

APPENDIX A – Site Information Tables with Data Sources

Table A.1 Coarse Bed Site Information

Site ID	Site Name	Sed. Source	Record Ext.	Rec. Len.	α	β	R^2	C_v	Q_{bf}	$Q_{1.5}$	Q_{eff}	Q_{s50}	D_{50}	DA	Latitude	Longitude
				(yrs)					(m ³ /s)	(m ³ /s)	(m ³ /s)	(m ³ /s)	(mm)	(km ²)		
11173575	Alameda nr Sunol, CA	1		14	1.29E-04	1.40	0.54	3.48	5.7	44	9.1	12	15	386	37.54049080	-121.85634500
11179000	Alameda Ck nr Niles, CA	1		113	2.15E-05	1.95	0.71	4.31	-	67	57	141	5	1,639	37.58715679	-121.96079300
09253400	Battle Ck nr Encampment, WY	3		10	6.05E-05	3.32	0.69	2.13	-	7.4	10	10	80	34	41.13222220	-107.06916670
09255900	Big Sandstone Ck nr Savery, WY	3		5	2.35E-04	2.42	0.76	2.35	3.7	5.6	7.0	5.0	60	26	41.19996287	-107.17561070
13135500	Big Wood River nr Ketchum, ID	2		25	3.59E-06	3.64	0.87	1.31	-	21	43	29	116	355	43.78629677	-114.42505470
13310565	Blackmare Ck nr CAscade, ID	2	X	47	1.19E-03	1.89	0.59	1.33	4.7	4.1	3.9	4.6	98	46	44.82184460	-115.70484000
13185000	Boise River nr Twin Springs, ID	2		102	4.37E-06	2.64	0.85	1.22	167	162	163	151	70	2,155	43.66805556	-115.72527780
13018300	Cache Creek nr Jackson, WY	4		51	6.21E-04	2.65	0.75	1.28	3.9	1.7	1.5	2.0	46	27	43.45215258	-110.70409130
11143250	Carmel River nr Carmel, CA	1		51	7.32E-04	1.58	0.70	3.22	-	41	11	42	8	640	36.53912780	-121.88050840
1241490A	Cat Spur Creek, ID	2	X	48	3.06E-03	2.05	0.42	1.21	2.4	2.4	1.3	1.5	27	28	46.96380200	-116.25256400
13342500	Clearwater River at Spalding, ID	11		91	2.80E-07	2.20	0.72	1.09	-	1,880	1,277	1,424	74	24,043	46.44849828	-116.82737490
11180960	Cull Ck Abv Res nr Castro Valley, CA	1		35	1.63E-02	1.63	0.75	4.75	-	6.7	0.4	3.2	4	15	37.71770737	-122.05440670
13310520	Dollar Creek nr Cascade, ID	2	X	47	1.06E-03	2.19	0.69	1.70	6.4	5.3	6.5	7.6	88	43	44.72017740	-115.69567230
0914650A	East Dallas Creek nr Ridgeway, CO	5	X	23	5.14E-03	2.84	0.76	1.21	3.7	3.3	3.5	3.4	58	44	38.09332490	-107.81367270
09339900	East Fork San Juan River, CO	4		45	3.77E-06	5.14	0.92	1.58	-	14	26	22	49	166	37.38972959	-106.84115090
09255400	East Fork Savery Ck nr Encampment, WY	3		4	8.71E-03	2.83	0.75	2.10	2.4	1.7	2.0	1.7	45	14	41.27218410	-107.15894320
09404900	East Fork Virgin River nr Springdale, UT	1		22	2.38E-03	0.97	0.46	0.87	-	14	1.1	1.6	25	888	37.16414955	-112.95854990
M332AEC	Eggers Creek, ID	2		32	9.16E-02	1.55	0.63	1.53	0.1	6.2	0.3	5.8	23	1	44.36780400	-115.77089300
12044900	Elwha R abv Lake Mills, WA	1	X	95	6.85E-04	2.34	0.70	0.81	-	312	55	91	-	513	47.97008900	-123.59074530
09362900	Florida River nr Lemon Reservoir, CO	4	X	79	1.14E-07	4.62	0.97	1.68	-	21	25	23	210	115	37.37916870	-107.66172700
11525600	Grass Valley nr Lewiston, CA	1		29	2.38E-03	0.59	0.09	1.69	-	11	0.3	1.6	19	80	40.67625718	-122.83057830
07083000	Halfmoon Creek nr Malta, CO	5		91	1.77E-04	3.33	0.66	1.56	6.2	6.0	5.6	5.8	49	61	39.17221259	-106.38919260
1329500B	Herd Creek, ID	2	X	92	3.10E-03	2.35	0.83	0.87	5.5	3.5	3.5	3.1	67	285	44.13274300	-114.27690100
11525670	Indian Ck nr Douglas City, CA	1	X	37	5.12E-06	2.87	0.87	2.14	-	12	18	33	-	87	40.65181225	-122.91446890
13162225	Jarbidge Rv bl Jarbidge, NV	2		14	1.97E-04	3.07	0.59	1.94	-	9.4	8.2	10	91	79	41.89046140	-115.42868160
1333850A	Johns Creek, ID	2	X	49	3.55E-06	2.48	0.50	1.20	49	20	23	19	197	293	45.82214900	-115.88850700
13313000	Johnson Creek at Yellow Pine, ID	2		85	4.56E-07	2.90	0.87	1.67	40	71	65	69	190	565	44.96166667	-115.50000000
09361400	Junction Ck nr Durango, CO	4	X	60	3.93E-07	4.80	0.79	1.85	-	4.9	7.6	7.4	64	68	37.33416764	-107.90951260
13310660	Little Buckhorn Ck nr Krassel Rngr Sta, ID	2	X	47	2.40E-02	2.13	0.49	1.08	-	0.5	0.8	0.7	66	16	44.91267746	-115.75067590
13019438	Little Granite Ck at Mth nr Bondurant, WY	4		10	2.41E-04	2.94	0.69	1.75	6.4	5.7	5.3	9.0	155	55	43.29861110	-110.51777780
1331650A	Little Slate Creek, ID	2		46	3.31E-04	1.45	0.44	1.02	12	12	1.1	7.7	125	162	45.61848200	-116.06672500

Table A.1 cont. Coarse Bed Site Information

Site ID	Site Name	Sed. Source	Record Ext.	Rec. Len.	α	β	R^2	C_v	Q_{bf}	$Q_{1.5}$	Q_{eff}	Q_{s50}	D_{50}	DA	Latitude	Longitude
				(yrs)					(m ³ /s)	(m ³ /s)	(m ³ /s)	(m ³ /s)	(mm)	(km ²)		
13337000	Lochsa River nr Lowell, ID	2		86	1.83E-11	3.99	0.78	1.36	446	456	451	496	131	3,051	46.15083330	-115.58722220
1333850B	Lolo Creek, ID	2		35	4.25E-04	1.61	0.37	1.22	12	11	7.0	8.4	74	106	46.31322900	-115.74887800
1333850C	Main Fork Red River, ID	2		36	1.77E-03	1.79	0.62	1.39	9.3	11	10	8.9	55	129	45.70963100	-115.34096900
1329500C	Marsh Creek, ID	2	X	92	2.43E-04	2.29	0.68	1.64	21	17	20	30	62	206	44.39677300	-115.16927000
09347200	Middle Fork Piedra River, CO	4	X	51	7.08E-06	4.59	0.91	1.58	-	5.5	25	15	79	83	37.48667027	-107.16338130
13309220	MF Salmon River nr Yellow Pine, ID	2		22	4.97E-16	6.39	0.82	1.37	-	209	586	498	134	2,699	44.72166667	-115.01638890
11148900	Nacimiento R nr Bryson, CA	1		42	1.36E-06	2.49	0.78	4.42	11	100	231	278	78	420	35.78857918	-121.09380480
13340600	NF Clearwater R nr Canyon Rngr Sta, ID	2		46	3.44E-11	3.92	0.88	1.15	453	430	454	513	86	3,357	46.84055556	-115.62111100
13011500	Pacific Creek at Moran, WY	6		65	1.71E-04	2.39	0.52	1.87	29	56	54	55	79	438	43.85027778	-110.51777780
1331070A	Rapid River, ID	2		87	9.97E-05	2.30	0.58	1.20	-	20	18	22	72	280	45.35128100	-116.39857700
11482500	Redwood Creek at Orick, CA	1		62	1.73E-04	1.34	0.77	1.91	127	456	48	115	7.0	717	41.29928960	-124.05118250
11481500	Redwood Ck nr Blue Lake, CA	1		42	9.21E-06	2.46	0.75	1.80	28	113	29	68	22	175	40.90596479	-123.81533500
11525530	Rush Ck nr Lewiston, CA	1	X	37	3.27E-06	3.11	0.74	1.44	3.5	8.7	6.3	7.1	-	58	40.72458990	-122.83474580
10343500	Sagehen Creek nr Truckee, CA	7		60	6.29E-03	1.57	0.29	1.84	2	1.8	0.1	1.8	58	27	39.43157246	-120.23797930
13296500	Salmon River bl Yankee Fork nr Clayton, ID	2		79	3.68E-09	3.87	0.72	1.16	-	110	175	162	104	2,090	44.26833330	-114.73277780
13292500	Salmon River nr Obsidian, ID	2	X	92	1.99E-05	3.43	0.61	1.49	-	12	16	15	60	245	43.96574038	-114.80118190
13307000	Salmon River nr Shoup, ID	2		48	3.01E-10	3.87	0.71	0.97	-	325	402	408	96	16,159	45.32250000	-114.44000000
11149900	San Antonio R nr Lockwood, CA	1		48	4.47E-03	0.82	0.70	3.90	-	67	0.0	14	5.0	562	35.89663404	-121.08824910
1333850D	SF Red River, ID	2		35	1.25E-03	1.52	0.41	1.51	7.2	6.7	3.5	6	104	99	45.70764000	-115.34381700
13310700	SF Salmon River, ID	2		41	2.29E-06	3.01	0.74	1.41	71	77	90	90	14	855	44.98694440	-115.72500000
13235000	SF Payette River at Lowman, ID	2		72	1.13E-04	2.13	0.70	1.14	86	99	82	90	95	1,155	44.08527778	-115.62222220
1329735A	Squaw Ck nr North Fork, ID (USFS)	2	X	41	1.20E-02	2.30	0.49	1.16	0.6	0.5	0.4	0.5	27	37	45.41082800	-114.20056600
13297355	Squaw Ck bl Bruno Creek Nr Clayton, ID	2		41	1.32E-03	2.40	0.79	1.67	5.1	5.1	7.9	7.6	46	185	44.29083330	-114.47166670
13297330	Thompson Creek, ID	2		41	3.02E-03	2.99	0.87	1.74	2.5	2.4	3.5	4.8	63	75	44.27027778	-114.51666670
1333850F	Trapper Creek, ID	2	X	49	5.84E-03	1.35	0.44	1.28	2.6	1.5	1.6	1.1	79	21	45.67160200	-115.32670800
11525854	Trinity R at Douglas City, CA	1		11	5.50E-09	2.98	0.71	1.20	113	177	191	184	-	2,411	40.64527778	-122.95666670
13295000	Valley Creek at Stanley, ID	2		73	9.08E-05	2.66	0.59	1.12	24	25	24	23	63	381	44.22250000	-114.93111100
13310670	WF Buckhorn Creek nr Krassel Rngr Sta, ID	2	X	47	1.59E-03	1.75	0.39	1.51	5.7	4.1	5.9	5.3	180	59	44.91684430	-115.74345350
06228000	Wind River at Riverton, WY	9		98	8.30E-03	1.18	0.22	1.51	142	131	10	68	22	5,980	43.01051478	-108.37677010

Sediment Data Sources: 1: [USGS, 2014], 2: [U.S.F.S. BAT, 2014], 3: [Rankl and Smalley, 1992], 4: [U.S.F.S., 2014b], 5: [Bunte and Abt, 2009], 6: [Erwin et al., 2011], 7: [Andrews, 1994], 8: [Andrews, 2000], 9: [Smalley et al., 1994], 10: [Williams and Krupkin, 1984], 11: [Jones and Seitz, 1980].

Table A.2 Fine Bed Site Information

Site ID	Site Name	Record Length	α	β	R^2	C_v	Q_{bf}	$Q_{1.5}$	Q_{eff}	Q_{s50}	D_{50}	DA	Latitude	Longitude
		(yrs)					(m ³ /s)	(m ³ /s)	(m ³ /s)	(m ³ /s)	(mm)	(km ²)		
09364500	Animas River at Farmington, NM	91	1.69E-03	2.23	0.62	1.37	-	129	111	124	0.29	3,522	36.72250000	-108.20175000
07146500	Arkansas R. at Arkansas City, KS	96	8.02E-04	1.96	0.78	1.90	481	429	40	545	0.43	113,216	37.05641799	-97.05809390
07137500	Arkansas R. nr Coolidge, KS	64	1.12E-02	1.89	0.77	4.60	31	34	12	1,678	0.53	65,812	38.02751290	-102.01157060
07152500	Arkansas River at Ralston, OK	89	1.12E-03	1.63	0.7	1.81	1,444	1,019	244	835	-	140,398	36.50421677	-96.72836720
08340500	Arroyo Chico nr Guadalupe, NM	51	1.86E+00	1.74	0.93	6.05	-	79	11	33	5.00	3,600	35.59225000	-107.18944440
11176900	Arroyo de la Laguna at Verona, CA	58	3.44E-03	1.99	0.77	4.16	26	90	77	70	2.91	1,044	37.62659915	-121.88301260
07196900	Baron Fork at Dutch Mills, AR	56	2.06E-03	0.97	0.72	3.55	-	1,465	0.9	4.2	-	105	35.88000000	-94.48638890
07290000	Big Black River nr Bovina, MS	78	3.52E-03	1.18	0.75	1.57	425	525	244	3,314	0.38	7,283	32.34777778	-90.69694440
06485500	Big Sioux R. at Akron, IA	86	4.50E-03	1.35	0.75	2.12	197	197	45	1,977	0.59	20,407	42.83752049	-96.56192190
08114000	Brazos River at Richmond, TX	94	3.67E-06	2.72	0.86	1.61	2,124	1,240	1,789	1,691	0.21	116,827	29.58245890	-95.75772750
03382170	Brushy Creek nr Harco, IL	47	3.28E-02	1.80	0.95	3.74	-	27	4.0	8.2	-	34	37.77504850	-88.65227890
02300700	Bullfrog Creek nr Wimauma FL	36	2.15E-03	0.95	0.58	2.78	4.3	20	0.5	2.8	-	75	27.79197208	-82.35203690
08123850	Colorado River abv Silver, TX	47	2.40E-03	1.42	0.79	6.12	37	57	0.6	77	-	38,617	32.05374399	-100.76205200
08162000	Colorado River at Wharton, TX	75	7.64E-05	2.28	0.71	1.89	1,529	575	876	974	-	108,787	29.30913668	-96.10384820
08147000	Colorado River nr San Saba, TX	95	2.23E-03	1.09	0.53	4.33	283	504	5.1	292	-	80,852	31.21794515	-98.56448400
09163500	Colorado River nr State Line, CO	63	4.28E-05	2.32	0.7	1.07	1,246	5,292	481	7,391	-	46,229	39.13276047	-109.02705460
02075500	Dan River at Paces, VA	63	7.66E-05	2.05	0.62	1.19	680	586	77	399	-	6,700	36.64236056	-79.08945900
01463500	Delaware River at Trenton NJ	101	1.95E-06	2.27	0.77	1.02	-	2,303	776	1,192	-	17,560	40.22166667	-74.77805560
03365500	E.F. White River at Seymour, IN	87	1.42E-02	0.99	0.69	1.67	313	7,831	46	1,541	1.63	6,063	38.98255300	-85.89914440
11475000	Eel River at Fort Seward, CA	59	1.26E-05	2.50	0.88	2.65	6,260	1,895	1,177	3,382	2.93	5,457	40.21820000	-123.63253000
09466500	Gila River at Calva, AZ	85	2.77E-02	1.95	0.87	4.42	-	95	69	1,026	-	29,707	33.18561278	-110.22009030
09431500	Gila River nr Redrock, NM	77	2.58E-03	2.09	0.65	2.75	-	1,151	26	262	-	7,327	32.72694444	-108.67555560
07277700	Hickahala Creek nr Senatobia, MS	24	8.16E-05	2.50	0.85	3.38	255	280	64	205	0.43	313	34.63194444	-89.92444440
05568800	Indian Creek nr Wyoming, IL	54	2.40E-02	1.36	0.64	2.36	18	36	1.5	6.9	1.00	162	41.01888889	-89.83555560
05451500	Iowa River at Marshalltown, IA	96	1.50E-03	1.77	0.82	1.61	282	183	59	139	0.47	3,968	42.06582096	-92.90769970
05526000	Iroquois River nr Chebanse, IL	91	1.88E-03	1.14	0.76	1.52	340	316	36	149	-	5,416	41.00892150	-87.82337190
02143040	Jacob Fork at Ramsey, NC	53	8.20E-04	1.75	0.73	1.57	-	41	1.2	7.4	-	67	35.59055556	-81.56694440
05520500	Kankakee River at Momence, IL	99	3.05E-04	1.76	0.63	0.73	34	174	110	113	-	5,941	41.16003338	-87.66864830
05591200	Kaskaskia River at Cooks Mills, IL	44	5.54E-03	0.99	0.67	1.77	20	120	7.1	35	0.91	1,225	39.58336660	-88.41338420
05594100	Kaskaskia River nr Venedy Sta., IL	45	2.14E-03	1.20	0.61	1.24	269	493	115	2,677	0.32	11,378	38.45060486	-89.62759260
11523000	Klamath River at Orleans, CA	87	3.49E-06	2.50	0.83	1.23	566	1,356	597	1,642	3.58	21,950	41.30345990	-123.53450360

Table A.2 cont. Fine Bed Site Information continued

Site ID	Site Name	Record Length	α	β	R^2	C_v	Q_{bf}	$Q_{1.5}$	Q_{eff}	Q_{s50}	D_{50}	DA	Latitude	Longitude
		(yrs)					(m ³ /s)	(m ³ /s)	(m ³ /s)	(m ³ /s)	(mm)	(km ²)		
11530500	Klamath River nr Klamath, CA	77	1.02E-06	2.61	0.88	1.28	1,841	27,691	1,003	33,131	-	31,339	41.51095430	-123.97951640
07143672	L. Arkansas R. 50 nr Halstead, KS	18	4.22E-03	1.45	0.89	3.71	170	95	0.6	110	-	1,966	38.02862230	-97.54059700
07144100	L. Arkansas R. nr Sedgwick, KS	20	1.48E-03	1.57	0.92	3.59	85	188	1.7	209	0.86	3,209	37.88306739	-97.42448640
05584500	La Moine River at Colmar, IL	69	3.25E-03	1.41	0.83	2.64	170	180	11	121	0.38	1,696	40.33032166	-90.89624510
03353600	Little Eagle Creek at Speedway, IN	54	1.27E-02	1.05	0.74	2.62	-	34	0.3	2.8	-	63	39.78754310	-86.22860010
05099400	Little S. Pembina River nr Walhalla, ND	39	1.47E-02	2.05	0.81	5.22	-	19	42	52	2.4	471	48.86527259	-98.00593170
09260000	Little Snake River nr Lily, CO	92	8.39E-02	1.48	0.62	1.82	-	107	79	85	0.63	10,448	40.54901667	-108.42432220
06753990	Lonetree Creek nr Greeley, CO	5	4.61E-02	1.52	0.72	2.30	-	4.6	0.2	1.6	-	1,487	40.44248080	-104.58884870
03261950	Loramie Creek nr Newport, OH	50	5.92E-04	1.74	0.89	2.49	8.5	67	38	44	0.38	394	40.30699246	-84.38383830
01466500	Mcdonalds Br in Byrne St. For., NJ	61	2.27E-03	1.26	0.22	0.53	0.2	0.2	0.04	0.1	-	6	39.88500000	-74.50527778
07374000	Mississippi R. at Baton Rouge, LA	9	1.30E-12	3.43	0.87	0.49	16,990	27,146	25,224	25,222	-	2,915,837	30.44566667	-91.19155560
07022000	Mississippi River at Thebes, IL	79	7.10E-05	1.73	0.49	0.67	16,424	13,459	6,651	10,251	0.44	1,847,181	37.22160000	-89.46297500
06088300	Muddy Creek nr Vaughn, MT	27	3.22E-03	2.51	0.85	1.03	-	15	8.0	9.7	-	580	47.62502220	-111.63540560
08041000	Neches River at Evadale, TX	95	5.63E-03	0.99	0.33	1.23	220	548	85	368	0.23	20,593	30.35576378	-94.09323730
04024430	Nemadji River nr South Superior, WI	40	4.93E-04	2.03	0.89	1.89	122	127	47	101	0.45	1,088	46.63327388	-92.09408030
02089500	Neuse River at Kinston, NC	83	7.94E-04	1.28	0.54	1.04	135	278	51	167	0.57	6,972	35.25777778	-77.58555560
05548105	Nippersink Ck. abv. Wonder Lake, IL	10	2.00E-02	0.93	0.61	1.63	-	19	0.7	2.6	-	219	42.38529819	-88.36953550
06817000	Nodaway River at Clarinda, IA	81	8.07E-04	2.22	0.92	2.90	-	2,581	111	3,681	0.48	1,974	40.74327778	-95.01419440
02047000	Nottoway River nr Sebrell, VA	73	7.66E-04	1.10	0.62	1.35	75	187	35	85	1.28	3,732	36.77042760	-77.16607780
04230380	Oatka Creek at Warsaw, NY	49	2.74E-04	3.08	0.92	1.65	-	39	14	24	-	101	42.74416667	-78.13750000
09382000	Paria River at Lees Ferry, AZ	91	9.81E-01	2.47	0.9	3.96	-	61	191	86	0.29	3,652	36.87220977	-111.59460520
08407500	Pecos River at Red Bluff, NM	77	4.76E-03	1.39	0.48	5.83	312	31	1.7	2,111	-	50,608	32.07519167	-104.03943610
08396500	Pecos River nr Artesia, NM	108	1.36E-02	1.84	0.85	3.10	99	63	23	293	-	39,627	32.84086110	-104.32383330
08383500	Pecos River nr Puerto de Luna, NM	76	6.39E-03	2.37	0.61	2.25	-	1,401	35	277	-	10,282	34.73008330	-104.52491110
02131000	Pee Dee River at Peedee, SC	74	1.68E-03	1.00	0.36	0.89	691	897	176	371	0.62	22,870	34.20432518	-79.54838960
05099600	Pembina River at Walhalla, ND	66	1.50E-02	1.53	0.78	2.85	113	40	19	97	1.47	8,676	48.91332840	-97.91703690
01653600	Piscataway Creek at Piscataway, MD	48	4.47E-03	1.98	0.76	2.62	17	24	1.7	36	-	102	38.70577778	-76.96619440
01618000	Potomac River at Shepherdstown, WV	70	4.55E-05	1.69	0.65	1.49	1,133	1,776	300	728	-	15,382	39.43472220	-77.80138889
01668000	Rappahannock R nr Fredericksburg, VA	107	1.94E-05	2.26	0.84	1.74	-	701	87	654	-	4,131	38.30846178	-77.52915268
05102500	Red R. of the N. at Emerson, Manitoba	101	5.92E-04	1.28	0.58	1.93	-	476	61	620	-	104,118	49.00832097	-97.21145070
07355500	Red River at Alexandria, LA	55	4.48E-05	2.15	0.76	1.08	-	2,486	2,375	2,795	-	174,824	31.31296019	-92.44291480

Table A.2 cont. Fine Bed Site Information continued

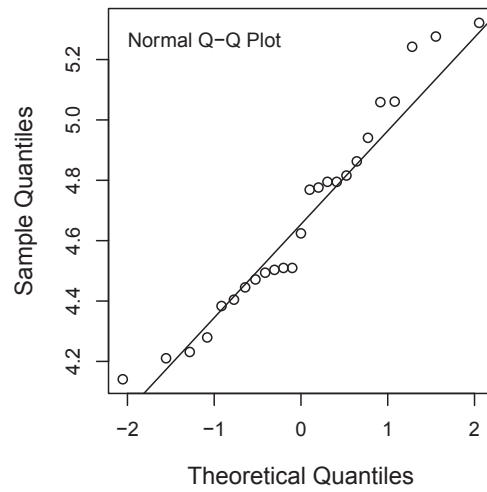
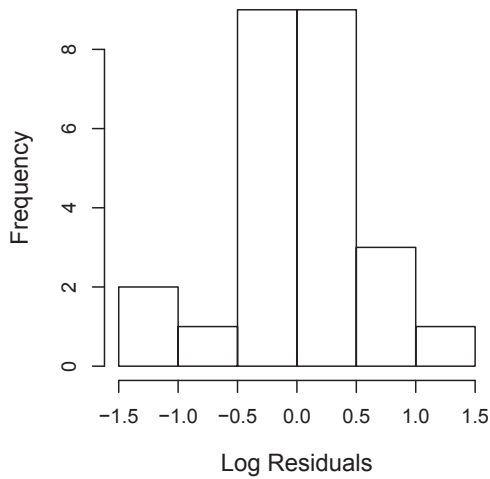
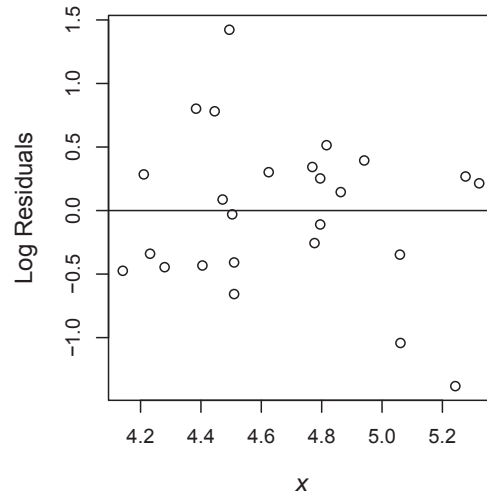
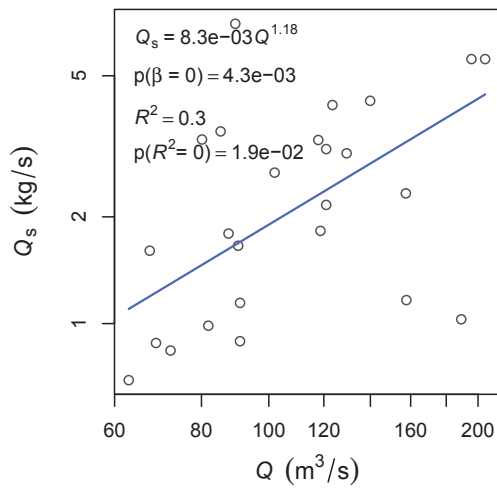
Site ID	Site Name	Record Length	α	β	R^2	C_v	Q_{bf}	$Q_{1.5}$	Q_{eff}	Q_{s50}	D_{50}	DA	Latitude	Longitude
		(yrs)					(m ³ /s)	(m ³ /s)	(m ³ /s)	(m ³ /s)	(mm)	(km ²)		
07337000	Red River at Index, AR	78	1.13E-05	2.42	0.76	1.39	1,352	1,727	1,604	1,846	0.26	124,320	33.55194444	-94.04111110
05054000	Red River of the North at Fargo, ND	112	7.35E-04	1.24	0.63	1.99	136	72	13	82	-	17,612	46.86107500	-96.78369240
05064500	Red River of the North at Halstad, MN	52	2.23E-03	0.98	0.5	1.89	623	265	26	189	0.62	56,462	47.35191800	-96.84369100
11482500	Redwood Ck. at Orick, CA	62	3.40E-04	2.29	0.86	1.91	105	456	108	300	5.00	717	41.29928960	-124.05118250
08330000	Rio Grande at Albuquerque, NM	72	3.25E-03	2.16	0.68	1.20	-	136	1,215	135	0.46	45,169	35.08916667	-106.68069440
08313000	Rio Grande at Otowi Bridge, NM	111	2.18E-02	1.70	0.44	1.25	-	151	21	153	0.84	37,037	35.87450000	-106.14244440
50024950	Rio Grande de Arecibo blw Utuado, PR	15	3.31E-02	2.12	0.73	1.95	-	195	5.6	133	-	170	18.29995229	-66.70378539
50038100	Rio Grnd de Manati nr Manati, PR	42	4.04E-03	1.56	0.94	3.77	170	447	5.1	391	-	510	18.42911367	-66.52656080
50144000	Rio Grnd. de Anasco nr Sn. Sebastian, PR	51	7.51E-04	2.31	0.82	2.13	-	332	838	18	-	244	20.91600000	-67.05129009
50051800	Rio Grnd. de Loiza at Sn. Lorenzo, PR	23	5.77E-03	2.05	0.83	2.04	-	215	2.7	69	-	106	18.18368835	-65.96095530
08353000	Rio Puerco nr Bernardo, NM	74	1.06E+00	1.76	0.85	5.37	43	40	27	57	2.64	19,036	34.41027778	-106.85444440
08334000	Rio Puerco nr Guadalupe, NM	62	4.00E+00	1.89	0.9	3.79	7.1	30	2.0	11	-	1,088	35.60088889	-107.16661110
50028000	Rio Tanama nr Utuado, PR	53	1.05E-02	2.38	0.84	1.29	-	118	1.8	22	1.50	48	18.29873289	-66.78263360
01658500	S.F. Quantico Ck nr Ind. Hill, VA	63	1.08E-02	1.70	0.96	2.86	1.4	13	0.2	3.5	-	20	38.58734270	-77.42859580
11042000	San Luis Rey R. at Oceanside, CA	80	2.49E-02	1.69	0.77	6.32	-	4	1.4	91	0.40	1,443	33.21809119	-117.36031620
09473500	San Pedro R. at Winkelman, AZ	12	5.85E-01	1.59	0.93	6.51	-	140	0.6	83	0.62	11,533	32.97728817	-110.77038300
09471000	San Pedro River at Charleston, AZ	99	9.87E-03	2.03	0.85	6.19	20	113	88	225	0.48	3,196	31.62592644	-110.17452260
05572000	Sangamon River at Monticello, IL	104	8.38E-03	1.02	0.6	1.85	60	110	7	35	0.49	1,424	40.03086735	-88.58895419
05570000	Spoon River at Seville, IL	99	7.79E-03	1.32	0.86	1.80	193	285	27	131	0.46	4,237	40.49004077	-90.34040250
05437632	Spring Cr. at Rockford, IL	63	2.25E-02	2.90	0.68	2.60	-	-	1.5	2.2	-	7	42.30972220	-88.98944440
02248000	Spruce Creek nr Samsula, FL	62	5.91E-03	1.34	0.79	2.33	5.7	13	0.8	6.2	-	87	29.05081845	-81.04644550
01095220	Stillwater River nr Sterling, MA	20	1.43E-03	1.28	0.87	1.46	15	23	2.3	4.2	-	82	42.41092507	-71.79118290
01401000	Stony Brook at Princeton, NJ	60	2.05E-04	2.08	0.67	2.54	37	87	18	36	-	115	40.33305556	-74.68194440
01570500	Susquehanna River at Harrisburg, PA	124	8.61E-06	1.86	0.82	1.20	-	6,569	1,575	3,341	-	62,419	40.25481164	-76.88608460
11382000	Thomes Ck. at Paskenta, CA	76	2.47E-03	2.25	0.91	2.37	71	129	30	181	5.43	526	39.88765496	-122.52916550
11530000	Trinity River at Hoopa, CA	87	1.28E-03	1.89	0.9	1.49	3,404	1,048	280	7,021	2.00	7,389	41.04985200	-123.67366800
08062700	Trinity River at Trinidad, TX	50	1.56E-04	1.90	0.67	1.62	623	718	413	649	-	22,113	32.14765255	-96.10247080
08057410	Trinity River blw Dallas, TX	54	4.87E-05	2.04	0.71	1.65	312	396	193	388	0.34	16,260	32.70763139	-96.73583190
07331000	Washita River nr Dickson, OK	85	3.76E-03	1.96	0.77	2.25	464	549	176	623	0.16	18,575	34.23342725	-96.97584470
02217274	Wheeler Ck nr Auburn, GA	13	1.27E-01	1.89	0.87	2.11	-	3.6	0.1	0.9	-	3	34.08232720	-83.85462170
07288955	Yazoo River blw Steele Bayou, MS	14	2.46E-03	1.14	0.35	0.78	-	1,729	374	875	0.06	34,589	32.44416667	-90.91416670

APPENDIX B – Sediment Load Regression Diagnostic Plots

As discussed in Chapter 2, I used a robust linear regression approach to fit log-linear models to the sediment load – discharge data. Statistical model diagnostic plots for each site are included below. These include a scatter plot of the data with the fitted model, probability values for significance tests for the slope coefficient and model fit, a residual plot, a histogram of the residuals, and finally a theoretical vs. empirical quantile plot for a normality test. Note that the robust linear regression method allow for thin and thick tailed residual distributions and therefore deviance from normality.

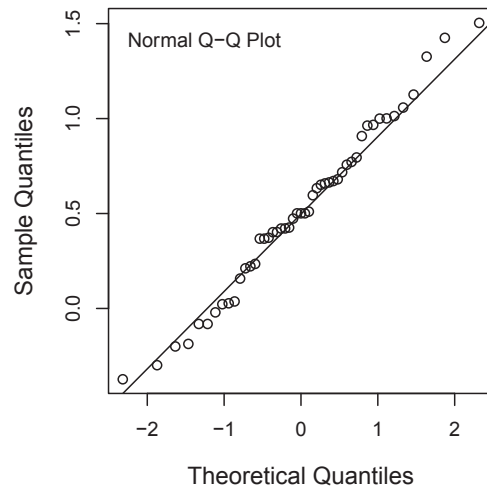
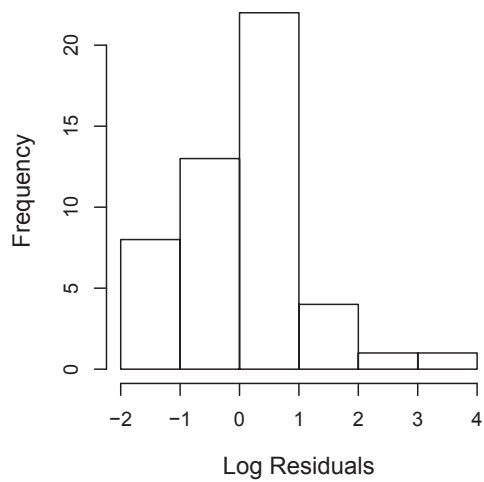
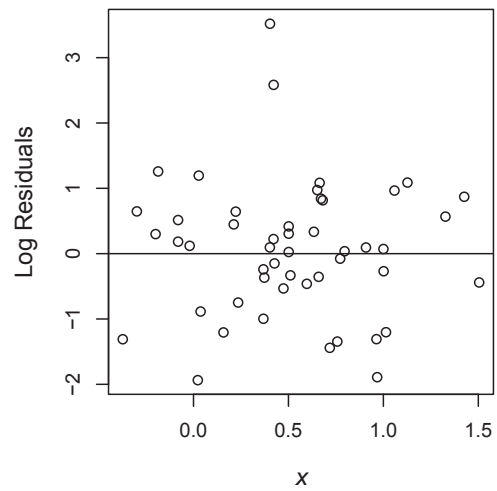
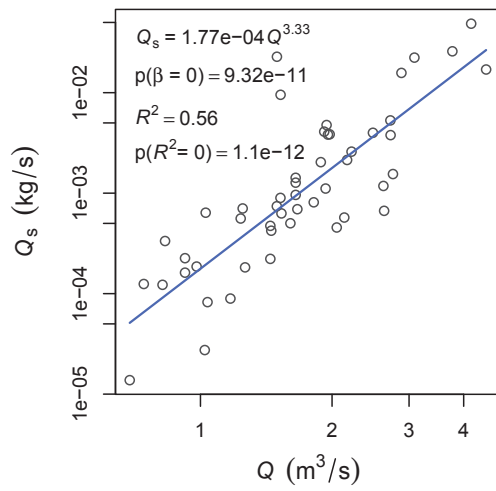
Coarse Bed Sites

06228000 - WIND RIVER AT RIVERTON, WY



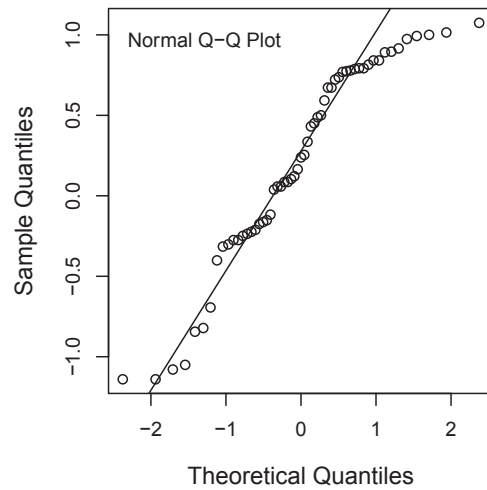
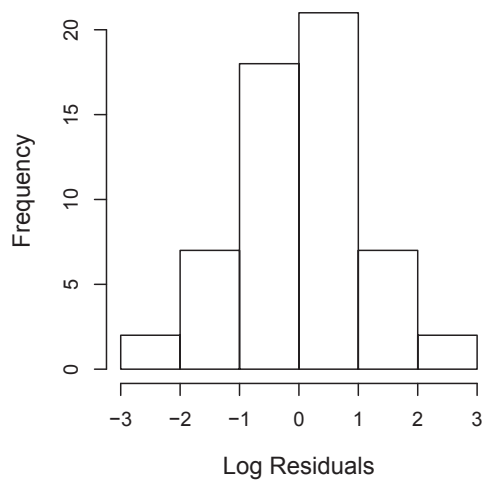
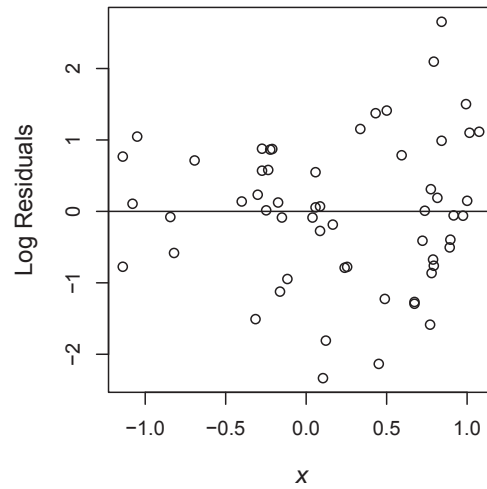
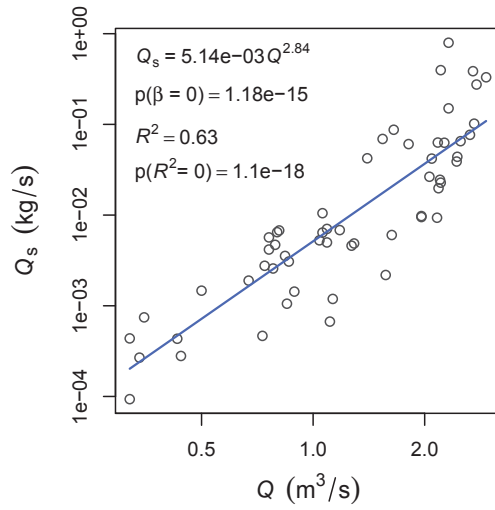
Coarse Bed Sites

07083000 - HALFMOON CREEK NEAR MALTA, CO



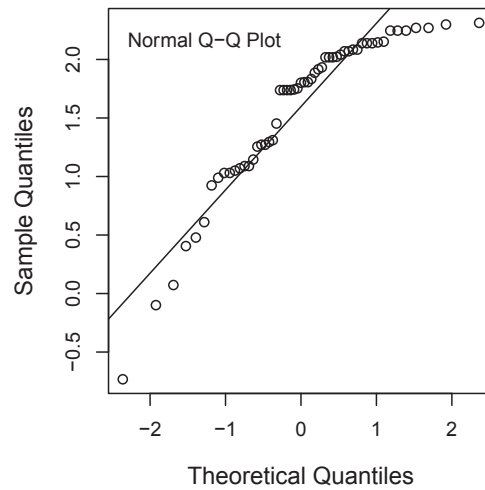
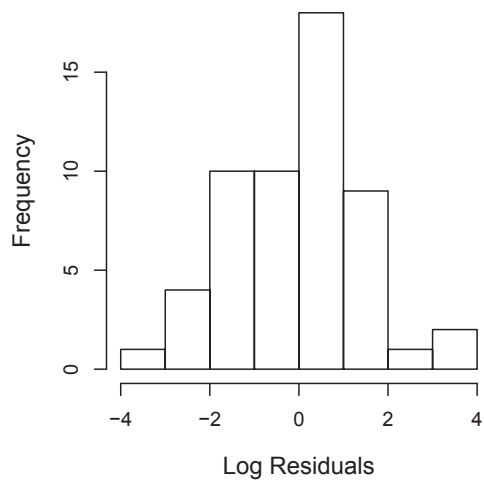
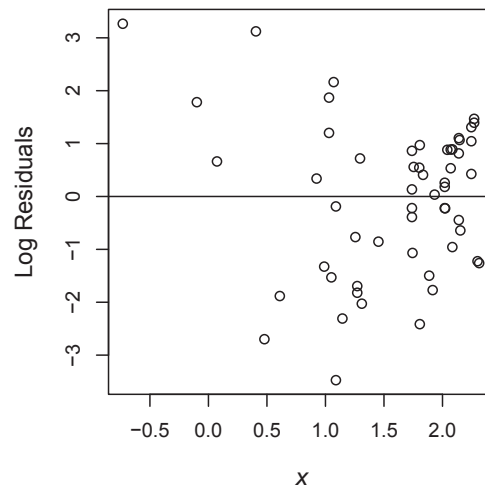
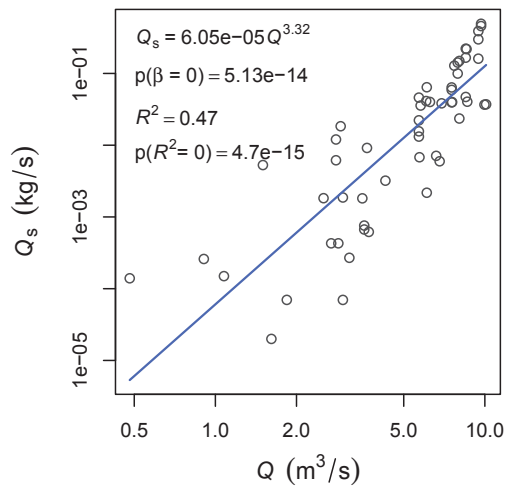
Coarse Bed Sites

0914650A - East Fk Dallas Creek nr Ridgeway, CO



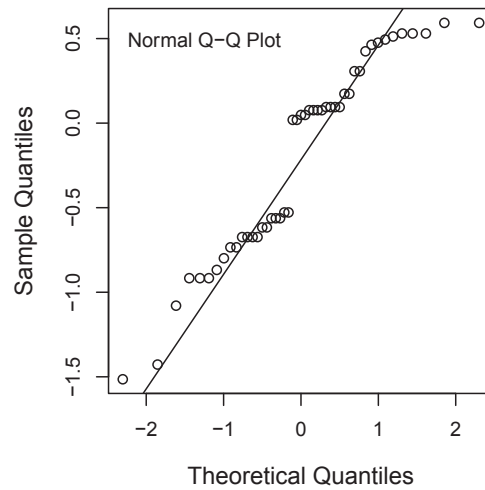
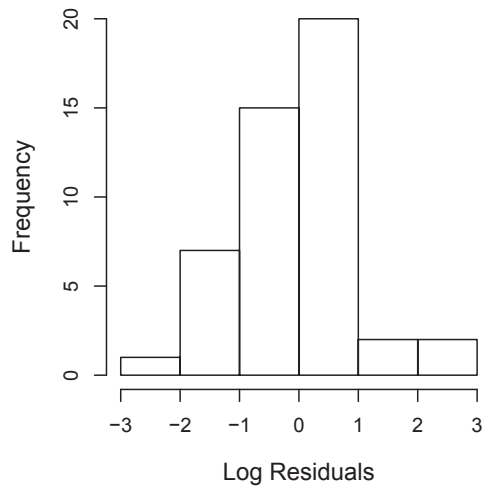
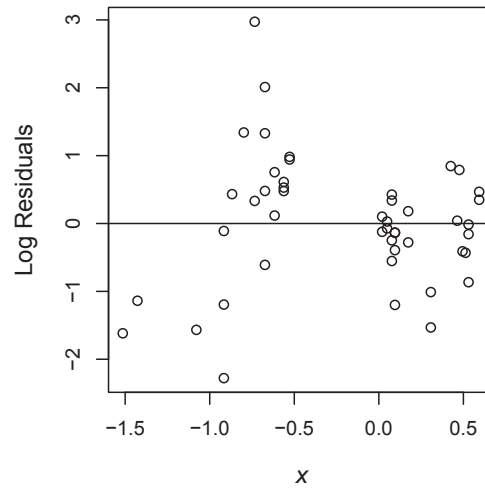
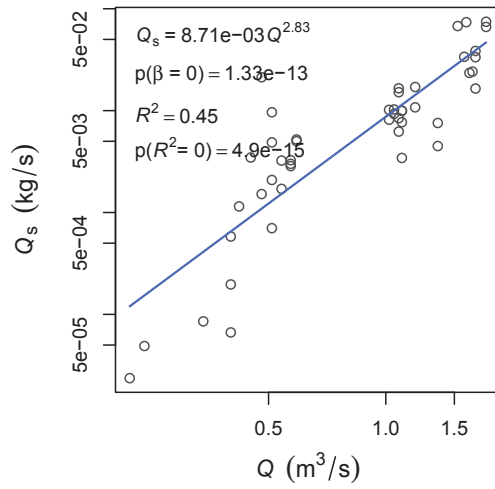
Coarse Bed Sites

09253400 - Battle Creek near Encampment, WY



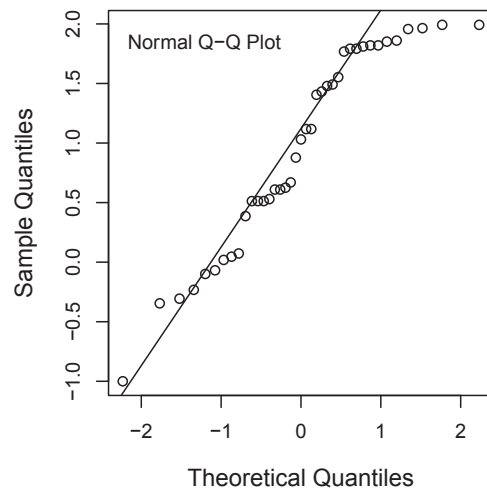
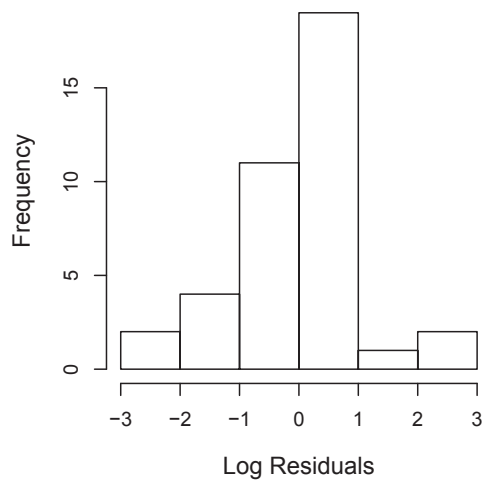
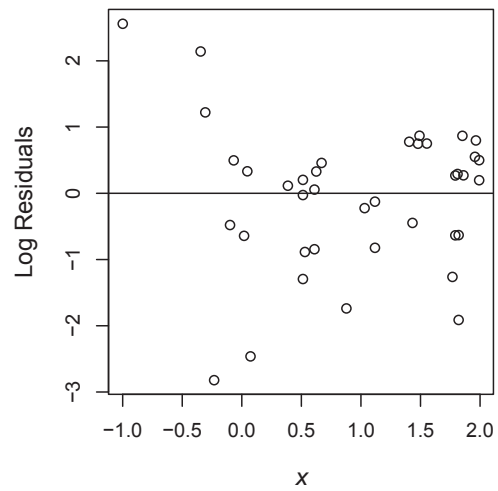
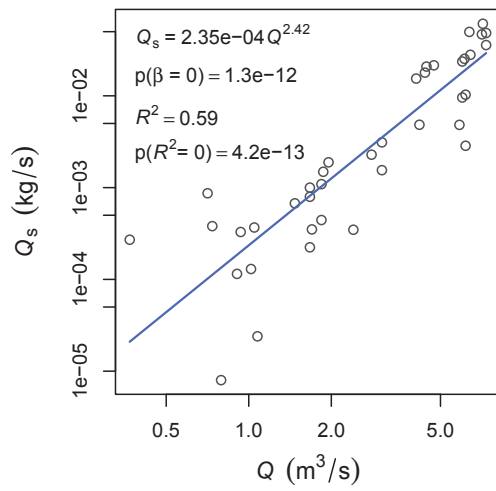
Coarse Bed Sites

09255400 - East Fork Savery Creek near Encampment, WY



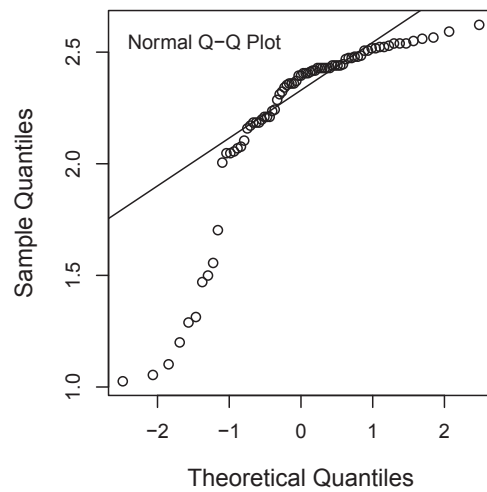
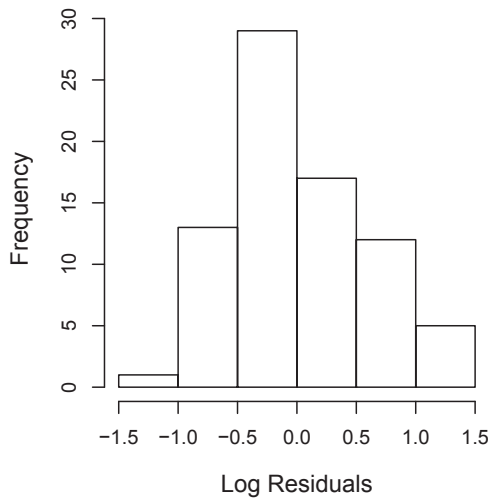
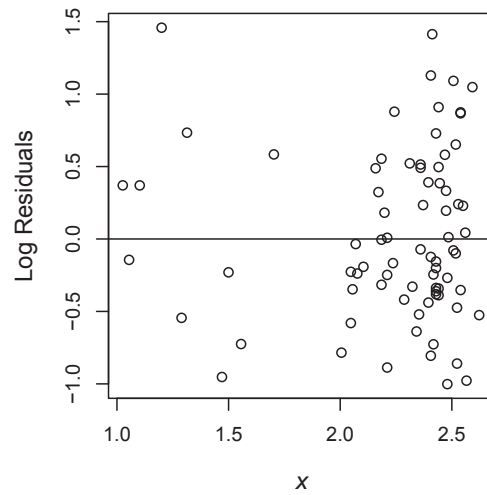
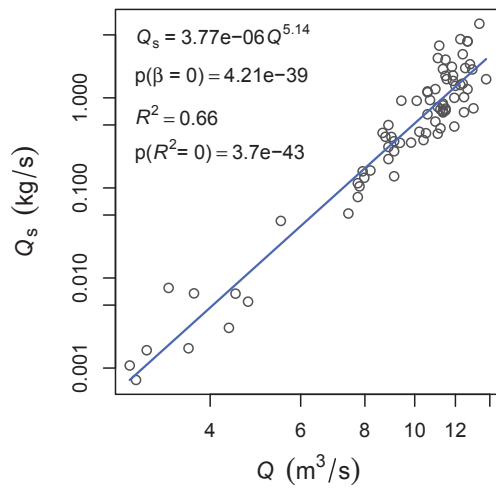
Coarse Bed Sites

09255900 - Big Sandstone Creek near Savery, WY



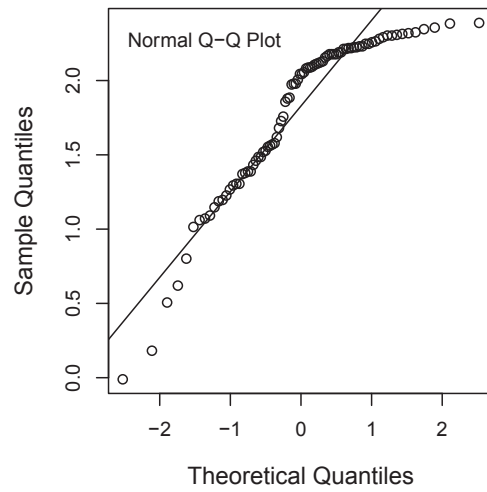
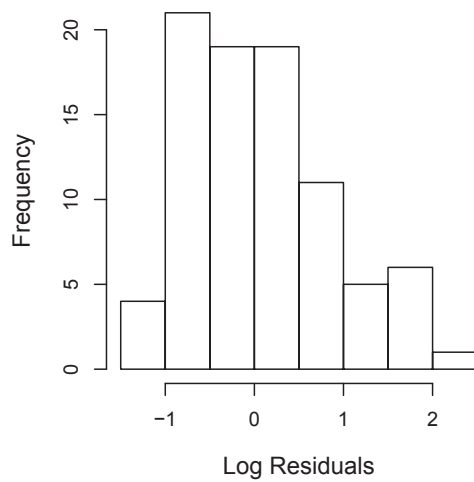
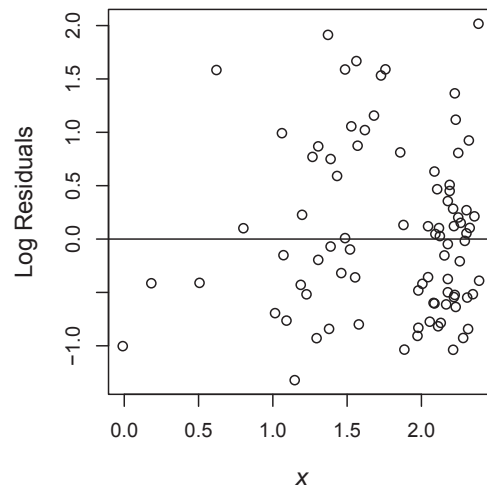
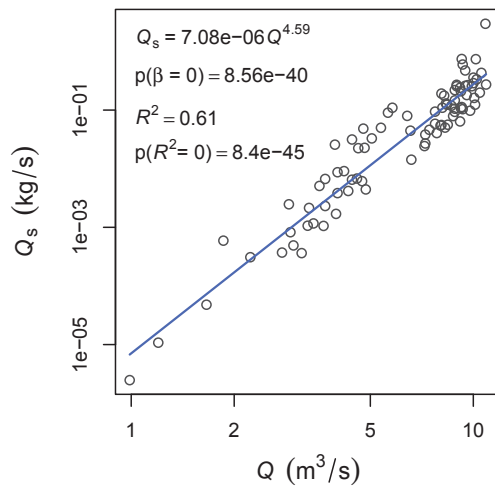
Coarse Bed Sites

