Solutions through Science

APPENDIX B
FOR
LABADIE ENERGY CENTER
TYPE 1 §316(a)

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February 27, 2020

TABLE OF CONTENTS

B. RETROSPECTIVE ASSESSEMENT SUPPORTIVE MATERIAL B-6

B.1 SECTION 5 TABLES B-6

B.2 DERIVATIVE OF HEAT SENSITIVE FISH SPECIES B-67

B.3 DERIVATIVE OF HEAT SENSITIVE BENTHIC MACROINVERTEBRATES ..... **ERROR! BOOKMARK NOT DEFINED.**

REFERENCES B-70

LIST OF TABLES

Table B-1 Species composition (numbers caught and weight in kg) of fish sampled with bag seine at the LEC in 2017-2018, by zone. B-6

Table B-2 Species composition (numbers caught and weight in kg) of fish sampled with electrofishing at the LEC in 2017-2018, by zone. B-8

Table B-3 Species composition (numbers caught and weight in kg) of fish sampled with hoop net at the LEC in 2017-2018, by zone. B-10

Table B-4 Species composition (numbers caught and weight in kg) of fish sampled with Missouri mini-trawl at the LEC in 2017-2018, by zone. B-11

Table B-5 Sampling statistics for fish monitoring program at LEC in 2017-2018 by gear, zone, and season. B-13

Table B-6 Sample size, estimated diversity and standard deviation at q = 0, 1, 2, and 3 for fish sampled with bag seine at the LEC in 2017-2018, by season, and zone. B-14

Table B-7 Sample size, estimated diversity and standard deviation at q = 0, 1, 2, and 3 for fish sampled with electrofishing at the LEC in 2017-2018, by season, and zone. B-15

Table B-8 Sample size, estimated diversity and standard deviation at q = 0, 1, 2, and 3 for fish sampled with hoop net at the LEC in 2017-2018, by season, and zone. B-16

Table B-9 Sample size, estimated diversity and standard deviation at q = 0, 1, 2, and 3 for fish sampled with Missouri mini-trawl at the LEC in 2017-2018, by season, and zone. B-17

Table B-10 Count and weight (kg) by fish type for fish sampled with bag seine at the LEC in 2017-2018, by season, and zone. R = Rough, F = Forage, P = Panfish, G = Gamefish, and S = Special Interest. NS indicated no sampling in the zone. B-18

Table B-11 Count and weight (kg) by fish type for fish sampled with electrofishing at the LEC in 2017-2018, by season, and zone. R = Rough, F = Forage, P = Panfish, G = Gamefish, and S = Special Interest. NS indicated no sampling in the zone. B-19

Table B-12 Count and weight (kg) by fish type for fish sampled with hoop net at the LEC in 2017-2018, by season, and zone. R = Rough, F = Forage, P = Panfish, G = Gamefish, and S = Special Interest. NS indicated no sampling in the zone. B-20

Table B-13 Count and weight (kg) by fish type for fish sampled with Missouri mini-trawl at the LEC in 2017-2018, by season, and zone. R = Rough, F = Forage, P = Panfish, G = Gamefish, and S = Special Interest. NS indicated no sampling in the zone. B-21

Table B-14 Count and weight (kg) by fish type for heat and pollution tolerant and intolerant fish sampled with bag seine at the LEC in 2017-2018, by season, and zone. NS indicated no sampling in the zone. B-22

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Table B-15 Count and weight (kg) by fish type for heat and pollution tolerant and intolerant fish sampled with electrofishing at the LEC in 2017-2018, by season, and zone. NS indicated no sampling in the zone. B-23

Table B-16 Count and weight (kg) by fish type for heat and pollution tolerant and intolerant fish sampled with hoop net at the LEC in 2017-2018, by season, and zone. NS indicated no sampling in the zone. B-24

Table B-17 Count and weight (kg) by fish type for heat and pollution tolerant and intolerant fish sampled with Missouri mini-trawl at the LEC in 2017-2018, by season, and zone. NS indicated no sampling in the zone....B-25

Table B-18 Means and standard errors for individual metrics, and standardized differences for winter fish sampling at the LEC in 2017-2018....B-26

Table B-19 Means and standard errors for individual metrics, and standardized differences for spring fish sampling at the LEC in 2017-2018....B-28

Table B-20 Means and standard errors for individual metrics, and standardized differences for summer fish sampling at the LEC in 2017-2018. ....B-30

Table B-21 Means and standard errors for individual metrics, and standardized differences for fall fish sampling at the LEC in 2017-2018....B-32

Table B-22 Summary of benthic invertebrates collected in Hester-Dendy bottom samples at the LEC during 2017-2018 sampling, by season and zone. B-34

Table B-23 Summary of benthic invertebrates collected in Hester-Dendy mid-depth samples at the LEC during 2017-2018 sampling, by season and zone. B-38

Table B-24 Summary of benthic invertebrates collected in Ponar samples at the LEC during 2017-2018 sampling, by season and zone. B-42

Table B-25 Mean density, standard error, and sample size for benthic inverebrate sampline at the LEC in 2017-2018, by gear, season and zone. B-47

Table B-26 Sample size, estimated diversity and standard deviation at q = 0, 1, 2, and 3 for benthic invertebrate sampling at the LEC in 2017-2018, by gear, season, and zone....B-48

Table B-27 Fraction of organisms in major groups during benthic sampling at the LEC in 2017-2018, by gear and zone. B-49

Table B-28 Number of species and fraction of organism in EPT orders during benthic sampling at the LEC in 2017-2018 by gear, season, and zone. B-49

Table B-29 Upper incipient lethal temperature (UILT) for EPT taxa from literature. Heat intolerant are those with UILT ≤ 30 in bold font. B-50

Table B-30 Number of organisms in EPT orders, number and fraction in heat-intolerant groups during benthic sampling at the LEC in 2017-2018 by gear, season, and zone....B-50

Table B-31 Means and standard errors for individual metrics, and standardized differences for benthic invertebrates collected during winter sampling at the LEC in 2017-2018....B-51

Table B-32 Means and standard errors for individual metrics, and standardized differences for benthic invertebrates collected during spring sampling at the LEC in 2017-2018....B-52

Table B-33 Means and standard errors for individual metrics, and standardized differences for benthic invertebrates collected during summer sampling at the LEC in 2017-2018. ..... B-53

Table B-34 Means and standard errors for individual metrics, and standardized differences for benthic invertebrates collected during fall sampling at the LEC in 2017-2018. ..... B-54

Table B-35 Sampling statistics for electrofishing sampling at LEC in 1980-1985, 1997-2002, and 2018-2018, by zone, habitat, and season. Only fish > 100 mm total length are included. B-55

Table B-36 Diversity statistics of fish community in electrofishing sampling by zone and season during 1980-1985, 1997-2002, and 2017-2018 LEC studies based on numerical count and total biomass. Only fish > 100 mm total length are included. B-57

Table B-37 Fish community in electrofishing sampling by zone, season, habitat, and type during 1980-1985, 1997-2002, and 2017-2018 LEC studies based on numerical count and total biomass. Only fish > 100 mm total length are included. B-59

Table B-38 Heat tolerance of fish community in electrofishing sampling by zone, season, and habitat during 1980-1985, 1997-2002, and 2017-2018 LEC studies based on numerical count and total biomass. Only fish > 100 mm total length are included. B-61

Table B-39 Standardized differences of ecological metrics between survey 1 (1980-1985) and survey 3 (2017-2018) in Upstream Reference zone. B-63

Table B-40 Standardized differences of ecological metrics between survey 1 (1980-1985) and survey 3 (2017-2018) in Thermally Exposed zone, CXLD habitat. B-65

Table B-41 Upper temperature tolerance values (°F) at high acclimation temperature—adult & juvenile heat shock B-68

Table B-42 Temperature tolerance values (°F) at high acclimation temperature—adult & juvenile avoidance B-69

Table B-43 Order, family, and scientific name for those benthic macroinvertebrates found to be heat intolerant (UILT ≤ 30) ..... **Error! Bookmark not defined.**

B. RETROSPECTIVE ASSESSEMENT SUPPORTIVE MATERIAL

B.1 SECTION 5 TABLES

Table B-1 Species composition (numbers caught and weight in kg) of fish sampled with bag seine at the LEC in 2017-2018, by zone.

Rank	Upstream			Discharge			Thermally Exposed			Downstream		
	Taxon	Count	Weight	Taxon	Count	Weight	Taxon	Count	Weight	Taxon	Count	Weight
1	Red shiner	2972	0.281	NS	NS	NS	Red shiner	1092	0.367	Red shiner	1155	0.351
2	Channel shiner	848	0.162	NS	NS	NS	Emerald shiner	666	0.600	Channel shiner	602	0.096
3	Emerald shiner	418	0.080	NS	NS	NS	Gizzard shad	348	0.649	Gizzard shad	556	0.583
4	Sand shiner	200	0.038	NS	NS	NS	Channel shiner	263	0.130	Emerald shiner	462	0.179
5	Bullhead minnow	198	0.038	NS	NS	NS	Sicklefin chub	116	0.014	Bullhead minnow	177	0.140
6	Shoal chub	195	0.037	NS	NS	NS	Shoal chub	98	0.030	Shoal chub	141	0.024
7	Gizzard shad	170	0.033	NS	NS	NS	Bullhead minnow	35	0.037	Mosquitofish	104	0.015
8	Bluntnose minnow	35	0.007	NS	NS	NS	Sand shiner	30	0.010	Sicklefin chub	78	0.019
9	Mosquitofish	34	0.007	NS	NS	NS	Freshwater drum	19	0.031	Sand shiner	69	0.025
10	Freshwater drum	28	0.005	NS	NS	NS	Channel catfish	16	0.036	Blacktail chubs	49	0.005
11	Sicklefin chub	27	0.005	NS	NS	NS	Sturgeon chub	13	0.002	Bluntnose minnow	44	0.038
12	Orangespotted sunfish	18	0.003	NS	NS	NS	Bluntnose minnow	12	0.006	Freshwater drum	28	0.084
13	Goldeye	12	0.002	NS	NS	NS	Goldeye	10	0.022	Orangespotted sunfish	25	0.047
14	Bluegill	11	0.002	NS	NS	NS	White bass	7	0.005	Bluegill	20	0.016
15	Smallmouth buffalo	8	0.002	NS	NS	NS	Minnow Family	6	0.001	Goldeye	15	0.007
16	Sunfish - Lepomis	6	0.001	NS	NS	NS	Silver chub	4	0.001	Silver carp	15	0.007
17	Plains minnow	4	0.001	NS	NS	NS	Bluegill	3	0.005	Smallmouth buffalo	13	0.014
18	River carpsucker	4	0.001	NS	NS	NS	Silver carp	3	0.004	Channel catfish	11	0.023
19	River shiner	4	0.001	NS	NS	NS	Smallmouth buffalo	3	0.005	Pikeperch	10	0.010
20	Silver chub	4	0.001	NS	NS	NS	Blacktail chubs	2	0.000	River shiner	7	0.003
21	Rosyface shiner	3	0.001	NS	NS	NS	Buffalofish	2	0.001	Sturgeon chub	7	0.002
22	Sturgeon chub	3	0.001	NS	NS	NS	Golden redhorse	2	0.013	White bass	6	0.005
23	Bigeye shiner	2	0.000	NS	NS	NS	Largemouth bass	2	0.004	Carpsuckers	5	0.001
24	Brook silverside	2	0.000	NS	NS	NS	Pikeperch	2	0.002	Ghost shiner	5	0.001
25	Channel catfish	2	0.000	NS	NS	NS	River shiner	2	0.002	Buffalofish	4	0.000
26	Longnose gar	2	0.000	NS	NS	NS	Striped bass x white bass	2	0.027	Golden redhorse	3	0.001
27	Silver carp	2	0.000	NS	NS	NS	Banded killifish	1	0.027	Minnow Family	3	0.000
28	Blacktail chubs	1	0.000	NS	NS	NS	Blue catfish	1	0.027	River carpsucker	3	1.182
29	Blue catfish	1	0.000	NS	NS	NS	Flathead catfish	1	0.179	Common carp	2	0.006
30	Grass carp	1	0.000	NS	NS	NS	Plains killifish	1	0.000	Grass carp	2	0.000
31	Ghost shiner	1	0.000	NS	NS	NS	Rosyface shiner	1	0.001	Green sunfish	2	0.004
32	Largemouth bass	1	0.000	NS	NS	NS	Shiners - Notropis	1	0.000	Plains minnow	2	0.001
33	Sauger x Walley	1	0.000	NS	NS	NS	Spotted bass	1	0.001	Silver chub	2	0.000

Rank	Upstream			Discharge			Thermally Exposed			Downstream		
	Taxon	Count	Weight	Taxon	Count	Weight	Taxon	Count	Weight	Taxon	Count	Weight
34	Spotted bass	1	0.000	NS	NS	NS	Suckermouth minnow	1	0.005	Spotted bass	2	0.001
35	Stonerollers	1	0.000	NS	NS	NS				Bigeye shiner	1	0.000
36	Temperate basses	1	0.000	NS	NS	NS				Brook silverside	1	0.001
37				NS	NS	NS				Creek chub	1	0.001
38				NS	NS	NS				Johnny darter	1	0.000
39				NS	NS	NS				Logperch	1	0.001
40				NS	NS	NS				Rosyface shiner	1	0.001
41				NS	NS	NS				Sunfish - Lepomis	1	0.000
Total	Taxa	Count	Weight	Taxa	Count	Weight	Taxa	Count	Weight	Taxa	Count	Weight
	36	**5221**	**0.71**	**0**	**0**	**0**	**34**	**2766**	**2.22**	**41**	**3636**	**2.89**

Table B-2 Species composition (numbers caught and weight in kg) of fish sampled with electrofishing at the LEC in 2017-2018, by zone.

Rank	Upstream			Discharge			Thermally Exposed			Downstream		
	Taxon	Count	Weight	Taxon	Count	Weight	Taxon	Count	Weight	Taxon	Count	Weight
1	Gizzard shad	192	6.116	Red shiner	330	0.162	Gizzard shad	346	24.950	Red shiner	659	0.143
2	Freshwater drum	173	0.150	Blue catfish	154	657.399	Emerald shiner	190	0.343	Gizzard shad	347	7.521
3	Blue catfish	81	0.070	River carpsucker	67	66.947	Red shiner	177	0.177	Emerald shiner	172	0.076
4	Longnose gar	62	0.054	Emerald shiner	59	0.094	Freshwater drum	99	35.768	Freshwater drum	129	25.817
5	River carpsucker	60	0.052	Gizzard shad	56	22.438	River carpsucker	92	98.209	Silver carp	97	130.312
6	Emerald shiner	59	0.051	Freshwater drum	46	39.517	Longnose gar	81	54.133	Shortnose gar	71	44.918
7	Red shiner	58	0.050	Longnose gar	35	23.762	Silver carp	79	144.381	River carpsucker	66	68.449
8	Silver carp	55	0.048	Shortnose gar	31	20.663	Shortnose gar	75	49.828	Blue catfish	65	129.927
9	Goldeye	52	0.045	Flathead catfish	22	57.945	Blue catfish	72	131.030	Flathead catfish	53	5.441
10	Shortnose gar	50	0.043	Common carp	20	71.394	Smallmouth buffalo	62	139.388	Longnose gar	50	32.564
11	Smallmouth buffalo	44	0.038	Channel catfish	19	21.036	Common carp	45	151.600	Goldeye	43	1.875
12	Channel catfish	43	0.037	Smallmouth buffalo	19	57.661	Goldeye	41	2.110	Common carp	41	121.116
13	Common carp	43	0.037	Silver carp	13	33.663	Flathead catfish	40	22.857	Channel shiner	38	0.029
14	Channel shiner	39	0.034	Striped bass x white bass	12	9.347	Channel catfish	25	11.916	Smallmouth buffalo	35	81.179
15	Flathead catfish	28	0.024	Goldeye	11	1.648	Channel shiner	20	0.017	Channel catfish	18	11.357
16	Grass carp	16	0.014	Channel shiner	10	0.007	Grass carp	14	90.115	Sand shiner	14	0.005
17	Bullhead minnow	15	0.013	Spotted bass	6	0.595	Blue sucker	13	20.138	Bullhead minnow	12	0.019
18	Black buffalo	9	0.008	Bullhead minnow	5	0.007	Bluegill	12	0.180	Grass carp	12	61.833
19	Bluegill	9	0.008	Shoal chub	5	0.003	Bullhead minnow	10	0.020	Blue sucker	11	13.126
20	Shovelnose sturgeon	9	0.008	Bighead carp	4	14.443	Spotted bass	10	0.848	Spotted bass	10	1.177
21	Orangespotted sunfish	8	0.007	Blue sucker	4	8.580	Black buffalo	8	27.658	Bluegill	9	0.258
22	Spotted bass	7	0.006	Sand shiner	4	0.003	Bigmouth buffalo	7	23.205	Bigmouth buffalo	7	11.161
23	Blue sucker	5	0.004	Quillback carpsucker	2	2.814	Green sunfish	6	0.052	Orangespotted sunfish	6	0.027
24	Green sunfish	4	0.003	Black buffalo	1	4.216	Mooneye	4	0.013	Shovelnose sturgeon	6	4.208
25	Walleye	4	0.003	Bluegill	1	0.068	Shovelnose sturgeon	4	2.734	Black buffalo	4	16.999
26	White bass	4	0.003	Chestnut lamprey	1	0.084	Shorthead redhorse	3	0.214	Bluntnose minnow	3	0.001
27	Logperch	3	0.003	Fathead minnow	1	0.002	Striped bass x white bass	3	1.521	Shorthead redhorse	2	0.736
28	Skipjack herring	3	0.003	Golden redhorse	1	0.128	White bass	3	0.728	Striped bass x white bass	2	0.103
29	White crappie	3	0.003	Grass carp	1	6.420	Freckled madtom	2	0.003	White bass	2	0.530
30	Bighead carp	2	0.002	Green sunfish	1	0.020	Orangespotted sunfish	2	0.013	Brook silverside	1	0.000
31	Bigmouth buffalo	2	0.002	Lake sturgeon	1	14.262	Quillback carpsucker	2	1.177	Chestnut lamprey	1	0.049
32	Bluntnose minnow	2	0.002	Orangespotted sunfish	1	0.009	White crappie	2	0.381	Goldfish	1	0.054

Rank	Upstream			Discharge			Thermally Exposed			Downstream		
	Taxon	Count	Weight	Taxon	Count	Weight	Taxon	Count	Weight	Taxon	Count	Weight
33	Brook silverside	1	0.001	Sauger	1	0.074	Black crappie	1	0.000	Logperch	1	0.003
34	Central stoneroller	1	0.001	Shorthead redhorse	1	0.392	Bluntnose minnow	1	0.001	Longear sunfish	1	0.065
35	Freckled madtom	1	0.001	Shovelnose sturgeon	1	0.430	Golden redhorse	1	0.212	Mooneye	1	0.018
36	Lake sturgeon	1	0.001	Suckermouth minnow	1	0.008	Goldfish	1	0.013	Rosyface shiner	1	0.002
37	Largescale stoneroller	1	0.001	White bass	1	0.000	Sand shiner	1	0.001	Skipjack herring	1	0.170
38	Mooneye	1	0.001				Sauger	1	0.733	Walleye	1	0.372
39	River shiner	1	0.001				Sauger x Walleye	1	0.135	White crappie	1	0.104
40	Sauger	1	0.001				Shoal chub	1	0.001			
41	Shoal chub	1	0.001				Silver lamprey	1	0.060			
42	Shorthead redhorse	1	0.001				Silver redhorse	1	0.018			
43	Silver chub	1	0.001				Skipjack herring	1	0.661			
44	Suckermouth minnow	1	0.001				Spotted sucker	1	0.190			
Total	Taxa	Count	Weight	Taxa	Count	Weight	Taxa	Count	Weight	Taxa	Count	Weight
	44	1156	6.95	37	948	1136.24	44	1561	1037.73	39	1994	771.74

Table B-3 Species composition (numbers caught and weight in kg) of fish sampled with hoop net at the LEC in 2017-2018, by zone. NS indicated no sampling in the zone.

Rank	Upstream			Discharge			Thermally Exposed			Downstream		
	Taxon	Count	Weight	Taxon	Count	Weight	Taxon	Count	Weight	Taxon	Count	Weight
1	Shovelnose sturgeon	41	25.597	NS	NS	NS	Blue sucker	29	74.455	Shovelnose sturgeon	35	38.291
2	Blue sucker	30	0.199	NS	NS	NS	Smallmouth buffalo	19	47.619	Blue sucker	23	51.735
3	Blue catfish	16	0.106	NS	NS	NS	Freshwater drum	14	11.086	Blue catfish	22	111.945
4	Freshwater drum	16	0.106	NS	NS	NS	Shovelnose sturgeon	14	9.611	Freshwater drum	14	14.412
5	Smallmouth buffalo	11	0.073	NS	NS	NS	River carpsucker	8	8.824	Goldeye	12	3.396
6	River carpsucker	10	0.066	NS	NS	NS	Flathead catfish	7	22.736	Smallmouth buffalo	12	29.384
7	Common carp	8	0.053	NS	NS	NS	Blue catfish	6	6.154	Flathead catfish	10	28.133
8	Flathead catfish	4	0.026	NS	NS	NS	Common carp	5	21.054	River carpsucker	8	10.468
9	Silver carp	3	0.020	NS	NS	NS	Goldeye	5	1.642	Common carp	5	21.806
10	Channel catfish	2	0.013	NS	NS	NS	Silver carp	5	13.002	Silver carp	4	7.180
11	Longnose gar	2	0.013	NS	NS	NS	Longnose gar	3	8.120	Channel catfish	3	6.250
12	Shorthead redhorse	2	0.013	NS	NS	NS	Shorthead redhorse	3	1.264	Longnose gar	3	10.890
13	Bighead carp	1	0.007	NS	NS	NS	Bigmouth buffalo	2	5.178	Bighead carp	2	18.220
14	Goldeye	1	0.007	NS	NS	NS	Channel catfish	2	1.079	Striped bass x white bass	2	0.880
15	Lake sturgeon	1	0.007	NS	NS	NS	Grass carp	2	13.575	Gizzard shad	1	0.850
16	Paddlefish	1	0.007	NS	NS	NS	Black buffalo	1	4.430	Grass carp	1	6.200
17	Sauger	1	0.007	NS	NS	NS	Sauger x Walleye	1	0.600	Mooneye	1	0.220
18	White bass	1	0.007	NS	NS	NS	Striped bass x white bass	1	0.390	Sauger x Walleye	1	1.930
Total	Taxa	Count	Weight	Taxa	Count	Weight	Taxa	Count	Weight	Taxa	Count	Weight
	18	151	26.33	0	0	0	18	127	250.82	18	159	362.19

Table B-4 Species composition (numbers caught and weight in kg) of fish sampled with Missouri mini-trawl at the LEC in 2017-2018, by zone. NS indicated no sampling in the zone.

