

Table S1: List of sampled waters from the White Sea watershed and their main characteristics

River	Water ID	Lat	Long	Sampling date (d/m/yr)	Type	Flow	Comments	Bedrock Lithology / Tributary type
Zone 1								
Ruiga	9	63°45'43"N	35°47'13"E	25.07.2004	II	BF	Upper reaches	
Ladreka	23	64°17'02"N	35°18'52"E	06.08.2004	II	BF	100 m above the bridge, freshwater	
Yukovo	Y-1	64°22'58"N	35°36'36"E	15.02.2006	III	BF	Stagnant surface water under 20 cm of ice	
Yukovo	Y-3	64°21'31"N	35°40'51"E	16.02.2006	III	BF	Stream from wetland zone, under ice 5-7 cm	Archean Granite, Marine deposits (sand, clay) and peat
Yukovo	Y-2	64°21'19"N	35°40'44"E	15.02.2006	IV	BF	Groundwater (pit)	
Yukovo	Y-4	64°21'39"N	35°40'50"E	16.02.2006	IV	BF	Water lenses trapped in the ice at the tidal zone (connected to Y3)	
Yukovo	Y-5	64°21'37"N	35°40'56"E	16.02.2006	IV	BF	Superficial flow frozen in form of stalactites	
Zone 2								
Peschanaya	S-32	66°12'03"N	43°40'12"E	23.08.2006	III	BF	Small stream (200-300 m length) from coastal wetland zone	
Peschanaya	S-40	66°12'00"N	43°32'12"E	24.08.2006	IV	BF	Soil pit water in the coastal bog discharging to the sea	Glacial morens (sand) and peat
Zone 3								
Severnaya Dvina	A-3 F	64°40'24"N	40°33'11"E	28.02.2007	I	BF	Ekonomiya monitoring point (13h20)	Carbonate P, K; clays (Q), sand (Q), claystone and sandstone (J, T)
Severnaya Dvina	A-18	64°27'04"N	40°40'54"E	6.05.2007	I	HF	Surface, above the city (M-12 Volodia)	
Severnaya Dvina	A-28	64°00'00"N	41°09'17"E	18.06.2007	I	BF	Above the bridge (Arkhangelsk), left bank	
Ilasskoe Bog	A-19	64°19'40"N	40°36'41"E	7.05.2007	IV	HF	Ombrotrophic bog	Ombrotrophic bog (peat deposits) on limestones (K)
Ilasskoe Creek	A-20	64°19'57"N	40°37'35"E	7.05.2007	III	HF	Creek from Ilasskoe bog near the railway	
Pinega	A-7	64°54'56"N	43°27'08"E	2.03.2007	I	BF	Mainstream	Carbonate P, K, gypsum; less amount of clays (Q), sand (Q),
Pinega	A-27	64°54'56"N	43°27'08"E	23.05.2007	I	HF	Mainstream (Golubino)	
Sotka	A-8	64°07'34"N	43°03'54"E	3.03.2007	I	BF	Mainstream	Carbonate P), gypsum (P1), clays (Q), sand (Q)
Sotka	A-25	64°07'34"N	43°03'54"E	22.05.2007	I	HF	Mainstream	

Type I: Large rivers 100 - 500,000 km², Type II: Small rivers, S < 50 km², Type III: Semi-permanent streams (1 - 10 km²)

Type IV: Stagnant (soil, wetland) water, soil pits close to coast high DOC

BF: Base flow, HF: High Flow

Table S2: List of sampled waters from the Copper River watershed in Alaska and their main characteristics and chemical compositions