09339900 - East Fork San Juan River, CO



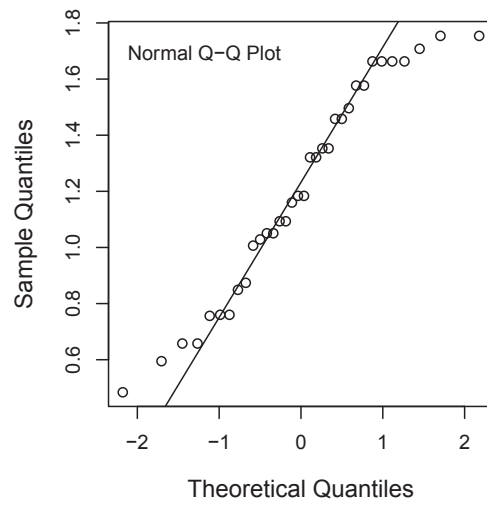
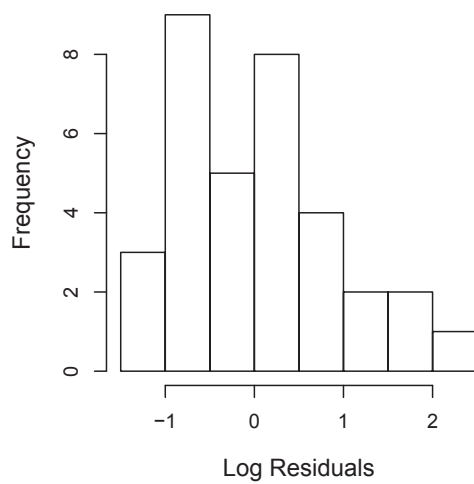
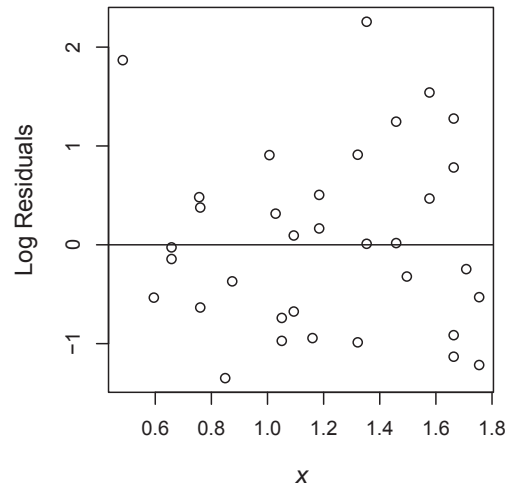
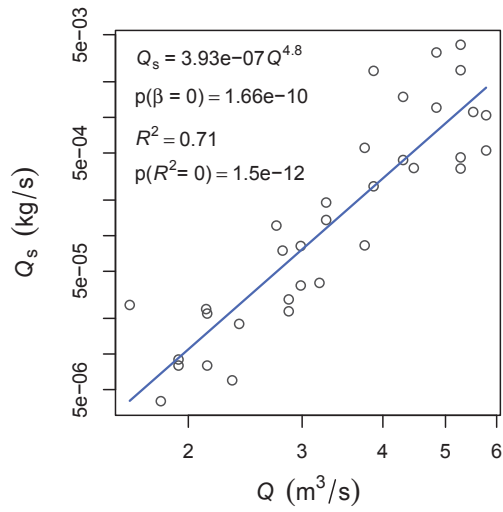
Coarse Bed Sites

09347200 - Middle Fork Piedra River, CO



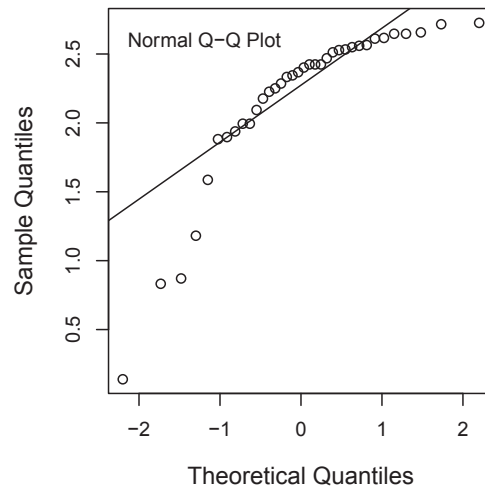
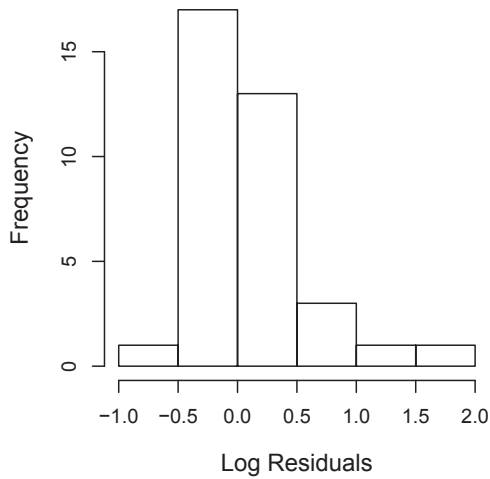
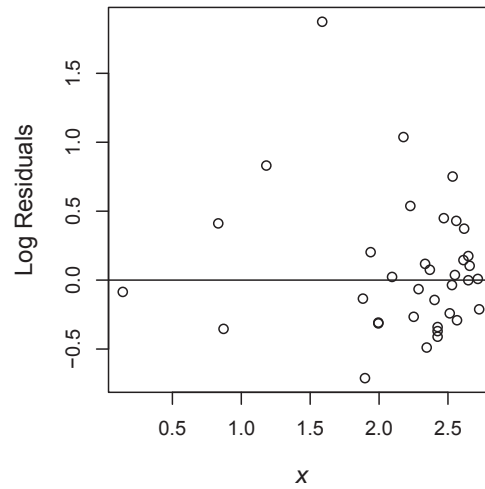
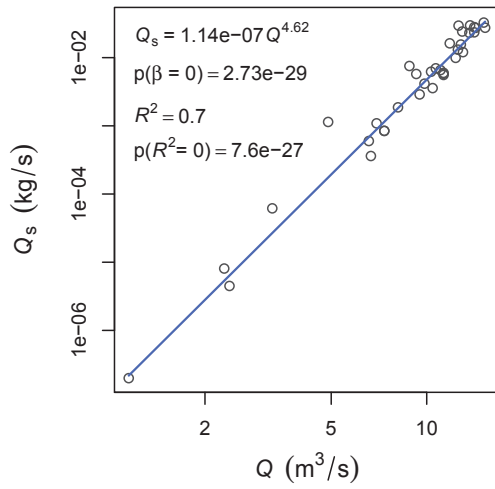
Coarse Bed Sites

09361400 - Junction Ck nr Durango, CO



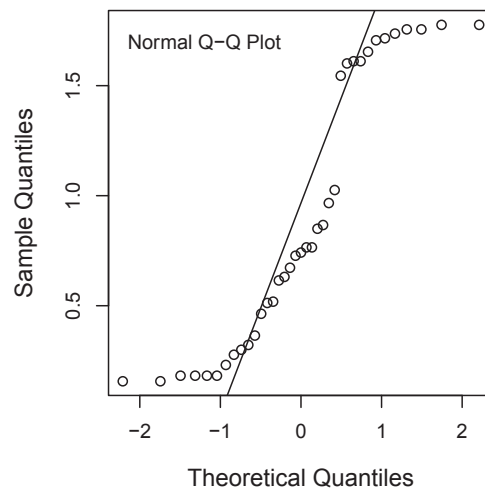
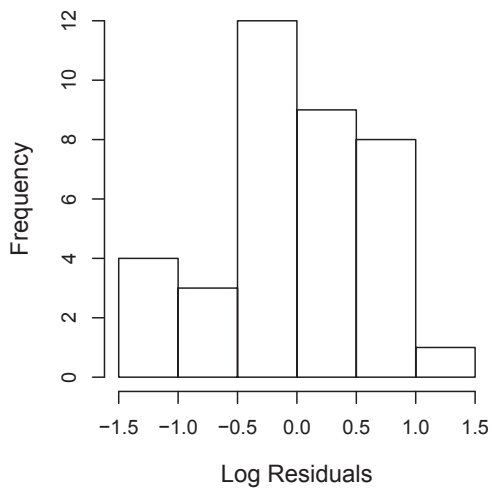
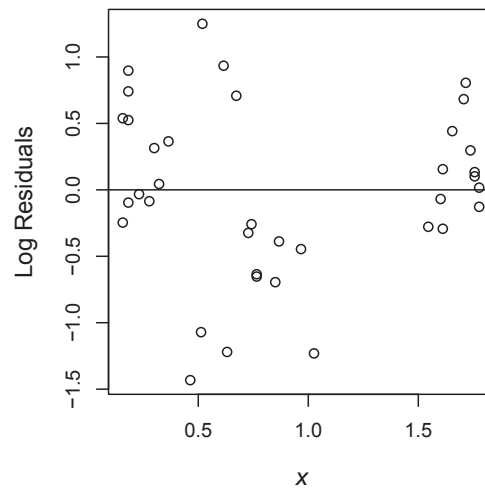
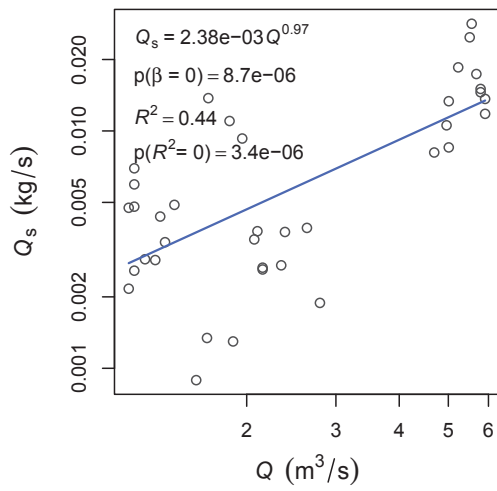
Coarse Bed Sites

09362900 - Florida River near Lemon Reservoir, CO



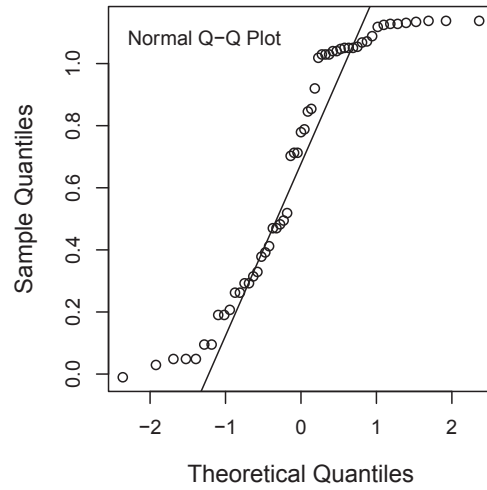
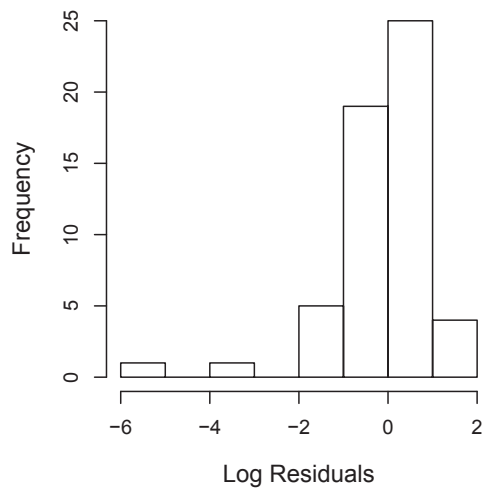
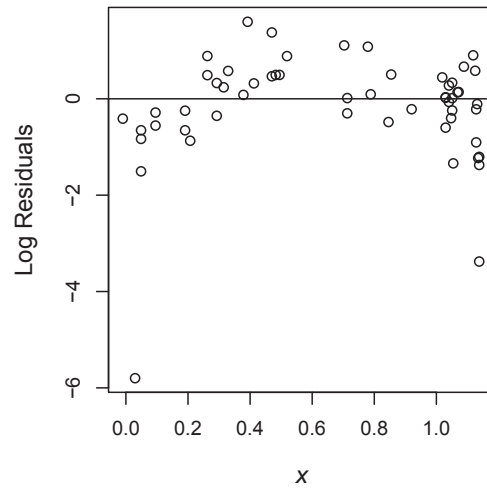
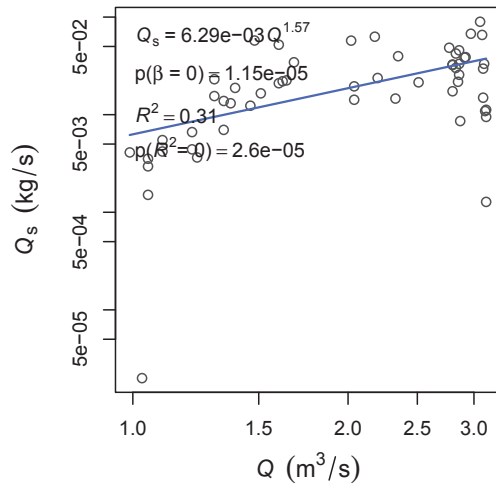
Coarse Bed Sites

09404900 - East Fork Virgin River nr Springdale, UT



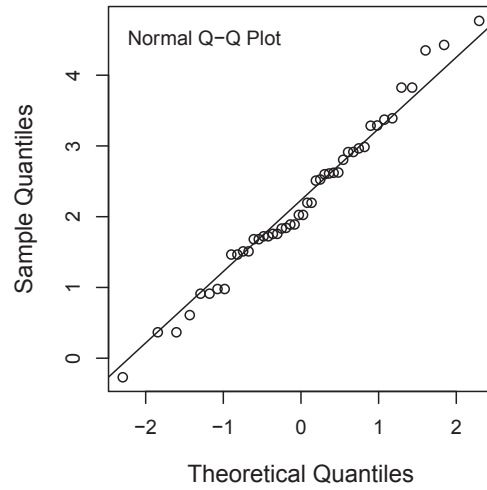
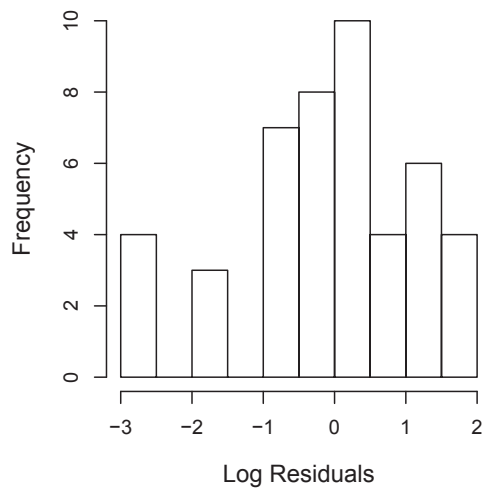
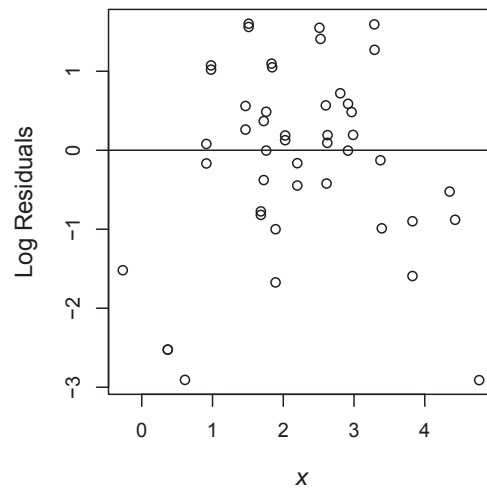
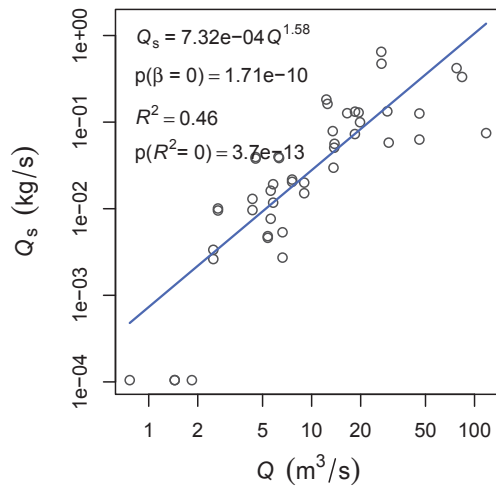
Coarse Bed Sites

10343500 - Sagehen Creek nr Truckee, CA



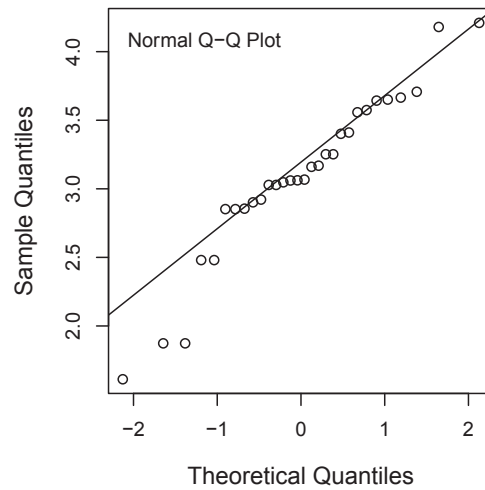
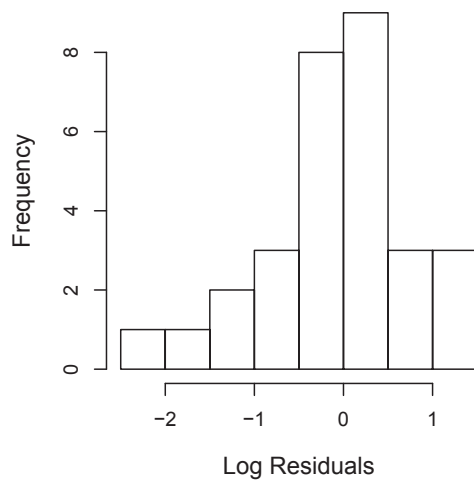
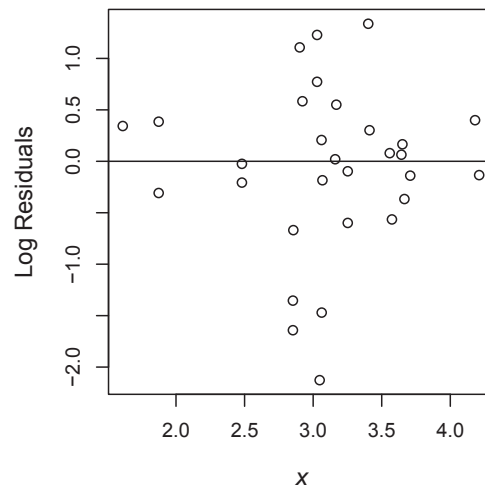
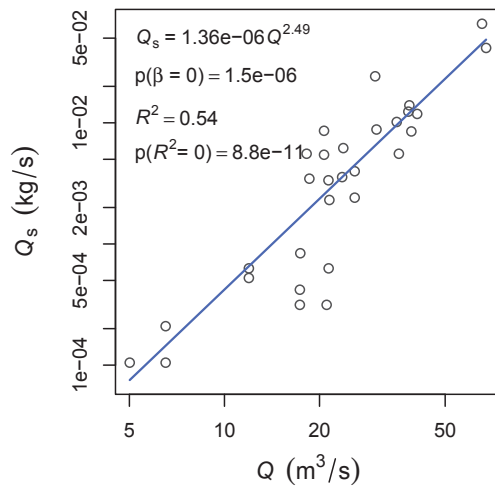
Coarse Bed Sites

11143250 - CARMEL RIVER NR CARMEL, CA



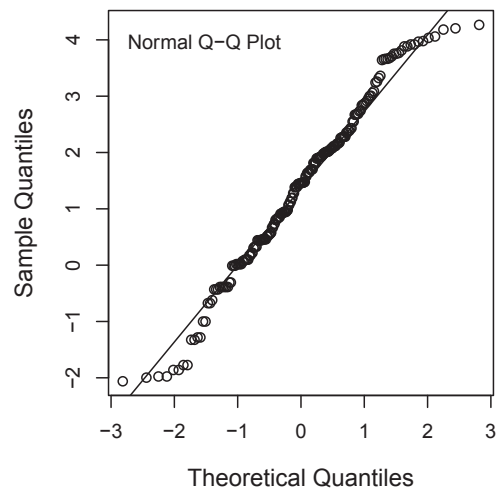
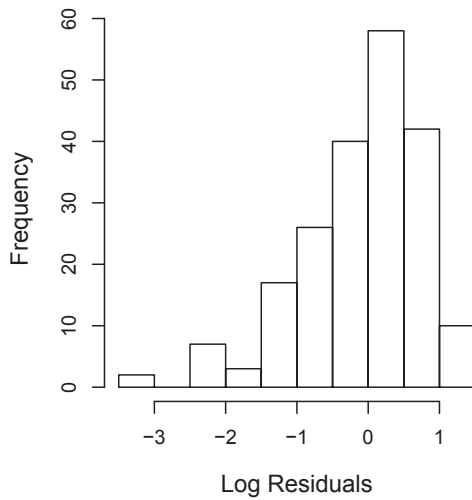
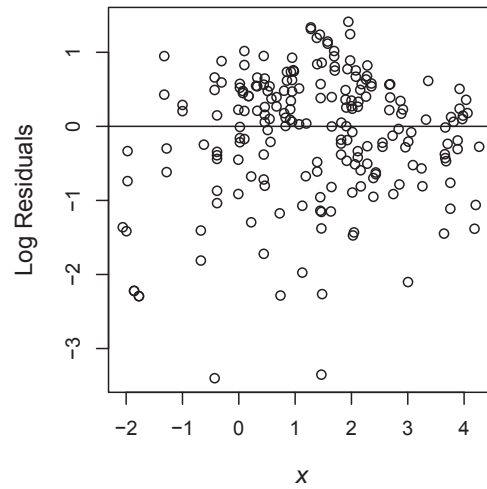
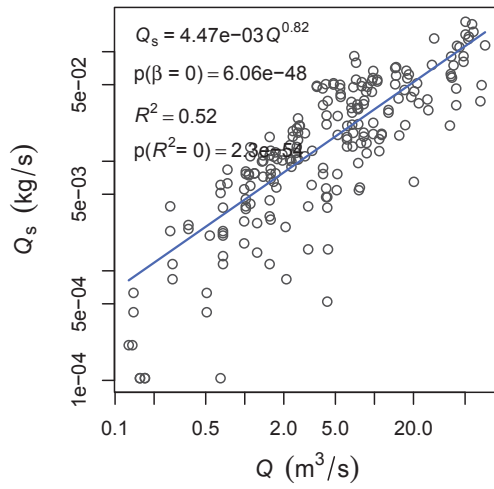
Coarse Bed Sites

11148900 - NACIMIENTO R BL SAPAQUE C NR BRYSON, CA



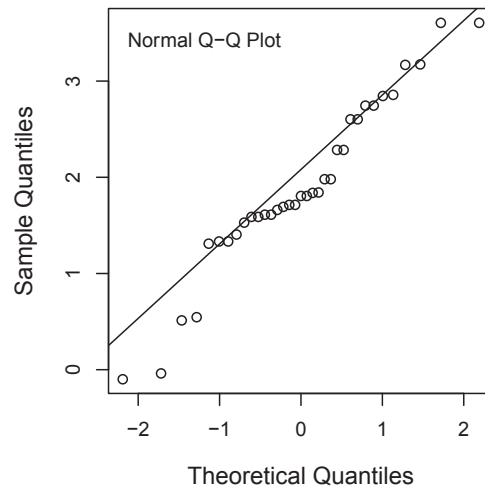
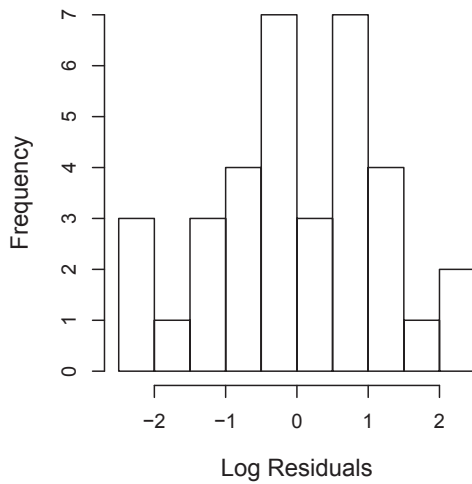
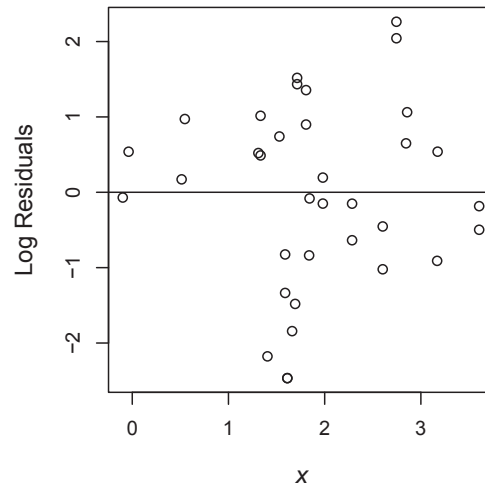
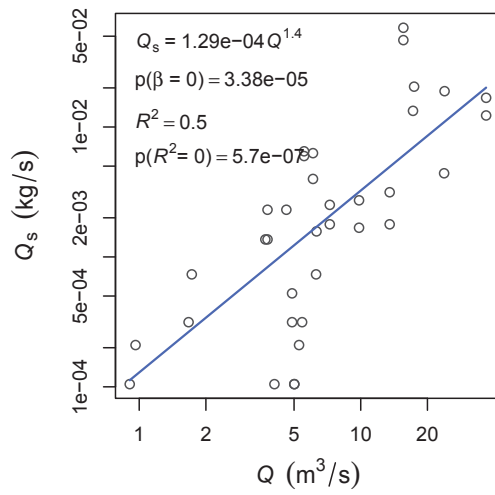
Coarse Bed Sites

11149900 - SAN ANTONIO R NR LOCKWOOD, CA



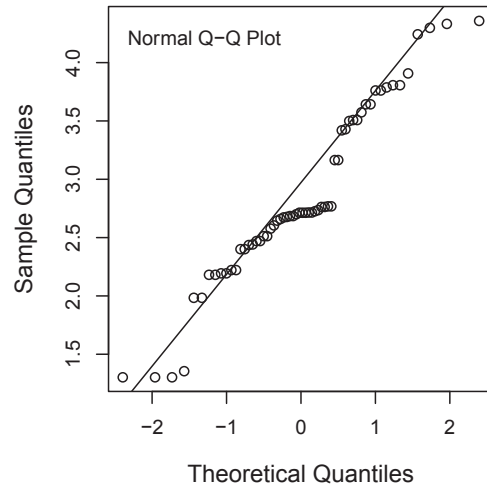
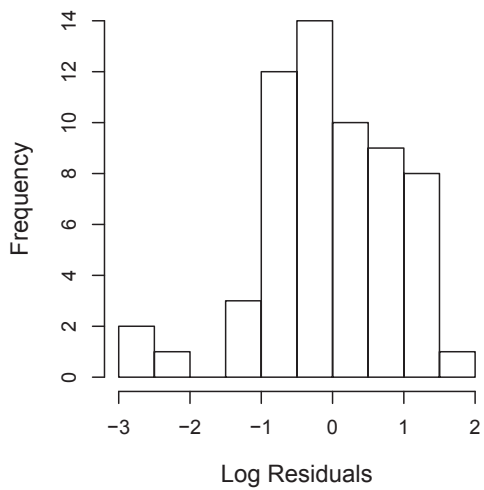
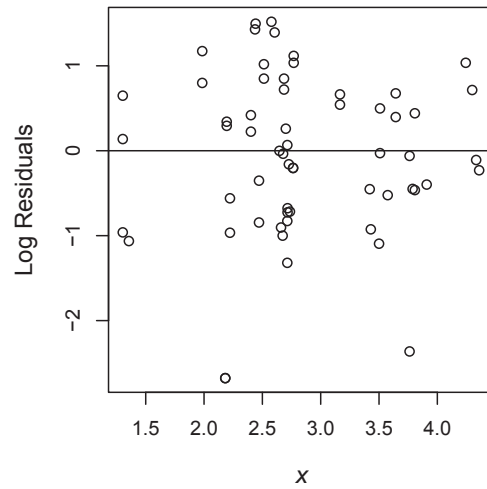
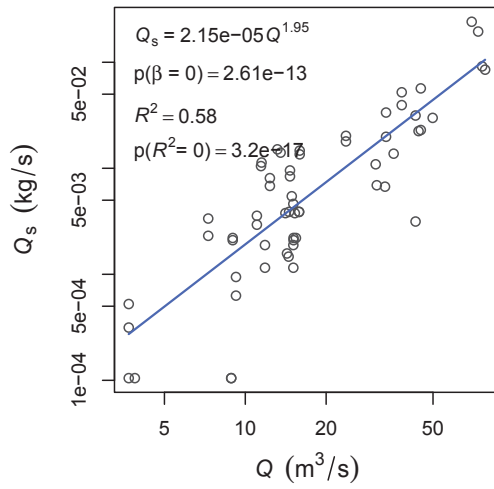
Coarse Bed Sites

11173575 - ALAMEDA Ck BL WELCH C NR SUNOL, CA



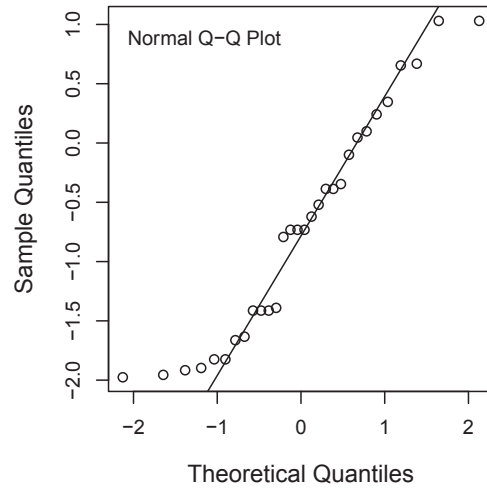
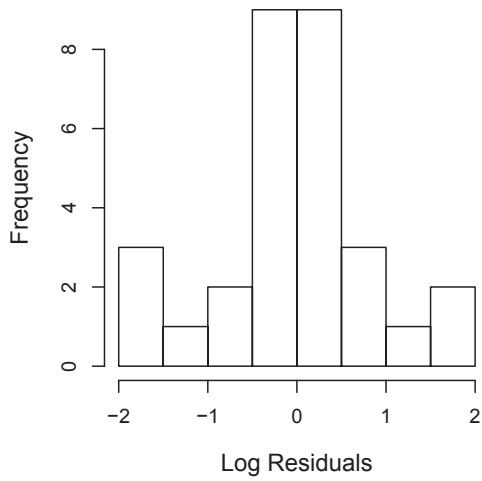
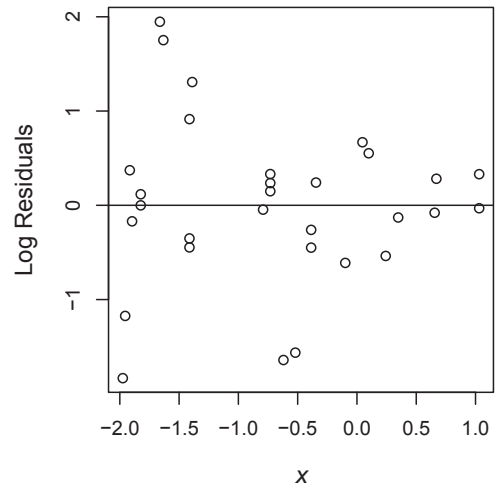
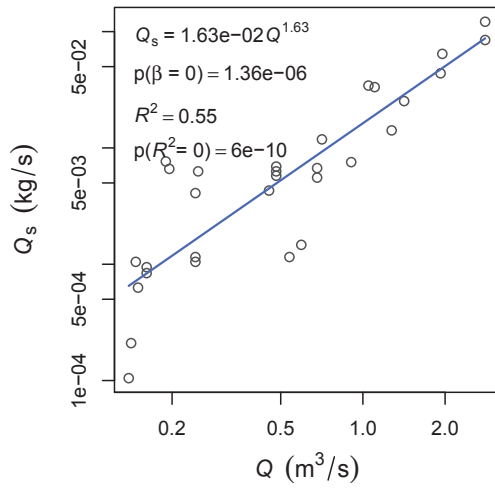
Coarse Bed Sites

11179000 - ALAMEDA Ck NR NILES, CA



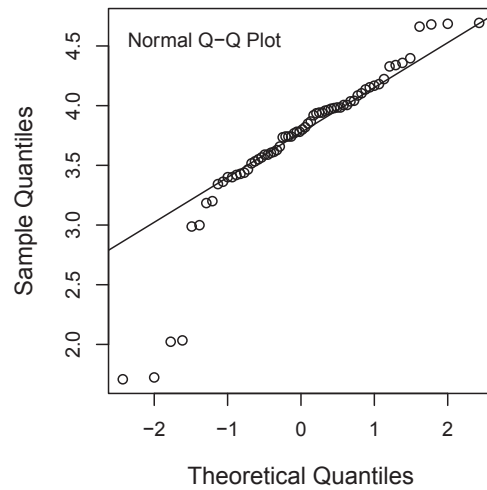
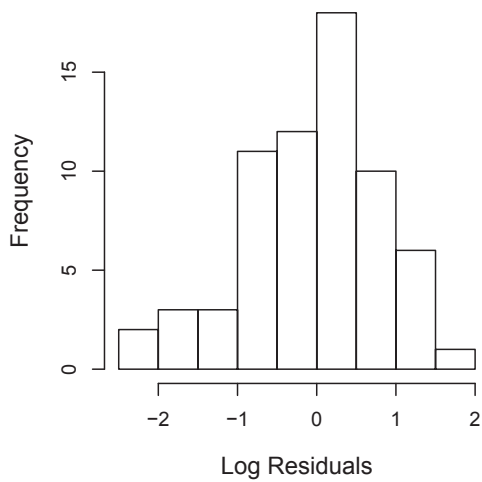
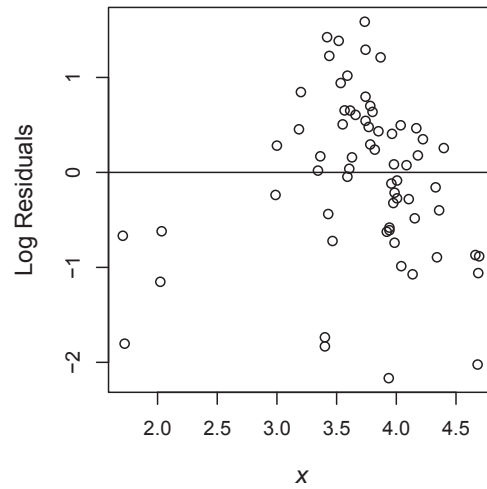
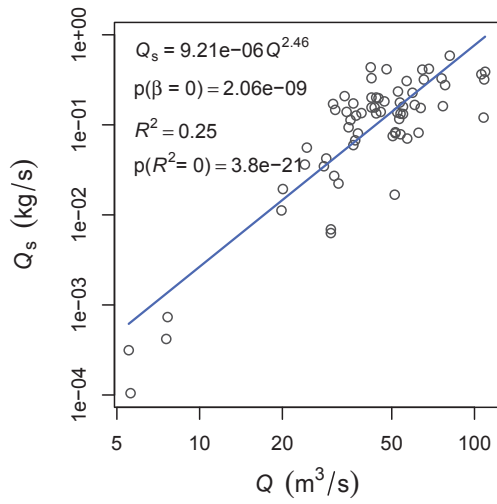
Coarse Bed Sites

11180960 - CULL Creek ABV CULL Ck RES NR CASTRO VALLEY, CA



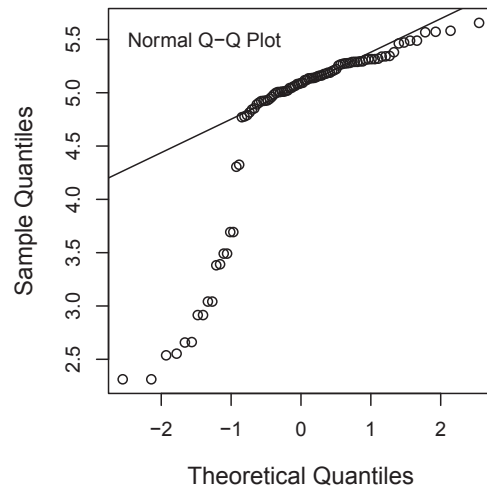
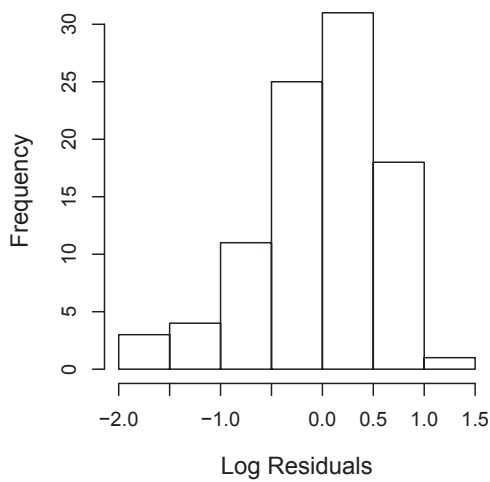
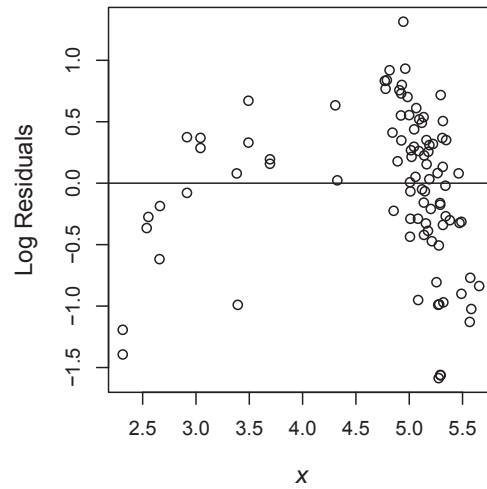
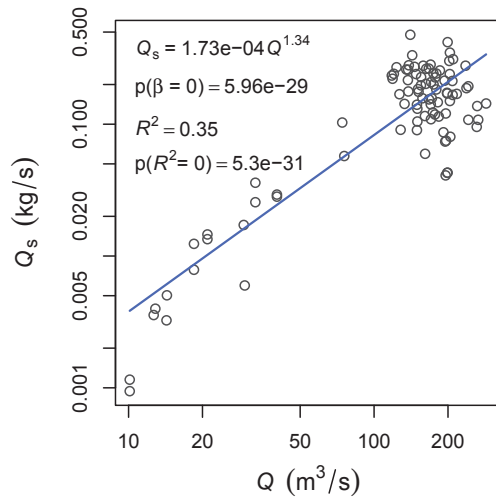
Coarse Bed Sites

11481500 - REDWOOD C NR BLUE LAKE, CA



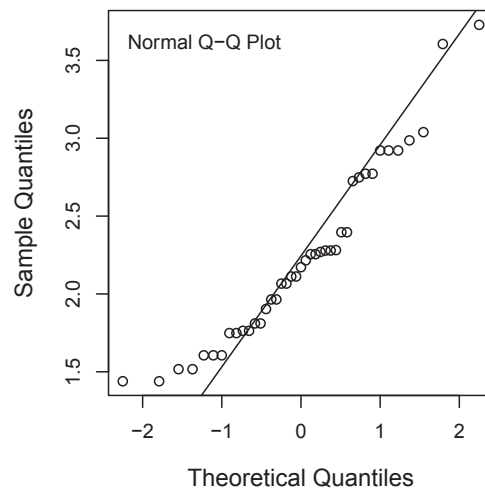
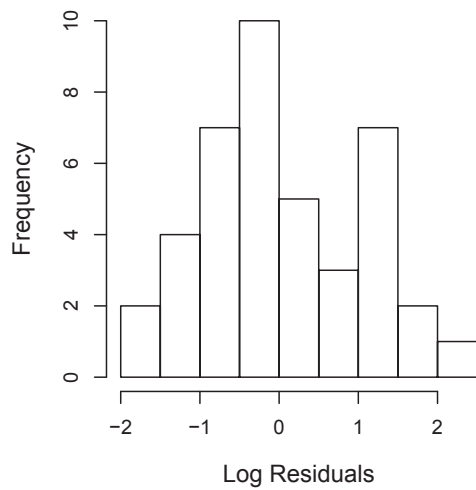
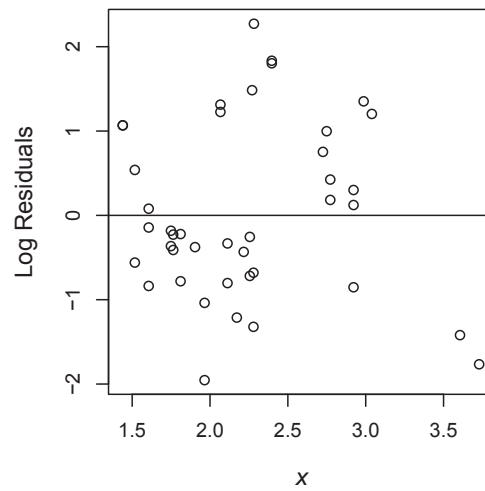
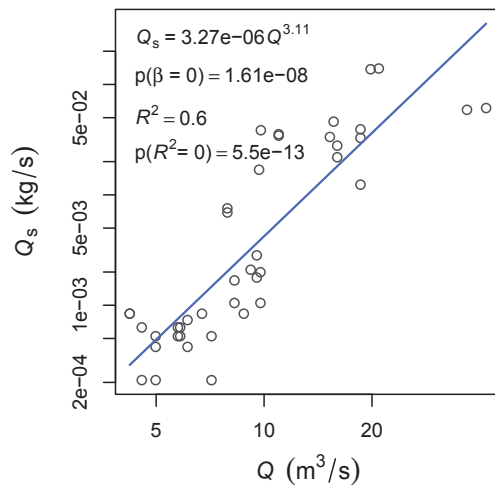
Coarse Bed Sites

11482500 - REDWOOD C A ORICK, CA



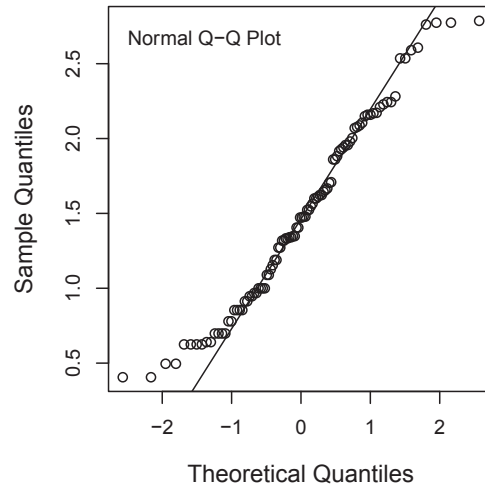
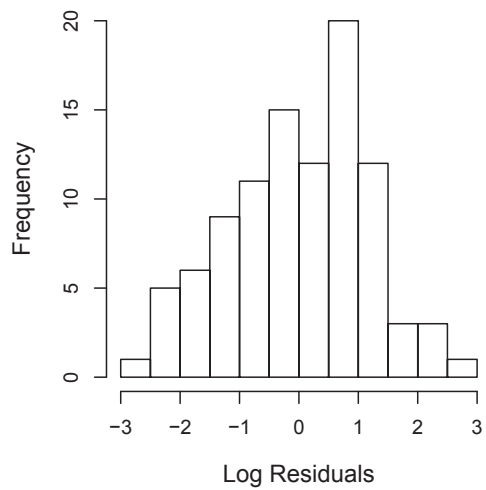
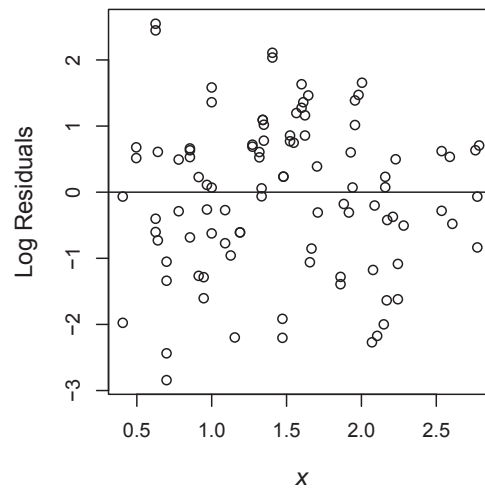
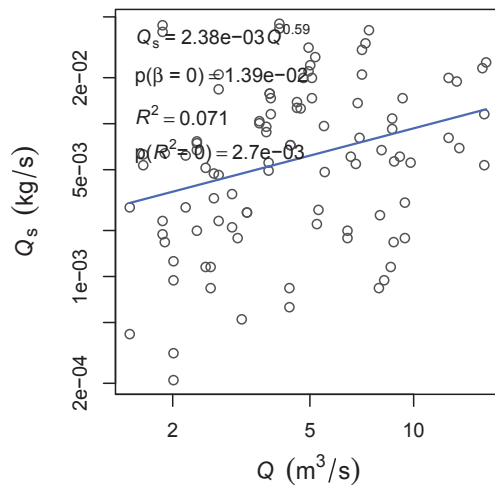
Coarse Bed Sites

11525530 - RUSH C NR LEWISTON, CA



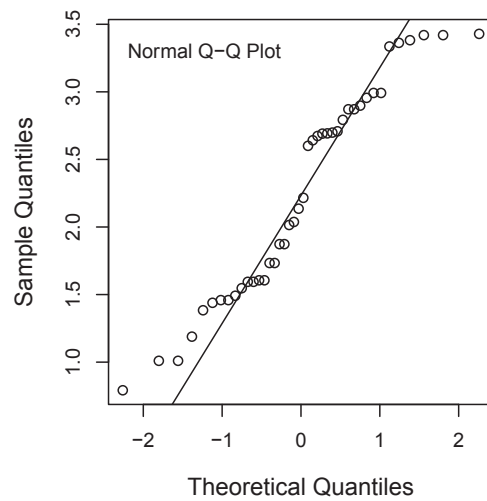
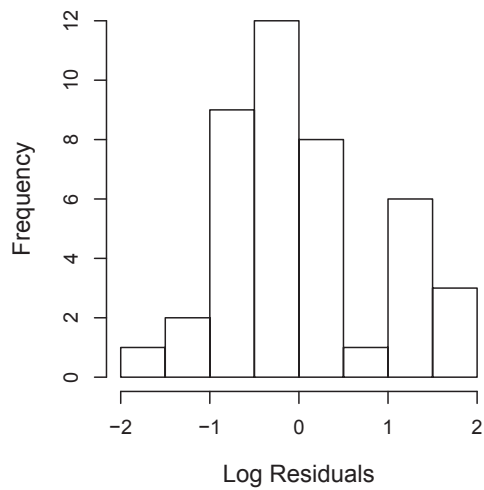
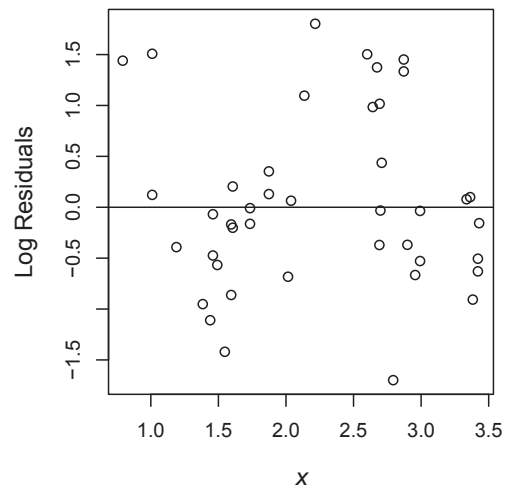
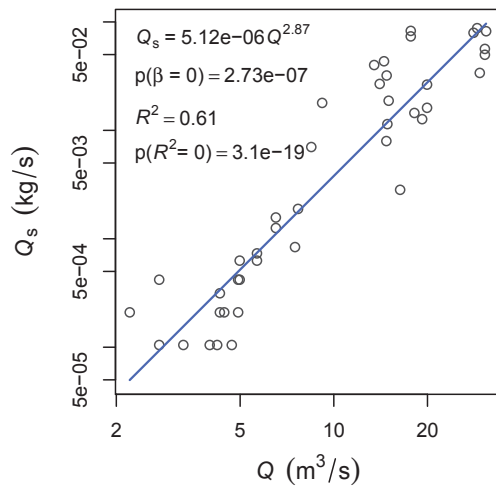
Coarse Bed Sites

11525600 - GRASS VALLEY C A FAWN LODGE NR LEWISTON, CA



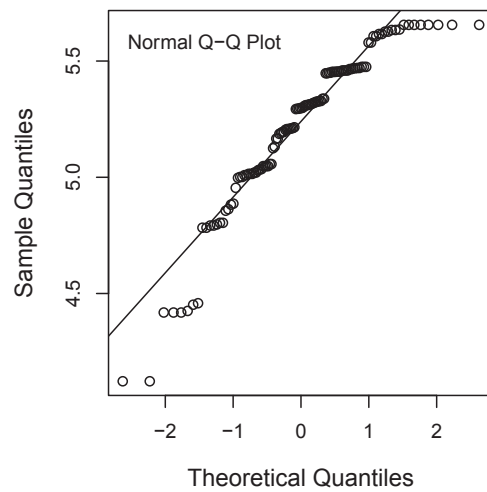
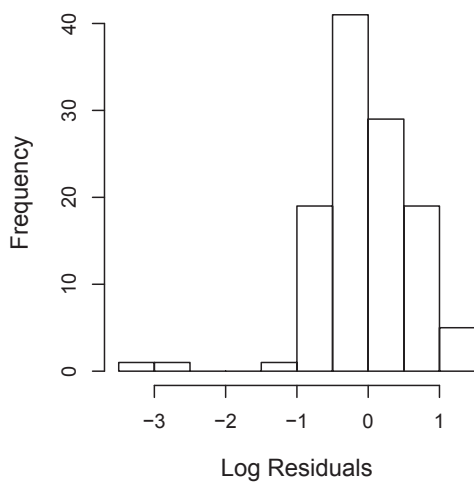
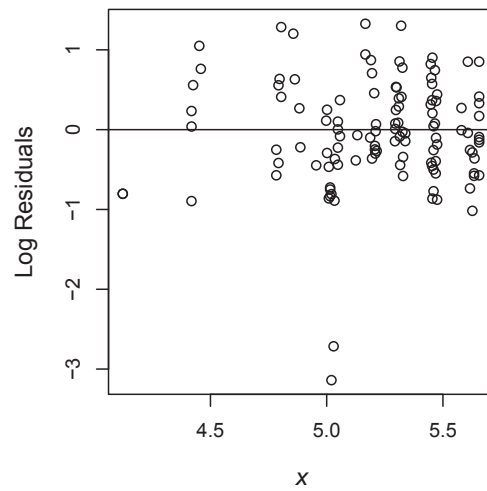
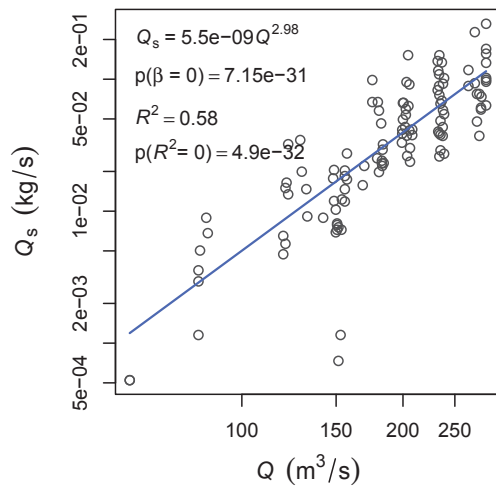
Coarse Bed Sites

11525670 - INDIAN C NR DOUGLAS CITY, CA



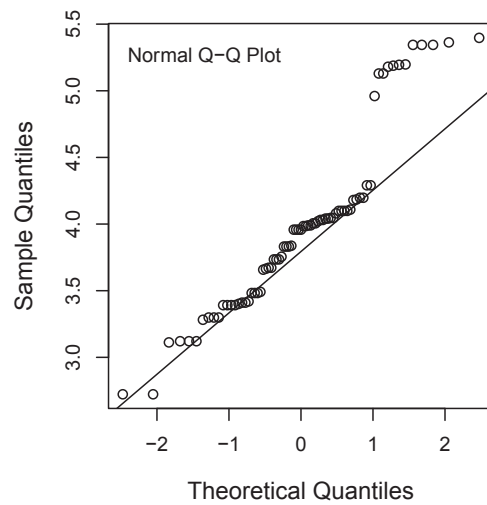
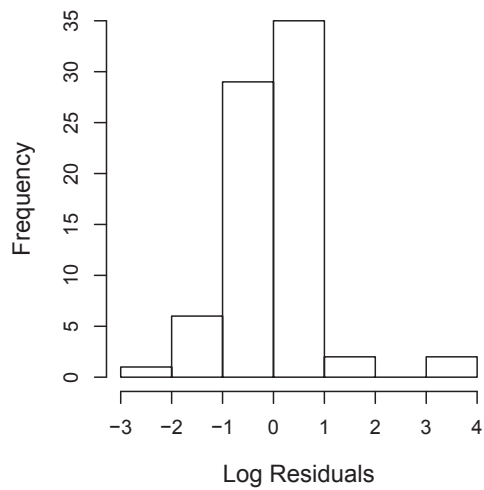
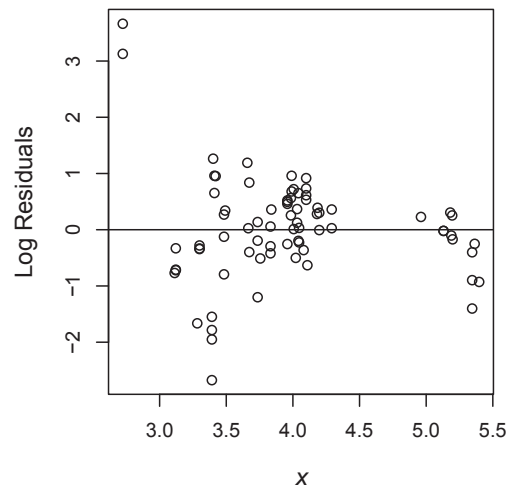
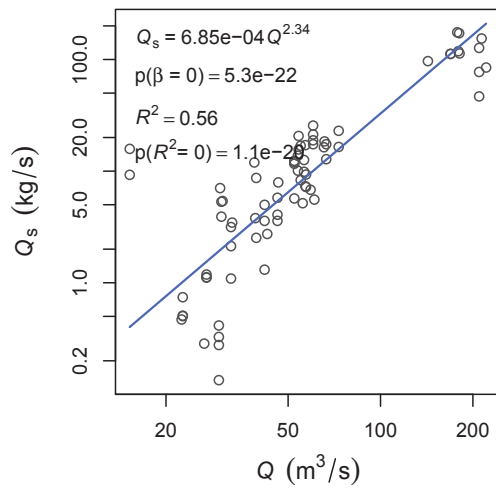
Coarse Bed Sites

11525854 - TRINITY R A DOUGLAS CITY, CA



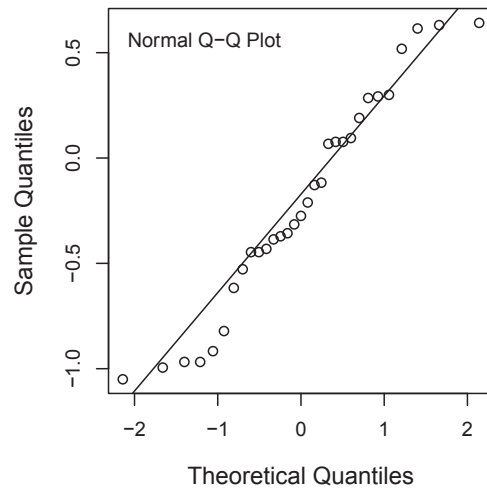
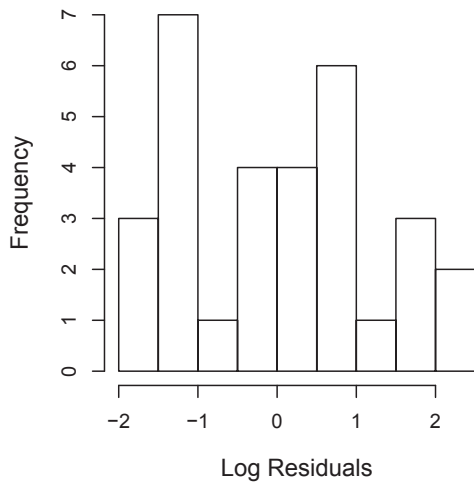
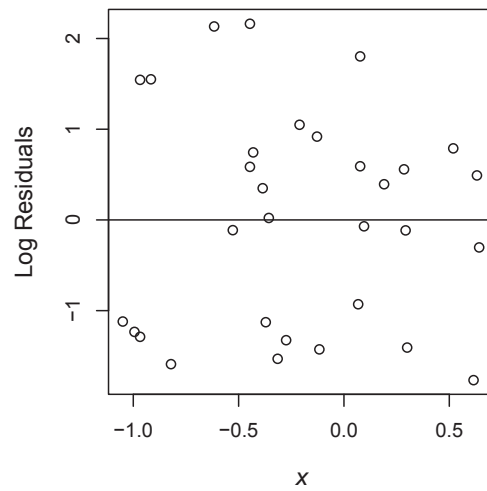
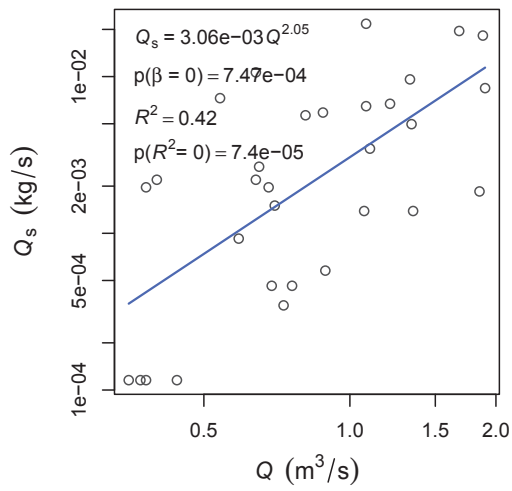
Coarse Bed Sites