Rank	Upstream			Discharge			Thermally Exposed			Downstream		
	Taxon	Count	Weight	Taxon	Count	Weight	Taxon	Count	Weight	Taxon	Count	Weight
1	Sicklefin chub	541	0.143	NS	NS	NS	Sicklefin chub	511	0.156	Shoal chub	490	0.099
2	Channel shiner	400	0.152	NS	NS	NS	Shoal chub	508	0.120	Channel shiner	412	0.126
3	Shoal chub	363	0.138	NS	NS	NS	Channel shiner	460	0.138	Sicklefin chub	394	0.112
4	Freshwater drum	270	0.103	NS	NS	NS	Freshwater drum	239	2.571	Channel catfish	224	0.573
5	Blue catfish	252	0.096	NS	NS	NS	Blue catfish	203	1.374	Blue catfish	183	2.710
6	Channel catfish	232	0.088	NS	NS	NS	Channel catfish	199	0.743	Freshwater drum	104	3.223
7	Gizzard shad	195	0.074	NS	NS	NS	Silver carp	80	4.539	Bullhead minnow	97	0.045
8	Silver carp	95	0.036	NS	NS	NS	Gizzard shad	63	0.088	Gizzard shad	76	0.092
9	Goldeye	50	0.019	NS	NS	NS	Bullhead minnow	59	0.024	Goldeye	71	0.055
10	Bullhead minnow	42	0.016	NS	NS	NS	Emerald shiner	58	0.091	Blacktail chubs	68	0.005
11	Red shiner	26	0.010	NS	NS	NS	Blacktail chubs	47	0.005	Silver carp	37	1.376
12	Emerald shiner	18	0.007	NS	NS	NS	Orangespotted sunfish	44	0.007	Sturgeon chub	25	0.012
13	Blacktail chubs	13	0.005	NS	NS	NS	Goldeye	34	0.072	White bass	14	0.004
14	Silver chub	13	0.005	NS	NS	NS	Sturgeon chub	23	0.008	Red shiner	10	0.003
15	Shovelnose sturgeon	12	0.005	NS	NS	NS	Red shiner	22	0.015	Shovelnose sturgeon	7	2.080
16	White bass	11	0.004	NS	NS	NS	Shovelnose sturgeon	19	9.337	Silver/bighead carp	6	0.003
17	Sucker - Ictiobinae	10	0.004	NS	NS	NS	Shortnose gar	11	6.491	Paddlefish	5	0.001
18	Minnow Family	8	0.003	NS	NS	NS	Paddlefish	10	0.004	Silver chub	5	0.001
19	Sunfish - Lepomis	8	0.003	NS	NS	NS	White bass	10	0.002	Sunfish - Lepomis	5	0.001
20	Pikeperch	7	0.003	NS	NS	NS	Sand shiner	6	0.002	Orangespotted sunfish	4	0.001
21	Sturgeon chub	7	0.003	NS	NS	NS	Common carp	5	0.002	Blue sucker	3	1.290
22	Sunfish - Pomoxis	6	0.002	NS	NS	NS	Silver chub	5	0.002	Bluegill	3	0.002
23	Paddlefish	5	0.002	NS	NS	NS	Bluegill	3	0.001	Common carp	3	0.008
24	Sand shiner	5	0.002	NS	NS	NS	Mooneyes	3	0.000	Longnose gar	3	2.092
25	Buffalofish	4	0.002	NS	NS	NS	Sunfish - Lepomis	3	0.000	Bluntnose minnow	2	0.001
26	Minnow Family group 2	4	0.002	NS	NS	NS	Flathead catfish	2	0.484	Emerald shiner	2	0.003
27	Silver/bighead carp	4	0.002	NS	NS	NS	Grass carp	2	0.005	Flathead catfish	2	0.004
28	Common carp	3	0.001	NS	NS	NS	Gravel chub	2	0.010	Golden redhorse	2	0.000
29	Orangespotted sunfish	2	0.001	NS	NS	NS	Logperch	2	0.000	Minnow Family	2	0.000
30	Shortnose gar	2	0.001	NS	NS	NS	Longnose gar	2	1.700	Mooneye	2	0.000
31	Spotted bass	2	0.001	NS	NS	NS	Minnow Family group 2	2	0.000	Mooneyes	2	0.000
32	Bluegill	1	0.000	NS	NS	NS	Sauger x Walleye	2	0.001	Buffalofish	1	0.000
33	Bluntnose minnow	1	0.000	NS	NS	NS	Sucker - Ictiobinae	2	0.000	Ghost shiner	1	0.000
34	Flathead catfish	1	0.000	NS	NS	NS	Sunfish – Pomoxis	2	0.000	Grass carp	1	0.003
35	Golden redhorse	1	0.000	NS	NS	NS	Bluntnose minnow	1	0.000	Mosquitofish	1	0.000

Rank	Upstream			Discharge			Thermally Exposed			Downstream		
	Taxon	Count	Weight	Taxon	Count	Weight	Taxon	Count	Weight	Taxon	Count	Weight
36	Grass carp	1	0.000	NS	NS	NS	Catfish (Ictalurus)	1	0.000	Sand shiner	1	0.000
37	Mooneyes	1	0.000	NS	NS	NS	Madtoms	1	0.000	Shiners - Notropis	1	0.000
38	Mosquitofish	1	0.000	NS	NS	NS	Shiners – Notropis	1	0.000	Smallmouth buffalo	1	1.280
39	River shiner	1	0.000	NS	NS	NS	Silverband shiner	1	0.001	Sucker - Ictiobinae	1	0.000
40	Shiners - Notropis	1	0.000	NS	NS	NS	Sturgeon – Scaphirhynchus	1	0.000	Sucker - Redhorses	1	0.000
41	Sturgeon - Scaphirhynchus	1	0.000	NS	NS	NS	Unidentifiedr	1	0.000	Temperate basses	1	0.000
42	Sucker - Catostominae	1	0.000	NS	NS	NS				Unidentified	1	0.000
43	Sucker - Catostomus	1	0.000	NS	NS	NS						
Total	Taxa	Count	Weight	Taxa	Count	Weight	Taxa	Count	Weight	Taxa	Count	Weight
	44	2622	0.94	0	0	0	41	2650	27.99	42	2274	15.20

Table B-5 Sampling statistics for fish monitoring program at LEC in 2017-2018 by gear, zone, and season. NS indicated no sampling in the zone.

Gear	Statistic	Upstream				Discharge				Thermally Exposed				Downstream			
		Win	Spr	Sum	Fal	Win	Spr	Sum	Fal	Win	Spr	Sum	Fal	Win	Spr	Sum	Fal
Bag Seine	Samples	10	6	8	8	NS	NS	NS	NS	10	6	8	8	10	6	8	8
	Count	745	248	445	3782	NS	NS	NS	NS	847	306	900	712	273	998	1463	902
	Weight (kg)	0.32	0.38	0.92	1.63	NS	NS	NS	NS	0.28	0.52	0.68	0.74	0.15	1.68	0.63	0.44
	Mn ct density	65.62	25.57	70.61	250.49	NS	NS	NS	NS	58.86	26.58	74.97	63.84	18.45	136.66	155.06	121.46
	se ct density	24.45	12.97	25.49	100.04	NS	NS	NS	NS	35.56	3.43	35.24	22.78	5.83	79.08	51.87	68.44
	Mn wt density	0.03	0.03	0.15	0.14	NS	NS	NS	NS	0.02	0.04	0.05	0.06	0.01	0.22	0.06	0.06
	se wt density	0.01	0.01	0.1	0.08	NS	NS	NS	NS	0.01	0.01	0.02	0.02	0	0.17	0.02	0.03
Electro-fishing	Samples	18	18	18	17	6	6	6	6	18	18	18	18	18	18	18	18
	Count	319	327	368	142	558	177	67	146	654	332	273	302	1140	287	285	282
	Weight (kg)	305.01	258.57	117.29	136.73	449.8	235.97	32.05	418.43	324.24	278.32	174.62	260.56	257.57	214.86	120.72	178.59
	Mn ct density	17	15.94	17.4	8.08	84.91	26.52	10.39	22.46	32.7	16.46	14.16	15.72	58.33	14.89	15.15	14.45
	se ct density	3.9	1.77	4.28	1.53	35.64	3.92	4.8	5.56	7.08	2.98	3.61	3.28	30.2	2.8	4.09	3.61
	Mn wt density	16.39	12.56	5.58	7.98	66.22	35.95	4.8	64.55	16.38	13.65	8.5	13.58	12.52	11.07	6.2	9.31
	se wt density	3.52	1.23	1.18	1.43	16.8	12.17	2.55	19	3.5	2.83	1.44	3.15	2.49	1.68	0.8	2.73
Hoop Net	Samples	18	18	18	18	NS	NS	NS	NS	18	18	18	18	18	18	18	18
	Count	28	51	42	30	NS	NS	NS	NS	36	36	21	34	32	57	31	39
	Weight (kg)	38.29	82.36	77.72	43.42	NS	NS	NS	NS	70.3	81.4	38.76	60.36	74.43	147.99	80.82	58.96
	Mn ct density	1.46	2.86	2.38	1.68	NS	NS	NS	NS	2.02	2.03	1.19	1.9	1.8	3.2	1.76	2.31
	se ct density	0.77	0.6	0.62	0.58	NS	NS	NS	NS	1.02	0.48	0.35	0.65	0.7	1.42	0.45	0.49
	Mn wt density	1.99	4.61	4.38	2.42	NS	NS	NS	NS	3.94	4.58	2.2	3.38	4.22	8.29	4.57	3.45
	se wt density	1.17	1.24	1.3	1.06	NS	NS	NS	NS	2.73	1.37	0.79	1.66	2.27	3.77	1.28	0.98
Missouri mini-trawl	Samples	24	24	24	24	NS	NS	NS	NS	24	24	24	24	24	24	24	24
	Count	247	613	1011	753	NS	NS	NS	NS	325	575	665	1087	371	475	784	645
	Weight (kg)	10.01	0.93	6.9	3.78	NS	NS	NS	NS	10.38	7.07	1.44	9.11	9.21	2.75	1.4	1.84
	Mn ct density	11.11	25	43.6	32.09	NS	NS	NS	NS	12.32	20.61	26.84	42.26	18.09	22.73	36.29	32.15
	se ct density	2.86	7.22	10.07	13.84	NS	NS	NS	NS	3.11	6.26	7.79	19.09	4.88	5.83	10.01	19.88
	Mn wt density	0.44	0.04	0.29	0.15	NS	NS	NS	NS	0.44	0.28	0.05	0.36	0.5	0.13	0.07	0.07
	se wt density	0.16	0.02	0.2	0.05	NS	NS	NS	NS	0.18	0.12	0.03	0.18	0.16	0.07	0.02	0.05

Table B-6 Sample size, estimated diversity and standard deviation at q = 0, 1, 2, and 3 for fish sampled with bag seine at the LEC in 2017-2018, by season, and zone. NS indicated no sampling in the zone.

Season	Statistic	Upstream			Discharge			Thermal			Downstream		
		Count		Weight	Count		Weight	Count		Weight	Count		Weight
		Estimate	StdDev	Estimate	Estimate	StdDev	Estimate	Estimate	StdDev	Estimate	Estimate	StdDev	Estimate
Winter	N	745	-	-	NS	-	-	847	-	-	273	-	-
	^{0}D	18	1.02	18	NS	NS	NS	16	2.33	15	15	1.05	15
	^{1}D	7.3	0.25	8.4	NS	NS	NS	3.2	0.15	5.3	4.8	0.37	5.1
	^{2}D	5.8	0.18	6.3	NS	NS	NS	2	0.08	4	2.7	0.22	3.4
	^{3}D	5.3	0.16	5.5	NS	NS	NS	1.8	0.06	3.5	2.3	0.16	2.9
Spring	N	248	-	-	NS	-	-	306	-	-	998	-	-
	^{0}D	20	1.73	20	NS	NS	NS	23	1.5	23	28	1.9	28
	^{1}D	7.6	0.62	7.9	NS	NS	NS	10.9	0.62	8	5.8	0.26	3.4
	^{2}D	5.2	0.41	5.7	NS	NS	NS	8	0.49	5.4	3.7	0.12	2
	^{3}D	4.5	0.34	4.8	NS	NS	NS	7	0.46	4.5	3.3	0.09	1.7
Summer	N	445	-	-	NS	-	-	900	-	-	1463	-	-
	^{0}D	15	1.41	15	NS	NS	NS	15	1.93	15	26	1.74	26
	^{1}D	7.2	0.32	3.6	NS	NS	NS	3.9	0.11	4	5.8	0.18	4.3
	^{2}D	5.8	0.25	2.4	NS	NS	NS	3.4	0.05	3	4.2	0.1	2.4
	^{3}D	5.2	0.25	2.1	NS	NS	NS	3.3	0.04	2.7	3.8	0.09	2
Fall	N	3782	-	-	NS	-	-	712	-	-	902	-	-
	^{0}D	22	1.81	22	NS	NS	NS	18	1.61	18	20	1.33	20
	^{1}D	3	0.06	5.6	NS	NS	NS	6.1	0.23	5.8	7.8	0.27	11.1
	^{2}D	1.9	0.03	4	NS	NS	NS	4.5	0.17	4.2	5.6	0.23	8.8
	^{3}D	1.7	0.02	3.4	NS	NS	NS	4	0.16	3.8	4.7	0.24	7.9

Table B-7 Sample size, estimated diversity and standard deviation at q = 0, 1, 2, and 3 for fish sampled with electrofishing at the LEC in 2017-2018, by season, and zone. NS indicated no sampling in the zone.

Season	Statistic	Upstream			Discharge			Thermal			Downstream		
		Count		Weight	Count		Weight	Count		Weight	Count		Weight
		Estimate	StdDev	Estimate	Estimate	StdDev	Estimate	Estimate	StdDev	Estimate	Estimate	StdDev	Estimate
Winter	N	319	-	-	558	-	-	654	-	-	1140	-	-
	^{0}D	28	2.49	28	29	3.18	29	30	3.44	30	31	2.84	31
	^{1}D	12.6	0.87	8.8	6.4	0.48	5.3	10.5	0.56	9	6.2	0.3	8.6
	^{2}D	8.7	0.69	7.3	3.1	0.2	3	7.1	0.33	7.1	3.4	0.16	6.7
	^{3}D	7.1	0.68	6.6	2.5	0.14	2.4	6.1	0.28	6.5	2.7	0.12	5.9
Spring	N	327	-	-	177	-	-	332	-	-	287	-	-
	^{0}D	33	2.36	33	22	1.62	22	27	1.23	27	30	2.87	30
	^{1}D	17.2	1.08	10.6	12.8	0.97	8.2	16.3	0.85	12.1	17.1	1.19	10.5
	^{2}D	12.9	0.83	8.3	10	0.77	5	11.8	0.91	9.8	12.5	1.1	8
	^{3}D	11.2	0.79	7.4	8.9	0.69	3.8	9.5	0.93	8.5	10.3	1.17	7
Summer	N	368	-	-	67	-	-	273	-	-	285	-	-
	^{0}D	29	1.82	29	14	0.98	14	30	3.18	30	23	1.75	23
	^{1}D	11.6	0.78	11.7	11.3	1	6.5	13.7	1.17	10.4	11.7	0.82	11
	^{2}D	6.2	0.57	9.9	9.4	1.12	5.6	8	0.9	8.4	7	0.73	9.3
	^{3}D	4.6	0.44	9	8.3	1.16	5.2	5.8	0.72	7.5	5.2	0.6	8.4
Fall	N	142	-	-	146	-	-	302	-	-	282	-	-
	^{0}D	23	2.17	23	18	1.6	18	24	2.02	24	22	1.31	22
	^{1}D	11.7	1.45	10.4	7.3	0.85	3.1	11.6	0.82	9.9	9	0.69	10.6
	^{2}D	6.6	1.15	8.3	4	0.55	1.8	7.7	0.68	7.9	5.2	0.49	9.1
	^{3}D	4.8	0.87	7.2	3.2	0.43	1.6	6.1	0.62	7.1	4.1	0.39	8.3

Table B-8 Sample size, estimated diversity and standard deviation at q = 0, 1, 2, and 3 for fish sampled with hoop net at the LEC in 2017-2018, by season, and zone. NS indicated no sampling in the zone.

Season	Statistic	Upstream			Discharge			Thermal			Downstream		
		Count		Weight	Count		Weight	Count		Weight	Count		Weight
		Estimate	StdDev	Estimate	Estimate	StdDev	Estimate	Estimate	StdDev	Estimate	Estimate	StdDev	Estimate
Winter	N	28	-	-	NS	-	-	36	-	-	32	-	-
	^{0}D	8	1.87	8	NS	NS	NS	7	1.07	7	10	1.77	10
	^{1}D	3.7	1.24	2.3	NS	NS	NS	3.7	0.69	1.8	6.5	1.52	3.6
	^{2}D	2.3	0.69	1.5	NS	NS	NS	2.5	0.49	1.3	4.8	1.3	2.7
	^{3}D	1.9	0.49	1.4	NS	NS	NS	2.1	0.38	1.2	4	1.13	2.5
Spring	N	51	-	-	NS	-	-	36	-	-	57	-	-
	^{0}D	8	0.72	8	NS	NS	NS	11	1.47	10	11	1.32	11
	^{1}D	6.6	0.58	6.5	NS	NS	NS	8.9	1.35	6.8	5.9	0.96	6
	^{2}D	5.8	0.62	5.3	NS	NS	NS	7.8	1.36	5.7	3.7	0.72	4.1
	^{3}D	5.3	0.64	4.5	NS	NS	NS	7.1	1.37	5.2	3	0.58	3.4
Summer	N	42	-	-	NS	-	-	21	-	-	31	-	-
	^{0}D	11	1.51	11	NS	NS	NS	9	1.48	9	11	1.53	11
	^{1}D	7.5	1.18	7.7	NS	NS	NS	7.7	1.41	7.4	9.1	1.37	9.1
	^{2}D	6	1.02	5.9	NS	NS	NS	7	1.38	6.5	8.1	1.34	8.3
	^{3}D	5.3	0.92	5	NS	NS	NS	6.6	1.35	6	7.5	1.31	7.9
Fall	N	30	-	-	NS	-	-	34	-	-	39	-	-
	^{0}D	8	1.43	8	NS	NS	NS	13	1.63	13	11	1.37	11
	^{1}D	4.9	1.03	5.5	NS	NS	NS	9.4	1.54	7.7	8.8	1.13	8.8
	^{2}D	3.5	0.82	4.7	NS	NS	NS	7.4	1.44	6	7.6	1.09	7.8
	^{3}D	3	0.7	4.4	NS	NS	NS	6.5	1.32	5.2	6.9	1.08	7.2

Table B-9 Sample size, estimated diversity and standard deviation at q = 0, 1, 2, and 3 for fish sampled with Missouri mini-trawl at the LEC in 2017-2018, by season, and zone. NS indicated no sampling in the zone.

Season	Statistic	Upstream			Discharge			Thermal			Downstream		
		Count		Weight	Count		Weight	Count		Weight	Count		Weight
		Estimate	StdDev	Estimate	Estimate	StdDev	Estimate	Estimate	StdDev	Estimate	Estimate	StdDev	Estimate
Winter	N	247	-	-	NS	-	-	325	-	-	371	-	-
	^0D	16	1.45	16	NS	NS	NS	19	1.22	19	22	2.35	21
	^1D	8.2	0.53	4.3	NS	NS	NS	7.7	0.52	4.2	7.8	0.52	6.3
	^2D	6.4	0.37	3.2	NS	NS	NS	5	0.37	3.5	5.3	0.32	5.4
	^3D	5.8	0.33	2.8	NS	NS	NS	4.2	0.31	3.2	4.6	0.27	5
Spring	N	613	-	-	NS	-	-	575	-	-	475	-	-
	^0D	28	3.41	28	NS	NS	NS	31	1.76	31	28	2.46	27
	^1D	10.6	0.54	5.9	NS	NS	NS	10.4	0.59	2.8	11	0.57	4.9
	^2D	8	0.37	4.2	NS	NS	NS	6.5	0.41	1.9	8.2	0.39	3.4
	^3D	7	0.4	3.7	NS	NS	NS	5.2	0.37	1.7	7.2	0.41	2.9
Summer	N	1011	-	-	NS	-	-	665	-	-	784	-	-
	^0D	28	2.12	28	NS	NS	NS	21	1.48	21	22	1.94	21
	^1D	10.7	0.35	2.7	NS	NS	NS	11.2	0.39	3.9	9.7	0.35	6.2
	^2D	8.3	0.27	1.8	NS	NS	NS	9.1	0.42	2.5	7.3	0.32	4.6
	^3D	7.4	0.3	1.6	NS	NS	NS	7.9	0.46	2.2	6.3	0.32	4.1
Fall	N	753	-	-	NS	-	-	1087	-	-	645	-	-
	^0D	15	1.03	15	NS	NS	NS	22	1.69	22	18	1.42	16
	^1D	5.4	0.22	2.8	NS	NS	NS	6.2	0.22	5.1	5.7	0.26	2.6
	^2D	3.7	0.16	1.8	NS	NS	NS	4.6	0.13	3.4	4.1	0.15	1.8
	^3D	3.2	0.14	1.6	NS	NS	NS	4.2	0.1	2.9	3.8	0.13	1.6

Table B-10 Count and weight (kg) by fish type for fish sampled with bag seine at the LEC in 2017-2018, by season, and zone. R = Rough, F = Forage, P = Panfish, G = Gamefish, and S = Special Interest. NS indicated no sampling in the zone.

Season	Statistic	Upstream					Discharge					Thermal					Downstream				
		R	F	P	G	S	R	F	P	G	S	R	F	P	G	S	R	F	P	G	S
Winter	Count	9	732	4	0		NS	NS	NS	NS	NS	5	842	0	1		10	257	6	0	
	Fraction	0.012	0.983	0.005	0		NS	NS	NS	NS	NS	0.006	0.993	0	0.001		0.037	0.941	0.022	0	
	Weight	0.030	0.286	0.005	0		NS	NS	NS	NS	NS	0.024	0.238	0	0.013		0.042	0.102	0.006	0	
	Fraction	0.093	0.891	0.017	0		NS	NS	NS	NS	NS	0.088	0.863	0	0.049		0.280	0.680	0.041	0	
	Total Ct	745					NS					848					273				
	Total Wt	0.322					NS					0.276					0.15				
Spring	Count	26	212	5	6		NS	NS	NS	NS	NS	54	223	8	21		54	907	20	19	
	Fraction	0.104	0.851	0.020	0.024		NS	NS	NS	NS	NS	0.176	0.729	0.026	0.069		0.052	0.909	0.020	0.019	
	Weight	0.129	0.172	0.031	0.050		NS	NS	NS	NS	NS	0.058	0.240	0.008	0.217		1.263	0.376	0.021	0.020	
	Fraction	0.338	0.450	0.082	0.130		NS	NS	NS	NS	NS	0.110	0.460	0.015	0.415		0.752	0.224	0.013	0.012	
	Total Ct	249					NS					306					998				
	Total Wt	0.383					NS					0.521					1.681				
Summer	Count	89	338	18	0		NS	NS	NS	NS	NS	2690	628	0	3		531	899	17	16	
	Fraction	0.200	0.760	0.040	0		NS	NS	NS	NS	NS	0.299	0.698	0	0.003		0.363	0.614	0.012	0.011	
	Weight	0.790	0.116	0.014	0		NS	NS	NS	NS	NS	0.341	0.309	0	0.028		0.413	0.178	0.028	0.007	
	Fraction	0.858	0.126	0.015	0		NS	NS	NS	NS	NS	0.503	0.456	0	0.041		0.660	0.285	0.045	0.010	
	Total Ct	445					NS					900					1463				
	Total Wt	0.92					NS					0.677					0.626				
Fall	Count	83	3682	9	8		NS	NS	NS	NS	NS	44	661	2	5		21	865	11	5	
	Fraction	0.022	0.974	0.002	0.002		NS	NS	NS	NS	NS	0.062	0.928	0.003	0.007		0.023	0.959	0.012	0.006	
	Weight	1.019	0.595	0.008	0.009		NS	NS	NS	NS	NS	0.275	0.441	0.002	0.024		0.145	0.252	0.017	0.022	
	Fraction	0.625	0.365	0.005	0.005		NS	NS	NS	NS	NS	0.370	0.594	0.003	0.033		0.333	0.580	0.038	0.049	
	Total Ct	3782					NS					712					902				
	Total Wt	1.630					NS					0.742					0.435				

Table B-11 Count and weight (kg) by fish type for fish sampled with electrofishing at the LEC in 2017-2018, by season, and zone. R = Rough, F = Forage, P = Panfish, G = Gamefish, and S = Special Interest. NS indicated no sampling in the zone.

Season	Statistic	Upstream					Discharge					Thermal					Downstream				
		R	F	P	G	S	R	F	P	G	S	R	F	P	G	S	R	F	P	G	S
Winter	Count	192	69	5	51	2	126	337	1	93	1	317	270	12	55	0	296	788	6	49	1
	Fraction	0.602	0.216	0.016	0.160	0.006	0.226	0.604	0.002	0.167	0.002	0.485	0.413	0.018	0.084	0.000	0.260	0.691	0.005	0.043	0.001
	Weight	216.651	0.410	0.572	86.017	1.360	127.958	1.686	0.020	319.704	0.430	238.305	2.386	0.603	82.945	0.000	164.609	0.327	0.212	91.395	1.030
	Fraction	0.710	0.001	0.002	0.282	0.004	0.284	0.004	0.000	0.711	0.001	0.735	0.007	0.002	0.256	0.000	0.639	0.001	0.001	0.355	0.004
	Total Ct	319					558					654					1140				
	Total Wt	305.01					449.80					324.24					257.57				
Spring	Count	161	71	16	77	2	89	44	3	40	1	173	92	9	56	2	141	83	10	52	1
	Fraction	0.492	0.217	0.049	0.235	0.006	0.503	0.249	0.017	0.226	0.006	0.521	0.277	0.027	0.169	0.006	0.491	0.289	0.035	0.181	0.003
	Weight	167.700	0.305	2.823	80.171	7.567	92.601	0.066	0.077	128.960	14.262	204.332	0.137	0.691	72.227	0.934	163.358	0.627	0.759	49.147	0.970
	Fraction	0.649	0.001	0.011	0.310	0.029	0.392	0.000	0.000	0.547	0.060	0.734	0.000	0.002	0.260	0.003	0.760	0.003	0.004	0.229	0.005
	Total Ct	327					177					332					327				
	Total Wt	258.565					235.966					278.321					258.57				
Summer	Count	218	84	5	56	5	20	26	0	21	0	162	51	4	56	0	170	52	1	58	4
	Fraction	0.592	0.228	0.014	0.152	0.014	0.299	0.388	0.000	0.313	0.000	0.593	0.187	0.015	0.205	0.000	0.596	0.182	0.004	0.204	0.014
	Weight	88.455	0.685	0.119	24.576	3.459	20.834	0.208	0.000	11.009	0.000	89.624	0.149	0.040	84.803	0.000	76.779	0.614	0.005	41.119	2.208
	Fraction	0.754	0.006	0.001	0.210	0.029	0.650	0.006	0.000	0.343	0.000	0.513	0.001	0.000	0.486	0.000	0.636	0.005	0.000	0.341	0.018
	Total Ct	368					67					273					368				
	Total Wt	117.295					32.051					174.616					117.29				
Fall	Count	97	16	2	26	1	47	20	0	79	0	209	36	1	54	2	224	24	2	32	0
	Fraction	0.683	0.113	0.014	0.183	0.007	0.322	0.137	0.000	0.541	0.000	0.692	0.119	0.003	0.179	0.007	0.794	0.085	0.007	0.113	0.000
	Weight	83.529	0.600	0.078	52.028	0.490	73.984	0.058	0.000	344.384	0.000	166.344	0.735	0.020	91.658	1.800	118.700	0.823	0.008	59.056	0.000
	Fraction	0.611	0.004	0.001	0.381	0.004	0.177	0.000	0.000	0.823	0.000	0.638	0.003	0.000	0.352	0.007	0.665	0.005	0.000	0.331	0.000
	Total Ct	142					146					302					282				
	Total Wt	136.73					418.43					260.56					178.59				

Table B-12 Count and weight (kg) by fish type for fish sampled with hoop net at the LEC in 2017-2018, by season, and zone. R = Rough, F = Forage, P = Panfish, G = Gamefish, and S = Special Interest. NS indicated no sampling in the zone.

