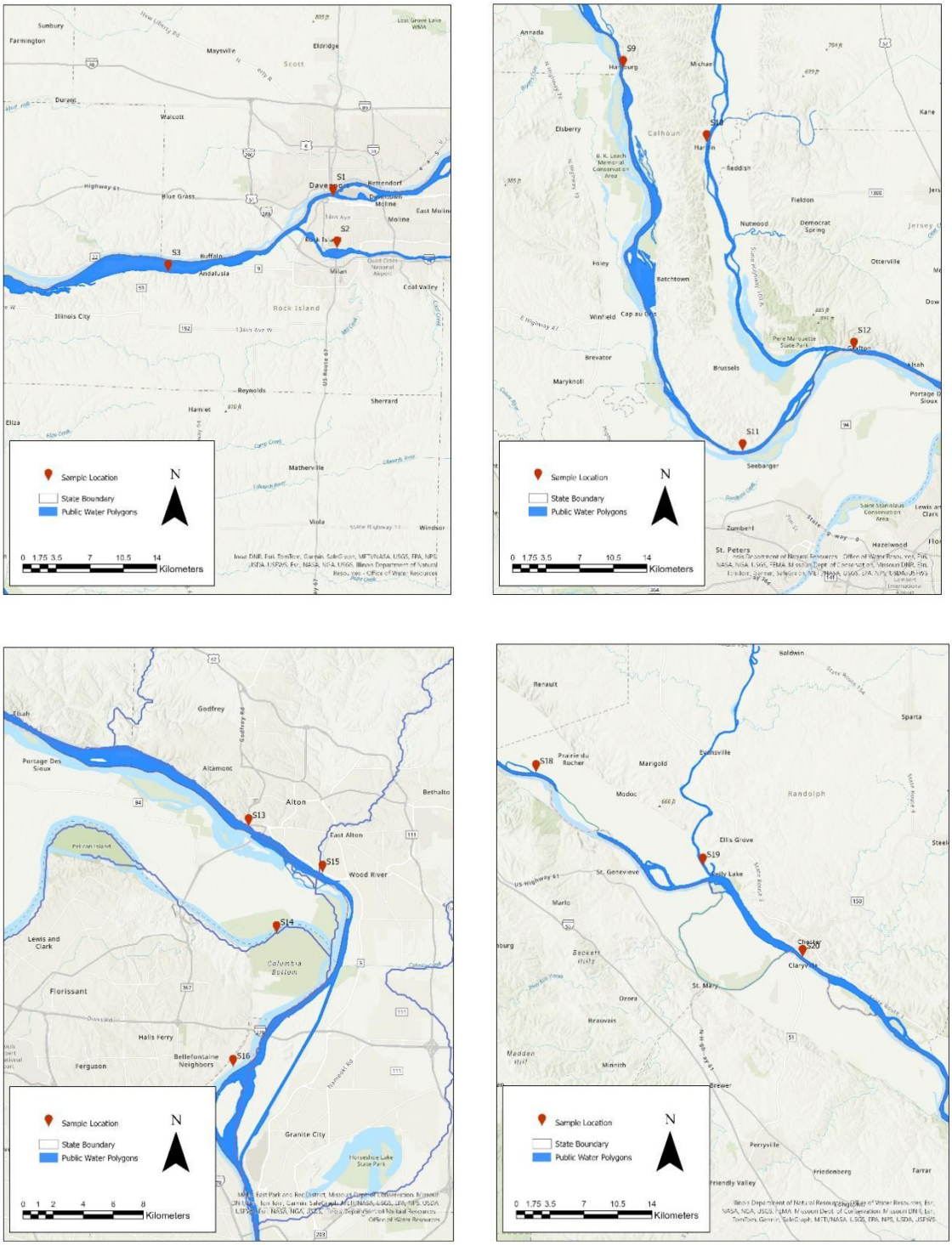
Supplementary Materials:

Figure S1: Sampling locations along the Mississippi River main stem and major tributaries.