12044900 - ELWHA RIVER ABV LAKE MILLS NR PT ANGELES, WA



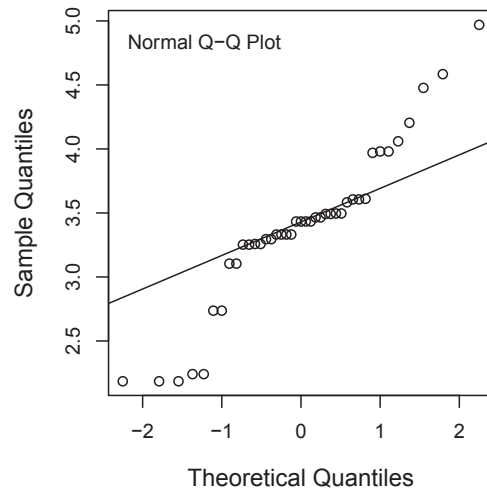
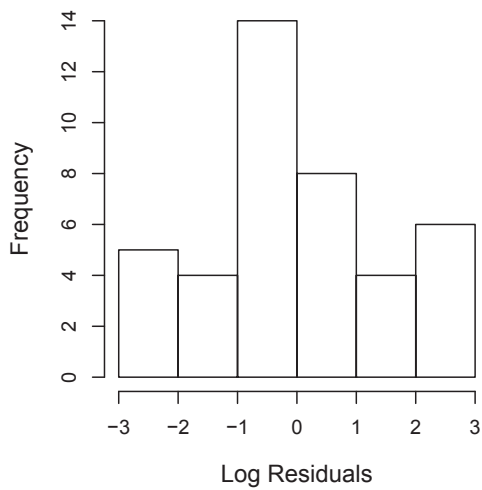
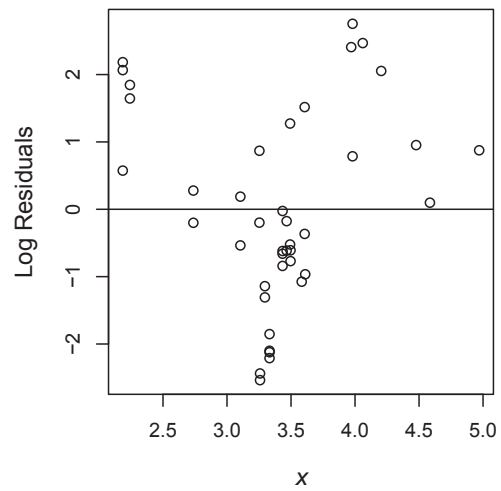
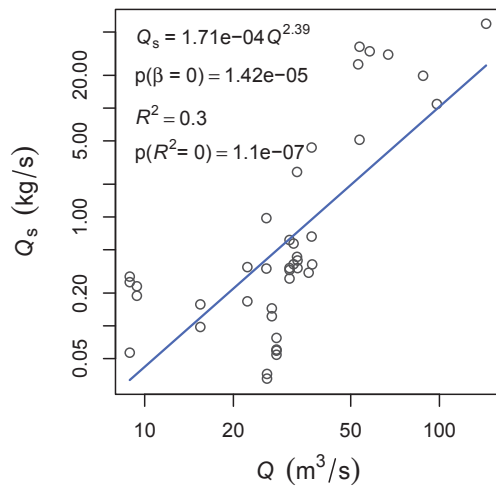
Coarse Bed Sites

1241490A - Cat Spur Creek, ID



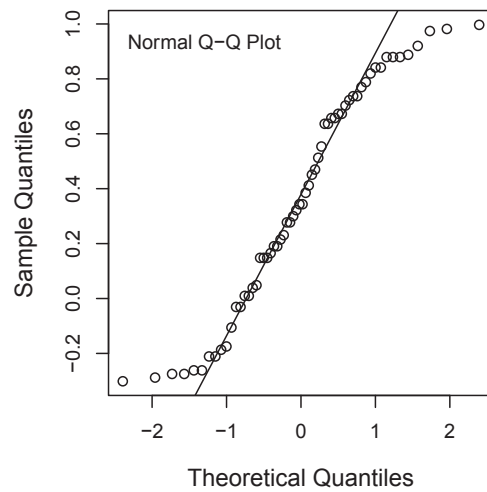
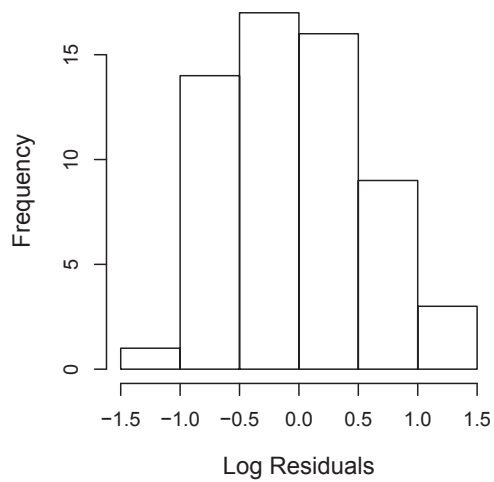
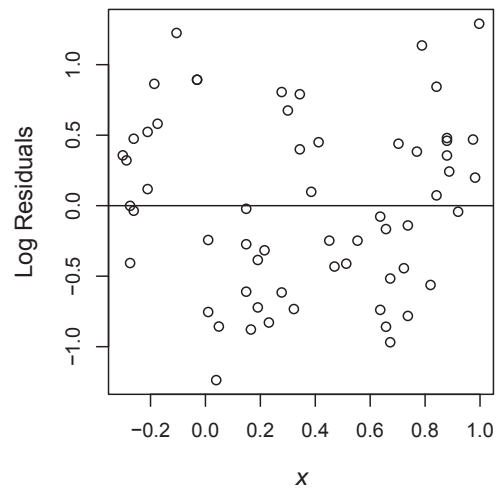
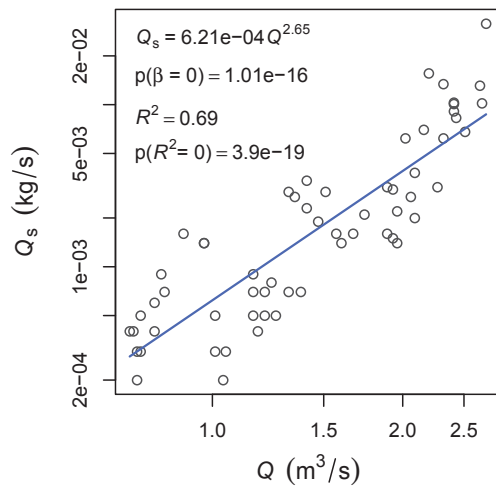
Coarse Bed Sites

13011500 – Pacific Creek at Moran, WY



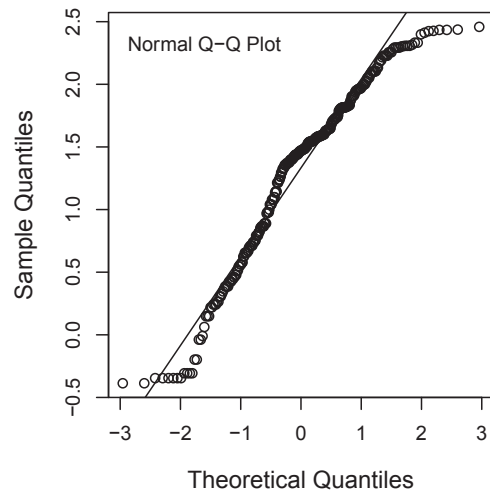
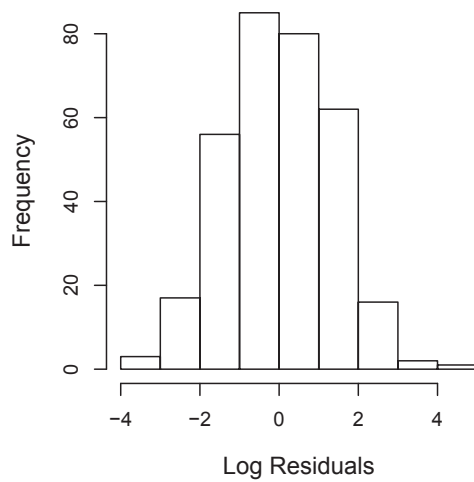
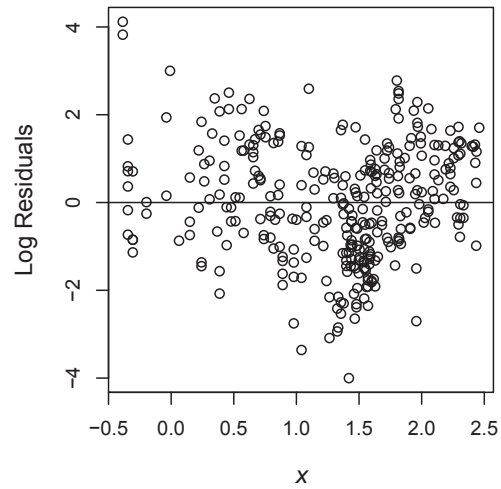
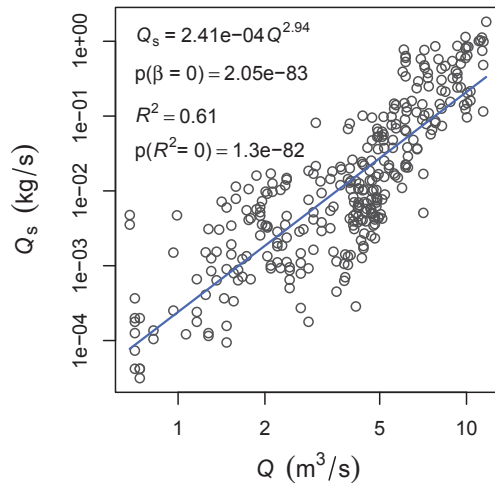
Coarse Bed Sites

13018300 - Cache Creek, nr Jackson, WY



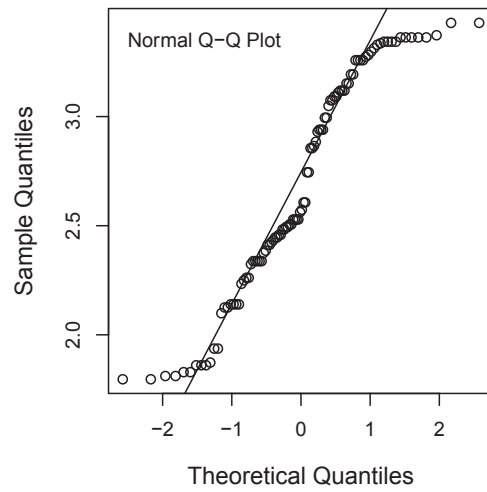
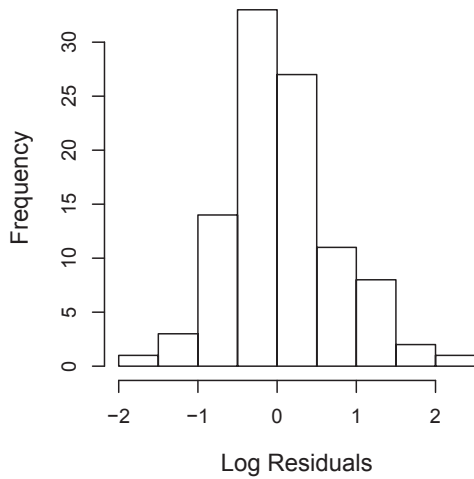
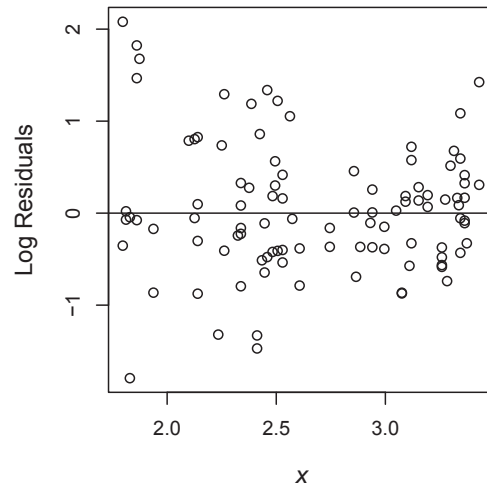
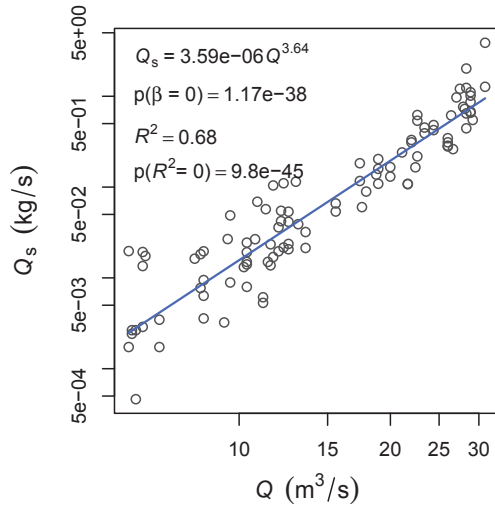
Coarse Bed Sites

13019438 - LITTLE GRANITE CK AT MOUTH NR BONDURANT, WY



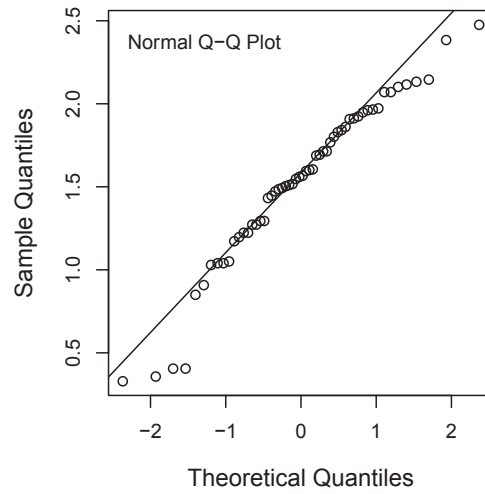
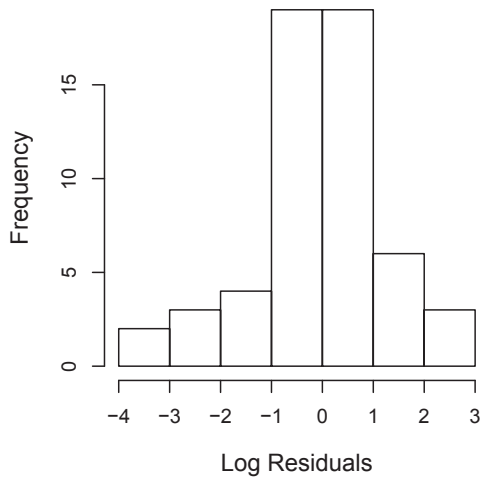
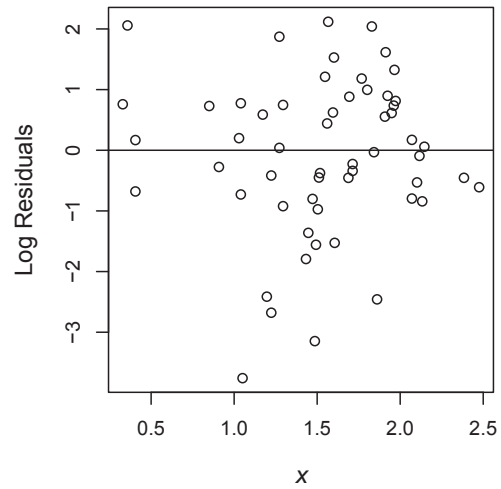
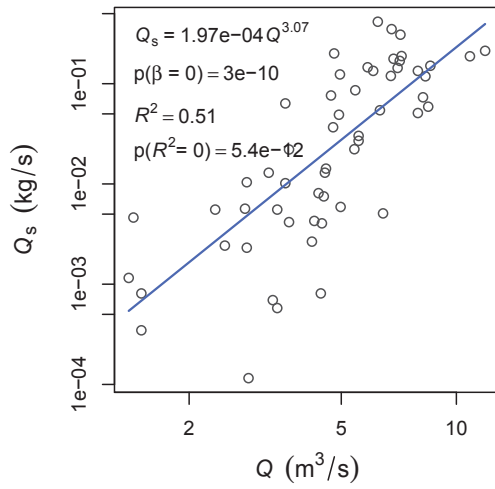
Coarse Bed Sites

13135500 - BIG WOOD RIVER NR KETCHUM, ID



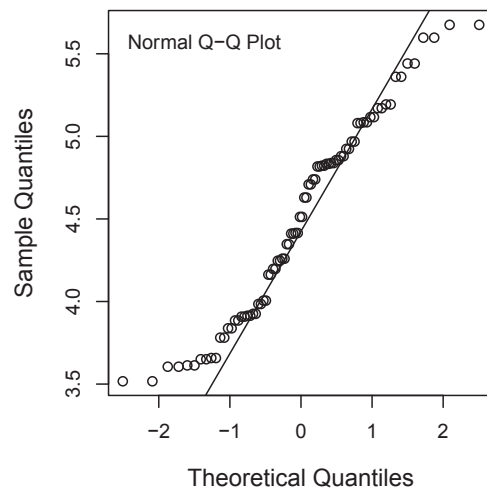
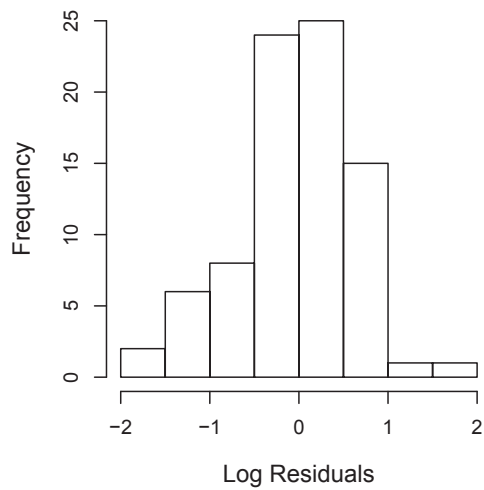
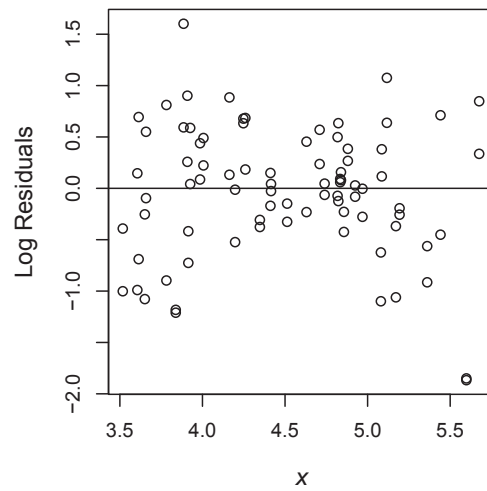
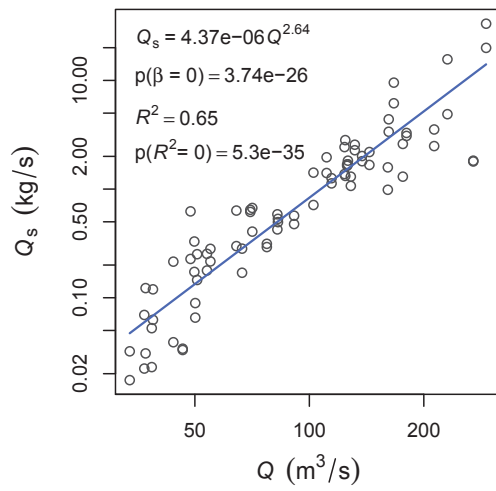
Coarse Bed Sites

13162225 - JARBIDGE RV BLW JARBIDGE, NV



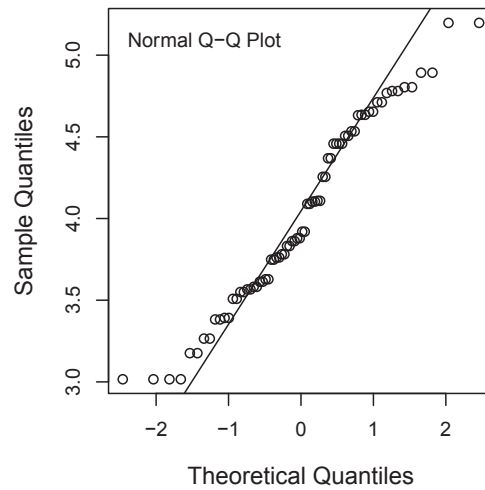
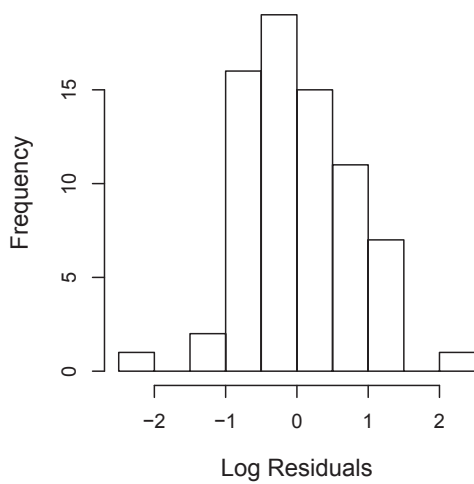
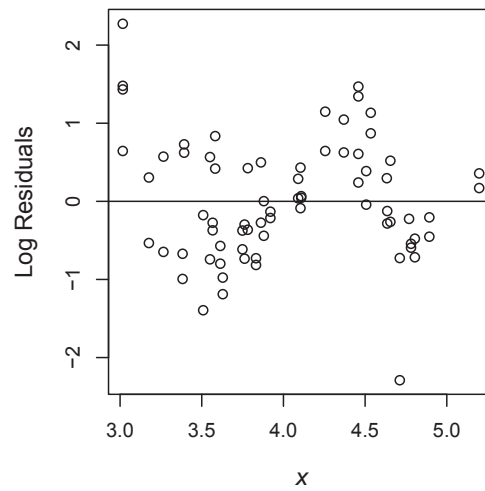
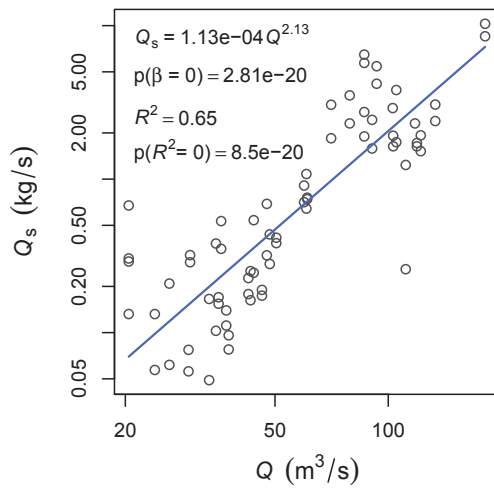
Coarse Bed Sites

13185000 - BOISE RIVER NR TWIN SPRINGS, ID



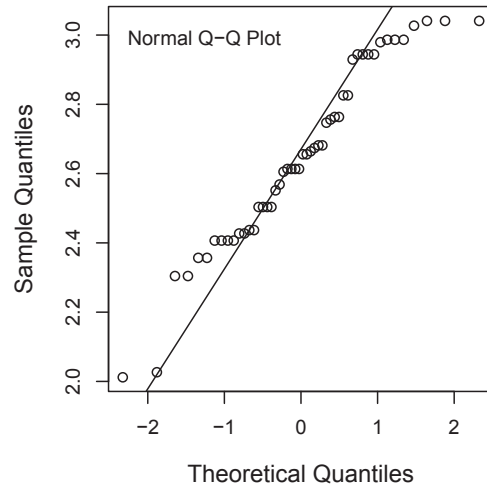
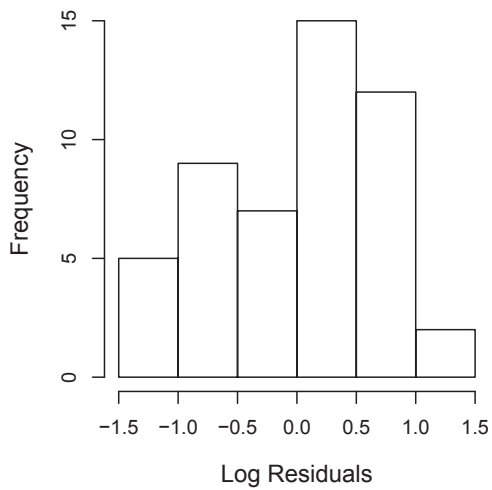
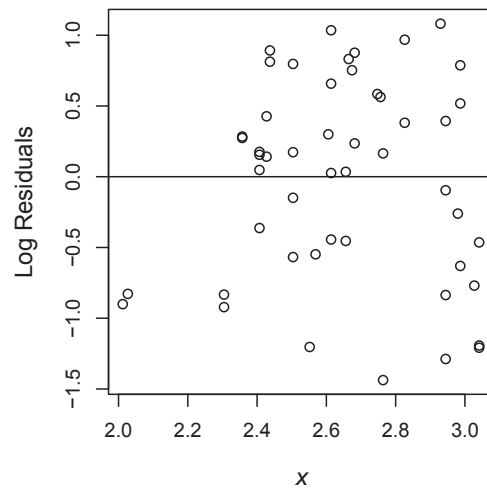
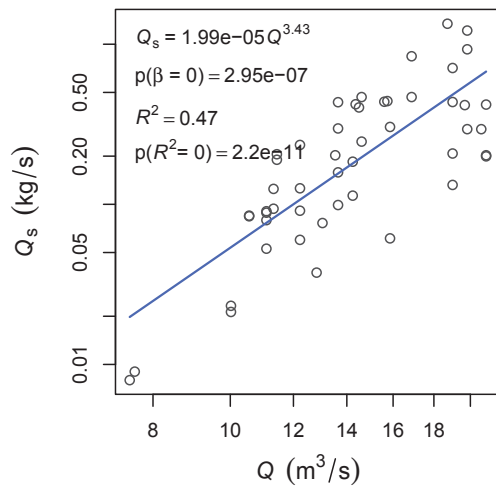
Coarse Bed Sites

13235000 - SOUTH FORK PAYETTE RIVER AT LOWMAN, ID



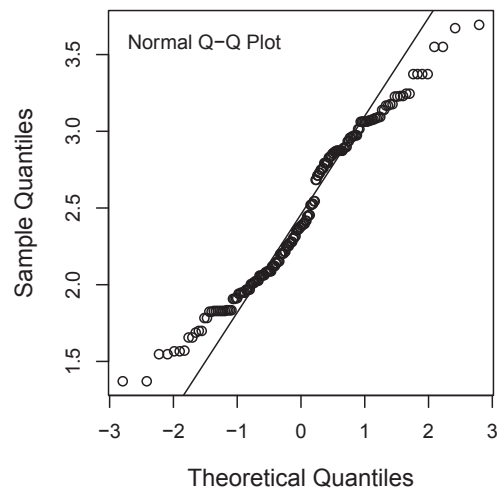
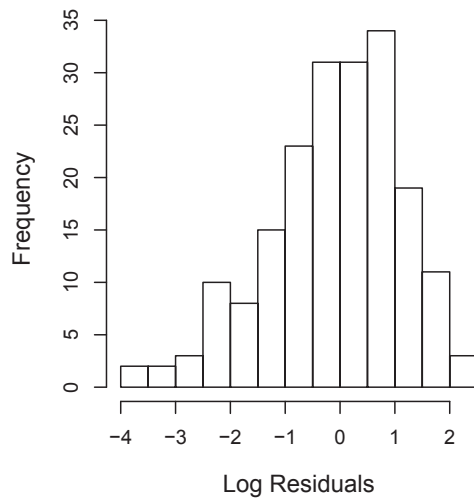
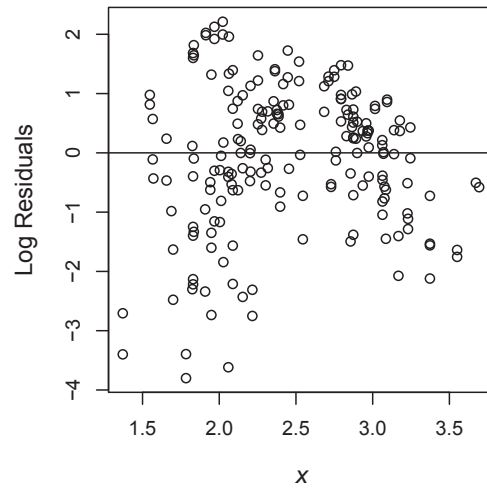
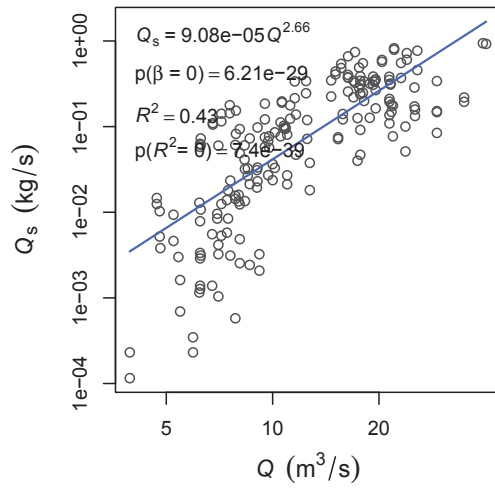
Coarse Bed Sites

13292500 - SALMON RIVER NR OBSIDIAN, ID



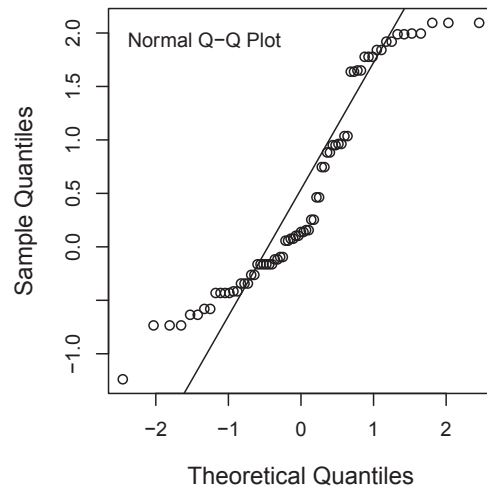
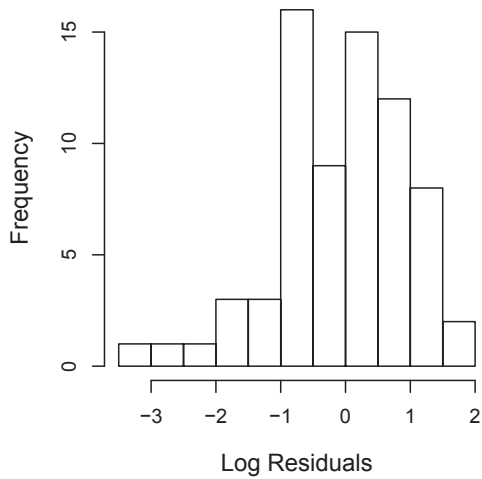
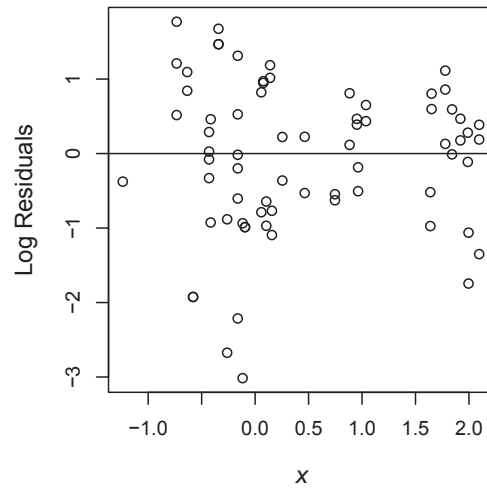
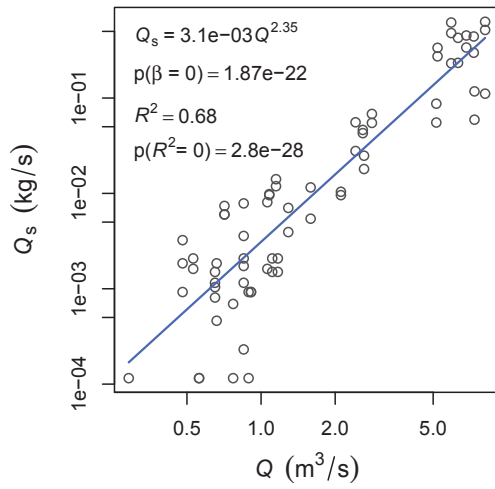
Coarse Bed Sites

13295000 - VALLEY CREEK AT STANLEY, ID



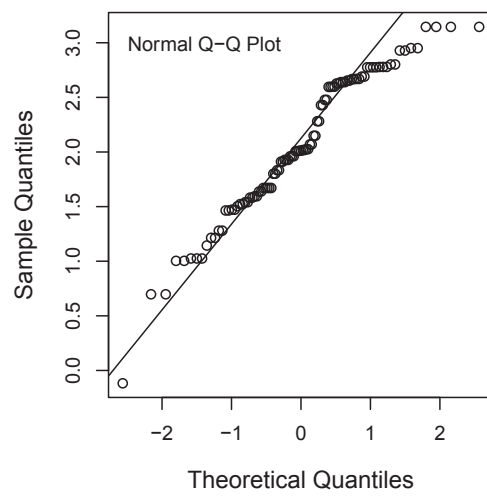
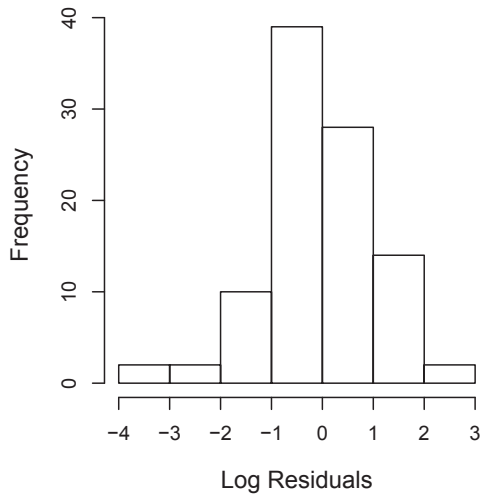
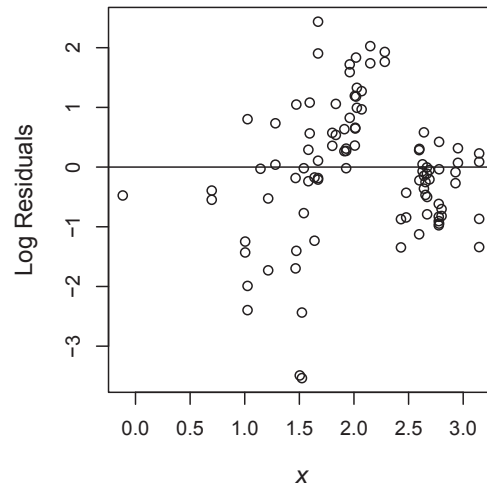
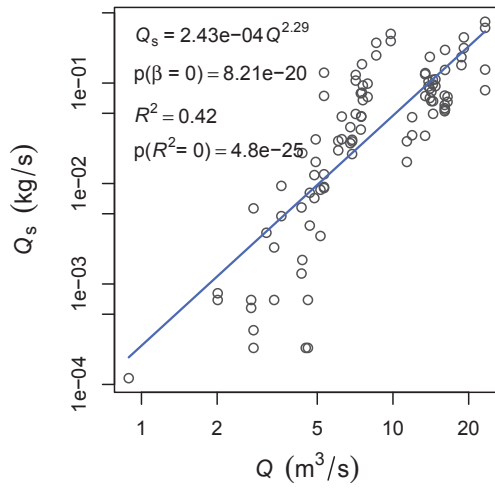
Coarse Bed Sites

1329500B - Herd Creek, ID



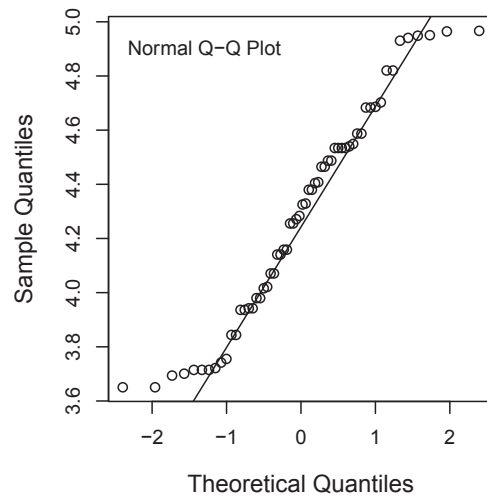
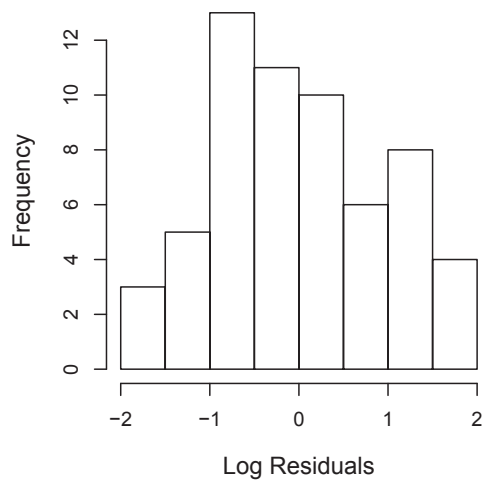
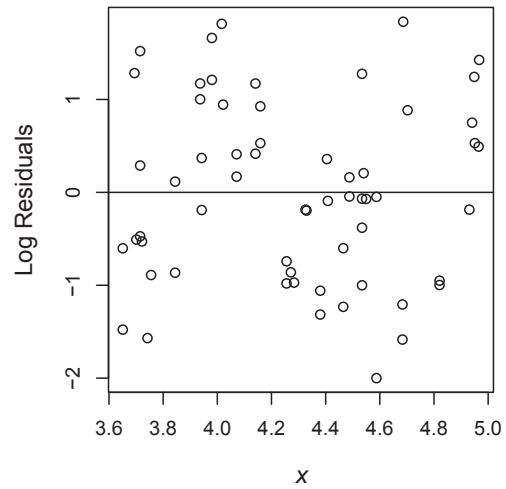
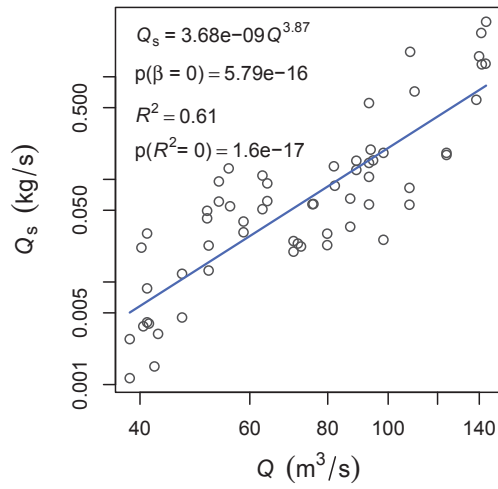
Coarse Bed Sites

1329500C - Marsh Creek, ID



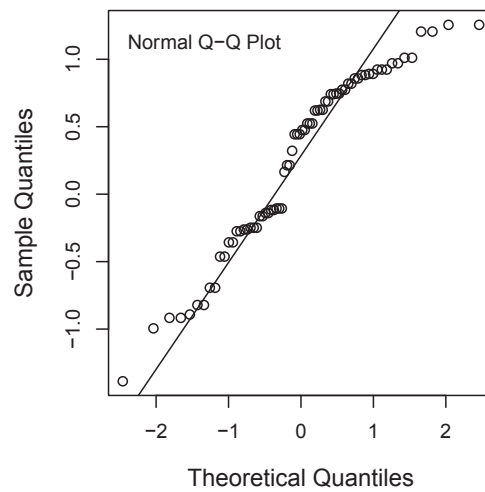
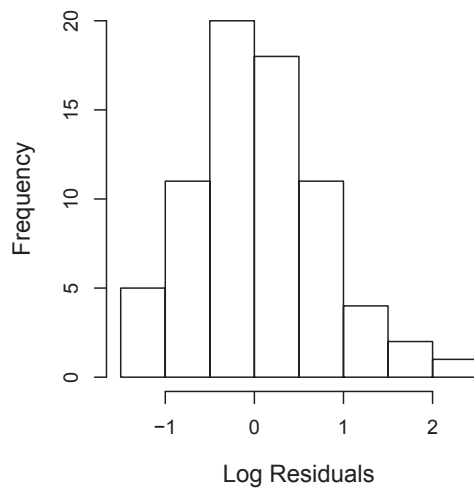
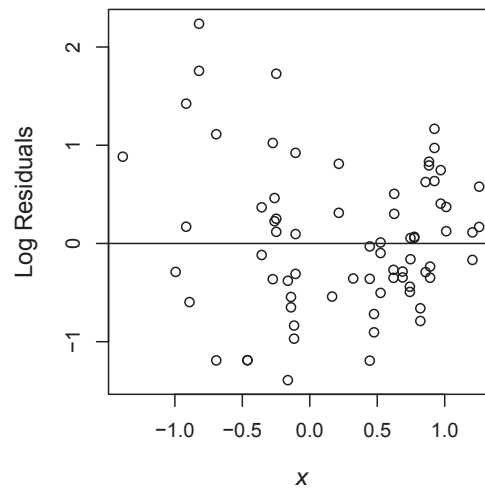
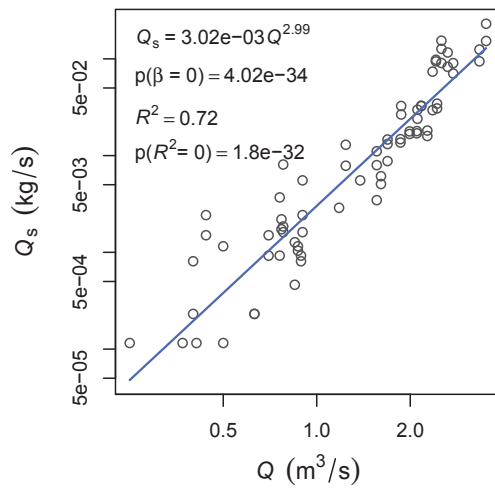
Coarse Bed Sites

13296500 - SALMON RIVER BL YANKEE FORK NR CLAYTON, ID



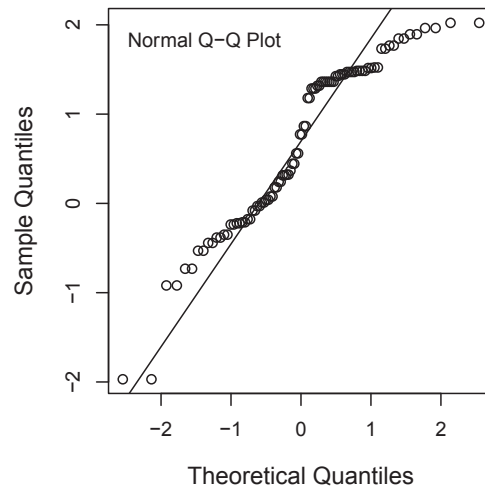
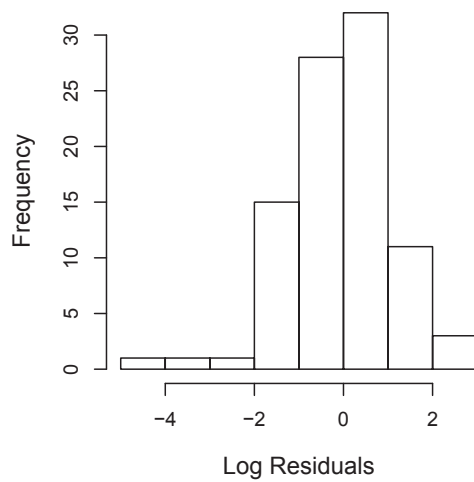
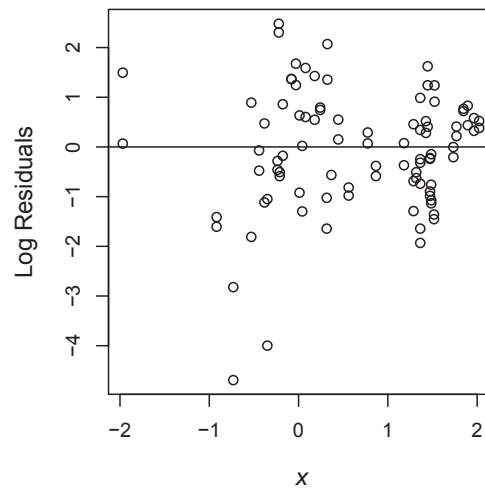
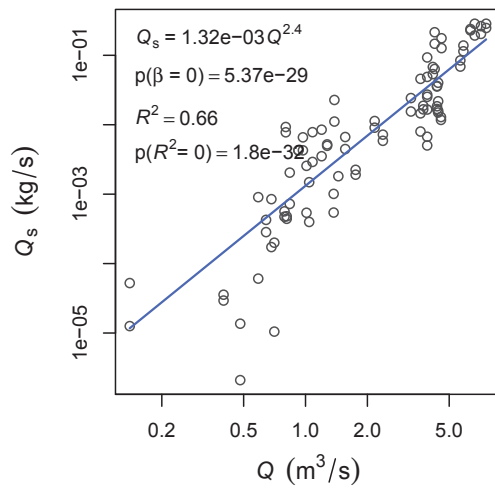
Coarse Bed Sites

13297330 - Thompson Creek, ID



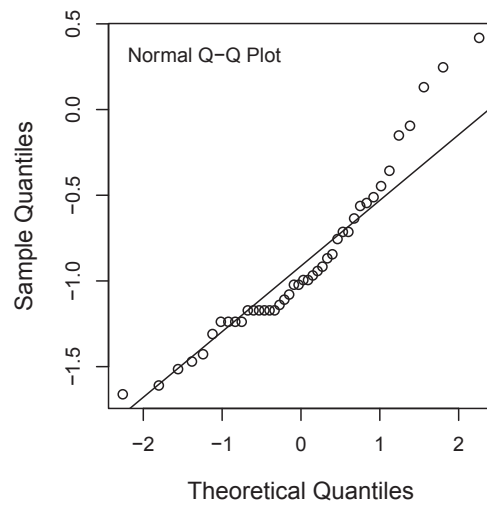
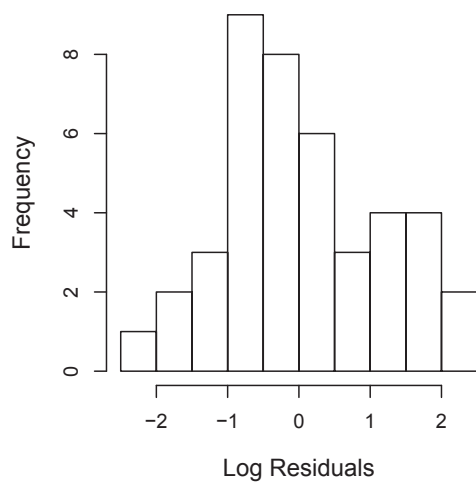
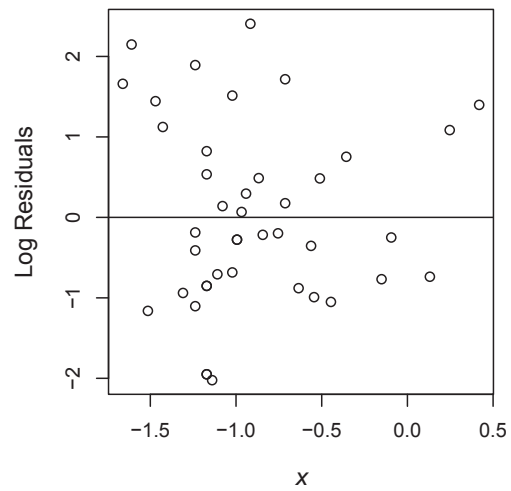
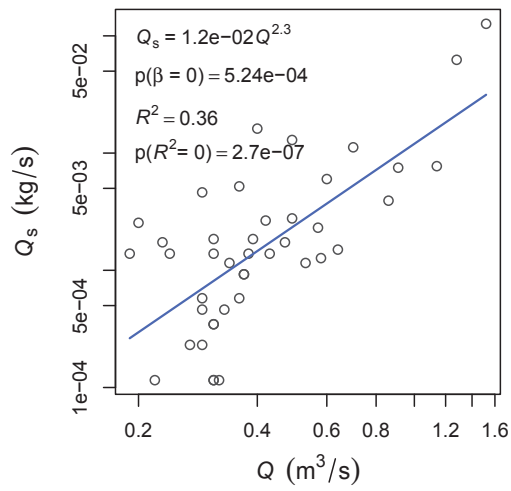
Coarse Bed Sites

13297355 - SQUAW CREEK BL BRUNO CREEK NR CLAYTON, ID



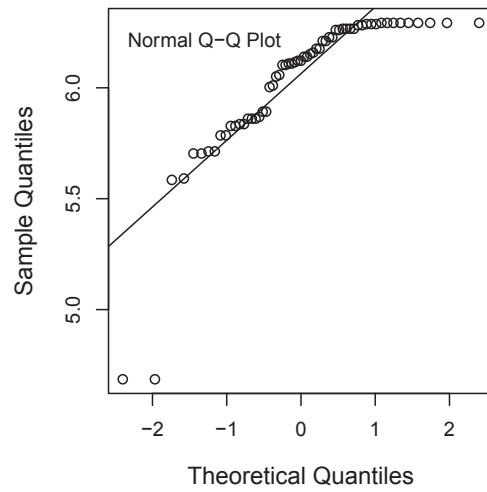
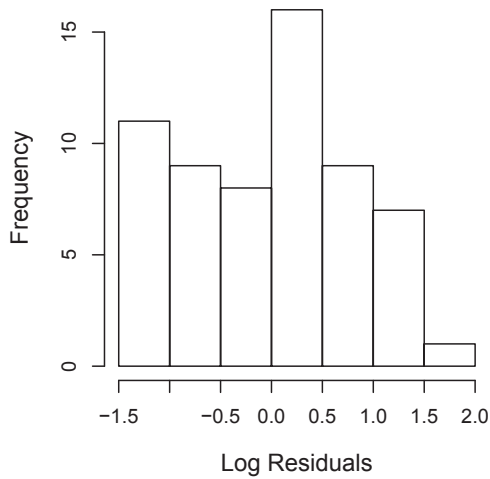
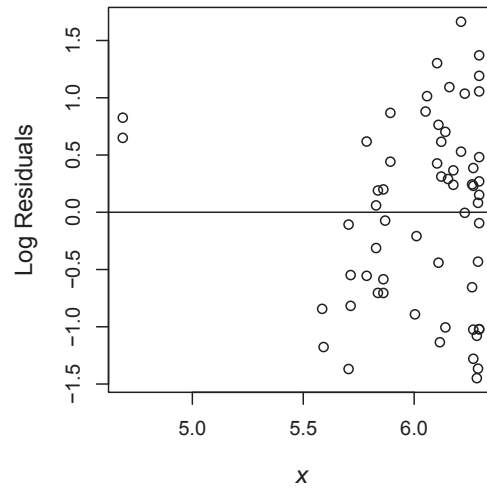
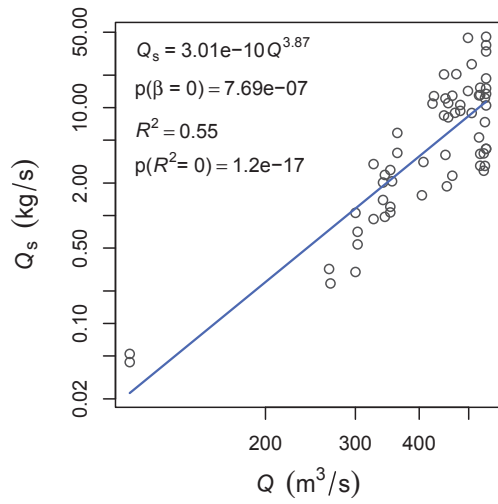
Coarse Bed Sites

1329735A - Squaw Ck nr North Fork, ID (USFS)



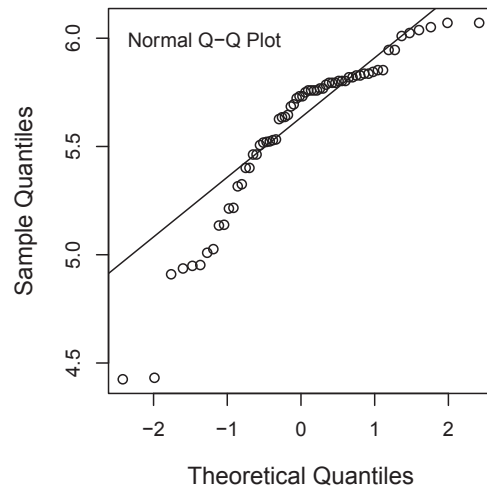
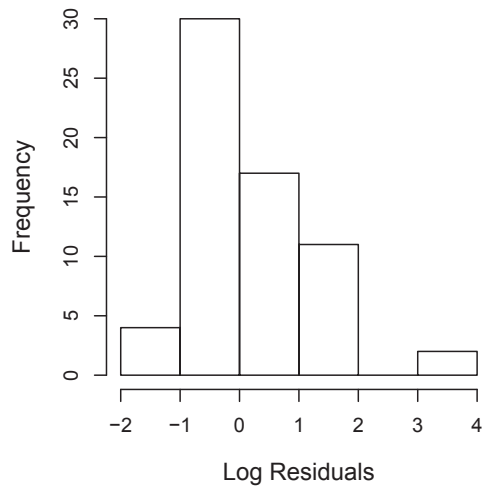
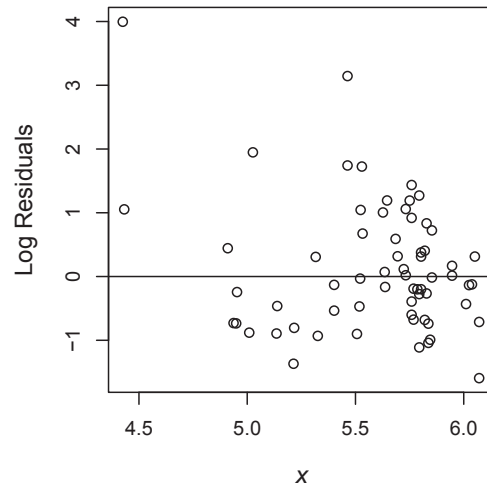
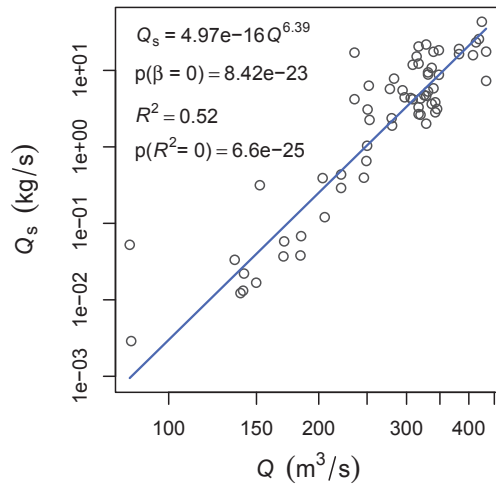
Coarse Bed Sites

13307000 - SALMON RIVER NR SHOUP, ID



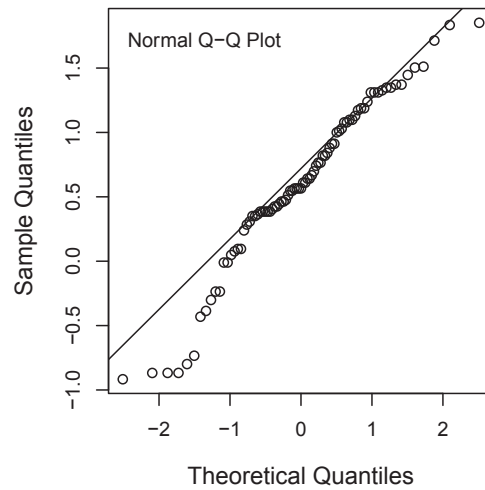
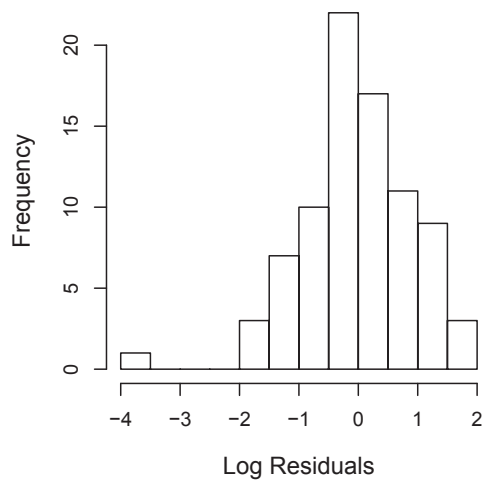
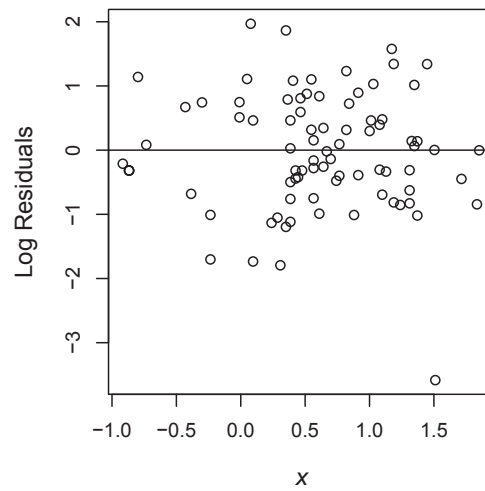
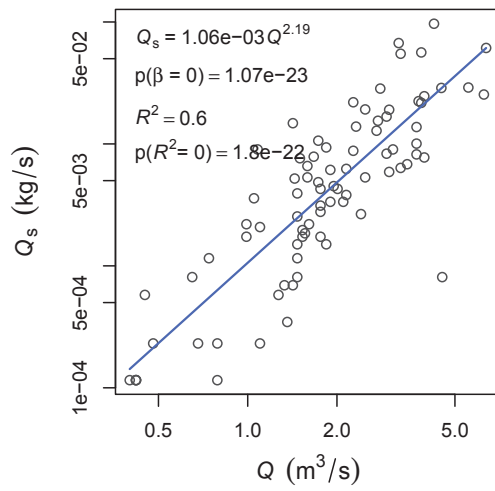
Coarse Bed Sites

