Supplemental Material

Relating Environmental Variables with Aquatic Community Structure in an Agricultural/Urban Coldwater Stream

Daniel T.L. Myers (0000-0002-1932-5775),* Richard R. Rediske (0000-0002-5048-1063), James N. McNair (0000-0002-7828-255X), Aaron D. Parker, and E. Wendy Ogilvie

D.T.L. Myers, R.R. Rediske, and J.N. McNair, Annis Water Resources Institute, Grand Valley State University, 740 W Shoreline Drive, Muskegon, MI 49401, USA; A.D. Parker, Michigan Department of Environmental Quality, Surface Water Assessment Section, 525 W Allegan Street, Lansing, MI 48909, USA; E.W. Ogilvie, Grand Valley Metropolitan Council, 678 Front Avenue NW, Suite 200, Grand Rapids, MI 49504, USA. *Corresponding author (myersda@mail.gvsu.edu)

Contents

Table S1 Common environmental stressors in agricultural and urban streams

Stressor	Impacts	Sources
Reduced habitat variability	Decreased macroinvertebrate abundance Decreased macroinvertebrate diversity Reduced habitat suitability for fish	(Raleigh 1982; Raleigh et al. 1984; Hogg and Norris 1991; Hawkins et al. 1993; Paul and Meyer 2001)
Riparian vegetation loss	Increased water temperature Increased bank erosion Increased pollutant loading Decreased terrestrial energy subsidies Decreased organic matter input	(Delong and Brusven 1991; Sweeney 1993; Maloney and Lamberti 1995; Weller et al. 1998; Magana 2001; Nakano and Murakami 2001; Allan 2004; Anbumozhi et al. 2005; Palmer 2008)
Increased sediment load	Decreased biological production Fewer macroinvertebrate scrapers Reduction in habitat variability Fish populations decline Displaced macroinvertebrates	(Pennak and Van Gerpen 1947; Bayley and Sparks 1989; Allan et al. 1997; Paul and Meyer 2001; Allan 2004; Chiu et al. 2016)
Fine substrate / sedimentation	Reduced habitat variability Reduced invertebrate diversity Reduced habitat suitability for fish Impeded fish reproduction	(Raleigh et al. 1984; Alexander and Hansen 1986; Culp et al. 1986; Paul and Meyer 2001)
Altered water velocity	Changed macroinvertebrate composition Impeded fish feeding and resting Impeded fish reproduction	(Raleigh et al. 1984; Paul and Meyer 2001; Schoen et al. 2013)
Woody debris reduction	Decreased habitat variability Decreased organic matter retention Decreased macroinvertebrate habitat Decreased macroinvertebrate diversity	(Ehrman and Lamberti 1992; Brookshire and Dwire 2003; Johnson et al. 2003; Cordova et al. 2007; Nakamura et al. 2017)
Episodic pollution events	Toxic sediments Fish mortality Fish emigration	(Seager and Maltby 1989; Van Sickle et al. 1996)
Increased stream temperature	Altered temperature regime Altered fluctuation regime Altered fish composition Reduced habitat suitability for fish Altered growth rates of organisms	(Crisp and Howson 1982; Raleigh et al. 1984; Sinokrot and Stefan 1993; Wehrly et al. 1999)

Table S2 Study sites in the Indian Mill Creek (IMC) watershed, Michigan, USA, including their dominant land use and inventories. U/S: upstream of dam, WAD: Walker Avenue Ditch, BC: Brandywine Creek

Site	Land use	Location	Inventories
IMC1	Agriculture	Upper watershed	Habitat, macroinvertebrates
IMC2	Agriculture	Upper watershed	Habitat, macroinvertebrates
IMC3	Agriculture	Upper watershed	Habitat, macroinvertebrates
IMC4	Urban with forest buffer	Middle watershed	Habitat, fish, macroinvertebrates
3 Mile Road	Urban	Middle watershed	Fish
IMC5	Urban with forest buffer	Middle watershed	Habitat, fish, macroinvertebrates
IMC6	Urban with forest buffer	Middle watershed	Habitat, fish, macroinvertebrates
U/S Richmond Dam	Urban	Lower watershed	Fish
IMC7	Urban	Lower watershed	Habitat, fish, macroinvertebrates
Turner Avenue	Urban	Lower watershed	Fish
WAD	Urban	Tributary	Habitat, macroinvertebrates
BC	Urban	Tributary	Habitat, macroinvertebrates

Table S3 Environmental, macroinvertebrate, macroinvertebrate trait, and fish variables used in the study, along with their inventory name and source. P 51: Procedure 51, Scr.: Score, Deb.: Debris, SSC: Suspended Sediment Concentration, Temp.: Temperature, EPT: Ephemeroptera, Plecoptera, and Trichoptera macroinvertebrates, FBI: Family Biotic Index