Season	Statistic	Upstream					Discharge					Thermal					Downstream				
		R	F	P	G	S	R	F	P	G	S	R	F	P	G	S	R	F	P	G	S
Winter	Count	22	0	0	3	3	NS	NS	NS	NS	NS	25	4	0	4	3	16	7	0	8	1
	Fraction	0.786	0.000	0.000	0.107	0.107	NS	NS	NS	NS	NS	0.694	0.111	0.000	0.111	0.083	0.500	0.219	0.000	0.250	0.031
	Weight	34.178	0.000	0.000	1.930	2.177	NS	NS	NS	NS	NS	62.520	1.332	0.000	4.238	2.206	32.540	1.872	0.000	39.410	0.610
	Fraction	0.893	0.000	0.000	0.050	0.057	NS	NS	NS	NS	NS	0.889	0.019	0.000	0.060	0.031	0.437	0.025	0.000	0.529	0.008
	Total Ct	28					NS					36					32				
	Total Wt	38.29					NS					70.30					74.432				
Spring	Count	24	0	0	14	13	NS	NS	NS	NS	NS	17	0	0	14	5	13	0	0	17	27
	Fraction	0.471	0.000	0.000	0.275	0.255	NS	NS	NS	NS	NS	0.472	0.000	0.000	0.389	0.139	0.228	0.000	0.000	0.298	0.474
	Weight	43.151	0.000	0.000	32.550	6.662	NS	NS	NS	NS	NS	39.160	0.000	0.000	38.731	3.513	29.362	0.000	0.000	86.136	32.487
	Fraction	0.524	0.000	0.000	0.395	0.081	NS	NS	NS	NS	NS	0.481	0.000	0.000	0.476	0.043	0.198	0.000	0.000	0.582	0.220
	Total Ct	51					NS					36					57				
	Total Wt	82.36					NS					81.40					147.99				
Summer	Count	17	0	0	13	12	NS	NS	NS	NS	NS	11	0	0	6	4	15	0	0	15	1
	Fraction	0.405	0.000	0.000	0.310	0.286	NS	NS	NS	NS	NS	0.524	0.000	0.000	0.286	0.190	0.484	0.000	0.000	0.484	0.032
	Weight	35.962	0.000	0.000	30.220	11.542	NS	NS	NS	NS	NS	24.246	0.000	0.000	11.748	2.761	51.428	0.000	0.000	28.150	1.240
	Fraction	0.463	0.000	0.000	0.389	0.148	NS	NS	NS	NS	NS	0.626	0.000	0.000	0.303	0.071	0.636	0.000	0.000	0.348	0.015
	Total Ct	42					NS					21					31				
	Total Wt	77.72					NS					38.76					80.82				
Fall	Count	9	1	1	4	15	NS	NS	NS	NS	NS	17	1	0	14	2	17	6	0	10	6
	Fraction	0.300	0.033	0.033	0.133	0.500	NS	NS	NS	NS	NS	0.500	0.029	0.000	0.412	0.059	0.436	0.154	0.000	0.256	0.154
	Weight	15.104	0.471	0.501	5.381	21.964	NS	NS	NS	NS	NS	29.884	0.310	0.000	29.039	1.131	28.431	1.744	0.000	24.826	3.954
	Fraction	0.348	0.011	0.012	0.124	0.506	NS	NS	NS	NS	NS	0.495	0.005	0.000	0.481	0.019	0.482	0.030	0.000	0.421	0.067
	Total Ct	30					NS					34					39				
	Total Wt	43.42					NS					60.36					58.96				

Table B-13 Count and weight (kg) by fish type for fish sampled with Missouri mini-trawl at the LEC in 2017-2018, by season, and zone. R = Rough, F = Forage, P = Panfish, G = Gamefish, and S = Special Interest. NS indicated no sampling in the zone.

Season	Statistic	Upstream					Discharge					Thermal					Downstream				
		R	F	P	G	S	R	F	P	G	S	R	F	P	G	S	R	F	P	G	S
Winter	Count	26	120	2	95	4	NS	NS	NS	NS	NS	31	243	1	50	0	19	273	2	74	3
	Fraction	0.105	0.486	0.008	0.385	0.016	NS	NS	NS	NS	NS	0.095	0.748	0.003	0.154	0.000	0.051	0.736	0.005	0.199	0.008
	Weight	7.488	0.057	0.001	0.604	1.863	NS	NS	NS	NS	NS	9.846	0.084	0.000	0.446	0.000	5.121	0.083	0.001	3.368	0.640
	Fraction	0.748	0.006	0.000	0.060	0.186	NS	NS	NS	NS	NS	0.949	0.008	0.000	0.043	0.000	0.556	0.009	0.000	0.366	0.069
	Total Ct	247					NS					325					371				
	Total Wt	10.01					NS					10.38					9.21				
Spring	Count	247	251	17	89	7	NS	NS	NS	NS	NS	213	256	14	71	19	57	317	16	78	7
	Fraction	0.404	0.411	0.028	0.146	0.011	NS	NS	NS	NS	NS	0.372	0.447	0.024	0.124	0.033	0.120	0.667	0.034	0.164	0.015
	Weight	0.136	0.132	0.002	0.609	0.053	NS	NS	NS	NS	NS	1.091	0.190	0.003	0.827	4.960	1.990	0.158	0.004	0.495	0.106
	Fraction	0.146	0.142	0.002	0.653	0.057	NS	NS	NS	NS	NS	0.154	0.027	0.000	0.117	0.701	0.723	0.058	0.001	0.180	0.038
	Total Ct	611					NS					573					475				
	Total Wt	0.93					NS					7.07					2.75				
Summer	Count	263	473	9	264	2	NS	NS	NS	NS	NS	119	298	45	200	3	115	425	8	236	0
	Fraction	0.260	0.468	0.009	0.261	0.002	NS	NS	NS	NS	NS	0.179	0.448	0.068	0.301	0.005	0.147	0.542	0.010	0.301	0.000
	Weight	5.154	0.092	0.002	0.960	0.691	NS	NS	NS	NS	NS	0.957	0.076	0.006	0.399	0.000	0.923	0.133	0.001	0.348	0.000
	Fraction	0.747	0.013	0.000	0.139	0.100	NS	NS	NS	NS	NS	0.665	0.053	0.004	0.277	0.000	0.657	0.095	0.001	0.248	0.000
	Total Ct	1011					NS					665					784				
	Total Wt	6.90					NS					1.44					1.40				
Fall	Count	47	651	0	50	5	NS	NS	NS	NS	NS	41	951	2	85	8	46	572	1	23	2
	Fraction	0.062	0.865	0.000	0.066	0.007	NS	NS	NS	NS	NS	0.038	0.875	0.002	0.078	0.007	0.071	0.888	0.002	0.036	0.003
	Weight	0.391	0.231	0.000	0.379	2.784	NS	NS	NS	NS	NS	3.502	0.293	0.001	0.929	4.381	0.056	0.090	0.001	0.356	1.335
	Fraction	0.103	0.061	0.000	0.100	0.736	NS	NS	NS	NS	NS	0.385	0.032	0.000	0.102	0.481	0.030	0.049	0.001	0.194	0.727
	Total Ct	753					NS					1087					644				
	Total Wt	3.78					NS					9.11					1.84				

Table B-14 Count and weight (kg) by fish type for heat and pollution tolerant and intolerant fish sampled with bag seine at the LEC in 2017-2018, by season, and zone. NS indicated no sampling in the zone.

Season	Statistic	Upstream				Upstream				Upstream				Upstream			
		Heat		Pollution		Heat		Pollution		Heat		Pollution		Heat		Pollution	
		Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant
Winter	Count	85	0	188	0	NS	NS	NS	NS	73	0	584	0	18	0	165	0
	Fraction	0.114	0.000	0.252	0.000	NS	NS	NS	NS	0.086	0.000	0.689	0.000	0.066	0.000	0.604	0.000
	Weight	0.106	0.000	0.079	0.000	NS	NS	NS	NS	0.136	0.000	0.066	0.000	0.048	0.000	0.072	0.000
	Fraction	0.328	0.000	0.244	0.000	NS	NS	NS	NS	0.492	0.000	0.239	0.000	0.320	0.000	0.481	0.000
	Total Ct	745				NS				847				273			
	Total Wt	0.32				NS				0.28				0.15			
Spring	Count	43	12	12	12	NS	NS	NS	NS	112	6	36	6	60	15	394	18
	Fraction	0.173	0.048	0.048	0.048	NS	NS	NS	NS	0.366	0.020	0.118	0.020	0.060	0.015	0.395	0.018
	Weight	0.067	0.011	0.011	0.011	NS	NS	NS	NS	0.360	0.005	0.043	0.005	1.290	0.007	0.199	0.008
	Fraction	0.176	0.030	0.028	0.030	NS	NS	NS	NS	0.690	0.009	0.083	0.009	0.767	0.004	0.118	0.005
	Total Ct	248				NS				306				998			
	Total Wt	0.38				NS				0.52				1.68			
Summer	Count	192	0	112	1	NS	NS	NS	NS	558	4	298	5	893	0	353	0
	Fraction	0.431	0.000	0.252	0.002	NS	NS	NS	NS	0.620	0.004	0.331	0.006	0.610	0.000	0.241	0.000
	Weight	0.818	0.000	0.032	0.000	NS	NS	NS	NS	0.494	0.018	0.121	0.020	0.481	0.000	0.068	0.000
	Fraction	0.889	0.000	0.035	0.000	NS	NS	NS	NS	0.729	0.026	0.179	0.029	0.768	0.000	0.108	0.000
	Total Ct	445				NS				900				1463			
	Total Wt	0.92				NS				0.68				0.63			
Fall	Count	286	0	2695	1	NS	NS	NS	NS	294	0	188	1	89	0	307	1
	Fraction	0.076	0.000	0.713	0.000	NS	NS	NS	NS	0.413	0.000	0.264	0.001	0.099	0.000	0.340	0.001
	Weight	1.261	0.000	0.173	0.001	NS	NS	NS	NS	0.484	0.000	0.146	0.011	0.170	0.000	0.068	0.001
	Fraction	0.773	0.000	0.106	0.001	NS	NS	NS	NS	0.653	0.000	0.197	0.015	0.391	0.000	0.157	0.003
	Total Ct	3782				NS				712				902			
	Total Wt	1.63				NS				0.74				0.44			

Table B-15 Count and weight (kg) by fish type for heat and pollution tolerant and intolerant fish sampled with electrofishing at the LEC in 2017-2018, by season, and zone. NS indicated no sampling in the zone.

Season	Statistic	Upstream				Upstream				Upstream				Upstream			
		Heat		Pollution		Heat		Pollution		Heat		Pollution		Heat		Pollution	
		Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant
Winter	Count	130	14	55	10	120	6	315	6	418	16	164	14	395	6	654	5
	Fraction	0.408	0.044	0.172	0.031	0.215	0.011	0.565	0.011	0.639	0.024	0.251	0.021	0.346	0.005	0.574	0.004
	Weight	143.674	4.841	104.65	0.333	133.732	1.5193	28.3706	1.5193	198.935	2.2476	126.16	1.38	123.805	0.6985	84.1013	0.2231
	Fraction	0.471	0.016	0.343	0.001	0.297	0.003	0.063	0.003	0.614	0.007	0.389	0.004	0.481	0.003	0.327	0.001
	Total Ct	319				558				654				1140			
	Total Wt	305.01				449.80				324.24				257.57			
Spring	Count	144	6	74	8	109	0	32	0	190	2	105	8	155	9	85	14
	Fraction	0.44	0.018	0.226	0.024	0.616	0	0.181	0	0.572	0.006	0.316	0.024	0.54	0.031	0.296	0.049
	Weight	116.204	0.3734	55.756	3.0137	105.841	0	35.0145	0	170.268	0.381	93.4924	14.692	123.247	0.352	86.391	8.133
	Fraction	0.449	0.001	0.216	0.012	0.449	0	0.148	0	0.612	0.001	0.336	0.053	0.574	0.002	0.402	0.038
	Total Ct	327				177				332				287			
	Total Wt	258.57				235.97				278.32				214.86			
Summer	Count	270	29	16	29	44	5	9	5	199	15	21	20	185	20	41	26
	Fraction	0.734	0.079	0.043	0.079	0.657	0.075	0.134	0.075	0.729	0.055	0.077	0.073	0.649	0.07	0.144	0.091
	Weight	59.0207	0.5297	24.2537	4.1308	19.134	0.183	6.979	0.183	92.2269	0.1061	34.2578	5.5521	57.964	0.571	34.113	4.721
	Fraction	0.503	0.005	0.207	0.035	0.597	0.006	0.218	0.006	0.528	0.001	0.196	0.032	0.48	0.005	0.283	0.039
	Total Ct	368				67				273				285			
	Total Wt	117.29				32.05				174.62				120.72			
Fall	Count	53	12	17	12	52	1	9	1	190	16	19	17	181	11	21	12
	Fraction	0.373	0.085	0.12	0.085	0.356	0.007	0.062	0.007	0.629	0.053	0.063	0.056	0.642	0.039	0.074	0.043
	Weight	67.476	0.591	31.714	0.591	59.945	0.02	34.877	0.02	107.78	0.637	42.314	0.849	87.9635	0.747	47.021	2.007
	Fraction	0.494	0.004	0.232	0.004	0.143	0	0.083	0	0.414	0.002	0.162	0.003	0.493	0.004	0.263	0.011
	Total Ct	142				146				302				282			
	Total Wt	136.73				418.43				260.56				178.59			

Table B-16 Count and weight (kg) by fish type for heat and pollution tolerant and intolerant fish sampled with hoop net at the LEC in 2017-2018, by season, and zone. NS indicated no sampling in the zone.

Season	Statistic	Upstream				Upstream				Upstream				Upstream			
		Heat		Pollution		Heat		Pollution		Heat		Pollution		Heat		Pollution	
		Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant
Winter	Count	2	1	1	18	NS	NS	NS	NS	1	4	0	26	5	8	0	19
	Fraction	0.071	0.036	0.036	0.643	NS	NS	NS	NS	0.028	0.111	0	0.722	0.156	0.25	0	0.594
	Weight	2.24	0.59	1.84	30.858	NS	NS	NS	NS	0.549	1.332	0	62.485	6.198	3.802	0	29.222
	Fraction	0.059	0.015	0.048	0.806	NS	NS	NS	NS	0.008	0.019	0	0.889	0.083	0.051	0	0.393
	Total Ct	28				NS				36				32			
	Total Wt	38.29				NS				70.30				74.43			
Spring	Count	11	0	6	4	NS	NS	NS	NS	18	0	8	3	15	0	1	5
	Fraction	0.216	0	0.118	0.078	NS	NS	NS	NS	0.5	0	0.222	0.083	0.263	0	0.018	0.088
	Weight	17.423	0	19.273	10.49	NS	NS	NS	NS	49.223	0	27.215	5.572	40.068	0	1.65	10.147
	Fraction	0.212	0	0.234	0.127	NS	NS	NS	NS	0.605	0	0.334	0.068	0.271	0	0.011	0.069
	Total Ct	51				NS				36				57			
	Total Wt	82.36				NS				81.40				147.99			
Summer	Count	19	0	1	9	NS	NS	NS	NS	8	0	1	3	15	0	3	3
	Fraction	0.452	0	0.024	0.214	NS	NS	NS	NS	0.381	0	0.048	0.143	0.484	0	0.097	0.097
	Weight	41.232	0	4.39	23.155	NS	NS	NS	NS	19.33	0	4.58	5.25	42.025	0	14.02	7.908
	Fraction	0.53	0	0.056	0.298	NS	NS	NS	NS	0.499	0	0.118	0.135	0.52	0	0.173	0.098
	Total Ct	42				NS				21				31			
	Total Wt	77.72				NS				38.76				80.82			
Fall	Count	1	1	3	1	NS	NS	NS	NS	19	2	1	2	8	6	5	9
	Fraction	0.033	0.033	0.1	0.033	NS	NS	NS	NS	0.559	0.059	0.029	0.059	0.205	0.154	0.128	0.231
	Weight	3.43	0.471	11.254	0.471	NS	NS	NS	NS	37.456	0.91	2.261	2.79	23.084	1.744	13.316	8.074
	Fraction	0.079	0.011	0.259	0.011	NS	NS	NS	NS	0.621	0.015	0.037	0.046	0.392	0.03	0.226	0.137
	Total Ct	30				NS				34				39			
	Total Wt	43.42				NS				60.36				58.96			

Table B-17 Count and weight (kg) by fish type for heat and pollution tolerant and intolerant fish sampled with Missouri mini-trawl at the LEC in 2017-2018, by season, and zone. NS indicated no sampling in the zone.

Season	Statistic	Upstream				Upstream				Upstream				Upstream			
		Heat		Pollution		Heat		Pollution		Heat		Pollution		Heat		Pollution	
		Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant	Tolerant	Intolerant
Winter	Count	55	0	4	0	NS	NS	NS	NS	59	0	14	0	38	0	5	0
	Fraction	0.223	0	0.016	0	NS	NS	NS	NS	0.182	0	0.043	0	0.102	0	0.013	0
	Weight	6.6586	0	4.881	0	NS	NS	NS	NS	9.2915	0	3.3295	0	3.9863	0	1.3635	0
	Fraction	0.665	0	0.487	0	NS	NS	NS	NS	0.895	0	0.321	0	0.433	0	0.148	0
	Total Ct	247				NS				325				371			
	Total Wt	10.01				NS				10.38				9.21			
Spring	Count	147	41	2	46	NS	NS	NS	NS	66	29	4	40	49	64	2	74
	Fraction	0.24	0.067	0.003	0.075	NS	NS	NS	NS	0.115	0.05	0.007	0.07	0.103	0.135	0.004	0.156
	Weight	0.333	0.0055	0.0019	0.0071	NS	NS	NS	NS	0.2867	0.0072	0.0024	0.0164	0.7896	0.0171	0.0005	1.3082
	Fraction	0.357	0.006	0.002	0.008	NS	NS	NS	NS	0.041	0.001	0	0.002	0.287	0.006	0	0.475
	Total Ct	613				NS				575				475			
	Total Wt	0.93				NS				7.07				2.75			
Summer	Count	277	8	73	9	NS	NS	NS	NS	149	7	53	7	241	11	33	11
	Fraction	0.274	0.008	0.072	0.009	NS	NS	NS	NS	0.224	0.011	0.08	0.011	0.307	0.014	0.042	0.014
	Weight	0.4563	0.0379	0.0171	0.041	NS	NS	NS	NS	0.9641	0.036	0.0135	0.036	0.6001	0.0387	0.017	0.0387
	Fraction	0.066	0.005	0.002	0.006	NS	NS	NS	NS	0.67	0.025	0.009	0.025	0.427	0.028	0.012	0.028
	Total Ct	1011				NS				665				784			
	Total Wt	6.90				NS				1.44				1.40			
Fall	Count	68	2	46	2	NS	NS	NS	NS	141	1	37	2	23	0	12	0
	Fraction	0.09	0.003	0.061	0.003	NS	NS	NS	NS	0.13	0.001	0.034	0.002	0.036	0	0.019	0
	Weight	0.0898	0.055	0.024	0.055	NS	NS	NS	NS	3.5932	0.029	1.211	0.0329	0.0481	0	0.007	0
	Fraction	0.024	0.015	0.006	0.015	NS	NS	NS	NS	0.395	0.003	0.133	0.004	0.026	0	0.004	0
	Total Ct	753				NS				1087				645			
	Total Wt	3.78				NS				9.11				1.84			

Table B-18 Means and standard errors for individual metrics, and standardized differences for winter fish sampling at the LEC in 2017-2018.

Gear	Type	Metric	Upstream Reference			Thermally Exposed				Downstream			
			Mean	Std Err	N	Mean	Std Err	N	Std Diff	Mean	Std Err	N	Std Diff
Bag Seine	Density	Count	65.617	24.45	10	58.859	35.561	10	-0.157	18.447	5.833	10	-1.876
		Weight	0.026	0.009	10	0.017	0.009	10	-0.712	0.009	0.003	10	-1.704
	Diversity	^{0}D Ct	18	1.02	745	16	2.326	847	-0.788	15	1.049	273	-2.051
		^{1}D Ct	7.301	0.253	745	3.208	0.146	847	14.020	4.805	0.371	273	-5.568
		^{2}D Ct	5.779	0.176	745	2.03	0.077	847	-19.522	2.739	0.217	273	-10.873
		^{3}D Ct	5.316	0.162	745	1.759	0.058	847	-20.725	2.254	0.161	273	-13.404
	Heat Tolerance	Fraction Ct Intolerant	0	0	745	0	0	847		0	0	273	
		Fraction Wt Intolerant	0	0	745	0	0	847		0	0	273	
		Fraction Ct Tolerant	0.114	0.012	745	0.086	0.01	847	1.853	0.066	0.015	273	2.525
		Fraction Wt Tolerant	0.328	0.017	745	0.492	0.017	847	-6.746	0.32	0.028	273	0.242
	Composition	Fraction Ct Non-R	0.988	0.004	745	0.994	0.003	847	1.252	0.963	0.011	273	-2.066
		Fraction Wt Non-R	0.907	0.011	745	0.912	0.01	847	0.347	0.72	0.027	273	-6.408
	Pollution Tolerance	Fraction Ct Tolerant	0.252	0.016	745	0.689	0.016	847	-19.427	0.604	0.03	273	-10.475
		Fraction Wt Tolerant	0.244	0.016	745	0.239	0.015	847	0.233	0.481	0.03	273	-6.952
		Fraction Ct Intolerant	0	0	745	0	0	847		0	0	273	
		Fraction Wt Intolerant	0	0	745	0	0	847		0	0	273	
Electrofishing	Density	Count	17.003	3.899	18	32.697	7.083	18	1.941	58.332	30.2	18	1.357
		Weight	16.387	3.517	18	16.377	3.501	18	-0.002	12.524	2.49	18	-0.896
	Diversity	^{0}D Ct	28	2.486	319	30	3.441	654	0.471	31	2.842	1140	0.794
		^{1}D Ct	12.64	0.865	319	10.474	0.557	654	-2.104	6.237	0.304	1140	-6.982
		^{2}D Ct	8.676	0.691	319	7.129	0.333	654	-2.017	3.387	0.156	1140	-7.467
		^{3}D Ct	7.084	0.681	319	6.095	0.285	654	-1.340	2.721	0.117	1140	-6.314
	Heat Tolerance	Fraction Ct Intolerant	0.044	0.011	319	0.024	0.006	654	-1.545	0.005	0.002	1140	-3.341
		Fraction Wt Intolerant	0.016	0.007	319	0.007	0.003	654	-1.162	0.003	0.002	1140	-1.803
		Fraction Ct Tolerant	0.408	0.028	319	0.639	0.019	654	-6.934	0.346	0.014	1140	2.006
		Fraction Wt Tolerant	0.471	0.028	319	0.614	0.019	654	-4.229	0.481	0.015	1140	-0.316
	Composition	Fraction Ct Non-R	0.348	0.027	319	0.489	0.02	654	4.264	0.732	0.013	1140	12.920
		Fraction Wt Non-R	0.132	0.019	319	0.129	0.013	654	-0.130	0.273	0.013	1140	6.106
	Pollution Tolerance	Fraction Ct Tolerant	0.172	0.021	319	0.251	0.017	654	-2.916	0.574	0.015	1140	-15.637
		Fraction Wt Tolerant	0.343	0.027	319	0.389	0.019	654	-1.406	0.327	0.014	1140	0.533
		Fraction Ct Intolerant	0.031	0.01	319	0.021	0.006	654	-0.892	0.004	0.002	1140	-2.732
		Fraction Wt Intolerant	0.001	0.002	319	0.004	0.002	654	0.988	0.001	0.001	1140	0.000
Hoop net	Density	Count	1.459	0.766	18	2.021	1.015	18	0.442	1.803	0.697	18	0.332
		Weight	1.993	1.166	18	3.941	2.733	18	0.656	4.215	2.267	18	0.872
	Diversity	^{0}D Ct	8	1.87	28	7	1.067	36	-0.465	10	1.769	32	0.777
		^{1}D Ct	3.695	1.239	28	3.739	0.691	36	0.031	6.543	1.522	32	1.451
		^{2}D Ct	2.292	0.693	28	2.473	0.491	36	0.213	4.785	1.303	32	1.689
		^{3}D Ct	1.933	0.489	28	2.081	0.382	36	0.237	4	1.134	32	1.673
	Heat Tolerance	Fraction Ct Intolerant	0.036	0.035	28	0.111	0.052	36	1.189	0.25	0.077	32	2.540
		Fraction Wt Intolerant	0.015	0.023	28	0.019	0.023	36	0.124	0.051	0.039	32	0.797
		Fraction Ct Tolerant	0.071	0.049	28	0.028	0.027	36	0.771	0.156	0.064	32	-1.057
		Fraction Wt Tolerant	0.059	0.045	28	0.008	0.015	36	1.087	0.083	0.049	32	-0.363
	Composition	Fraction Ct Non-R	0.214	0.078	28	0.306	0.077	36	0.843	0.5	0.088	32	2.433
		Fraction Wt Non-R	0.107	0.058	28	0.111	0.052	36	0.051	0.563	0.088	32	4.328
	Pollution Tolerance	Fraction Ct Tolerant	0.036	0.035	28	0	0	36	1.023	0	0	32	1.023
		Fraction Wt Tolerant	0.048	0.04	28	0	0	36	1.188	0	0	32	1.188
		Fraction Ct Intolerant	0.643	0.091	28	0.722	0.075	36	0.673	0.594	0.087	32	-0.391
		Fraction Wt Intolerant	0.806	0.075	28	0.889	0.052	36	0.910	0.393	0.086	32	-3.617

Gear	Type	Metric	Upstream Reference			Thermally Exposed				Downstream			
			Mean	Std Err	N	Mean	Std Err	N	Std Diff	Mean	Std Err	N	Std Diff
Missouri mini-trawl	Density	Count	11.109	2.859	24	12.315	3.113	24	0.285	18.091	4.884	24	1.234
		Weight	0.435	0.159	24	0.441	0.184	24	0.022	0.502	0.156	24	0.300
	Diversity	^{0}D Ct	16	1.449	247	19	1.22	325	1.584	22	2.346	371	2.176
		^{1}D Ct	8.237	0.525	247	7.688	0.523	325	-0.741	7.762	0.517	371	-0.646
		^{2}D Ct	6.386	0.373	247	5	0.369	325	-2.642	5.318	0.317	371	-2.183
		^{3}D Ct	5.78	0.333	247	4.197	0.314	325	-3.460	4.575	0.266	371	-2.828
	Heat Tolerance	Fraction Ct Intolerant	0	0	247	0	0	325		0	0	371	
		Fraction Wt Intolerant	0	0	247	0	0	325		0	0	371	
		Fraction Ct Tolerant	0.223	0.026	247	0.182	0.021	325	1.204	0.102	0.016	371	3.929
		Fraction Wt Tolerant	0.665	0.03	247	0.895	0.017	325	-6.664	0.433	0.026	371	5.867
	Composition	Fraction Ct Non-R	0.895	0.02	247	0.905	0.016	325	0.394	0.946	0.012	371	2.240
		Fraction Wt Non-R	0.252	0.028	247	0.051	0.012	325	-6.656	0.305	0.024	371	1.451
	Pollution Tolerance	Fraction Ct Tolerant	0.016	0.008	247	0.043	0.011	325	-1.957	0.013	0.006	371	0.303
		Fraction Wt Tolerant	0.487	0.032	247	0.321	0.026	325	4.047	0.148	0.018	371	9.222
		Fraction Ct Intolerant	0	0	247	0	0	325		0	0	371	
		Fraction Wt Intolerant	0	0	247	0	0	325		0	0	371	

Table B-19 Means and standard errors for individual metrics, and standardized differences for spring fish sampling at the LEC in 2017-2018.