13309220 - MIDDLE FORK SALMON RIVER NR YELLOW PINE, ID



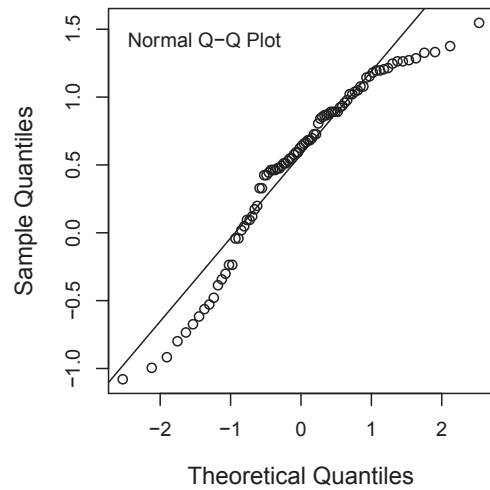
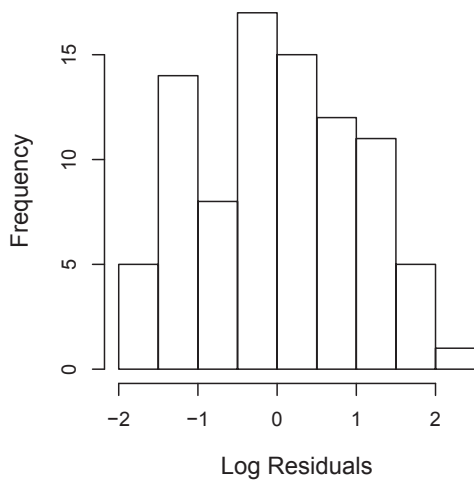
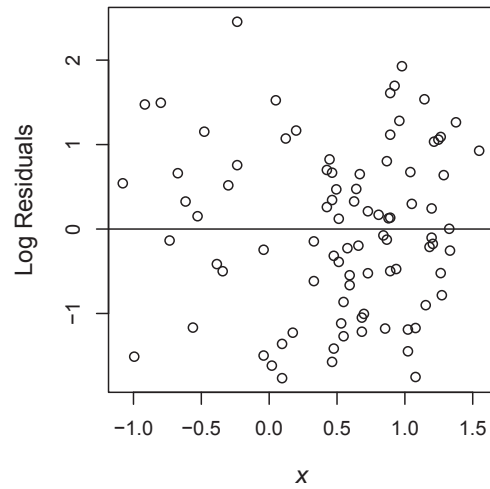
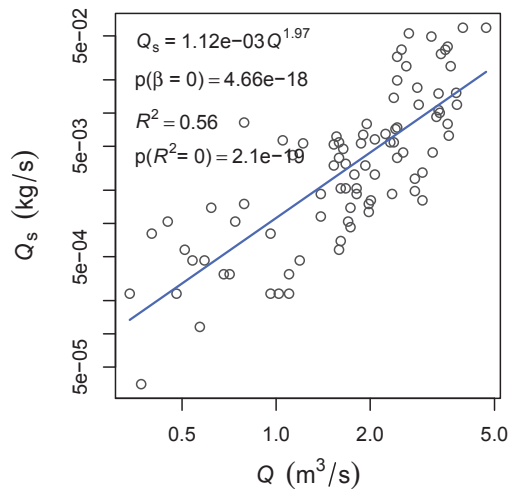
Coarse Bed Sites

13310520 - DOLLAR CREEK NR WARM LAKE NR CASCADE, ID



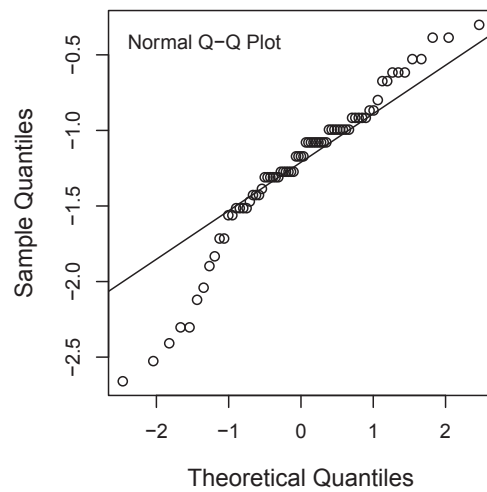
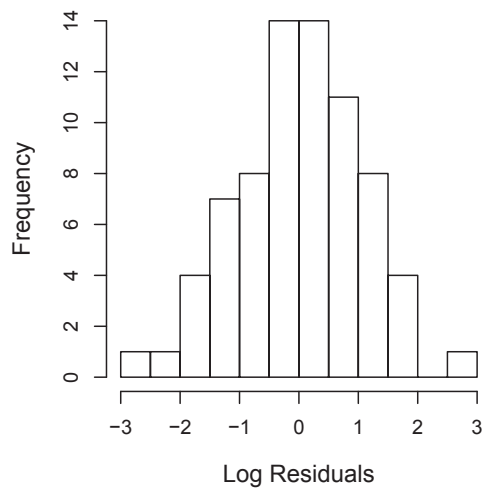
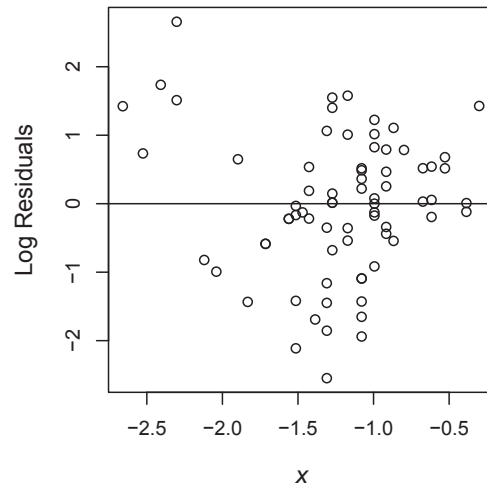
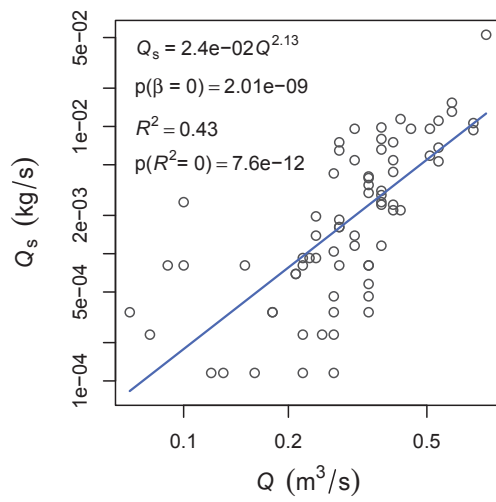
Coarse Bed Sites

13310565 - BLACKMARE CREEK NR POVERTY FLAT NR CASCADE, ID



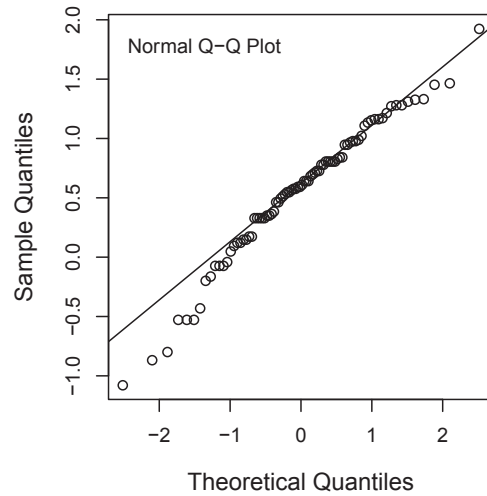
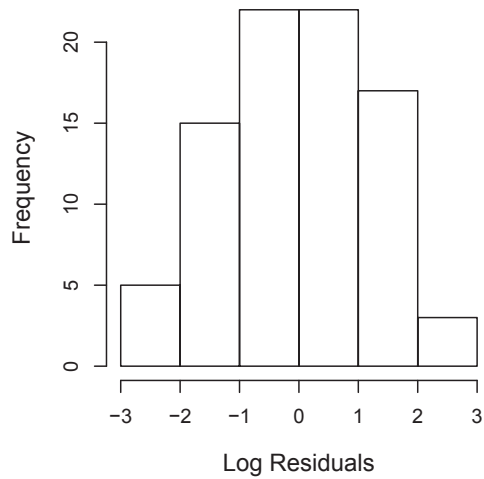
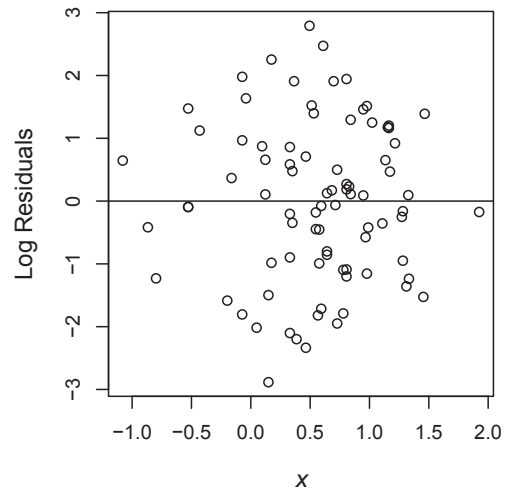
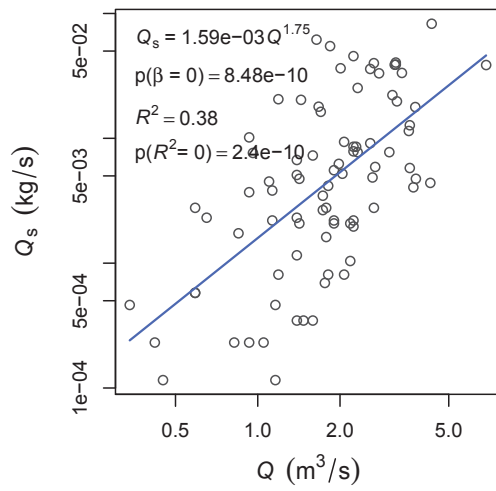
Coarse Bed Sites

13310660 - LITTLE BUCKHORN CREEK NR KRASSEL RANGER STATION, ID



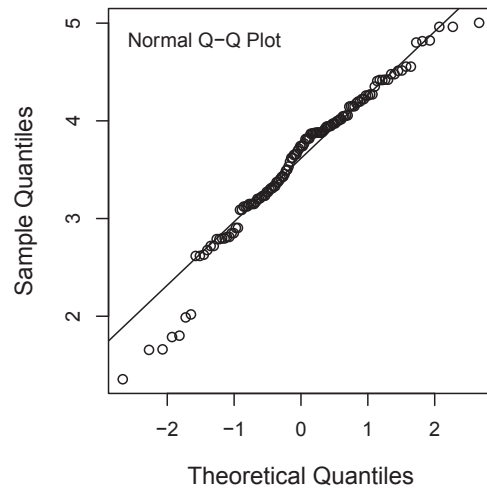
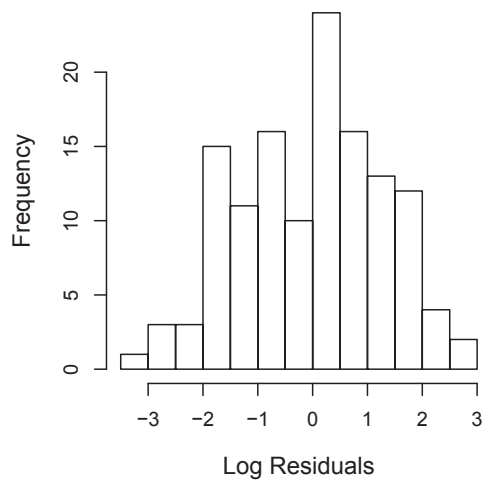
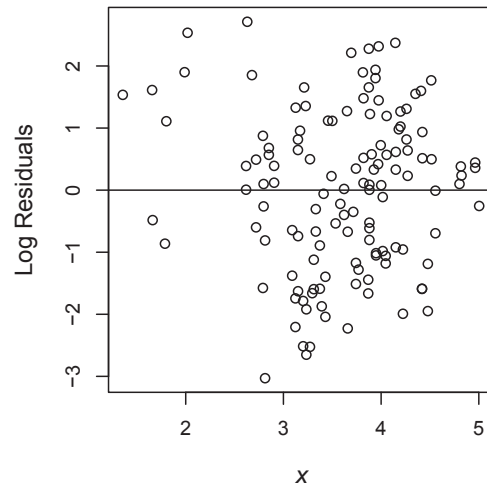
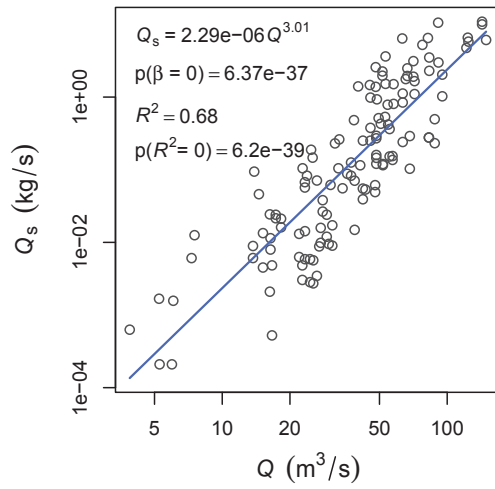
Coarse Bed Sites

13310670 - WF BUCKHORN CREEK NR KRASSEL RANGER STATION, ID



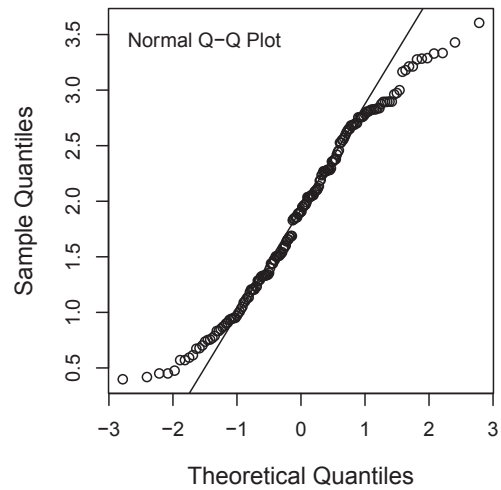
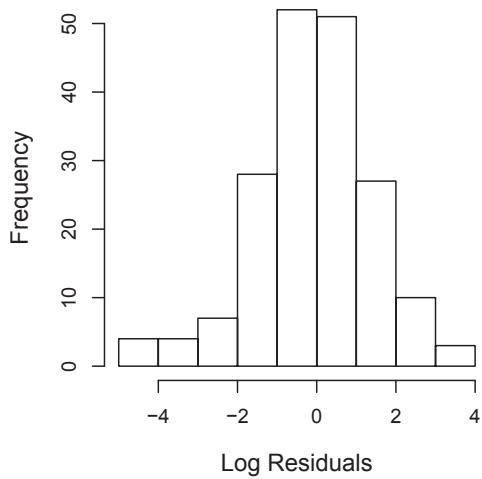
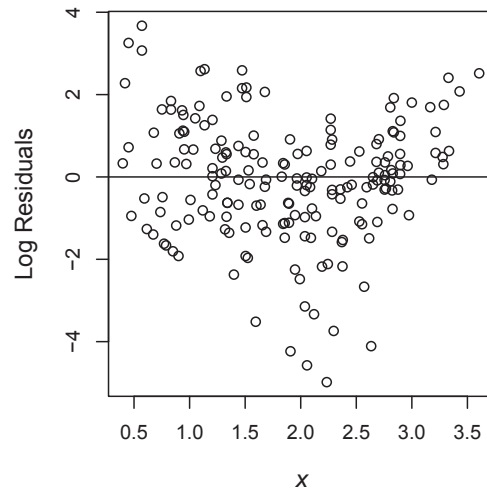
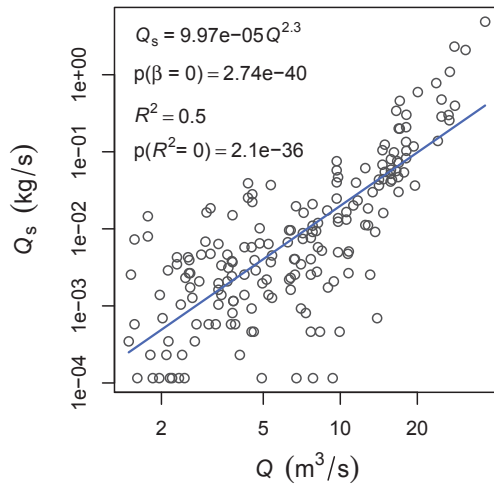
Coarse Bed Sites

13310700 - South Fk Salmon River, ID



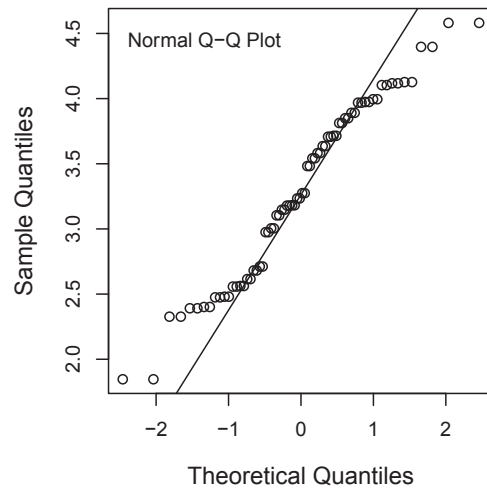
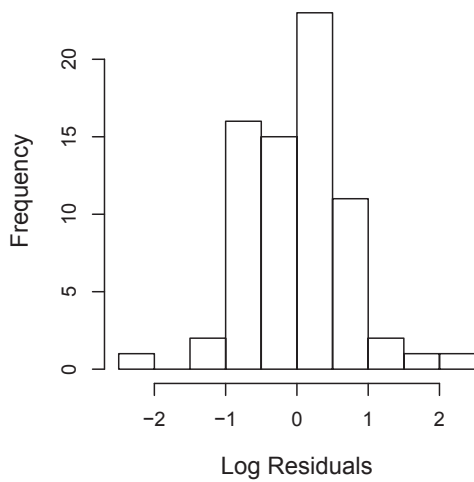
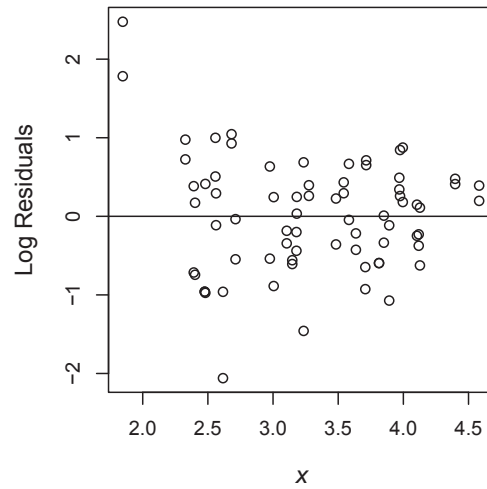
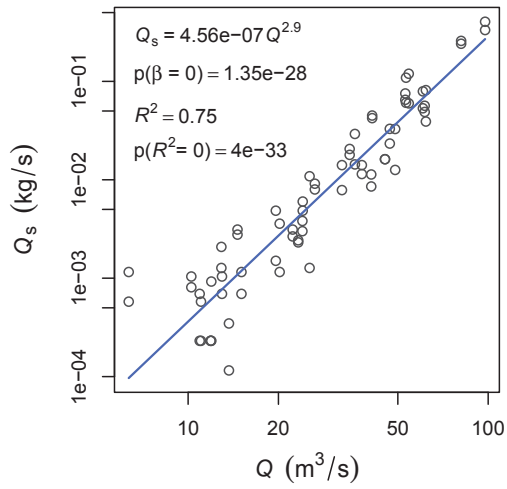
Coarse Bed Sites

1331070A - Rapid River, ID



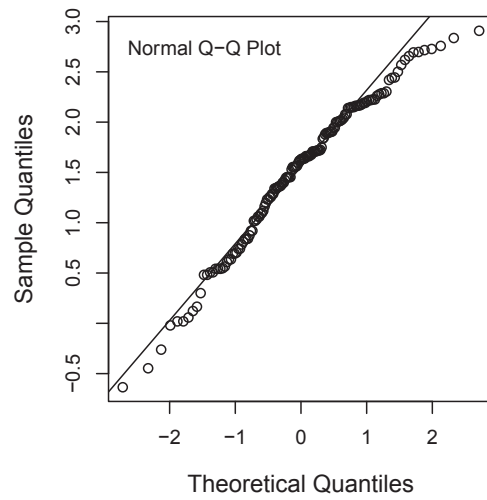
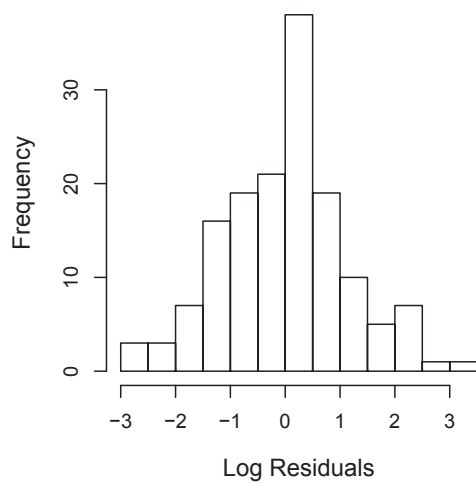
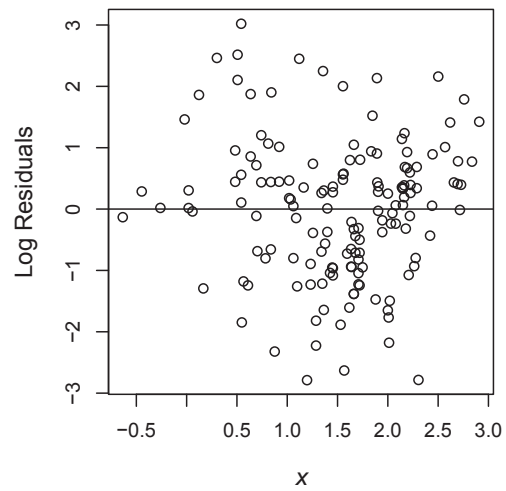
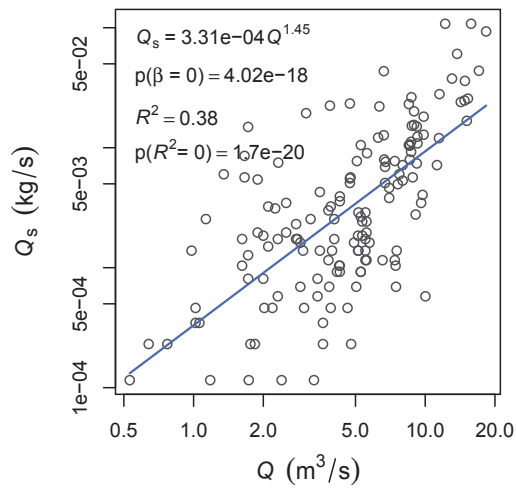
Coarse Bed Sites

13313000 - JOHNSON CREEK AT YELLOW PINE, ID



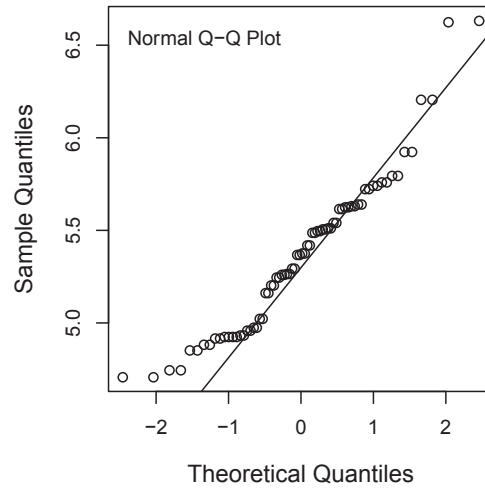
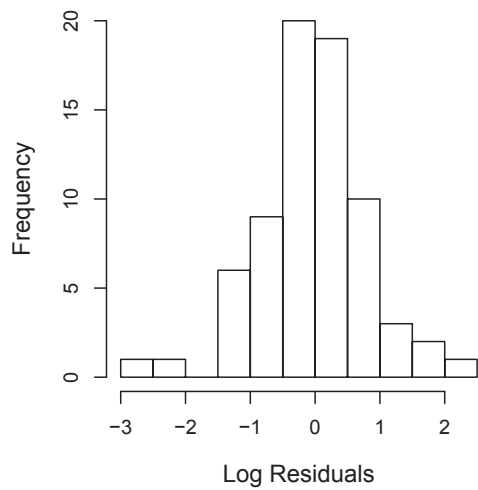
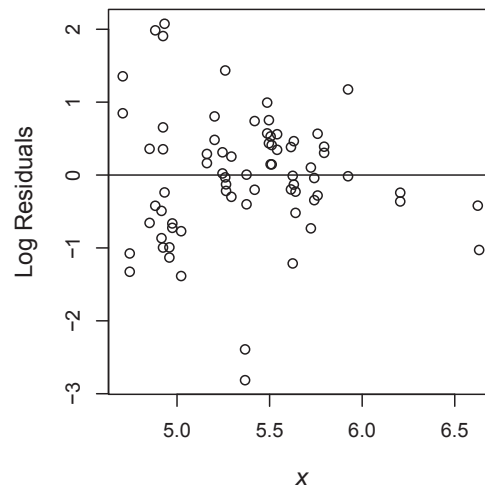
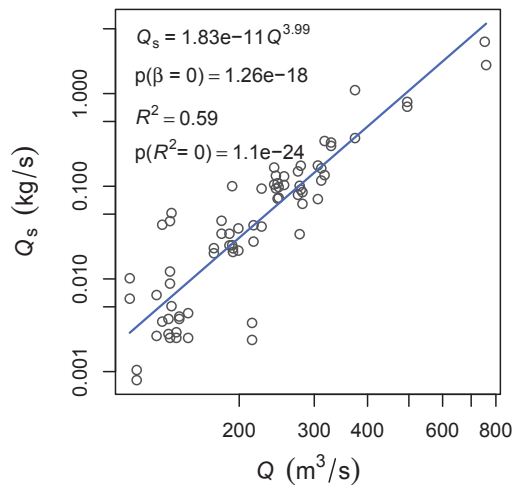
Coarse Bed Sites

1331650A - Little Slate Creek, ID



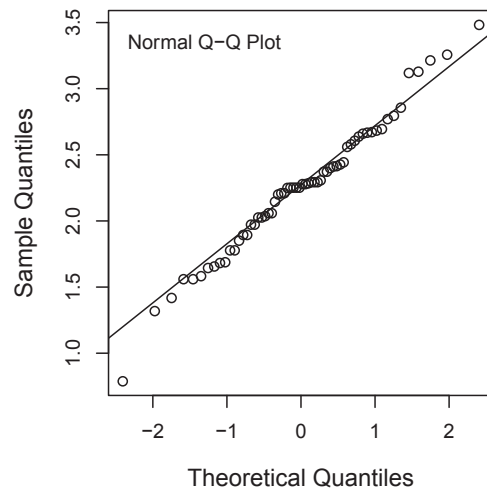
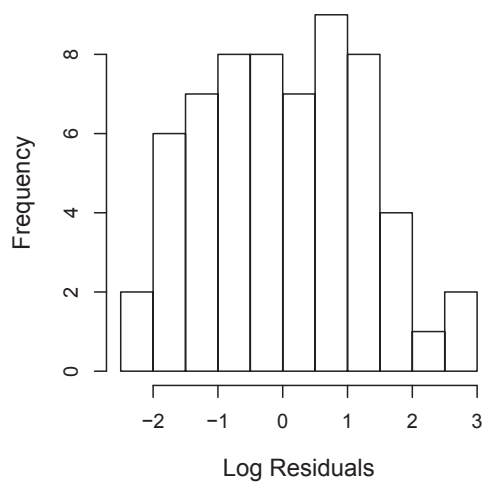
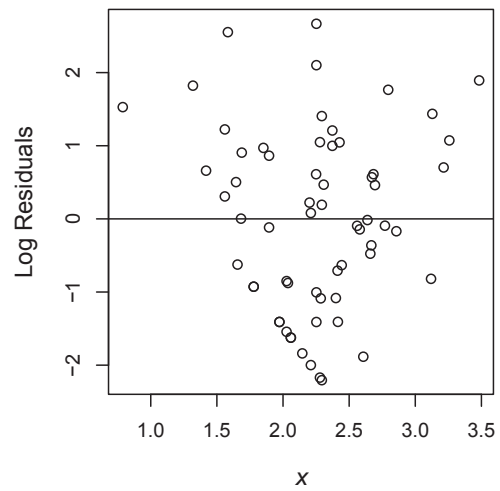
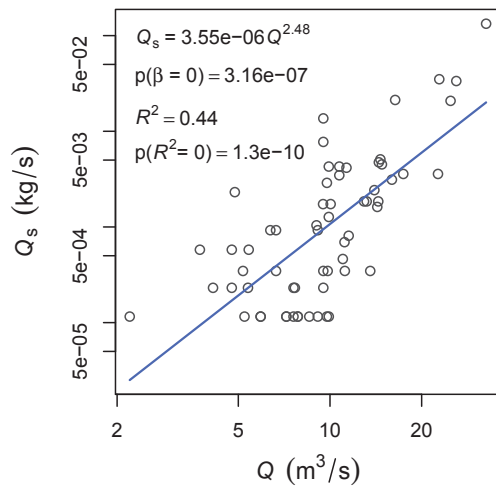
Coarse Bed Sites

13337000 - LOCHSA RIVER NR LOWELL, ID



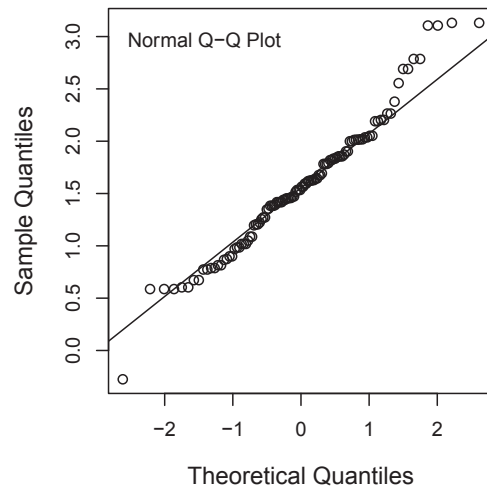
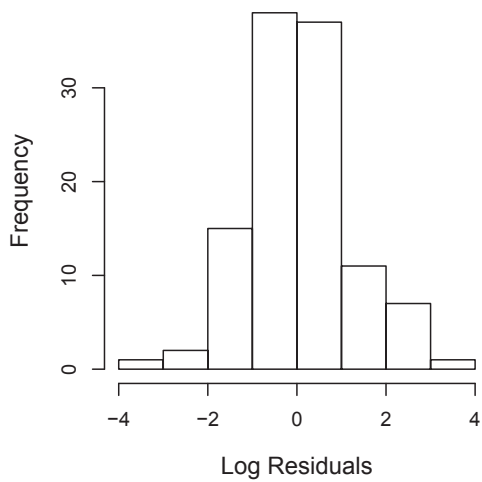
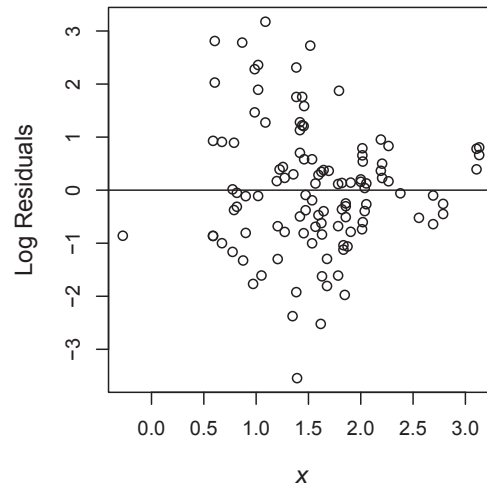
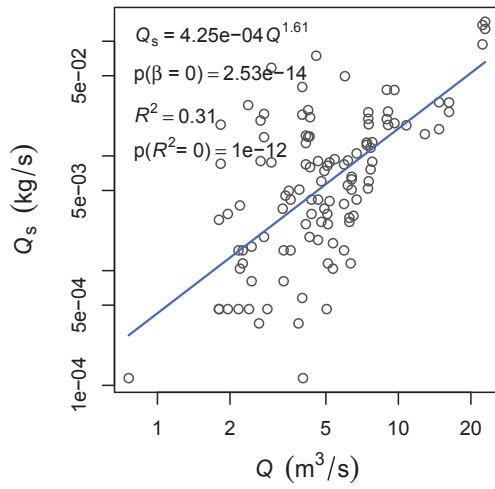
Coarse Bed Sites

1333850A - Johns Creek, ID



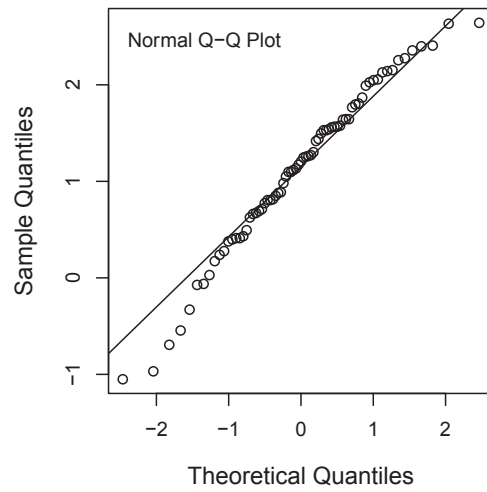
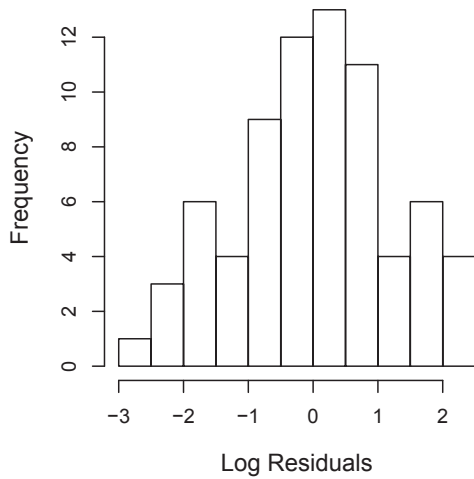
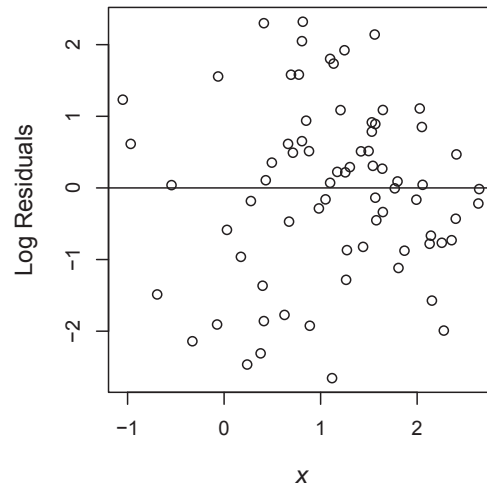
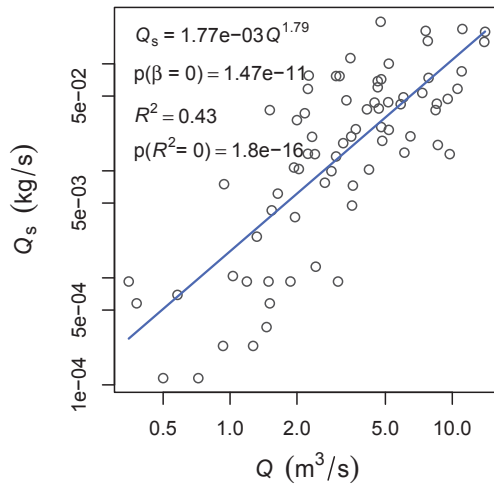
Coarse Bed Sites

1333850B - Lolo Creek, ID



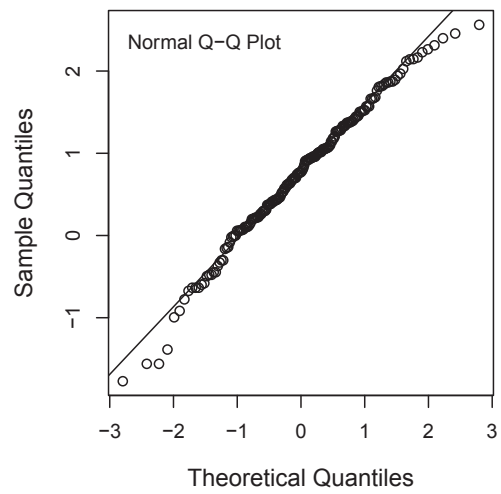
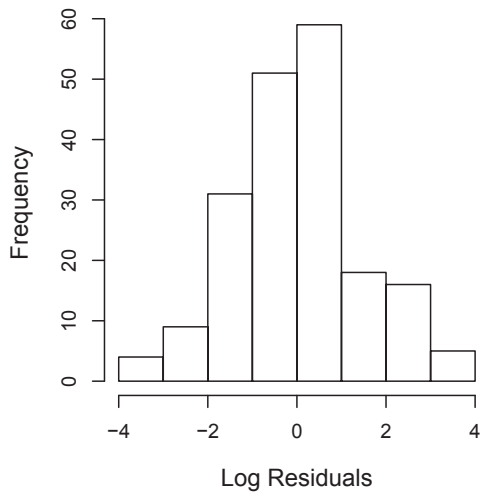
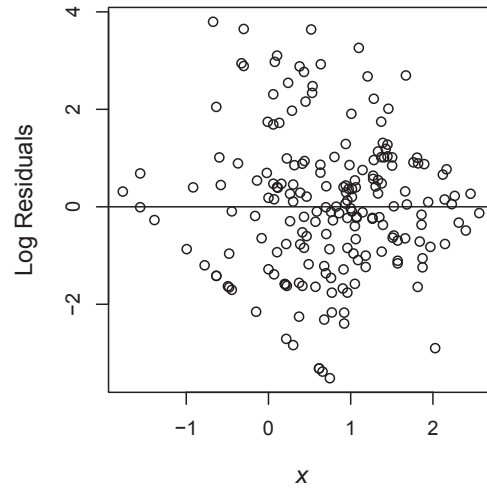
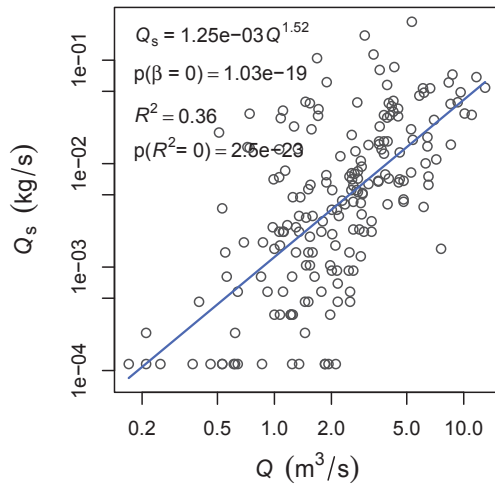
Coarse Bed Sites

1333850C - Main Fork Red River, ID



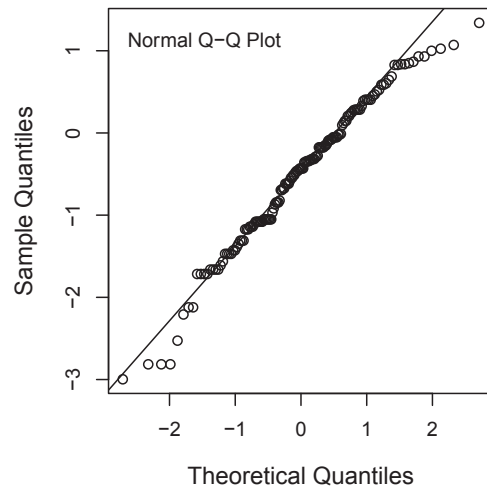
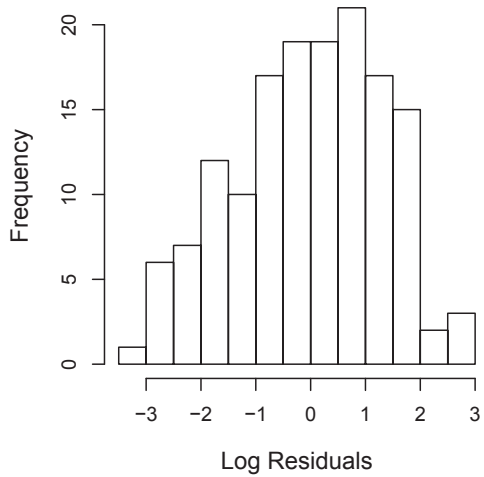
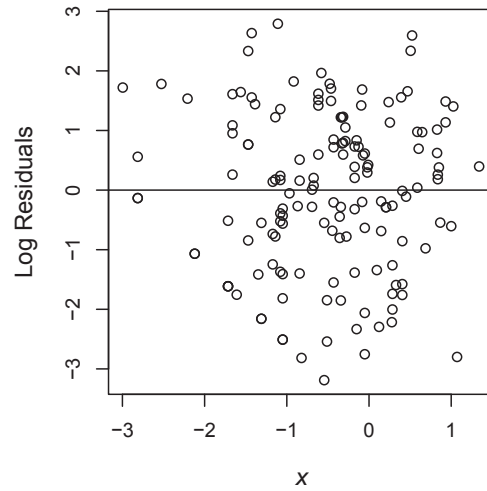
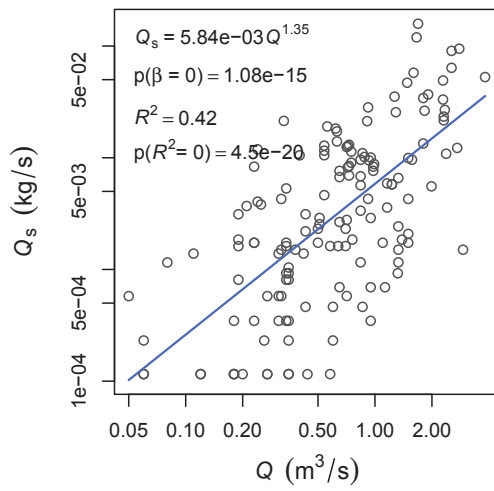
Coarse Bed Sites

1333850D - South Fk Red River, ID



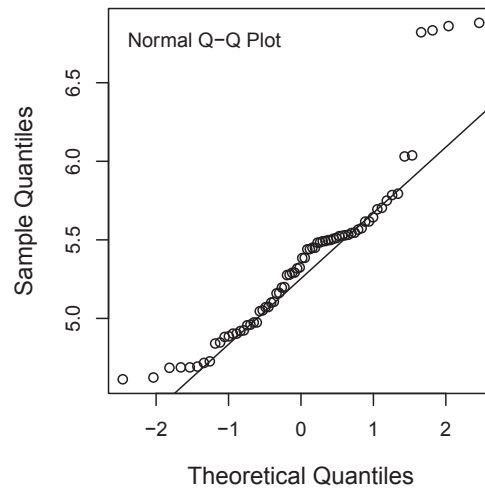
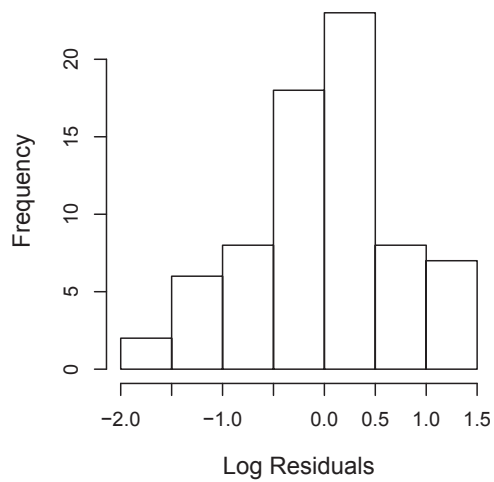
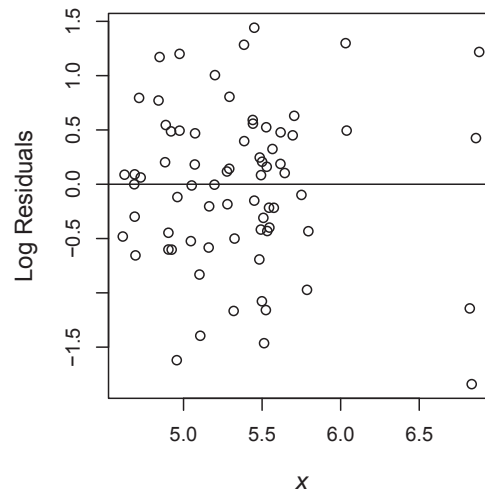
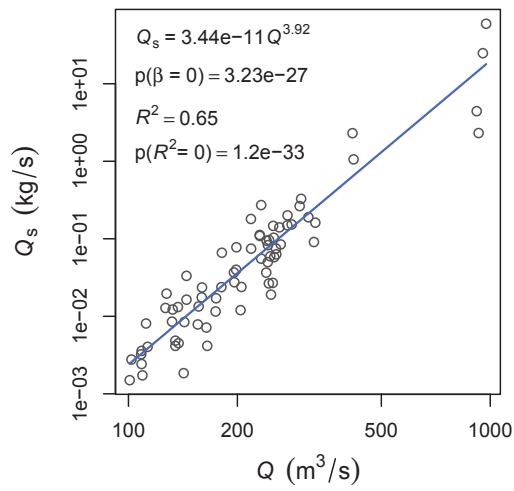
Coarse Bed Sites

1333850F - Trapper Creek, ID



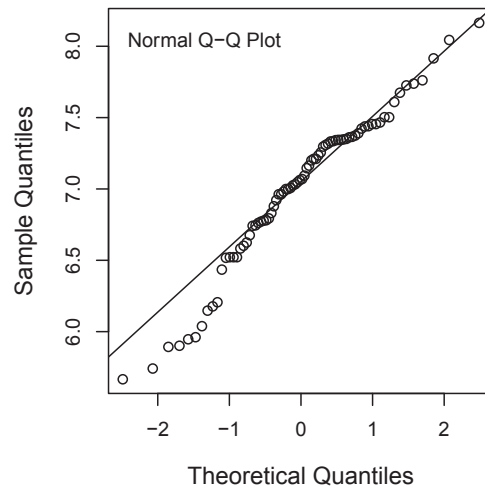
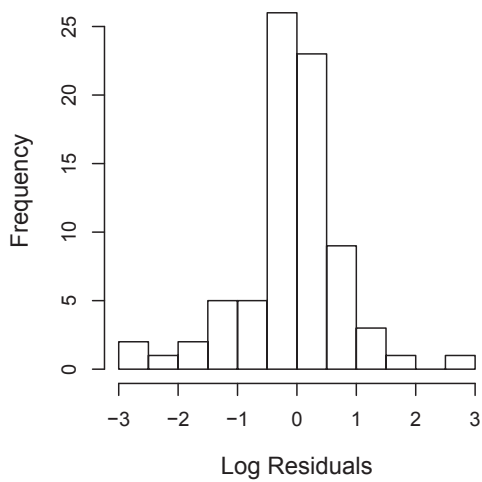
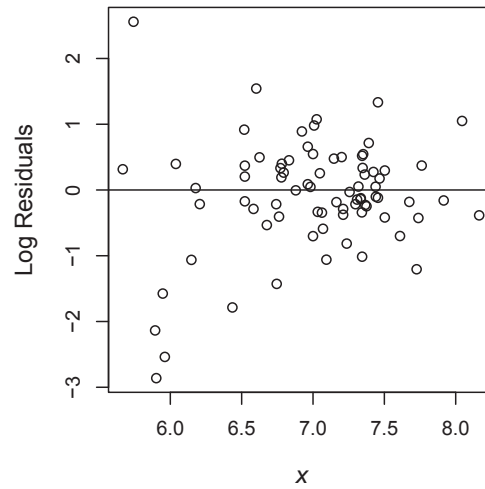
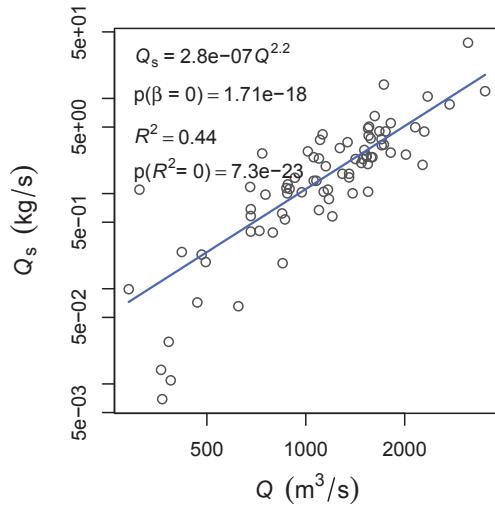
Coarse Bed Sites

13340600 - NF CLEARWATER RIVER NR CANYON RANGER STATION, ID



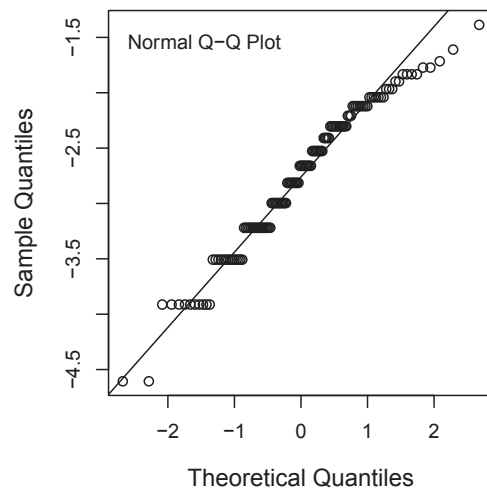
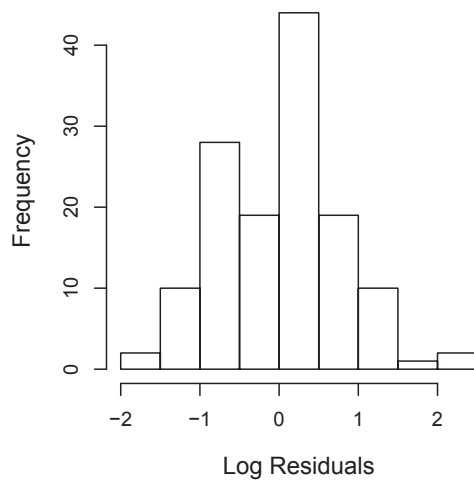
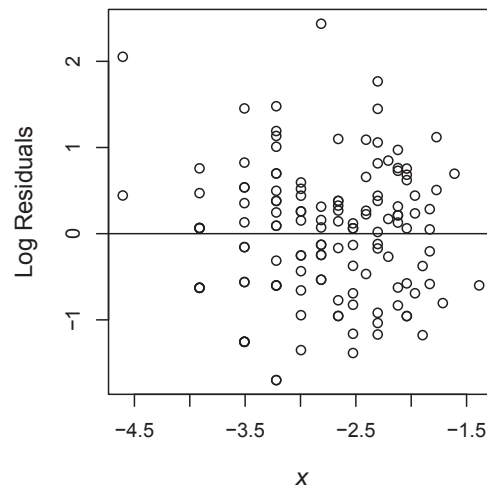
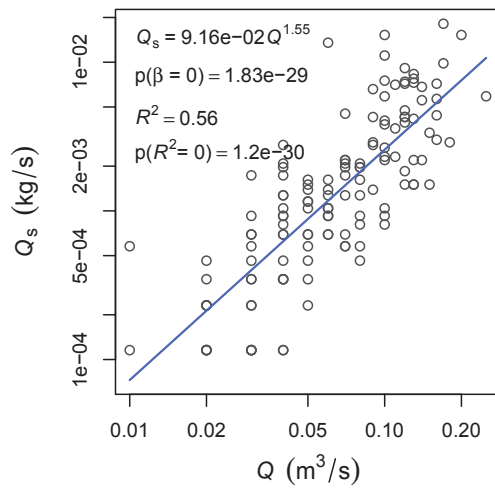
Coarse Bed Sites

13342500 - Clearwater River at Spalding, ID



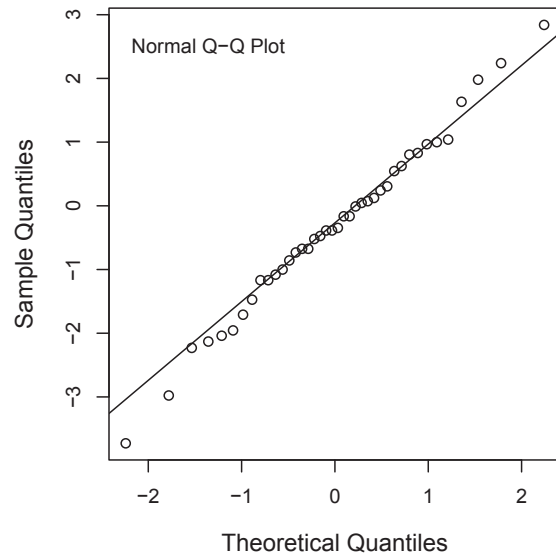
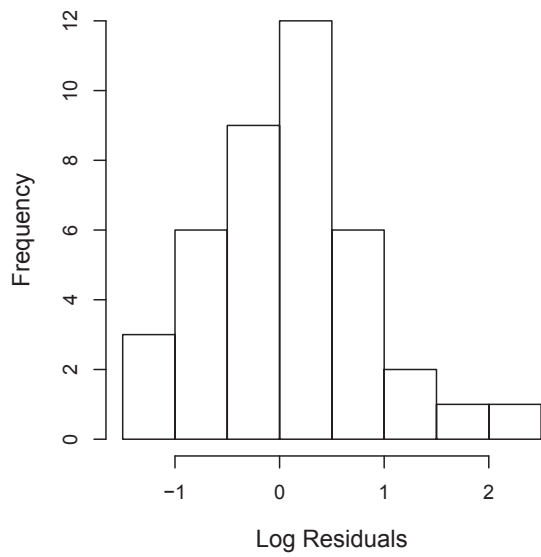
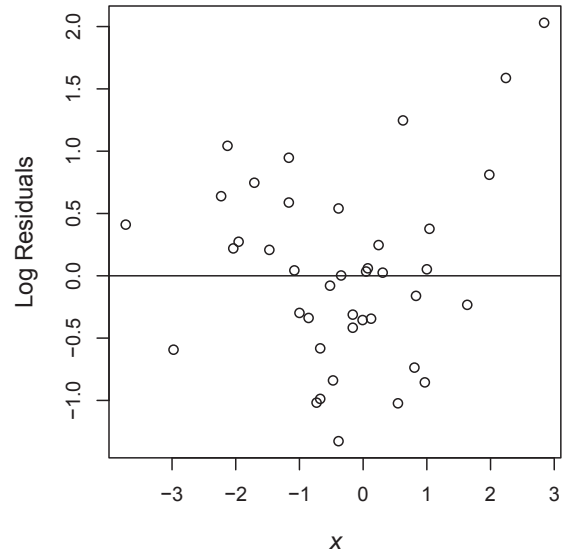
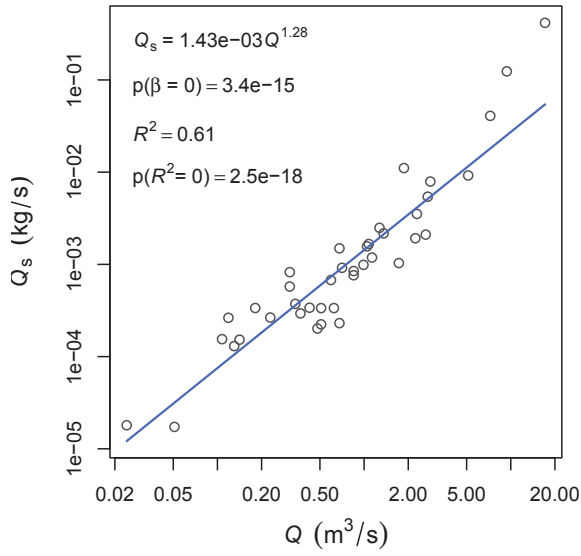
Coarse Bed Sites

