**Table S5.** Test set based on genus-level taxonomic bioindicators of *uncategorized* instances (i.e. operational parameters) obtained from full-scale DWDSs studies. Values represent abundance of each taxon as a ratio of all sequences obtained for each individual sample. Legend: ND = not detected; missing value = ?. †Sequence data was reanalyzed using RDP v16 database.

Sample (reference)	Operational			Ta	xonomy grou	ı <b>ps</b> (bioindica	tors)		
Sample (reference)	scheme	Taxa A1	Taxa A2	Taxa A3	Taxa A4	Taxa A5	Taxa B1	Taxa B2	Taxa B3
Arkansas and lower M	lississippi Rivers	(Holinger et a	al., 2014)						
CO2-1a	?	ND	ND	?	ND	ND	ND	ND	0.0056
CO2-1b	?	ND	ND	?	ND	ND	ND	ND	0.0095
CO2-2	?	ND	ND	?	0.0021	ND	0.0031	ND	0.5849
CO2-3	?	ND	0.0008	?	0.0030	ND	ND	0.0008	0.0030
KS2-1a	?	ND	0.0077	?	ND	ND	ND	0.0346	0.2308
KS2-1b	?	ND	0.0018	?	0.0018	ND	ND	0.0140	0.0595
KS2-2a	?	ND	0.0052	?	0.0009	ND	0.0061	0.0506	0.5681
KS2-2b	?	ND	0.0032	?	0.0011	ND	0.0032	0.0485	0.4335
KS3-1a	?	0.0011	0.1171	?	ND	ND	ND	ND	0.7341
KS3-1b	?	0.0011	0.0995	?	0.0011	ND	ND	ND	0.5690
KS3-2a	?	ND	0.0585	?	ND	ND	ND	ND	0.0338
KS3-2b	?	ND	0.0079	?	ND	ND	0.0032	ND	0.0333
LA3-1	?	0.0040	ND	?	ND	ND	ND	ND	ND
LA3-2	?	0.0054	ND	?	ND	ND	ND	ND	ND
LA3-3	?	0.0043	ND	?	ND	ND	ND	ND	ND
LA3-4a	?	0.0206	ND	?	ND	0.0029	ND	ND	ND
LA3-4b	?	0.0202	ND	?	ND	ND	ND	ND	ND
LA4-1a	?	ND	ND	?	ND	ND	ND	ND	0.2624
LA4-1b	?	ND	0.0029	?	ND	ND	0.0029	0.0029	0.2151
LA4-2a	?	ND	ND	?	ND	ND	ND	ND	0.6081
LA4-2b	?	ND	ND	?	ND	ND	0.2048	ND	0.5127

Ohio River Basin<sup>†</sup> (Stanish et al., 2016)

M06S1	?	ND	0.0311	ND	0.0001	0.0458	0.0038	0.0009	0.0769
M06S2	?	ND	0.0218	ND	0.0034	0.0256	0.0016	0.0043	0.0469
M06S3	?	0.0006	0.0005	ND	ND	ND	0.0582	0.0169	0.4959

M06S4	?	ND	0.0015	ND	0.0005	0.0001	0.0002	0.0096	0.0506
M06S5	?	ND	0.0011	ND	0.0001	0.0018	0.0001	0.0012	0.1325
M07S1	?	ND	0.0009	ND	0.0021	0.0143	0.0018	0.0041	0.0593
M07S2	?	ND	0.0002	ND	0.0005	0.0045	0.0616	0.0014	0.2983
M07S3	?	ND	0.0002	ND	ND	0.0020	0.0001	0.0028	0.0701
M07S4	?	ND	0.0015	ND	0.0011	0.0065	0.0001	0.0125	0.0588

Ann Arbor, MI<sup>†</sup> (**Pinto et al., 2014**)

