

Table S1. Basic information of the 47 hydrological stations. Average daily streamflow data are available from the SWAT model, calibrated, and validated for the 1986–2007 period [48] (<http://www.sciencedirect.com/science/article/pii/S1364815215300499?via%3Dihub>) and [47] (<http://www.sciencedirect.com/science/article/pii/S2214581816301859?via%3Dihub>)]

Station No.	Station Name	Location		
		Lat.	Long.	Elevation (m)
1	CROWSNEST_RIVER_AT_FRANK	49.597	-114.411	1269.974
3	OLDMAN_RIVER_NEAR_WALDRON_S_CORNER	49.814	-114.183	1262.274
4	OLDMAN_RIVER_NEAR_BROCKET	49.558	-113.823	1035.469
11	OLDMAN_RIVER_NEAR_LETHBRIDGE	49.709	-112.863	818.967
17	OLDMAN_RIVER_NEAR_THE_MOUTH	49.919	-111.800	705.588
18	SOUTH_SASKATCHEWAN_RIVER_AT_MEDICINE	50.042	-110.678	652.04
20	PIPESTONE_RIVER_NEAR_LAKE_LOUISE	51.433	-116.175	-
23	BOW_RIVER_AT_CALGARY	51.050	-114.051	1038.03
24	HIGHWOOD_RIVER_BELOW_LITTLE_BOW	50.586	-113.869	1032.915
27	HIGHWOOD_RIVER_AT_DIEBEL_S_RANCH	50.405	-114.501	-
28	HIGHWOOD_RIVER_NEAR_THE_MOUTH	50.783	-113.821	960.201
29	BOW_RIVER_NEAR_THE_MOUTH	50.047	-111.591	698.135
33	LITTLE_RED_DEER_RIVER_NEAR	52.028	-114.140	-
37	RED_DEER_RIVER_AT_RED	52.276	-113.817	847.951
40	RED_DEER_RIVER_AT_DRUMHELLER	51.467	-112.711	676.72
42	RED_DEER_RIVER_NEAR_BINDLOSS	50.903	-110.299	589.422
43	NORTH_SASKATCHEWAN_RIVER_AT_WHIRLPOOL	52.001	-116.471	-
46	RAM_RIVER_NEAR_THE_MOUTH	52.368	-115.422	1052.35
51	NORTH_SASKATCHEWAN_RIVER_AT_HIGHWAY	53.315	-114.758	-
52	NORTH_SASKATCHEWAN_RIVER_AT_EDMONTON	53.537	-113.485	609.701
58	BATTLE_RIVER_NEAR_PONOKA	52.663	-113.581	799.707
59	BATTLE_RIVER_AT_DUHAMEL	52.948	-112.964	-
61	BATTLE_RIVER_AT_HIGHWAY_NO.	52.402	-111.411	-
62	BATTLE_RIVER_NEAR_THE_SASKATCHEWAN	52.856	-110.019	536.334
66	MIETTE_RIVER_NEAR_JASPER	52.864	-118.107	1033.755
67	ATHABASCA_RIVER_NEAR_JASPER	52.910	-118.059	1016.882
71	ATHABASCA_RIVER_AT_HINTON	53.424	-117.569	-
72	ATHABASCA_RIVER_NEAR_WINDFALL	54.208	-116.063	730.453
73	MCLEOD_RIVER_OVE_EMBARRAS_RIVER	53.470	-116.631	-
74	MCLEOD_RIVER_NEAR_CADOMIN	53.079	-117.198	-
84	PEMBINA_RIVER_AT_JARVIE	54.450	-113.993	-
85	ATHABASCA_RIVER_AT_ATHASCA	54.722	-113.288	506.873
97	CLEARWATER_RIVER_AT_DRAPER	56.685	-111.255	240.640
99	CLEARWATER_RIVER_OVE_CHRISTINA_RIVER	56.663	-110.929	-
101	ATHABASCA_RIVER_BELOW_MCMURRAY	56.780	-111.402	235.821
108	PEACE_RIVER_AT_DUNVEGAN_BRIDGE	55.919	-118.606	336.664
114	KAKWA_RIVER_AT_HIGHWAY_NO.	54.421	-118.554	-
119	LITTLE_SMOKY_RIVER_NEAR_GUY	55.456	-117.162	-
120	SMOKY_RIVER_AT_WATINO	55.714	-117.623	373.737