M332AEC - Eggers Creek, ID



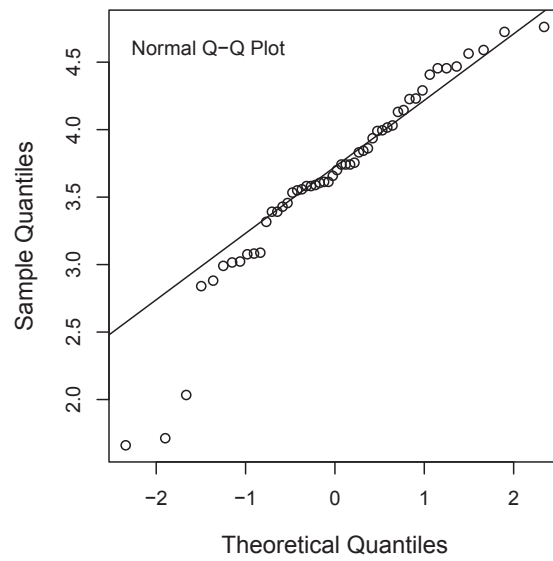
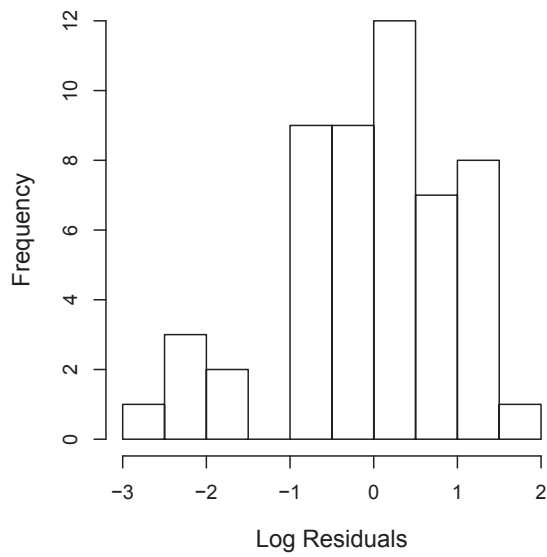
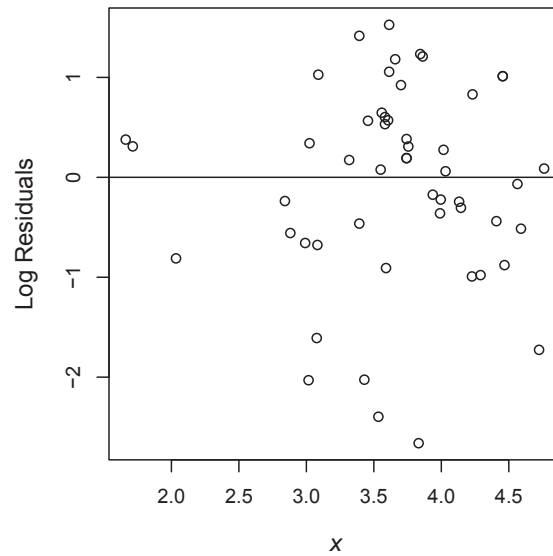
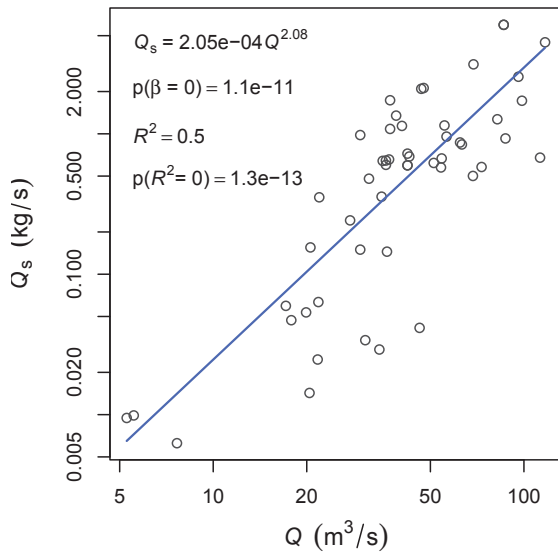
Fine Bed Sites

1095220 - STILLWATER RIVER NEAR STERLING, MA



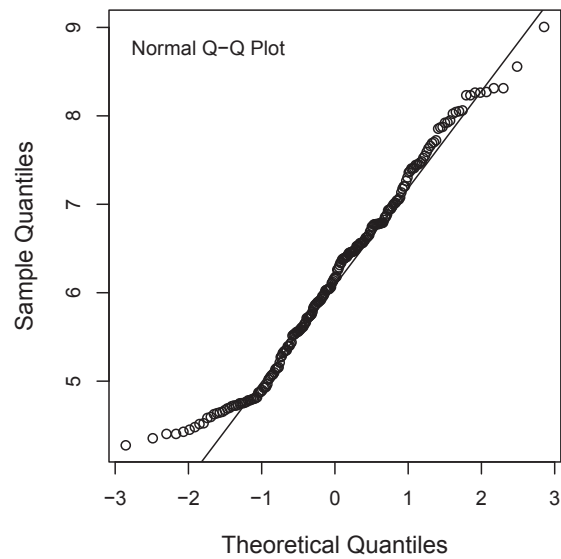
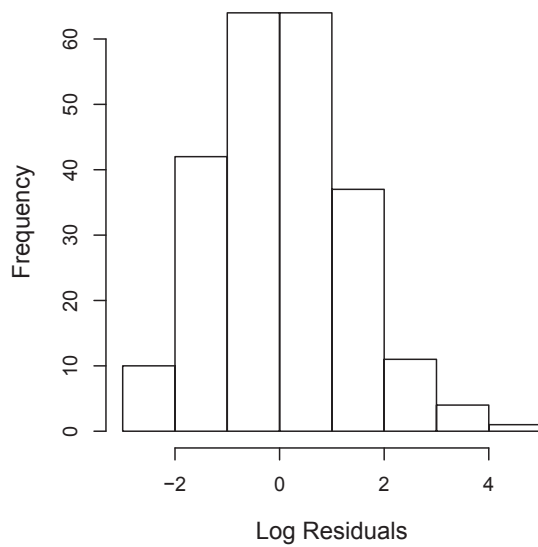
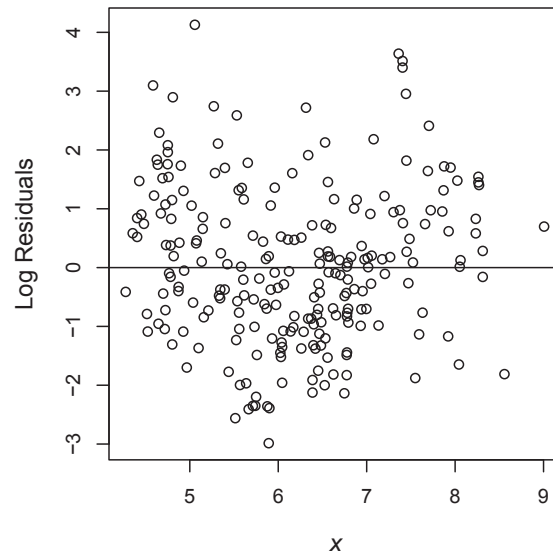
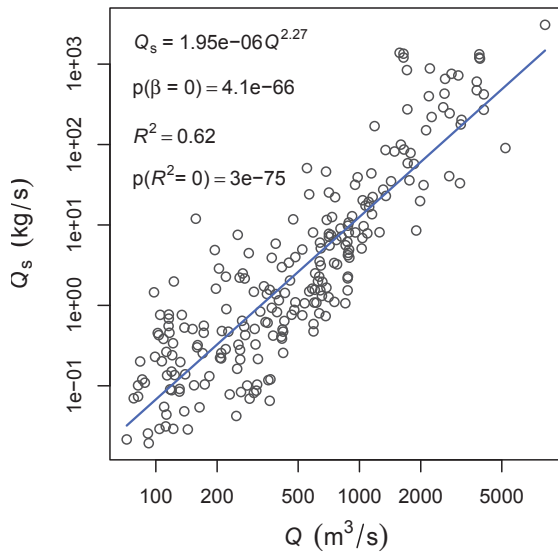
Fine Bed Sites

1401000 - Stony Brook at Princeton NJ



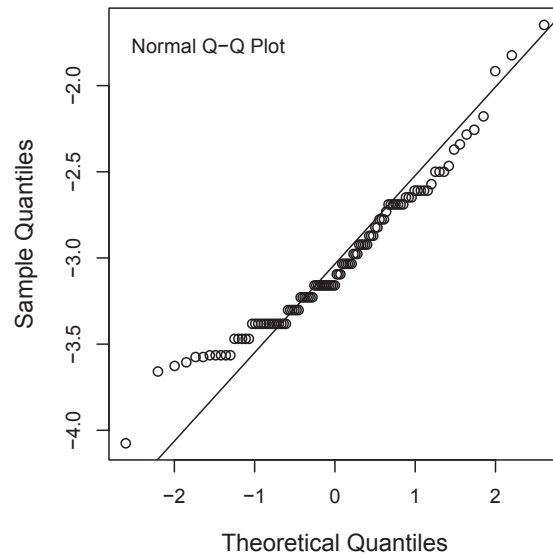
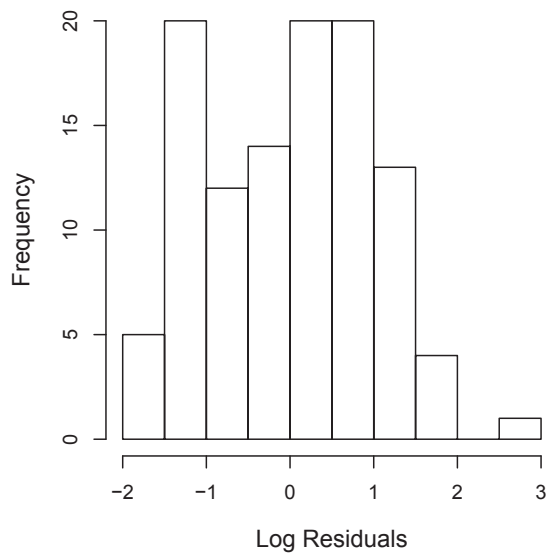
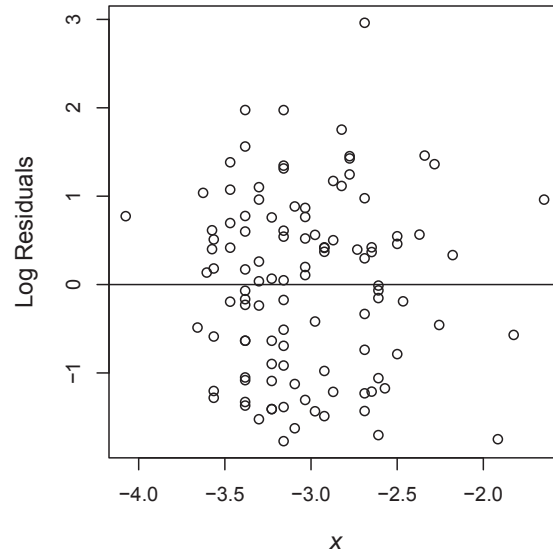
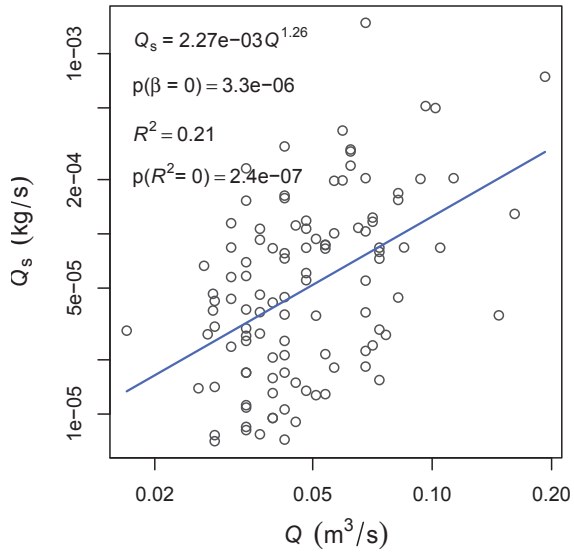
Fine Bed Sites

1463500 - Delaware River at Trenton NJ



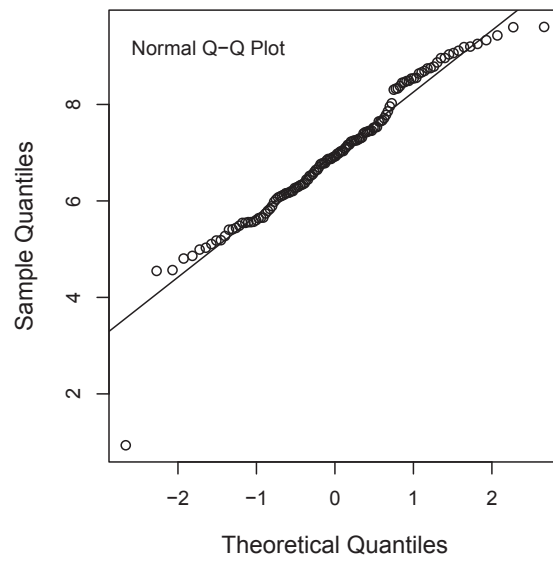
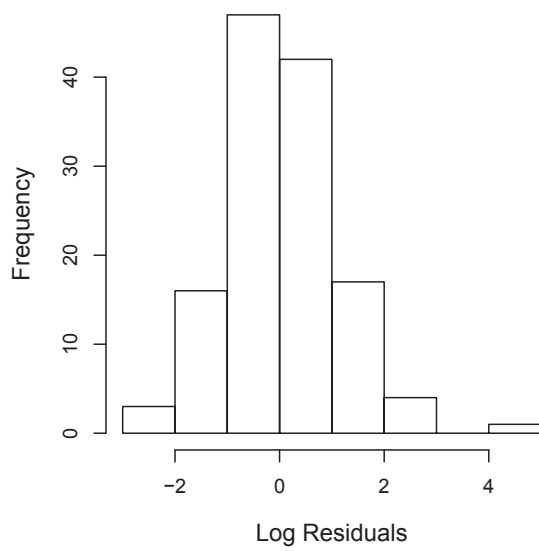
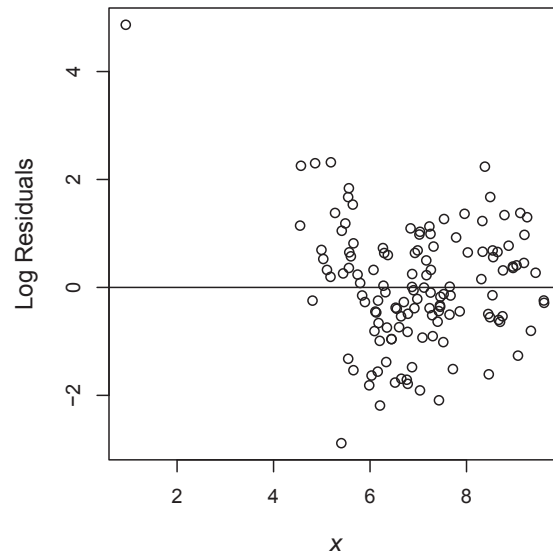
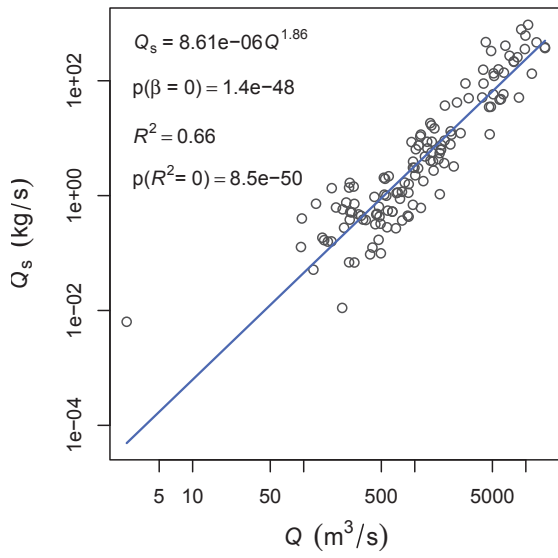
Fine Bed Sites

1466500 – McDonalds Branch in Byrne State Forest NJ



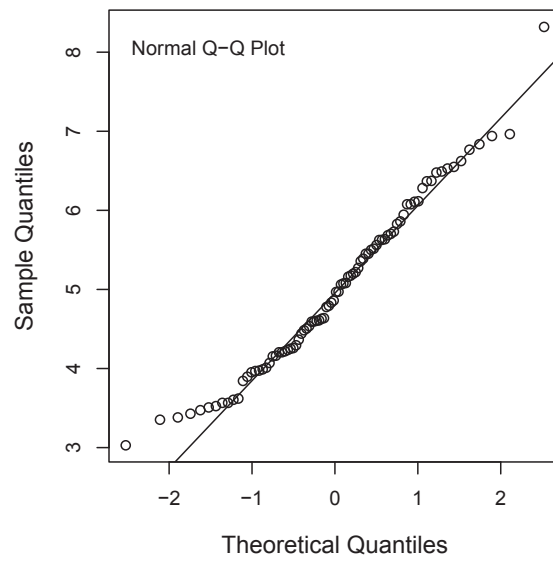
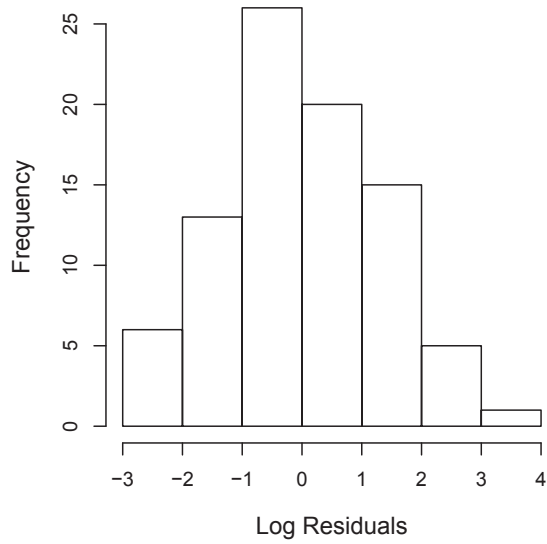
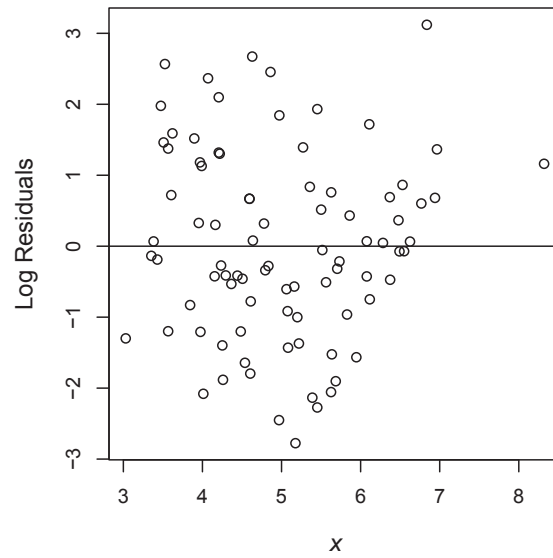
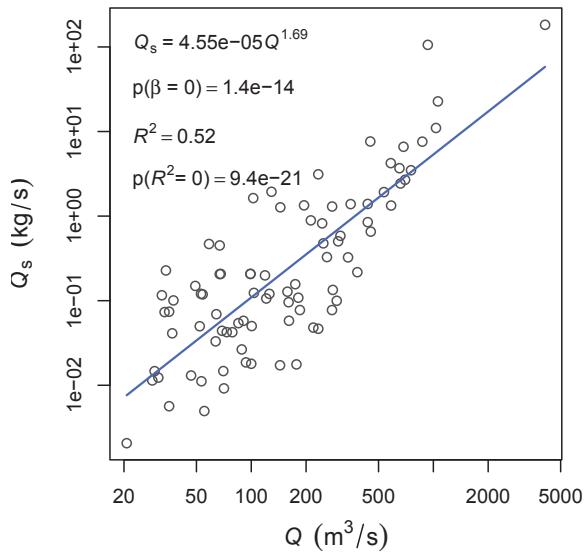
Fine Bed Sites

1570500 - Susquehanna River at Harrisburg, PA



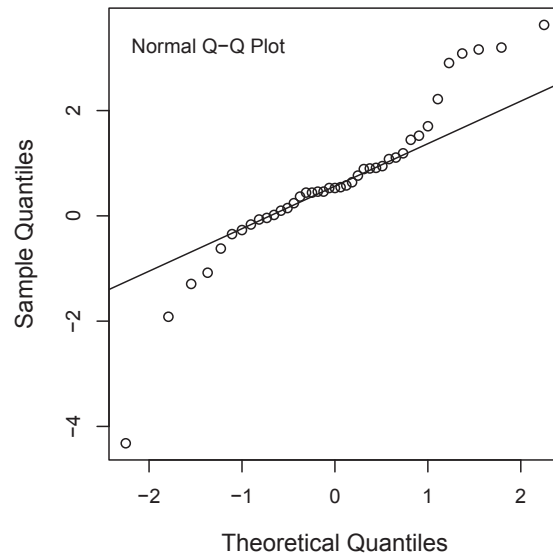
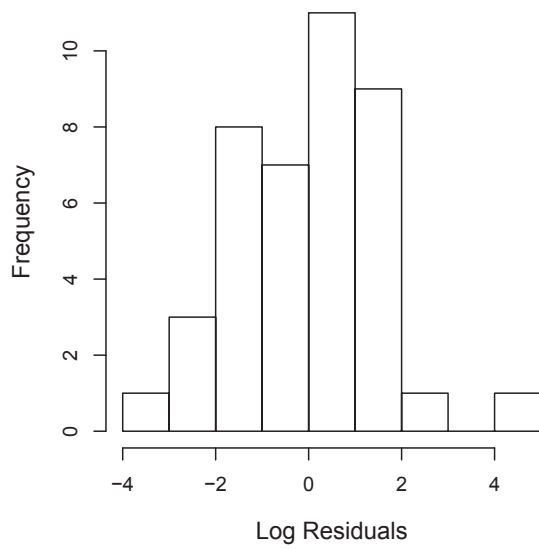
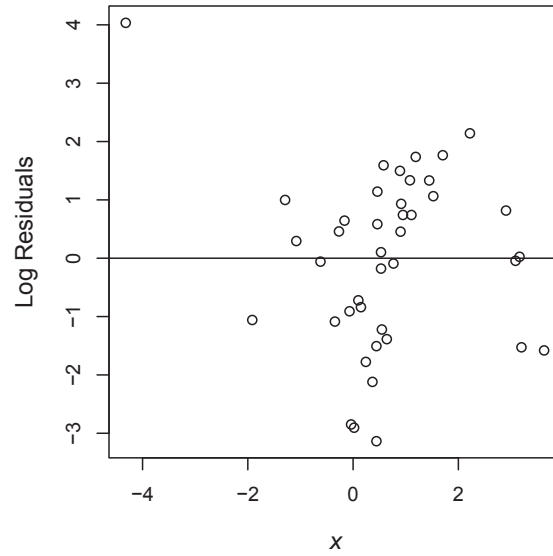
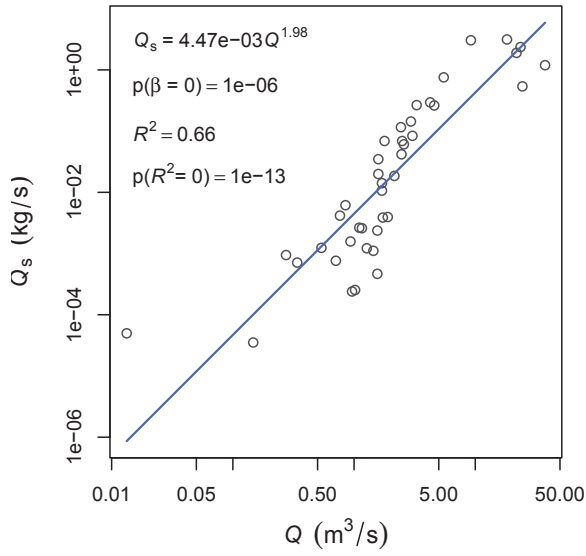
Fine Bed Sites

1618000 - POTOMAC RIVER AT SHEPHERDSTOWN, WV



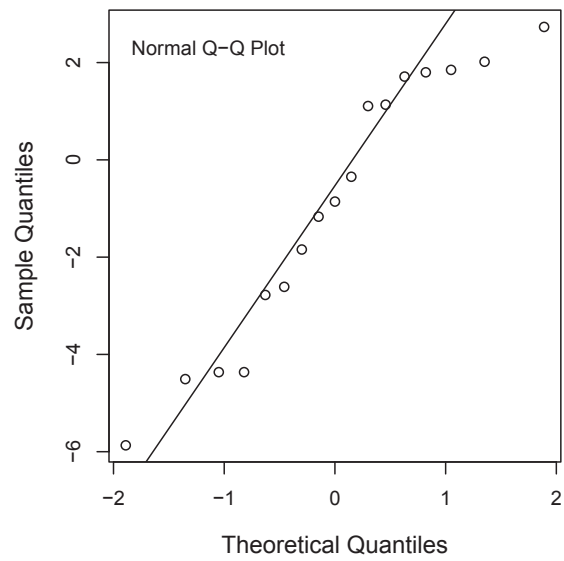
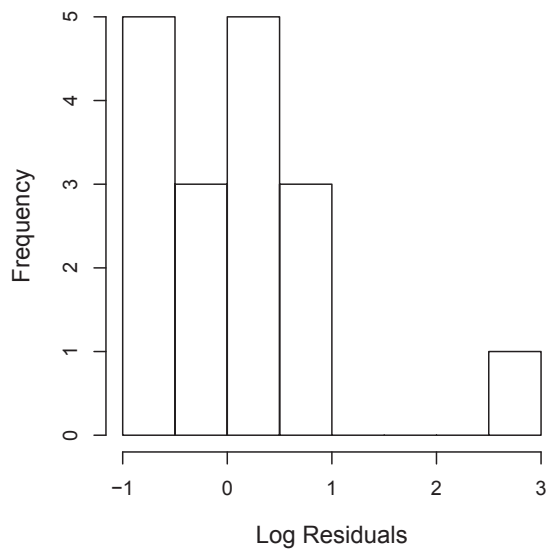
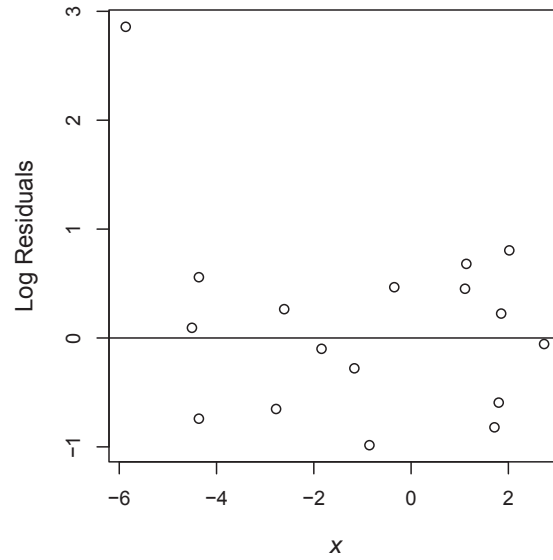
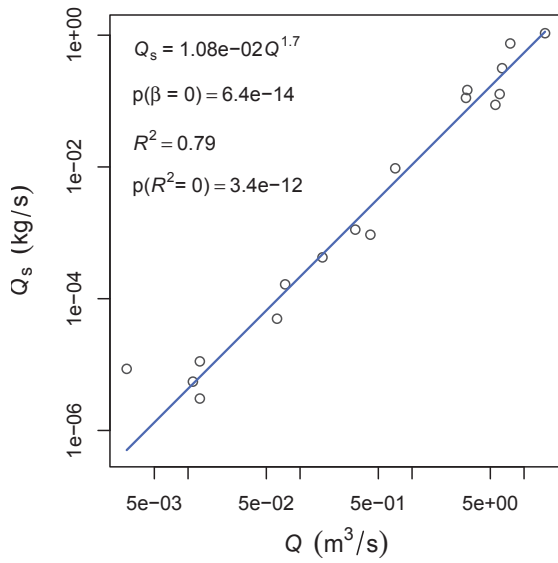
Fine Bed Sites

1653600 - PISCATAWAY CREEK AT PISCATAWAY, MD



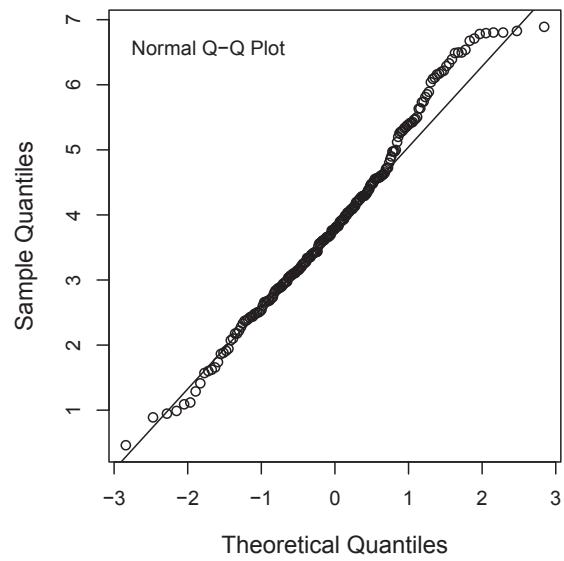
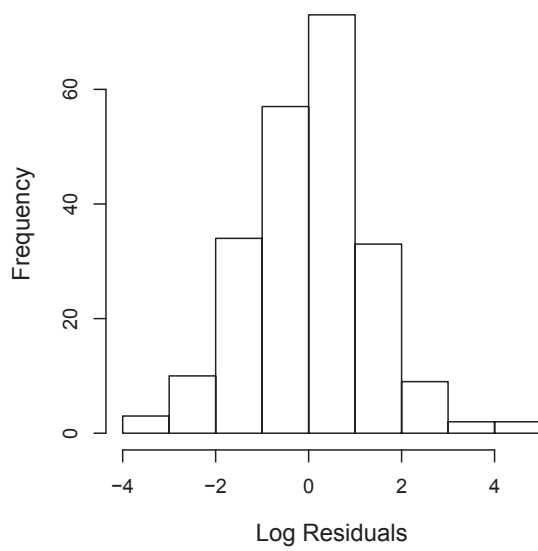
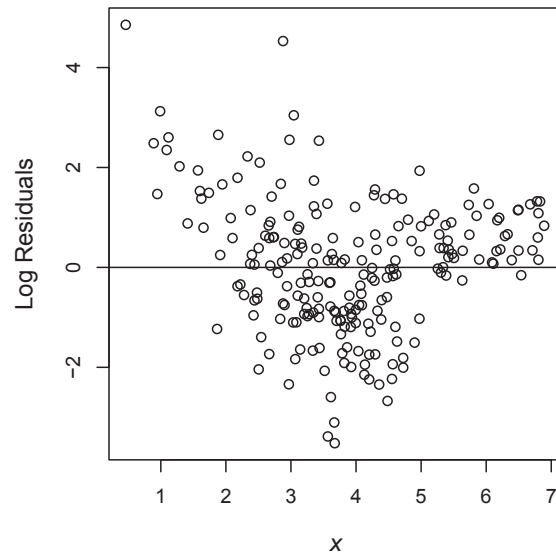
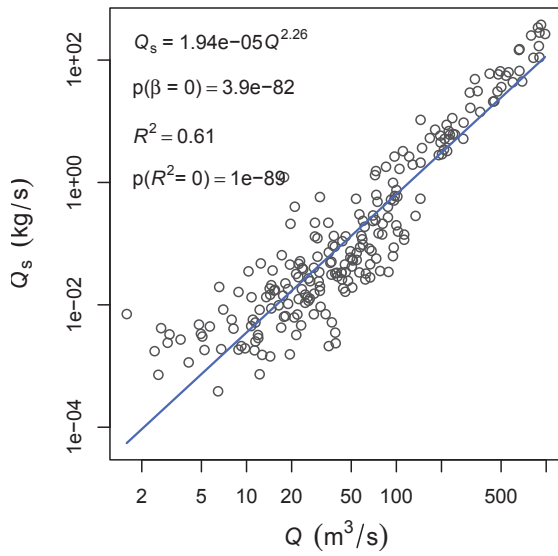
Fine Bed Sites

1658500 - S F QUANTICO CREEK NEAR INDEPENDENT HILL, VA



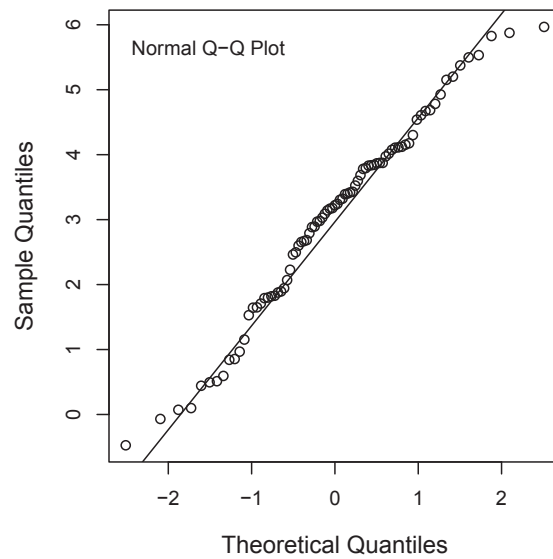
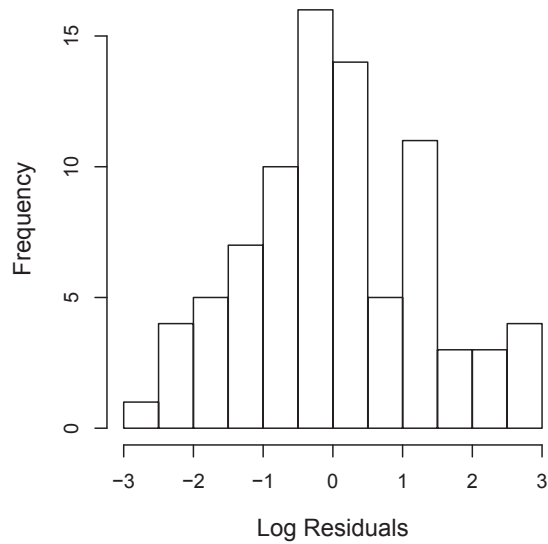
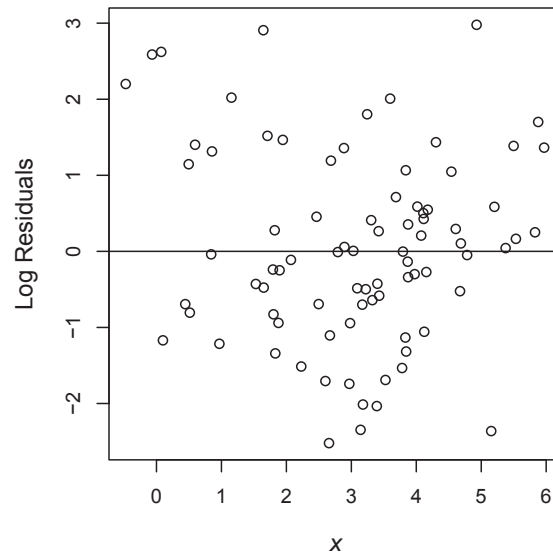
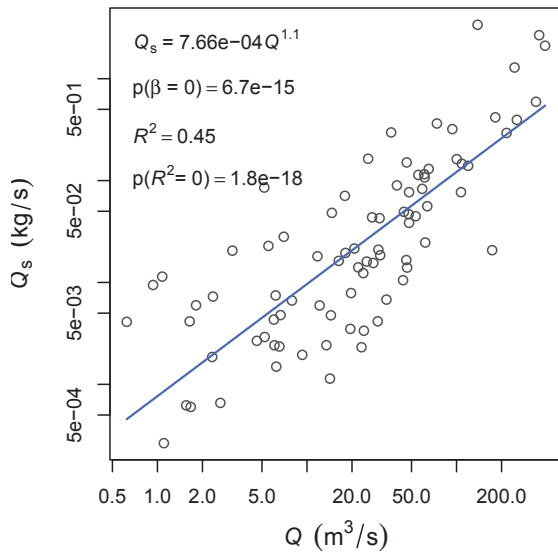
Fine Bed Sites

1668000 - RAPPAHANNOCK RIVER NEAR FREDERICKSBURG, VA



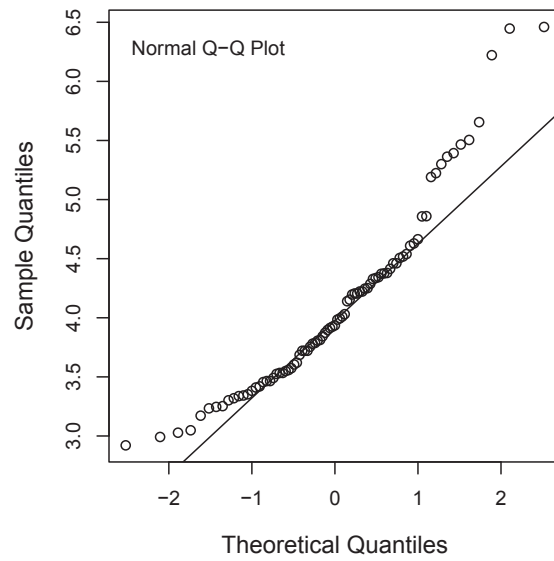
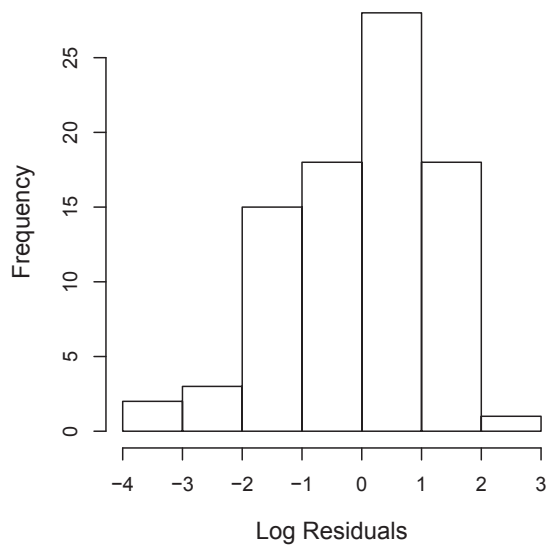
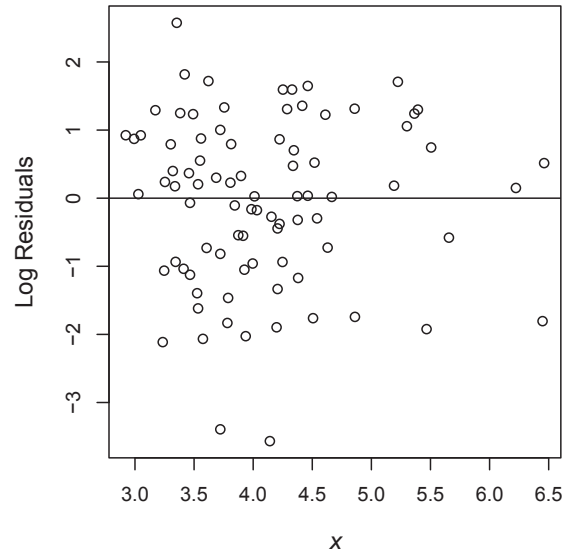
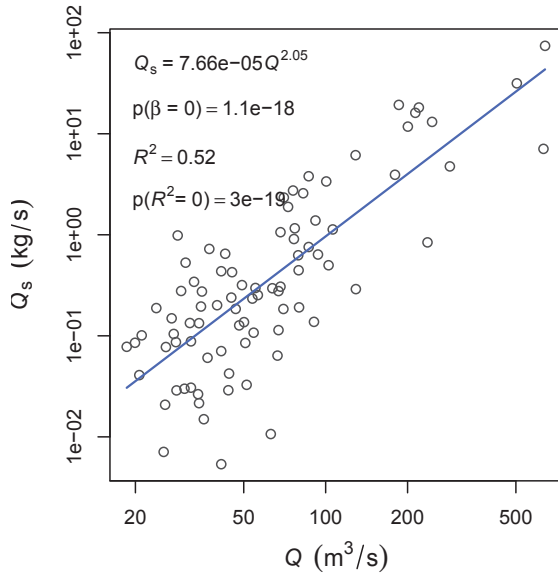
Fine Bed Sites

2047000 - NOTTOWAY RIVER NEAR SEBRELL, VA



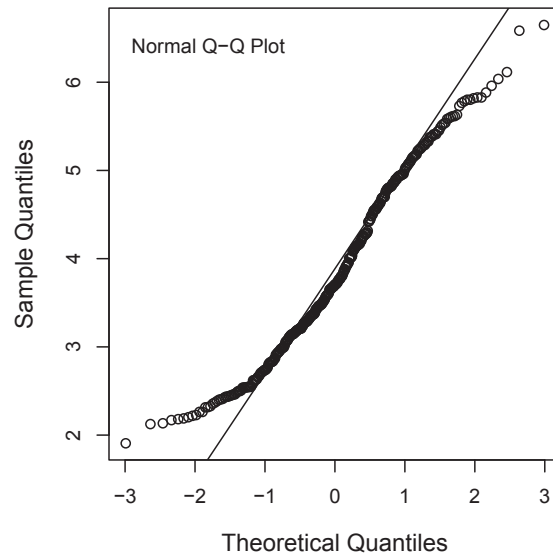
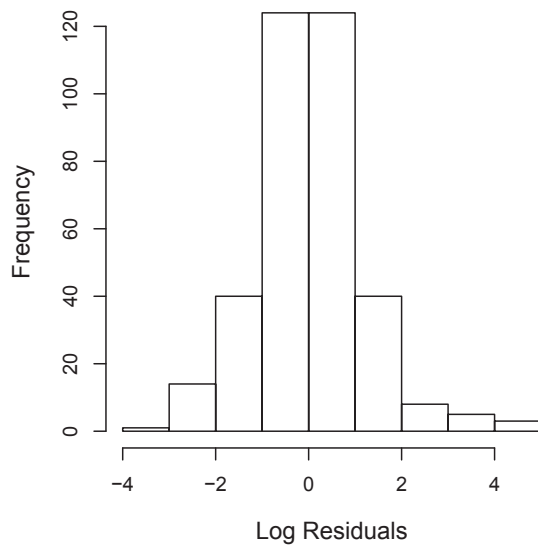
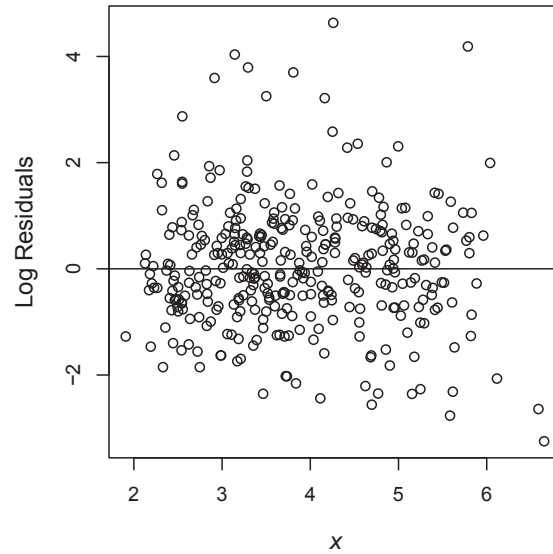
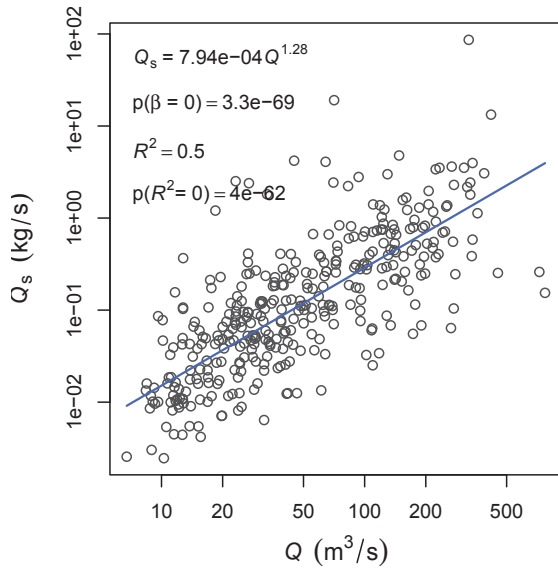
Fine Bed Sites

2075500 - DAN RIVER AT PACES, VA



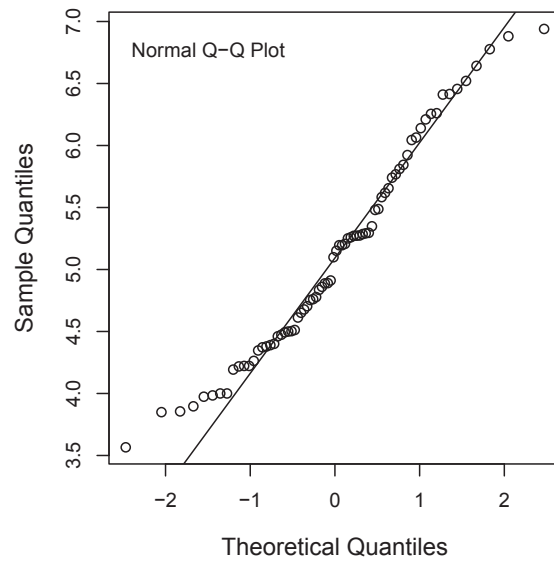
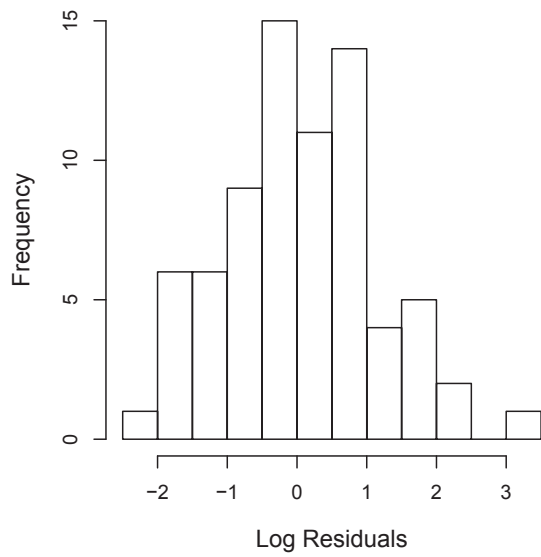
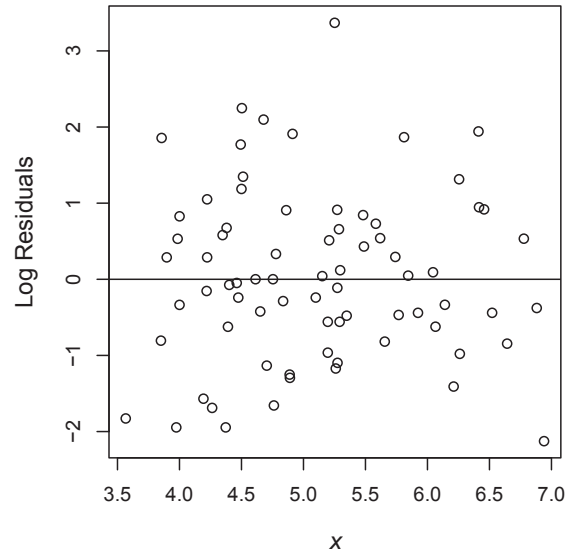
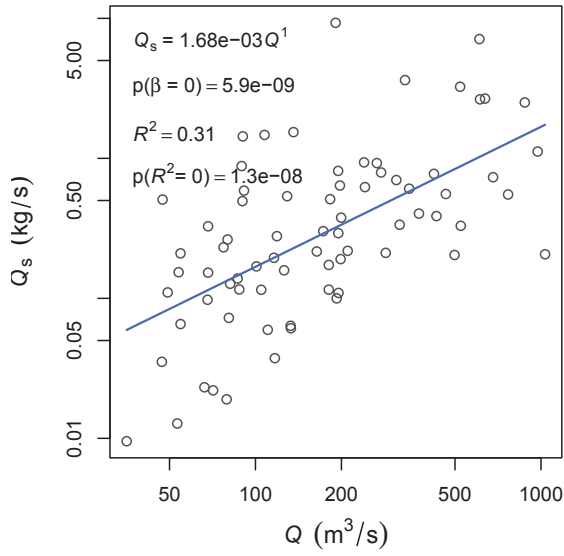
Fine Bed Sites

2089500 - NEUSE RIVER AT KINSTON, NC



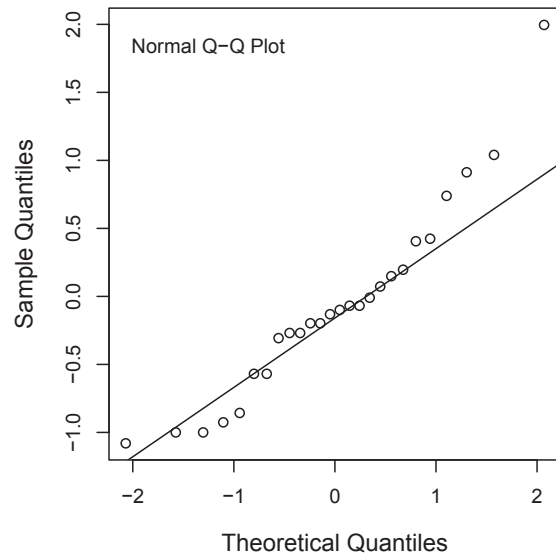
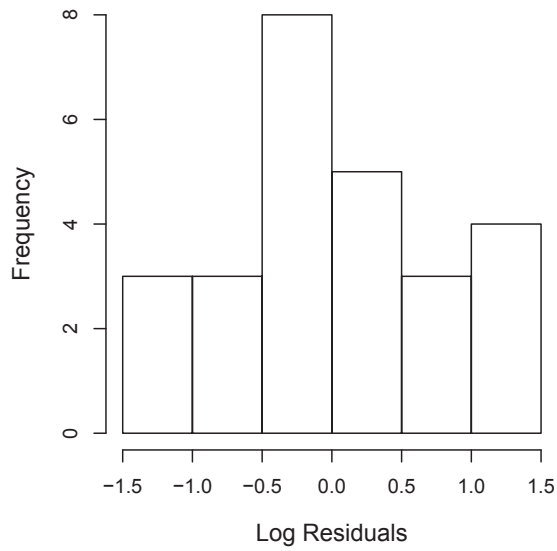
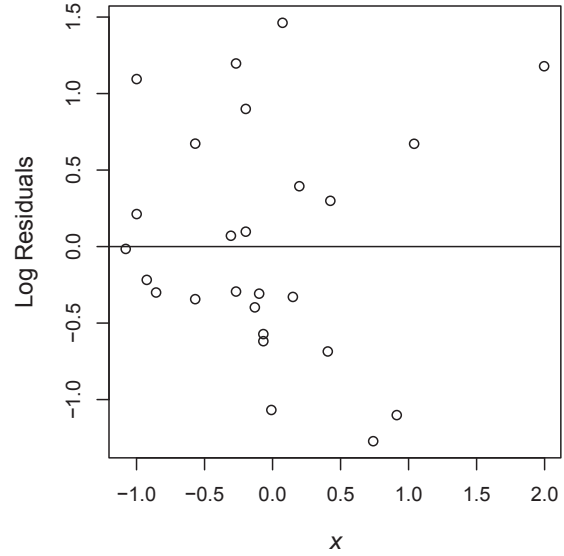
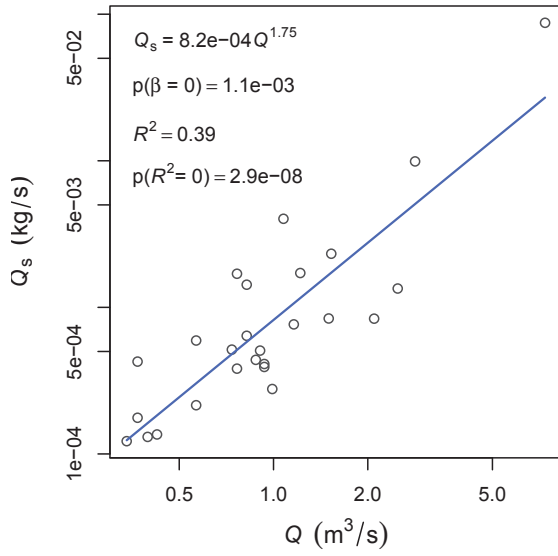
Fine Bed Sites

2131000 - PEE DEE RIVER AT PEEDEE, SC



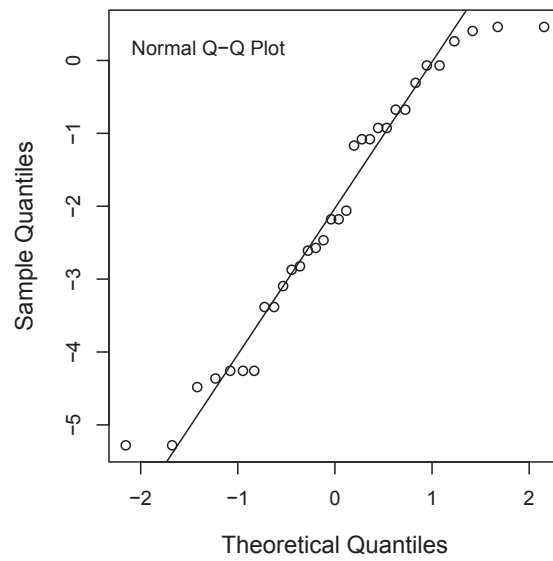
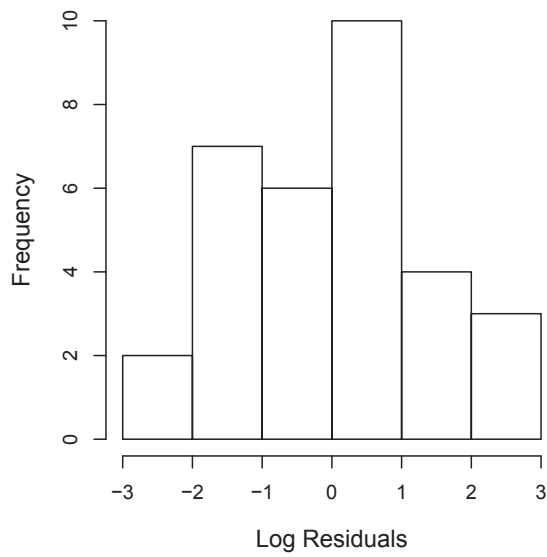
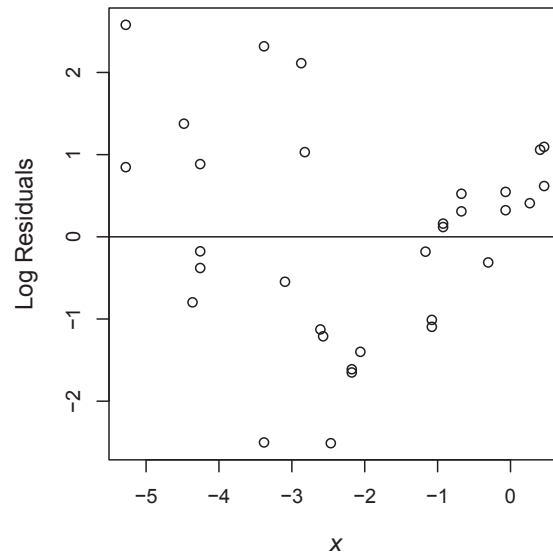
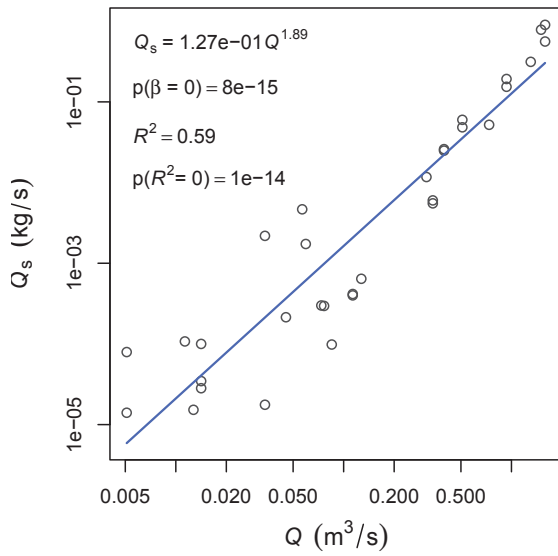
Fine Bed Sites