S.1.1.Apr11	?	ND	0.0110	ND	ND	ND	ND	0.0020	0.0010
S.1.1.Aug10	?	0.0010	0.0030	ND	ND	0.0020	ND	ND	ND
S.1.1.Aug11	?	ND	0.0040	ND	ND	0.0040	ND	0.0010	ND
S.1.1.Dec10	?	ND	0.0050	ND	ND	0.0010	ND	ND	ND
S.1.1.Jan11	?	ND	0.0460	ND	ND	0.0020	ND	ND	ND
S.1.1.Jul11	?	0.0010	0.0030	ND	ND	0.0060	ND	ND	0.0010
S.1.1.Jun11	?	0.0030	ND	ND	ND	0.0020	ND	ND	ND
S.1.1.May11	?	ND	0.0050	ND	ND	ND	ND	ND	ND
S.1.1.Oct10	?	0.0030	0.0030	ND	ND	0.0030	ND	ND	ND
S.1.1.Sep10	?	0.0010	0.0100	ND	ND	0.0060	ND	ND	ND
S.1.2.Apr11	?	ND	0.0110	ND	0.0020	ND	ND	ND	ND
S.1.2.Aug10	?	ND	ND	ND	ND	0.0030	ND	ND	ND
S.1.2.Aug11	?	0.0040	0.0110	ND	ND	0.0090	ND	ND	ND
S.1.2.Dec10	?	ND	0.0130	ND	ND	0.0020	ND	ND	0.0010
S.1.2.Feb11	?	ND	0.0360	ND	ND	ND	0.0010	ND	0.0030
S.1.2.Jan11	?	ND	0.0510	ND	ND	0.0010	ND	ND	ND
S.1.2.Jul10	?	ND	0.0060	ND	ND	0.0010	ND	ND	ND
S.1.2.Jul11	?	0.0020	0.0010	ND	ND	0.0070	ND	0.0010	ND
S.1.2.Jun10	?	0.0040	0.0050	ND	ND	ND	ND	ND	0.0010
S.1.2.Jun11	?	ND	0.0040	ND	ND	0.0050	ND	ND	ND
S.1.2.Mar11	?	0.0010	0.0160	ND	0.0030	ND	ND	0.0020	0.0060
S.1.2.May11	?	ND	0.0020	ND	ND	0.0010	ND	ND	ND
S.1.2.Nov10	?	ND	0.0200	ND	ND	0.0010	ND	0.0010	ND
S.1.2.Oct10	?	0.0010	0.0050	ND	ND	0.0040	ND	0.0010	ND
S.1.2.Sep10	?	0.0030	0.0080	ND	ND	0.0010	ND	ND	0.0010
S.1.3.Apr11	?	ND	0.0050	ND	ND	ND	ND	0.0020	ND

S.1.3.Aug10	?	ND	0.0890	ND	0.0010	0.0040	ND	ND	0.0020
S.1.3.Feb11	?	ND	0.0200	ND	ND	0.0040	ND	0.0050	0.0030
S.1.3.Jul10	?	0.0030	0.0020	ND	0.0020	0.0030	ND	0.0010	0.0020
S.1.3.Jul11	?	ND	0.0020	ND	ND	0.0160	ND	ND	0.0060
S.1.3.Jun10	?	0.0020	0.0010	ND	ND	ND	ND	0.0010	ND
S.1.3.Jun11	?	0.0020	ND	ND	ND	0.0040	ND	ND	0.0020
S.1.3.Mar11	?	0.0020	0.0170	ND	0.0010	0.0020	ND	0.0020	ND
S.2.1.Apr11	?	ND	0.0090	ND	ND	ND	ND	0.0020	ND
S.2.1.Aug10	?	ND	0.0010	ND	ND	0.0010	ND	ND	ND
S.2.1.Aug11	?	0.0030	ND	ND	ND	0.0050	ND	ND	ND
S.2.1.Dec10	?	0.0010	0.0060	ND	ND	ND	ND	ND	0.0010
S.2.1.Feb11	?	ND	0.0160	ND	ND	0.0010	ND	0.0010	ND
S.2.1.Jul10	?	ND	0.0030	ND	ND	ND	ND	0.0010	ND
S.2.1.Jul11	?	0.0020	0.0020	ND	ND	0.0020	ND	ND	ND
S.2.1.Jun10	?	0.0030	0.0010	ND	ND	ND	ND	ND	ND
S.2.1.Mar11	?	ND	0.0360	ND	0.0020	0.0020	ND	ND	ND
S.2.1.May11	?	0.0010	0.0010	ND	ND	ND	ND	ND	0.0020
S.2.1.Nov10	?	ND	0.0200	ND	ND	0.0030	ND	ND	0.0040
S.2.1.Oct10	?	0.0030	0.0100	ND	ND	0.0010	ND	ND	ND
S.2.1.Sep10	?	ND	0.0060	ND	ND	0.0040	ND	ND	ND
S.2.2.Apr11	?	ND	0.0050	ND	ND	ND	ND	ND	ND
S.2.2.Aug10	?	0.0020	0.0090	ND	ND	0.0010	ND	ND	ND
S.2.2.Aug11	?	0.0010	0.0010	ND	ND	0.0040	ND	ND	ND
S.2.2.Dec10	?	ND	0.0080	ND	ND	0.0040	ND	ND	ND
S.2.2.Feb11	?	0.0020	0.0210	ND	ND	ND	ND	ND	0.0010
S.2.2.Jan11	?	ND	0.0330	ND	ND	0.0030	ND	0.0020	ND
S.2.2.Jul10	?	0.0060	0.0080	ND	ND	0.0020	ND	ND	ND
S.2.2.Jul11	?	0.0040	ND	ND	ND	0.0020	ND	ND	ND
S.2.2.Jun10	?	ND	0.0070	ND	ND	ND	ND	ND	ND
S.2.2.Jun11	?	0.0010	ND	ND	ND	0.0020	ND	ND	ND
S.2.2.Mar11	?	0.0010	0.0300	ND	0.0010	0.0020	ND	ND	0.0010
S.2.2.May11	?	ND	0.0020	ND	ND	ND	ND	ND	ND
S.2.2.Nov10	?	0.0020	0.0130	ND	0.0010	0.0020	ND	ND	ND
S.2.2.Oct10	?	0.0020	0.0050	ND	0.0010	0.0010	ND	0.0010	0.0010