River	Water ID	Lat	Long	Type	Sample ID	Filtration	pH	Fe (ug/L)	DOC (mg/L)	$\delta^{56}\text{Fe}$	2SD	$\delta^{57}\text{Fe}$	2SD	Note
<i>Copper River (CR)</i>														
CR above Chitina river	8	61.529	144.408	GL	AK-07	<0.2um	7.9	600.0		0.09	0.09	0.14	0.40	
CR below Chitina river	10	61.482	144.452	GL	A22	<0.45um	7.8	530.0		0.07	0.06	0.10	0.13	*
CR delta channel	26	60.445	145.08	GL	A25	<0.45um	7.9	800.0	0.45	0.09	0.06	0.15	0.13	*
					AK-09	<0.2um	7.9	798.9		0.07	0.06	0.14	0.31	
CR above childs glacier	33	60.673	144.755	GL	A14	<0.45um	8.1	460.0		0.03	0.06	0.20	0.13	*
<i>Copper River tributaries and local waters</i>														
College Creek	13	63.227	145.485	GL	A20	<0.45um	7.9			0.01	0.06	0.00	0.13	*
Ibeck Creek	27	60.508	145.541	GL	A23	<0.45um	7.5	720.0		0.13	0.06	0.24	0.13	*
Kotsina River	9	61.581	144.408	GL	A21	<0.45um	7.7	500.0		0.00	0.06	0.02	0.13	*
Kuskulana River	12	61.556	144.022	GL	A17	<0.45um	8	200.0		0.06	0.06	0.06	0.13	*
McCarthy Creek	23	61.431	142.926	GL	A16	<0.45um	8	30.0		0.34	0.06	0.26	0.13	*
Meterasbe River	35			GL	AK-08	<0.2um		3.0		0.05	0.17	0.10	0.86	
Knik River	34			GL	AK-11	<0.2um		3.0		-0.01	0.22	-0.13	0.30	
					A18	<0.45um		50.0	0.66	0.22	0.06	0.31	0.13	*
Strerler Creek	18			GL	AK-04	<0.2um		4.0		0.34	0.15	0.44	0.26	
Matanuska River	Mat			GL	A15	<0.45um		180.0		0.06	0.15	0.12	0.32	
Airport Creek	29	60.461	145.293	BB	A11	<0.45um	7.3	230.0	3.2	-0.56	0.06	-0.87	0.13	*
					AK-03	<0.2um	7.3	317.4		-0.83	0.05	-1.21	0.14	
					A10	<0.02um	7.3	110.0		-1.60	0.06	-2.37	0.13	
Eyak River	28	60.529	145.64	BB	A9	<0.45um	7.3	420.0	4.99	-1.17	0.06	-1.71	0.13	*
					A19	<0.02um	7.3	300.0		-1.73	0.15	-2.58	0.32	
					AK-13	<0.2um	7.3	402.5		-1.12	0.08	-1.70	0.20	
Gulkana River	16	62.27	145.385	BB	A5	<0.45um	7.7	60.0	5.56	-0.21	0.12	-0.29	0.24	*
					A2	<0.02um	7.7	15.0		-0.05	0.15	-0.13	0.32	
Swampy Creek	31	60.435	145.214	BB	A24	<0.45um	7.4			-0.03	0.06	-0.09	0.13	*
Tolsona Creek	17	62.101	145.969	BB	A7	<0.45um	7.6	100.0		0.11	0.15	0.07	0.32	*
					A6	<0.02um	7.6	40.0		-0.01	0.12	0.05	0.24	
Willow Creek	4	61.817	145.216	BB	A3	<0.45um	7.3	100.0	7.6	-0.40	0.15	-0.69	0.32	*
					A8	<0.02um	7.3	70.0		-0.18	0.06	-0.32	0.13	
Tractor Creek	25	61.388	143.197	BM	A4	<0.45um	6.9	35.0		0.68	0.12	0.99	0.24	
Klutina River	3	61.954	145.322	LK	AK-06	<0.2um	7.4	7.5		0.16	0.06	0.23	0.16	
Tazlina River	2	62.054	145.426	LK	A12	<0.45um	7.4	140.0	0.35	0.36	0.06	0.51	0.13	*
					AK-12	<0.2um		99.1		0.05	0.10	0.11	0.28	
Tonsina River	6	61.663	145.183	LK	A13	<0.45um	7.4	140.0	0.52	0.03	0.06	0.02	0.13	*
Clear Creek	24			MW	AK-05	<0.2um		1.0		-0.12	0.19	-0.11	0.56	
Glacial meltwater	St32			MW	AK-02	<0.2um		2.2		-0.81	0.23	-1.21	0.43	

Sampling date between 8/19/2008 and 8/27/2008

Type "GL": glacial; Type "LK": proglacial lake fed; Type "BB": boreal blackwater; Type "BM": boreal montane, Type "MW": meltwater

(*) Reference from Schroth et al., 2011

Table S3: List of sampled waters from the Lena and Ob and their main characteristics and chemical compositions