2143040 - JACOB FORK AT RAMSEY, NC



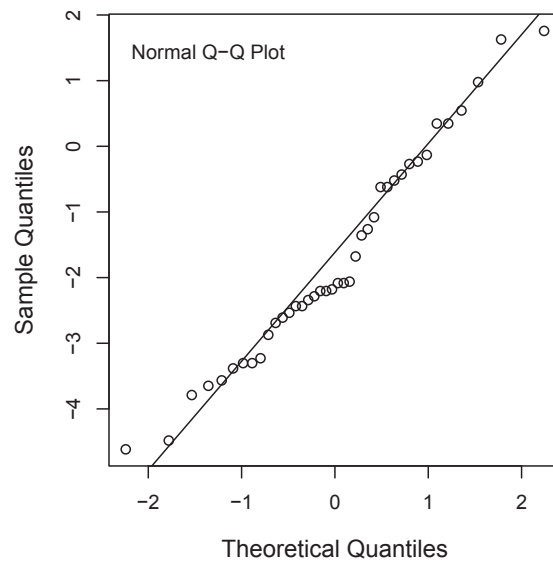
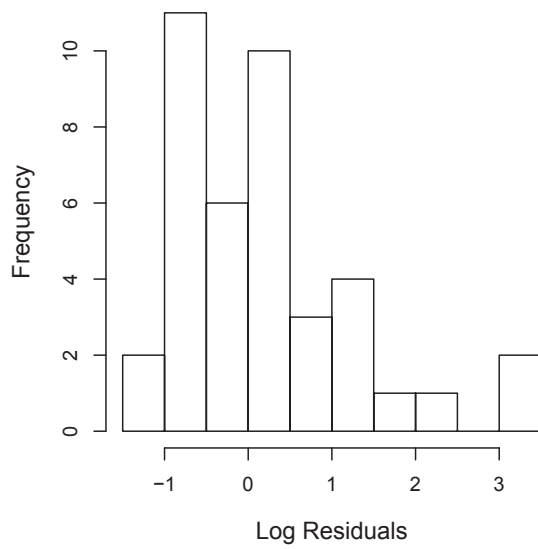
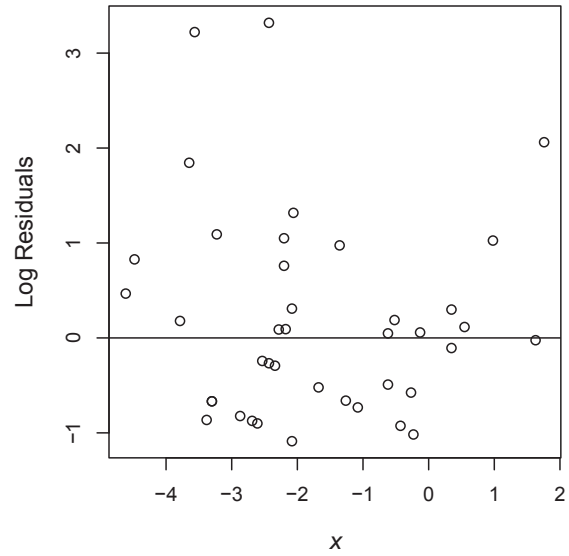
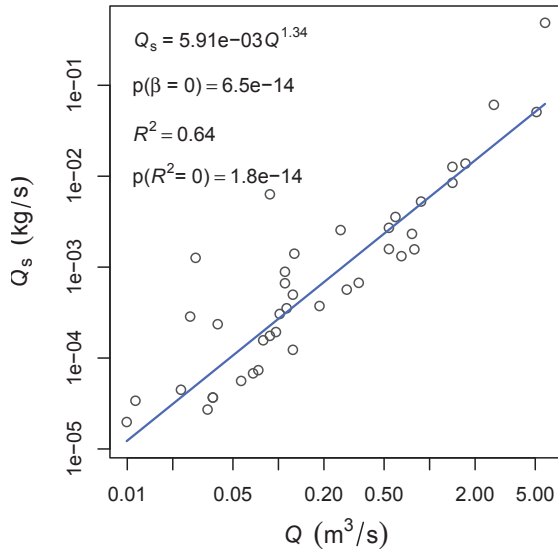
Fine Bed Sites

2217274 - WHEELER CREEK AT BILL CHEEK ROAD, NEAR AUBURN, GA



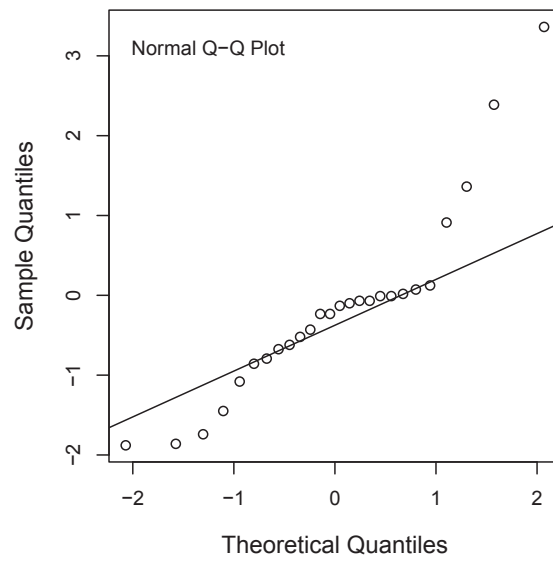
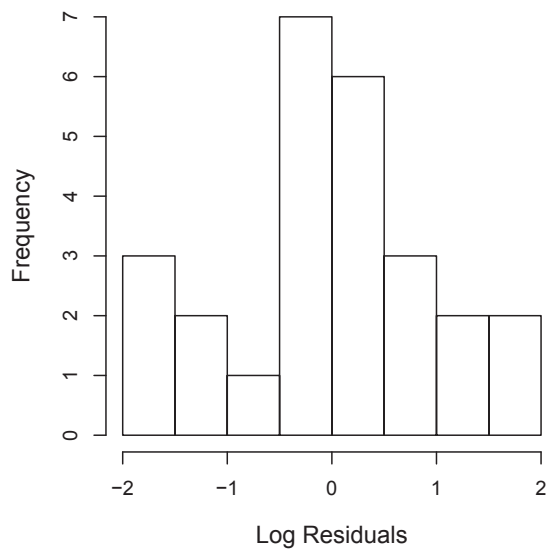
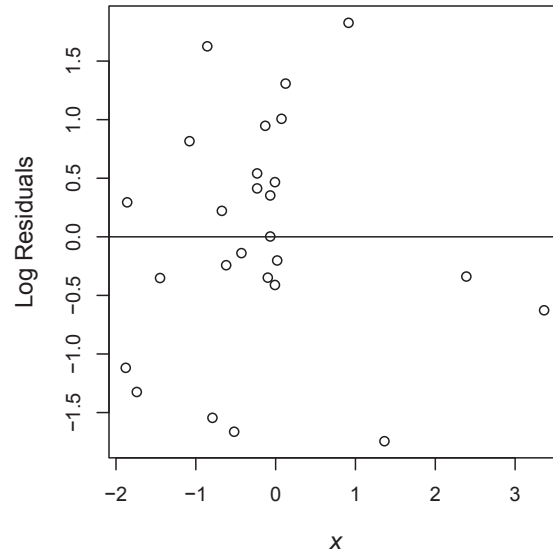
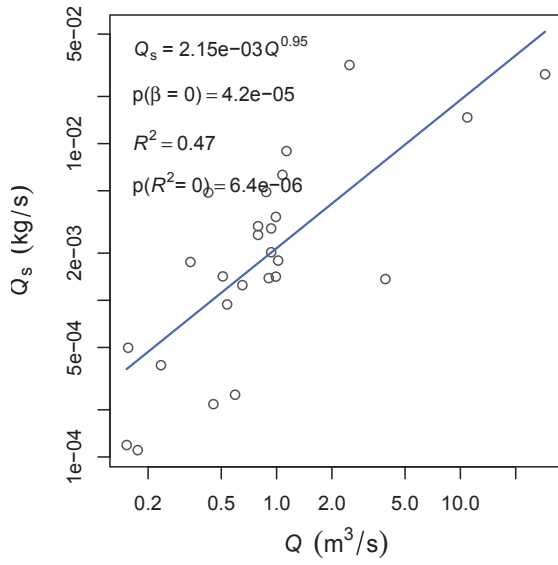
Fine Bed Sites

2248000 - SPRUCE CREEK NEAR SAMSULA, FL



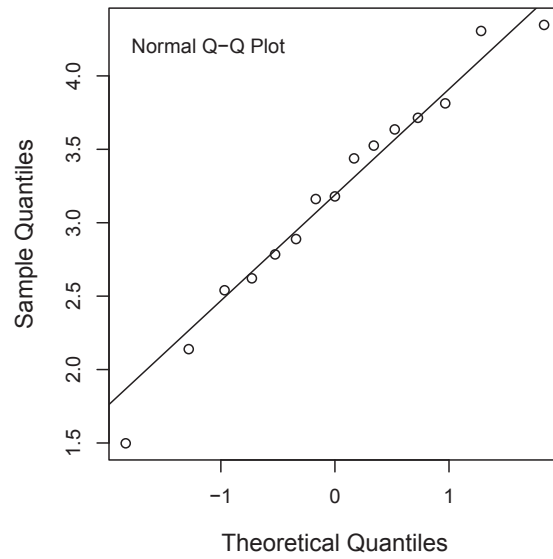
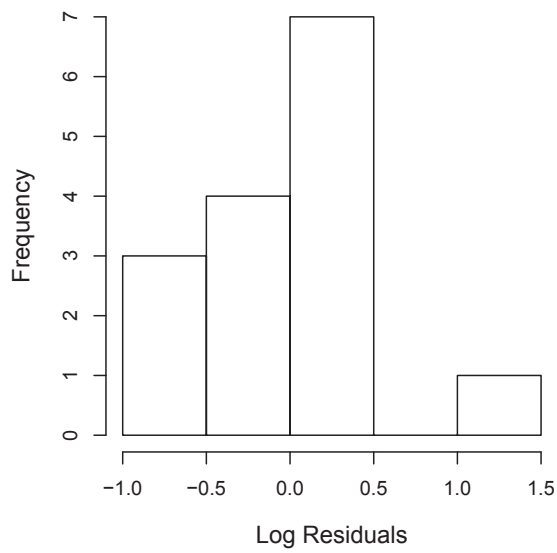
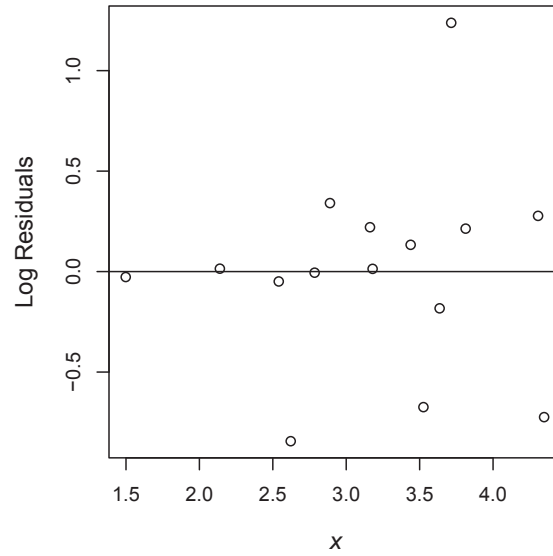
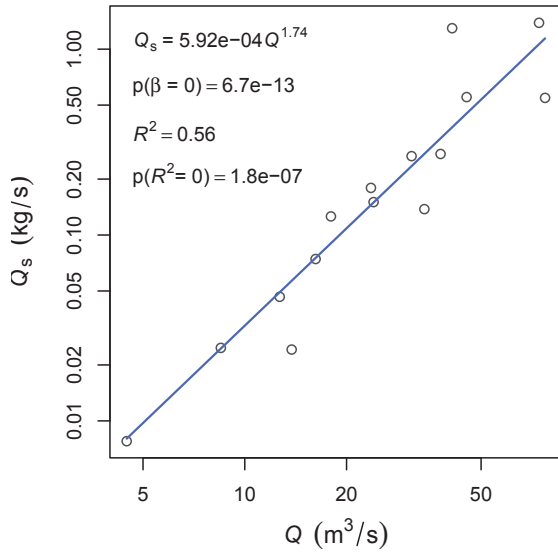
Fine Bed Sites

2300700 - BULLFROG CREEK NEAR WIMAUMA FL



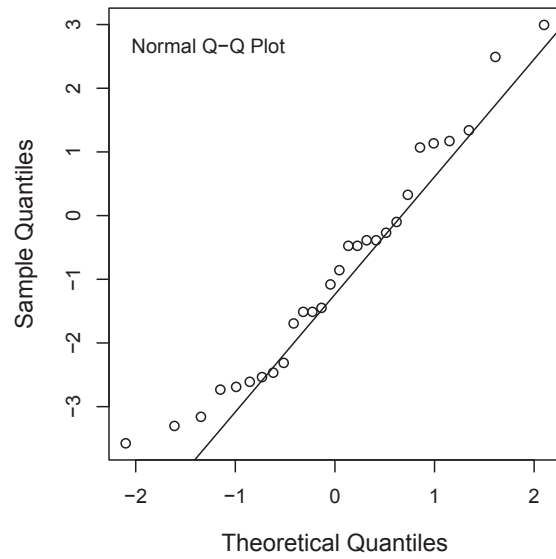
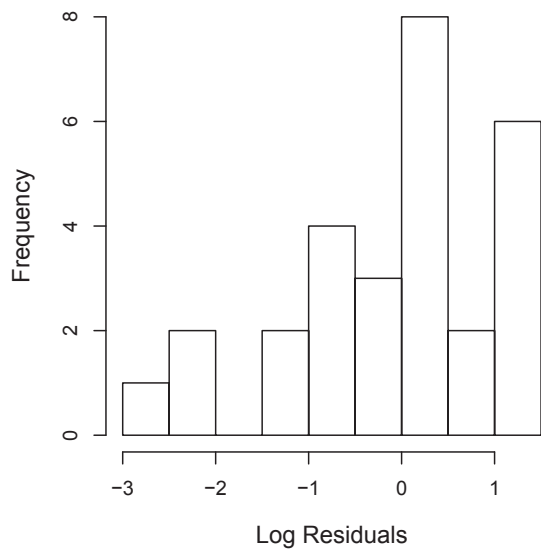
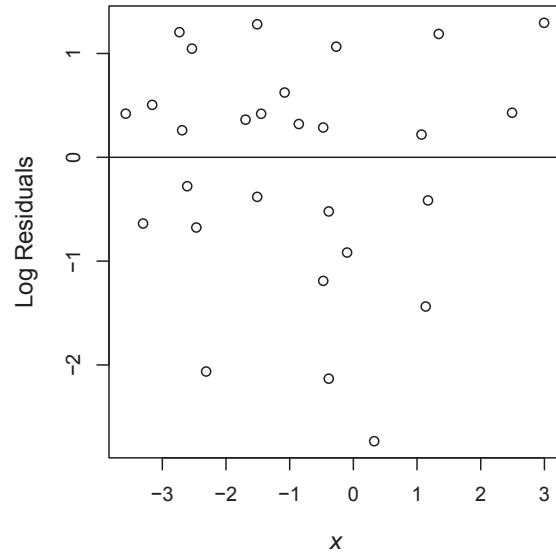
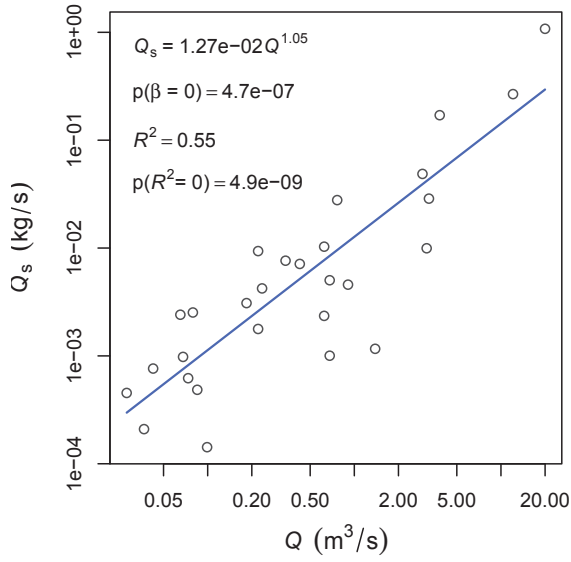
Fine Bed Sites

3261950 - Loramie Creek near Newport OH



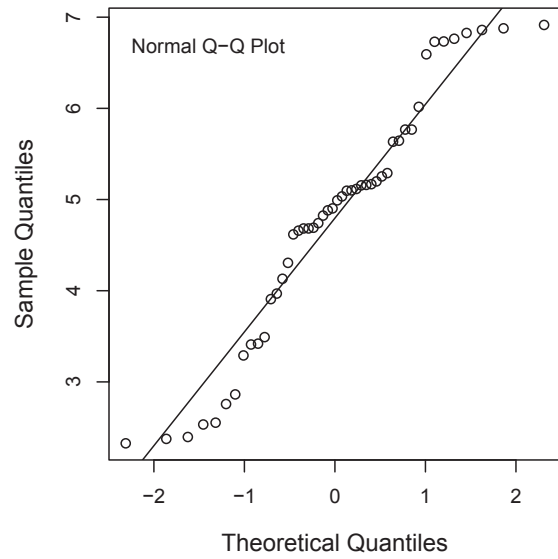
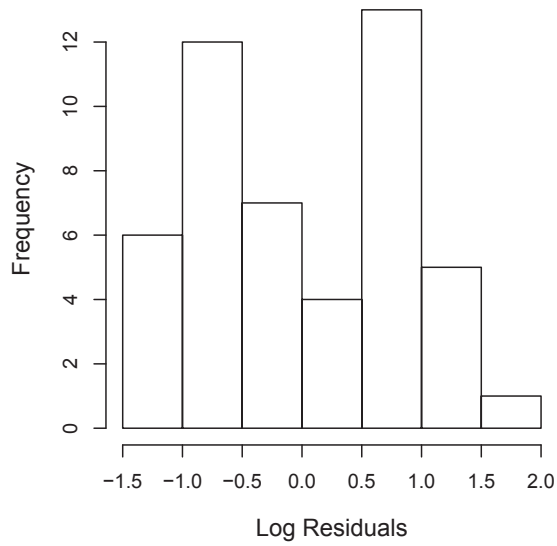
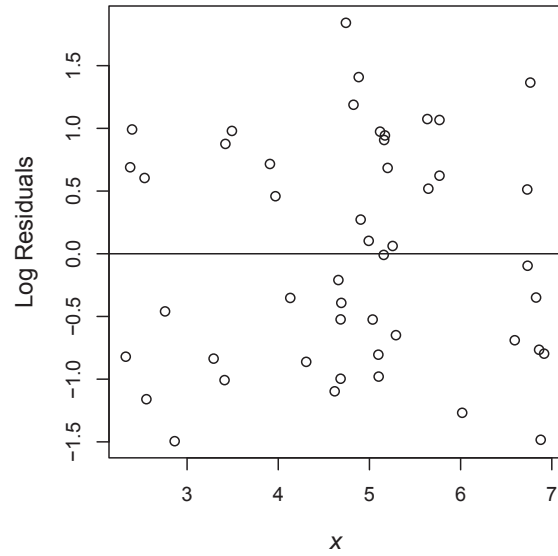
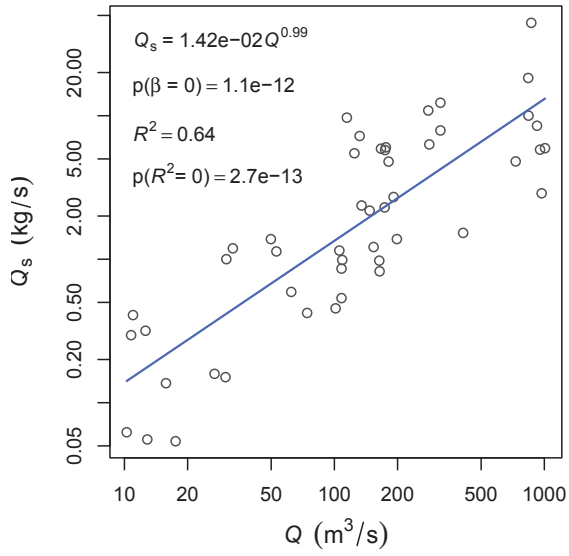
Fine Bed Sites

3353600 - LITTLE EAGLE CREEK AT SPEEDWAY, IN



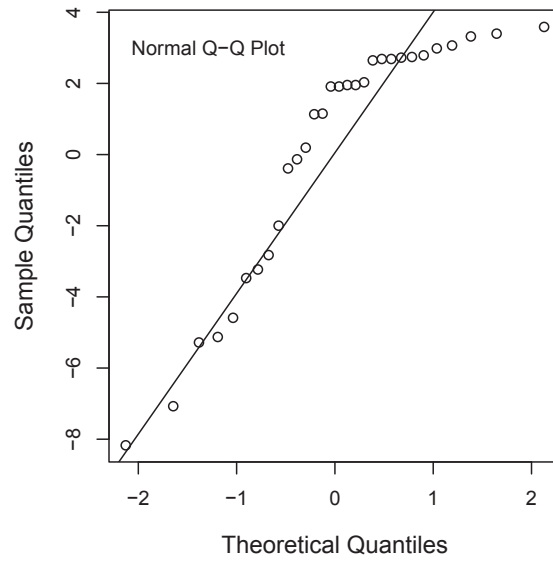
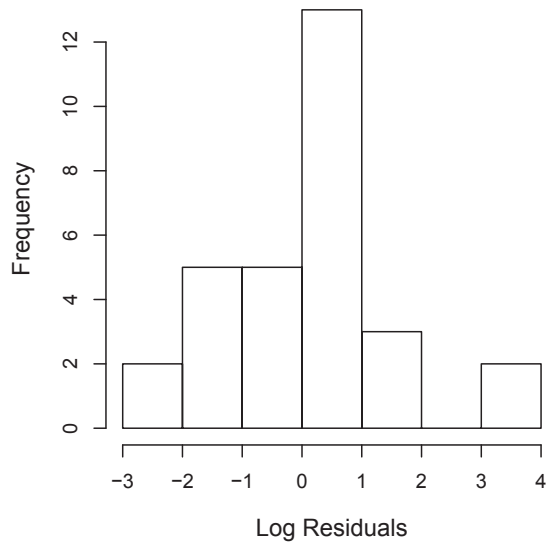
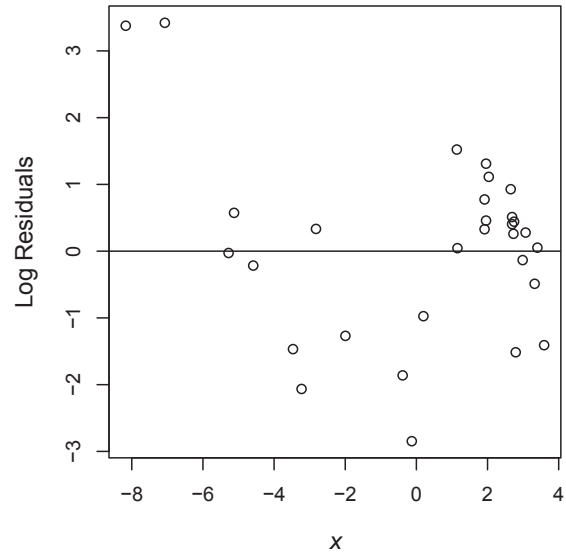
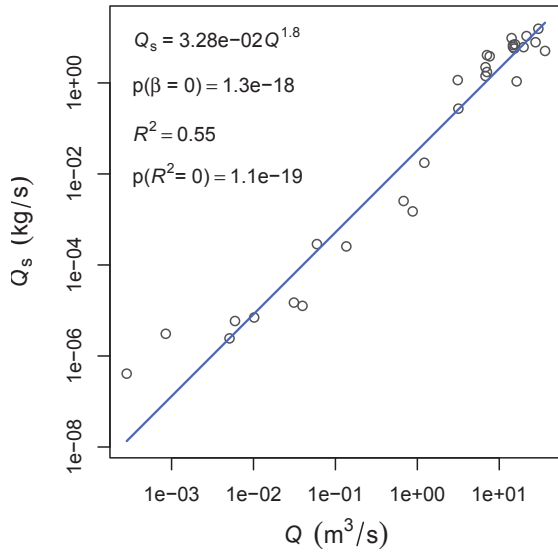
Fine Bed Sites

3365500 - EAST FORK WHITE RIVER AT SEYMOUR, IN



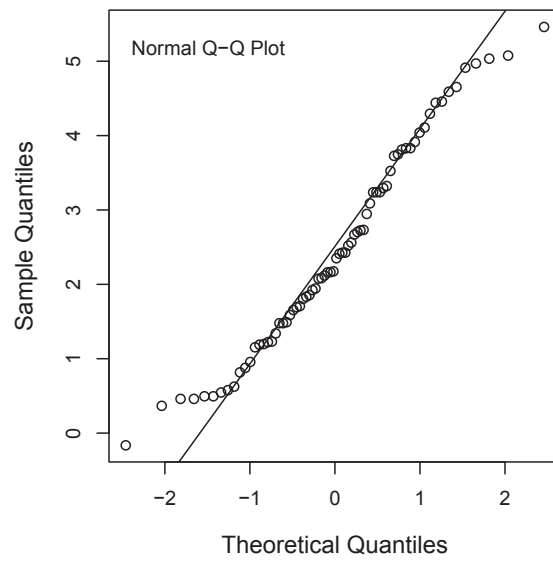
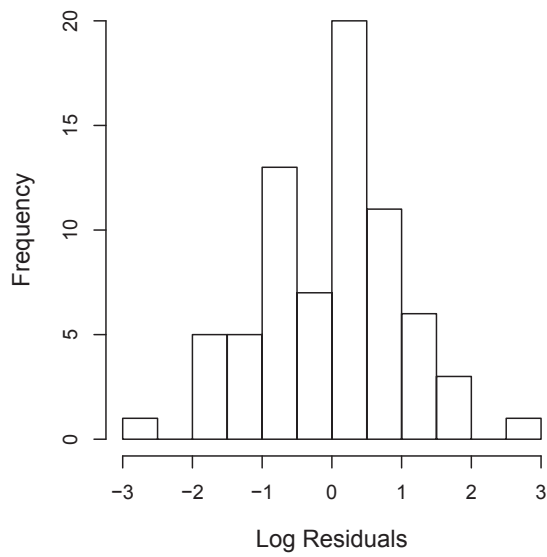
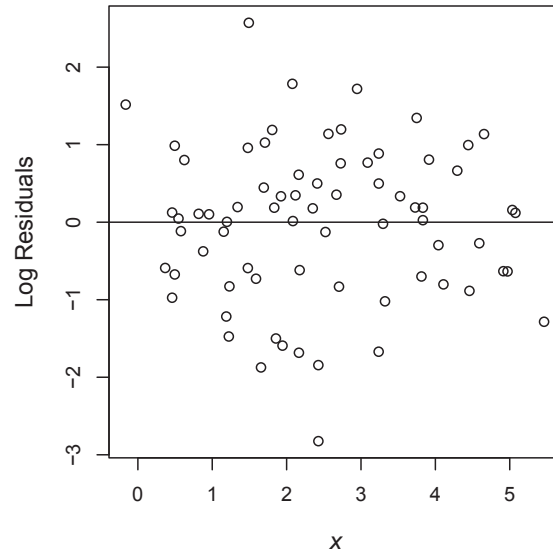
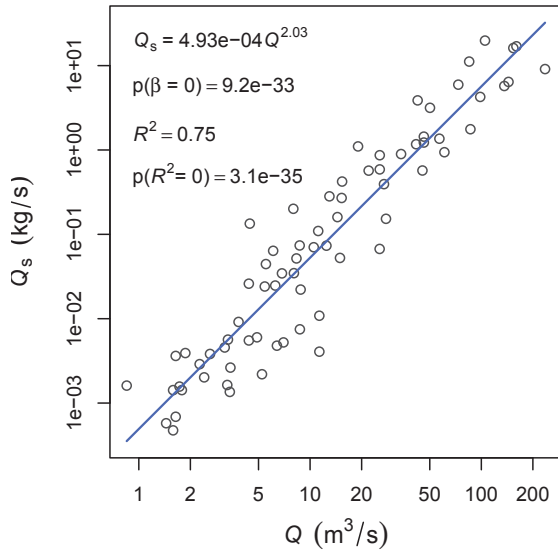
Fine Bed Sites

3382170 - BRUSHY CREEK NEAR HARCO, IL



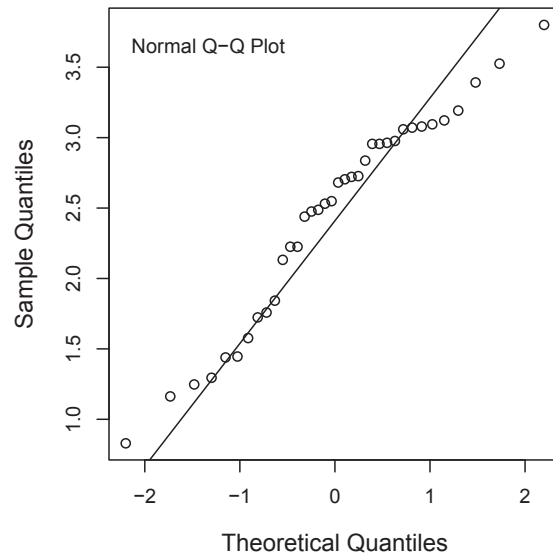
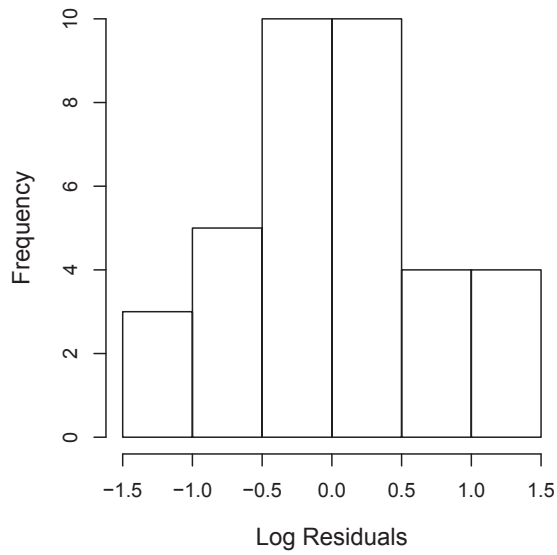
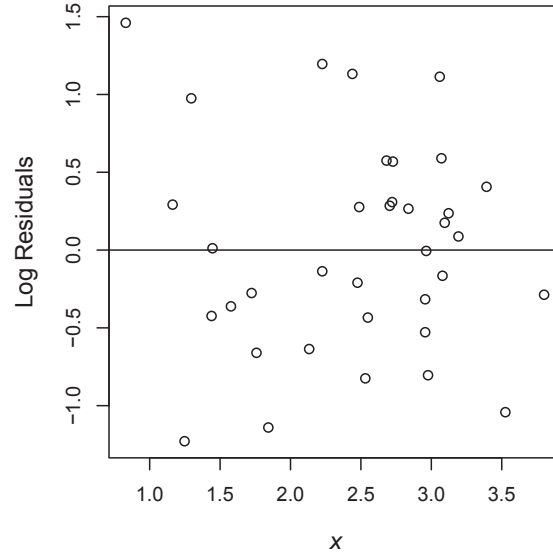
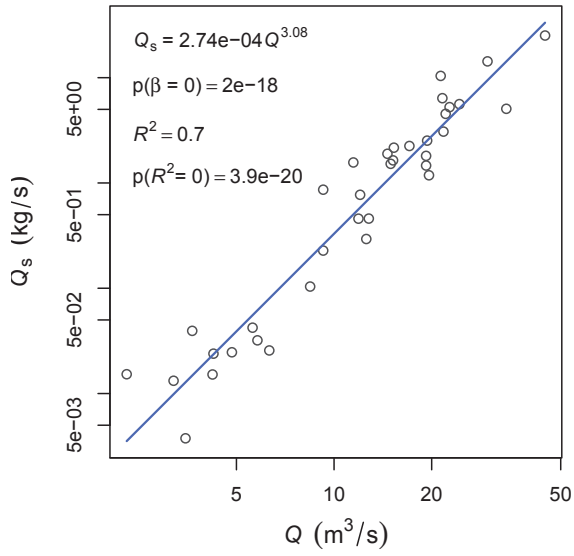
Fine Bed Sites

4024430 - NEMADJI RIVER NEAR SOUTH SUPERIOR, WI



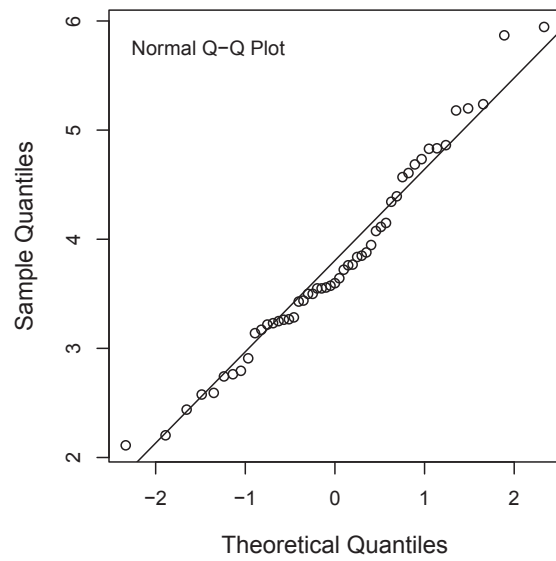
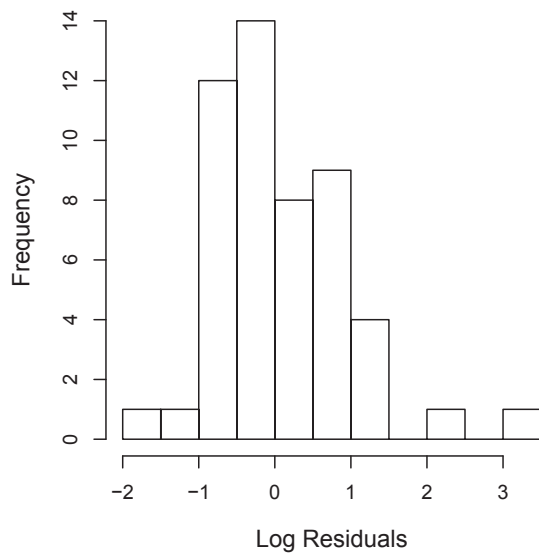
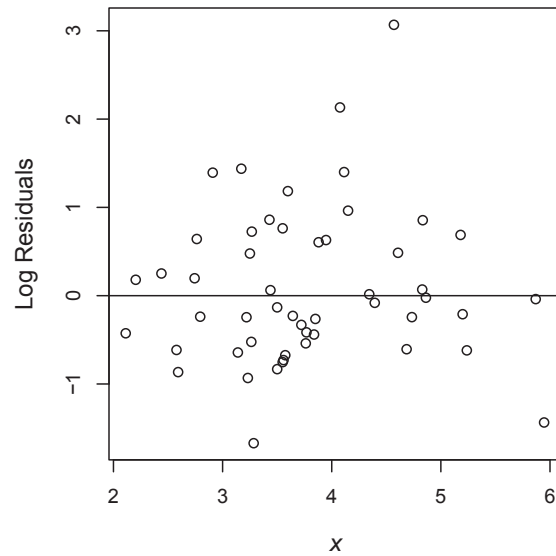
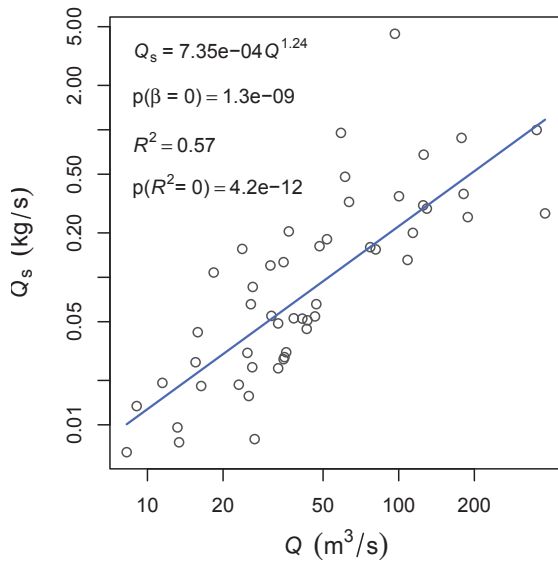
Fine Bed Sites

4230380 - OATKA CREEK AT WARSAW NY



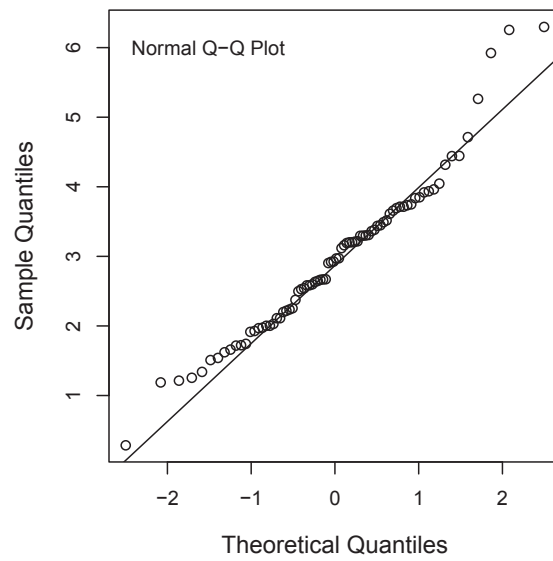
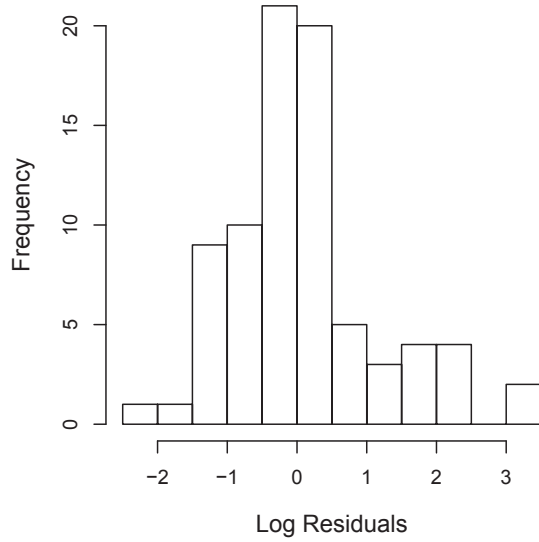
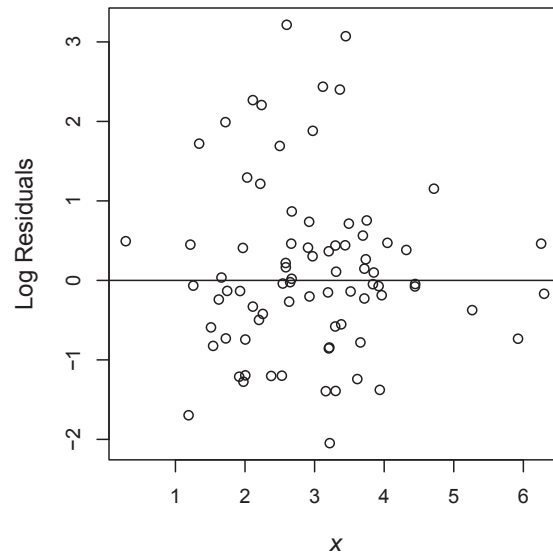
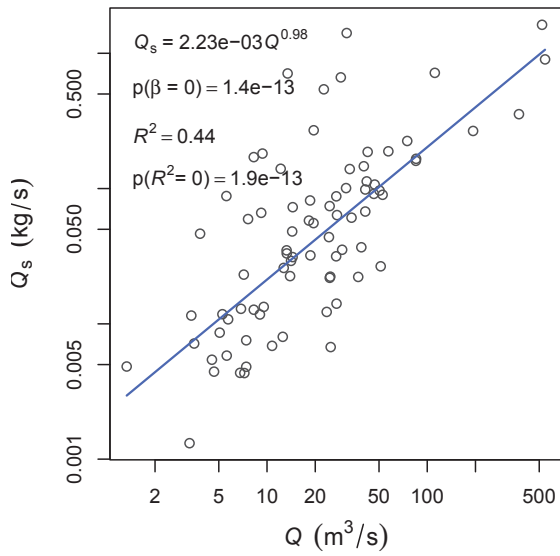
Fine Bed Sites

5054000 - RED RIVER OF THE NORTH AT FARGO, ND



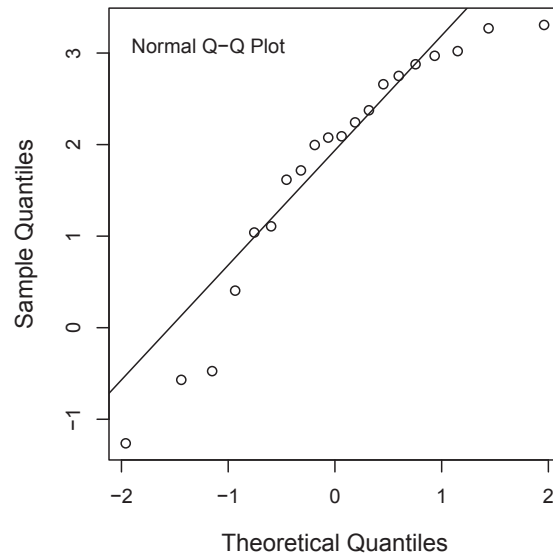
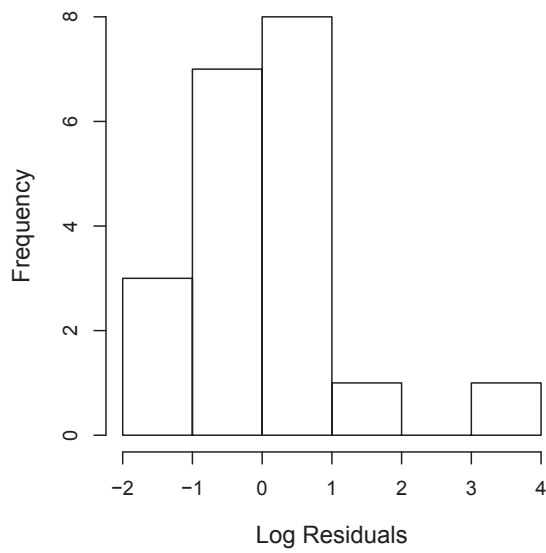
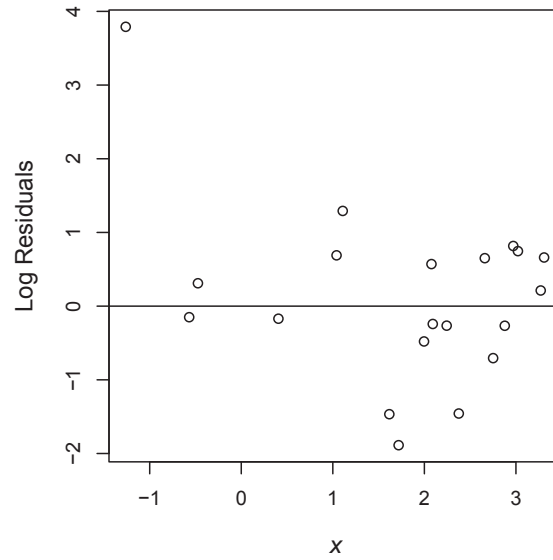
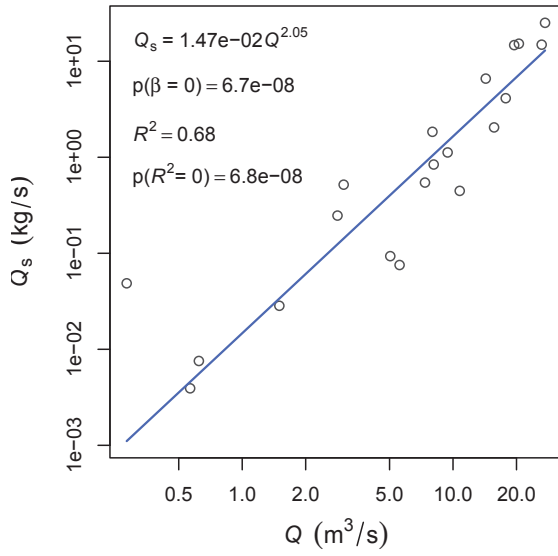
Fine Bed Sites

5064500 - RED RIVER OF THE NORTH AT HALSTAD, MN



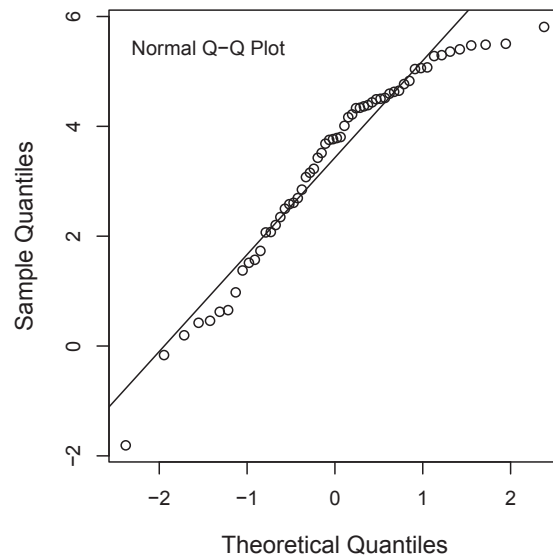
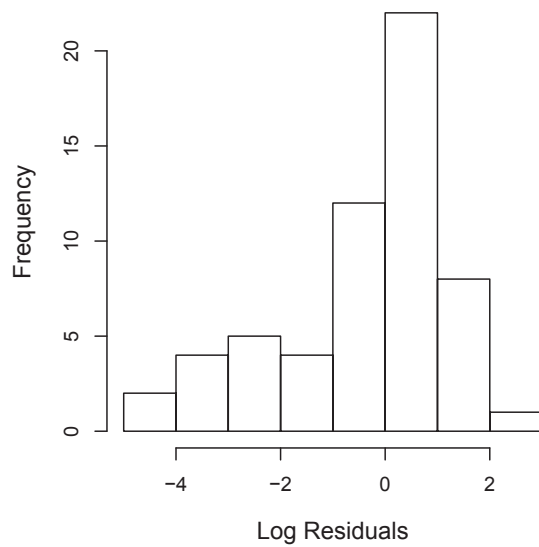
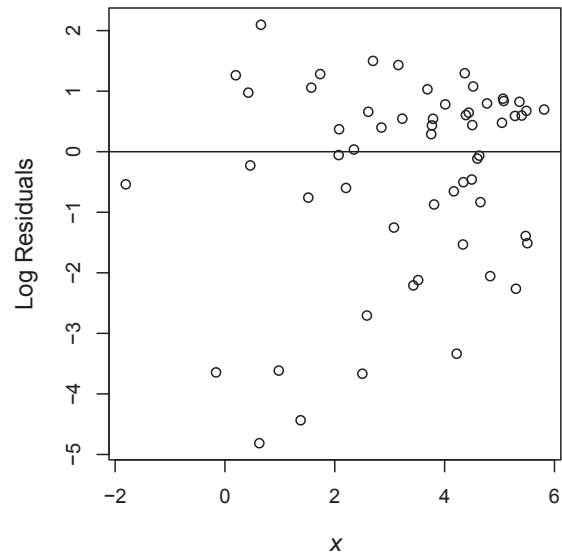
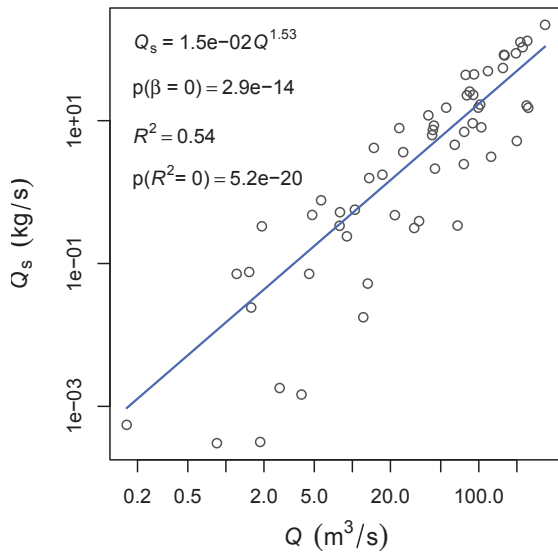
Fine Bed Sites

5099400 - LITTLE SOUTH PEMBINA RIVER NR WALHALLA, ND



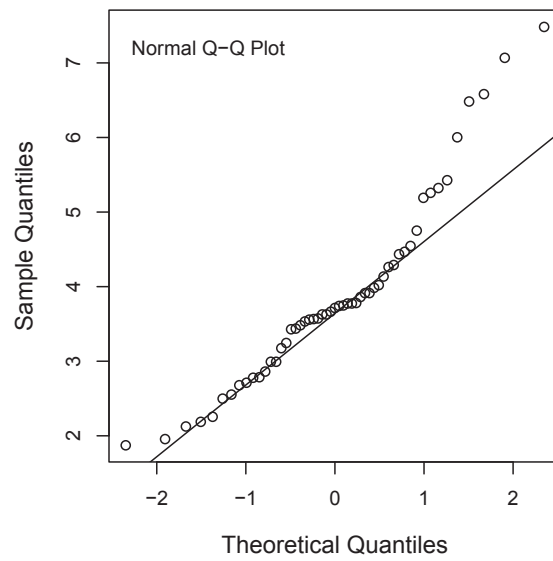
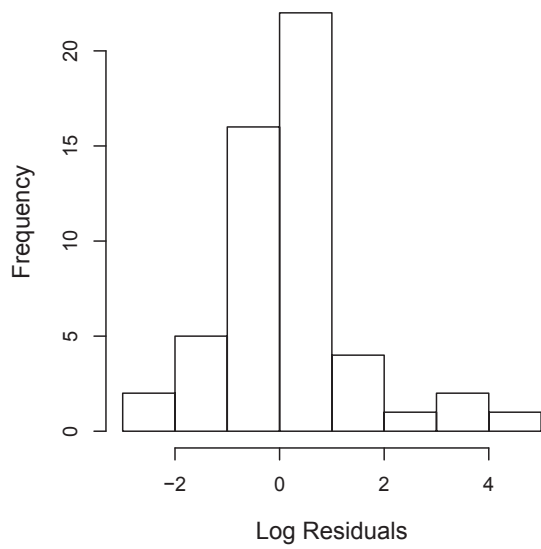
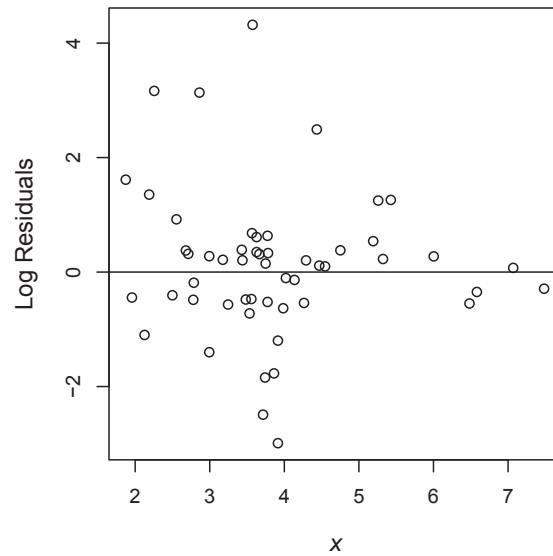
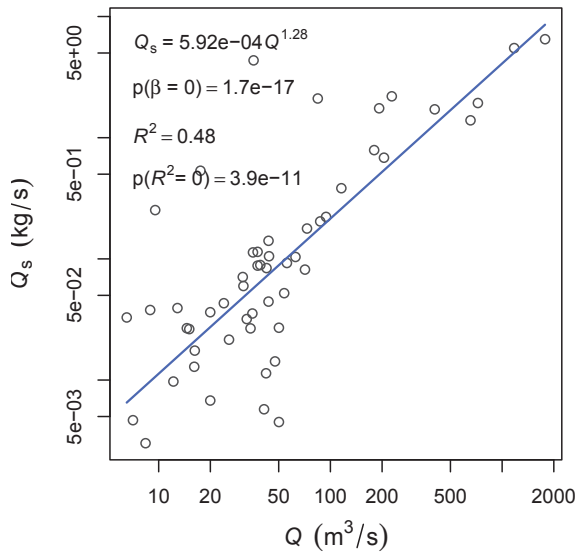
Fine Bed Sites

5099600 - PEMBINA RIVER AT WALHALLA, ND



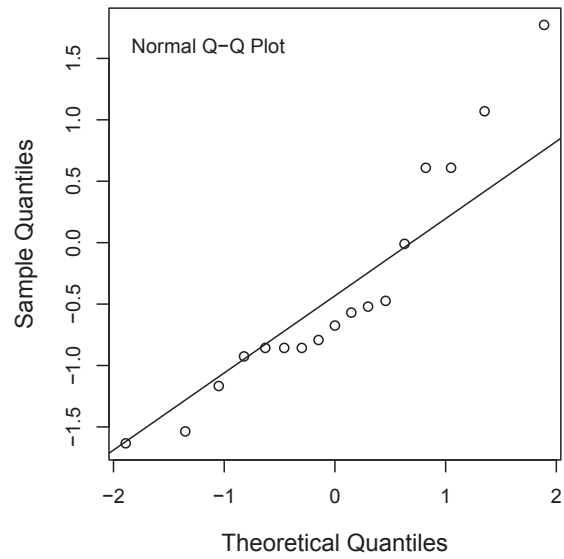
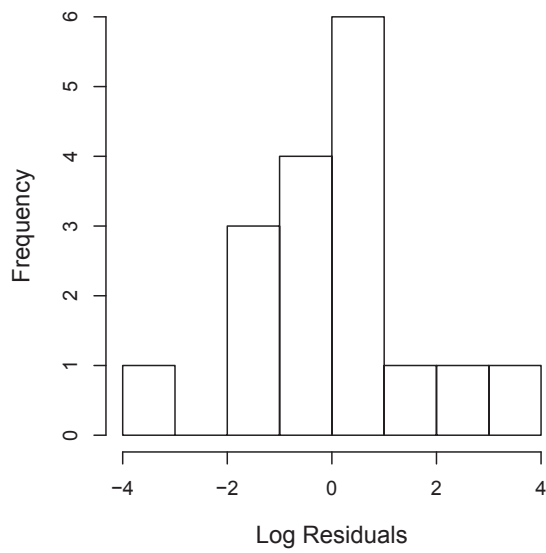
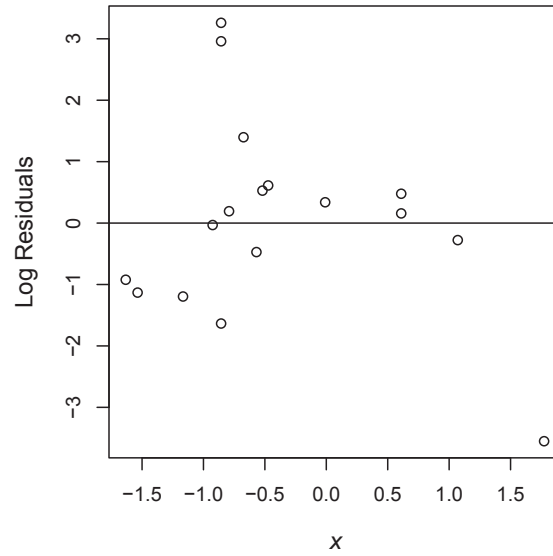
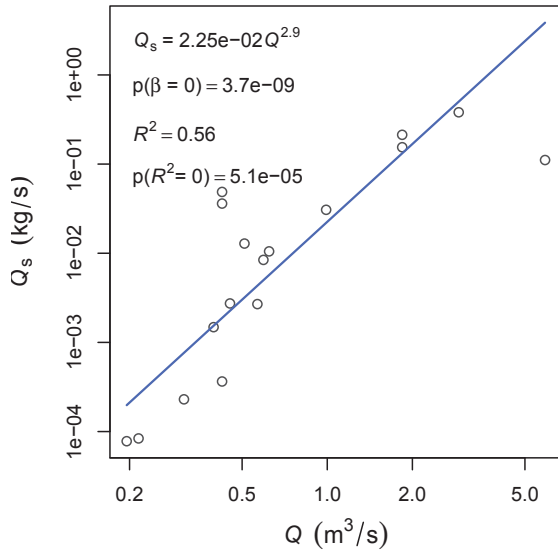
Fine Bed Sites