Category	Variable Name	Inventory Name	Source
Environmental	Riffles (% area)	Basinwide Visual Estimation Technique	(Dolloff et al. 1993; Tip of the Mitt Watershed Council 2015)
Environmental	Pools (% area)	Basinwide Visual Estimation Technique	(Dolloff et al. 1993; Tip of the Mitt Watershed Council 2015)
Environmental	Riparian Scr. (P 51)	Procedure 51	(MDEGLE 2008)
Environmental	% Fine Substrate	Wolman Pebble Count	(Bevenger and King 1995)
Environmental	Wood Deb. (per 100 m)	Woody debris survey	(Cordova et al. 2007)
Environmental	Velocity (m s^{-1})	Marsh-McBirney Flow Mate 2000	Hach Company, Loveland, Colorado, USA
Environmental	SSC (ppm)	Grab sample	(Greensberg et al. 1992)
Environmental	Bedload (kg day^{-1})	Helley-Smith sampler	(Bunte et al. 2008)
Environmental	Avg. Temp. (C°)	Tidbit temperature data logger	(Wehrly et al. 1999)
Environmental	Temp. Fluct. (C°)	Tidbit temperature data logger	(Wehrly et al. 1999)
Environmental	Hours >19 C°	Tidbit temperature data logger	(Raleigh et al. 1984)
Environmental	Max. Temp. (C°)	Tidbit temperature data logger	Onset Computer Corp., Bourne, Massachusetts, USA
Environmental	Slope (m km^{-1})	Geographic Information System	(Gesch et al. 2002)
Macroinvertebrate	Mayfly Richness	Procedure 51	(MDEGLE 2008)
Macroinvertebrate	Caddisfly Richness	Procedure 51	(MDEGLE 2008)
Macroinvertebrate	EPT Richness	Procedure 51	(MDEGLE 2008)
Macroinvertebrate	% Mayfly	Procedure 51	(MDEGLE 2008)
Macroinvertebrate	% Caddisfly	Procedure 51	(MDEGLE 2008)
Macroinvertebrate	% EPT	Procedure 51	(MDEGLE 2008)
Macroinvertebrate	% Air Breathers	Procedure 51	(MDEGLE 2008)
Macroinvertebrate	% Diptera	Procedure 51	(MDEGLE 2008)
Macroinvertebrate	P 51 Score	Procedure 51	(MDEGLE 2008)
Macroinvertebrate	FBI	Family Biotic Index	(Hilsenhoff 1988)
Macroinvertebrate	Total Taxa Richness	Procedure 51	(MDEGLE 2008)

Category	Variable Name	Inventory Name	Source
Macroinvertebrate	Shannon Diversity	Macroinvertebrate inventory	(Qu et al. 2017)
Macroinvertebrate	Pielou's Evenness	Macroinvertebrate inventory	(Qu et al. 2017)
Macroinvertebrate trait	Shredders	Macroinvertebrate inventory	(Bouchard et al. 2004; Merritt et al. 2006, 2008)
Macroinvertebrate trait	Predators	Macroinvertebrate inventory	(Bouchard et al. 2004; Merritt et al. 2006, 2008)
Macroinvertebrate trait	Collector Gatherers	Macroinvertebrate inventory	(Bouchard et al. 2004; Merritt et al. 2006, 2008)
Macroinvertebrate trait	Collector Filterers	Macroinvertebrate inventory	(Bouchard et al. 2004; Merritt et al. 2006, 2008)
Macroinvertebrate trait	Scrapers	Macroinvertebrate inventory	(Bouchard et al. 2004; Merritt et al. 2006, 2008)
Macroinvertebrate trait	Herbivores	Macroinvertebrate inventory	(Bouchard et al. 2004; Merritt et al. 2006, 2008)
Macroinvertebrate trait	Swimmers	Macroinvertebrate inventory	(Bouchard et al. 2004; Merritt et al. 2006, 2008)
Macroinvertebrate trait	Burrowers	Macroinvertebrate inventory	(Bouchard et al. 2004; Merritt et al. 2006, 2008)
Macroinvertebrate trait	Clingers	Macroinvertebrate inventory	(Bouchard et al. 2004; Merritt et al. 2006, 2008)
Macroinvertebrate trait	Climbers	Macroinvertebrate inventory	(Bouchard et al. 2004; Merritt et al. 2006, 2008)
Macroinvertebrate trait	Skaters	Macroinvertebrate inventory	(Bouchard et al. 2004; Merritt et al. 2006, 2008)
Macroinvertebrate trait	Sprawlers	Macroinvertebrate inventory	(Bouchard et al. 2004; Merritt et al. 2006, 2008)
Fish	Total Individuals	Procedure 51	(MDEGLE 2008)
Fish	Taxa Richness	Procedure 51	(MDEGLE 2008)
Fish	Shannon Diversity	Procedure 51	(MDEGLE 2008)
Fish	Pielou’s Evenness	Procedure 51	(MDEGLE 2008)
Fish	% Salmonids	Procedure 51	(MDEGLE 2008)
Fish	P 51 Score	Procedure 51	(MDEGLE 2008)

Table S4 Length and area of macroinvertebrate surveys following Procedure 51 protocol at sites in the Indian Mill Creek (IMC) watershed, Michigan, USA. WAD: Walker Avenue Ditch, BC: Brandywine Creek

Site	Length Surveyed (m)	Area Surveyed (m^2)
IMC1	23	14
IMC2	38	70
IMC3	61	279
IMC4	61	242
IMC5	76	697
IMC6	61	465
IMC7	79	372
WAD	61	19
BC	122	260

Table S5 Macroinvertebrate traits data used for research in the Indian Mill Creek watershed, Michigan, USA. FFG: Functional Feeding Group

Scientific Name	# Collected	FFG	Trait	Source
Ephemeroptera				
Baetidae	62	Collector gatherers	Swimmers	Merritt et al. 2008
Heptageniidae	4	Scrapers	Clingers	Merritt et al. 2008
Trichoptera				
Hydropsychidae	129	Collector filterers	Clingers	Merritt et al. 2008
Limnephilidae	1	Shredders	Sprawlers	Merritt et al. 2008
Phryganeidae	1	Shredders	Climbers	Merritt et al. 2008
Odonata				
Aeshnidae	32	Predators	Climbers	Merritt et al. 2008
Calopterygidae	26	Predators	Climbers	Merritt et al. 2008
Coenagrionidae	44	Predators	Climbers	Merritt et al. 2008
Hemiptera				
Corixidae	4	Herbivores	Swimmers	Merritt et al. 2008
Gerridae	87	Predators	Skaters	Merritt et al. 2008
Notonectidae	6	Predators	Swimmers	Merritt et al. 2008
Pleidae	4	Predators	Swimmers	Merritt et al. 2008
Veliidae	338	Predators	Skaters	Merritt et al. 2008
Coleoptera				
Dytiscidae	36	Predators	Swimmers	Merritt et al. 2008
Haliplidae	3	Shredders	Swimmers	Merritt et al. 2008
Hydrophilidae	29	Collector gatherers	Swimmers	Merritt et al. 2008
Dryopidae	2	Scrapers	Clingers	Merritt et al. 2008
Elmidae	48	Collector gatherers	Clingers	Merritt et al. 2008
Diptera				
Athericidae	3	Predators	Sprawlers	Merritt et al. 2008
Ceratopogonidae	3	Predators	Sprawlers	Merritt et al. 2008
Chironomidae	139	Collector-gatherers	Burrowers	Merritt et al. 2008
Culicidae	159	Collector gatherers	Swimmers	Merritt et al. 2008
Dixidae	1	Collector gatherers	Swimmers	Merritt et al. 2008
Sciomyzidae	2	Predators	Burrowers	Merritt et al. 2008
Simuliidae	53	Collector filterers	Clingers	Merritt et al. 2008
Tipulidae	7	Shredders	Burrowers	Merritt et al. 2008
Platyhelminthes, Nematoda, & Annelida				
Turbellaria	367	Collector gatherer	Clingers	Bouchard et al. 2004
Nematomorpha	11	Predator	Swimmers	Bouchard et al. 2004
Hirudinea	19	Predator	Clingers	Bouchard et al. 2004
Oligochaeta	1	Collector gatherer	Burrowers	Bouchard et al. 2004
Crustacea				
Amphipoda (Gammar.)	85	Shredders	Swimmers	Merritt et al. 2006; Bouchard et al. 2004
Decapoda	32	Shredders	Sprawlers	Merritt and Cummins 2006; Bouchard et al. 2004