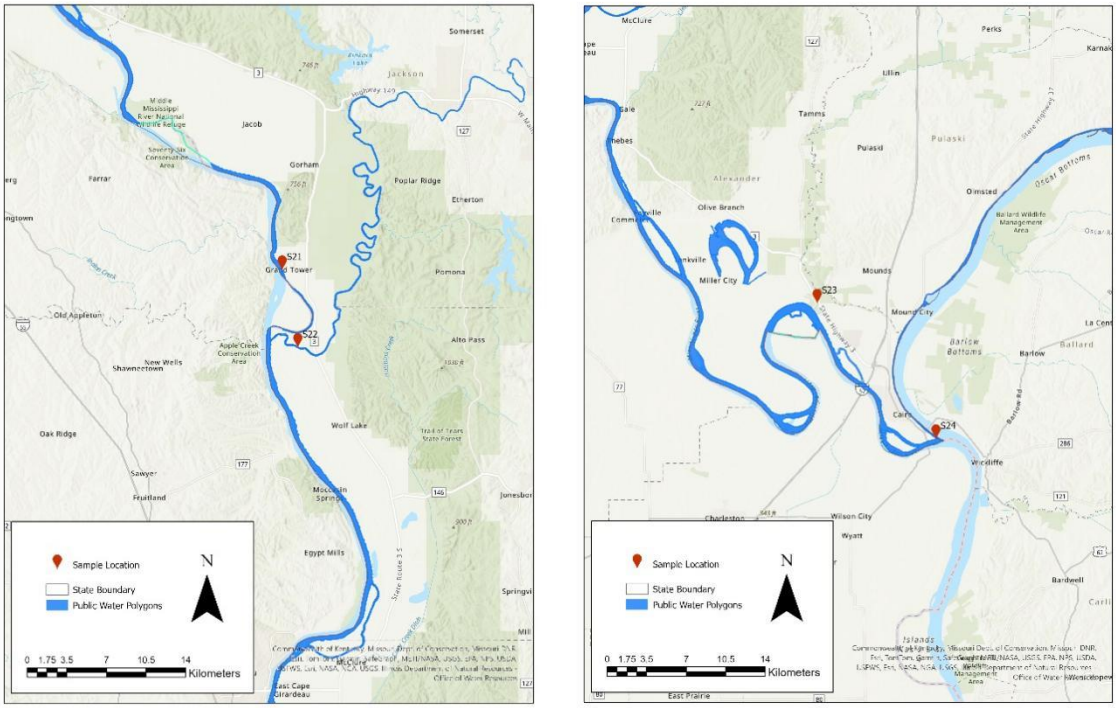


Table S1: Sampling locations within the Mississippi River system, including GPS coordinates, sampling dates, and location name

Sl No.	Latitude	Longitude	Location Name	Sample Collection Date
1	41.5125913	-90.5717082	Rock Island	July 4, 2025
2	41.4638494	-90.5660270	Rock River	July 4, 2025
3	41.4394035	-90.7768194	Andalusia Slough	July 4, 2025
4	41.4109318	-91.0441394	Drury Township	July 4, 2025
5	41.1688500	-91.0030922	New Boston	July 4, 2025
6	40.8156606	-91.0899505	Gulfport	July 4, 2025
7	40.5522060	-91.4009151	Nauvoo	July 4, 2025
8	39.9368340	-91.4158900	Quincy	July 4, 2025
9	39.2301250	-90.7176660	Hamburg	July 17, 2025
10	39.1614247	-90.6157289	Hardin (Illinois River)	July 17, 2025
11	38.8714088	-90.5679547	Golden Eagle	July 17, 2025
12	38.9679332	-90.4352595	Grafton	July 17, 2025
13	38.8882844	-90.1855234	Alton	July 17, 2025
14	38.8243907	-90.1634967	Missouri River	July 17, 2025
15	38.8608240	-90.1286410	Wood River	July 17, 2025
16	38.7442135	-90.1960058	Granite City, St Louis	July 17, 2025
17	38.6119141	-90.1881077	St. Louis	July 17, 2025

18	38.0704500	-90.1444200	Prairie Du Rocher	July 24, 2025
19	37.9845226	-89.9472701	Kaskaskia River	July 24, 2025
20	37.8998336	-89.8294356	Chester	July 24, 2025
21	37.6294115	-89.5060189	Grand Tower	July 24, 2025
22	37.5677406	-89.4903947	Big Muddy River	July 24, 2025
23	37.0919375	-89.2576095	Cache River	July 24, 2025
24	36.9835482	-89.1398229	Cairo	July 24, 2025

Table S2: Land cover percentages within 1 km, 2 km, and 10 km buffer zones and their association with microplastic abundance and type distribution at sampling sites along the Mississippi River, Illinois.

		MPs types					1km			2km			10km		
Sample ID	**Total MPs (Particles/L)**	**Fiber**	**Fragments**	**Film**	**Foam**	**Pellets**	**Urban Area (%)**	**Industrial Area (%)**	**Agricultural Area (%)**	**Urban Area (%)**	**Industrial Area (%)**	**Agricultural Area (%)**	**Urban Area (%)**	**Industrial Area (%)**	**Agricultural Area (%)**
S-1	43	32	2	2.5	3	3.5	30.41	32.47	0	51.63	28.07	0	59.27	7.77	9.94
S-2	44	25.5	5	4	2.5	7	32.96	0.89	0.03	61.73	5.60	0.82	44.10	5.98	12.91
S-3	76	43	6	6	11.5	9.5	11.78	0	5.30	7.94	0.44	9.06	10.27	0.35	36.91
S-4	42.5	31.5	7.5	2.5	0.5	0.5	9.31	1.23	23.68	27.18	7.66	25.90	16.55	1.34	46.34
S-5	44	36	4	2	0.5	1.5	31.57	0.46	1.43	13.21	0.11	25.17	5.40	0.04	58.90
S-6	63.5	51	6.5	0.5	2	3.5	27.55	3.69	13.99	28.75	7.86	14.39	17.45	1.30	40.84
S-7	29.5	18.5	7.5	1.5	0.5	1.5	11.32	0.63	18.23	15.91	0.42	5.62	10.18	0.55	33.75
S-8	36	28.5	3.5	2	0.5	1.5	33.92	23.17	0	41.23	14.51	7.22	22.25	2.19	47.34
S-9	15	13	1	1	0	0	11.64	0	1.26	7.27	0.04	2.69	5.43	0.03	26.43
S-10	27.5	23.5	3.5	0.5	0	0	20.68	1.18	14.57	13.71	0.40	30.08	5.15	0.02	30.14
S-11	18	11.5	4.5	1	0.5	0.5	8.06	0.03	7.31	6.54	0.01	15.31	19.06	2.16	46.04
S-12	15	14	0.5	0.5	0	0	28.05	1.00	0	13.53	0.28	0.55	7.02	0.15	33.80
S-13	14.5	12	1.5	1	0	0	35.06	21.07	0	42.43	8.33	0.33	31.48	2.66	24.20
S-14	15	11	1.5	1.5	1	0	6.59	0.00	36.00	3.98	0.29	48.41	36.32	4.45	26.27

