Ecography

E6518
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Supplementary material

Table S1. Environmental variables used in calculation of environmental distance matrix used in partial Mantel tests. Stream variables came from the Maryland Biological Stream Survey (MBSS) and watershed variables were calculated in ArcGIS using publicly available geospatial data sets.

Scale	Variable	Range			Mean (SE)		
		Patuxent	Piedmont	Plains	Patuxent	Piedmont	Plains
Watershed	Drainage area (km^2)	0.5–383.8	0.5–290.2	0.5–383.8	30.4 (5.8)	35.7 (7.9)	24.3 (8.5)
	Average watershed slope (%)	1.2–6.4	1.5–6.4	1.2–5.5	3.6 (0.1)	4 (0.1)	3 (0.1)
	Average watershed elevation (m)	19.2–232.7	119.7–232.7	19.2–120.5	116.6 (5.6)	170 (3.3)	55.1 (3.1)
	Average annual precipitation (cm)	110.4–115.8	112.8–115.8	110.4–114.3	113.4 (0.1)	114.6 (0.1)	112 (0.1)
	Row crop cover (%)	0–54.2	0–54.2	0.3–39.3	10.9 (0.8)	12.1 (1.2)	9.5 (1.1)
	Developed cover (%)	0.2–76.5	0.5–76.5	0.2–57.3	23.9 (1.5)	19.7 (2)	28.8 (2.3)
	Forest cover (%)	5.5–81.1	5.5–49.8	15.5–81.1	35.8 (1.1)	30.9 (1.1)	41.4 (1.8)
	Pasture cover (%)	0.3–59.7	0.3–59.7	0.5–41.3	21.8 (1.3)	29.6 (1.5)	12.8 (1.3)
	Wetland cover (%)	0–8.1	0–1.4	0–8.1	0.7 (0.1)	0.4 (0)	1 (0.2)
	Sand content of soils (%)	26.1–64.2	26.1–32.8	28.1–64.2	34.5 (0.7)	28.2 (0.2)	41.8 (0.9)
Stream	Stream water pH	5.5–8.5	6.5–7.9	5.5–8.5	7.10 (0.04)	7.18 (0.04)	7.00 (0.07)
	Stream water conductivity (μmhos cm^{-1})	0–552	0–458	0–552	117.9 (13.1)	80.5 (13)	160.9 (22.7)
	Stream water DOC (mg L^{-1})	0.8–10.4	0.8–4.9	1.1–10.4	2.9 (0.2)	2.1 (0.1)	3.8 (0.3)
	Stream water NO_3 (mg L^{-1})	0–7.6	0.9–7.6	0–2.7	1.8 (0.1)	2.6 (0.1)	0.9 (0.1)
	Stream water SO_4 (mg L^{-1})	1.7–327	1.7–20.4	8.4–327	17.5 (2.6)	7.5 (0.4)	28.9 (5.1)
	Pieces wood debris (#)	0–120	0–14	0–120	5.6 (1)	4 (0.4)	7.5 (2.1)
	Rootwads (#)	0–18	0–7	0–18	2.4 (0.2)	2 (0.2)	2.8 (0.4)
	Stream gradient (%)	0–1.9	0–1.9	0–1.3	0.5 (0)	0.6 (0.1)	0.4 (0.1)
	Average channel width (m)	0.58–23.6	0.7–16.45	0.58–23.6	4.8 (0.4)	5.5 (0.5)	3.9 (0.5)
	Average stream depth (cm)	4–98.5	5–98.5	4–91	31.2 (1.8)	33.6 (2.5)	28.4 (2.6)
	Average flow velocity (m s^{-1})	0–0.44	0.02–0.4	0–0.44	0.13 (0.01)	0.12 (0.01)	0.13(0.01)
	Average stream discharge (cfs)	0–64.9	0.1–26.4	0–64.9	3.4 (0.8)	3.5 (0.7)	3.3 (1.5)

Table S2. List of benthic macroinvertebrates identified in data set. NP = Northern Piedmont, SEP = Southeastern Plains; "X" = taxa collected.