Isopoda	845	Shredders	Sprawlers	Merritt and Cummins 2006; Bouchard et al. 2004
Arachnoidea				
Hydracarina	41	Predator	Sprawlers	Bouchard et al. 2004
Mollusca				
Lymnaeidae	7	Scraper	Clingers	Bouchard et al. 2004
Physidae	170	Scraper	Clingers	Bouchard et al. 2004
Planorbidae	1	Scraper	Clingers	Bouchard et al. 2004
Sphaeriidae	4	Collector filterer	Burrowers	Bouchard et al. 2004

Table S6 Macroinvertebrate count data from Procedure 51 surveys in the Indian Mill Creek (IMC) watershed, Michigan, USA

	Macroinvertebrates Collected at Each Site								
Macroinvertebrate Taxa	**IMC7**	**BC**	**IMC6**	**IMC5**	**WD**	**IMC4**	**IMC3**	**IMC2**	**IMC1**
PLATYHELMINTHES (flatworms)									
Turbellaria	22		167	40	2	86	50		
NEMATOMORPHA (roundworms)			1			1	9		
ANNELIDA (segmented worms)									
Hirudinea (leeches)		2			17				
Oligochaeta (worms)									1
ARTHROPODA									
Crustacea									
Amphipoda (scuds)	7	9	14	42			3	10	
Decapoda (crayfish)		2	9	6		4	6	2	3
Isopoda (sowbugs)	141		106	105		186	140	2	165
Arachnoidea									
Hydracarina					3	11	1	1	25
Insecta									
Ephemeroptera (mayflies)									
Baetidae	30	12	2	1	3	10	4		
Heptageniidae				1		3			
Odonata									
Anisoptera (dragonflies)									
Aeshnidae		2	5	15	1	5	4		
Zygoptera (damselflies)									
Calopterygidae	1	2	3	6		9		5	
Coenagrionidae		1	1		38	4			
Hemiptera (true bugs)									
Corixidae							1	3	
Gerridae	1	32	1	9		1	1	40	2
Notonectidae			1		4		1		
Pleidae							4		
Veliidae	1	206	7	1	1	6	9	98	9
Trichoptera (caddisflies)									
Hydropsychidae	61	1	8	28		7	18		6
Limnephilidae				1					
Phryganeidae									1
Coleoptera (beetles)									
Dytiscidae (total)		2			30				4
Haliplidae (adults)					2		1		

Hydrophilidae (total)	1	1		1	17		4	1	4
Dryopidae				2					
Elmidae	1		14	14		19			
Diptera (flies)									
Athericidae			2	1					
Ceratopogonidae					2		1		
Chironomidae	15	25	7	8	9	14	19	15	27
Culicidae					158		1		
Dixidae				1					
Sciomyzidae					2				
Simuliidae	24	4	1	2	1	3	7		11
Tipulidae	4	1			1				1
MOLLUSCA									
Gastropoda (snails)									
Lymnaeidae					2			3	2
Physidae	1	5			21	1	4	135	3
Planorbidae						1			
Pelecypoda (bivalves)									
Sphaeriidae (clams)		1				3			

Table S7 Fish count data for seven sites in the Indian Mill Creek (IMC) watershed, Michigan, USA.

Fish Species	Turner	IMC 7	Upstream of Dam	IMC 6	IMC 5	3 Mile	IMC 4
Brown trout (*Salmo trutta*)	2	9	3	1	3	7	2
Rainbow trout (*Oncorhynchus mykiss*)	2	9	2	14	3	4	0
Smallmouth bass (*Micropterus dolomieu*)	1	0	0	0	0	0	0
White sucker (*Catostomus commersonii*)	8	0	16	0	3	12	12
Green sunfish (*Lepomis cyanellus*)	7	2	0	3	1	2	3
Round goby (*Neogobius melanostomus*)	3	0	0	0	0	0	0
Silver lamprey (*Ichthyomyzon unicuspis*)	1	0	0	0	0	0	0
Bluegill (*Lepomis macrochirus*)	1	6	0	7	2	0	0
Chestnut lamprey (*Ichthyomyzon castaneus*)	1	0	0	0	0	0	0
Brook stickleback (*Culaea inconstans*)	0	0	1	0	0	0	0
Johnny darter (*Etheostoma nigrum*)	0	0	2	5	1	7	20
Creek chub (*Semotilus atromaculatus*)	0	0	1	4	15	9	41
Pumpkinseed (*Lepomis gibbosus*)	0	0	0	2	3	0	0
Blacknose dace (*Rhinichthys atratulus*)	0	0	0	1	7	23	17
Central mudminnow (*Umbra limi*)	0	0	0	0	1	0	0
Lake chubsucker (*Erimyzon sucetta*)	0	0	0	0	0	1	0
Central stoneroller (*Campostoma anomalum*)	0	0	0	0	0	1	0

