

**Table S1.** Sample preparation and analytical methods used for measuring the various water quality parameters. Methods according DIN (German Institute for Standardization, EN (European Standard) and ISO (International Organization for Standardization) or LCK (vial test, Hach GmbH, Düsseldorf).

Parameter	Ortho-phosphate	Total phosphorous	Nitrate	Ammonium	Sulphate	Chloride	Calcium	Magnesium	Iron	Aluminium	Biological oxygen demand after 5 days	Total organic carbon	Total nitrogen
Abbreviation	$\text{o-PO}_4^{3-}$	TP	$\text{NO}_3^-$	$\text{NH}_4^+$	$\text{SO}_4^{2-}$	$\text{Cl}^-$	Ca	Mg	Fe	$\text{Al}^{3+}$	BOD5	TOC	TN
Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Sample container	Glass	Plastic	Glass	Glass	Glass	Glass	Plastic	Plastic	Glass	Glass	Plastic	Glass	Glass
Acidified	No	No	No	No	No	No	No	No	Acidified $\text{H}_2\text{SO}_4$	No	No	Acidified HCl	Acidified HCl
Filtering details	Filtered 0,45 $\mu\text{m}$	Unfiltered	Filtered 0,45 $\mu\text{m}$	Filtered 0,45 $\mu\text{m}$	Filtered 0,45 $\mu\text{m}$	Filtered 0,45 $\mu\text{m}$	Unfiltered	Unfiltered	Unfiltered	Unfiltered	Unfiltered	Unfiltered	Unfiltered
Method	DIN EN ISO 6878:2004-09	DIN 38 405 D 11-4	LCK 339	LCK 304	DIN 38405-5:1985 DE	LCK 311	DIN 38 409	DIN 38 409	LCK 321/ LCK 521	LCK 301	DIN 38 409 H 52 (DIN EN 1899-2)	DIN 38 409 H 3	DIN 38 409 H27
Instrument and measurement principle	Photometric (LP2W instrument)	Photometric (LP2W instrument)	Photometric (LP2W instrument)	Photometric (LP2W instrument)	Photometric (CADAS 200/LP2W)	Photometric (CADAS 200/LP2W)	Titration	Titration	Photometric (LP2W instrument)	Photometric (LP2W instrument)	WTW oxygen sensor	DIMATOC 2000 N (catalytic thermal oxidation)	DIMATOC 2000 N (chemo-luminescence)

**Table S2.** Water quality parameters measured at Site 4: Kalte Bode (Schierke). Levels below method detection limits were not included in the summary statistics and have been designated as “<” and “nd” means not determined. Temp. is the water temperature, conduct. is the conductivity, BOD5 is the biological oxygen demand measured after 5 days and TOC is total organic carbon.