Gear	Type	Metric	Upstream Reference			Thermally Exposed				Downstream			
			Mean	Std Err	N	Mean	Std Err	N	Std Diff	Mean	Std Err	N	Std Diff
Bag Seine	Density	Count	25.575	12.97	6	26.577	3.428	6	0.075	136.66	79.08	6	1.386
		Weight	0.028	0.01	6	0.037	0.012	6	0.591	0.223	0.174	6	1.124
	Diversity	^{0}D Ct	20	1.731	248	23	1.503	306	1.309	28	1.903	998	3.110
		^{1}D Ct	7.595	0.62	248	10.897	0.622	306	3.761	5.775	0.258	998	-2.712
		^{2}D Ct	5.24	0.407	248	7.974	0.491	306	4.287	3.686	0.118	998	-3.666
		^{3}D Ct	4.546	0.343	248	6.954	0.461	306	4.193	3.268	0.091	998	-3.605
	Heat Tolerance	Fraction Ct Intolerant	0.048	0.014	248	0.02	0.008	306	-1.777	0.015	0.004	998	-2.339
		Fraction Wt Intolerant	0.03	0.011	248	0.009	0.005	306	-1.735	0.004	0.002	998	-2.360
		Fraction Ct Tolerant	0.173	0.024	248	0.366	0.028	306	-5.282	0.06	0.008	998	4.490
		Fraction Wt Tolerant	0.176	0.024	248	0.69	0.026	306	-14.345	0.767	0.013	998	-21.384
	Composition	Fraction Ct Non-R	0.895	0.019	248	0.81	0.022	306	-2.862	0.946	0.007	998	2.459
		Fraction Wt Non-R	0.662	0.03	248	0.879	0.019	306	6.138	0.245	0.014	998	-12.645
	Pollution Tolerance	Fraction Ct Tolerant	0.048	0.014	248	0.118	0.018	306	-3.057	0.395	0.015	998	-16.858
		Fraction Wt Tolerant	0.028	0.01	248	0.083	0.016	306	-2.905	0.118	0.01	998	-6.152
		Fraction Ct Intolerant	0.048	0.014	248	0.02	0.008	306	-1.777	0.018	0.004	998	-2.111
		Fraction Wt Intolerant	0.03	0.011	248	0.009	0.005	306	-1.735	0.005	0.002	998	-2.260
Electrofishing	Density	Count	15.945	1.772	18	16.461	2.983	18	0.149	14.891	2.799	18	-0.318
		Weight	12.555	1.23	18	13.655	2.832	18	0.356	11.068	1.677	18	-0.715
	Diversity	^{0}D Ct	33	2.362	327	27	1.227	332	-2.254	30	2.867	287	-0.808
		^{1}D Ct	17.23	1.08	327	16.325	0.854	332	-0.657	17.111	1.193	287	-0.074
		^{2}D Ct	12.863	0.83	327	11.776	0.913	332	-0.881	12.52	1.103	287	-0.248
		^{3}D Ct	11.202	0.793	327	9.506	0.931	332	-1.387	10.262	1.167	287	-0.667
	Heat Tolerance	Fraction Ct Intolerant	0.018	0.007	327	0.006	0.004	332	-1.414	0.031	0.01	287	1.032
		Fraction Wt Intolerant	0.001	0.002	327	0.001	0.002	332	0.000	0.002	0.003	287	0.316
		Fraction Ct Tolerant	0.44	0.027	327	0.572	0.027	332	-3.419	0.54	0.029	287	-2.485
		Fraction Wt Tolerant	0.449	0.028	327	0.612	0.027	332	-4.249	0.574	0.029	287	-3.117
	Composition	Fraction Ct Non-R	0.465	0.028	327	0.416	0.027	332	-1.268	0.484	0.029	287	0.470
		Fraction Wt Non-R	0.241	0.024	327	0.119	0.018	332	-4.124	0.146	0.021	287	-3.013
	Pollution Tolerance	Fraction Ct Tolerant	0.226	0.023	327	0.316	0.026	332	-2.613	0.296	0.027	287	-1.971
		Fraction Wt Tolerant	0.216	0.023	327	0.336	0.026	332	-3.479	0.402	0.029	287	-5.052
		Fraction Ct Intolerant	0.024	0.008	327	0.024	0.008	332	0.000	0.049	0.013	287	1.634
		Fraction Wt Intolerant	0.012	0.006	327	0.053	0.012	332	2.995	0.038	0.011	287	2.033
Hoop net	Density	Count	2.859	0.603	18	2.028	0.475	18	-1.081	3.204	1.424	18	0.223
		Weight	4.61	1.24	18	4.579	1.373	18	-0.017	8.292	3.775	18	0.927
	Diversity	^{0}D Ct	8	0.72	51	11	1.475	36	1.828	11	1.319	57	1.996
		^{1}D Ct	6.602	0.581	51	8.937	1.345	36	1.594	5.911	0.956	57	-0.617
		^{2}D Ct	5.767	0.624	51	7.807	1.359	36	1.364	3.747	0.723	57	-2.115
		^{3}D Ct	5.282	0.639	51	7.106	1.368	36	1.208	3.006	0.582	57	-2.634
	Heat Tolerance	Fraction Ct Intolerant	0	0	51	0	0	36		0	0	57	
		Fraction Wt Intolerant	0	0	51	0	0	36		0	0	57	
		Fraction Ct Tolerant	0.216	0.058	51	0.5	0.083	36	-2.803	0.263	0.058	57	-0.573
		Fraction Wt Tolerant	0.212	0.057	51	0.605	0.081	36	-3.947	0.271	0.059	57	-0.719
	Composition	Fraction Ct Non-R	0.49	0.07	51	0.306	0.077	36	-1.771	0.684	0.062	57	2.081
		Fraction Wt Non-R	0.422	0.069	51	0.25	0.072	36	-1.721	0.707	0.06	57	3.106
	Pollution Tolerance	Fraction Ct Tolerant	0.118	0.045	51	0.222	0.069	36	-1.258	0.018	0.018	57	2.062
		Fraction Wt Tolerant	0.234	0.059	51	0.334	0.079	36	-1.016	0.011	0.014	57	3.663
		Fraction Ct Intolerant	0.078	0.038	51	0.083	0.046	36	0.084	0.088	0.038	57	0.188
		Fraction Wt Intolerant	0.127	0.047	51	0.068	0.042	36	-0.941	0.069	0.034	57	-1.010

Gear	Type	Metric	Upstream Reference			Thermally Exposed				Downstream			
			Mean	Std Err	N	Mean	Std Err	N	Std Diff	Mean	Std Err	N	Std Diff
Missouri mini-trawl	Density	Count	25.002	7.217	24	20.608	6.262	24	-0.460	22.727	5.832	24	-0.245
		Weight	0.04	0.017	24	0.277	0.117	24	2.008	0.133	0.069	24	1.304
	Diversity	^{0}D Ct	28	3.414	613	31	1.762	575	0.781	28	2.463	475	0.000
		^{1}D Ct	10.629	0.536	613	10.371	0.588	575	-0.324	11.041	0.573	475	0.525
		^{2}D Ct	8.006	0.373	613	6.504	0.412	575	-2.703	8.224	0.391	475	0.403
		^{3}D Ct	7.01	0.399	613	5.181	0.365	575	-3.381	7.237	0.409	475	0.396
	Heat Tolerance	Fraction Ct Intolerant	0.067	0.01	613	0.05	0.009	575	-1.251	0.135	0.016	475	3.646
		Fraction Wt Intolerant	0.006	0.003	613	0.001	0.001	575	-1.477	0.006	0.004	475	0.000
		Fraction Ct Tolerant	0.24	0.017	613	0.115	0.013	575	5.738	0.103	0.014	475	6.176
		Fraction Wt Tolerant	0.357	0.019	613	0.041	0.008	575	15.016	0.287	0.021	475	2.467
	Composition	Fraction Ct Non-R	0.597	0.02	613	0.63	0.02	575	1.168	0.878	0.015	475	11.304
		Fraction Wt Non-R	0.854	0.014	613	0.846	0.015	575	-0.386	0.277	0.021	475	-23.080
	Pollution Tolerance	Fraction Ct Tolerant	0.003	0.002	613	0.007	0.003	575	-0.971	0.004	0.003	475	-0.275
		Fraction Wt Tolerant	0.002	0.002	613	0	0	575	1.108	0	0	475	1.108
		Fraction Ct Intolerant	0.075	0.011	613	0.07	0.011	575	-0.332	0.156	0.017	475	4.100
		Fraction Wt Intolerant	0.008	0.004	613	0.002	0.002	575	-1.481	0.475	0.023	475	20.135

Table B-20 Means and standard errors for individual metrics, and standardized differences for summer fish sampling at the LEC in 2017-2018.

Gear	Type	Metric	Upstream Reference			Thermally Exposed				Downstream			
			Mean	Std Err	N	Mean	Std Err	N	Std Diff	Mean	Std Err	N	Std Diff
Bag Seine	Density	Count	70.61	25.49	8	74.97	35.238	8	0.100	155.06	51.87	8	1.461
		Weight	0.152	0.096	8	0.053	0.019	8	-1.008	0.057	0.016	8	-0.972
	Diversity	^{0}D Ct	15	1.41	445	15	1.932	900	0.000	26	1.738	1463	4.915
		^{1}D Ct	7.246	0.32	445	3.883	0.114	900	-9.903	5.842	0.182	1463	-3.815
		^{2}D Ct	5.754	0.246	445	3.356	0.05	900	-9.553	4.219	0.099	1463	-5.791
		^{3}D Ct	5.246	0.246	445	3.265	0.04	900	-7.956	3.837	0.09	1463	-5.389
	Heat Tolerance	Fraction Ct Intolerant	0	0	445	0.004	0.002	900	1.901	0	0	1463	
		Fraction Wt Intolerant	0	0	445	0.026	0.005	900	4.901	0	0	1463	
		Fraction Ct Tolerant	0.431	0.023	445	0.62	0.016	900	-6.629	0.61	0.013	1463	-6.700
		Fraction Wt Tolerant	0.889	0.015	445	0.729	0.015	900	7.617	0.768	0.011	1463	6.528
	Composition	Fraction Ct Non-R	0.8	0.019	445	0.7	0.015	900	-4.107	0.629	0.013	1463	-7.506
		Fraction Wt Non-R	0.142	0.017	445	0.497	0.017	900	15.116	0.333	0.012	1463	9.258
	Pollution Tolerance	Fraction Ct Tolerant	0.252	0.021	445	0.331	0.016	900	-3.053	0.241	0.011	1463	0.470
		Fraction Wt Tolerant	0.035	0.009	445	0.179	0.013	900	-9.311	0.108	0.008	1463	-6.131
		Fraction Ct Intolerant	0.002	0.002	445	0.006	0.003	900	1.200	0	0	1463	-0.944
		Fraction Wt Intolerant	0	0	445	0.029	0.006	900	5.185	0	0	1463	
Electrofishing	Density	Count	17.396	4.278	18	14.163	3.611	18	-0.577	15.146	4.092	18	-0.380
		Weight	5.584	1.184	18	8.501	1.441	18	1.564	6.198	0.795	18	0.431
	Diversity	^{0}D Ct	29	1.824	368	30	3.183	273	0.273	23	1.753	285	-2.372
		^{1}D Ct	11.579	0.781	368	13.721	1.166	273	1.526	11.685	0.821	285	0.093
		^{2}D Ct	6.214	0.57	368	8.011	0.904	273	1.682	6.972	0.734	285	0.815
		^{3}D Ct	4.586	0.437	368	5.849	0.717	273	1.505	5.174	0.598	285	0.793
	Heat Tolerance	Fraction Ct Intolerant	0.079	0.014	368	0.055	0.014	273	-1.218	0.07	0.015	285	-0.436
		Fraction Wt Intolerant	0.005	0.004	368	0.001	0.002	273	-0.965	0.005	0.004	285	0.000
		Fraction Ct Tolerant	0.734	0.023	368	0.729	0.027	273	0.141	0.649	0.028	285	2.331
		Fraction Wt Tolerant	0.503	0.026	368	0.528	0.03	273	-0.627	0.48	0.03	285	0.583
	Composition	Fraction Ct Non-R	0.391	0.025	368	0.359	0.029	273	-0.829	0.375	0.029	285	-0.417
		Fraction Wt Non-R	0.157	0.019	368	0.306	0.028	273	4.418	0.244	0.025	285	2.742
	Pollution Tolerance	Fraction Ct Tolerant	0.043	0.011	368	0.077	0.016	273	-1.762	0.144	0.021	285	-4.329
		Fraction Wt Tolerant	0.207	0.021	368	0.196	0.024	273	0.344	0.283	0.027	285	-2.233
		Fraction Ct Intolerant	0.079	0.014	368	0.073	0.016	273	-0.284	0.091	0.017	285	0.543
		Fraction Wt Intolerant	0.035	0.01	368	0.032	0.011	273	-0.209	0.039	0.011	285	0.268
Hoop net	Density	Count	2.379	0.621	18	1.193	0.351	18	-1.663	1.759	0.447	18	-0.810
		Weight	4.376	1.303	18	2.204	0.788	18	-1.426	4.57	1.28	18	0.106
	Diversity	^{0}D Ct	11	1.515	42	9	1.48	21	-0.944	11	1.525	31	0.000
		^{1}D Ct	7.537	1.181	42	7.734	1.414	21	0.107	9.139	1.372	31	0.885
		^{2}D Ct	5.959	1.017	42	7	1.382	21	0.606	8.076	1.338	31	1.259
		^{3}D Ct	5.292	0.916	42	6.594	1.349	21	0.799	7.462	1.31	31	1.358
	Heat Tolerance	Fraction Ct Intolerant	0	0	42	0	0	21		0	0	31	
		Fraction Wt Intolerant	0	0	42	0	0	21		0	0	31	
		Fraction Ct Tolerant	0.452	0.077	42	0.381	0.106	21	0.543	0.484	0.09	31	-0.271
		Fraction Wt Tolerant	0.53	0.077	42	0.499	0.109	21	0.232	0.52	0.09	31	0.085
	Composition	Fraction Ct Non-R	0.381	0.075	42	0.286	0.099	21	-0.767	0.323	0.084	31	-0.515
		Fraction Wt Non-R	0.245	0.066	42	0.143	0.076	21	-1.008	0.212	0.073	31	-0.333
	Pollution Tolerance	Fraction Ct Tolerant	0.024	0.024	42	0.048	0.047	21	-0.459	0.097	0.053	31	-1.255
		Fraction Wt Tolerant	0.056	0.035	42	0.118	0.07	21	-0.786	0.173	0.068	31	-1.527
		Fraction Ct Intolerant	0.214	0.063	42	0.143	0.076	21	-0.716	0.097	0.053	31	-1.416
		Fraction Wt Intolerant	0.298	0.071	42	0.135	0.075	21	-1.588	0.098	0.053	31	-2.260

Gear	Type	Metric	Upstream Reference			Thermally Exposed				Downstream			
			Mean	Std Err	N	Mean	Std Err	N	Std Diff	Mean	Std Err	N	Std Diff
Missouri mini-trawl	Density	Count	43.595	10.07	24	26.836	7.79	24	-1.317	36.29	10.01	24	-0.515
		Weight	0.286	0.198	24	0.054	0.028	24	-1.158	0.065	0.023	24	-1.106
	Diversity	^{0}D Ct	28	2.125	1011	21	1.483	665	-2.701	22	1.935	784	-2.088
		^{1}D Ct	10.711	0.345	1011	11.189	0.392	665	0.916	9.737	0.354	784	-1.971
		^{2}D Ct	8.337	0.267	1011	9.064	0.419	665	1.465	7.34	0.318	784	-2.403
		^{3}D Ct	7.411	0.303	1011	7.922	0.461	665	0.927	6.299	0.316	784	-2.541
	Heat Tolerance	Fraction Ct Intolerant	0.008	0.003	1011	0.011	0.004	665	0.610	0.014	0.004	784	1.189
		Fraction Wt Intolerant	0.005	0.002	1011	0.025	0.006	665	3.102	0.028	0.006	784	3.653
		Fraction Ct Tolerant	0.274	0.014	1011	0.224	0.016	665	2.336	0.307	0.016	784	-1.525
		Fraction Wt Tolerant	0.066	0.008	1011	0.67	0.018	665	-30.450	0.427	0.018	784	-18.691
	Composition	Fraction Ct Non-R	0.736	0.014	1011	0.821	0.015	665	4.182	0.853	0.013	784	6.235
		Fraction Wt Non-R	0.253	0.014	1011	0.335	0.018	665	3.589	0.343	0.017	784	4.132
	Pollution Tolerance	Fraction Ct Tolerant	0.072	0.008	1011	0.08	0.011	665	-0.602	0.042	0.007	784	2.769
		Fraction Wt Tolerant	0.002	0.001	1011	0.009	0.004	665	-1.785	0.012	0.004	784	-2.418
		Fraction Ct Intolerant	0.009	0.003	1011	0.011	0.004	665	0.399	0.014	0.004	784	0.973
		Fraction Wt Intolerant	0.006	0.002	1011	0.025	0.006	665	2.913	0.028	0.006	784	3.452

Table B-21 Means and standard errors for individual metrics, and standardized differences for fall fish sampling at the LEC in 2017-2018.

Gear	Type	Metric	Upstream Reference			Thermally Exposed				Downstream			
			Mean	Std Err	N	Mean	Std Err	N	Std Diff	Mean	Std Err	N	Std Diff
Bag Seine	Density	Count	250.49	100	8	63.844	22.776	8	-1.819	121.46	68.44	8	-1.064
		Weight	0.143	0.077	8	0.063	0.018	8	-1.006	0.059	0.028	8	-1.017
	Diversity	^{0}D Ct	22	1.812	3782	18	1.607	712	-1.651	20	1.33	902	-0.890
		^{1}D Ct	2.971	0.06	3782	6.139	0.232	712	13.223	7.78	0.268	902	17.479
		^{2}D Ct	1.899	0.031	3782	4.505	0.173	712	14.799	5.592	0.235	902	15.580
		^{3}D Ct	1.673	0.024	3782	3.961	0.164	712	13.797	4.723	0.236	902	12.884
	Heat Tolerance	Fraction Ct Intolerant	0	0	3782	0	0	712		0	0	902	
		Fraction Wt Intolerant	0	0	3782	0	0	712		0	0	902	
		Fraction Ct Tolerant	0.076	0.004	3782	0.413	0.018	712	-17.785	0.099	0.01	902	-2.122
		Fraction Wt Tolerant	0.773	0.007	3782	0.653	0.018	712	6.284	0.391	0.016	902	21.683
	Composition	Fraction Ct Non-R	0.976	0.002	3782	0.938	0.009	712	-4.054	0.973	0.005	902	-0.505
		Fraction Wt Non-R	0.37	0.008	3782	0.63	0.018	712	13.182	0.657	0.016	902	16.262
	Pollution Tolerance	Fraction Ct Tolerant	0.713	0.007	3782	0.264	0.017	712	24.830	0.34	0.016	902	21.432
		Fraction Wt Tolerant	0.106	0.005	3782	0.197	0.015	712	-5.787	0.157	0.012	902	-3.891
		Fraction Ct Intolerant	0	0	3782	0.001	0.001	712	0.844	0.001	0.001	902	0.950
		Fraction Wt Intolerant	0.001	0.001	3782	0.015	0.005	712	3.054	0.003	0.002	902	1.057
Electrofishing	Density	Count	8.079	1.526	17	15.72	3.28	18	2.112	14.455	3.614	18	1.625
		Weight	7.977	1.428	17	13.58	3.15	18	1.620	9.312	2.725	18	0.434
	Diversity	^{0}D Ct	23	2.165	142	24	2.025	302	0.337	22	1.314	282	-0.395
		^{1}D Ct	11.75	1.454	142	11.634	0.823	302	-0.069	9.008	0.694	282	-1.702
		^{2}D Ct	6.642	1.149	142	7.699	0.683	302	0.791	5.23	0.491	282	-1.129
		^{3}D Ct	4.829	0.873	142	6.116	0.621	302	1.202	4.113	0.391	282	-0.749
	Heat Tolerance	Fraction Ct Intolerant	0.085	0.023	142	0.053	0.013	302	-1.198	0.039	0.012	282	-1.763
		Fraction Wt Intolerant	0.004	0.005	142	0.002	0.003	302	-0.340	0.004	0.004	282	0.000
		Fraction Ct Tolerant	0.373	0.041	142	0.629	0.028	302	-5.204	0.642	0.029	282	-5.421
		Fraction Wt Tolerant	0.494	0.042	142	0.414	0.028	302	1.580	0.493	0.03	282	0.019
	Composition	Fraction Ct Non-R	0.246	0.036	142	0.248	0.025	302	0.046	0.145	0.021	282	-2.417
		Fraction Wt Non-R	0.131	0.028	142	0.185	0.022	302	1.497	0.14	0.021	282	0.257
	Pollution Tolerance	Fraction Ct Tolerant	0.12	0.027	142	0.063	0.014	302	1.860	0.074	0.016	282	1.464
		Fraction Wt Tolerant	0.232	0.035	142	0.162	0.021	302	1.696	0.263	0.026	282	-0.703
		Fraction Ct Intolerant	0.085	0.023	142	0.056	0.013	302	-1.079	0.043	0.012	282	-1.595
		Fraction Wt Intolerant	0.004	0.005	142	0.003	0.003	302	-0.162	0.011	0.006	282	0.858
Hoop net	Density	Count	1.678	0.579	18	1.904	0.647	18	0.261	2.313	0.491	18	0.837
		Weight	2.423	1.055	18	3.377	1.661	18	0.485	3.451	0.978	18	0.715
	Diversity	^{0}D Ct	8	1.43	30	13	1.626	34	2.309	11	1.369	39	1.516
		^{1}D Ct	4.911	1.029	30	9.448	1.539	34	2.451	8.758	1.125	39	2.523
		^{2}D Ct	3.543	0.817	30	7.41	1.437	34	2.339	7.567	1.089	39	2.956
		^{3}D Ct	2.991	0.697	30	6.466	1.319	34	2.330	6.936	1.078	39	3.074
	Heat Tolerance	Fraction Ct Intolerant	0.033	0.033	30	0.059	0.04	34	0.501	0.154	0.058	39	1.823
		Fraction Wt Intolerant	0.011	0.019	30	0.015	0.021	34	0.142	0.03	0.027	39	0.571
		Fraction Ct Tolerant	0.033	0.033	30	0.559	0.085	34	-5.769	0.205	0.065	39	-2.376
		Fraction Wt Tolerant	0.079	0.049	30	0.621	0.083	34	-5.606	0.392	0.078	39	-3.388
	Composition	Fraction Ct Non-R	0.7	0.084	30	0.235	0.073	34	-4.195	0.538	0.08	39	-1.401
		Fraction Wt Non-R	0.652	0.087	30	0.142	0.06	34	-4.831	0.464	0.08	39	-1.592
	Pollution Tolerance	Fraction Ct Tolerant	0.1	0.055	30	0.029	0.029	34	1.148	0.128	0.053	39	-0.366
		Fraction Wt Tolerant	0.259	0.08	30	0.037	0.032	34	2.573	0.226	0.067	39	0.316
		Fraction Ct Intolerant	0.033	0.033	30	0.059	0.04	34	0.501	0.231	0.067	39	2.642
		Fraction Wt Intolerant	0.011	0.019	30	0.046	0.036	34	0.861	0.137	0.055	39	2.163