S.2.2.Sep10	?	0.0020	ND	ND	ND	0.0030	ND	0.0010	0.0020
S.2.3.Apr11	?	ND	0.0050	ND	ND	ND	ND	ND	0.0020
S.2.3.Aug10	?	ND	ND	ND	ND	ND	ND	ND	0.0050
S.2.3.Aug11	?	ND	0.0020	ND	ND	0.0020	ND	0.0010	0.0020
S.2.3.Dec10	?	ND	0.0040	ND	ND	0.0010	0.0010	ND	0.0040
S.2.3.Feb11	?	ND	0.0210	ND	ND	0.0010	ND	0.0010	0.0020
S.2.3.Jan11	?	ND	0.0280	ND	ND	ND	ND	ND	ND
S.2.3.Jul10	?	0.0010	ND	ND	ND	0.0020	ND	ND	0.0010
S.2.3.Jul11	?	0.0010	0.0010	ND	ND	0.0080	ND	0.0020	0.0080
S.2.3.Jun10	?	ND	0.0010	ND	ND	ND	ND	ND	ND
S.2.3.Jun11	?	ND	0.0020	ND	ND	0.0020	ND	ND	0.0010
S.2.3.May11	?	0.0010	0.0050	ND	ND	ND	ND	ND	ND
S.2.3.Oct10	?	0.0030	0.0050	ND	ND	0.0160	ND	0.0010	ND
S.2.3.Sep10	?	0.0030	0.0090	ND	ND	0.0010	ND	ND	ND
S.3.1.Apr11	?	ND	0.0040	ND	ND	ND	ND	ND	0.0020
S.3.1.Aug10	?	0.0020	0.0100	ND	0.0010	0.0020	ND	ND	0.0010
S.3.1.Aug11	?	ND	0.0760	ND	ND	ND	ND	ND	0.0010
S.3.1.Dec10	?	ND	0.0050	ND	ND	0.0020	ND	0.0010	ND
S.3.1.Feb11	?	ND	0.0280	ND	ND	0.0020	ND	ND	0.0010
S.3.1.Jul10	?	ND	0.0020	ND	ND	0.0010	ND	0.0010	0.0010
S.3.1.Jun10	?	0.0030	0.0070	ND	ND	0.0050	ND	ND	ND
S.3.1.Mar11	?	ND	0.0280	ND	ND	0.0020	ND	ND	0.0010
S.3.1.May11	?	ND	ND	ND	ND	ND	ND	ND	0.0010
S.3.1.Nov10	?	ND	0.0160	ND	ND	0.0040	ND	0.0010	0.0080
S.3.1.Oct10	?	0.0030	0.0520	ND	ND	0.0060	ND	0.0010	0.0030
S.3.1.Sep10	?	0.0020	0.0170	ND	ND	0.0030	ND	ND	0.0010
S.3.2.Apr11	?	0.0010	0.0050	ND	ND	0.0010	ND	ND	ND
S.3.2.Aug10	?	0.0030	ND	ND	ND	0.0020	ND	0.0010	ND
S.3.2.Aug11	?	ND	0.0040	ND	ND	0.0060	ND	ND	0.0010
S.3.2.Dec10	?	ND	0.0120	ND	ND	0.0010	ND	ND	0.0040
S.3.2.Feb11	?	0.0020	0.0330	ND	ND	0.0010	ND	ND	0.0060
S.3.2.Jan11	?	ND	0.0610	ND	0.0010	0.0010	ND	ND	ND
S.3.2.Jul10	?	ND	ND	ND	ND	ND	ND	ND	ND
S.3.2.Jul11	?	0.0010	ND	ND	ND	0.0030	ND	ND	0.0020