Sampling date	Temp.	Conduct.	pH	O <sub>2</sub>	O <sub>2</sub>	o-PO <sub>4</sub> <sup>3-</sup>	Total P	NO <sub>3</sub>	NH <sub>4</sub> <sup>+</sup>	Total N	SO <sub>4</sub> <sup>2-</sup>	Cl <sup>-</sup>	Ca	Mg	Fe	Al <sup>3+</sup>	BOD 5	TOC
	°C	µS/cm		mg/l	%	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
4/11/1994	2.7	54.00	5.50	14.3	109.0	<0,050	<0,050	1.200	0.030		<40	nd	4.80	nd	<0,20	0.308	1.80	10.00
5/18/1994	7.5	57.00	6.50	11.6	105.0	0.013	0.016	1.600	0.030	1.60	14.00	2.40	4.44	1.18	<0,20	0.112	0.90	2.51
6/22/1994	10.0	60.00	6.47	10.3			0.015	1.100	0.030	1.10	15.00	3.60	3.61	1.94	<0,20	0.056	0.80	3.90
7/19/1994	12.0	60.00	6.80	9.8		<0,007	0.016	1.000	0.050	1.70	13.00	4.20	3.53	2.53	<0,20	0.048	1.40	3.28
8/17/1994	11.1	60.00	7.03	10.1		<0,007	0.014	0.900	0.040	1.20	13.00	3.30	4.96	1.15	<0,20	0.048	0.60	1.89
10/26/1994	5.8	60.00	8.31	11.3	99.0		0.007	1.370	0.030		9.00	3.80	3.09	2.19	<0,20	0.078	1.30	4.21
4/27/1995	6.2	53.00	6.35	11.1	96.0	<0,003	0.015	1.090	0.160	2.70	15.00	2.50	5.41	0.39	<0,01	0.171	0.60	-
5/31/1995	7.0	72.00	7.53	14.8	130.0	<0,003	0.003	0.840	<0,016		14.00	2.70	3.29	1.48	0.010	0.116	2.00	2.59
7/25/1995	9.3	74.00	7.06	10.2	88.0		<0,030	0.980	0.110	3.39	22.00	2.50	5.01	1.75	0.040	0.074	0.50	6.31
8/22/1995	11.2	72.00	7.27	9.5	94.0		0.004	0.950	0.180	1.92	17.00	2.10	5.05	1.85	0.010	0.040	0.30	1.08
9/7/1995	8.0	57.00	8.46	11.2	105.0		0.013	0.890	0.010	1.28	16.00	2.80	5.45	1.26	0.060	0.086	0.40	2.36
11/9/1995	4.2	54.00	7.15	11.8	98.0	0.004	0.007	0.960	0.220	1.25		3.90	3.21	2.19	0.070	0.193		5.72
4/30/1996	2.8	59.00	6.85	11.7	96.0	0.003	0.035	1.420	0.068	1.37	16.70	4.22	6.73	nd	0.042	0.156	0.90	6.96
6/4/1996	5.2	57.00	7.20	11.5	99.0	<0,003	0.006	1.230	0.041	<1,0	16.20	3.33	4.65	1.17	0.027	0.083	0.26	6.55
8/20/1996	11.1	57.00	6.30	9.9	98.0	<0,003	0.009	0.890	<0,016	2.64	16.70	3.33	4.74	0.72	0.018	0.025	0.40	2.40
10/1/1996	8.0	57.00	6.56	10.8	99.0	<0,003	0.008	0.670	<0,016	<1,0	21.90	3.22	4.83	0.78	0.052	0.245	0.82	6.80
11/12/1996	5.8	55.00	6.48	10.9	95.0	<0,003	0.006	0.950	<0,016	1.35	18.50	3.55	4.33	0.83	0.192	0.049	0.67	5.50
7/10/1997	9.2	56.00	6.61	10.9	101.0	<0,003	0.008	0.940	<0,016		11.20	3.33	3.74	1.44	nd	0.023	0.30	2.00
10/28/1997	0.9	56.60	6.00	14.0	111.0	<0,003	0.009	0.930	<0,016		36.00	3.66	4.75	0.54	0.022	0.043	0.90	1.90
4/1/1998			6.11															
5/1/1998			6.74															
6/1/1998			6.60															
7/1/1998			5.62															
