L R (Per Bank)
☐ ☐-EXTENSIVE >100m [5]	☐ ☐-FOREST, SWAMP [5] ☐ ☐-URBAN [1]	☐ ☐-NONE [5]
☐ ☐-WIDE 50-100m [4]	☐ ☐-OPEN PASTURE [3] ☐ ☐-ROWCROP [1]	☐ ☐-LITTLE [4]
☐ ☐-MODERATE 10-50m [3]	☐ ☐-OLD FIELD [3] ☐ ☐-SHRUB [4]	☐ ☐-MODER. [3]
☐ ☐-NARROW 5-10m [2]	☐ ☐-RESIDENTIAL, PARK [2]	☐ ☐-HEAVY [2]
☐ ☐-VERY NARROW 1-5m [1]	☐ ☐-CONSERV. TILLAGE [2]	☐ ☐-SEVERE [1]
☐ ☐-NONE [0]	☐ ☐-FENCED PASTURE [2]	

COMMENTS:

8 RIPARIAN

5] POOL/GLIDE AND RIFFLE/RUN QUALITY

MAX. DEPTH (Check 1)	POOL COVER (Check 1)	OVERALL CURRENT VELOCITY (Check ALL That Apply)		MORPHOLOGY (Check 1)
☒- >1m [5]	☐-EXTENSIVE [5]	☐-TORRENTIAL [-1]	☐-EDDIES [1]	☐-POOL WIDTH > RIFFLE WIDTH [2]
☐- 0.7-1m [2]	☒-MODERATE [2]	☒-FAST [1]	☐-INTERSTITIAL [-1]	☐-POOL WIDTH = RIFFLE WIDTH [1]
☐- 0.4-0.7m [1]	☐-SPARSE [1]	☐-MODERATE [1]		☐-POOL WIDTH < RIFFLE W. [0]
☐- <0.4m [0]	☐-NEARLY ABSENT [0]	☒-SLOW [1]		
		☐-INTERMITTENT [-2]		

☐-NO POOL [0] COMMENTS:

RIFFLE/RUN DEPTH	RIFFLE/RUN SUBSTRATE	RIFFLE/RUN SUBSTRATE QUALITY
☐- GENERALLY <10 cm [1]	☒- STABLE (Cobble, Bedrock) [1]	☐- EMBEDDED [0]
☒- GENERALLY >10 cm, MAX<50 [2]	☐- UNSTABLE (Gravel, Sand) [0]	☒- NOT EMBED. [1]
☐- GENERALLY >10 cm, MAX>50 [3]		6] Gradient (ft/mi): _____
☐- NO RIFFLE [0]		7] Drainage area (sq.mi.): _____

10'/mi 10 GRADIENT

107 mi² 12 DRAINAGE AREA

1pm
D.O. 11.2
pH 8.4
temp 15.6C
cond. 480

COMMONWEALTH BIOMONITORING
Macroinvertebrate Identification Literature

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BIOASSESSMENT SUMMARY

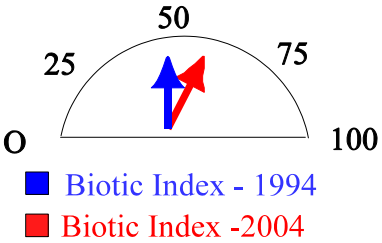
Hog Run and Middle Fork of Wildcat Creek
Clinton and Tippecanoe Counties

Purpose

To measure the water quality of Hog Run and the Middle Fork of Wildcat Creek after implementation of "best management practices" in the watersheds.

Methods

A bioassessment technique was used. Bioassessment uses knowledge of the biology of stream-dwelling animals to measure stream health.



Watershed Gauge
A score of 100 is our goal

Watershed Characteristics

The watershed is primarily agricultural. BMPS to reduce sedimentation and nutrient inputs were initiated in 1994.

Results

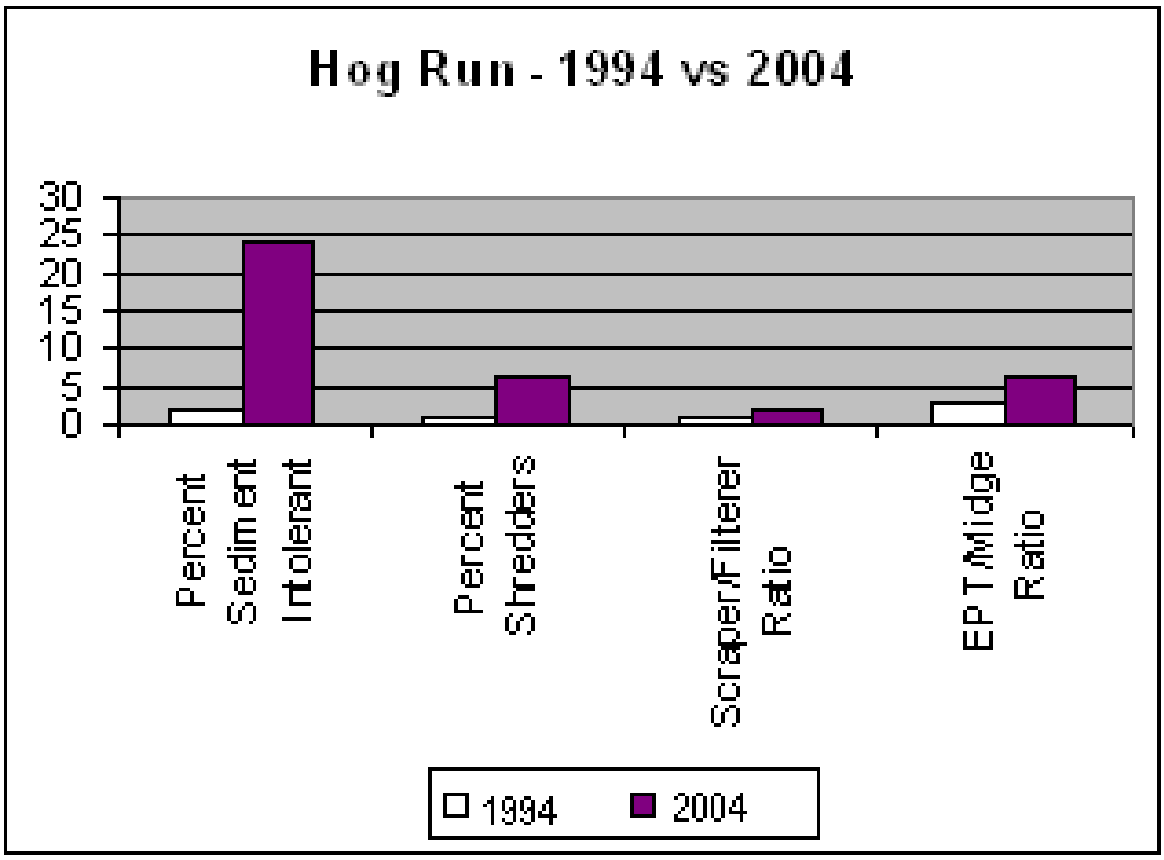
Water quality in Hog Run has improved since 1994. The number and kinds of animals are indicative of healthy conditions. Aquatic habitat could be improved by restoring bank vegetation in places. The Middle Fork of Wildcat Creek needs additional attention to improve water quality.