5102500 - RED RIVER OF THE NORTH AT EMERSON, MANITOBA



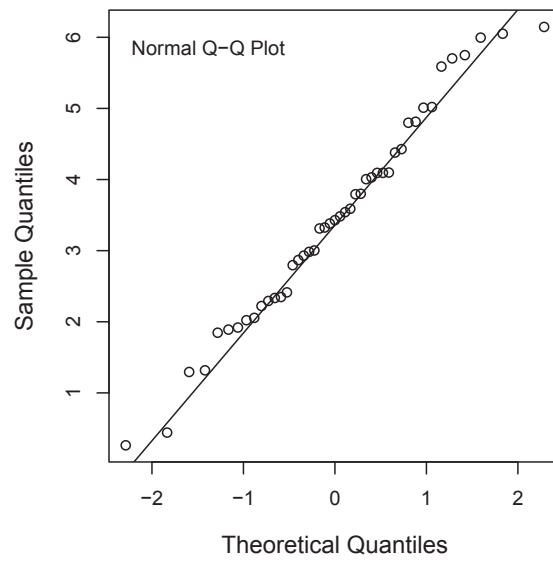
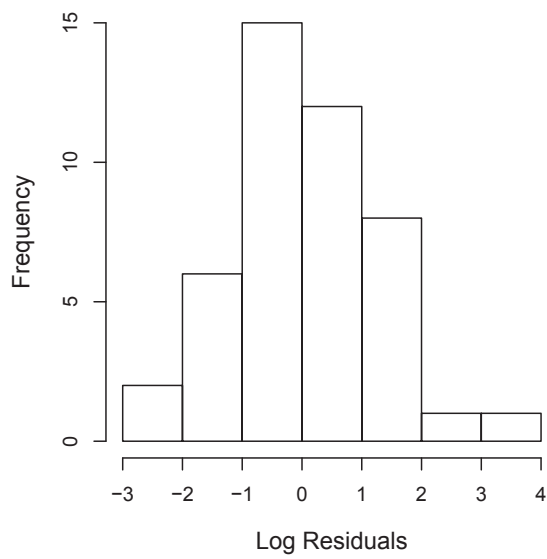
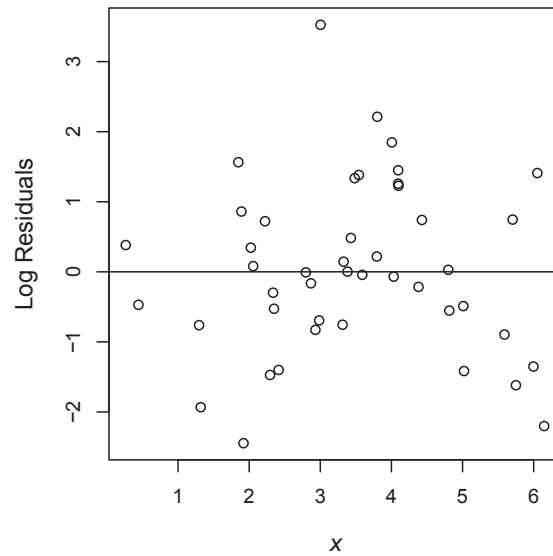
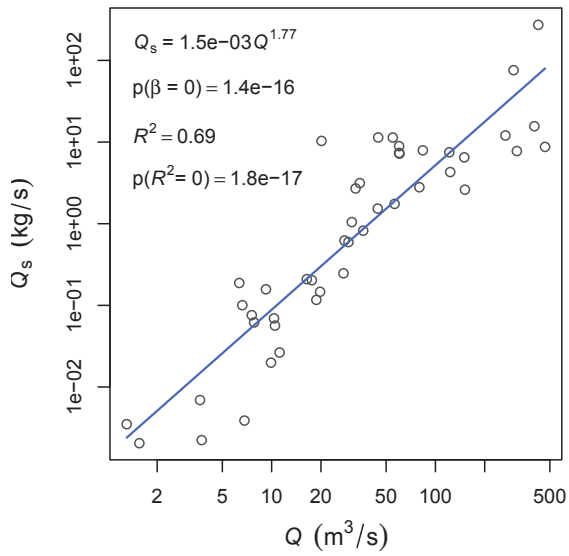
Fine Bed Sites

5437632 - SPRING CR AT ROCK VALLEY COLLEGE AT ROCKFORD IL



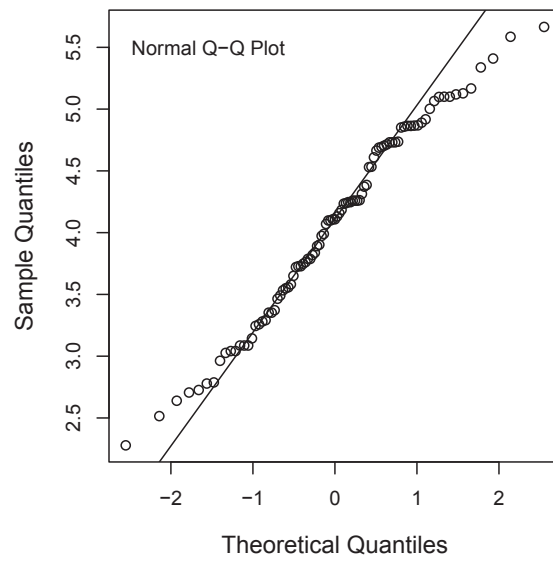
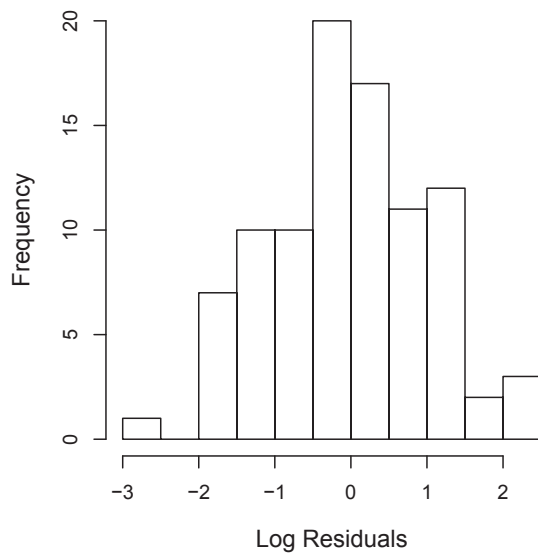
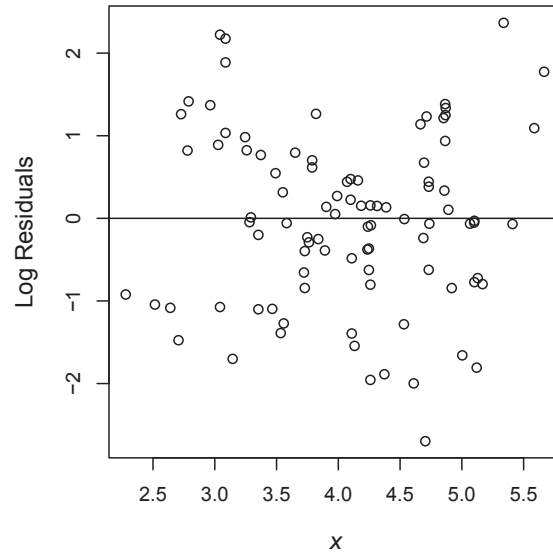
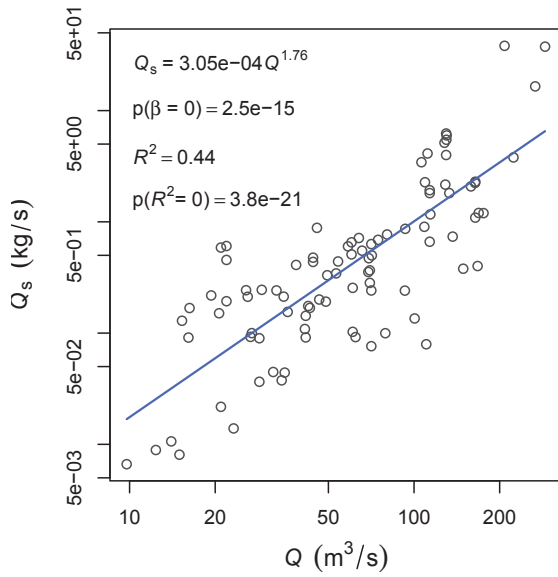
Fine Bed Sites

5451500 - Iowa River at Marshalltown, IA



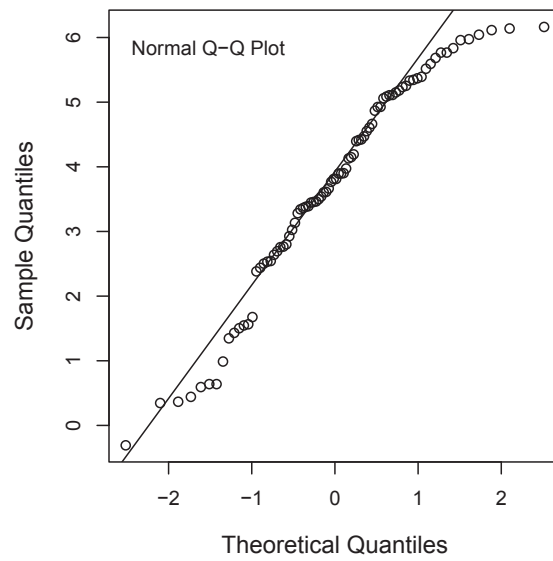
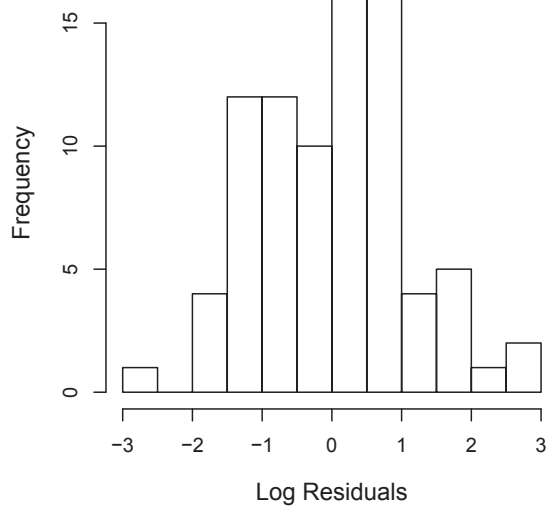
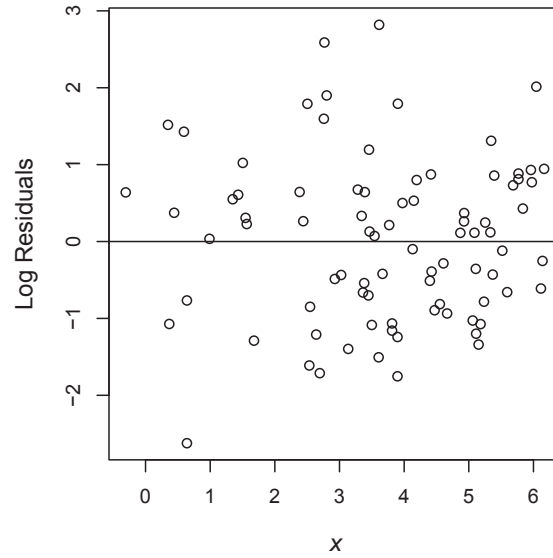
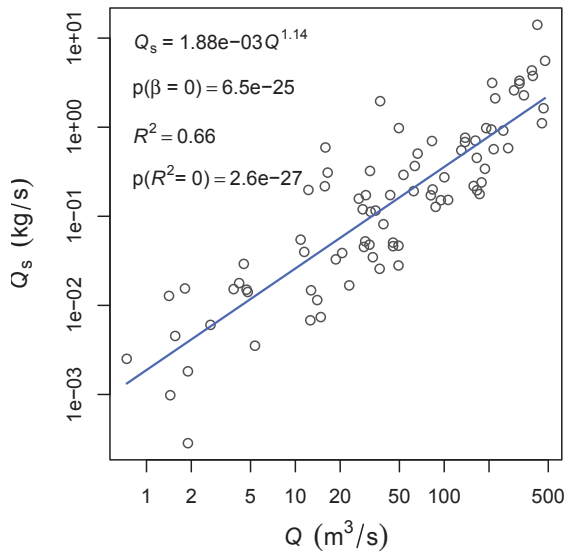
Fine Bed Sites

5520500 - KANKAKEE RIVER AT MOMENCE, IL



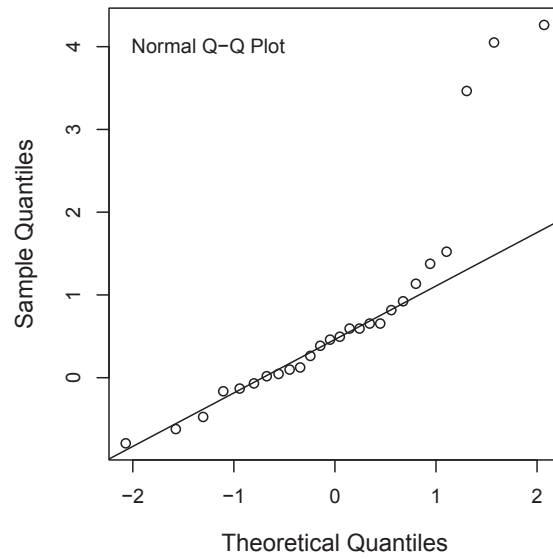
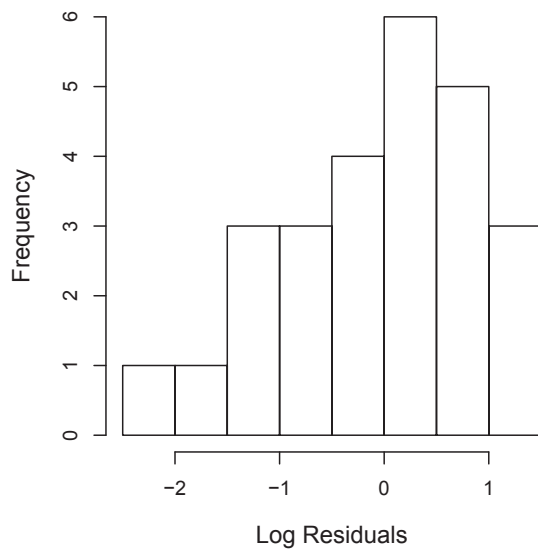
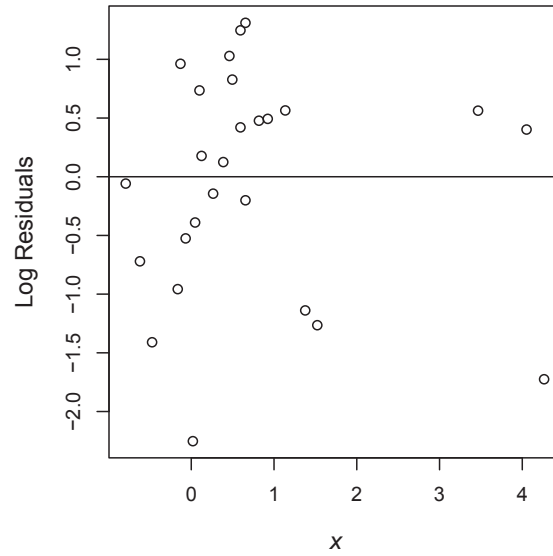
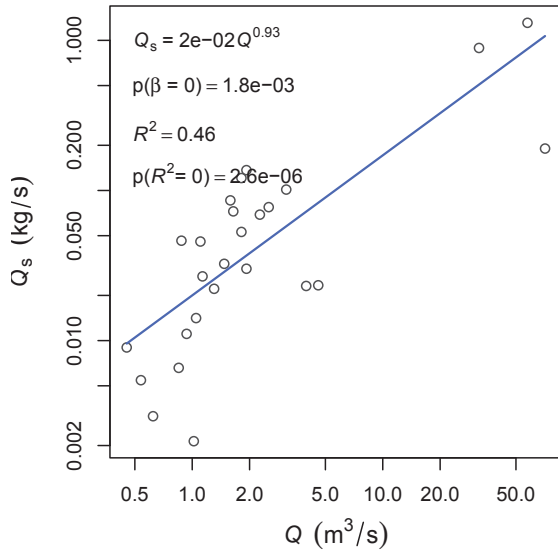
Fine Bed Sites

5526000 - IROQUOIS RIVER NEAR CHEBANSE, IL



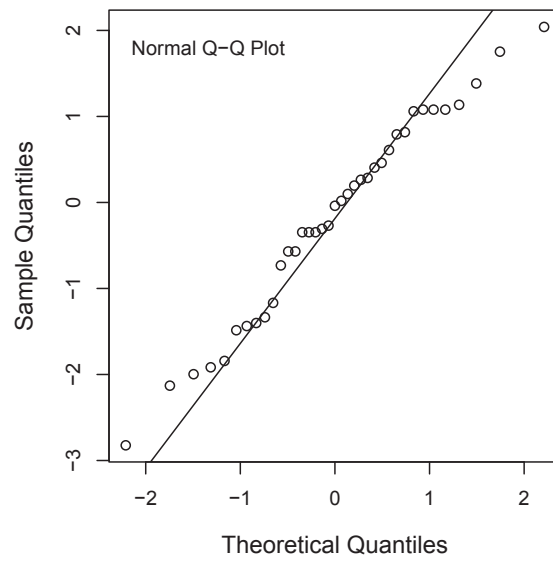
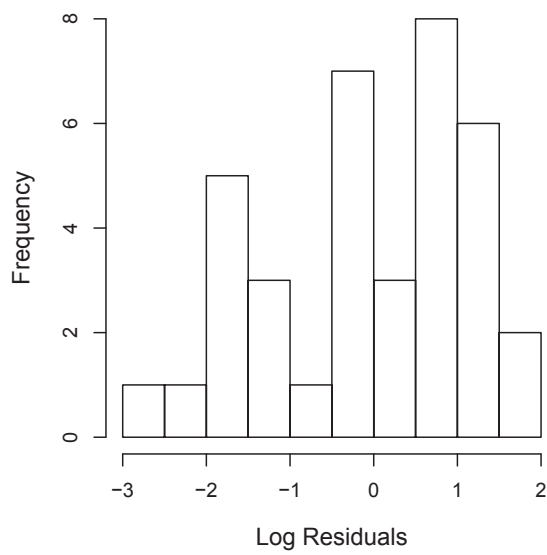
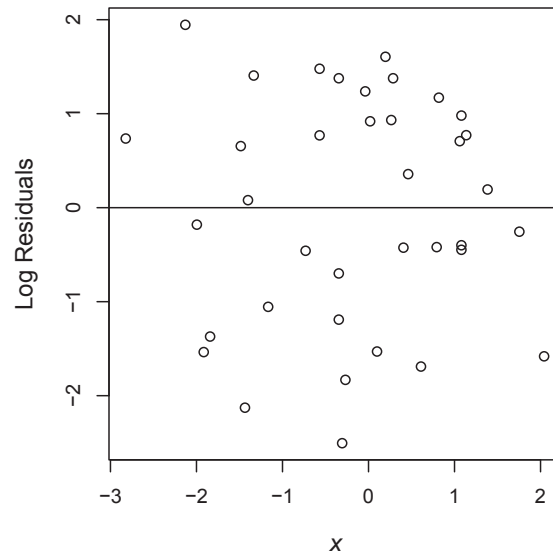
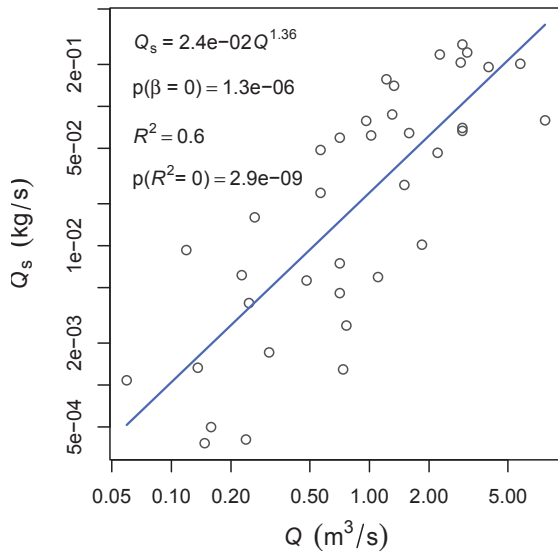
Fine Bed Sites

5548105 - NIPPERSINK CREEK ABOVE WONDER LAKE, IL



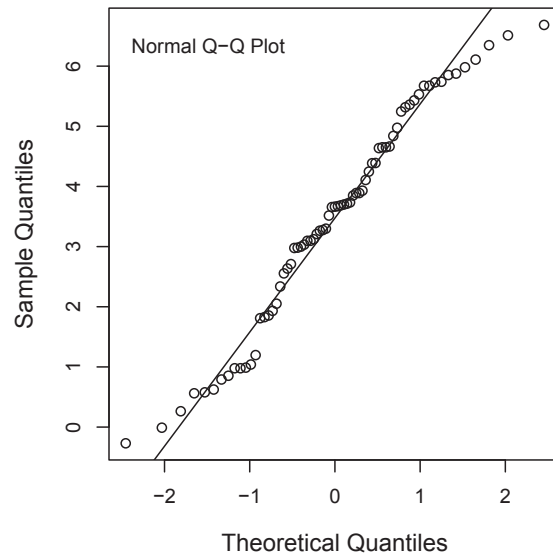
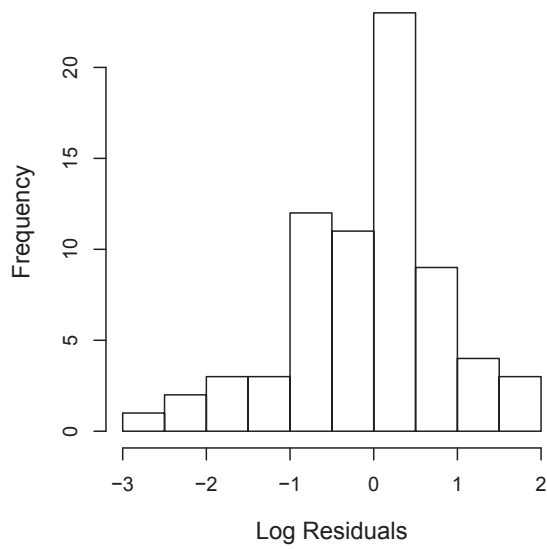
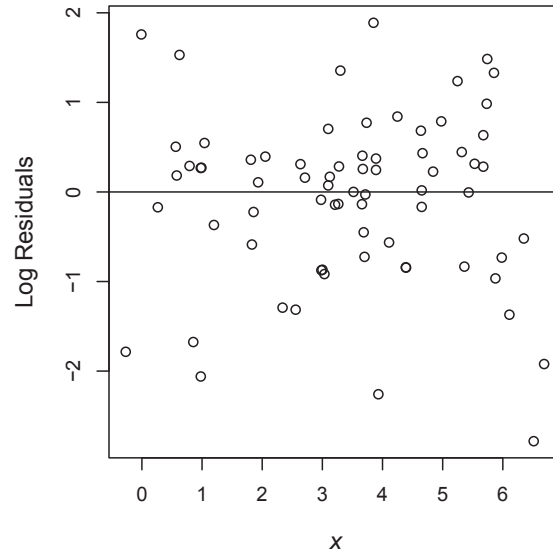
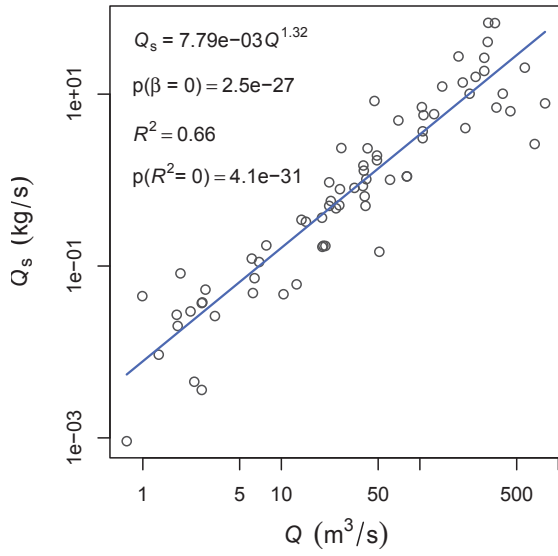
Fine Bed Sites

5568800 - INDIAN CREEK NEAR WYOMING, IL



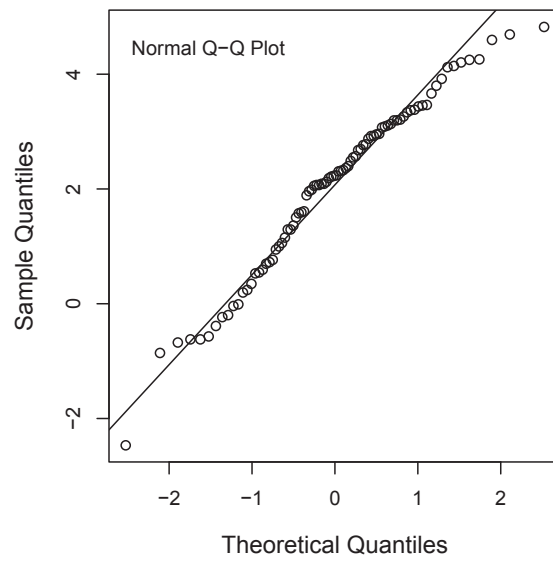
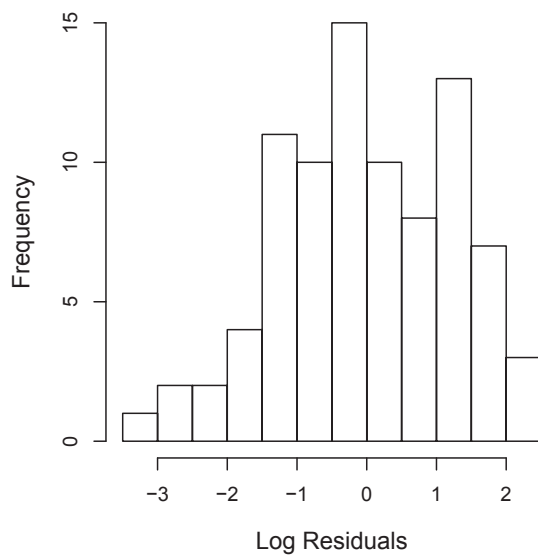
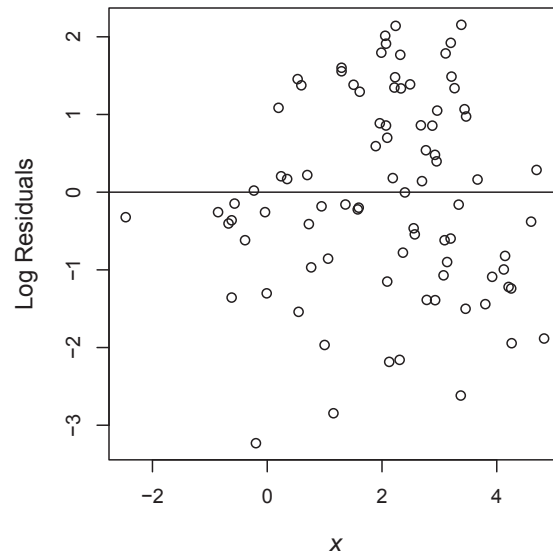
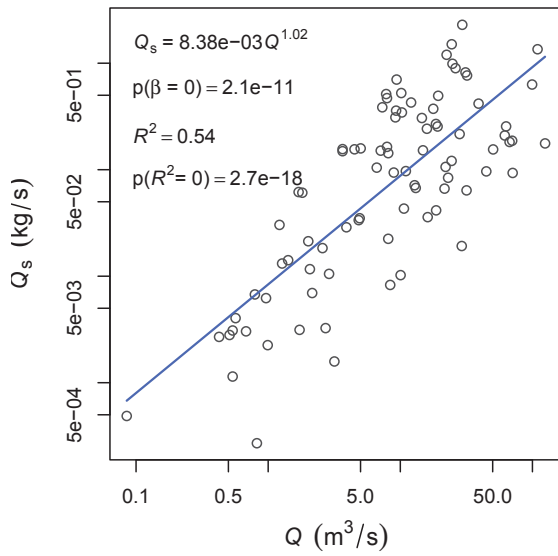
Fine Bed Sites

5570000 - SPOON RIVER AT SEVILLE, IL



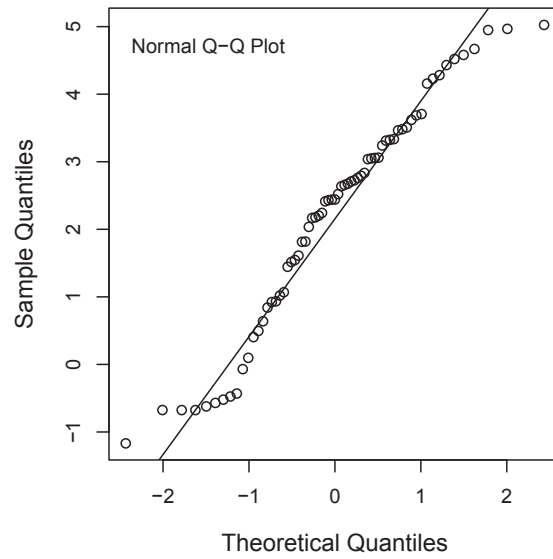
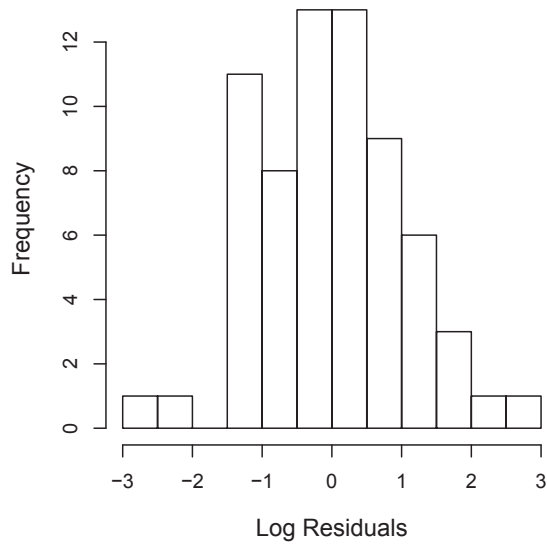
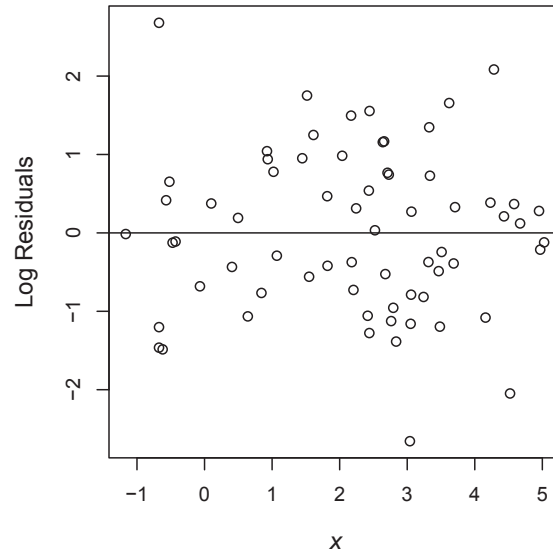
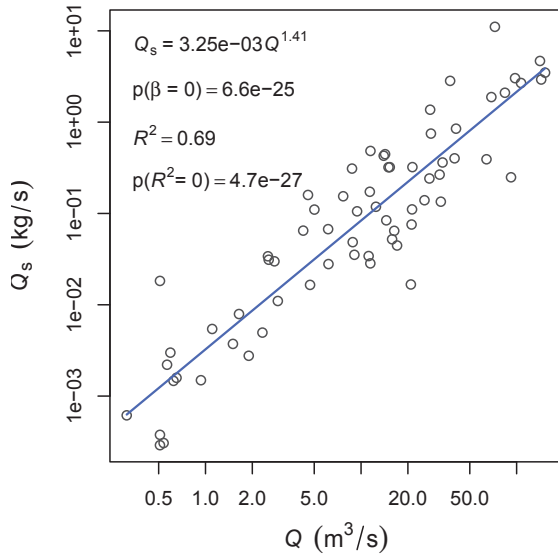
Fine Bed Sites

5572000 - SANGAMON RIVER AT MONTICELLO, IL



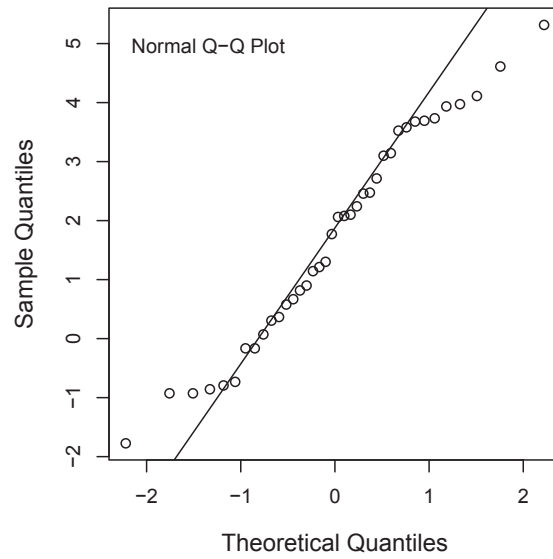
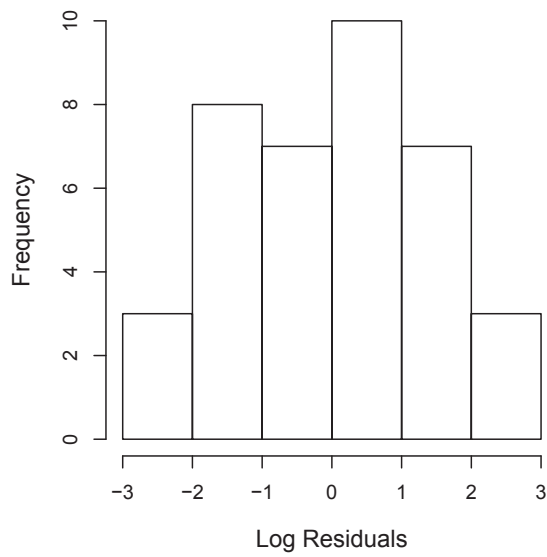
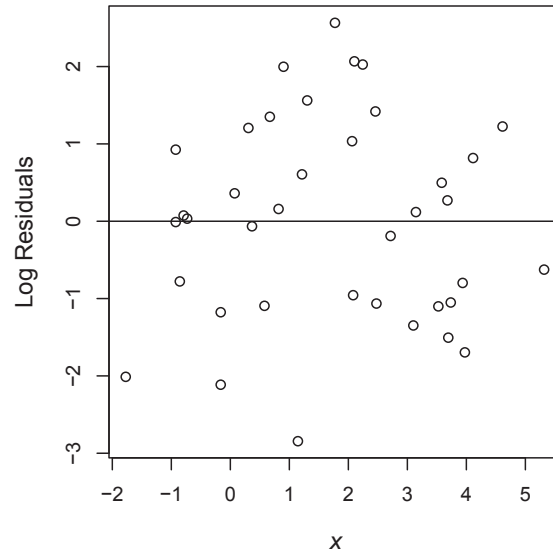
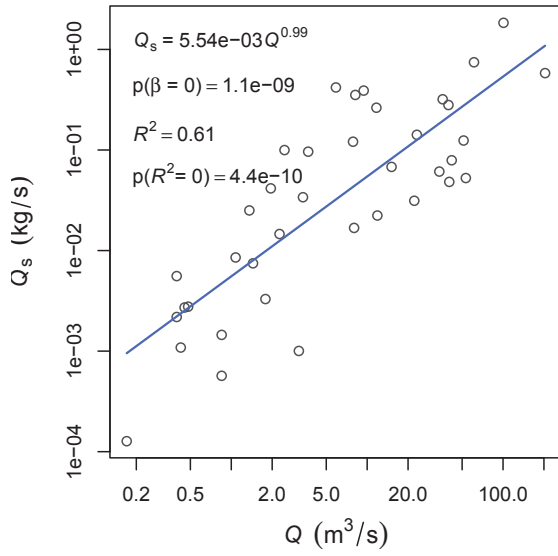
Fine Bed Sites

5584500 - LA MOINE RIVER AT COLMAR, IL



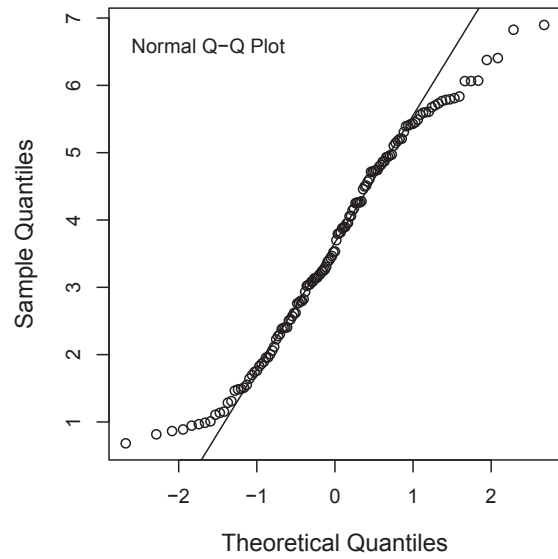
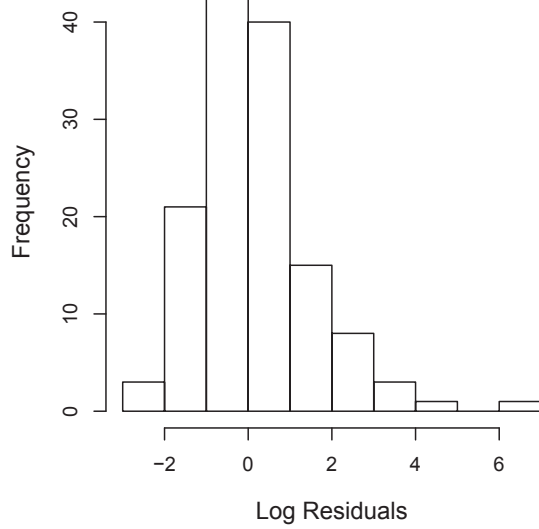
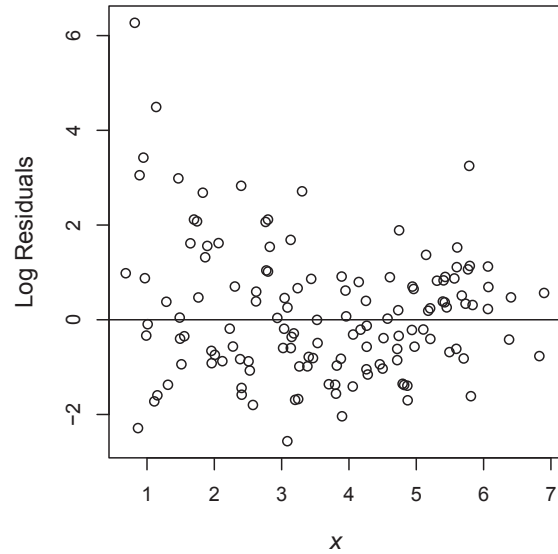
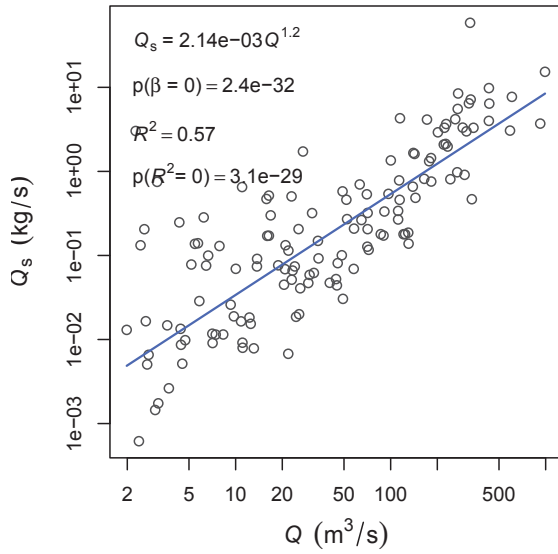
Fine Bed Sites

5591200 - KASKASKIA RIVER AT COOKS MILLS, IL



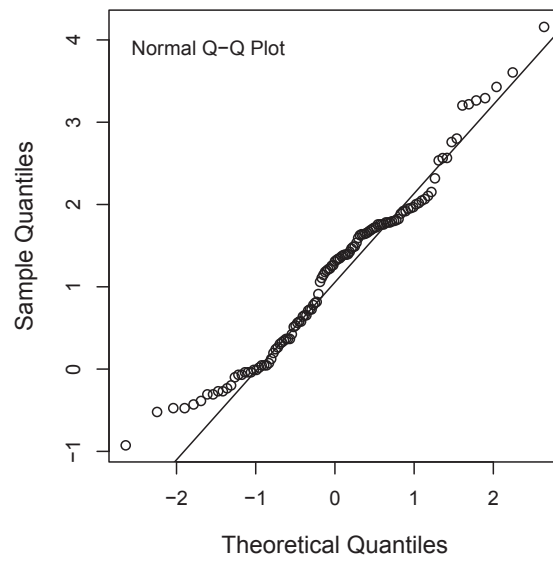
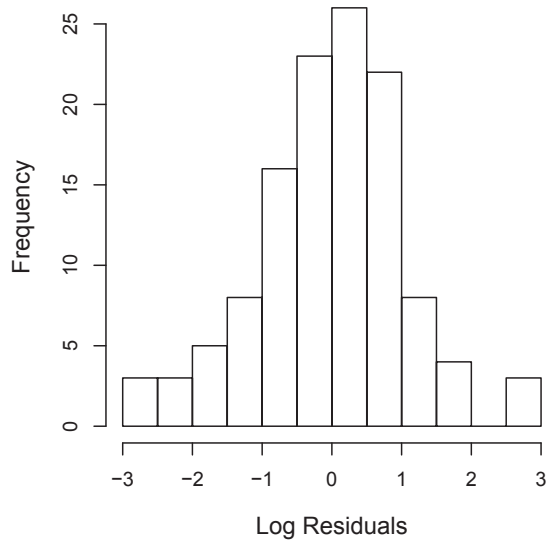
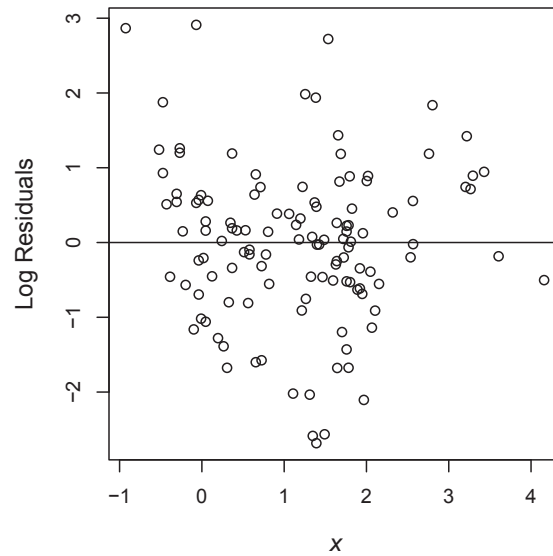
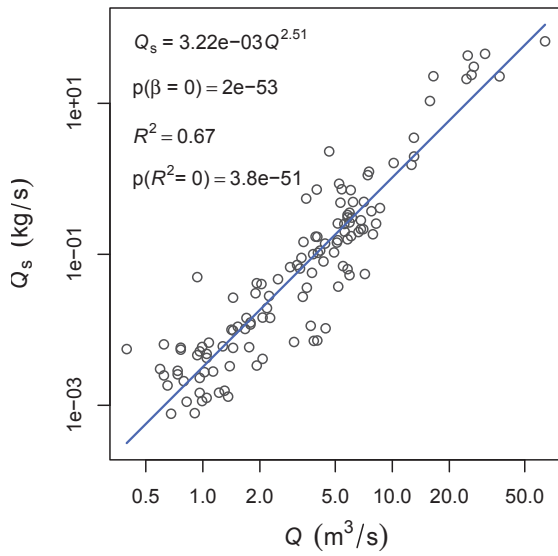
Fine Bed Sites

5594100 - KASKASKIA RIVER NEAR VENEDY STATION, IL



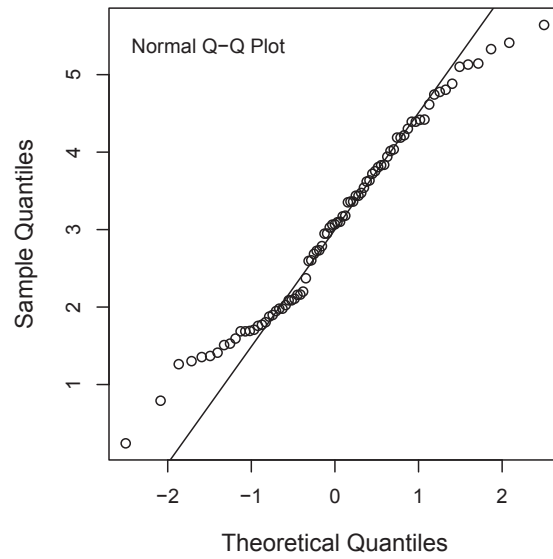
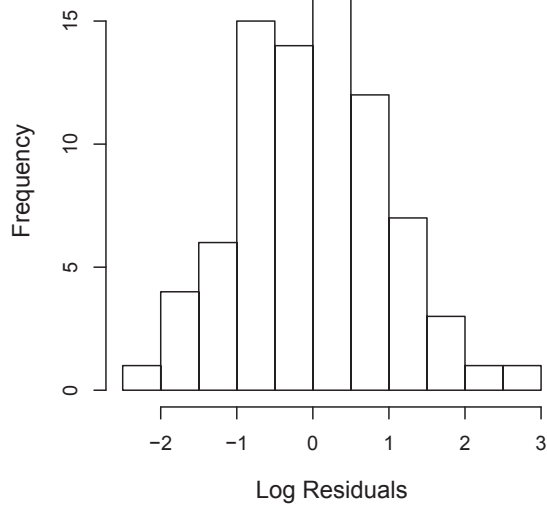
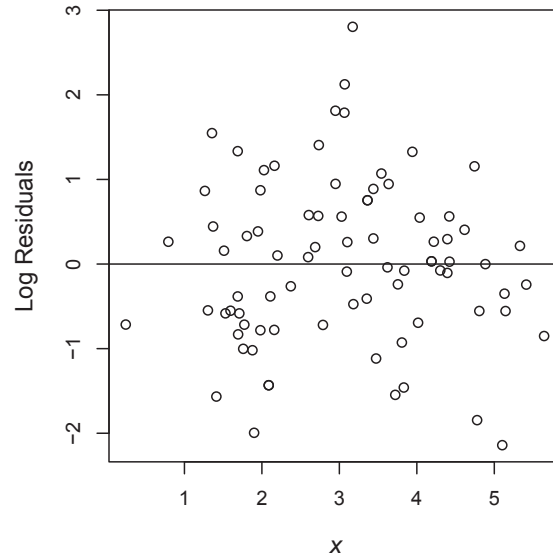
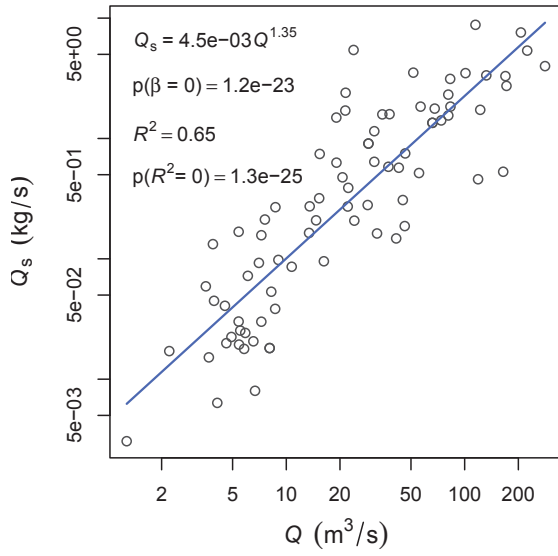
Fine Bed Sites

6088300 - Muddy Creek near Vaughn MT



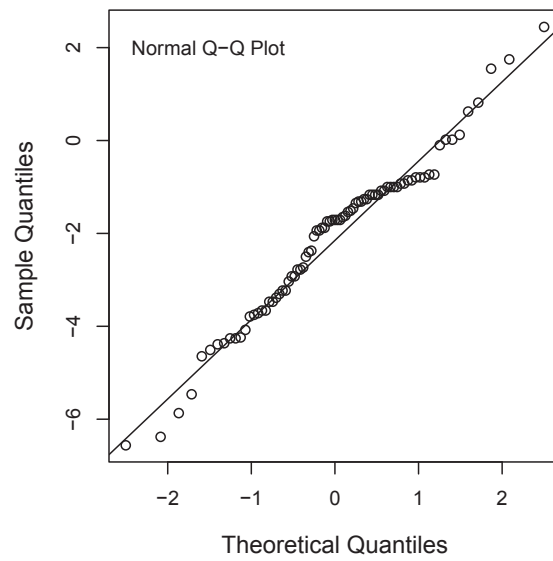
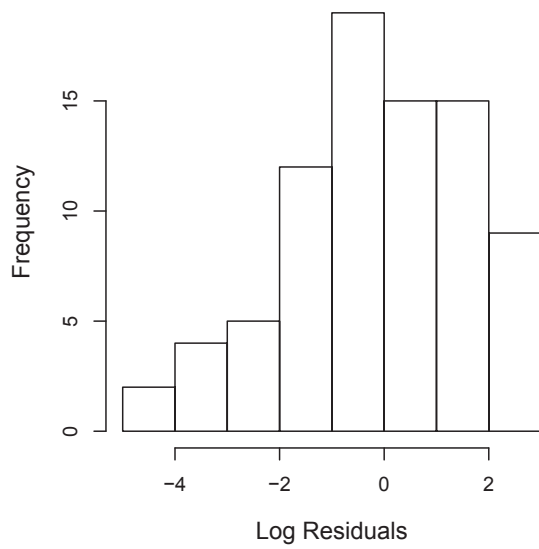
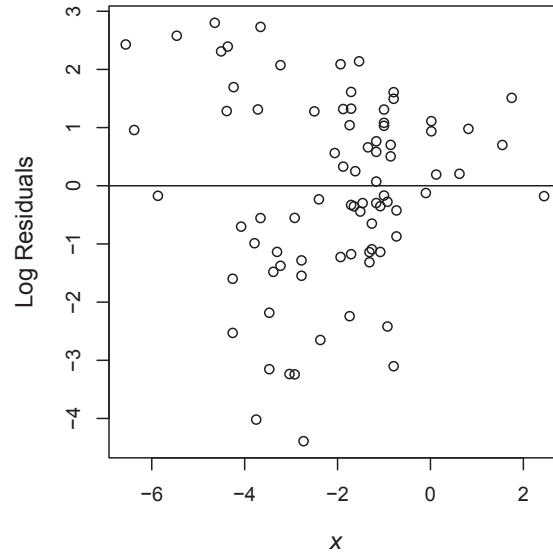
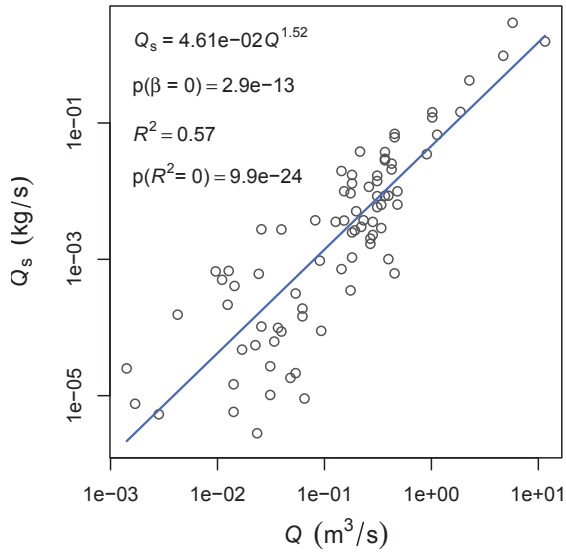
Fine Bed Sites

6485500 - BIG SIOUX R AT AKRON,IA



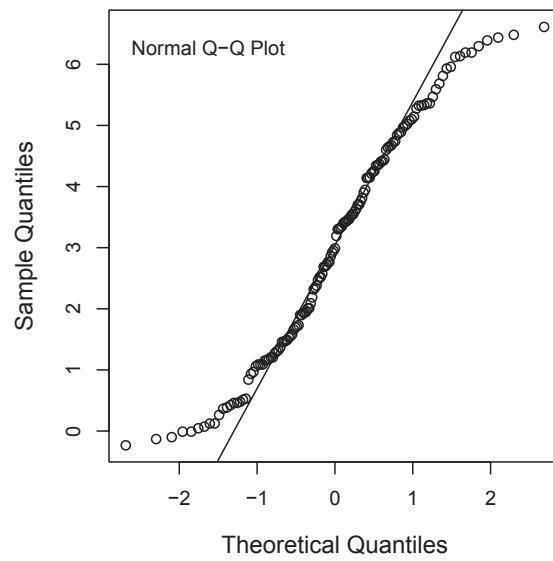
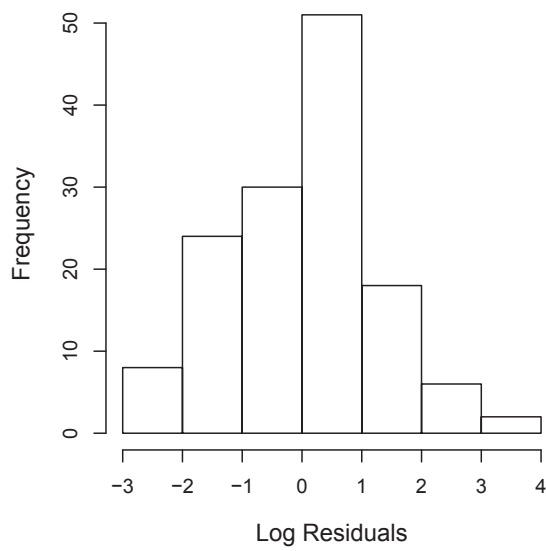
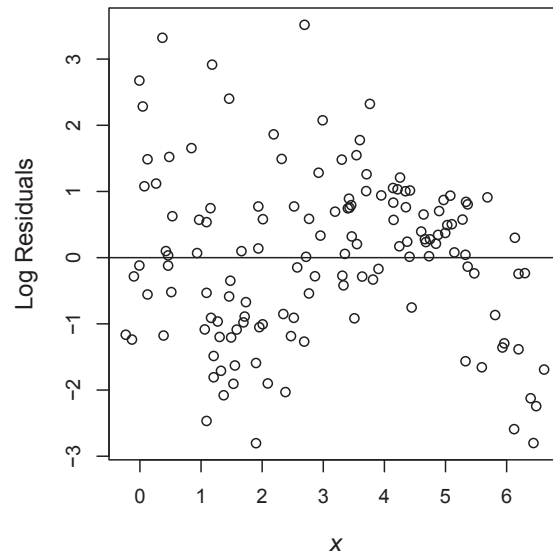
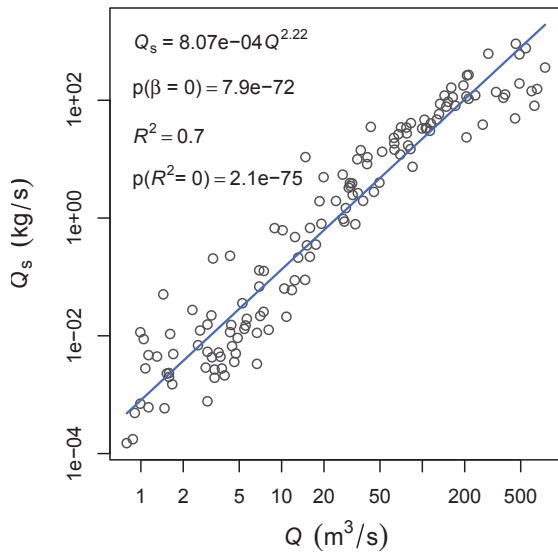
Fine Bed Sites

6753990 - LONETREE CREEK NEAR GREELEY, CO.