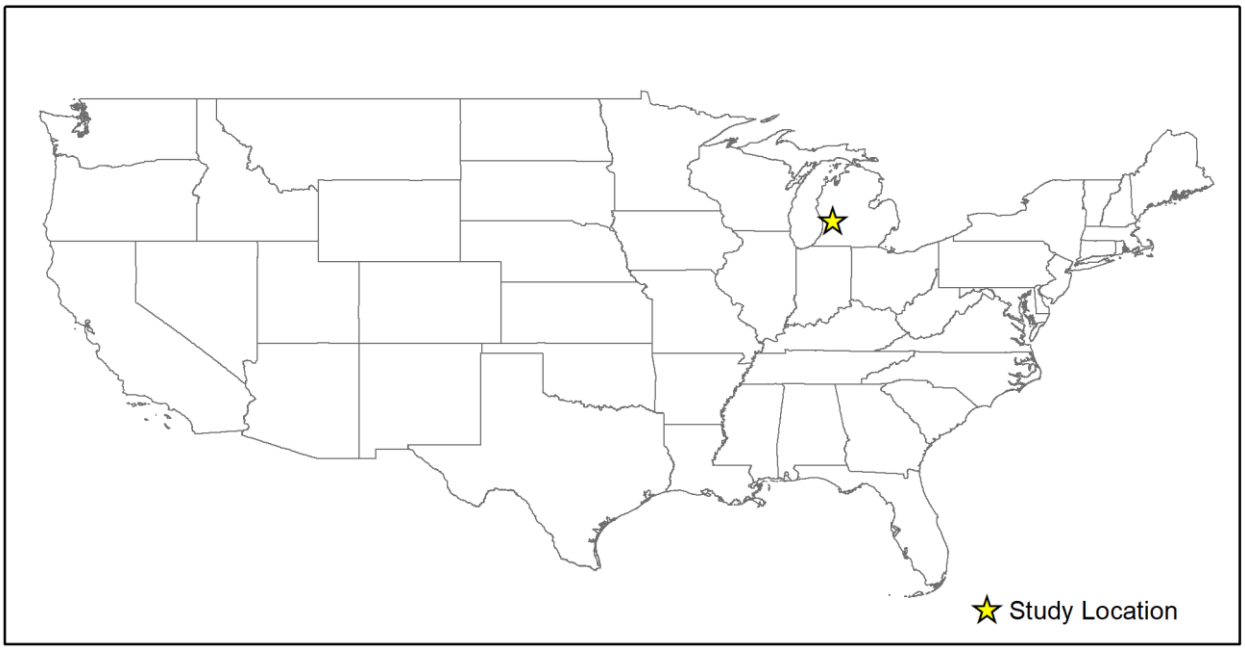

Fig. S1 Location of the Indian Mill Creek watershed, Michigan, USA study site on a United States map

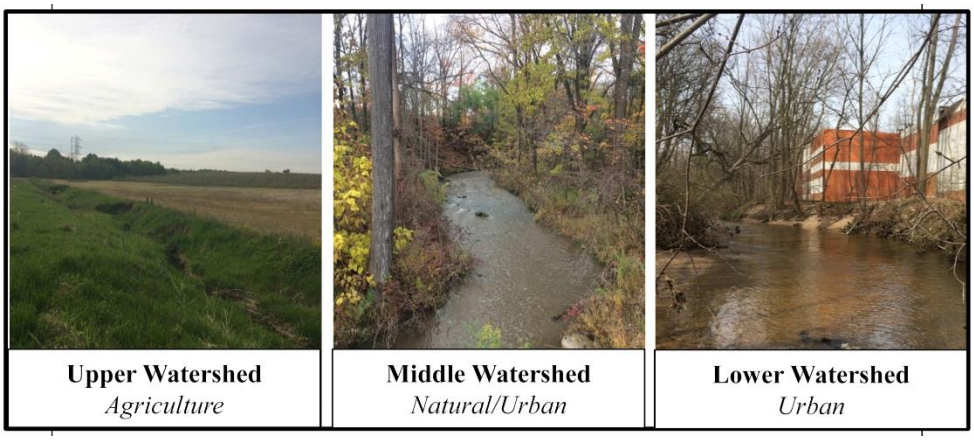

Fig. S2 Photographs of the watershed's agricultural to urban land cover gradient in the Indian Mill Creek watershed, Michigan, USA (2017)