River	Water ID	Date (m/d/yr)	Discharge (km ³ /d)	Water Temp (°C)	DOC (mg/L)	Ca (mg/L)	Sr (ug/L)	Ba (ug/L)	Al (ug/L)	Mn (ug/L)	Fe (ug/L)	$\delta^{56}\text{Fe}$	2SD	$\delta^{57}\text{Fe}$	2SD
Lena	SK1	5/26/2007	2.08	5.9	13.11	12.00	128.3	15.96	22.1	66.2	334	-0.05	0.02	0.02	0.07
	SK2	5/27/2007	3.15	5.2	14.66	12.82	141.1	17.40	24.4	75.0	359	-0.10	0.02	-0.01	0.16
	SK3	5/28/2007	4.94	5.4	14.97	12.48	129.2	17.07	23.2	76.6	363	-0.24	0.05	-0.32	0.13
	SK4	5/29/2007	6.22	6.4	14.91	9.69	92.8	14.57	26.1	69.1	443	-0.16	0.06	-0.25	0.08
	SK5	5/30/2007	7.01	7.4	15.59	9.15	86.8	14.23	27.7	66.6	459	-0.01	0.09	0.14	0.13
	SK6	5/31/2007	7.78	8.9	17.05	9.53	89.9	14.51	29.2	62.6	457	-0.20	0.07	-0.16	0.10
	SK7	6/1/2007	8.64	9.7	16.73	9.12	83.2	14.19	29.3	43.8	377	-0.12	0.04	-0.09	0.11
	SK8	6/2/2007	8.50	13.1	16.20	8.29	83.6	12.57	29.2	33.5	345	-0.07	0.04	0.15	0.08
	SK9	6/4/2007	8.03	13.7	16.25	9.19	91.9	13.82	29.9	30.9	324	-0.04	0.04	-0.04	0.08
	SK10	6/5/2007	9.50	9.7	18.22	7.67	70.9	12.61	30.1	24.6	301	-0.07	0.03	-0.04	0.10
	SK11	6/6/2007	8.99	11.1	20.66	8.96	89.4	13.50	28.6	23.7	287	-0.10	0.02	-0.20	0.02
	SK12	6/8/2007	7.67	11.1	16.31	9.15	80.0	11.79	29.4	15.5	249	-0.18	0.09	-0.24	0.09
	SK13	6/9/2007	7.49	9.2	17.00	9.01	75.4	11.83	25.7	14.9	228	-0.05	0.16	-0.04	0.06
	SK14	6/10/2007	7.38		17.46	7.86	71.1	11.01	25.4	13.7	217	-0.14	0.08	0.03	0.19
	SK15	6/11/2007	7.23		16.64	9.36	76.5	11.82	21.9	14.6	225	-0.11	0.04	-0.07	0.02
Ob'	SK1	5/29/2007	3.21	6.0	9.37	3.95	27.4	5.12	27.2	90.7	592	-0.29	0.12	-0.32	0.13
	SK2	5/30/2007	3.20	6.0	9.86	3.72	24.6	4.60	31.4	118.3	663	-0.25	0.05	-0.28	0.07
	SK3	5/31/2007	3.14	7.0	10.79	2.67	18.8	3.78	41.2	95.6	764	-0.11	0.06	-0.18	0.08
	SK4	6/1/2007	3.14	7.0	11.19	2.80	17.8	3.78	49.2	74.3	746	-0.09	0.05	-0.10	0.07
	SK5	6/2/2007	3.13	7.0	10.89	2.46	15.5	4.72	36.4	33.3	653	-0.12	0.04	-0.20	0.04
	SK6	6/3/2007	3.11	5.0	11.16	2.00	13.3	3.54	53.7	41.2	736	-0.12	0.04	-0.13	0.10
	SK7	6/4/2007	3.08	5.0	10.65	2.15	14.3	5.22	54.1	45.0	843	-0.13	0.04	-0.11	0.10
	SK8	6/5/2007	3.03	8.0	10.65	1.91	11.8	4.88	50.2	35.2	692	-0.12	0.04	-0.13	0.10
	SK9	6/6/2007	3.02	9.0	10.70	2.03	12.4	3.48	51.6	27.4	690	-0.11	0.04	-0.28	0.04
	SK10	6/7/2007	3.02	10.0	10.16	2.42	15.3	3.68	50.8	33.9	657	-0.07	0.09	-0.11	0.14
	SK11	6/8/2007	3.02	11.0	9.88	2.05	13.5	4.46	54.7	38.9	637	-0.03	0.05	-0.01	0.15
	SK12	6/9/2007	3.01	9.0	9.94	2.28	15.8	5.13	55.1	36.3	678	0.01	0.04	-0.10	0.09
	SK13	6/10/2007	3.00	9.8	10.51	3.68	29.0	7.02	33.4	33.5	533	-0.05	0.06	0.10	0.05
	SK14	6/11/2007	3.00	10.0	10.48	3.02	21.6	6.15	29.4	18.7	573	-0.08	0.02	-0.13	0.05
	SK15	6/12/2007	3.01	10.0	11.20	2.07	11.6	3.08	45.2	13.3	667	-0.13	0.02	-0.03	0.04
SK16	6/13/2007	3.01	10.0	11.47	2.39	15.5	4.46	39.8	11.1	598	-0.08	0.01	-0.07	0.01	
SK17	6/14/2007	3.01	11.0	11.48	2.20	14.4	3.59	48.3	15.1	717	-0.13	0.11	-0.13	0.08	
SK18	6/15/2007	3.08	11.0	10.90	1.99	12.9	3.26	43.1	12.9	486	-0.06	0.04	-0.05	0.14	
SK19	6/16/2007	3.10	11.5	11.27	3.33	23.5	4.86	39.1	18.3	566	-0.10	0.07	-0.21	0.08	
SK20	6/17/2007	3.11	11.5	11.21	2.72	18.0	3.96	43.4	19.2	597	-0.15	0.03	-0.12	0.01	