8/1/1998			6.21															
9/1/1998			4.16															
9/1/1998		43.44	4.66			0.003	0.015	0.475	0.013		15.30	2.80	3.09	1.17	0.190	0.548	0.52	14.30
10/1/1998			4.46															
11/1/1998			6.22															
4/26/2000	5.5	53.30	5.75	7.7	103.3	0.005	0.005	1.097	0.066		10.25	2.33	4.28	0.74	0.060	0.043	0.20	1.00
7/20/2000	8.9	39.60	6.98	7.2	102.9	<0,003	0.007	0.942	<0,015		12.10	2.33	3.79	1.31	0.070	0.042	0.05	1.90
11/2/2000	5.4	33.10	6.36	7.7	105.0	<0,003	0.012	1.370	nd		19.53	2.89	4.04	1.22	0.023	0.092	0.56	4.40
5/17/2001	7.6	37.10	6.51	10.7	97.2	<0,003	<0,003	1.190	<0,015		11.65	3.11	3.99	1.09	0.044	0.107	0.60	0.90
7/18/2001	8.4	33.30	6.18	10.9	101.2	<0,003	<0,003	0.674	<0,015		15.14	3.22	3.64	1.23	0.078	0.209	0.58	4.10
10/5/2001	7.1	32.60	5.88	11.1	100.5	<0,003	<0,003	0.751	0.047		19.15	3.77	3.42	0.24	0.069	0.249	0.65	3.10
5/2/2002	5.9	48.20	5.96	11.8	101.9	<0,003	0.005	0.971	<0,015		15.21	4.11	3.31	0.94	0.049	0.168	0.42	2.87
8/13/2002	11.6	30.20	4.28	9.7	99.1	<0,003	0.043	0.317	<0,015		13.17	3.77	2.76	1.97	0.331	0.440		11.25
11/8/2002	4.3	51.20	5.80	11.7	96.7	<0,003	<0,003	0.338	<0,015		15.00	3.22	1.79	2.54	0.048	0.098	0.62	1.20
8/3/2006	10.6	51.00	7.43	10.5	102.2	<0,003	0.007	0.691	<0,015	0.94	16.13	20.50	4.19	0.67	0.076	0.350	1.04	1.68
4/24/2008	5.3	49.30	6.60	12.7	107.2	<0,003	<0,003	0.999	nd		16.03	2.55	4.01	0.36	0.062	0.192	1.19	1.56
5/15/2008	7.9	53.60	6.10	10.9	10.0											0.071		
5/29/2008	11.7	50.70	6.34	9.9	100.7											0.050		
6/12/2008	9.2	50.70	6.22	10.6	99.8											0.034		
6/26/2008	12.9	49.20	6.86	10.6	104.3										0.011	0.056		
7/10/2008	10.4	36.70	5.99	10.6	102.3										0.321	0.376		
7/24/2008	10.4	37.20	5.10	10.6	102.4											0.408		
9/4/2008	9.6	42.20	6.21	10.1	96.1										0.189	0.298		
3/28/2017	6.6	47.00	5.90															
5/18/2017		53.00	6.41													0.037		
6/22/2017	15.0	50.00	6.90													0.072		
3/29/2022	3.7	47.00	5.94	12.0	97.6	<0,010		9.250			21.47					0.526		5.26
6/9/2022	9.1	58.30	6.54	12.4	115.6	<0,010		6.590	0.025		20.85					0.318		2.11
8/30/2022	8.5	54.70	6.30	10.7	99.8											0.212		
Mean	7.9	51.44	6.34	10.9	99.2	0.006	0.012	1.381	0.068	1.73	16.33	3.77	4.13	1.27	0.083	0.162	0.73	4.11
Min	0.9	30.20	4.16	7.2	10.0	0.003	0.003	0.317	0.010	0.94	9.00	2.10	1.79	0.24	0.010	0.023	0.05	0.90
Max	15.0	74.00	8.46	14.8	130.0	0.013	0.043	9.250	0.220	3.39	36.00	20.50	6.73	2.54	0.331	0.548	2.00	14.30