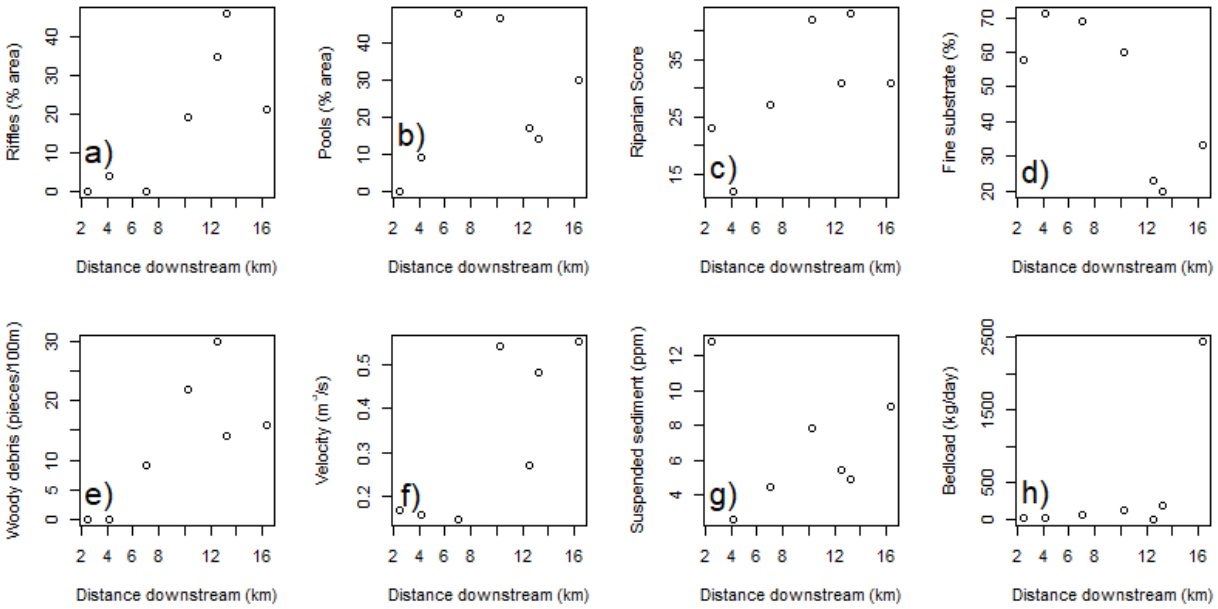

Fig. S3 Relationships between longitudinal position (distance downstream) and environmental variables in the Indian Mill Creek watershed, Michigan, USA. a) riffles, b) pools, c) Procedure 51 riparian score, d) fine substrate, e) large woody debris prevalence, f) velocity, g) suspended sediment, and h) bedload sediment

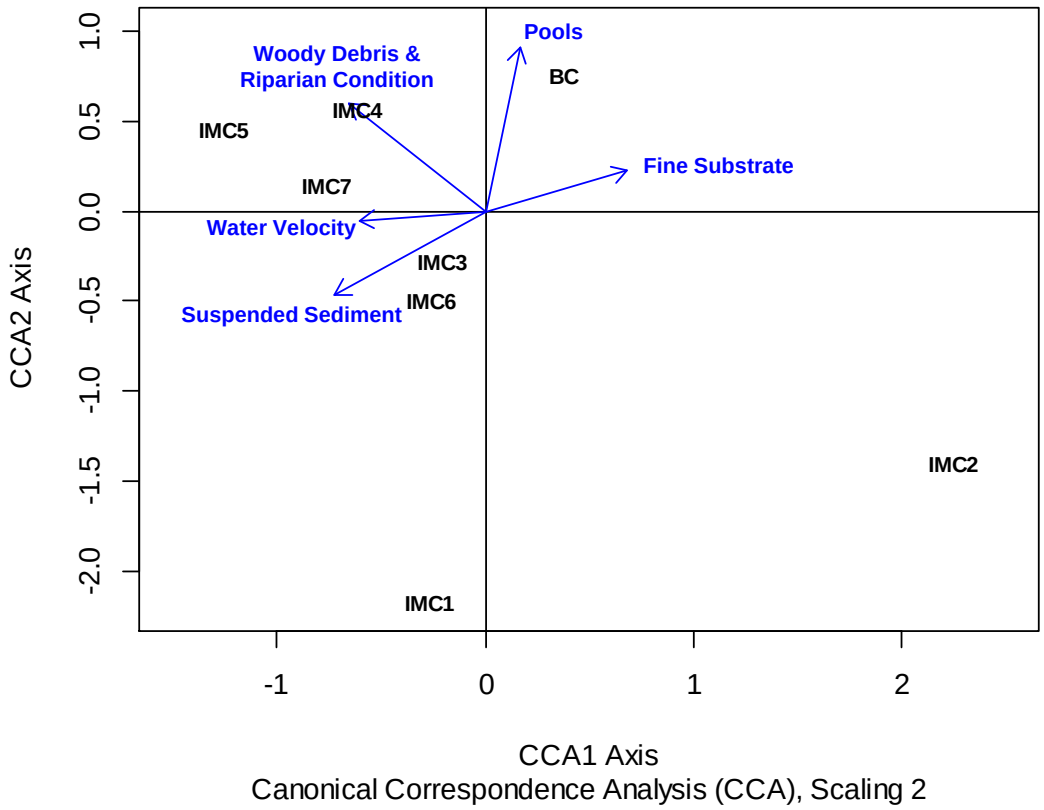

Fig. S4 Canonical Correspondence Analysis (CCA) ordination describing the relationships between environmental stressors and macroinvertebrate metric study sites in the Indian Mill Creek (IMC) watershed, Michigan, USA (2017). BC: Brandywine Creek, WAD: Walker Avenue Ditch