121	PEACE_RIVER_AT_PEACE_RIVER	56.245	-117.314	304.800
124	NOTIKEWIN_RIVER_AT_MANNING	56.920	-117.618	450.674
125	PEACE_RIVER_AT_FORT_VERMILION	58.388	-116.029	243.508
128	PEACE_RIVER_AT_PEACE_POINT	59.114	-112.426	207.246
130	SLAVE_RIVER_AT_FITZGERALD_(ALBERTA)	59.872	-111.583	196.014
131	HAY_RIVER_NEAR_MEANDER_RIVER	59.149	-117.636	292.345
133	CHINCHAGA_RIVER_NEAR_HIGH	58.597	-118.334	-
135	MILK_RIVER_AT_WESTERN_CROSSING	49.008	-112.546	-

Table S2. The drainage area, sample sizes and values of the estimated shape (ξ) and scale (σ) parameters with their variance, $\text{Var}(\xi)$ and $\text{Var}(\sigma)$, to show the ranges of the shape and scale parameter values used in the study, along with the percentage of improvement of root-mean-square error (RMSE) and Anderson Darling (AD) statistic for the stations. Abbreviations are as follow: RMSE – root-mean-square error, AD – Anderson Darling.

Station No.	Drainage Area (km ²)	Sample Size (n)	Shape (ξ)	Scale (σ)	Variance in Shape: $\text{Var}(\xi)$	Variance in Scale: $\text{Var}(\sigma)$	RMSE	AD
1	402.700	53	-0.01	43	0.024	14.6	0%	0%
3	1446.100	67	0.11	62	0.002	2.2	85%	67%
4	4401.100	83	0.13	99	0.005	29.6	53%	93%
11	17045.600	72	0.14	196	0.005	55.1	87%	15%
17	27531.300	81	-0.03	263	0.001	15.0	80%	89%
18	56368.600	48	0.13	331	0.008	310.8	0%	0%
20	306.000	49	-0.36	56	0.004	7.0	13%	15%
23	7868.200	88	0.39	70	0.011	16.5	0%	0%
24	1953.400	40	0.26	53	0.027	18.2	0%	0%
27	773.600	88	-0.03	69	0.009	46.7	0%	0%
28	3952.200	85	0.13	155	0.015	115.8	0%	0%
29	25300.000	79	0.05	141	0.002	11.8	89%	100%
33	2578.300	47	-0.68	65	0.008	98.9	0%	0%
37	11608.800	85	-0.12	131	0.002	33.2	-88%	39%
40	24900.000	73	-0.04	132	0.014	104.2	0%	0%
42	47849.500	41	0.07	125	0.026	148.4	0%	0%
43	1923.200	69	-0.07	191	0.005	100.8	0%	0%
46	1853.600	55	0.22	102	0.011	39.8	0%	0%
51	22100.000	79	0.29	315	0.004	111.1	0%	0%
52	28096.000	81	0.25	308	0.002	45.6	0%	0%
58	1821.500	88	0.45	10	0.005	0.2	0%	0%
59	5010.000	80	0.38	18	0.008	0.8	0%	0%
61	11700.000	83	0.01	15	0.000	0.0	65%	68%
62	25071.300	48	-0.34	35	0.002	2.3	6%	18%
66	628.500	84	-0.04	73	0.002	6.3	0%	0%
67	3872.700	66	0.09	346	0.002	58.9	0%	0%
71	9764.800	79	0.22	526	0.003	199.7	0%	0%

72	19600.000	87	0.08	563	0.009	163.0	0%	0%
73	2551.300	47	0.10	60	0.005	7.8	0%	0%
74	330.000	66	-0.11	89	0.030	83.5	0%	0%
84	13103.700	41	-0.08	133	0.001	3.4	23%	48%
85	74602.300	71	0.13	139	0.018	67.6	0%	0%
97	30791.600	57	0.17	80	0.016	35.1	0%	0%
99	17016.600	50	0.19	50	0.016	13.2	0%	0%
101	132585.000	67	-0.15	263	0.001	39.6	57%	72%
108	135396.500	51	0.11	363	0.007	235.2	69%	99%
114	3370.900	84	0.09	158	0.000	2.4	66%	91%
119	11100.000	88	-0.06	164	0.007	42.3	68%	95%
120	50300.000	87	0.01	369	0.001	39.9	68%	91%
121	194374.200	60	0.19	813	0.001	213.4	0%	0%
124	4680.000	85	0.19	76	0.001	3.4	0%	0%
125	227000.000	67	0.17	859	0.001	170.9	63%	75%
128	293000.000	43	-0.01	1361	0.004	181.0	0%	0%
130	606000.000	43	-0.07	1039	0.000	208.7	40%	41%
131	36900.000	40	-0.17	163	0.000	6.5	22%	54%
133	10369.600	37	-0.13	92	0.007	71.5	1%	15%
135	1045.000	59	0.12	18	0.020	20.7	0%	0%