Table S4: Chemical composition and pH of sampled waters from the White Sea watershed for different filtration size

Zone	River	Type / Flow	Water ID	Filtration	pH	DOC (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	Sr (ug/L)	Al (ug/L)	Mn (ug/L)	Fe (ug/L)	$\delta^{56}\text{Fe}$	2SD		
Zone 1	Ruiga	II / BF	9	<2.5um	5.92	34.4	1.84	2.93	2.23	13.3	749.8	131.5	2660.0	-0.09	0.09		
				<100kD/UF	6.67	32.8	1.84	2.91	2.29	12.8	717.0	149.4	1805.0	0.37	0.09		
				<10kD/UF	6.46	32.0	1.82	2.87	2.40	12.5	696.4	145.5	1290.0	0.42	0.12		
				<1kD/UF	6.75	13.0	1.27	2.36	2.48	8.3	240.8	106.5	219.0	-0.07	0.28		
	Ladreka	II / BF	23	<2.5um	7.5	41.3	4.23	3.45	33.73	35.0	439.3	115.8	3279.0	0.14	0.06		
				<0.22um	7.5	39.8	3.93	3.29	34.99	32.1	235.6	118.2	1088.0	0.63	0.08		
				<100 kD UF	7.47	40.1	4.17	3.40	33.22	33.3	270.4	102.1	1453.0	0.58	0.08		
				<10kD UF	7.51	39.4	2.30	2.35	31.77	25.6	136.3	72.6	530.6	0.83	0.06		
				III / BF	Y-1	<2.5 um	6.14	91.2	2.68	6.20	46.86	47.0	1491.0	20.5	535.3	0.50	0.03
						<0.2 um		78.9	2.27	4.45	40.15	38.4	1020.6	16.6	404.9	0.79	0.03
	<10kD dial		15.4			1.35	3.67	39.02	26.4	370.0	10.2	63.1	1.31	0.10			
				<1kD dial			1.17	3.22	37.39	21.6	191.8	7.9	24.8	1.58	0.13		
				IV / BF	Y-2	<0.22 um	7.44	4.0	22.97	8.40	13.22	112.1	1.7	439.6	603.5	0.37	0.10
						<5um	6.04	31.3	3.70	3.12	11.89	34.9	480.2	129.3	1337.2	0.24	0.04
	Yukovo & local water				<0.22um		19.7	4.53			34.1	356.9	125.0	1117.3	0.24	0.12	
III / BF					Y-3	<10kD dial		8.2	2.83	2.66	26.30	29.3	107.2	96.4	93.3	0.69	0.09
						<1kD dial		5.1	3.73			28.2	68.1	93.4	46.3	0.86	0.14
IV / BF					Y-4	<2.5 um		76.4	214.46			2983.6	2423.0	1474.5	9016.7	-1.04	0.16
	<1.2 um		67.7	49.40				755.5	634.5	409.1	2757.3	-1.09	0.05				
Zone 2	Peschanaya & local water			<10kD dial		50.3	60.19			740.3	235.1	317.5	416.0	-1.19	0.08		
				<10kD dial		50.3	60.19			740.3	235.1	317.5	416.0	-1.29	0.10		
				<1kD dial		46.7	59.00			720.5	170.6	306.1	279.9	-1.28	0.06		
				<0.22 um	3.92	47.6	2.15	0.97	6.68	12.5	890.4	45.3	1072.1	0.24	0.03		