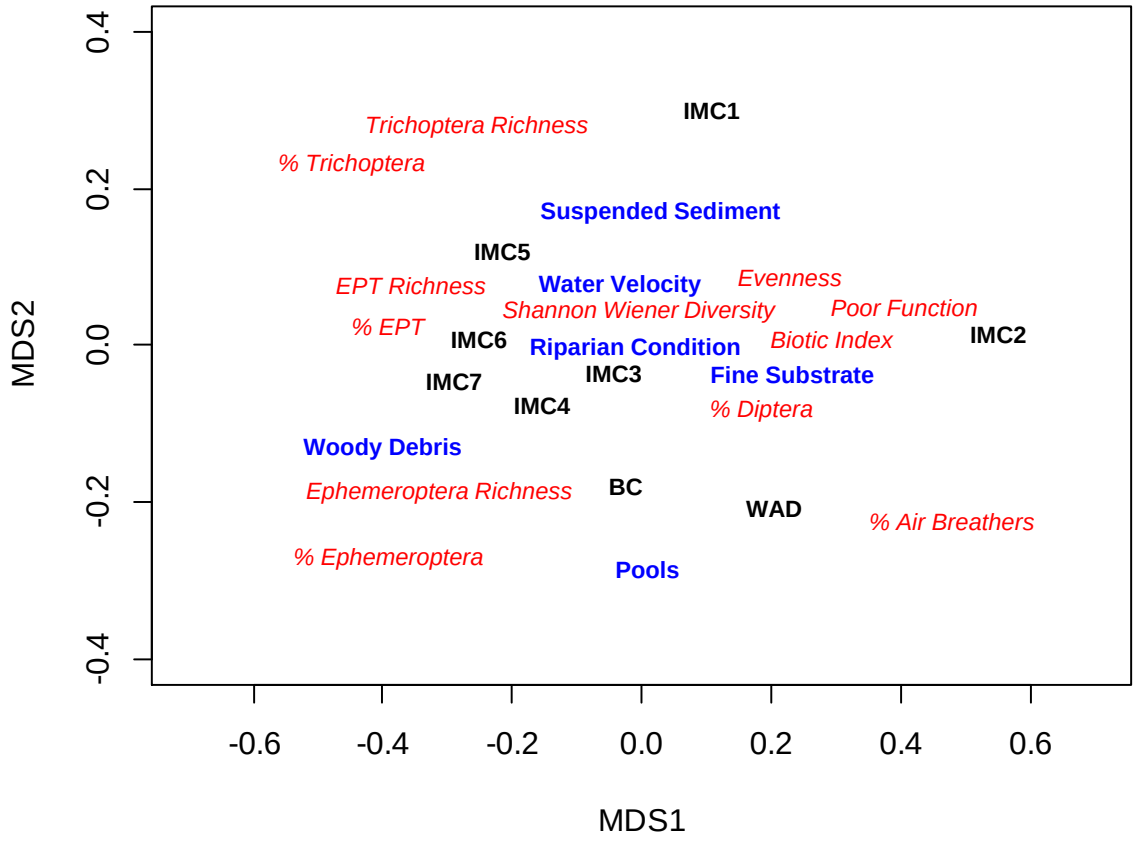

Fig. S5 Nonmetric Multidimensional Scaling (NMDS) ordination showing the relationships between environmental stressors and macroinvertebrate metrics in the Indian Mill Creek (IMC) watershed, Michigan, USA (2017). EPT: Ephemeroptera, Plecoptera, Trichoptera; BC: Brandywine Creek; WAD: Walker Avenue Ditch

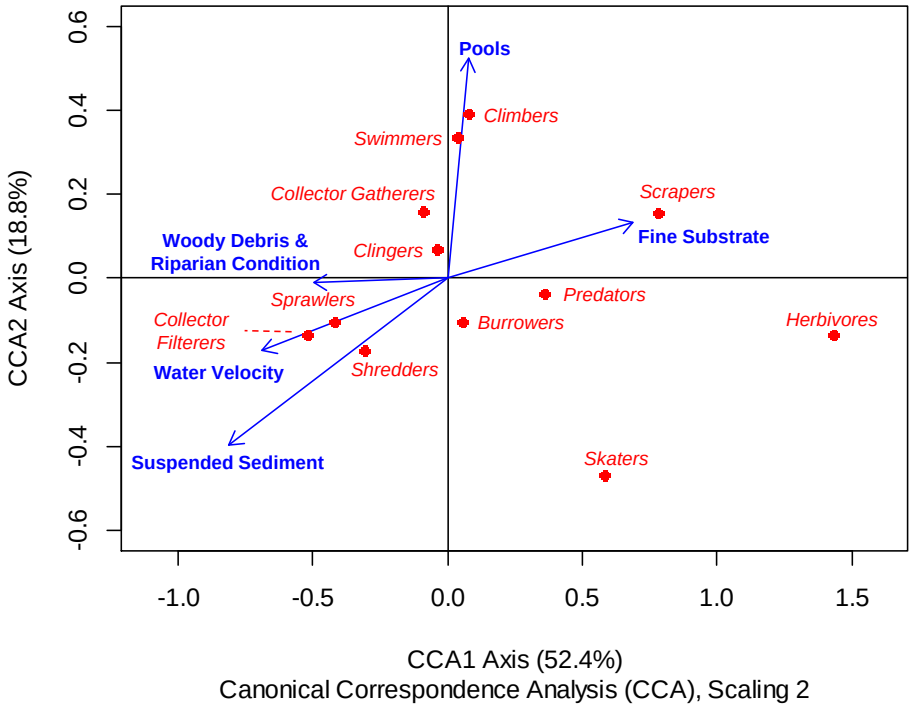

Fig. S6 Canonical Correspondence Analysis (CCA) ordination describing the relationships between environmental stressors and macroinvertebrate traits in the Indian Mill Creek watershed, Michigan, USA (2017)