Phylum	Class	Order	Family	SubFamily/ Tribe	Genus	Number collected	NP	SEP
Arthropoda	Insecta	Coleoptera	Dryopidae		*Helichus*	4	X	
					Hydroporus	7	X	X
			Elmidae		*Ancyronyx*	20	X	X
					Dubiraphia	15	X	X
					Macronychus	12	X	X
					Optioservus	76	X	X
					Oulimnius	75	X	X
					Stenelmis	74	X	X
			Gyrinidae		*Dineutus*	9	X	X
					Gyrinus	1	X	
			Haliplidae		*Peltodytes*	1		X
			Psephenidae		*Psephenus*	5	X	
			Ptilodactylidae		*Anchytarsus*	41	X	
			Scirtidae		*Cyphon*	2		X
		Collembola	Isotomidae		*Isotomurus*	2		X
		Diptera	Ceratopogonidae		*Bezzia*	7	X	X
					Ceratopogon	5	X	X
					Culicoides	1		X
					Probezzia	7	X	X
					Stilobezzia	4	X	
			Chaoboridae		*Chaoborus*	1		X
			Chironomidae	Chironomini	*Chironomus*	2	X	X
					Cryptochironomus	14	X	X
					Dicrotendipes	5	X	
					Endochironomus	10	X	X
					Glyptotendipes	8	X	
					Kiefferulus	1		X
					Microtendipes	69	X	X
					Paracladopelma	1		X
					Paralauterborniella	2	X	
					Paratendipes	17	X	X
					Phaenopsectra	4	X	X
					Polypedilum	330	X	X
					Saetheria	28	X	X
					Stenochironomus	11	X	X
					Stictochironomus	22	X	X
					Tribelos	31	X	X
				Diamesinae	*Diamesa*	116	X	X
					Pagastia	1	X	
					Potthastia	7	X	X
					Sympotthastia	91	X	X
				Orthocladiinae	*Brillia*	38	X	X
					Chaetocladius	11	X	X
					Corynoneura	36	X	X
					Cricotopus	265	X	X
					Cricotopus/ Orthocladius	1750	X	X

		Diplocladius	54	X	X
		Eukiefferiella	287	X	X
		Heleniella	1	X	
		Heterotrissocladius	7	X	X
		Hydrobaenus	128	X	X
		Limnophyes	1	X	
		Nanocladius	34	X	X
		Orthocladiinae A	875	X	X
		Orthocladius	202	X	X
		Parachaetocladius	1	X	
		Parakiefferiella	6	X	
		Parametriocnemus	631	X	X
		Paraphaenocladius	5		X
		Pseudorthocladius	8	X	X
		Rheocricotopus	178	X	X
		Rheosmittia	2		X
		Stilocladius	4	X	X
		Symposiocladius	34	X	X
		Synorthocladius	2	X	
		Thienemanniella	112	X	X
		Tvetenia	75	X	X
		Xylotopus	4	X	X
	Prodiamesinae	*Prodiamesa*	1		X
	Tanypodinae	*Ablabesmyia*	37	X	X
		Conchapelopia	230	X	X
		Labrundinia	5	X	
		Larsia	12		X
		Meropelopia	32	X	X
		Natarsia	7	X	X
		Procladius	2	X	X
		Thienemannimyia	50	X	X
		Trissopelopia	35	X	X
		Zavrelimyia	24	X	X
	Tanytarsini	*Cladotanytarsus*	2	X	
		Micropsectra	147	X	X
		Paratanytarsus	47	X	X
		Rheotanytarsus	200	X	X
		Stempellinella	10	X	X
		Sublettea	17	X	X
		Tanytarsus	133	X	X
Dixidae		*Dixa*	1	X	
		Dixella	2	X	
Empididae		*Chelifera*	34	X	X
		Clinocera	196	X	X
		Hemerodromia	102	X	X
Psychodidae		*Pericoma*	1		X
Ptychopteridae		*Bittacomorpha*	6		X
Simuliidae		*Prosimulium*	562	X	X
		Simulium	192	X	X
		Stegopterna	219	X	X