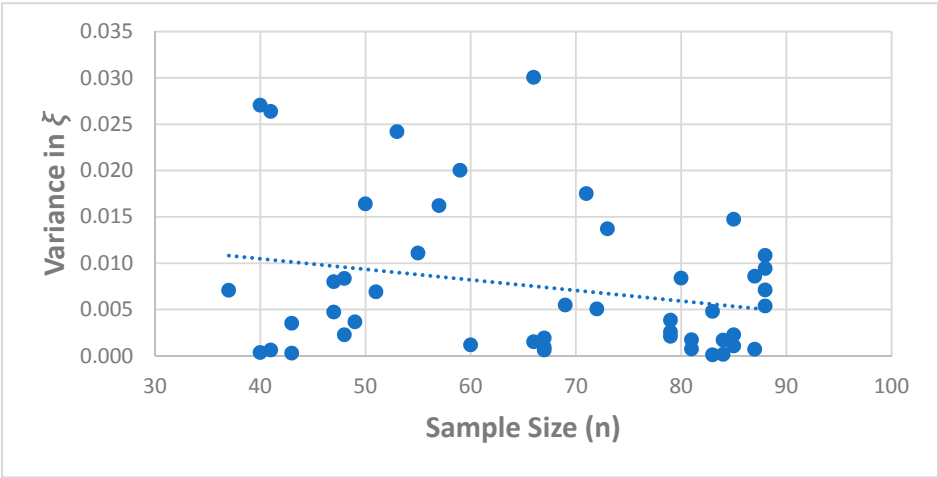


Figure S1. The relationship between the sample size (n), and the variance in shape parameter $\text{Var}(\xi)$ values.

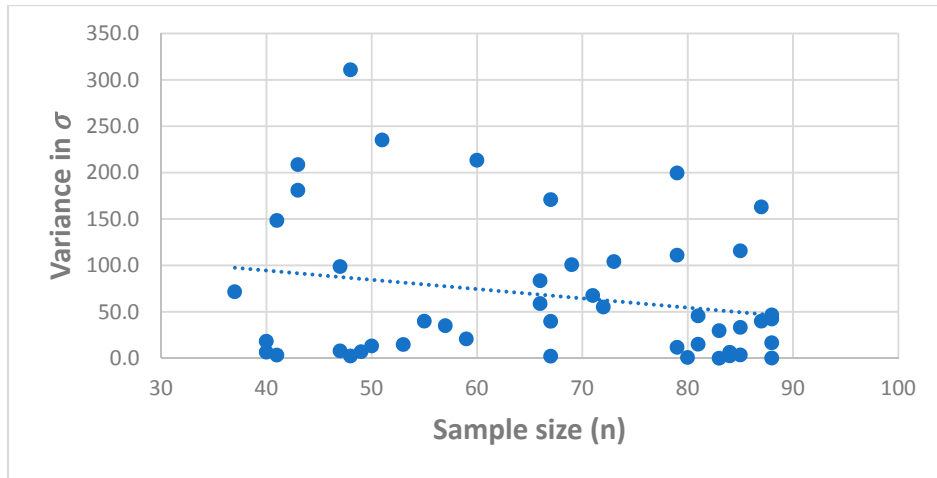


Figure S2. The relationship between the sample size (n), and the variance in scale parameter $\text{Var}(\sigma)$ values.