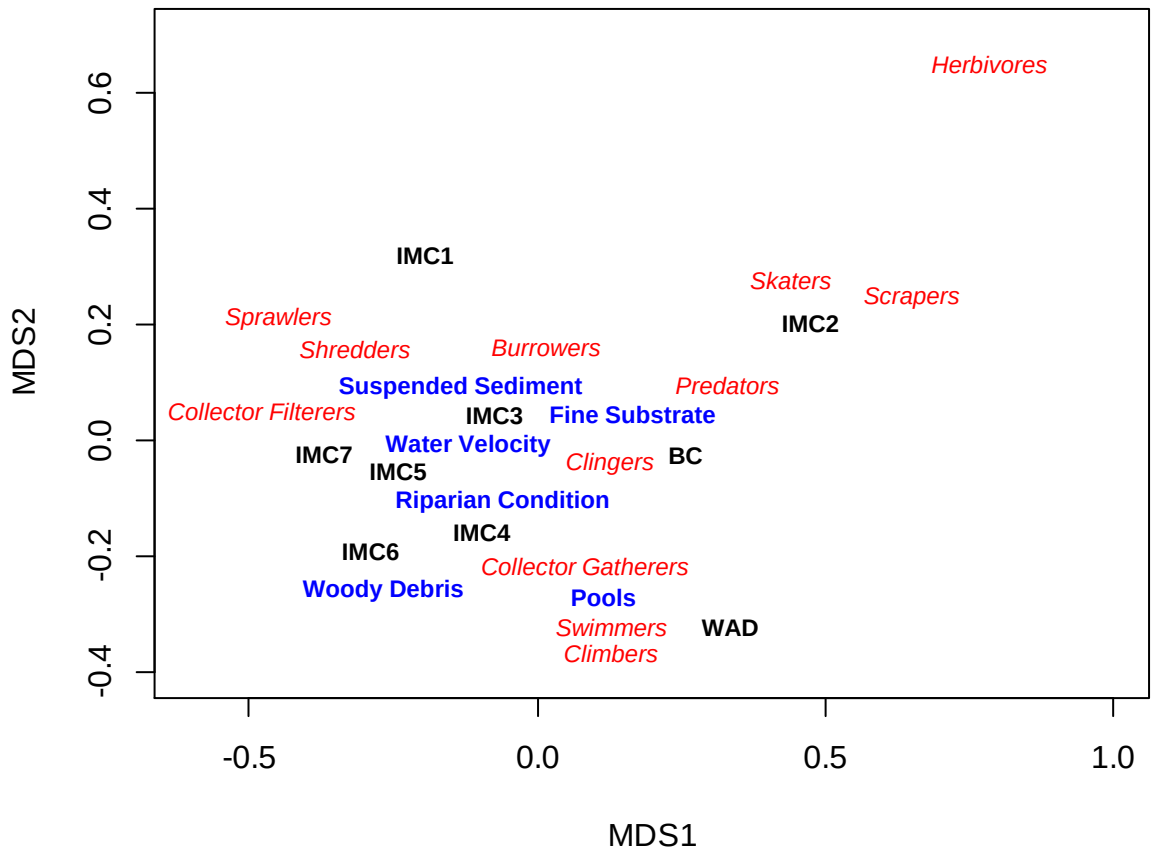

Fig. S7 Nonmetric Multidimensional Scaling (NMDS) ordination showing the relationships between environmental stressors and macroinvertebrate traits in the Indian Mill Creek (IMC) watershed, Michigan, USA (2017). BC: Brandywine Creek; WAD: Walker Avenue Ditch

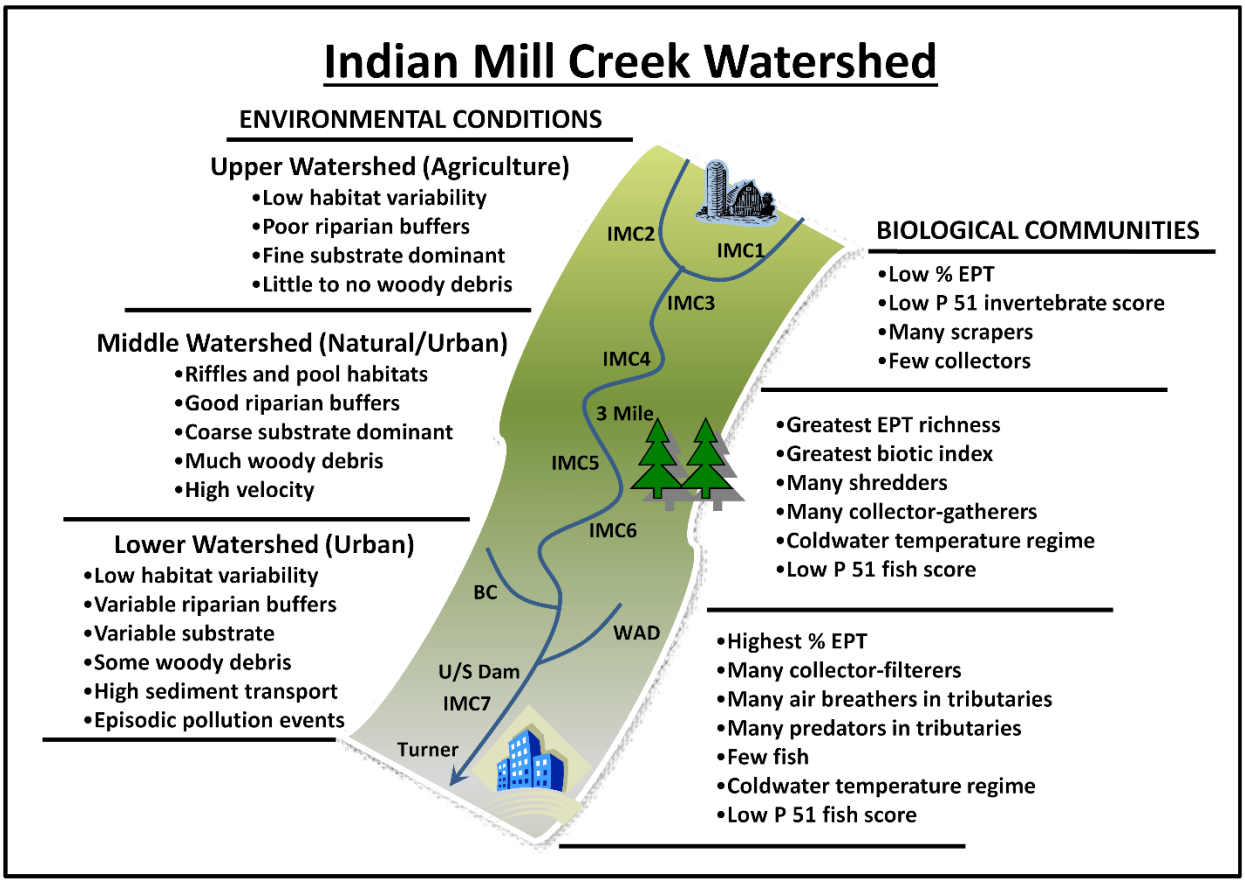

Fig. S8 Conceptual model of biological communities and their interactions with environmental conditions along a gradient of agricultural to urban land cover in the Indian Mill Creek watershed, Michigan, USA. EPT: Ephemeroptera, Plecoptera, Trichoptera macroinvertebrates; P 51: Procedure 51 bioassessment survey

R script for macroinvertebrate metrics and traits Canonical Correspondence Analysis tests