S.3.2.Jun10	?	ND	0.0010	ND	0.0030	ND	ND	ND	ND
S.3.2.Jun11	?	0.0040	ND	ND	ND	0.0020	ND	ND	ND
S.3.2.Mar11	?	0.0020	0.0380	ND	ND	ND	ND	ND	0.0010
S.3.2.May11	?	ND	0.0010	ND	ND	ND	ND	ND	ND
S.3.2.Nov10	?	0.0020	0.0040	ND	ND	0.0040	ND	0.0010	ND
S.3.2.Oct10	?	0.0030	0.0090	ND	ND	0.0060	ND	ND	ND
S.3.2.Sep10	?	0.0010	0.0120	ND	ND	0.0010	ND	0.0020	ND
S.3.3.Apr11	?	ND	0.0130	ND	ND	ND	ND	ND	0.0020
S.3.3.Aug10	?	0.0010	0.0040	ND	ND	0.0030	ND	ND	ND
S.3.3.Aug11	?	0.0030	0.0020	ND	ND	0.0050	ND	0.0010	ND
S.3.3.Dec10	?	ND	0.0020	ND	ND	ND	ND	0.0030	ND
S.3.3.Feb11	?	ND	0.0200	ND	ND	0.0020	ND	0.0060	0.0030
S.3.3.Jan11	?	ND	0.0300	ND	ND	ND	ND	ND	ND
S.3.3.Jul10	?	0.0030	0.0040	ND	ND	0.0010	ND	ND	ND
S.3.3.Jul11	?	ND	ND	ND	ND	0.0030	ND	ND	0.0010
S.3.3.Jun10	?	ND	ND	ND	ND	ND	ND	ND	0.0010
S.3.3.Jun11	?	ND	ND	ND	ND	0.0040	ND	ND	ND
S.3.3.Mar11	?	ND	0.0300	ND	ND	ND	ND	ND	ND
S.3.3.May11	?	0.0010	ND	ND	ND	0.0010	ND	0.0010	ND
S.3.3.Nov10	?	ND	0.0180	ND	ND	0.0080	0.0010	ND	ND
S.3.3.Oct10	?	ND	0.2430	ND	ND	0.0070	ND	0.0010	0.0020
S.3.3.Sep10	?	0.0020	0.0020	ND	ND	0.0030	ND	0.0010	ND

Eastern USA<sup>†</sup> (**Ji et al., 2015**)

E.B.1.1D	?	0.0009	0.0149	ND	0.1112	0.0020	0.0285	0.0268	0.1383
E.B.1.2D	?	0.0017	0.0149	ND	0.1284	0.0026	0.0288	0.0182	0.1246
E.B.1.3D	?	0.0009	0.0157	ND	0.1455	0.0032	0.0294	0.0205	0.1101
E.B.2.1D	?	0.0154	0.0273	ND	0.1880	0.0029	0.0571	0.0227	0.0973
E.B.2.2D	?	0.0058	0.0188	ND	0.2368	0.0023	0.0543	0.0191	0.1051
E.B.2.3D	?	0.0064	0.0145	ND	0.2180	0.0036	0.0633	0.0228	0.1059
E.B.3.1D	?	0.0015	0.0218	ND	0.2035	0.0022	0.0610	0.0355	0.3084
E.B.3.2D	?	0.0012	0.0137	ND	0.2286	0.0029	0.0638	0.0294	0.2762
E.B.3.3D	?	0.0017	0.0148	ND	0.2494	0.0037	0.0534	0.0312	0.2085
E.CS.1.1D	?	0.0005	0.0069	ND	0.1786	0.0006	0.0334	0.0833	0.0964