	Tabanidae	*Chrysops*	7	X	X
	Tipulidae	*Antocha*	77	X	X
		Dicranota	21	X	X
		Erioptera	4	X	
		Hexatoma	23	X	X
		Limnophila	1		X
		Ormosia	1		X
		Pseudolimnophila	9	X	X
		Rhabdomastix	1		X
		Tipula	77	X	X
Ephemeroptera	Ameletidae	*Ameletus*	71	X	X
	Baetidae	*Acentrella*	3	X	
		Acerpenna	105	X	X
		Baetis	11	X	
		Centroptilum	8	X	X
		Diphetor	17	X	
		Procloeon	2	X	
	Caenidae	*Caenis*	2	X	X
	Ephemerellidae	*Drunella*	11	X	
		Ephemerella	1155	X	X
		Eurylophella	59	X	X
		Serratella	39	X	
	Heptageniidae	*Epeorus*	17	X	
		Leucrocuta	1	X	
		Stenacron	4	X	
		Stenonema	241	X	X
	Isonychiidae	*Isonychia*	28	X	X
	Leptophlebiidae	*Leptophlebia*	15	X	X
		Paraleptophlebia	30	X	X
Hemiptera	Gerridae	*Gerris*	1	X	
	Gerridae	*Limnoporus*	1	X	
	Notonectidae	*Notonecta*	1		X
	Veliidae	*Microvelia*	1	X	
Lepidoptera	Pyralidae	*Crambus*	1		X
Megaloptera	Corydalidae	*Corydalus*	1	X	
	Corydalidae	*Nigronia*	25	X	X
	Sialidae	*Sialis*	7	X	X
Odonata	Aeshnidae	*Boyeria*	12	X	X
	Calopterygidae	*Calopteryx*	31	X	X
	Coenagrionidae	*Argia*	21	X	X
	Cordulegasteridae	*Cordulegaster*	4	X	X
	Corduliidae	*Macromia*	2	X	X
	Gomphidae	*Gomphus*	2	X	X
	Gomphidae	*Stylogomphus*	4	X	
Plecoptera	Capniidae	*Allocapnia*	10	X	X
		Paracapnia	13	X	X
	Chloroperlidae	*Sweltsa*	1		X
	Leuctridae	*Leuctra*	20	X	X
	Nemouridae	*Amphinemura*	372	X	X
		Ostrocerca	1		X

				Prostoia	108	X	X
			Perlidae	*Acroneuria*	6	X	
				Eccoptura	9	X	X
			Perlodidae	*Clioperla*	8	X	X
				Cultus	1	X	
				Diploperla	3	X	
				Isoperla	58	X	X
			Taeniopterygidae	*Oemopteryx*	2	X	X
				Strophopteryx	18	X	X
				Taeniopteryx	4	X	X
		Trichoptera	Brachycentridae	*Micrasema*	2	X	
			Glossosomatidae	*Agapetus*	4	X	
				Glossosoma	18	X	
			Hydropsychidae	*Cheumatopsyche*	409	X	X
				Diplectrona	72	X	X
				Hydropsyche	276	X	X
			Hydroptilidae	*Hydroptila*	1	X	
			Leptoceridae	*Triaenodes*	1		X
			Limnephilidae	*Ironoquia*	22	X	X
				Pycnopsyche	16	X	X
			Odontoceridae	*Psilotreta*	3	X	
			Philopotamidae	*Chimarra*	39	X	X
				Dolophilodes	5	X	
				Wormaldia	1		X
			Phryganeidae	*Ptilostomis*	5	X	X
			Polycentropodidae	*Polycentropus*	14	X	X
			Psychomyiidae	*Lype*	21	X	X
				Psychomyia	1	X	
			Rhyacophilidae	*Rhyacophila*	18	X	X
			Uenoidae	*Neophylax*	165	X	X
	Malacostraca	Amphipoda	Asellidae	*Caecidotea*	46		X
			Crangonyctidae	*Crangonyx*	104	X	X
				Synurella	40		X
			Gammaridae	*Gammarus*	257		X
				Stygonectes	14	X	X
			Hyalellidae	*Hyalella*	13	X	X
Mollusca	Bivalvia	Veneroida	Corbiculidae	*Corbicula*	15	X	X
			Pisidiidae	*Musculium*	1	X	
				Pisidium	37	X	X
			Sphaeriidae	*Sphaerium*	29	X	X
	Gastropoda	Architaenioglossa	Viviparidae	*Viviparus*	1		X
	Gastropoda	Basommatophora	Ancylidae	*Ferrissia*	2	X	
			Lymnaeidae	*Pseudosuccinea*	7	X	X
				Stagnicola	2		X
			Physidae	*Physella*	13	X	X
			Planorbidae	*Gyraulus*	21	X	X
Nemertea	Enopla	Hoplonemertea	Tetrastemmatidae	*Prostoma*	41	X	X
Platyhelminthes	Turbellaria	Tricladida	Dugesiidae	*Cura*	2		X
			Planariidae	*Dugesia*	5	X	X

Table S3. List of fishes identified in data set. NP = Northern Piedmont, SEP = Southeastern Plains; "X" = taxa collected.