	IV / BF	Y-5	<10kD		21.5	1.30			8.9	417.8	32.7	479.6	-0.69	0.08			
			<1kD dial		17.0	1.07	0.63	5.24	7.7	302.1	28.1	392.8	-0.83	0.15			
	III / BF	s32	<0.45um	4.18	32.5	0.93	0.88	4.07	7.3	192.2	39.1	816.7	-0.30	0.08			
			<0.45 um	4.43	63.2	0.85	1.15	5.49	8.9	99.6	4.4	350.2	-0.24	0.13			
	IV / BF	s40	<1 kD UF		28.8	0.96	0.91		6.7	49.2	4.0	107.7	-0.07	0.08			
			<0.22um	7.17	14.9	37.36	8.62	14.03	375.5	112.3	44.2	372.8	-0.01	0.09			
	Severnaya Dvina	I / BF	A-3	<10kD UF		6.7	37.25	8.44	14.26	390.3	58.8	44.3	62.8	0.24	0.07		
				<10kD dial		6.8	36.58	8.28	14.05	380.6	36.5	40.3	18.9	-0.02	0.03		
				<1kD UF		4.6	33.43	7.53	12.72	355.6	34.5	37.9	5.0	0.28	0.12		
				<1kD dial		9.6	35.86	8.13	13.76	375.1	34.8	40.1	16.3	-0.09	0.10		
		I / HF	A-18	<0.22 um	7.66	18.6	11.60	2.81	1.75	106.6	268.8	36.6	564.7	0.55	0.09		
<10kDa UF					14.1	11.11	2.63	1.69	103.0	57.9	12.5	89.0	0.89	0.10			
Zone 3	I / BF	A-28	<0.22 um		20.2	18.52	4.09	4.50	163.0	40.7	24.6	231.9	-0.01	0.08			
			<0.22 um	4.15		0.31	0.22	1.34	2.2	112.1	8.4	232.3	0.31	0.06			
	IV / HF	A-19	<100kDa UF		23.8	0.30	0.21	1.29	2.2	98.9	7.0	192.5	0.27	0.06			
			<10kDa UF		20.5	0.23	0.18	1.25	1.6	55.8	6.1	87.0	0.11	0.10			
	III / HF	A-20	<0.22 um	4.22	21.2	0.29	0.19	1.09	2.0	110.9	10.2	226.8	0.01	0.08			
			<0.22 um	7.34	6.5	44.75	9.90	9.22	1041.4	17.2	22.4	137.8	-0.09	0.11			
Pinega	I / BF	A-7	<10kD UF		3.8	43.96	9.74	9.18	1051.0	9.7	21.6	25.4	0.06	0.04			
			<1kD UF		2.2	39.46	8.78	8.60	953.7	17.0	18.9	12.8	-0.05	0.04			
			I / HF	A-27	<0.22 um		17.1	11.11	2.36	1.37	166.4	116.5	4.1	150.2	0.64	0.21	
Sotka	I / BF	A-8	<0.22 um	7.61	3.9	319.48	14.81	4.66	3797.5	6.3	16.8	36.3	0.34	0.06			
			I / HF	A-25	<0.22 um	7.55	15.1	122.70	3.99	1.28	1099.0	87.8	22.1	231.2	0.31	0.17	

Type I: Large rivers 100 - 500,000 km², Type II: Small rivers, S < 50 km²; Type III: Semi-permanent streams (1 - 10 km²)

Type IV: Stagnant (soil, wetland) water, soil pits close to coast high DOC

BF: Base flow, HF: High Flow