T 00 1 1D	2	0.0000	0.0100	ND	0.0044	0.0000	0.0075	0.05.60	0.1110
<b>E.CS.1.2D</b>	?	0.0008	0.0100	ND	0.2344	0.0008	0.0375	0.0563	0.1112
E.CS.1.3D	?	0.0023	0.0097	ND	0.1911	0.0015	0.0236	0.0646	0.1274
<b>E.CS.2.1D</b>	?	0.0005	0.0022	ND	0.1432	0.0014	0.0168	0.1204	0.1113
<b>E.CS.2.2D</b>	?	0.0010	0.0043	ND	0.1317	0.0012	0.0120	0.1336	0.1181
E.CS.2.3D	?	0.0003	0.0034	ND	0.1519	0.0014	0.0193	0.1733	0.0906
E.CS.3.1D	?	0.0008	0.0103	ND	0.1952	0.0024	0.0220	0.0431	0.0989
E.CS.3.2D	?	0.0010	0.0145	ND	0.2313	0.0014	0.0255	0.0434	0.0565
E.CS.3.3D	?	0.0014	0.0056	ND	0.2072	0.0014	0.0118	0.0727	0.0594
E.I.1D	?	0.0168	0.0020	ND	0.0211	0.0040	0.0314	0.0152	0.0062
E.I.2D	?	0.0146	0.0103	ND	0.0143	0.0031	0.0214	0.0150	0.0063
E.I.3D	?	0.0058	0.0202	ND	0.0235	0.0042	0.0223	0.0140	0.0028
E.LC.1.1D	?	0.0009	0.0207	ND	0.2492	0.0021	0.0504	0.0237	0.2714
E.LC.1.2D	?	0.0014	0.0058	ND	0.2666	0.0024	0.0675	0.0179	0.2071
E.LC.1.3D	?	0.0014	0.0100	ND	0.3103	0.0019	0.0614	0.0180	0.2122
E.LC.2.1D	?	0.0009	0.0166	ND	0.1747	0.0021	0.0343	0.0141	0.2530
<b>E.LC.2.2D</b>	?	0.0032	0.0117	ND	0.1615	0.0047	0.0287	0.0174	0.2391
E.LC.2.3D	?	0.0018	0.0062	ND	0.1845	0.0020	0.0308	0.0394	0.1521
E.LC.3.1D	?	0.0006	0.0079	ND	0.1238	0.0016	0.0342	0.0054	0.1555
E.LC.3.2D	?	0.0031	0.0066	ND	0.2324	0.0025	0.0616	0.0113	0.1784
E.LC.3.3D	?	ND	0.0074	ND	0.0436	0.0010	0.0821	0.0212	0.2516

New Orleans, LA<sup>†</sup> (Hull et al., 2017)

A_NO26	?	ND	0.0006	ND	0.0001	ND	ND	ND	0.0016
A_NO27	?	ND	0.0007	ND	ND	ND	0.0006	0.0005	0.0021
A_NO28	?	ND	0.0004	0.0001	ND	ND	ND	ND	0.0142
A_NO29	?	ND	0.0002	ND	0.0001	ND	ND	0.0002	0.0195
A_NO31	?	0.0001	0.0001	ND	0.0039	ND	ND	0.0013	0.0049
C_NO16	?	0.0001	0.0001	0.0002	ND	0.0002	ND	0.0051	0.0091
C_NO17	?	ND	ND	ND	ND	0.0005	ND	ND	0.0107
C_NO18	?	ND	ND	0.0001	0.0002	ND	ND	ND	0.0009
C_NO19	?	ND	ND	ND	ND	ND	ND	0.0002	0.1259
C_NO20	?	ND	ND	0.0001	ND	0.0002	ND	0.0004	0.0036
C_NO21	?	ND	ND	ND	ND	ND	ND	0.0013	0.4707
C_NO23	?	ND	ND	ND	ND	ND	ND	0.0001	0.0016