Family	Species	Common name	Number collected	NP	SEP
Anguillidae	*Anguilla rostrata* (Lesueur, 1817)	American eel	646	X	X
Aphredoderidae	*Aphredoderus sayanus* (Gilliams, 1824)	Pirate perch	66		X
Catostomidae	*Catostomus commersonii* (Lacepède, 1803)	White sucker	4172	X	X
	Erimyzon oblongus (Mitchill, 1814)	Creek chubsucker	296		X
	Hypentelium nigricans (Lesueur, 1817)	Northern hog sucker	217	X	X
	Moxostoma macrolepidotum (Lesueur, 1817)	Shorthead redhorse	4	X	
Centrarchidae	*Ambloplites rupestris* (Rafinesque, 1817)	Rock bass	33	X	
	Lepomis auritus (Linnaeus, 1758)	Redbreast sunfish	498	X	X
	Lepomis cyanellus Rafinesque, 1819	Green sunfish	467	X	X
	Lepomis gibbosus (Linnaeus, 1758)	Pumpkinseed	453	X	X
	Lepomis macrochirus Rafinesque, 1819	Bluegill	1403	X	X
	Micropterus dolomieu Lacepède, 1802	Smallmouth bass	177	X	X
	Micropterus salmoides (Lacepède, 1802)	Largemouth bass	545	X	X
	Pomoxis nigromaculatus (Lesueur, 1829)	Black crappie	7	X	X
Clupeidae	*Dorosoma cepedianum* (Lesueur, 1818)	Gizzard shad	126	X	X
Cottidae	*Cottus caeruleomentum* Kinziger, Raesly & Neely, 2000	Blue Ridge sculpin	404	X	
Cyprinidae	*Campostoma anomalum* (Rafinesque, 1820)	Central stoneroller	762	X	
	Clinostomus funduloides Girard, 1856	Rosyside dace	5729	X	X
	Cyprinella analostana Girard, 1859	Satinfin shiner	466	X	X
	Cyprinella spiloptera (Cope, 1867)	Spotfin shiner	34	X	
	Cyprinus carpio carpio Linnaeus, 1758	Common carp	2	X	
	Exoglossum maxillingua (Lesueur, 1817)	Cutlips minnow	394	X	X
	Luxilus cornutus (Mitchill, 1817)	Common shiner	1321	X	X
	Nocomis micropogon (Cope, 1865)	River chub	348	X	X
	Notemigonus crysoleucas (Mitchill, 1814)	Golden Shiner	386	X	X
	Notropis hudsonius (Clinton, 1824)	Spottail shiner	48	X	X
	Notropis procne (Cope, 1865)	Swallowtail shiner	1843	X	X
	Notropis rubellus (Agassiz, 1850)	Rosyface shiner	240	X	X
	Pimephales notatus (Rafinesque, 1820)	Bluntnose minnow	2	X	
	Pimephales promelas Rafinesque, 1820	Fathead minnow	25	X	X
	Rhinichthys atratulus (Hermann, 1804)	Eastern blacknose dace	12354	X	X
	Rhinichthys cataractae (Valenciennes, 1842)	Longnose dace	3238	X	X
	Semotilus atromaculatus (Mitchill, 1818)	Creek chub	2022	X	X
	Semotilus corporalis (Mitchill, 1817)	Fallfish	3115	X	X
Esocidae	*Esox americanus americanus* Gmelin, 1789	Redfin pickerel	159		X
	Esox niger Lesueur, 1818	Chain pickerel	2		X
Fundulidae	*Fundulus heteroclitus heteroclitus* (Linnaeus, 1766)	Mummichog	19	X	X
Ictaluridae	*Ameiurus natalis* (Lesueur, 1819)	Yellow bullhead	163	X	X
	Ameiurus nebulosus (Lesueur, 1819)	Brown bullhead	253	X	X
	Noturus gyrinus (Mitchill, 1817)	Tadpole madtom	45		X
	Noturus insignis (Richardson, 1836)	Margined madtom	259	X	X
Moronidae	*Morone americana* (Gmelin, 1789)	White perch	2	X	
Percidae	*Etheostoma olmstedi* Storer, 1842	Tessellated darter	7577	X	X
	Perca flavescens (Mitchill, 1814)	Yellow perch	84	X	X
Petromyzontidae	*Lampetra aepyptera* (Abbott, 1860)	Least brook lamprey	274		X
	Petromyzon marinus Linnaeus, 1758	Sea lamprey	137		X

Poeciliidae	*Gambusia holbrooki* Girard, 1859	Eastern mosquitofish	2		X
Salmonidae	*Oncorhynchus mykiss* (Walbaum, 1792)	Rainbow trout	11	X	
	Salmo trutta trutta Linnaeus, 1758	Brown trout	642	X	
Umbridae	*Umbra pygmaea* (DeKay, 1842)	Eastern mudminnow	1450	X	X