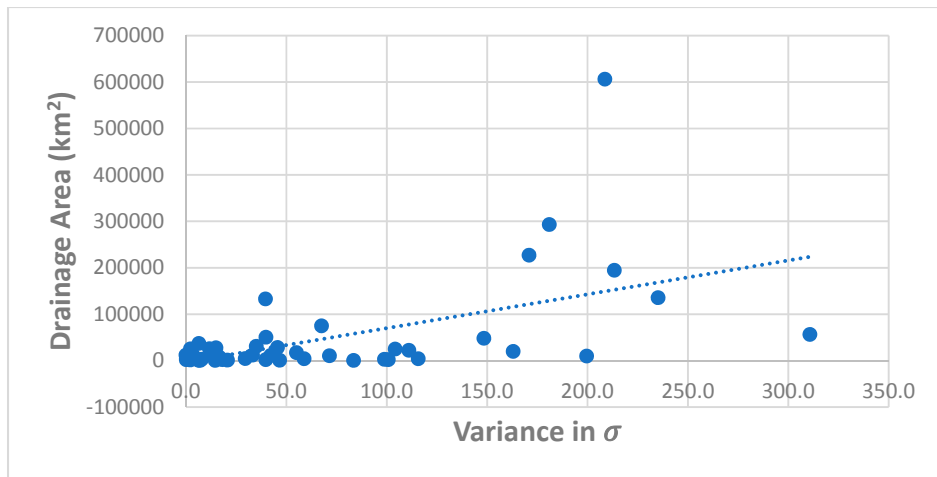


Figure S3. The relationship between the variance in scale parameter $\text{Var}(\sigma)$ values and the drainage area (km^2).

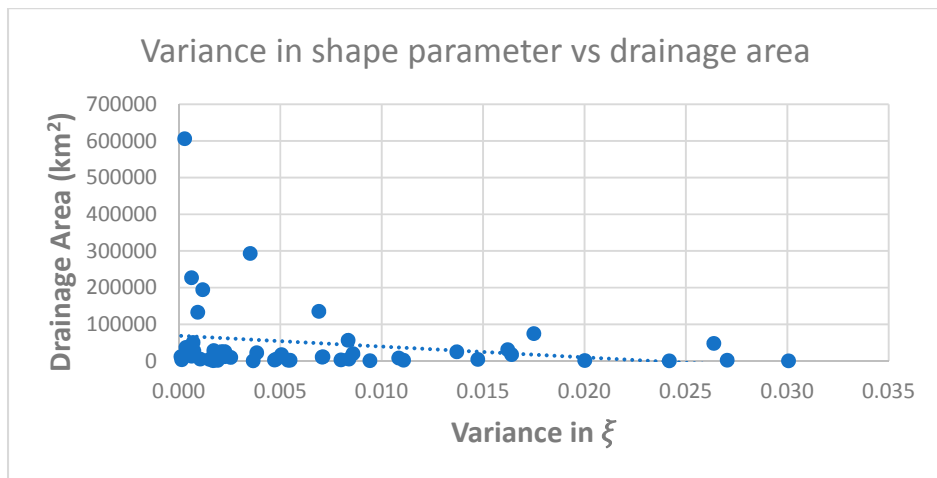


Figure S4. The relationship between the variance in shape parameter $\text{Var}(\xi)$ values and the drainage area (km^2).

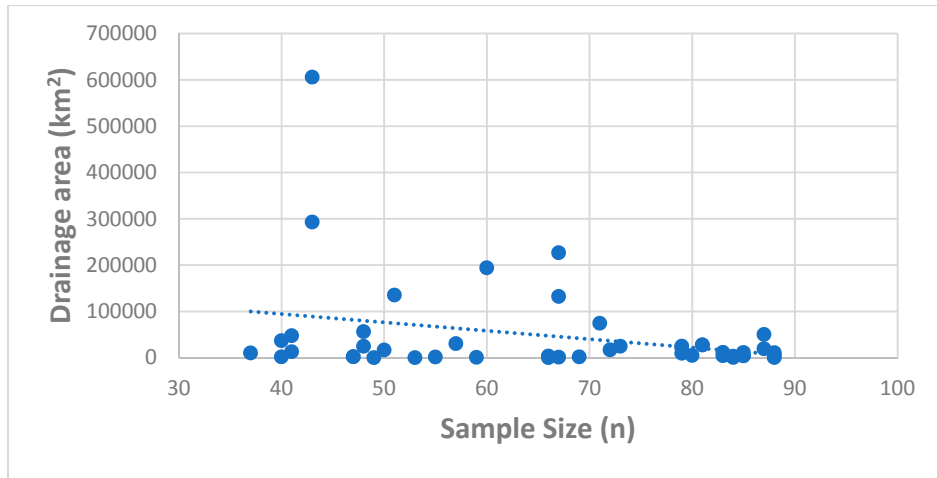


Figure S5. The relationship between the sample size (n) and drainage area (km²).