**Table S3.** Water quality parameters measured at Site 5: Ilse. Levels below the method detection limits were not included in the summary statistics and have been designated as “<” and “nd” means not determined. Temp. is the water temperature, conduct. is the conductivity, BOD5 is the biological oxygen demand measured after 5 days and TOC is total organic carbon.

Sampling date	Temp. °C	Conduct. µS/cm	pH	O <sub>2</sub> mg/l	O <sub>2</sub> %	o-PO <sub>4</sub> <sup>3-</sup> mg/l	Total P mg/l	NO <sub>3</sub> <sup>-</sup> mg/l	NH <sub>4</sub> <sup>+</sup> mg/l	Total N mg/l	SO <sub>4</sub> <sup>2-</sup> mg/l	Cl <sup>-</sup> mg/l	Ca mg/l	Mg mg/l	Fe mg/l	Al <sup>3+</sup> mg/l	BOD5 mg/l	TOC mg/l
4/25/1994	4.0	65.0	4.50	13.30	106.0	<0.009	0.009	-	0.080	1.70	20.00	7.00	1.84	1.80	<0.20	0.538	2.90	6.36
5/18/1994	7.8	62.0	4.80	12.00	108.0	0.007	0.018	1.300	0.040	1.90	19.00	3.20	3.52	1.90	<0.20	0.506	1.50	3.26
6/22/1994	10.1	77.0	5.26	10.30	-	0.015	0.015	1.200	0.020	1.30	25.00	4.80	4.97	2.29	<0.20	0.194	0.50	3.46
7/6/1994	13.1	76.0	5.77	11.90	120.0	<0.007	0.011	1.000	0.050		19.00	4.60	4.81	2.58	<0.20	0.234	0.80	
8/3/1994	15.7	80.0	6.92	10.20	108.0	0.011	0.015	0.900	0.020	2.80	15.00	4.10	6.41	1.51	<0.20	0.142	1.10	2.79
11/2/1994	5.9	74.0	4.66	11.40	100.0	0.013	0.014	1.260	0.210	2.29	14.00	4.30	4.05	2.27	0.22	0.660	1.30	
5/3/1995	4.4	70.0	4.50	12.90	105.0	0.004	0.011	1.400	0.050	2.29	20.00	3.10	3.85	2.11	0.10	0.614	1.70	
6/7/1995	7.5	94.0	4.82	16.00	145.0	<0.003	0.008	0.610	0.030	1.60	21.00	3.40	4.81	1.70	0.12	0.604	0.10	6.44
8/2/1995	15.0	85.0	6.51	13.90	152.0		0.005	0.880	0.020	1.19	23.00	3.70	6.01	1.70	0.09	0.220	0.30	5.44
8/24/1995	12.9	78.0	6.95	10.10	105.0		0.007	0.890	0.320	1.92	30.00	3.40	6.13	1.80	0.12	0.194	1.10	4.83
9/14/1995	10.1	66.0	6.42	15.40	148.0		0.011	0.780	0.380	1.19	26.00	3.50	6.21	1.58	0.23	0.420	1.00	6.89
11/9/1995	3.9	69.0	4.88	14.30	116.0	0.006	0.008	0.980	0.140		42.00	5.00	5.21	2.43	0.21	0.793		8.61
4/30/1996	2.2	81.0	4.96	11.90	95.0	0.004	0.007	1.720	0.162	2.24	28.10	3.89	6.81	1.02	0.11	0.628	1.10	6.84
6/4/1996	7.3	82.0	5.13	11.10	100.0	< 0.003	0.008	1.750	0.038	1.28	22.70	3.89	7.18	1.19	0.11	0.632	0.55	6.55
8/20/1996	11.9	75.0	6.19	10.10	100.0	<0.003	0.011	0.790	0.018	1.50	33.10	4.33	5.81	1.02	0.09	0.238	0.16	7.50
10/1/1996	9.7	68.0	5.02	10.90	105.0	< 0.003	0.008	0.770	< 0.016	< 1.0	28.40	3.11	5.64	1.08	0.14	0.572	0.83	6.60
11/12/1996	5.9	72.0	5.09	11.20	98.0	< 0.003	0.011	0.970	0.033	3.05	22.30	4.55	4.17	1.68	0.16	0.600	0.71	6.20
7/10/1997	12.6	70.0	5.74	10.60	107.0	< 0.003	0.011	0.800	< 0.016		18.00	5.11	5.22	1.36	0.04	0.165	0.70	3.40