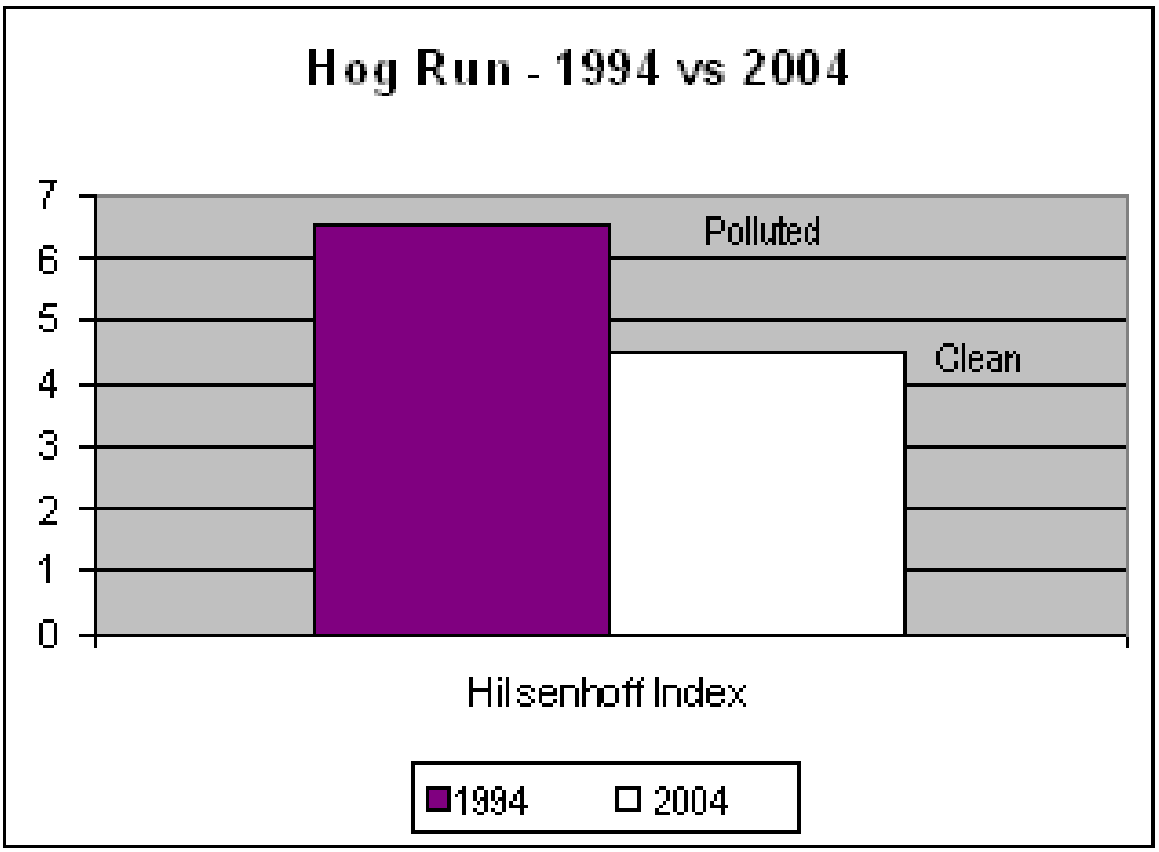
Study conducted by:

Commonwealth Biomonitoring, Inc.
8061 Windham Lake Drive
Indianapolis, IN 46214

317-297-7713
www.biomonitor.com

Date: April and October 2004


Hog Run - 1994 vs 2004
30
25
20
15
10
5
0
Percent Sediment Intolerant
Percent Shredders
Scraper/Filterer Ratio
EPT/Midge Ratio
1994
2004


Hog Run - 1994 vs 2004
7
6
5
4
3
2
1
0
Polluted
Clean
Hilsenhoff Index
1994
2004