Gear	Type	Metric	Upstream Reference			Thermally Exposed				Downstream			
			Mean	Std Err	N	Mean	Std Err	N	Std Diff	Mean	Std Err	N	Std Diff
Missouri mini-trawl	Density	Count	32.089	13.85	24	42.259	19.095	24	0.431	32.149	19.89	24	0.002
		Weight	0.147	0.054	24	0.363	0.183	24	1.127	0.07	0.049	24	-1.061
	Diversity	^{0}D Ct	15	1.026	753	22	1.692	1087	3.538	18	1.418	645	1.714
		^{1}D Ct	5.439	0.222	753	6.194	0.223	1087	2.395	5.664	0.256	645	0.662
		^{2}D Ct	3.718	0.156	753	4.574	0.129	1087	4.238	4.129	0.149	645	1.905
		^{3}D Ct	3.192	0.139	753	4.196	0.101	1087	5.839	3.755	0.13	645	2.957
	Heat Tolerance	Fraction Ct Intolerant	0.003	0.002	753	0.001	0.001	1087	-0.904	0	0	645	-1.505
		Fraction Wt Intolerant	0.015	0.004	753	0.003	0.002	1087	-2.537	0	0	645	-3.386
		Fraction Ct Tolerant	0.09	0.01	753	0.13	0.01	1087	-2.742	0.036	0.007	645	4.235
		Fraction Wt Tolerant	0.024	0.006	753	0.395	0.015	1087	-23.419	0.026	0.006	645	-0.238
	Composition	Fraction Ct Non-R	0.938	0.009	753	0.962	0.006	1087	2.279	0.929	0.01	645	-0.672
		Fraction Wt Non-R	0.897	0.011	753	0.615	0.015	1087	-15.282	0.97	0.007	645	5.635
	Pollution Tolerance	Fraction Ct Tolerant	0.061	0.009	753	0.034	0.005	1087	2.619	0.019	0.005	645	4.099
		Fraction Wt Tolerant	0.006	0.003	753	0.133	0.01	1087	-11.895	0.004	0.002	645	0.533
		Fraction Ct Intolerant	0.003	0.002	753	0.002	0.001	1087	-0.415	0	0	645	-1.505
		Fraction Wt Intolerant	0.015	0.004	753	0.004	0.002	1087	-2.279	0	0	645	-3.386

Table B-22 Summary of benthic invertebrates collected in Hester-Dendy bottom samples at the LEC during 2017-2018 sampling, by season and zone.

Class-Order-Family	Name	Winter				Spring				Summer				Fall			
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Cli-Tubi-Naididae	Stylaria lacustris	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Slavina appendiculata	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Pristina longiseta	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Cli-Tubi-Naididae	Piguetiella sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Paranais sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Nais pardalis	1	5	4	7	0	0	0	0	0	0	0	0	1	0	0	0
Cli-Tubi-Naididae	Nais communis/variabilis complex	0	4	6	8	0	0	0	0	1	0	0	0	0	0	2	0
Cli-Tubi-Naididae	Nais behningi	0	16	4	0	2	0	1	12	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Nais sp.	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Limnodrilus claparedianus/cervix	1	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0
Cli-Tubi-Naididae	Dero digitata	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	2
Cli-Tubi-Naididae	Naidinae	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Tubificinae	32	0	7	2	2	0	2	0	0	0	1	0	0	0	0	0
Cli-Hiru-Glossiphoniidae	Helobdella austinensis	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Cli- -	Clitellata	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0
Ins-Tric-Polycentropodidae	Neureclipsis sp.	1	2	2	0	60	0	49	38	23	0	16	3	8	0	18	2
Ins-Tric-Polycentropodidae	Cyrnellus fraternus	0	0	0	0	0	0	1	0	23	0	4	12	0	0	1	0
Ins-Tric-Polycentropodidae	Polycentropodidae	0	1	0	0	7	0	1	0	1	0	2	1	0	0	1	0
Ins-Tric-Leptoceridae	Nectopsyche sp.	0	0	0	0	0	0	1	0	2	0	1	0	0	0	1	0
Ins-Tric-Leptoceridae	Leptoceridae	0	0	0	0	1	0	0	0	3	0	1	0	0	0	0	0
Ins-Tric-Hydroptilidae	Mayatrichia sp.	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
Ins-Tric-Hydroptilidae	Hydroptilidae	0	0	0	1	0	0	0	0	0	2	1	0	0	0	0	0
Ins-Tric-Hydropsychidae	Potamyia flava	10	46	57	20	388	222	327	691	344	690	705	64	104	344	186	75
Ins-Tric-Hydropsychidae	Hydropsyche sp.	14	67	34	16	925	754	890	1119	400	1619	1750	24	30	188	85	33
Ins-Tric-Hydropsychidae	Cheumatopsyche sp.	1	0	0	0	8	0	14	2	0	0	0	0	0	0	0	0
Ins-Tric-Hydropsychidae	Hydropsychidae	2	7	7	7	640	792	129	308	78	229	163	20	38	44	42	12
Ins-Tric-	Trichoptera	0	0	0	0	11	8	0	0	2	0	2	1	0	0	0	0
Ins-Plec-Taeniopterygidae	Taeniopteryx sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Ins-Plec-Taeniopterygidae	Taeniopterygidae	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Plec-Perlodidae	Isoperla sp.	2	2	0	2	0	0	0	0	0	0	0	0	0	0	1	0
Ins-Plec-Perlodidae	Hydroperla sp.	3	3	6	1	0	0	0	0	0	0	0	0	3	8	6	1
Ins-Plec-Perlodidae	Perlodidae	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	1
Ins-Plec-Perlidae	Perlinella sp.	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0
Ins-Plec-Perlidae	Perlesta sp.	0	2	0	0	11	4	14	18	0	0	1	0	0	0	0	0
Ins-Plec-Perlidae	Neoperla sp.	1	1	3	2	2	0	2	6	9	0	20	5	8	1	11	3

Class-Order-Family	Name	Winter				Spring				Summer				Fall			
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Ins-Plec-Perlidae	Attaneuria sp.	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	1
Ins-Plec-Perlidae	Acroneuria sp.	2	0	1	6	5	0	2	1	21	8	6	6	2	0	2	1
Ins-Plec-Perlidae	Perlidae	0	4	0	1	4	0	4	1	0	0	2	1	0	0	0	0
Ins-Plec-	Plecoptera	0	1	0	0	1	0	0	0	0	0	16	0	1	1	4	0
Ins-Odon-Gomphidae	Gomphus sp.	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Ins-Odon-Gomphidae	Dromogomphus sp.	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
Ins-Odon-Gomphidae	Gomphidae	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
Ins-Odon-Corduliidae	Neurocordulia molesta	1	0	0	2	0	0	0	0	15	0	5	4	0	0	6	4
Ins-Odon-Corduliidae	Didymops transversa	0	0	0	0	0	0	0	0	4	0	0	0	1	0	0	0
Ins-Odon-Coenagrionidae	Argia sp.	0	0	0	2	1	0	4	0	15	0	38	19	1	0	12	6
Ins-Odon-	Zygoptera	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Mega-Corydalidae	Corydalus sp.	0	0	0	2	0	0	0	0	27	10	2	2	1	0	0	0
Ins-Mega-Corydalidae	Chauliodes sp.	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Ins-Ephe-Potamanthidae	Anthopotamus sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Ins-Ephe-Polymitarcyidae	Ephoron album	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0
Ins-Ephe-Polymitarcyidae	Ephoron sp.	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Ins-Ephe-Palingeniidae	Pentagenia vittigera	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Ins-Ephe-Leptohyphidae	Tricorythodes sp.	0	0	1	0	15	2	10	12	7	2	4	3	0	2	0	0
Ins-Ephe-Isonychiidae	Isonychia sicca	0	0	0	0	11	0	13	0	0	0	2	0	0	0	0	0
Ins-Ephe-Isonychiidae	Isonychia rufa	0	0	0	0	7	6	26	0	11	0	1	2	0	4	0	0
Ins-Ephe-Isonychiidae	Isonychia bicolor	0	0	0	0	1	6	18	0	16	0	16	1	0	0	0	0
Ins-Ephe-Isonychiidae	Isonychia sp.	0	0	0	0	133	14	116	29	18	0	1	2	0	0	0	0
Ins-Ephe-Heptageniidae	Stenacron sp.	0	0	0	1	2	0	0	0	4	0	1	1	0	0	1	2
Ins-Ephe-Heptageniidae	Maccaffertium terminatum	0	2	1	1	4	0	0	4	2	0	1	0	0	0	0	0
Ins-Ephe-Heptageniidae	Maccaffertium mexicanum integrum	11	9	23	10	99	22	71	76	119	30	154	77	131	54	157	93
Ins-Ephe-Heptageniidae	Maccaffertium sp.	2	0	4	2	8	0	1	5	2	0	0	2	7	2	3	0
Ins-Ephe-Heptageniidae	Heptagenia sp.	0	4	4	0	43	0	22	15	0	5	17	1	7	23	6	7
Ins-Ephe-Heptageniidae	Heptageniidae	8	2	7	8	122	20	48	95	53	27	95	25	27	3	39	12
Ins-Ephe-Ephemeridae	Hexagenia sp.	0	0	0	0	0	0	0	0	1	0	4	0	0	0	1	0
Ins-Ephe-Ephemeridae	Ephemeridae	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Ins-Ephe-Caenidae	Caenis sp.	0	0	0	0	22	0	21	27	28	2	36	14	1	0	0	0
Ins-Ephe-Caenidae	Amercaenis sp.	0	0	0	0	224	180	47	525	46	8	19	18	0	0	0	0
Ins-Ephe-Caenidae	Caenidae	0	0	0	1	0	0	0	4	0	0	0	0	0	0	0	0
Ins-Ephe-Baetidae	Pseudocloeon sp.	0	0	0	0	469	262	281	346	93	159	86	31	0	0	0	0
Ins-Ephe-Baetidae	Baetidae	0	0	0	0	150	40	55	119	2	2	3	35	0	0	0	0
Ins-Ephe-	Ephemeroptera	0	1	0	0	21	4	3	8	0	0	0	2	1	0	0	0
Ins-Dipt-Tabanidae	Tabanidae	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0

Class-Order-Family	Name	Winter				Spring				Summer				Fall			
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Ins-Dipt-Chironomidae	Tvetenia vitracies	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Tribelos fuscicorne	0	0	0	0	0	0	0	0	7	0	2	10	0	0	0	0
Ins-Dipt-Chironomidae	Tribelos sp.	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0
Ins-Dipt-Chironomidae	Thienemannimyia sp. group	0	2	0	2	3	0	7	4	5	0	15	14	5	0	13	4
Ins-Dipt-Chironomidae	Thienemanniella xena	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Thienemanniella lobapodema	0	0	0	0	8	0	2	0	2	0	0	0	0	0	1	0
Ins-Dipt-Chironomidae	Thienemanniella sp.	0	2	4	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Telopelopia okoboji	7	6	13	5	22	0	22	8	7	0	28	0	1	0	2	0
Ins-Dipt-Chironomidae	Tanytarsus sepp	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Tanytarsus glabrescens group	0	3	1	2	5	0	2	8	9	0	6	6	0	1	1	0
Ins-Dipt-Chironomidae	Tanytarsus sp.	3	4	1	4	0	0	0	0	4	0	1	0	0	0	0	0
Ins-Dipt-Chironomidae	Stenochironomus sp.	0	0	0	0	255	92	134	148	616	76	683	813	0	0	0	0
Ins-Dipt-Chironomidae	Robackia claviger	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Rheotanytarsus exiguus group	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Rheotanytarsus sp.	0	30	49	8	523	116	246	664	1749	524	1193	99	1	1	6	4
Ins-Dipt-Chironomidae	Procladius (Psilotanypus) sp.	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Procladius sp.	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Ins-Dipt-Chironomidae	Polypedilum scalaenum group	0	2	0	0	6	0	14	8	77	0	50	58	0	0	0	1
Ins-Dipt-Chironomidae	Polypedilum illinoense group	0	0	1	2	0	0	0	0	16	0	10	0	0	0	0	0
Ins-Dipt-Chironomidae	Polypedilum halterale group	0	0	0	0	0	0	0	0	1	0	16	1	0	0	0	0
Ins-Dipt-Chironomidae	Polypedilum flavum	0	22	22	7	239	104	235	429	67	145	94	83	4	3	9	6
Ins-Dipt-Chironomidae	Polypedilum sp.	0	2	1	1	1	4	0	0	195	4	21	13	0	2	0	0
Ins-Dipt-Chironomidae	Phaenopsectra obediens group	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Ins-Dipt-Chironomidae	Paralauterborniella nigrohaltera	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Paracladopelma sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Parachironomus frequens	0	0	0	0	0	0	0	0	13	0	0	5	0	0	0	0
Ins-Dipt-Chironomidae	Orthocladius sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Nanocladius minimus	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Nanocladius distinctus	0	7	8	16	0	0	0	0	0	0	0	2	0	0	0	0
Ins-Dipt-Chironomidae	Nanocladius crassicornus/rectine	0	1	0	3	0	0	0	0	2	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Nanocladius alternantherae	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Nanocladius sp.	0	6	0	4	0	0	0	0	0	0	0	1	0	0	1	1
Ins-Dipt-Chironomidae	Labrundinia pilosella	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Kribiodorum perpulchrum	0	0	0	0	8	0	4	4	14	4	11	24	0	0	0	0
Ins-Dipt-Chironomidae	Hydrobaenus sp.	2	1	0	1	0	0	0	0	0	0	0	0	1	0	0	2
Ins-Dipt-Chironomidae	Harnischia sp.	1	0	0	0	6	0	2	0	7	0	12	3	0	0	0	0
Ins-Dipt-Chironomidae	Glyptotendipes sp.	0	0	4	0	0	0	0	0	0	0	4	1	0	0	0	1

Class-Order-Family	Name	Winter				Spring				Summer				Fall			
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Ins-Dipt-Chironomidae	Dicrotendipes neomodestus	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Dicrotendipes sp.	2	2	0	0	4	0	0	0	5	0	1	4	0	0	0	0
Ins-Dipt-Chironomidae	Cryptotendipes sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Cryptochironomus sp.	0	0	0	0	7	0	0	0	2	0	1	1	0	0	6	0
Ins-Dipt-Chironomidae	Cricotopus/Orthocladius sp.	0	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Corynoneura lobata	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Corynoneura floridaensis	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Cladotanytarsus sp. group A	0	0	0	0	4	0	0	0	2	0	1	0	0	0	0	0
Ins-Dipt-Chironomidae	Chironomus decorus group	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Chironomus sp.	0	0	0	0	0	0	0	0	9	0	0	2	0	0	5	1
Ins-Dipt-Chironomidae	Axarus sp.	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Ins-Dipt-Chironomidae	Ablabesmyia mallochi	2	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0
Ins-Dipt-Chironomidae	Ablabesmyia (Ablabesmyia)	0	0	0	0	0	0	0	0	74	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Ablabesmyia (Karelia) sp.	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Ablabesmyia sp.	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0
Ins-Dipt-Chironomidae	Chironomidae	0	1	7	4	18	0	32	40	136	20	45	217	0	1	1	3
Ins-Dipt-Chironomidae	Chironominae	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Chironominae (Chironomini)	0	0	0	0	8	0	2	0	68	0	2	8	0	0	0	0
Ins-Dipt-Chironomidae	Chironominae (Tanytarsini)	0	0	1	0	0	4	7	18	64	16	0	2	0	0	0	0
Ins-Dipt-Chironomidae	Orthocladiinae	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Tanypodinae	0	1	0	0	4	0	0	0	0	0	0	4	0	0	1	0
Ins-Dipt-Chaoboridae	Chaoborus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Ins- -	Insecta	0	0	0	0	0	0	0	195	65	0	138	90	0	0	0	0
Ara-Trom-Hydrachnidia	Hydracarina	0	0	0	0	2	0	0	0	0	2	0	1	0	1	0	1
Hyd-Anth-Hydridae	Hydra sp.	1	0	5	7	0	0	0	0	0	0	2	0	1	0	0	0
Gas-Baso-Physidae	Physa sp.	0	0	2	2	0	0	0	0	0	0	0	1	0	0	2	0
Gas-Baso-Ancylidae	Ferrissia sp.	5	2	0	3	0	0	0	0	0	0	1	0	0	0	0	0
Biv-Vene-Dreissenidae	Dreissena polymorpha	0	0	0	0	0	0	0	0	4	0	15	3	0	0	1	1
Biv-Vene-Corbiculidae	Corbicula fluminea	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
Tre-Neoo-Planariidae	Planariidae	0	1	0	0	0	0	2	0	6	0	7	43	0	2	1	1
Tre- -	Trepaxonemata	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0

Table B-23 Summary of benthic invertebrates collected in Hester-Dendy mid-depth samples at the LEC during 2017-2018 sampling, by season and zone.

Class-Order-Family	Name	Winter				Spring				Summer				Fall			
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Cli-Tubi-Naididae	Stylaria lacustris	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Slavina appendiculata	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Piguetiella sp.	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Paranais sp.	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Nais pardalis	0	5	0	2	0	0	0	0	0	0	0	1	0	0	0	0
Cli-Tubi-Naididae	Nais communis/variabilis complex	3	6	18	4	0	0	0	0	0	0	1	0	0	0	0	0
Cli-Tubi-Naididae	Nais behningi	0	28	5	0	5	0	8	8	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Nais sp.	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Limnodrilus udekemianus	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Cli-Tubi-Naididae	Limnodrilus claparedianus/cervix	0	0	0	2	0	0	0	0	0	0	0	2	3	0	0	0
Cli-Tubi-Naididae	Dero digitata	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
Cli-Tubi-Naididae	Aulodrilus pluriseta	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Tubificinae	8	0	11	9	0	0	0	0	0	0	0	11	2	1	0	0
Cli- -	Clitellata	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Ins-Tric-Polycentropodidae	Neureclipsis sp.	1	0	5	1	31	2	21	26	16	0	9	0	12	0	27	1
Ins-Tric-Polycentropodidae	Cyrnellus fraternus	0	0	0	0	3	0	0	0	3	0	2	3	0	0	2	6
Ins-Tric-Polycentropodidae	Polycentropodidae	0	0	0	0	0	0	2	0	4	0	3	1	0	0	0	0
Ins-Tric-Leptoceridae	Nectopsyche sp.	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Ins-Tric-Leptoceridae	Leptoceridae	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Ins-Tric-Hydroptilidae	Mayatrichia sp.	0	0	0	0	11	0	2	11	2	0	0	2	0	0	0	0
Ins-Tric-Hydroptilidae	Hydroptilidae	0	0	0	0	2	0	2	1	0	0	0	0	0	0	0	0
Ins-Tric-Hydropsychidae	Potamyia flava	8	37	38	23	446	253	230	631	202	391	458	41	149	65	277	211
Ins-Tric-Hydropsychidae	Hydropsyche sp.	18	91	38	16	1673	1674	1187	1356	398	2228	1372	16	72	254	115	93
Ins-Tric-Hydropsychidae	Cheumatopsyche sp.	0	0	0	0	17	4	3	8	0	0	0	0	1	0	2	1
Ins-Tric-Hydropsychidae	Hydropsychidae	4	8	4	8	497	258	251	435	61	210	190	23	70	14	6	8
Ins-Tric-	Trichoptera	0	0	0	0	2	0	0	4	0	2	1	1	0	0	0	0
Ins-Plec-Taeniopterygidae	Taeniopteryx sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	3
Ins-Plec-Taeniopterygidae	Strophopteryx sp.	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Plec-Perlodidae	Isoperla sp.	17	1	20	10	0	0	0	0	0	0	0	0	2	1	0	0
Ins-Plec-Perlodidae	Hydroperla sp.	1	4	28	5	0	0	0	0	0	0	0	0	0	7	5	7
Ins-Plec-Perlodidae	Perlodidae	0	0	1	0	0	0	0	0	0	0	0	0	2	1	2	1
Ins-Plec-Perlidae	Perlesta sp.	0	0	0	0	34	34	17	36	0	0	0	0	0	0	0	0
Ins-Plec-Perlidae	Neoperla sp.	0	0	0	0	4	0	0	2	10	0	4	9	3	1	9	9
Ins-Plec-Perlidae	Attaneuria sp.	0	0	1	0	1	0	0	3	1	8	6	1	1	0	1	2
Ins-Plec-Perlidae	Acroneuria sp.	4	0	1	1	4	0	5	1	15	0	10	1	1	1	3	3

Class-Order-Family	Name	Winter				Spring				Summer				Fall			
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Ins-Plec-Perlidae	Perlidae	0	1	0	0	4	2	2	0	0	0	2	0	0	1	2	1
Ins-Plec-	Plecoptera	0	0	1	0	1	0	0	0	0	0	0	0	0	1	4	0
Ins-Odon-Gomphidae	Dromogomphus sp.	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Ins-Odon-Gomphidae	Gomphidae	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Ins-Odon-Corduliidae	Neurocordulia molesta	0	0	1	1	3	0	0	3	12	0	4	7	1	0	1	4
Ins-Odon-Corduliidae	Didymops transversa	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Ins-Odon-Corduliidae	Didymops sp.	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
Ins-Odon-Corduliidae	Macromiinae	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Ins-Odon-Coenagrionidae	Coenagrion/Enallagma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ins-Odon-Coenagrionidae	Argia sp.	1	0	0	3	2	0	3	0	9	0	11	10	0	0	8	7
Ins-Odon-Coenagrionidae	Coenagrionidae	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Ins-Odon-	Zygoptera	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Ins-Mega-Corydalidae	Corydalus sp.	0	0	0	0	0	0	0	4	8	0	12	5	0	0	1	0
Ins-Mega-Corydalidae	Chauliodes sp.	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Ins-Ephe-Potamanthidae	Anthopotamus sp.	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Ephe-Leptohyphidae	Tricorythodes sp.	0	0	0	0	15	2	2	12	23	2	15	8	0	0	1	1
Ins-Ephe-Leptohyphidae	Leptohyphidae	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Ins-Ephe-Isonychiidae	Isonychia sicca	0	0	0	0	3	14	5	8	0	0	1	0	0	0	0	0
Ins-Ephe-Isonychiidae	Isonychia rufa	0	0	0	0	43	10	17	13	4	0	1	2	1	0	0	0
Ins-Ephe-Isonychiidae	Isonychia bicolor	0	0	0	0	22	0	13	1	2	10	1	0	0	0	0	0
Ins-Ephe-Isonychiidae	Isonychia sp.	0	0	0	0	116	32	53	55	11	2	2	1	0	0	2	0
Ins-Ephe-Heptageniidae	Stenonema femoratum	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Ins-Ephe-Heptageniidae	Stenacron sp.	1	0	0	4	0	0	1	0	7	0	0	2	2	0	2	1
Ins-Ephe-Heptageniidae	Spinadis simplex	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Ins-Ephe-Heptageniidae	Raptoheptagenia cruentata	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Ins-Ephe-Heptageniidae	Maccaffertium terminatum	1	0	4	0	0	0	1	6	1	0	1	1	0	0	0	0
Ins-Ephe-Heptageniidae	Maccaffertium mexicanum integrum	50	7	58	25	185	26	87	111	238	55	213	225	206	52	245	190
Ins-Ephe-Heptageniidae	Maccaffertium exiguum	0	0	0	0	2	0	1	4	1	0	0	0	0	0	0	0
Ins-Ephe-Heptageniidae	Maccaffertium sp.	1	2	5	4	0	0	5	2	4	0	19	0	1	0	4	2
Ins-Ephe-Heptageniidae	Heptagenia sp.	7	10	7	6	39	34	27	62	4	20	0	0	6	16	17	10
Ins-Ephe-Heptageniidae	Heptageniidae	10	2	13	13	138	26	80	152	154	22	82	79	48	18	80	63
Ins-Ephe-Ephemeridae	Hexagenia limbata	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Ins-Ephe-Ephemeridae	Hexagenia sp.	2	0	0	0	12	0	0	0	1	0	1	0	0	0	0	0
Ins-Ephe-Caenidae	Caenis sp.	0	0	0	0	9	0	12	42	59	4	30	18	2	0	0	1
Ins-Ephe-Caenidae	Amercaenis sp.	0	0	0	0	354	388	212	483	22	12	21	11	0	0	0	0
Ins-Ephe-Caenidae	Caenidae	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Ins-Ephe-Baetidae	Pseudocloeon sp.	0	0	0	0	536	372	272	474	252	294	206	94	0	0	0	0