10/28/1997	1.1	68.3	5.54	12.20	83.0	< 0.003	0.011	0.830	< 0.016		42.00	4.44	4.83	1.47	0.10	0.305	1.00	3.40
4/1/1998			5.15															
5/1/1998			5.75															
6/1/1998			4.97															
7/1/1998			4.32															
8/1/1998			4.14															
9/1/1998			4.10															
10/1/1998			4.72															
11/1/1998			4.96															
4/26/2000	5.7	57.0	5.01	8.10	107.2	0.006	0.007	1.237	0.041		12.05	2.33	3.67	1.11	0.14	0.492	0.44	5.00
7/20/2000	9.5	55.1	5.68	7.30	104.1	< 0.003	0.007	0.583	0.017		16.10	2.89	3.25	0.98	0.22	0.258	0.10	4.10
11/2/2000	5.6	41.1	6.10	7.74	103.0	<0.003	< 0.003	1.060	0.037		23.84	4.11	4.04	1.59	0.23	0.208	1.37	5.80
4/19/2001	2.1	60.0	5.37	11.66	90.7	<0.003	0.011	1.310	nd		25.37	3.55	4.98	2.06	0.11	0.331	2.04	4.40
5/17/2001	8.1	44.4	6.11	11.10	101.0	<0.003	<0.003	1.320	<0.015		16.03	4.77	4.98	0.97	0.09	0.429	0.49	3.80
7/18/2001	10.4	40.0	5.24	10.73	103.4	<0.003	<0.003	0.606	nd		18.58	3.66	4.66	0.74	0.25	0.538	0.97	11.60
10/5/2001	8.9	65.6	5.54	11.18	102.0	< 0.003	<0.003	0.712	0.109		20.44	4.11	3.72	1.58	0.21	0.504	0.33	5.96
5/2/2002	5.7	60.8	4.93	12.10	102.0	<0.003	<0.003	1.306	0.052		18.32	4.00	3.89	1.06	0.14	0.498	0.47	5.35
8/13/2002	11.4	28.0	5.65	10.02	98.0	0.005	0.009	0.299	<0.015		15.90	4.33	3.24	1.16	0.53	0.414		15.50
11/8/2002	4.3	68.4	5.70	12.02	97.9	0.007	0.016	0.347	0.024		19.40	4.66	3.89	1.39	0.18	0.284	0.95	4.00
4/24/2008	4.9	52.9	5.05	12.20	100.8	<0.003	0.007	1.287	nd	1.36	17.10	3.00	3.91	0.97	0.15	0.513	1.17	4.10
5/15/2008	8.2	59.5	5.66	11.04	101.0											0.335		
5/29/2008	11.6	61.6	5.88	10.29	101.2											0.247		
6/12/2008	9.6	63.4	6.11	10.69	100.2										0.10	0.197		
6/26/2008	11.6	54.0	6.13	10.40	101.1											0.351		
7/10/2008	11.2	56.5	6.55	10.65	104.1	0.007	0.009	0.578	nd	0.56	19.80	3.22	4.21	0.97	0.26	0.310	0.05	6.03
7/24/2008	11.2	51.6	5.73	10.80	102.2											0.420		
9/4/2008	10.2	60.4	6.71	10.94	104.6	0.004	0.012	0.595	<0.015	0.74	17.85	3.44	4.56	0.90	0.20	0.312	0.49	3.46
3/28/2017	4.2	63.0	4.99															
5/18/2017		74.0	5.65													0.216		
6/22/2017	18	65.0	6.5													0.358		
4/22/2022	7.3	51.0	5.49	11.84	97.4	0.010		8.260			23.48					0.600		6.44
6/18/2022	12.0	69.4	6.50	5.25	53.7	< 0.010		7.570			19.30					0.374		4.81
7/25/2022	14.2	69.9	6.53													0.290		
8/30/2022	11.4	71.6	6.48	11.65	108.8											0.432		
Mean	8.8	64.9	5.52	11.19	104.8	0.008	0.010	1.391	0.086	1.70	22.12	3.98	4.70	1.50	0.166	0.399	0.87	5.77
Min	1.1	28.0	4.10	5.25	53.7	0.004	0.005	0.299	0.017	0.56	12.05	2.33	1.84	0.74	0.042	0.142	0.05	2.79
Max	18.0	94.0	6.95	16.00	152.0	0.015	0.018	8.260	0.380	3.05	42.00	7.00	7.18	2.58	0.528	0.793	2.90	15.50