C_NO24	?	ND	0.0001	ND	ND	ND	ND	0.0001	0.0022
C_NO25	?	ND	0.0004	ND	ND	0.0002	ND	0.0067	0.1191
C_NO32	?	ND	ND	ND	ND	ND	ND	0.0005	0.0541
C_NO33	?	ND	0.0001	ND	ND	0.0002	0.0002	0.0001	0.0382
C_NO34	?	0.0001	ND	ND	ND	0.0001	0.0001	0.0008	0.0116
C_NO35	?	ND	0.0002	ND	0.0002	0.0001	ND	0.0012	0.0060
C_NO36	?	ND	0.0001	ND	ND	ND	ND	0.0001	0.0595
C_NO37	?	ND	ND	0.0001	ND	0.0001	0.0001	0.0002	0.0034
C_NO38	?	ND	ND	0.0001	0.0005	0.0001	ND	0.0018	0.0244
C_NO39	?	ND	ND	ND	ND	0.0011	ND	0.0194	0.4369
C_NO40	?	ND	0.0001	0.0002	ND	0.0002	0.0001	ND	0.1095
C_NO41	?	ND	0.0001	ND	ND	0.0001	ND	ND	0.0024
C_NO42	?	ND	0.0001	ND	0.0002	0.0008	ND	0.0012	0.0074
C_NO43	?	ND	ND	ND	0.0001	ND	ND	ND	0.0380
C_NO44	?	ND	ND	0.0001	ND	ND	0.0001	0.0002	0.0033
C_NO45	?	ND	0.0001	0.0001	ND	0.0001	ND	0.0001	0.0276
C_NO46	?	ND	ND	0.0001	ND	0.0001	0.0001	0.0004	0.0566
C_NO47	?	ND	ND	ND	ND	0.0002	ND	0.0002	0.0122
C_NO48	?	ND	0.0004	ND	ND	ND	ND	ND	0.0045
C_NO49	?	ND	0.0001	0.0001	0.0002	0.0001	ND	0.0002	0.0196
C_NO50	?	ND	0.0001	ND	ND	0.0001	ND	ND	0.1174
C_NO51	?	ND	ND	ND	ND	0.0002	ND	0.0001	0.0493
C_NO52	?	0.0042	0.0041	ND	0.0002	0.0051	ND	0.0006	0.0014
C_NO53	?	ND	ND	ND	ND	0.0002	ND	0.0001	0.3029
C_NO54	?	ND	ND	ND	ND	0.0004	0.0001	0.0012	0.2919
C_NO55	?	ND	0.0002	ND	ND	ND	ND	ND	0.0015
C_NO56	?	ND	ND	0.0001	0.0008	0.0005	0.0001	0.0001	0.0047
C_NO57	?	ND	0.0001	ND	0.0001	ND	ND	0.0001	0.0061

Urbana,  $IL^{\dagger}$  (**Hwang et al., 2012**)

S10_C0	?	ND	ND	ND	0.0007	ND	ND	ND	0.0007
S10_N1	?	ND	ND	ND	ND	ND	ND	ND	ND
S10_N2	?	ND	ND	ND	ND	ND	ND	ND	ND
S10_S1	?	ND	ND	ND	0.0020	ND	ND	ND	0.0013

S10_S2	?	ND	ND	ND	0.0040	ND	ND	0.0007	0.0007
S11_C0	?	ND	ND	ND	ND	ND	ND	ND	ND
S11_N1	?	ND	ND	ND	ND	ND	ND	ND	ND
S11_N2	?	ND	ND	ND	0.0073	ND	ND	ND	0.0013
S11_S1	?	ND	ND	ND	ND	ND	ND	ND	ND
W10_C0	?	ND	ND	ND	0.0087	0.0013	ND	0.0007	0.0007
W10_N1	?	ND	ND	ND	0.0107	0.0020	ND	ND	ND
W10_N2	?	ND	ND	ND	0.0060	0.0027	ND	ND	ND
W10_S1	?	ND	ND	ND	0.0020	ND	ND	ND	ND
W10_S2	?	ND	ND	ND	0.0013	ND	ND	ND	ND