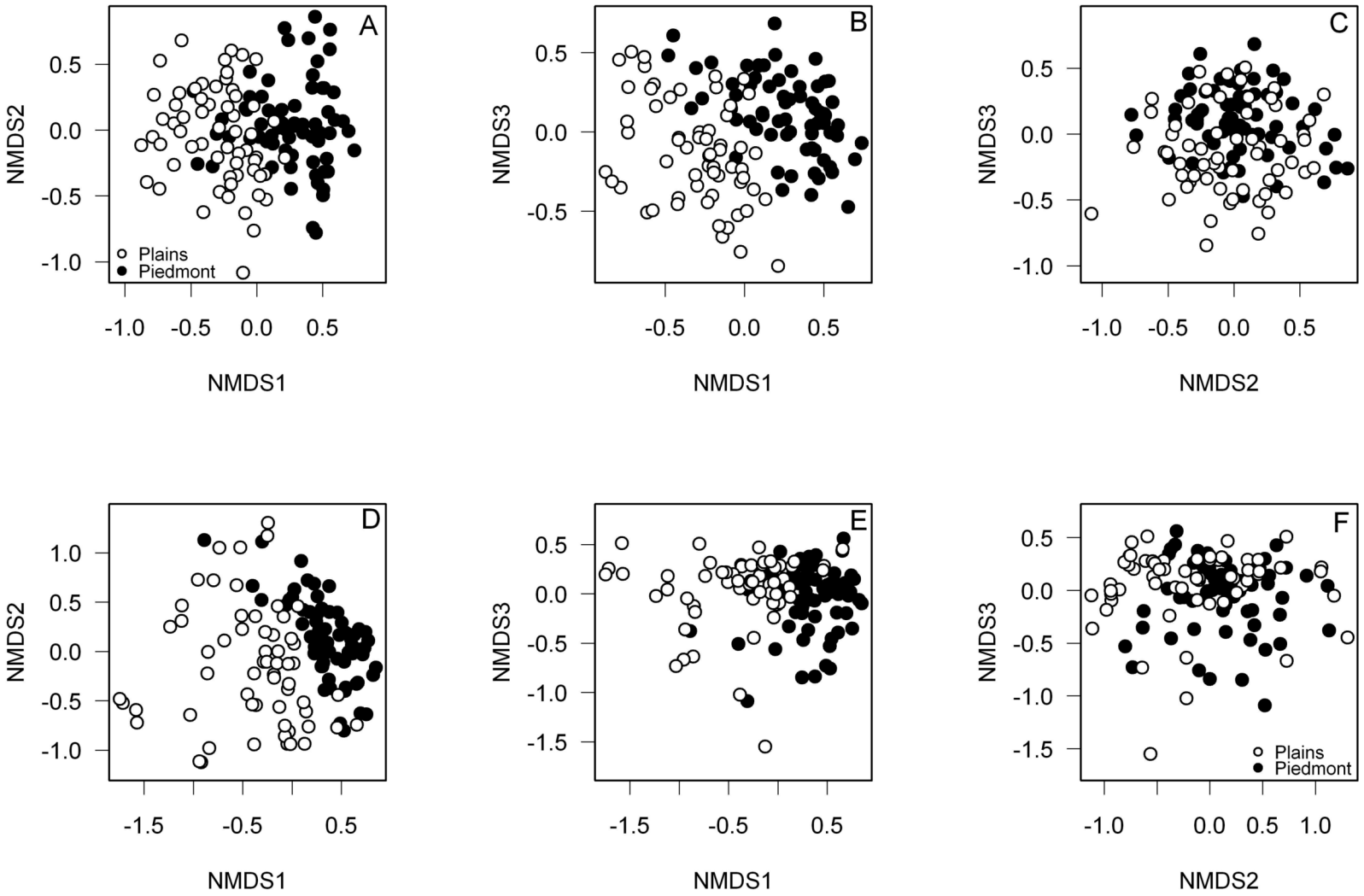

Figure S1. Plots of non-metric multidimensional scaling (NMDS) ordination site scores for benthic macroinvertebrates (top row) and fish (bottom row). (A) benthic macroinvertebrate assemblage sites scores for axis 1 vs axis 2; (B) benthic macroinvertebrate assemblage sites scores for axis 1 vs axis 3; (C) benthic macroinvertebrate assemblage sites scores for axis 2 vs axis 3; (D) fish assemblage sites scores for axis 1 vs axis 2; (E) fish assemblage sites scores for axis 1 vs axis 3; (F) fish assemblage sites scores for axis 2 vs axis 3. Plains = Southeastern Plains, Piedmont = Northern Piedmont.