Class-Order-Family	Name	Winter				Spring				Summer				Fall			
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Ins-Ephe-Baetidae	Baetidae	0	0	0	1	236	68	90	165	11	20	37	21	0	0	0	0
Ins-Ephe-	Ephemeroptera	0	0	0	0	11	52	1	12	2	4	0	0	0	0	0	0
Ins-Dipt-Simuliidae	Simulium sp.	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Empididae	Hemerodromia sp.	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Tribelos fuscicorne	0	0	0	0	0	0	0	0	12	0	0	4	0	0	0	0
Ins-Dipt-Chironomidae	Thienemannimyia sp. group	2	0	2	5	10	0	11	6	11	0	5	16	2	0	1	5
Ins-Dipt-Chironomidae	Thienemanniella xena	0	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Thienemanniella lobapodema	0	0	0	0	4	0	0	0	4	0	0	2	0	0	1	0
Ins-Dipt-Chironomidae	Telopelopia okoboji	16	5	11	4	2	0	2	2	25	1	38	1	0	0	0	0
Ins-Dipt-Chironomidae	Tanytarsus sepp	0	0	0	0	0	0	2	0	8	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Tanytarsus glabrescens group	1	0	0	0	2	0	1	1	6	0	10	6	0	1	0	0
Ins-Dipt-Chironomidae	Tanytarsus sp.	5	0	8	5	4	0	0	0	0	0	8	2	0	0	0	0
Ins-Dipt-Chironomidae	Stenochironomus sp.	0	0	0	0	176	54	112	138	395	26	664	738	0	0	0	0
Ins-Dipt-Chironomidae	Rheotanytarsus sp.	0	44	31	11	557	184	363	578	1930	481	2413	166	1	9	3	4
Ins-Dipt-Chironomidae	Polypedilum scalaenum group	0	0	1	0	12	0	0	4	85	0	53	74	0	0	0	0
Ins-Dipt-Chironomidae	Polypedilum illinoense group	0	7	1	5	0	0	0	0	5	0	16	15	0	0	0	1
Ins-Dipt-Chironomidae	Polypedilum halterale group	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Polypedilum flavum	3	24	16	10	294	228	158	297	234	136	354	72	2	9	6	8
Ins-Dipt-Chironomidae	Polypedilum sp.	0	0	0	0	0	0	1	0	32	0	3	19	0	0	0	0
Ins-Dipt-Chironomidae	Phaenopsectra obediens	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Paratanytarsus sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Ins-Dipt-Chironomidae	Paralauterborniella nigrohaltera	4	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0
Ins-Dipt-Chironomidae	Parachironomus frequens	0	0	0	0	0	0	0	0	0	0	4	17	0	0	0	0
Ins-Dipt-Chironomidae	Orthocladius (Orthocladius)	1	4	4	2	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Orthocladius sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Nanocladius distinctus	8	12	10	4	0	0	0	0	0	0	12	2	0	0	0	0
Ins-Dipt-Chironomidae	Nanocladius crassicornus/rectine	0	0	5	1	0	0	1	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Nanocladius alternantherae	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Nanocladius sp.	0	0	7	2	0	0	0	0	0	0	0	0	0	0	0	2
Ins-Dipt-Chironomidae	Micropsectra sp.	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Kribiodorum perpulchrum	0	0	0	0	8	0	0	2	7	0	9	17	0	0	0	0
Ins-Dipt-Chironomidae	Hydrobaenus sp.	3	0	4	3	0	0	0	0	0	0	0	0	0	0	0	2
Ins-Dipt-Chironomidae	Harnischia sp.	0	0	1	3	0	0	1	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Glyptotendipes sp.	0	0	0	0	0	0	0	0	2	0	21	3	0	0	0	0
Ins-Dipt-Chironomidae	Eukiefferiella claripennis group	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Dicrotendipes neomodestus	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Dicrotendipes sp.	0	2	0	0	0	0	0	0	9	0	1	3	0	0	0	0

Class-Order-Family	Name	Winter				Spring				Summer				Fall			
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Ins-Dipt-Chironomidae	Cryptochironomus sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Cricotopus/Orthocladius sp.	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0
Ins-Dipt-Chironomidae	Cricotopus sylvestris group	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Cricotopus bicinctus	0	13	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Cricotopus sp.	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Corynoneura lobata	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Corynoneura sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Cladotanytarsus sp. group A	0	0	0	0	0	0	0	0	2	0	2	2	0	0	0	0
Ins-Dipt-Chironomidae	Chironomus decorus group	0	0	1	0	0	0	0	8	0	0	0	2	0	0	0	0
Ins-Dipt-Chironomidae	Chironomus sp.	0	0	0	1	0	0	0	0	4	0	0	1	0	0	0	2
Ins-Dipt-Chironomidae	Ablabesmyia mallochi	1	0	0	0	0	0	0	0	1	0	8	0	0	0	0	0
Ins-Dipt-Chironomidae	Ablabesmyia annulata	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	1
Ins-Dipt-Chironomidae	Ablabesmyia (Ablabesmyia)	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Ablabesmyia (Karelia) sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Chironomidae	1	0	4	1	22	8	6	16	78	24	39	151	0	0	2	1
Ins-Dipt-Chironomidae	Chironominae	0	0	0	0	2	0	5	0	0	0	0	1	0	0	0	0
Ins-Dipt-Chironomidae	Chironominae (Chironomini)	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
Ins-Dipt-Chironomidae	Chironominae (Tanytarsini)	0	0	0	0	2	12	11	13	17	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Orthocladiinae	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Ins-Dipt-Chironomidae	Tanypodinae	0	0	0	1	0	0	0	0	8	0	0	0	0	0	2	0
Ins-Dipt-Chaoboridae	Chaoborus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Ins-Dipt-Ceratopogonidae	Sphaeromias sp.	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Ceratopogonidae	Bezzia/Palpomyia sp.	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Cole-Elmidae	Macronychus glabratus	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Ins-Cole-Elmidae	Ancyronyx variegatus	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Ins- -	Insecta	0	0	0	0	0	0	0	0	107	42	112	118	0	0	0	0
Ara-Trom-Hydrachnidia	Hydracarina	0	0	2	0	4	2	0	2	0	0	0	0	1	0	0	0
Hyd-Anth-Hydridae	Hydra sp.	0	0	4	2	0	0	0	0	0	0	0	0	0	0	1	1
Gas-Baso-Physidae	Physa sp.	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas-Baso-Ancylidae	Ferrissia sp.	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Biv-Vene-Dreissenidae	Dreissena polymorpha	1	0	0	0	0	0	0	0	5	0	4	2	0	0	0	0
Biv-Vene-Corbiculidae	Corbicula fluminea	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Tre-Neoo-Planariidae	Planariidae	0	0	0	1	0	0	0	0	5	8	4	13	1	4	1	0

Table B-24 Summary of benthic invertebrates collected in Ponar samples at the LEC during 2017-2018 sampling, by season and zone.

Class-Order-Family	Name	Winter				Spring				Summer				Fall			
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Cli-Tubi-Naididae	Quistadrilus multisetosus	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Pristina synclites	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Cli-Tubi-Naididae	Piguetiella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Cli-Tubi-Naididae	Paranais sp.	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Nais pardalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Cli-Tubi-Naididae	Nais communis/variabilis complex	0	0	0	208	0	0	0	0	0	0	0	0	0	0	0	2
Cli-Tubi-Naididae	Nais behningi	0	20	16	1	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Limnodrilus udekemianus	4	0	2	6	0	0	0	15	71	0	2	68	10	5	2	1
Cli-Tubi-Naididae	Limnodrilus hoffmeisteri	18	1	15	37	0	0	2	9	4	0	5	2	11	1	10	8
Cli-Tubi-Naididae	Limnodrilus hoffmeisteri complex	56	8	0	16	64	0	14	60	0	0	96	72	0	1	16	0
Cli-Tubi-Naididae	Limnodrilus claparedianus/cervix	224	1	147	249	38	5	11	110	527	0	111	438	28	1	131	56
Cli-Tubi-Naididae	Limnodrilus sp.	4	0	3	5	0	0	1	2	5	0	1	1	8	3	9	15
Cli-Tubi-Naididae	Dero digitata	0	1	0	0	0	0	0	1	0	0	0	1	0	0	1	4
Cli-Tubi-Naididae	Dero sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Cli-Tubi-Naididae	Branchiura sowerbyi	29	1	42	25	83	8	21	55	264	1	160	333	352	9	111	226
Cli-Tubi-Naididae	Aulodrilus pluriseta	0	0	1	0	0	0	0	4	0	0	0	0	0	0	0	16
Cli-Tubi-Naididae	Naididae	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	8
Cli-Tubi-Naididae	Naidinae	1	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0
Cli-Tubi-Naididae	Tubificinae	871	56	669	564	488	87	196	376	891	9	432	319	1403	41	691	648
Cli-Lumb-Lumbriculidae	Lumbriculidae	0	0	0	0	3	0	2	6	0	0	0	0	1	0	1	4
Cli-Hiru-Glossiphoniidae	Helobdella papillata	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Cli-Hiru-Glossiphoniidae	Helobdella sp.	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Cli-Hiru-Glossiphoniidae	Actinobdella inequiannulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Cli-Hiru-Glossiphoniidae	Actinobdella sp.	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Cli- -	Clitellata	334	6	773	883	40	14	79	171	209	0	85	128	404	18	232	256
Ins-Tric-Polycentropodidae	Neureclipsis sp.	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0
Ins-Tric-Polycentropodidae	Cymellus fraternus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Ins-Tric-Leptoceridae	Oecetis sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Tric-Hydroptilidae	Hydroptila sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Tric-Hydropsychidae	Potamyia flava	1	1	0	4	2	4	1	1	14	6	10	3	6	3	10	21
Ins-Tric-Hydropsychidae	Hydropsyche sp.	0	1	4	6	36	25	28	21	45	12	4	5	3	16	8	11
Ins-Tric-Hydropsychidae	Hydropsychidae	0	0	0	0	2	0	8	2	6	2	3	0	1	2	1	2
Ins-Tric-	Trichoptera	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Ins-Plec-Taeniopterygidae	Taeniopteryx sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Ins-Plec-Perlodidae	Isoperla sp.	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0

Class-Order-Family	Name	Winter				Spring				Summer				Fall			
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Ins-Plec-Perlodidae	Perlodidae	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Ins-Plec-Perlidae	Neoperla sp.	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Ins-Plec-	Plecoptera	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
Ins-Odon-Gomphidae	Gomphus sp.	0	0	0	1	1	1	1	3	1	0	0	2	3	1	5	3
Ins-Odon-Gomphidae	Dromogomphus sp.	0	0	2	4	0	0	0	1	0	0	0	0	0	0	0	0
Ins-Odon-Gomphidae	Gomphidae	0	0	1	2	0	1	0	0	0	0	0	4	0	0	0	0
Ins-Odon-Corduliidae	Neurocordulia molesta	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
Ins-Odon-Corduliidae	Didymops transversa	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Ins-Mega-Corydalidae	Corydalus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ins-Lepi-	Lepidoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ins-Hemi-Corixidae	Corixidae	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Hemi-Aphididae	Aphididae	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Ins-Hemi-	Hemiptera	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
Ins-Ephe-Polymitarcyidae	Tortopus primus	0	0	0	0	19	0	6	2	0	0	0	0	0	0	0	0
Ins-Ephe-Polymitarcyidae	Ephoron album	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Ins-Ephe-Polymitarcyidae	Ephoron sp.	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Ins-Ephe-Polymitarcyidae	Polymitarcidae	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0
Ins-Ephe-Palingeniidae	Pentagenia vittigera	3	25	7	1	1	0	10	2	89	4	67	163	22	68	1	23
Ins-Ephe-Leptohyphidae	Tricorythodes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ins-Ephe-Isonychiidae	Isonychia sp.	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Ins-Ephe-Heptageniidae	Maccaffertium mexicanum integrum	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	1
Ins-Ephe-Heptageniidae	Heptageniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Ins-Ephe-Ephemeridae	Hexagenia limbata	39	0	27	45	23	0	10	16	234	0	78	105	105	3	82	64
Ins-Ephe-Ephemeridae	Hexagenia bilineata	0	0	0	0	13	0	4	18	71	0	10	13	0	0	0	0
Ins-Ephe-Ephemeridae	Hexagenia atrocaudata	1	0	0	1	0	0	0	0	29	0	2	2	2	0	6	1
Ins-Ephe-Ephemeridae	Hexagenia sp.	59	0	21	14	3	0	0	0	374	0	106	99	38	0	22	24
Ins-Ephe-Ephemeridae	Ephemeridae	8	0	8	14	2	0	0	2	12	0	31	12	4	0	2	0
Ins-Ephe-Caenidae	Caenis sp.	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Ins-Ephe-Caenidae	Amercaenis sp.	0	0	0	0	0	0	0	3	0	0	1	1	0	0	0	0
Ins-Ephe-Caenidae	Caenidae	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0
Ins-Ephe-Baetidae	Pseudocloeon sp.	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Ins-Ephe-Baetidae	Baetidae	0	0	0	0	0	0	0	1	0	0	0	2	1	0	0	0
Ins-Ephe-	Ephemeroptera	5	0	9	2	0	0	5	2	0	0	2	0	0	0	0	0
Ins-Dipt-Simuliidae	Simuliidae	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Psychodidae	Psychoda sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Ins-Dipt-Psychodidae	Psychodidae	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	3
Ins-Dipt-Dolichopodidae	Dolichopodidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

Class-Order-Family	Name	Winter				Spring				Summer				Fall			
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Ins-Dipt-Chironomidae	Tribelos jucundus	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Tribelos fuscicorne	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Tribelos ater	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Thienemannimyia sp. group	0	0	0	2	0	0	0	4	2	0	0	0	0	0	0	3
Ins-Dipt-Chironomidae	Telopelopia okoboji	0	0	1	0	1	0	0	32	1	0	1	5	0	0	0	3
Ins-Dipt-Chironomidae	Tanytarsus sepp	0	0	1	2	5	0	0	2	0	0	0	0	0	0	0	2
Ins-Dipt-Chironomidae	Tanytarsus sp.	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Tanypus neopunctipennis	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Stictochironomus caffrarius grou	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Ins-Dipt-Chironomidae	Stictochironomus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ins-Dipt-Chironomidae	Stenochironomus sp.	0	0	0	0	2	0	2	0	6	0	0	0	0	0	0	1
Ins-Dipt-Chironomidae	Stempellinella leptocelloides	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Robackia claviger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Ins-Dipt-Chironomidae	Rheotanytarsus sp.	0	1	0	0	17	1	1	52	41	6	9	13	0	0	1	1
Ins-Dipt-Chironomidae	Rheosmittia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Ins-Dipt-Chironomidae	Procladius (Psilotanypus) sp.	19	0	13	17	4	0	5	8	4	0	0	0	0	3	0	8
Ins-Dipt-Chironomidae	Procladius (Holotanypus) sp.	20	0	8	7	8	0	2	2	0	0	0	0	0	0	3	6
Ins-Dipt-Chironomidae	Procladius sp.	9	0	4	0	0	0	0	2	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Polypedilum trigonus	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Ins-Dipt-Chironomidae	Polypedilum scalaenum group	0	0	0	0	0	1	0	0	9	0	48	2	0	0	2	1
Ins-Dipt-Chironomidae	Polypedilum nubifer	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Polypedilum illinoense group	0	1	0	18	16	0	1	0	3	0	4	0	0	0	1	2
Ins-Dipt-Chironomidae	Polypedilum halterale group	1	15	1	5	3	5	1	36	4	0	5	1	0	0	0	1
Ins-Dipt-Chironomidae	Polypedilum flavum	2	0	0	4	1	3	6	6	32	0	8	4	0	0	1	0
Ins-Dipt-Chironomidae	Polypedilum sp.	0	2	0	0	0	1	0	0	1	0	4	0	0	0	0	0
Ins-Dipt-Chironomidae	Paratendipes basidens	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2	3
Ins-Dipt-Chironomidae	Paralauterborniella nigrohaltera	4	7	1	0	0	1	0	0	0	0	0	0	0	0	2	0
Ins-Dipt-Chironomidae	Paracladopelma undine	3	0	1	4	1	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Paracladopelma nereis	1	1	1	5	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Paracladopelma sp.	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Parachironomus frequens	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Ins-Dipt-Chironomidae	Orthocladius (Orthocladius)	1	1	2	10	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Orthocladius sp.	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Nilotanypus sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Kribiodorum perpulchrum	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Hydrobaenus sp.	18	0	3	7	0	0	0	0	0	0	0	0	0	0	1	5
Ins-Dipt-Chironomidae	Harnischia sp.	1	5	1	0	100	2	14	70	4	0	17	4	2	0	0	0

Class-Order-Family	Name	Winter				Spring				Summer				Fall			
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Ins-Dipt-Chironomidae	Glyptotendipes sp.	1	0	1	0	4	0	0	0	0	0	0	0	0	0	1	0
Ins-Dipt-Chironomidae	Epoicocladius sp.	2	0	1	1	0	0	1	5	1	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Dicrotendipes sp.	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Demicryptochironomus sp.	6	1	0	2	0	0	0	1	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Cryptotendipes sp.	0	1	0	1	20	0	7	7	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Cryptochironomus sp.	15	3	8	4	30	3	6	58	25	0	27	21	120	2	36	44
Ins-Dipt-Chironomidae	Cricotopus/Orthocladius sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ins-Dipt-Chironomidae	Cricotopus sp.	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	1
Ins-Dipt-Chironomidae	Coelotanypus sp.	0	1	1	3	0	0	0	0	0	0	0	1	0	0	2	2
Ins-Dipt-Chironomidae	Chironomus decorus group	7	0	6	13	139	0	68	135	0	0	10	30	18	0	0	1
Ins-Dipt-Chironomidae	Chironomus sp.	0	0	3	3	106	0	10	29	3	0	12	28	0	0	38	14
Ins-Dipt-Chironomidae	Chernovskiia sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Ins-Dipt-Chironomidae	Axarus sp.	0	0	0	0	1	0	0	0	6	0	0	3	6	0	0	0
Ins-Dipt-Chironomidae	Ablabesmyia mallochi	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Ablabesmyia annulata	2	0	1	2	7	0	2	8	1	0	21	5	18	0	15	8
Ins-Dipt-Chironomidae	Ablabesmyia (Karelia) sp.	2	0	2	1	0	0	0	8	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Ablabesmyia sp.	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Ins-Dipt-Chironomidae	Chironomidae	14	0	4	2	15	1	3	4	0	0	3	0	0	0	0	3
Ins-Dipt-Chironomidae	Chironominae	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Chironominae (Chironomini)	3	3	1	2	3	0	0	1	1	0	0	0	0	0	0	2
Ins-Dipt-Chironomidae	Orthocladiinae	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Tanypodinae	1	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0
Ins-Dipt-Chironomidae	Tanypus sp.	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Ins-Dipt-Chaoboridae	Chaoborus sp.	1	0	0	1	0	0	0	0	1	0	0	0	0	0	9	6
Ins-Dipt-Chaoboridae	Chaoboridae	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
Ins-Dipt-Ceratopogonidae	Stilobezzia sp.	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Ins-Dipt-Ceratopogonidae	Sphaeromias sp.	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	1
Ins-Dipt-Ceratopogonidae	Probezzia sp.	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1
Ins-Dipt-Ceratopogonidae	Culicoides sp.	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	2
Ins-Dipt-Ceratopogonidae	Ceratopogon sp.	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Ceratopogonidae	Bezzia/Palpomyia sp.	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ins-Dipt-Ceratopogonidae	Ceratopogonidae	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
Ins-Dipt-	Diptera	0	0	0	0	0	0	30	0	1	0	1	0	0	1	0	0
Ins-Cole-Staphylinidae	Staphylinidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ins-Cole-Elmidae	Stenelmis sp.	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Ins-Cole-Elmidae	Dubiraphia sp.	1	0	0	1	1	0	0	0	0	0	0	0	1	0	0	1
Ins-Cole-	Coleoptera	2	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0

Class-Order-Family	Name	Winter				Spring				Summer				Fall			
		Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Ins- -	Insecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Ent-Coll-Isotomidae	Isotomidae	44	0	2	1	0	0	0	0	1	0	0	0	0	0	1	6
Ara-Trom-Hydrachnidia	Hydracarina	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Gas-Baso-Planorbidae	Planorbidae	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Gas-Baso-Ancylidae	Ancylidae	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Biv-Vene-Dreissenidae	Dreissena polymorpha	4	0	0	5	0	0	0	0	1	0	0	8	2	0	1	1
Biv-Vene-Corbiculidae	Corbicula fluminea	2	6	2	2	1	0	1	0	13	0	3	2	0	2	1	2
Biv-Unio-Unionidae	Leptodea fragilis	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Biv- -	Bivalvia	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

Table B-25 Mean density, standard error, and sample size for benthic inverebrate sampline at the LEC in 2017-2018, by gear, season and zone.

Gear	Season	Statistic	Zone			
			Upstream Reference	Discharge	Thermally Exposed	Downstream
Hester-Dendy	Winter	Mean	19.59	103.77	40.07	23.12
		Std Err	2.24	26.79	8.57	3.54
		N	23	8	24	24
	Spring	Mean	601.73	1251.47	605.28	776.26
		Std Err	90.27	281.60	128.19	122.51
		N	23	7	14	18
	Summer	Mean	546.10	1298.97	687.73	246.14
		Std Err	195.54	496.67	271.02	40.49
		N	23	8	24	22
	Fall	Mean	56.28	196.58	84.25	55.99
		Std Err	15.19	74.48	16.84	8.52
		N	24	8	24	23
Ponar	Winter	Mean	199.25	56.09	195.51	238.68
		Std Err	49.39	13.78	64.23	84.92
		N	6	2	6	6
	Spring	Mean	140.17	52.24	60.58	146.15
		Std Err	39.81	0.96	17.49	39.25
		N	6	2	6	6
	Summer	Mean	321.90	13.46	148.40	204.38
		Std Err	107.99	8.97	48.76	46.63
		N	6	2	6	6
	Fall	Mean	275.11	58.97	157.59	164.64
		Std Err	64.00	1.28	45.56	39.81
		N	6	2	6	6

Table B-26 Sample size, estimated diversity and standard deviation at q = 0, 1, 2, and 3 for benthic invertebrate sampling at the LEC in 2017-2018, by gear, season, and zone.

Gear	Season	Statistic	Upstream		Discharge		Thermal		Downstream	
			Estimate	StdDev	Estimate	StdDev	Estimate	StdDev	Estimate	StdDev
Hester-Dendy	Winter	N	248	-	558	-	602	-	324	-
		^0D	42	3.16	37	2.14	49	2.7	49	3.47
		^1D	17.32	1.54	12.15	0.67	17.41	0.88	25.94	1.59
		^2D	9.64	1.04	7.26	0.46	11.23	0.59	17.1	1.28
		^3D	7.29	0.89	5.82	0.42	9.51	0.5	13.63	1.16
	Spring	N	6853	-	5051	-	5275	-	8523	-
		^0D	48	1.55	17	0.76	42	2.05	41	1.83
		^1D	8.1	0.12	5.5	0.09	8.24	0.15	8.32	0.09
		^2D	5.01	0.09	3.61	0.07	4.95	0.1	6.17	0.07
		^3D	4.05	0.08	2.94	0.06	3.91	0.09	5.38	0.08
	Summer	N	7900	-	6962	-	11048	-	3085	-
		^0D	55	1.76	20	0.86	56	2.78	56	3.62
		^1D	7.58	0.13	4.13	0.05	6.92	0.09	7.81	0.23
		^2D	3.93	0.07	2.8	0.04	4.63	0.05	3.6	0.11
		^3D	3.09	0.05	2.38	0.03	4.07	0.04	2.78	0.07
	Fall	N	788	-	1055	-	1281	-	835	-
		^0D	33	3.43	18	1.71	39	2.69	35	2.99
		^1D	4.93	0.25	3.92	0.13	6.06	0.24	6.22	0.31
		^2D	3.29	0.11	2.96	0.07	3.91	0.11	3.9	0.14
		^3D	2.97	0.09	2.74	0.06	3.49	0.09	3.48	0.11
Ponar	Winter	N	556	-	107	-	330	-	738	-
		^0D	42	3.13	25	2.87	36	2.91	45	3.19
		^1D	10.14	0.63	11.73	1.15	9.25	0.82	9.27	0.52
		^2D	5.02	0.35	7.8	0.82	4.35	0.41	4.86	0.23
		^3D	3.81	0.26	6.56	0.76	3.31	0.29	4.03	0.17
	Spring	N	653	-	59	-	232	-	763	-
		^0D	36	3.12	12	1.7	29	2.11	40	2.54
		^1D	13.63	0.62	6.89	1.02	13.24	1	15.52	0.6
		^2D	9.23	0.48	4.46	0.81	7.86	0.85	10.98	0.46
		^3D	7.71	0.44	3.53	0.69	5.91	0.74	9.36	0.46
	Summer	N	1513	-	31	-	705	-	1318	-
		^0D	35	2.88	7	0.93	27	1.76	32	1.77
		^1D	8.66	0.27	4.95	0.64	10.87	0.43	7.42	0.23
		^2D	5.36	0.19	4.09	0.63	7.89	0.33	4.93	0.15
		^3D	4.4	0.17	3.66	0.63	6.87	0.33	4.24	0.13
	Fall	N	717	-	119	-	514	-	563	-
		^0D	23	1.91	16	1.74	41	3.5	49	3.58
		^1D	5.61	0.27	5.17	0.65	10.39	0.6	11.03	0.75
		^2D	3.39	0.17	2.81	0.35	6.57	0.35	5.11	0.36
		^3D	2.81	0.14	2.3	0.26	5.62	0.3	3.84	0.26

Table B-27 Fraction of organisms in major groups during benthic sampling at the LEC in 2017-2018, by gear and zone.