**Table S4.** Total species list of MI. The numbers are the highest abundances of the respective species found in the study year. ID-no: name of the species in the operational taxa list of the German assessment system PERLODES. Estimation literature: see references [64–89]

## Part 1: Bivalvia, Coleoptera.

[illegible]

## Part 2: Crustacea, Diptera, Ephemeroptera.

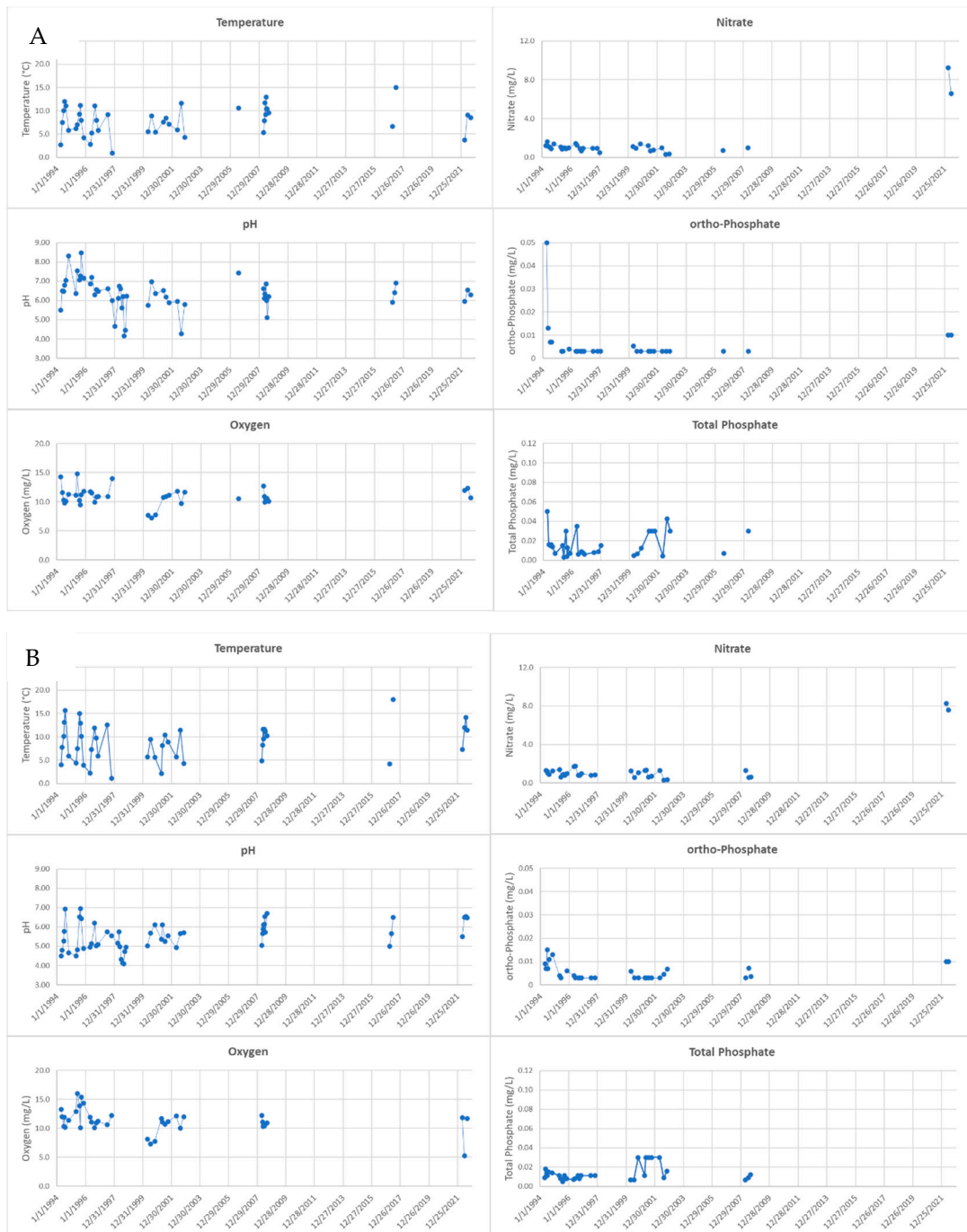
[illegible]

**Part 3: Gastropoda, Heteroptera, Hirudinea, Megaloptera, Odonata, Oligochaeta, Plecoptera, Turbellaria.**

[illegible]

## Part 4: Trichoptera.

[illegible]



**Figure S1.** Temporal trends in selected water quality parameter for (A) Site 4: Kalte Bode and (B) Site 5: Ilse river.