Myers et al. environmental variables.csv

Site,Riffles,Pools,Fine Substrate,Woody Debris,Suspended Sediment,Water Velocity,Slope
IMC7,0.21,0.3,0.33,251,10.3,0.57,4.26
BC,0.21,0.5,0.86,472,3.4,0.13,3.36
IMC6,0.46,0.14,0.2,229,5.6,0.5,5.02
IMC5,0.35,0.17,0.23,485,6.1,0.28,4.91
WAD,0,0.65,0.9,9,2.9,0.06,9.22
IMC4,0.19,0.47,0.6,349,8.9,0.56,4.26
IMC3,0,0.48,0.69,150,4.9,0.17,2.23
IMC2,0.04,0.09,0.71,0,2.8,0.17,3.54
IMC1,0,0,0.58,0,13.4,0.18,5.78

Myers et al. macroinvertebrate metrics.csv

Site,Mayfly Taxa Richness,Caddisfly Taxa Richness,Percent Mayfly,Percent Caddisfly,Air Breathers,Poor P51 Score,EPT Richness,Percent EPT,Shannon Wiener Diversity,Evenness,Percent Diptera,Fam. Biotic Index
IMC7,1,1,0.1,0.2,0.01,4,2,0.3,1.69,0.64,0.14,6.14
BC,1,1,0.04,0,0.78,3,2,0.04,1.32,0.47,0.1,5.81
IMC6,1,1,0.01,0.02,0.03,6,2,0.03,1.56,0.55,0.03,6.13
IMC5,2,2,0.01,0.1,0.04,2,4,0.11,2.04,0.69,0.04,5.19
WAD,1,0,0.01,0,0.68,5,1,0.01,1.8,0.61,0.55,7.61
IMC4,2,1,0.03,0.02,0.02,4,3,0.05,1.72,0.59,0.05,7.65
IMC3,1,1,0.01,0.06,0.08,6,2,0.07,1.88,0.62,0.1,6.16
IMC2,0,0,0,0,0.45,8,0,0,1.5,0.6,0.05,6.41
IMC1,0,2,0,0.03,0.07,4,2,0.03,1.45,0.54,0.15,6.04

Myers et al. macroinvertebrate traits.csv

Site,Shredders,Predators,Collector gatherers,Collector filterers,Scrapers,Herbivores,Swimmers,Burrowers,Clingers,Climbers,Sprawlers,Skaters
IMC7,49.032,0.968,22.258,27.419,0.323,0,12.258,6.129,35.161,0.323,45.484,0.645
BC,3.896,80.195,12.338,1.948,1.623,0,7.792,8.766,3.896,1.623,0.649,77.273
IMC6,36.963,6.017,54.441,2.579,0,0,5.158,2.006,54.441,2.579,33.524,2.292
IMC5,54.225,11.268,22.887,10.563,1.056,0,15.845,2.817,30.634,7.394,39.789,3.521
WAD,0.955,31.21,60.191,0.318,7.325,0,68.153,3.822,13.694,12.42,1.592,0.318
IMC4,50.802,9.893,34.492,3.476,1.337,0,2.941,4.545,32.086,4.813,53.743,1.872
IMC3,52.083,10.417,27.083,8.681,1.389,0.347,9.722,6.597,27.431,1.389,51.389,3.472
IMC2,4.444,45.714,5.079,0,43.81,0.952,4.444,4.762,43.81,1.587,1.587,43.81
IMC1,64.394,15.152,12.121,6.439,1.894,0,3.03,10.985,8.333,0.379,73.106,4.167

R script for macroinvertebrate metrics CCA

```
# Load packages
library(vegan)
library(MASS)

# Read environmental variables
ind1<-read.csv("Myers et al. environmental variables.csv")
ind1

# Read macroinvertebrate metrics
dep1<-read.csv("Myers et al. macroinvertebrate metrics.csv")
dep1

# Log + 1 transform data and remove site names
dep1_log = log(dep1[-1]+1)
ind1_log = log(ind1[-1]+1)

# Perform CCA
cca1 = cca(dep1_log ~ (Pools + Fine.Substrate + Wood.deb.and.rip.cond. + Suspended.Sediment
+ Water.Velocity), data = ind1_log)

# Plot results
plot(cca1, scaling=2, main = "Environmental Variables and Macroinvertebrates", sub =
"Canonical Correspondence Analysis (CCA), Scaling 2", xlab = "CCA1 Axis (52.9%)", ylab =
"CCA2 Axis (15.0%)", display=c("sp","cn"))
#add "wa" display parameter to see sites

# Examine summaries
summary(cca1)
cca1

# Perform PERMANOVA
perm1 = adonis2(dep1_log ~ (Pools + Fine.Substrate + Wood.deb.and.rip.cond. +
Suspended.Sediment + Water.Velocity), data = ind1_log, permutations = 100000)
perm1
```

R script for macroinvertebrate traits CCA

```
# Load packages
library(vegan)
library(MASS)

# Read environmental variables
ind2<-read.csv("Myers et al. environmental variables.csv")
ind2

# Read macroinvertebrate trait variables
dep2<-read.csv("Myers et al. macroinvertebrate traits.csv")
dep2

# Log + 1 transform data and remove site names
dep2_log = log(dep2[-1]+1)
ind2_log = log(ind2[-1]+1)

# Perform CCA
cca2 = cca(dep2_log ~ (Pools + Fine.Substrate + Wood.deb.and.rip.cond. + Suspended.Sediment
+ Water.Velocity), data = ind2_log)

# Plot CCA
plot(cca2, scaling=2, main = "Environmental Variables and Macroinvertebrate Traits", sub =
"Canonical Correspondence Analysis (CCA), Scaling 2", xlab = "First CCA Axis (52.4%)", ylab
= "Second CCA Axis (18.8%)", display=c("sp","cn"))
#add "wa" display parameter to see sites

# Examine summaries
summary(cca2)
cca2

# Perform PERMANOVA
perm2 = adonis2(dep2_log ~ (Pools + Fine.Substrate + Wood.deb.and.rip.cond. +
Suspended.Sediment + Water.Velocity), data = ind2_log, permutations = 100000)
perm2
```

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