Gear	Major Group	Zone			
		Upstream Reference	Discharge	Thermally Exposed	Downstream
Hester-Dendy	Trichoptera	0.3317	0.6676	0.4281	0.3471
	Diptera	0.4063	0.1594	0.3703	0.3420
	Ephemeroptera	0.2328	0.1571	0.1650	0.2584
	Plecoptera	0.0099	0.0066	0.0112	0.0099
	Tubificida	0.0038	0.0043	0.0042	0.0048
	Other	0.0084	0.0027	0.0122	0.0260
Ponar	Trichoptera	0.0134	0.1277	0.0150	0.0115
	Diptera	0.1089	0.1436	0.1001	0.1208
	Ephemeroptera	0.1324	0.1791	0.0992	0.0911
	Plecoptera	0.0002	0.0000	0.0004	0.0007
	Tubificida	0.6222	0.4610	0.5567	0.5624
	Other	0.1126	0.0674	0.2222	0.2038

Table B-28 Number of species and fraction of organism in EPT orders during benthic sampling at the LEC in 2017-2018 by gear, season, and zone.

Gear	Season	Statistic	Zone			
			Upstream Reference	Discharge	Thermally Exposed	Downstream
Hester-Dendy	Winter	# Species	14	11	14	16
		Fraction	0.559	0.525	0.536	0.489
		N	329	606	702	405
	Spring	# Species	27	13	23	22
		Fraction	0.778	0.874	0.771	0.742
		N	10103	6395	6186	10200
	Summer	# Species	21	12	22	19
		Fraction	0.309	0.8	0.483	0.231
		N	9169	7586	12049	3953
	Fall	# Species	17	11	19	16
		Fraction	0.966	0.969	0.931	0.913
		N	986	1148	1476	940
Ponar	Winter	# Species	5	3	4	7
		Fraction	0.063	0.154	0.042	0.041
		N	1865	175	1830	2234
	Spring	# Species	8	2	8	9
		Fraction	0.079	0.178	0.134	0.056
		N	1312	163	567	1368
	Summer	# Species	9	4	9	9
		Fraction	0.291	0.595	0.228	0.214
		N	3013	42	1389	1913
	Fall	# Species	7	4	7	9
		Fraction	0.071	0.5	0.091	0.099
		N	2575	184	1475	1541

Table B-29 Upper incipient lethal temperature (UILT) for EPT taxa from literature. Heat intolerant are those with UILT ≤ 30 in bold font.

Order	Family	Scientific Name	UILT*
Ephemeroptera	**Baetidae**	**Baetidae**	**26.1**
	Baetidae	Pseudocloeon sp.	41.1
	Caenidae	**Caenis sp.**	**26.7**
	Ephemeridae	Hexagenia bilineata	>30
	Ephemeridae	**Hexagenia limbata**	**26.6**
	Heptageniidae	**Heptagenia sp.**	**28.3**
	Heptageniidae	**Heptageniidae**	**22**
	Heptageniidae	**Stenonema femoratum**	**25.5**
Plecoptera	**Perlidae**	**Acroneuria sp.**	**30**
	Perlidae	**Perlidae**	**24.1**
	Taeniopterygidae	**Taeniopterygidae**	**29.5, 21**
	Taeniopterygidae	**Taeniopteryx sp.**	**29.5, 21**
Trichoptera	Hydropsychidae	Hydropsyche sp.	>35
	Hydroptilidae	**Hydroptila sp.**	**30-41.1**
	Hydroptilidae	**Hydroptilidae**	**30-41.1**
	Polycentropodidae	Neureclipsis sp.	>35

*Dallas and Ross-Gillespie 2015; Environmental Canada 2014; Nebeker and Lemke 1968; Stewart et al. 2013; Yoder and Rankin 2005

Table B-30 Number of organisms in EPT orders, number and fraction in heat-intolerant groups during benthic sampling at the LEC in 2017-2018 by gear, season, and zone.

Gear	Season	Statistic	Zone			
			Upstream Reference	Discharge	Thermally Exposed	Downstream
Hester-Dendy	Winter	Total EPT	184	318	376	198
		# Intolerant	31	23	33	38
		Fraction	0.168	0.072	0.088	0.192
	Spring	Total EPT	7856	5587	4768	7567
		# Intolerant	778	190	370	681
		Fraction	0.099	0.034	0.078	0.09
	Summer	Total EPT	2834	6067	5822	912
		# Intolerant	347	112	321	202
		Fraction	0.122	0.018	0.055	0.221
	Fall	Total EPT	952	1112	1374	858
		# Intolerant	97	63	151	101
		Fraction	0.102	0.057	0.11	0.118
Ponar	Winter	Total EPT	117	27	77	91
		# Intolerant	39	0	27	46
		Fraction	0.333	0	0.351	0.505
	Spring	Total EPT	103	29	76	76
		# Intolerant	23	0	10	17
		Fraction	0.223	0	0.132	0.224
	Summer	Total EPT	878	25	316	409
		# Intolerant	235	0	78	107
		Fraction	0.268	0	0.247	0.262
	Fall	Total EPT	183	92	134	152
		# Intolerant	106	3	83	66
		Fraction	0.579	0.033	0.619	0.434

Table B-31 Means and standard errors for individual metrics, and standardized differences for benthic invertebrates collected during winter sampling at the LEC in 2017-2018.

Season	Gear	Type	Metric	Upstream Reference			Thermally Exposed				Downstream			
				Mean	Std Err	N	Mean	Std Err	N	Std Diff	Mean	Std Err	N	Std Diff
Winter	Hester-Dendy	Composition	Fraction EPT	0.559	0.027	329	0.536	0.019	702	-0.692	0.489	0.025	405	-1.894
			EPT Species	14	1	329	14	1	702	0	16	1	405	1.414
		Density	Mean Countt	19.595	2.242	23	40.07	8.566	24	2.312	23.116	3.537	24	0.841
		Diversity	^{0}D	42	3.158	248	49	2.7	602	1.685	49	3.473	324	1.491
			^{1}D	17.32	1.54	248	17.41	0.88	602	0.052	25.945	1.593	324	3.893
			^{2}D	9.64	1.045	248	11.23	0.585	602	1.331	17.097	1.283	324	4.508
			^{3}D	7.288	0.894	248	9.506	0.499	602	2.166	13.633	1.155	324	4.344
		Thermal Tolerance	Fraction EPT Intolerant	0.168	0.028	184	0.088	0.015	376	-2.565	0.192	0.028	198	0.611
	Ponar	Composition	Fraction EPT	0.063	0.006	1865	0.042	0.005	1830	-2.867	0.041	0.004	2234	-3.135
			EPT Species	5	1	1865	4	1	1830	-0.707	7	1	2234	1.414
		Density	Mean Count	199.25	49.389	6	195.5	64.232	6	-0.046	238.68	84.919	6	0.401
		Diversity	^{0}D	42	3.13	556	36	2.911	330	-1.404	45	3.187	738	0.672
			^{1}D	10.136	0.631	556	9.249	0.821	330	-0.857	9.27	0.52	738	-1.058
			^{2}D	5.023	0.347	556	4.347	0.406	330	-1.265	4.861	0.228	738	-0.390
			^{3}D	3.81	0.26	556	3.309	0.289	330	-1.288	4.033	0.169	738	0.720
		Thermal Tolerance	Fraction EPT Intolerant	0.333	0.044	117	0.351	0.054	77	0.258	0.505	0.052	91	2.524

Table B-32 Means and standard errors for individual metrics, and standardized differences for benthic invertebrates collected during spring sampling at the LEC in 2017-2018.

Season	Gear	Type	Metric	Upstream Reference			Thermally Exposed				Downstream			
				Mean	Std Err	N	Mean	Std Err	N	Std Diff	Mean	Std Err	N	Std Diff
Spring	Hester-Dendy	Composition	Fraction EPT	0.778	0.004	10103	0.771	0.005	6186	-1.036	0.742	0.004	10200	-6.011
			EPT Species	27	1	10103	23	1	6186	-2.828	22	1	10200	-3.536
		Density	Mean Countt	601.73	90.27	23	605.3	128.19	14	0.023	776.26	122.51	18	1.147
		Diversity	^{0}D	48	1.552	6853	42	2.054	5275	-2.331	41	1.834	8523	-2.914
			^{1}D	8.099	0.121	6853	8.242	0.147	5275	0.751	8.32	0.092	8523	1.455
			^{2}D	5.015	0.088	6853	4.949	0.104	5275	-0.483	6.173	0.075	8523	10.031
			^{3}D	4.054	0.079	6853	3.905	0.086	5275	-1.275	5.382	0.083	8523	11.543
		Thermal Tolerance	Fraction EPT Intolerant	0.099	0.003	7856	0.078	0.004	4768	-4.084	0.09	0.003	7567	-1.911
	Ponar	Composition	Fraction EPT	0.079	0.007	1312	0.134	0.014	567	3.41	0.056	0.006	1368	-2.371
			EPT Species	8	1	1312	8	1	567	0	9	1	1368	0.707
		Density	Mean Count	140.17	39.812	6	60.58	17.486	6	-1.83	146.15	39.254	6	0.107
		Diversity	^{0}D	36	3.124	653	29	2.109	232	-1.857	40	2.544	763	0.993
			^{1}D	13.628	0.62	653	13.24	1	232	-0.328	15.518	0.604	763	2.183
			^{2}D	9.235	0.481	653	7.858	0.853	232	-1.407	10.984	0.462	763	2.624
			^{3}D	7.707	0.445	653	5.914	0.738	232	-2.081	9.361	0.463	763	2.576
		Thermal Tolerance	Fraction EPT Intolerant	0.223	0.041	103	0.132	0.039	76	-1.611	0.224	0.048	76	0.016

Table B-33 Means and standard errors for individual metrics, and standardized differences for benthic invertebrates collected during summer sampling at the LEC in 2017-2018.

Season	Gear	Type	Metric	Upstream Reference			Thermally Exposed				Downstream			
				Mean	Std Err	N	Mean	Std Err	N	Std Diff	Mean	Std Err	N	Std Diff
Summer	Hester-Dendy	Composition	Fraction EPT	0.309	0.005	9169	0.483	0.005	12049	26.23	0.231	0.007	3953	-9.443
			EPT Species	21	1	9169	22	1	12049	0.707	19	1	3953	-1.414
		Density	Mean Countt	546.1	195.54	23	687.7	271.02	24	0.424	246.14	40.486	22	-1.502
		Diversity	^{0}D	55	1.757	7900	56	2.784	11048	0.304	56	3.615	3085	0.249
			^{1}D	7.583	0.129	7900	6.915	0.089	11048	-4.258	7.814	0.23	3085	0.875
			^{2}D	3.93	0.066	7900	4.629	0.05	11048	8.443	3.595	0.106	3085	-2.681
			^{3}D	3.091	0.049	7900	4.068	0.044	11048	14.8	2.784	0.073	3085	-3.466
		Thermal Tolerance	Fraction EPT Intolerant	0.122	0.006	2834	0.055	0.003	5822	-9.802	0.221	0.014	912	6.577
	Ponar	Composition	Fraction EPT	0.291	0.008	3013	0.228	0.011	1389	-4.509	0.214	0.009	1913	-6.157
			EPT Species	9	1	3013	9	1	1389	0	9	1	1913	0.000
		Density	Mean Count	321.9	107.99	6	148.4	48.755	6	-1.464	204.38	46.634	6	-0.999
		Diversity	^{0}D	35	2.885	1513	27	1.76	705	-2.367	32	1.771	1318	-0.886
			^{1}D	8.66	0.272	1513	10.87	0.43	705	4.343	7.421	0.233	1318	-3.458
			^{2}D	5.361	0.188	1513	7.891	0.334	705	6.597	4.93	0.15	1318	-1.794
			^{3}D	4.396	0.168	1513	6.873	0.332	705	6.653	4.243	0.133	1318	-0.715
		Thermal Tolerance	Fraction EPT Intolerant	0.268	0.015	878	0.247	0.024	316	-0.737	0.262	0.022	409	-0.227

Table B-34 Means and standard errors for individual metrics, and standardized differences for benthic invertebrates collected during fall sampling at the LEC in 2017-2018.

Season	Gear	Type	Metric	Upstream Reference			Thermally Exposed				Downstream			
				Mean	Std Err	N	Mean	Std Err	N	Std Diff	Mean	Std Err	N	Std Diff
Fall	Hester-Dendy	Composition	Fraction EPT	0.966	0.006	986	0.931	0.007	1476	-3.993	0.913	0.009	940	-4.883
			EPT Species	17	1	986	19	1	1476	1.414	16	1	940	-0.707
		Density	Mean Countt	56.279	15.192	24	84.25	16.836	24	1.233	55.986	8.522	23	-0.017
		Diversity	^{0}D	33	3.427	788	39	2.693	1281	1.377	35	2.992	835	0.440
			^{1}D	4.926	0.247	788	6.065	0.236	1281	3.336	6.221	0.308	835	3.283
			^{2}D	3.288	0.109	788	3.906	0.109	1281	3.991	3.895	0.138	835	3.442
			^{3}D	2.968	0.095	788	3.492	0.091	1281	3.988	3.48	0.111	835	3.508
		Thermal Tolerance	Fraction EPT Intolerant	0.102	0.01	952	0.11	0.008	1374	0.618	0.118	0.011	858	1.085
	Ponar	Composition	Fraction EPT	0.071	0.005	2575	0.091	0.007	1475	2.213	0.099	0.008	1541	3.064
			EPT Species	7	1	2575	7	1	1475	0	9	1	1541	1.414
		Density	Mean Count	275.11	63.998	6	157.6	45.557	6	-1.496	164.64	39.814	6	-1.466
		Diversity	^{0}D	23	1.911	717	41	3.495	514	4.518	49	3.58	563	6.407
			^{1}D	5.613	0.27	717	10.39	0.601	514	7.257	11.03	0.75	563	6.795
			^{2}D	3.391	0.168	717	6.571	0.348	514	8.231	5.11	0.361	563	4.318
			^{3}D	2.814	0.143	717	5.625	0.303	514	8.385	3.841	0.262	563	3.444
		Thermal Tolerance	Fraction EPT Intolerant	0.579	0.036	183	0.619	0.042	134	0.719	0.434	0.04	152	-2.671

Table B-35 Sampling statistics for electrofishing sampling at LEC in 1980-1985, 1997-2002, and 2018-2018, by zone, habitat, and season. Only fish > 100 mm total length are included.

Zone	Habitat	Season	Survey	Number of Samples	Number of Fish	Biomass (Kg)	Mean N. Fish per 20 min	StdErr (Mean Mean N. Fish)	Mean Biomass (Kg per 20 min)	StdErr (Mean Biomass)
Upstream Reference	OLD	Winter	1980-1985	1	85	16.31	65.38		16.31	
			1997-2002	6	460	58.51	77.75	41.46	9.75	5.05
			2017-2018	6	95	109.23	15.48	5.74	18.21	7.73
		Spring	1980-1985	5	204	50.83	35.32	4.22	10.17	2.57
			1997-2002	6	229	271.6	33.02	6.72	45.27	9.77
			2017-2018	6	91	93.89	13.39	0.9	15.65	3.56
		Summer	1980-1985	6	188	70.72	23.74	6.21	11.79	5.58
			1997-2002	6	109	83.43	19.42	4.7	13.91	3.85
			2017-2018	6	64	50.48	9.27	2.41	8.41	3.24
		Fall	1980-1985	7	480	45.06	57.63	17.01	6.44	1.53
			1997-2002	5	120	97.38	28.1	10.29	19.48	8.65
			2017-2018	6	61	45.09	9.63	3.24	7.51	3.12
Discharge	DIS	Winter	1980-1985	1	36	14.13	32.73		14.13	
			1997-2002	6	454	430.49	76.32	10.06	71.75	13.21
			2017-2018	6	223	449.62	33.86	4.29	74.94	23.29
		Spring	1980-1985	5	277	112.97	55.45	15.69	22.59	5.15
			1997-2002	6	302	395.63	52.51	13.35	65.94	20.83
			2017-2018	6	129	235.88	19.43	3.67	39.31	12.46
		Summer	1980-1985	6	67	42.01	11.28	2.73	7	2.67
			1997-2002	6	113	133.11	18.83	5.34	22.19	4.81
			2017-2018	6	36	32	5.47	1.43	5.33	2.89
		Fall	1980-1985	7	456	176.4	64.3	29.52	25.2	10.63
			1997-2002	5	325	289.82	66.56	9.59	57.96	6.15
			2017-2018	6	127	418.39	19.47	4.67	69.73	20.58
Thermally Exposed	CXLD	Winter	1980-1985	1	25	8.35	20.83		8.35	
			1997-2002	6	90	90.75	15	4.2	15.12	2.02
			2017-2018	6	100	75.21	14.49	6.3	12.53	4.46
		Spring	1980-1985	5	237	52.65	47.4	15.09	10.53	1.92
			1997-2002	6	144	92.45	24	7.33	15.41	3.95
			2017-2018	6	82	95.18	12.09	1.7	15.86	3.82

Zone	Habitat	Season	Survey	Number of Samples	Number of Fish	Biomass (Kg)	Mean N. Fish per 20 min	StdErr (Mean Mean N. Fish)	Mean Biomass (Kg per 20 min)	StdErr (Mean Biomass)
Thermally Exposed	CXLD	Summer	1980-1985	6	136	61.68	22.67	7.64	10.28	4.94
			1997-2002	6	64	31.26	10.67	3.41	5.21	1.67
			2017-2018	6	54	56.14	8.01	1.8	9.36	3.14
		Fall	1980-1985	7	713	106.24	100.19	36.5	15.18	3.05
			1997-2002	5	48	73.09	9.6	3.23	14.62	2.37
			2017-2018	6	76	107.3	11.78	3.02	17.88	5.28
	OLD	Winter	1997-2002	6	106	136.96	17.54	3.32	22.83	6.95
			2017-2018	6	167	175.38	26.04	6.17	29.23	9.31
		Spring	1997-2002	6	136	163.26	22.52	7.24	27.21	4.47
			2017-2018	6	93	143.87	13.63	3.96	23.98	7.31
		Summer	1997-2002	6	114	117.25	20.24	5.45	19.54	4.59
			2017-2018	6	48	72.49	6.84	2.27	12.08	4.4
		Fall	1997-2002	5	123	180.42	24.04	3.87	36.08	6.87
			2017-2018	6	81	98.71	12.04	3.29	16.45	7.39

Table B-36 Diversity statistics of fish community in electrofishing sampling by zone and season during 1980-1985, 1997-2002, and 2017-2018 LEC studies based on numerical count and total biomass. Only fish > 100 mm total length are included.

Zone	Habitat	Season	Survey	Number of Fish	$^{0}D_{Count}$	$^{0}D_{Count}$ Standard Deviation	$^{1}D_{Count}$	$^{1}D_{Count}$ Standard Deviation	$^{2}D_{Count}$	$^{2}D_{Count}$ Standard Deviation	$^{0}D_{weight}$	$^{1}D_{weight}$	$^{2}D_{weight}$
Upstream Reference	OLD	Winter	1980-1985	57	9	1.32	3.33	0.49	2.11	0.27	9	4.63	3.76
			1997-2002	397	14	1.99	1.96	0.14	1.34	0.05	14	6.41	5.02
			2017-2018	29	17	2.16	9.06	1.25	6.22	0.92	17	7.43	5.57
		Spring	1980-1985	102	17	2.68	5.83	0.68	3.42	0.36	17	7.74	6.03
			1997-2002	83	19	1.04	8.95	0.73	5.52	0.6	19	8.33	5.39
			2017-2018	14	16	1.77	11.62	1.11	10.09	0.94	16	8.65	7.3
		Summer	1980-1985	47	18	2.16	9.37	0.74	7.34	0.59	18	7.66	6.25
			1997-2002	36	10	0.81	6.1	0.57	4.58	0.51	10	5.01	3.08
			2017-2018	14	14	1.22	10.13	1.07	8.09	1.1	14	8.97	7.08
		Fall	1980-1985	308	20	1.4	4.08	0.26	2.3	0.13	20	7.38	4.63
			1997-2002	46	13	1.48	6.37	0.65	4.39	0.47	13	4.97	3.26
			2017-2018	18	17	1.4	11.49	1.36	7.74	1.44	17	10.61	9.25
	DIS	Winter	1980-1985	9	10	1.38	7.9	1.16	6.75	1.1	10	6.7	5.73
			1997-2002	203	21	1.64	7.24	0.45	4.17	0.31	21	8.32	5.65
			2017-2018	55	22	3.1	9.56	0.91	6.78	0.52	22	5.31	2.98
		Spring	1980-1985	136	16	1.34	6.26	0.51	3.62	0.34	16	6.09	4.09
			1997-2002	130	15	1.49	6.99	0.48	4.38	0.39	15	4.19	2.3
			2017-2018	26	16	1.25	9.72	0.84	7.45	0.7	16	8.16	4.97
		Summer	1980-1985	10	12	1.05	10.07	0.8	9.18	0.82	12	6.33	4.17
			1997-2002	45	12	1.54	6.42	0.71	4.51	0.59	12	3.69	2.35
			2017-2018	10	10	0.98	7.95	0.95	6.61	1.04	10	6.43	5.61
		Fall	1980-1985	199	21	2.03	7.88	0.52	4.43	0.36	21	10.76	7.36
			1997-2002	160	21	2.25	7.23	0.63	3.72	0.34	21	9.94	7.03
			2017-2018	67	16	1.48	5.89	0.75	3.21	0.42	16	3.1	1.82

Zone	Habitat	Season	Survey	Number of Fish	$^{0}D_{Count}$	$^{0}D_{Count}$ Standard Deviation	$^{1}D_{Count}$	$^{1}D_{Count}$ Standard Deviation	$^{2}D_{Count}$	$^{2}D_{Count}$ Standard Deviation	$^{0}D_{weight}$	$^{1}D_{weight}$	$^{2}D_{weight}$
Thermally Exposed	CXLD	Winter	1980-1985	6	6	0.73	5.38	0.59	5.08	0.61	6	3.87	3.09
			1997-2002	23	14	1.93	8.75	1.02	6.82	0.85	14	8.28	5.6
			2017-2018	37	15	1.87	7.22	0.91	4.85	0.63	15	7.33	5.39
		Spring	1980-1985	162	20	2.7	4.2	0.51	2.09	0.17	20	7.9	5.67
			1997-2002	46	19	1.73	9.8	0.96	6.46	0.77	19	8.34	5.84
			2017-2018	10	18	1.73	13.9	1.33	12.05	1.27	18	10.23	8.31
		Summer	1980-1985	60	17	2.49	6.81	0.92	4.06	0.52	17	6.2	4.09
			1997-2002	21	10	0.88	6.66	0.78	5.01	0.73	10	6.64	4.78
			2017-2018	10	13	1.55	10.04	1.21	8.63	1.12	13	8.05	6.87
		Fall	1980-1985	504	25	2.04	3.75	0.24	1.96	0.09	25	8.71	5.94
			1997-2002	10	10	0.88	8.13	0.72	7.16	0.75	10	5.06	3.93
			2017-2018	18	15	1.47	10.42	1.16	8.11	1.13	15	7.05	5.84
	OLD	Winter	1997-2002	27	14	1.31	8.92	0.83	6.98	0.75	14	5.66	3.79
			2017-2018	58	19	2.45	8.42	0.91	5.51	0.61	19	8.43	7.07
		Spring	1997-2002	36	12	1.79	6.91	0.62	5.78	0.44	12	5.05	3.83
			2017-2018	23	17	1.98	10.92	1.26	8.26	1.16	17	10	8.07
		Summer	1997-2002	35	13	2.08	7.28	0.8	5.66	0.63	13	5.57	4.33
			2017-2018	11	11	0.97	8.74	0.84	7.38	0.9	11	8.29	7.14
		Fall	1997-2002	28	14	1.62	7.52	0.71	6.04	0.5	14	5.31	3.88
			2017-2018	15	17	1.67	11.51	1.27	9.1	1.14	17	8.83	7.09

Table B-37 Fish community in electrofishing sampling by zone, season, habitat, and type during 1980-1985, 1997-2002, and 2017-2018 LEC studies based on numerical count and total biomass. Only fish > 100 mm total length are included.