S-15	20	11	4.5	1.5	3	0	21.69	5.97	7.89	23.94	3.91	19.53	34.41	4.39	29.13
S-16	24.5	16.5	4.5	2	1.5	0	46.05	0.49	0.03	44.12	0.82	0.58	55.71	7.69	12.53
S-17	19	10	5	1	3	0	18.35	40.45	0	37.26	39.43	0	59.78	16.22	8.23
S-18	17.5	11.5	4	0.5	0.5	1	2.49	0	30.90	3.79	0	43.55	5.95	0.01	35.64
S-19	11	8.5	2.5	0	0	0	6.80	0	31.06	5.57	0	30.34	8.01	0.16	52.38
S-20	11	4	3.5	2	1.5	0	38.77	0.97	7.56	31.34	1.78	24.16	9.45	0.19	45.17
S-21	8	5.5	0.5	0.5	1.5	0	29.00	0	9.08	12.78	0.00	29.54	5.22	0.05	21.38
S-22	14	9	2.5	1.5	0	1	7.74	0	74.71	5.88	0.01	66.24	5.02	0.23	22.33
S-23	4.5	4.5	0	0	0	0	8.51	0	22.33	5.08	0	35.13	6.31	0.09	50.84
S-24	10	9.5	0.5	0	0	0	3.38	0	14.25	4.10	0	38.25	6.71	0.29	48.65

Table S3: Microplastic concentrations (particles/L) upstream, within tributaries, and downstream of major tributary confluences along the Mississippi River.

Tributary	**Upstream Site**	**Tributary Site**	**Downstream Site**
Rock River	S-1 Rock Island (43)	S-2 Rock River (44)	S-3 Andalusia Slough (76)
Illinois River	S-11 Golden Eagle (18)	S-10 Hardin (Illinois River) (27.5)	S-12 Grafton (15)
Missouri River	S-13 Alton (14.5) and S-15 Wood River (20)	S-14 Missouri River (15)	S-16 Granite City, St Louis (24.5)
Kaskaskia River	S-18 Prairie Du Rocher (17.5)	S-19 Kaskaskia River (11)	S-20 Chester (11)
Big Muddy River	S-21 Grand Tower (8)	S-22 Big Muddy River (14)	-
Cache River	-	S-23 Cache River (4.5)	S-24 Cairo (10)

Table S4: Site-specific contamination factor (CF), pollution load index (PLI), contamination level, and pollution status of microplastic contamination in the Mississippi River study area, including the overall zone-level PLI classification.

Sample ID	**CF**	**Contamination level***	**PLI**	**Pollution Risk***	**PLI Zone**
S-1	9.56	Very high	3.09	Low	
S-2	9.78	Very high	3.13	Low	
S-3	16.89	Very high	4.11	Low	
S-4	9.44	Very high	3.07	Low	
S-5	9.78	Very high	3.13	Low	
S-6	14.11	Very high	3.76	Low	
S-7	6.56	Very high	2.56	Low	
S-8	8.00	Very high	2.83	Low	

S-9	3.33	Considerable	1.83	Low	
S-10	6.11	Very high	2.47	Low	
S-11	4.00	Considerable	2.00	Low	4.62
S-12	3.33	Considerable	1.83	Low	
S-13	3.22	Considerable	1.80	Low	
S-14	3.33	Considerable	1.83	Low	
S-15	4.44	Considerable	2.11	Low	
S-16	5.44	Considerable	2.33	Low	
S-17	4.22	Considerable	2.05	Low	
S-18	3.89	Considerable	1.97	Low	
S-19	2.44	Moderate	1.56	Low	
S-20	2.44	Moderate	1.56	Low	
S-21	1.78	Moderate	1.33	Low	
S-22	3.11	Considerable	1.76	Low	
S-23	1.00	Moderate	1.00	Low	
S-24	2.22	Moderate	1.49	Low	