Zone	Habitat	Survey	Season	Number of Fish					Biomass (Kg)				
				Rough	Forage	Pan	Game	Special	Rough	Forage	Pan	Game	Special
Upstream Reference	OLD	1980-1985	Winter	77	5	1	2	0	15.04	0.752	0.39	0.132	0
			Spring	167	10	3	23	1	41.373	1.195	0.89	6.71	0.657
			Summer	140	15	2	31	0	55.957	0.934	0.162	13.667	0
			Fall	402	46	16	16	0	34.461	3.878	1.126	5.59	0
		1997-2002	Winter	444	13	2	1	0	55.475	2.531	0.142	0.365	0
			Spring	195	5	5	23	1	241.344	0.751	1.669	25.683	2.15
			Summer	97	0	5	7	0	72.026	0	2.647	8.757	0
			Fall	97	7	0	16	0	83.533	0.298	0	13.548	0
		2017-2018	Winter	69	8	1	17	0	80.797	0.289	0.48	27.665	0
			Spring	65	3	2	21	0	73.442	0.171	0.386	19.89	0
			Summer	48	6	0	9	1	43.082	0.409	0	6.009	0.98
			Fall	47	6	1	6	1	37.894	0.231	0.076	6.397	0.49
Discharge	DIS	1980-1985	Winter	14	17	2	3	0	9.852	0.755	0.456	3.064	0
			Spring	233	27	4	12	1	99.714	2.654	0.783	9.473	0.345
			Summer	42	4	0	21	0	30.323	0.668	0	11.021	0
			Fall	344	61	24	27	0	113.717	7.804	5.435	49.443	0
		1997-2002	Winter	365	37	16	36	0	216.668	5.461	6.509	201.853	0
			Spring	247	1	7	45	2	330.465	0.051	2.046	58.814	4.25
			Summer	99	1	0	13	0	127.116	0.088	0	5.908	0
			Fall	256	18	17	34	0	191.872	2.913	7.265	87.77	0
		2017-2018	Winter	135	6	1	80	1	167.3787	1.529	0.02	280.258	0.43
			Spring	94	0	1	33	1	101.602	0	0.068	119.946	14.262
			Summer	16	4	0	16	0	23.029	0.177	0	8.789	0
			Fall	49	1	0	77	0	81.004	0.02	0	337.364	0

Zone	Habitat	Survey	Season	Number of Fish					Biomass (Kg)				
				Rough	Forage	Pan	Game	Special	Rough	Forage	Pan	Game	Special
Thermally Exposed	CXLD	1980-1985	Winter	18	3	0	4	0	6.144	0.176	0	2.025	0
			Spring	205	9	10	13	0	43.14	0.565	1.316	7.633	0
			Summer	88	2	5	41	0	27.609	0.058	0.892	33.119	0
			Fall	643	17	31	21	1	79.832	1.971	3.941	17.892	2.6
		1997-2002	Winter	64	18	1	7	0	68.528	2.206	0.533	19.478	0
			Spring	115	4	4	21	0	78.678	0.728	1.229	11.811	0
			Summer	40	0	0	24	0	27.489	0	0	3.768	0
			Fall	36	6	1	5	0	64.276	2.074	0.069	6.675	0
		2017-2018	Winter	90	4	0	6	0	70.7296	0.465	0	4.0136	0
			Spring	64	0	2	15	1	84.489	0	0.278	9.875	0.54
			Summer	43	0	1	10	0	49.365	0	0.0233	6.7548	0
			Fall	56	5	0	14	1	84.003	0.167	0	22.383	0.75
	OLD	1997-2002	Winter	74	5	0	27	0	65.188	0.486	0	71.289	0
			Spring	88	0	1	47	0	77.158	0	0.225	85.88	0
			Summer	51	0	1	62	0	27.344	0	0.033	89.875	0
			Fall	75	1	3	44	0	91.525	0.162	0.585	88.147	0
		2017-2018	Winter	141	6	2	18	0	149.7344	0.722	0.489	24.435	0
			Spring	81	0	1	11	0	125.385	0	0.323	18.157	0
			Summer	36	2	0	10	0	52.354	0.044	0	20.092	0
			Fall	63	4	1	13	0	82.537	0.063	0.02	16.085	0

Table B-38 Heat tolerance of fish community in electrofishing sampling by zone, season, and habitat during 1980-1985, 1997-2002, and 2017-2018 LEC studies based on numerical count and total biomass. Only fish > 100 mm total length are included.

Zone	Habitat	Survey	Season	Number of Fish			Biomass (Kg)		
				Intolerant	Neutral	Tolerant	Intolerant	Neutral	Tolerant
Upstream Reference	OLD	1980-1985	Winter	6	7	72	1.142	3.48	11.692
			Spring	10	55	139	1.196	23.098	26.531
			Summer	15	42	131	1.713	16.737	52.27
			Fall	51	81	348	4.635	12.777	27.643
		1997-2002	Winter	12	23	425	2.451	13.694	42.368
			Spring	6	59	164	0.842	98.228	172.527
			Summer	0	46	63	0	57.728	25.702
			Fall	4	41	75	0.154	65.792	31.433
		2017-2018	Winter	11	51	33	2.007	82.993	24.231
			Spring	2	31	58	0.343	46.957	46.589
			Summer	5	18	41	0.198	26.179	24.103
			Fall	6	28	27	0.231	21.439	23.418
Discharge	DIS	1980-1985	Winter	8	18	10	0.584	8.906	4.637
			Spring	16	68	193	1.988	59.215	51.766
			Summer	4	26	37	0.668	28.691	12.653
			Fall	47	125	284	7.534	87.973	80.892
		1997-2002	Winter	36	96	322	5.363	251.609	173.519
			Spring	0	178	124	0	295.581	100.045
			Summer	1	61	51	0.088	96.177	36.847
			Fall	15	98	212	2.37	175.583	111.867
		2017-2018	Winter	6	110	107	1.5193	314.4014	133.695
			Spring	0	42	87	0	130.066	105.812
			Summer	4	8	24	0.177	12.718	19.1
			Fall	1	90	36	0.02	358.458	59.91

Zone	Habitat	Survey	Season	Number of Fish			Biomass (Kg)		
				Intolerant	Neutral	Tolerant	Intolerant	Neutral	Tolerant
Thermally Exposed	CXLD	1980-1985	Winter	7	5	13	2.201	0.897	5.247
			Spring	7	33	197	1.135	13.36	38.159
			Summer	3	41	92	0.34	38.238	23.1
			Fall	19	102	592	2.766	38.847	64.623
		1997-2002	Winter	18	39	33	2.206	61.219	27.32
			Spring	2	43	99	0.332	37.655	54.459
			Summer	0	6	58	0	6.745	24.512
			Fall	6	15	27	2.074	30.902	40.118
		2017-2018	Winter	5	32	63	0.5996	34.666	39.9426
			Spring	0	26	56	0	39.336	55.846
			Summer	0	16	38	0	26.8083	29.3348
			Fall	4	42	30	0.107	78.611	28.585
	OLD	1997-2002	Winter	5	49	52	0.486	103.704	32.773
			Spring	0	76	60	0	116.359	46.904
			Summer	1	52	61	0.18	59.835	57.237
			Fall	1	61	61	0.162	128.855	51.402
		2017-2018	Winter	6	38	123	0.722	64.4444	110.214
			Spring	1	27	65	0.323	62.43	81.112
			Summer	2	9	37	0.044	27.917	44.529
			Fall	4	26	51	0.063	60.145	38.497

Table B-39 Standardized differences of ecological metrics between survey 1 (1980-1985) and survey 3 (2017-2018) in Upstream Reference zone, OLD habitat.

Metric	Season	Mean value of metric in Survey 1	Standard Error of Metric	Number of Samples	Mean value of metric in Survey 3	Standard Error of Metric	Number of Samples	Difference of Metric Values	Pooled Standard Deviation	Standardized Difference
Abundance Count	Spring	35.32	4.22	5	13.39	0.90	6	-21.93	4.32	-5.08
	Summer	23.74	6.21	6	9.27	2.41	6	-14.47	6.66	-2.17
	Fall	57.63	17.01	7	9.63	3.24	6	-48.00	17.32	-2.77
Abundance (Kg)	Spring	10.17	2.57	5	15.65	3.56	6	5.48	4.39	1.25
	Summer	11.79	5.58	6	8.41	3.24	6	-3.38	6.45	-0.52
	Fall	6.44	1.53	7	7.51	3.12	6	1.07	3.48	0.31
Diversity ^{0}D	Winter	9	1.32	57	17.00	2.16	29	8.00	2.53	3.16
	Spring	17	2.68	102	16.00	1.77	14	-1.00	3.21	-0.31
	Summer	18	2.16	47	14.00	1.22	14	-4.00	2.48	-1.61
	Fall	20	1.40	308	17.00	1.40	18	-3.00	1.98	-1.52
Diversity ^{1}D	Winter	3.33	0.49	57	9.06	1.25	29	5.73	1.34	4.27
	Spring	5.83	0.68	102	11.62	1.11	14	5.79	1.30	4.45
	Summer	9.37	0.74	47	10.13	1.07	14	0.76	1.30	0.58
	Fall	4.08	0.26	308	11.49	1.36	18	7.41	1.39	5.35
Diversity ^{2}D	Winter	2.11	0.27	57	6.22	0.92	29	4.11	0.96	4.29
	Spring	3.42	0.36	102	10.09	0.94	14	6.67	1.01	6.63
	Summer	7.34	0.59	47	8.09	1.10	14	0.75	1.25	0.60
	Fall	2.30	0.13	308	7.74	1.44	18	5.44	1.45	3.76
Diversity ^{3}D	Winter	1.81	0.20	57	5.15	0.79	29	3.34	0.82	4.10
	Spring	2.77	0.27	102	9.38	0.94	14	6.61	0.98	6.76
	Summer	6.42	0.62	47	7.06	1.08	14	0.64	1.25	0.51
	Fall	1.94	0.09	308	5.90	1.32	18	3.96	1.32	2.99
	Winter	0.07	0.03	85	0.12	0.03	95	0.05	0.04	1.05

Metric	Season	Mean value of metric in Survey 1	Standard Error of Metric	Number of Samples	Mean value of metric in Survey 3	Standard Error of Metric	Number of Samples	Difference of Metric Values	Pooled Standard Deviation	Standardized Difference
Heat Intolerant Count	Spring	0.05	0.02	204	0.02	0.02	91	-0.03	0.02	-1.25
	Summer	0.08	0.02	188	0.08	0.03	64	0.00	0.04	-0.04
	Fall	0.11	0.01	480	0.10	0.04	61	-0.01	0.04	-0.19
Heat Intolerant (Kg)	Winter	0.07	0.03	85	0.02	0.01	95	-0.05	0.03	-1.67
	Spring	0.02	0.01	204	0.00	0.01	91	-0.02	0.02	-1.34
	Summer	0.02	0.01	188	0.00	0.01	64	-0.02	0.02	-1.21
	Fall	0.10	0.01	480	0.01	0.01	61	-0.10	0.02	-5.19
Heat Tolerant Count	Winter	0.85	0.04	85	0.35	0.05	95	0.50	0.06	7.99
	Spring	0.68	0.03	204	0.64	0.05	91	0.04	0.06	0.73
	Summer	0.70	0.03	188	0.64	0.06	64	0.06	0.07	0.82
	Fall	0.73	0.02	480	0.44	0.06	61	0.28	0.07	4.23
Heat Tolerant (Kg)	Winter	0.72	0.05	85	0.22	0.04	95	0.50	0.07	7.63
	Spring	0.52	0.04	204	0.50	0.05	91	0.03	0.06	0.41
	Summer	0.74	0.03	188	0.48	0.06	64	0.26	0.07	3.73
	Fall	0.61	0.02	480	0.52	0.06	61	0.09	0.07	1.39
Non-Rough Count	Winter	0.13	0.04	85	0.34	0.05	95	0.21	0.06	3.42
	Spring	0.19	0.03	204	0.37	0.05	91	0.19	0.06	3.25
	Summer	0.26	0.03	188	0.30	0.06	64	0.04	0.07	0.55
	Fall	0.17	0.02	480	0.33	0.06	61	0.16	0.06	2.58
Non-Rough (Kg)	Winter	0.13	0.04	85	0.39	0.05	95	0.26	0.06	4.16
	Spring	0.19	0.03	204	0.39	0.05	91	0.20	0.06	3.39
	Summer	0.22	0.03	188	0.20	0.05	64	-0.03	0.06	-0.50
	Fall	0.24	0.02	480	0.52	0.06	61	0.29	0.07	4.29

Table B-40 Standardized differences of ecological metrics between survey 1 (1980-1985) and survey 3 (2017-2018) in Thermally Exposed zone, CXLD habitat.

Metric	Season	Mean value of metric in Survey 1	Standard Error of Metric	Number of Samples	Mean value of metric in Survey 3	Standard Error of Metric	Number of Samples	Difference of Metric Values	Pooled Standard Deviation	Standardized Difference
Abundance Count	Spring	47.40	15.09	5	12.09	1.70	6	-35.31	15.19	-2.33
	Summer	22.67	7.64	6	8.01	1.80	6	-14.66	7.85	-1.87
	Fall	100.19	36.50	7	11.78	3.02	6	-88.41	36.63	-2.41
Abundance (Kg)	Spring	10.53	1.92	5	15.86	3.82	6	5.33	4.28	1.25
	Summer	10.28	4.94	6	9.36	3.14	6	-0.92	5.85	-0.16
	Fall	15.18	3.05	7	17.88	5.28	6	2.70	6.10	0.44
Diversity ^{0}D	Winter	6	0.73	6	15.00	1.87	37	9.00	2.01	4.48
	Spring	20	2.70	162	18.00	1.73	10	-2.00	3.21	-0.62
	Summer	17	2.49	60	13.00	1.55	10	-4.00	2.93	-1.36
	Fall	25	2.04	504	15.00	1.47	18	-10.00	2.51	-3.98
Diversity ^{1}D	Winter	5.38	0.59	6	7.22	0.91	37	1.84	1.09	1.70
	Spring	4.20	0.51	162	13.90	1.33	10	9.70	1.42	6.81
	Summer	6.81	0.92	60	10.04	1.21	10	3.23	1.52	2.13
	Fall	3.75	0.24	504	10.42	1.16	18	6.67	1.19	5.63
Diversity ^{2}D	Winter	5.08	0.61	6	4.85	0.63	37	-0.23	0.88	-0.26
	Spring	2.09	0.17	162	12.05	1.27	10	9.96	1.28	7.77
	Summer	4.06	0.52	60	8.63	1.12	10	4.57	1.24	3.70
	Fall	1.96	0.09	504	8.11	1.13	18	6.15	1.13	5.43
Diversity ^{3}D	Winter	4.91	0.62	6	4.03	0.54	37	-0.88	0.82	-1.07
	Spring	1.77	0.12	162	11.11	1.28	10	9.34	1.29	7.27
	Summer	3.27	0.40	60	7.90	1.09	10	4.63	1.16	3.99
	Fall	1.68	0.06	504	6.92	1.08	18	5.24	1.08	4.84
	Winter	0.28	0.09	25	0.05	0.02	100	-0.23	0.09	-2.49

Metric	Season	Mean value of metric in Survey 1	Standard Error of Metric	Number of Samples	Mean value of metric in Survey 3	Standard Error of Metric	Number of Samples	Difference of Metric Values	Pooled Standard Deviation	Standardized Difference
Heat Intolerant Count	Spring	0.03	0.01	237	0.00	0.01	82	-0.03	0.02	-1.90
	Summer	0.02	0.01	136	0.00	0.01	54	-0.02	0.02	-1.19
	Fall	0.03	0.01	713	0.05	0.03	76	0.03	0.03	0.99
Heat Intolerant (Kg)	Winter	0.26	0.09	25	0.01	0.01	100	-0.26	0.09	-2.88
	Spring	0.02	0.01	237	0.00	0.01	82	-0.02	0.01	-1.49
	Summer	0.01	0.01	136	0.00	0.01	54	-0.01	0.02	-0.34
	Fall	0.03	0.01	713	0.00	0.01	76	-0.03	0.01	-1.94
Heat Tolerant Count	Winter	0.52	0.10	25	0.63	0.05	100	-0.11	0.11	-0.99
	Spring	0.83	0.02	237	0.68	0.05	82	0.15	0.06	2.61
	Summer	0.68	0.04	136	0.70	0.06	54	-0.03	0.07	-0.37
	Fall	0.83	0.01	713	0.40	0.06	76	0.44	0.06	7.54
Heat Tolerant (Kg)	Winter	0.63	0.10	25	0.53	0.05	100	0.10	0.11	0.90
	Spring	0.73	0.03	237	0.59	0.05	82	0.14	0.06	2.24
	Summer	0.38	0.04	136	0.52	0.07	54	-0.15	0.08	-1.86
	Fall	0.61	0.02	713	0.27	0.05	76	0.34	0.05	6.34
Non-Rough Count	Winter	0.32	0.09	25	0.18	0.04	100	-0.14	0.10	-1.39
	Spring	0.16	0.02	237	0.34	0.05	82	0.19	0.06	3.23
	Summer	0.37	0.04	136	0.28	0.06	54	-0.09	0.07	-1.22
	Fall	0.11	0.01	713	0.34	0.05	76	0.24	0.06	4.23
Non-Rough (Kg)	Winter	0.29	0.09	25	0.36	0.05	100	0.07	0.10	0.68
	Spring	0.26	0.03	237	0.33	0.05	82	0.07	0.06	1.16
	Summer	0.58	0.04	136	0.34	0.07	54	-0.24	0.08	-3.05
	Fall	0.27	0.02	713	0.35	0.06	76	0.08	0.06	1.46

B.2 DERIVATION OF HEAT SENSITIVE FISH SPECIES

Heat tolerance data available in the literature from laboratory tests were used to categorize heat sensitive or intolerant species versus more heat tolerant species for several fish species that reside in the lower Missouri River. Although heat tolerance data are limited for some of these species (and nonexistent for several other species), the existing data were used to differentiate species less tolerant of the naturally high ambient temperatures in the river, according to the laboratory testing results. Temperatures greater than approximately 90-91°F (adjusted to 93-94°F as appearing in Table B-54) were used to differentiate heat tolerant fish species from more heat sensitive species.

The Table B-54 and Table B-55 present the tolerance limits for species of adult or juvenile fish commonly found in the vicinity of the LEC and the literature sources from which they originated. These data represent the temperatures at which acute mortality (typically for 50 percent of the test subjects when held for 24 or 48 hours) or active avoidance can occur. Test results were selected for the highest acclimation temperature available from the testing to best represent the actual ambient temperature to which the fish would be acclimated in the river.

The lab testing results are considered to be conservative in that the tests were conducted under controlled laboratory conditions, usually under temperature held constant for 24-48 hours or more, rather than under diel or spatial temperature fluctuations typically occurring in the river. Tests usually were conducted with fish specimens from locales other than the river, thus the test fish were not subjected to the lower Missouri River's thermal regime to which they could be adapted. Evidence is provided by collections of species from temperatures in the wild exceeding the supposed maximum temperature tolerated under lab conditions, such as documented in the Ohio River (EPRI 2013).

Table B-41 Upper temperature tolerance values (°F) at high acclimation temperature—adult & juvenile heat shock

Species	Value	Acclimation	Parameter	Comments	Source(s)
Pallid sturgeon	91.4, 95 92.1-95.9	82.4 75.2	CTM17%, CTM100% LTM(CTM)	Small sample size (6 fish) 20-203 mm fish	Chipps et al. 2010 Deslaurieres et al. 2016
Bighead carp	96.1	86.0	UILT50	103-134 mm fish	Sheng and Xu 2008
Silver carp	98.8	86.0	UILT50	103-134 mm fish	Sheng and Xu 2008
Gizzard shad	96.8 97.7	80.6-86 95.0	UILT50 24 h TL50	Ohio River Knoxville , TN	Yoder and Emery 2003 Hart 1952
Walleye	93.4 94.6 88.9	78.8-82.1 73.4 78.4	UUILT CTM UILT	Slow heating <1C/day Mean CTM for Iowa fish	Hokanson and Koenst 1986 Peterson 1993 Smith and Koenst 1975
Sauger	86.7	75.0	UILT50		Smith and Koenst 1975
Channel catfish	100.0 107.8	86.0 95	UILT CTM	Texas	Allen and Strawn 1967 Bennett, McCauley, and Beitinger 1998
Emerald shiner	100.1 95.4	77.0 66.2-77.0	CTM 7-day TL50 and UUILT	St. Louis Bay, L. Superior	Matthews and Maness 1979 McCormick and Kleiner 1976
White crappie	91.4 91.0	84.2 75.9	UILT >96 h TL50	Lake Erie	Brungs and Jones 1977 Reutter and Herdendorf 1976
Shorthead redhorse	95.2 91.9	69.1-74.8 69.1-74.8	CTM mean UUILT	Muskingham R. Ohio Muskingham R. Ohio	Reash 2000 et al. Reash 2000 et al.
River carpsucker	95.4 102.2	N/A 80.6-86.0	UILT UILT	Does not cite original source Ohio R.	Hasnian 2012 Yoder and Emery 2003
Freshwater drum	93.2 91.0	N/A 82.4-95.0	CTM UILT	Lake Erie Same UILT as Jinks 1981	Reutter and Herdendorf 1976 Houston 1982
Mooneye	90.7	80.6-86.0	UILT	Ohio R.	Yoder and Emery 2003
Goldeye	90.7	80.6-86.0	UILT	Ohio R.	Yoder and Emery 2003
Flathead catfish	100.0	80.6-86.0	UILT	Ohio R.	Yoder and Emery 2003
Longnose gar	100.9	80.6-86.0	UILT	Ohio R.	Yoder and Emery 2003
Shortnose gar	100.9	80.6-86.0	UILT	Ohio R.	Yoder and Emery 2003
Smallmouth buffalo	102.7	80.6-86.0	UILT	Ohio R.	Yoder and Emery 2003
Bigmouth buffalo	100.9	80.6-86.0	UILT	Ohio R.	Yoder and Emery 2003

Table B-42 Temperature tolerance values (°F) at high acclimation temperature—adult & juvenile avoidance

Species	Value	Acclimation	Parameter	Comments	Source(s)
Pallid sturgeon	N/A				
Bighead carp	94.1 91.4	86.0 77.0	Upper avoidance		Sheng and Xu 2008
Silver carp	96.8 91.6	86.0 77.0	Upper avoidance		Sheng and Xu 2008
Gizzard shad	93.2 93.0-93.9	80.6-86.0 N/A	Upper avoidance	Ohio R.	Yoder and Emery 2003 Churchill and Wojtalik 1969
Walleye	69.8 84.2	N/A 80.6-86.0	Upper avoidance	WI lake fish Ohio R.	Inskip and Magnuson 1983 Yoder and Emery 2003
Sauger	82.4	N/A	Upper avoidance		Coutant 1977
Channel catfish	95.0 93.2	86.0 80.6	Upper avoidance		Cherry et al. 1977
Emerald shiner	107.6 88.0	N/A 80.6-86.0	Upper avoidance Upper avoidance		Ellis 1984 Yoder and Emery 2003
White crappie	87.8 89.6	N/A	Upper avoidance Upper avoidance	thermal effluent IN	Proffit and Benda 1971 Yoder and Emery 2003
Shorthead redhorse	78.8 80.2	N/A	Upper avoidance Final preferendum	Should be <preference No original source cited	Coutant 1977 Hasnian 2012
River carpsucker	96.6	80.6-86.0	Upper avoidance	Ohio River	Yoder and Emery 2003
Freshwater drum	86	N/A 80.6-86.0	Upper avoidance	Wabash River, IN	Coutant 1977 Yoder and Emery 2003
Mooneye	84.2	80.6-86.0	Upper avoidance	Ohio River	Yoder and Emery 2003
Goldeye	84.2	80.6-86.0	Upper avoidance	Ohio River	Yoder and Emery 2003
Flathead catfish	94.1	80.6-86.0	Upper avoidance	Ohio River	Yoder and Emery 2003
Longnose gar	95.0	80.6-86.0	Upper avoidance	Ohio River	Yoder and Emery 2003
Shortnose gar	95.0	80.6-86.0	Upper avoidance	Ohio River	Yoder and Emery 2003
Smallmouth buffalo	96.8	80.6-86.0	Upper avoidance	Ohio River	Yoder and Emery 2003
Bigmouth buffalo	95.0	80.6-86.0	Upper avoidance	Ohio River	Yoder and Emery 2003

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