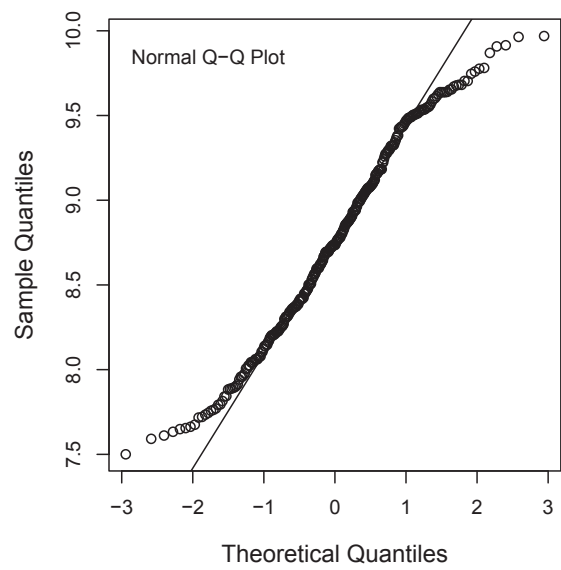
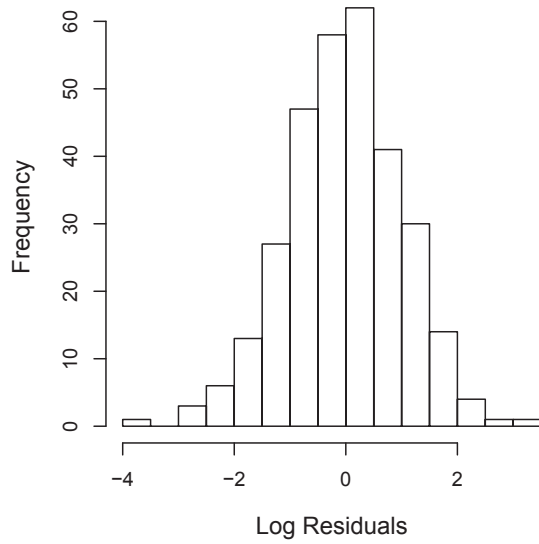
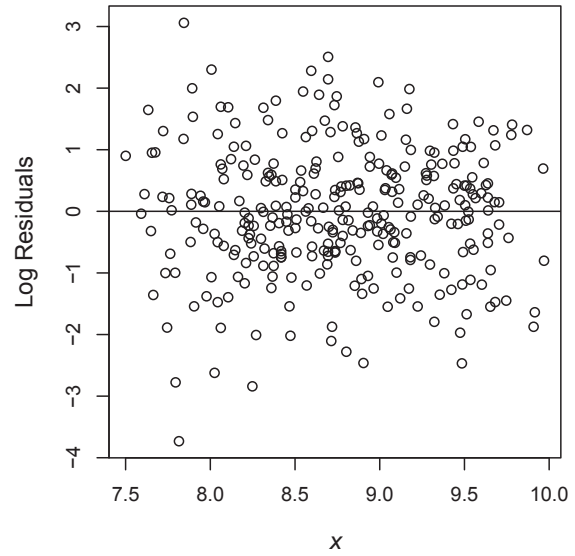
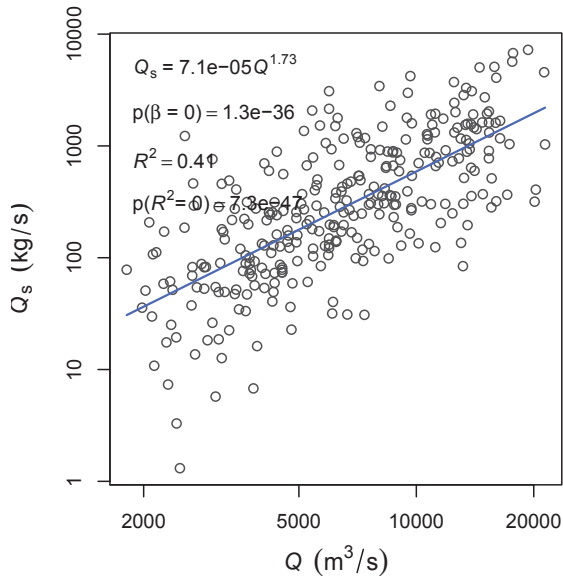
Fine Bed Sites

6817000 - Nodaway River at Clarinda, IA



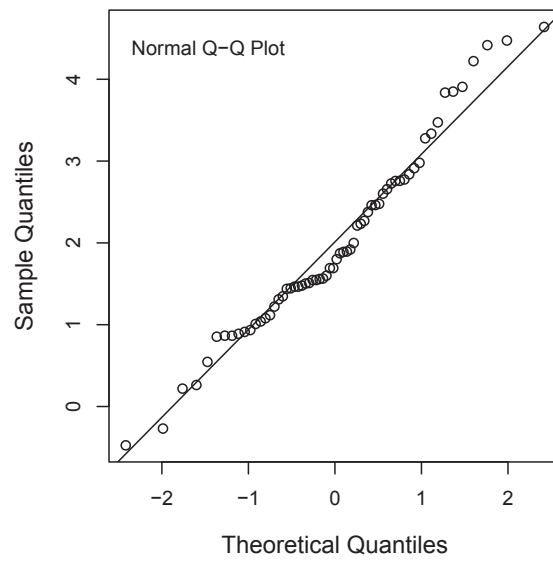
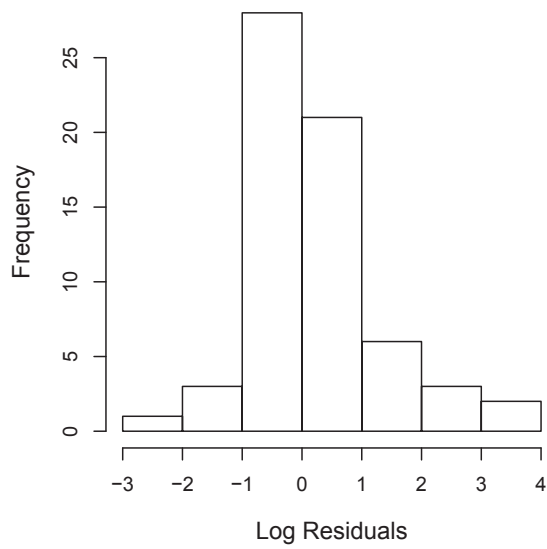
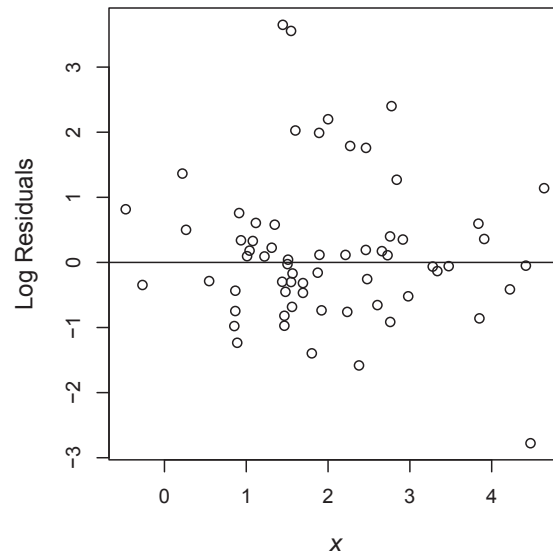
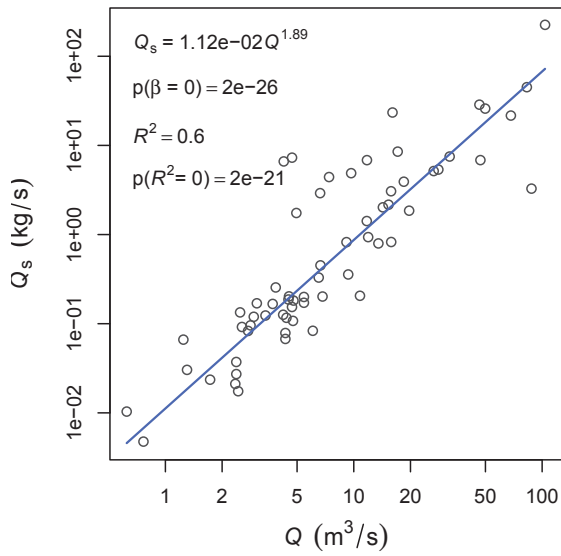
Fine Bed Sites

7022000 - Mississippi River at Thebes, IL



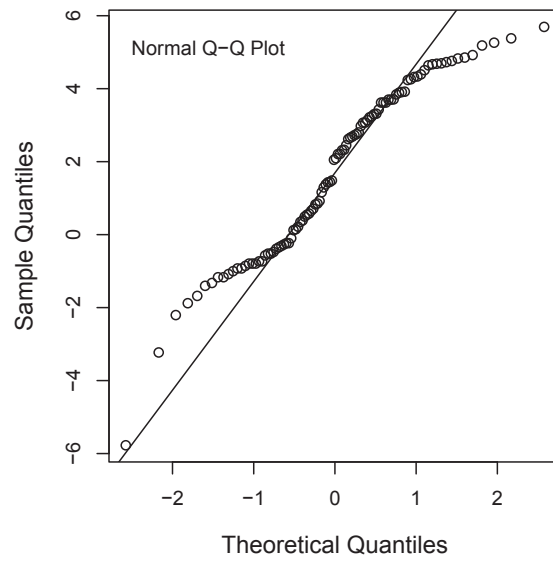
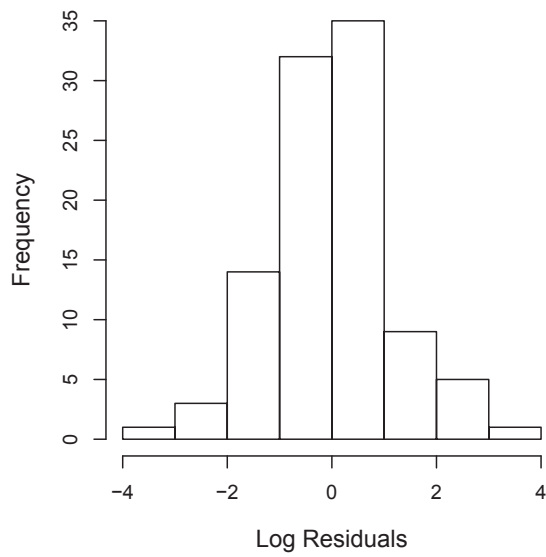
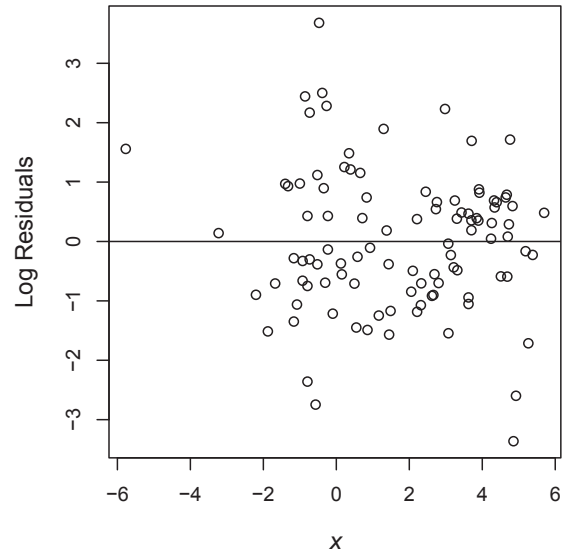
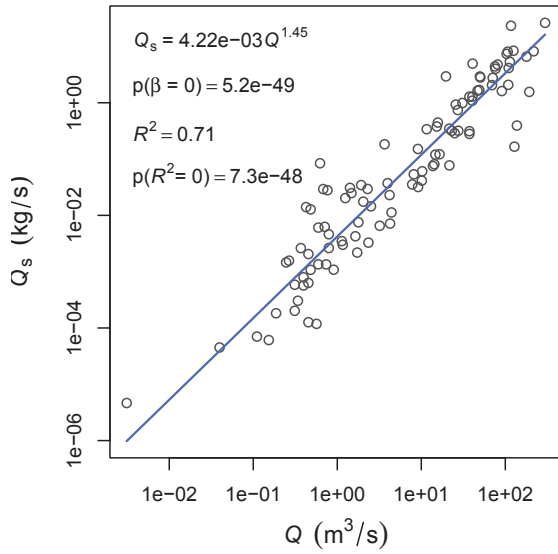
Fine Bed Sites

7137500 - ARKANSAS R NR COOLIDGE, KS



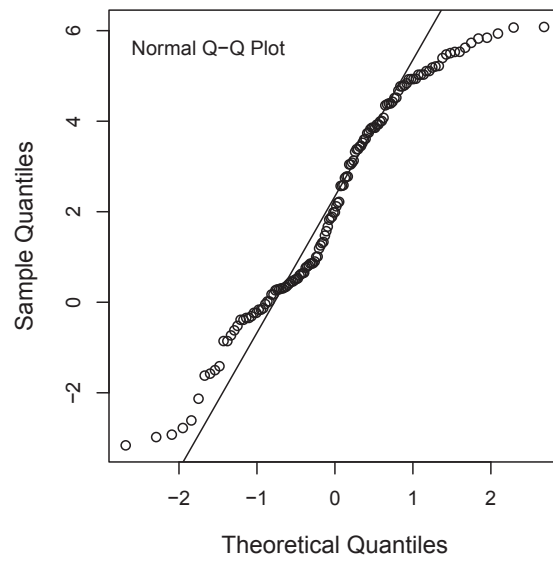
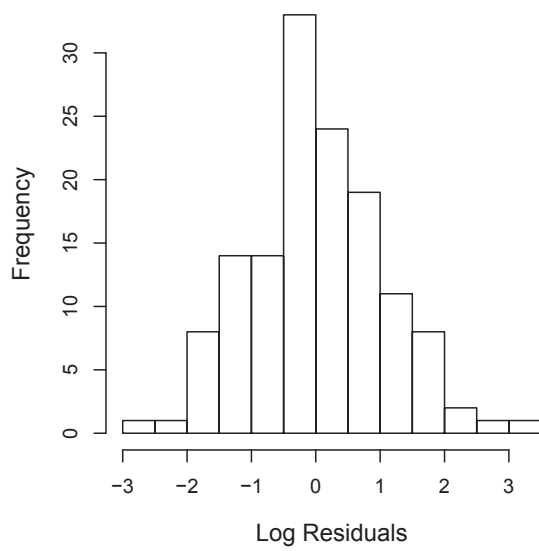
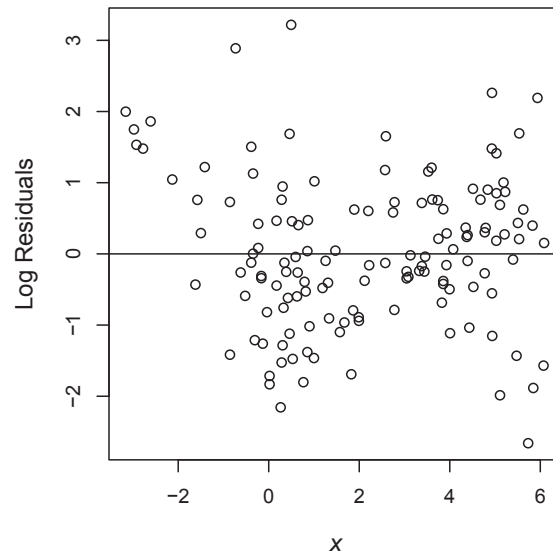
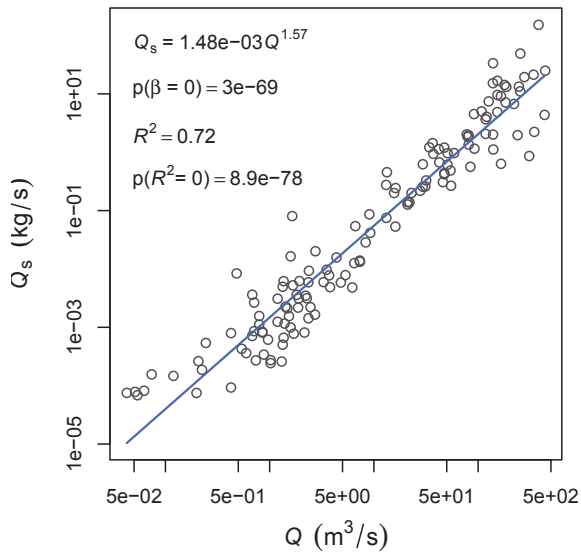
Fine Bed Sites

7143672 - L ARKANSAS R AT HWY 50 NR HALSTEAD, KS



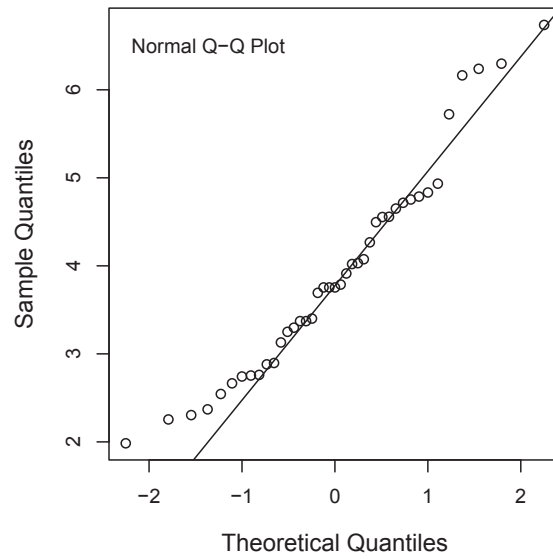
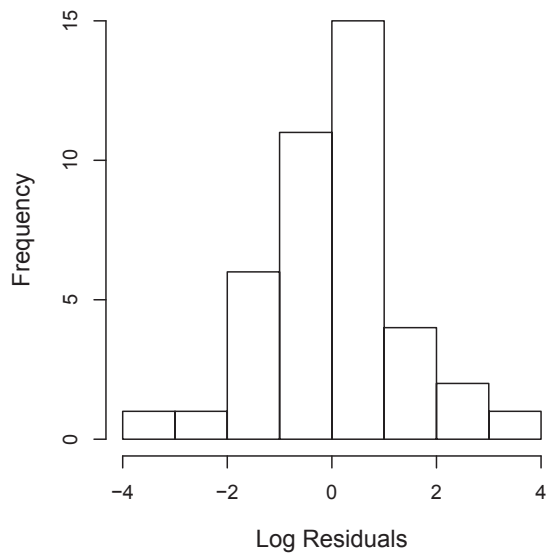
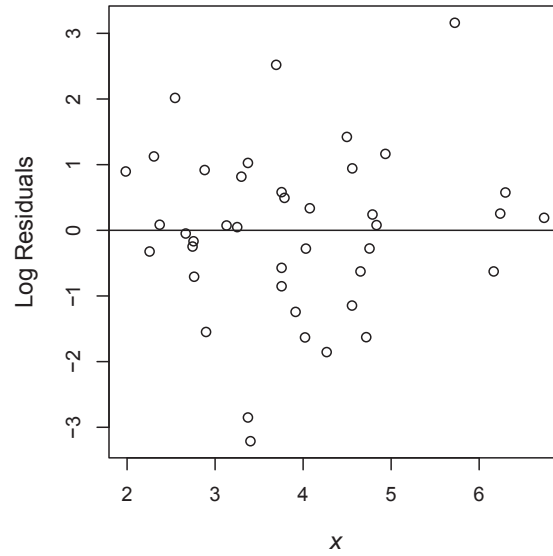
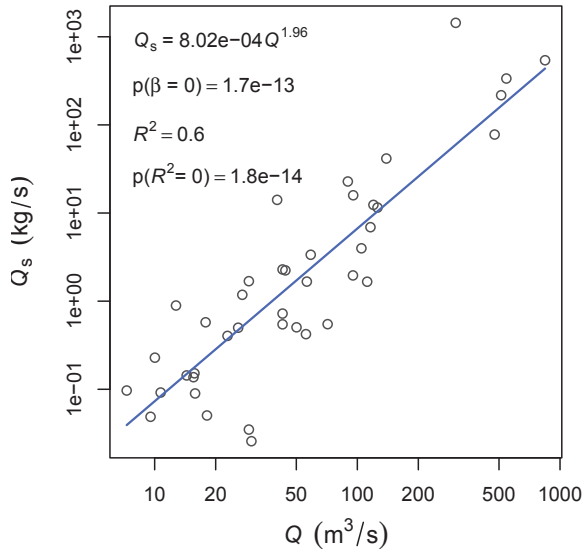
Fine Bed Sites

7144100 - L ARKANSAS R NR SEDGWICK, KS



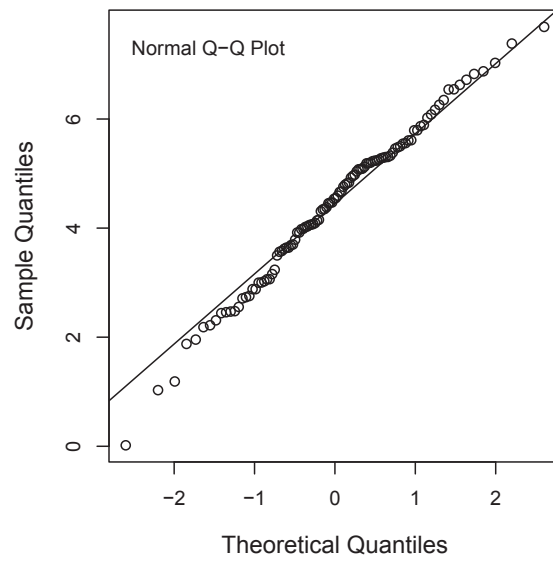
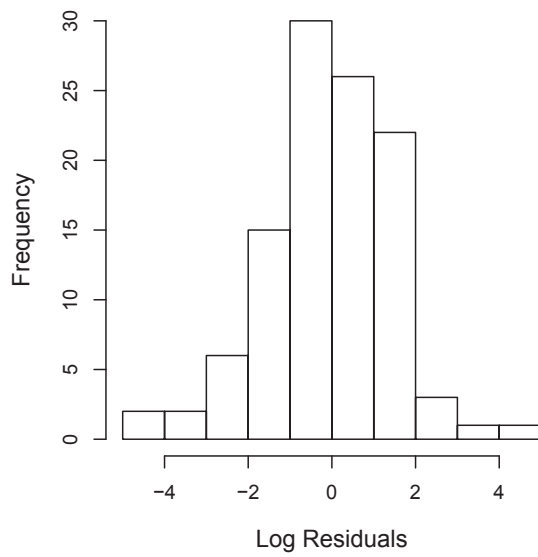
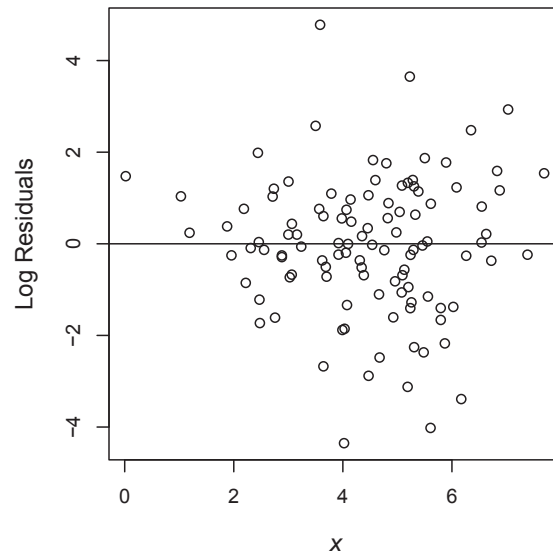
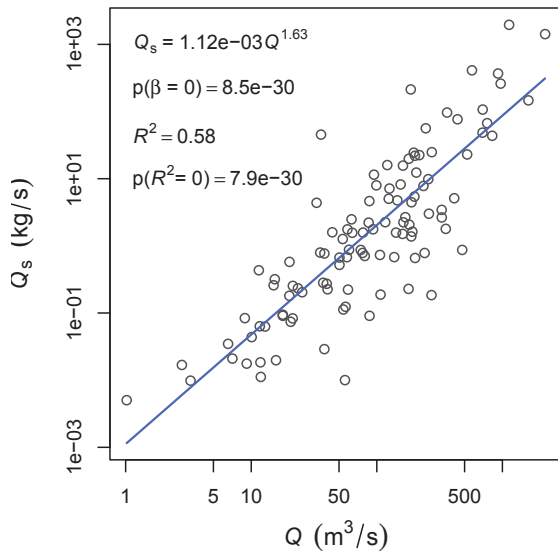
Fine Bed Sites

7146500 - ARKANSAS R AT ARKANSAS CITY, KS



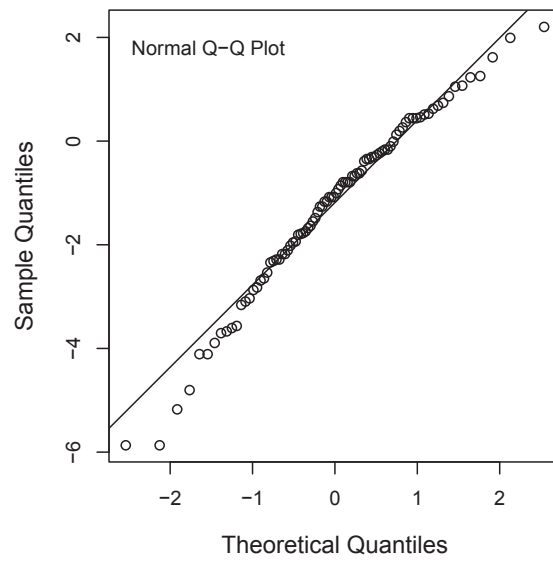
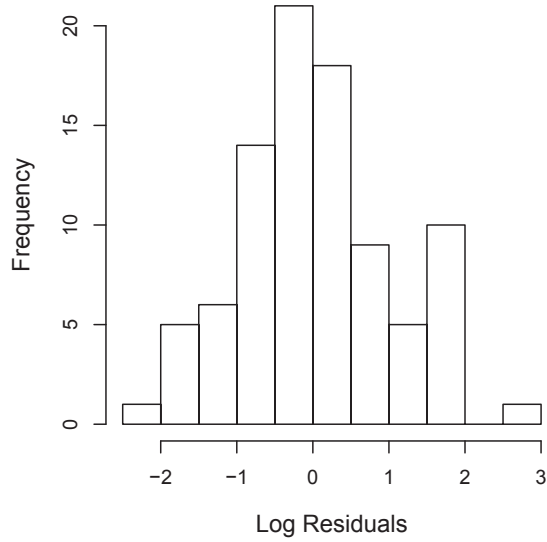
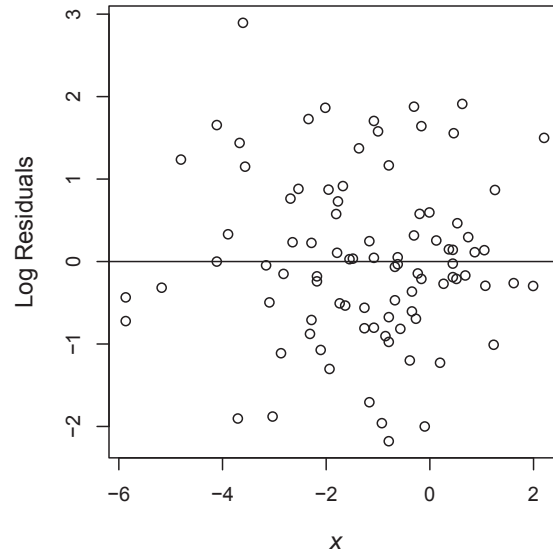
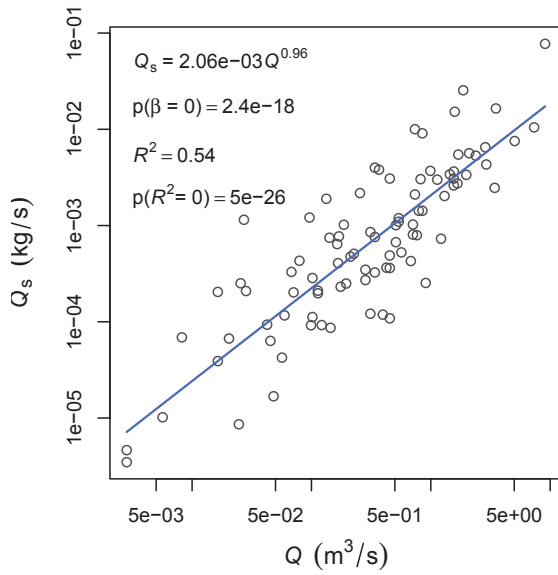
Fine Bed Sites

7152500 - Arkansas River at Ralston, OK



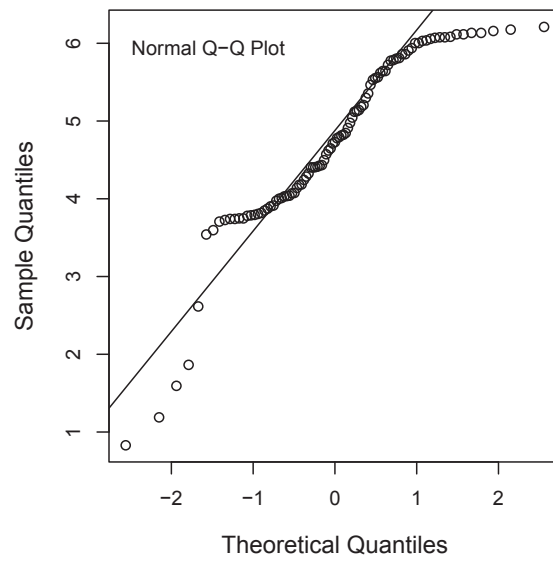
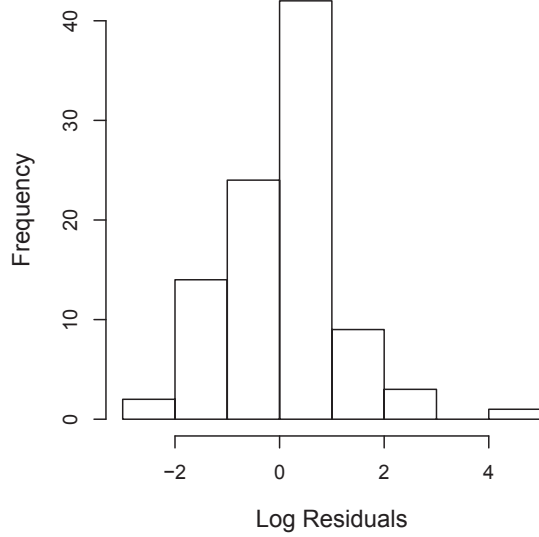
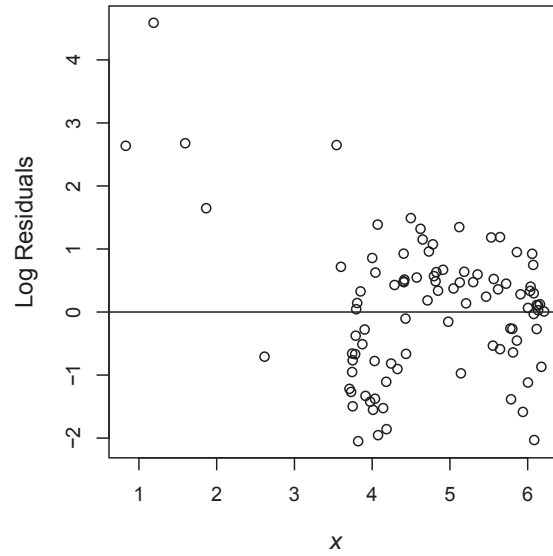
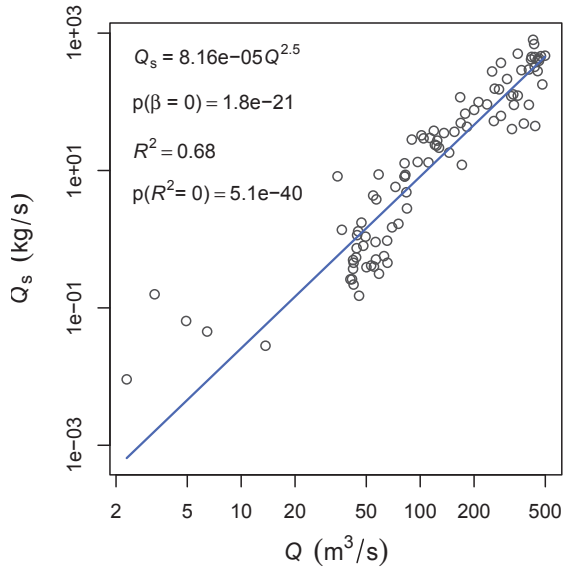
Fine Bed Sites

7196900 – Baron Fork at Dutch Mills, AR



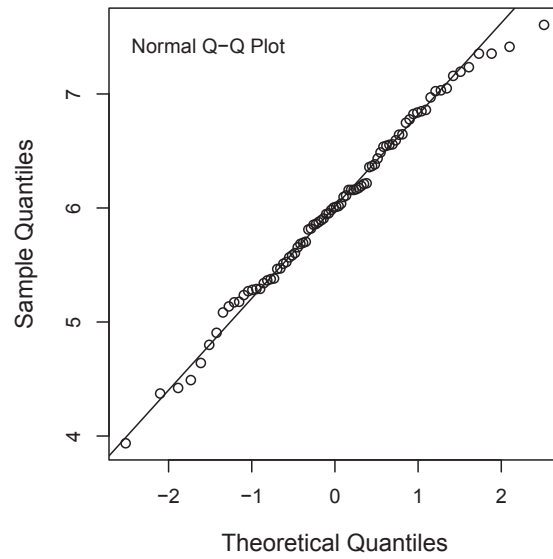
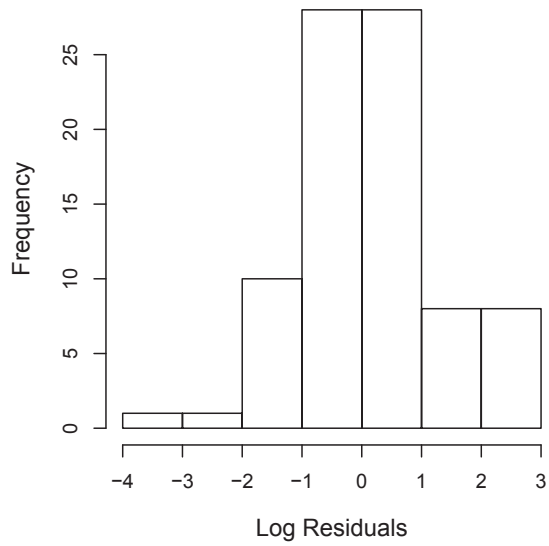
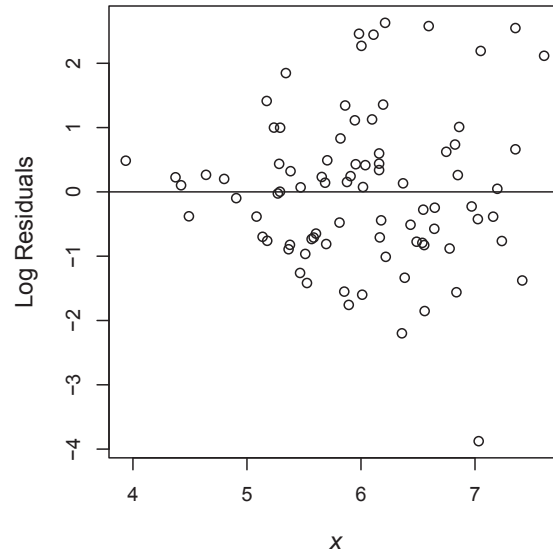
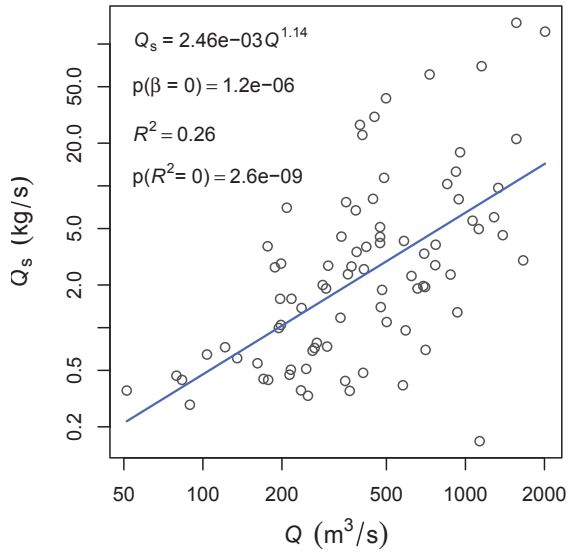
Fine Bed Sites

7277700 - HICKAHALA CREEK NR SENATOBIA, MS



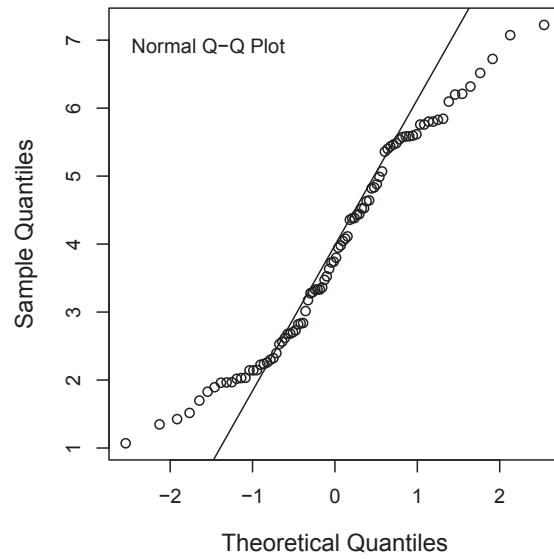
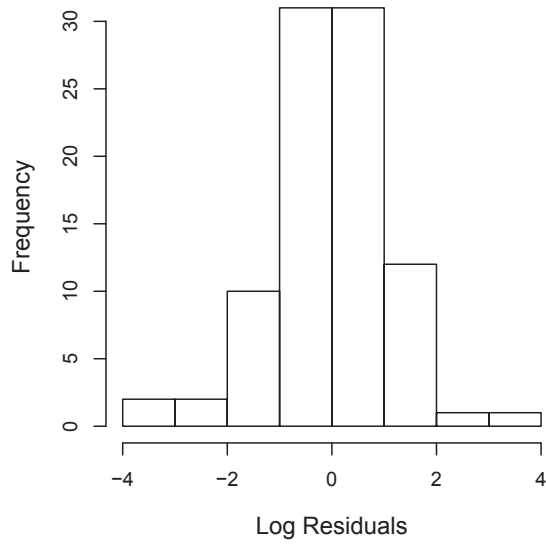
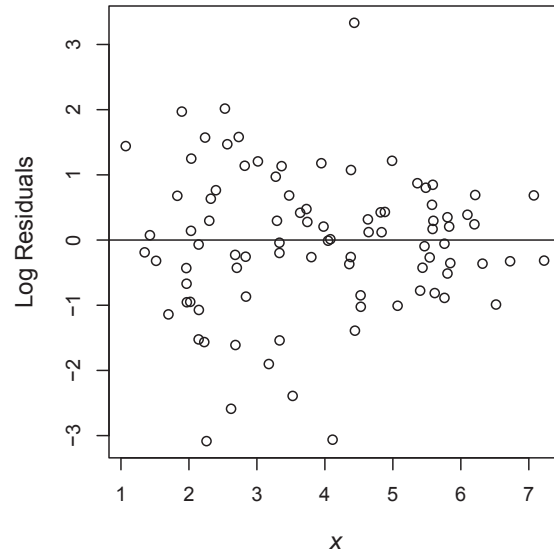
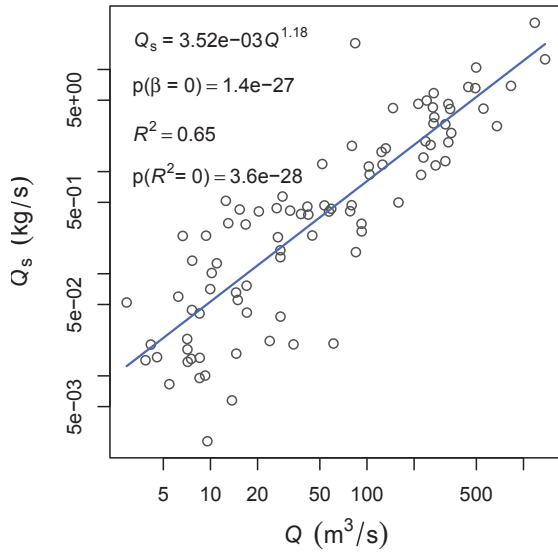
Fine Bed Sites

7288955 - YAZOO RIVER BL STEELE BAYOU NR LONG LAKE, MS



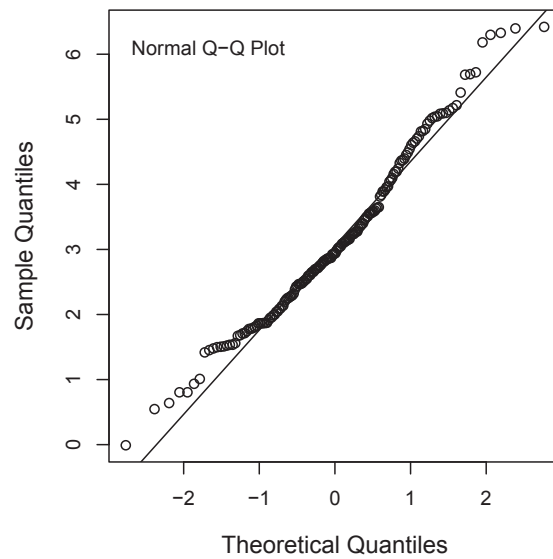
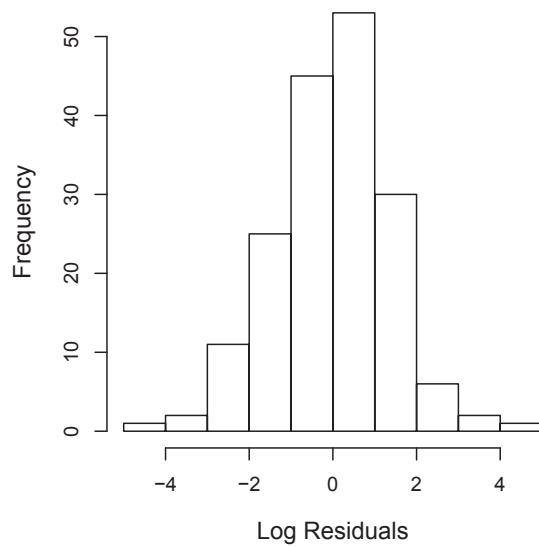
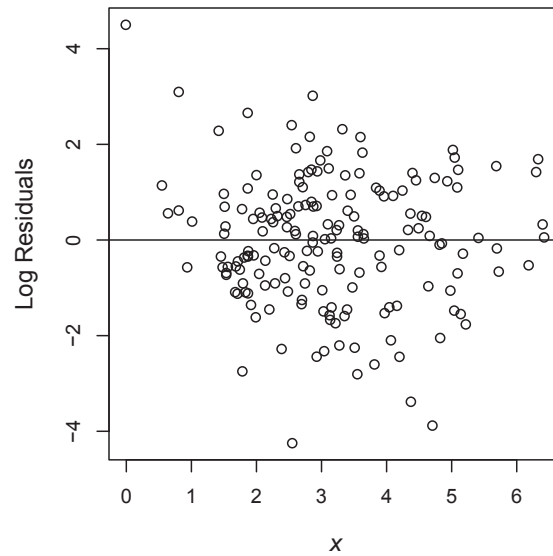
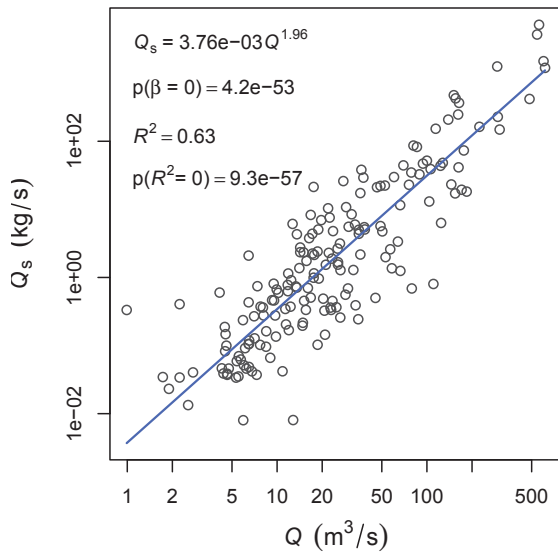
Fine Bed Sites

7290000 - BIG BLACK RIVER NR BOVINA, MS



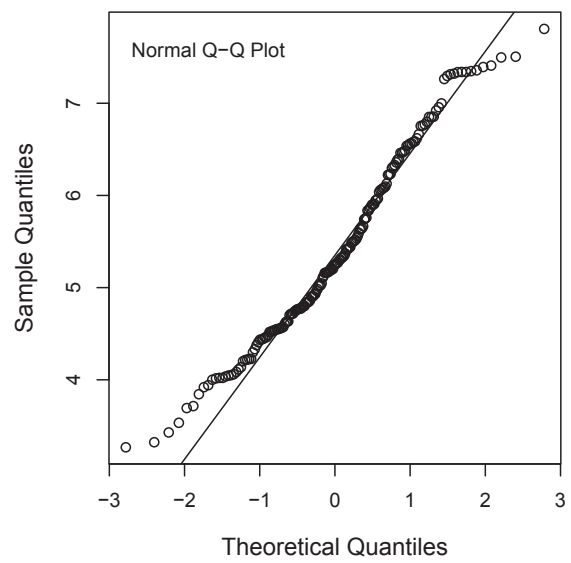
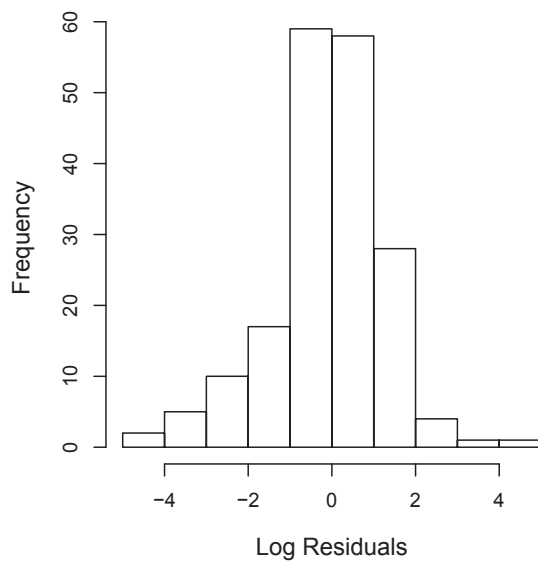
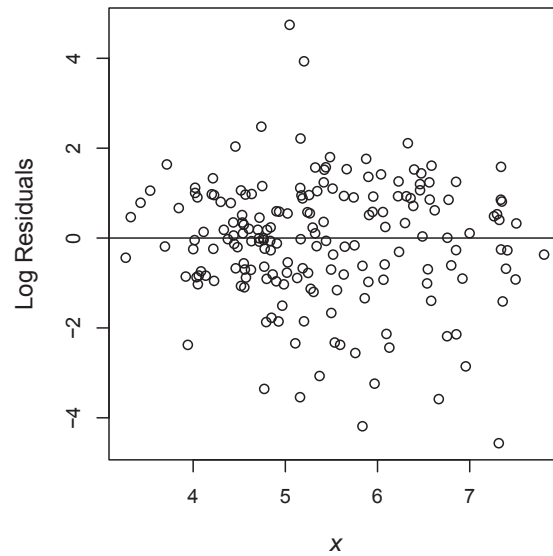
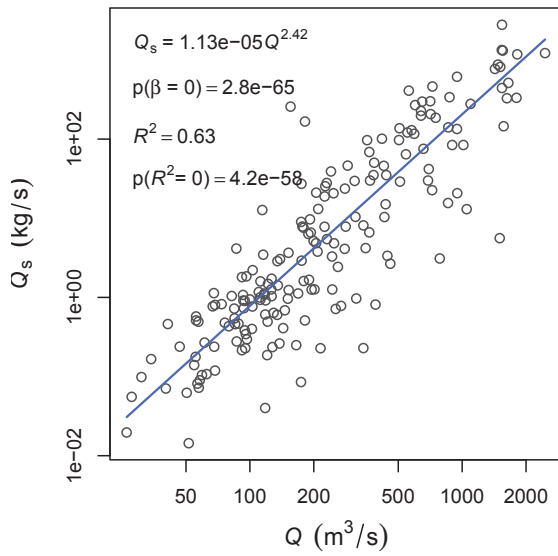
Fine Bed Sites

7331000 – Washita River near Dickson, OK



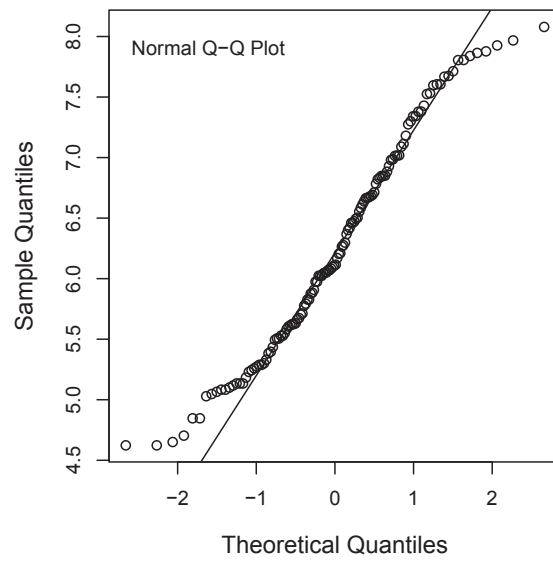
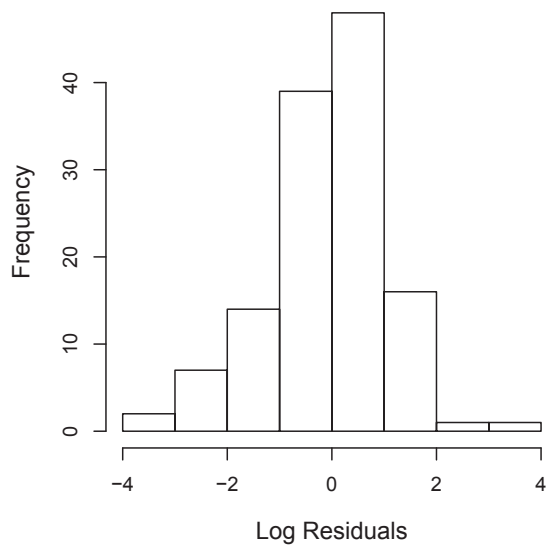
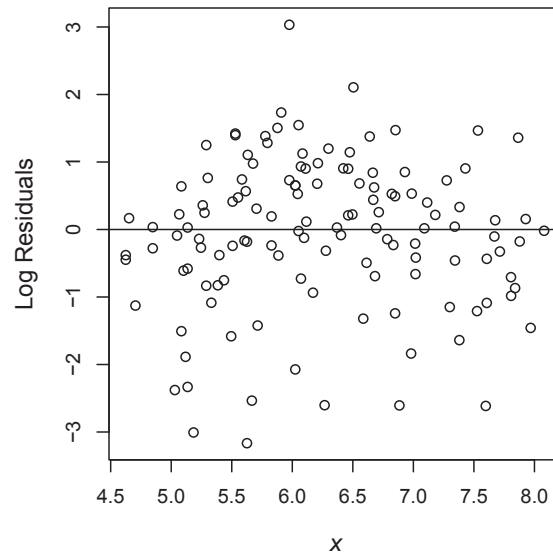
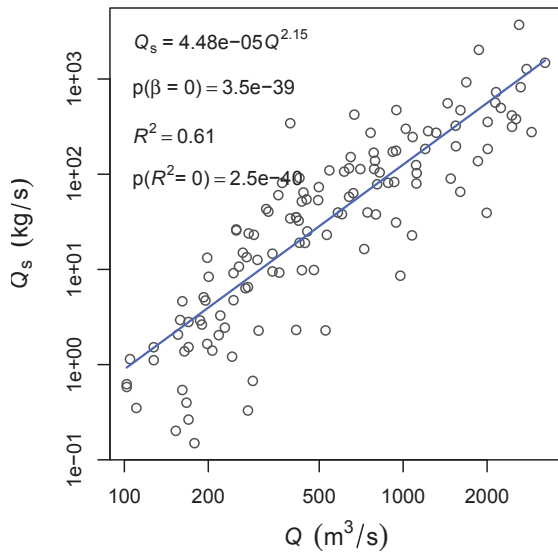
Fine Bed Sites

7337000 - Red River at Index, AR



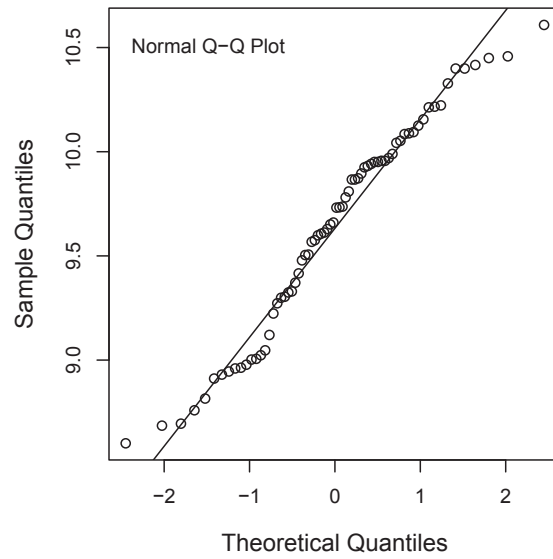
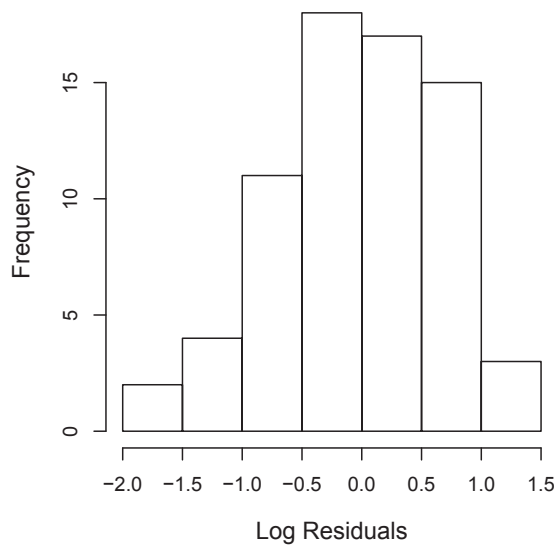
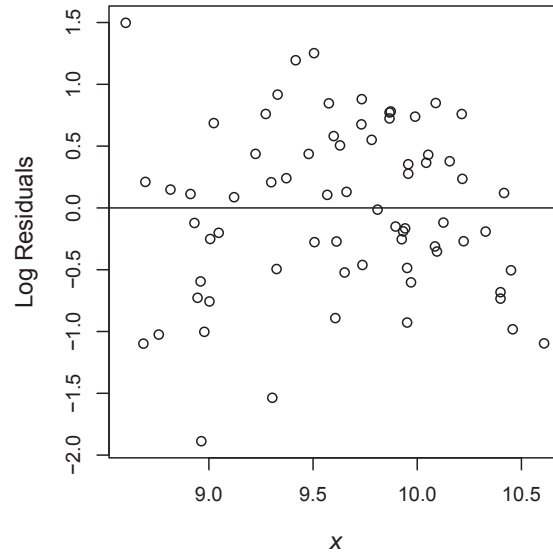
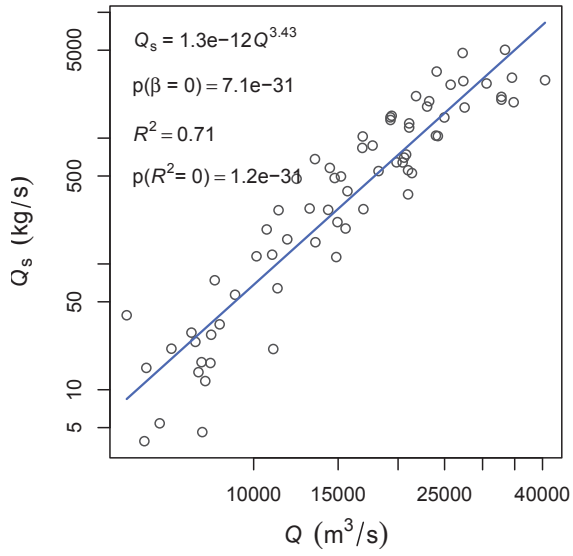
Fine Bed Sites

7355500 - RED R @ ALEXANDRIA, LA



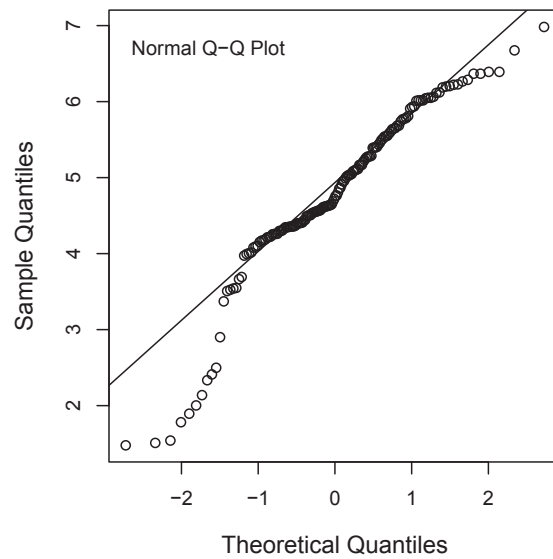
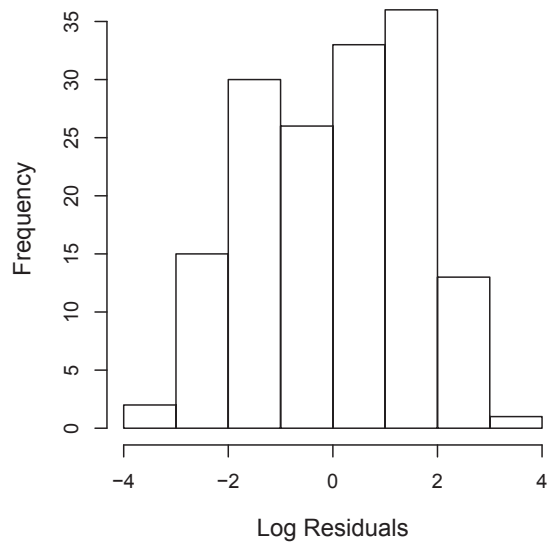
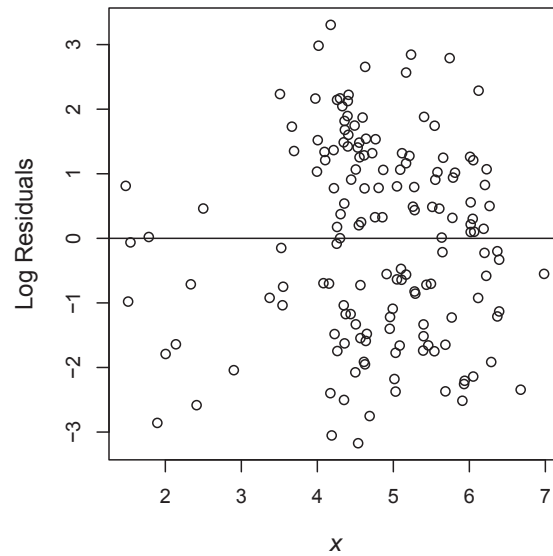
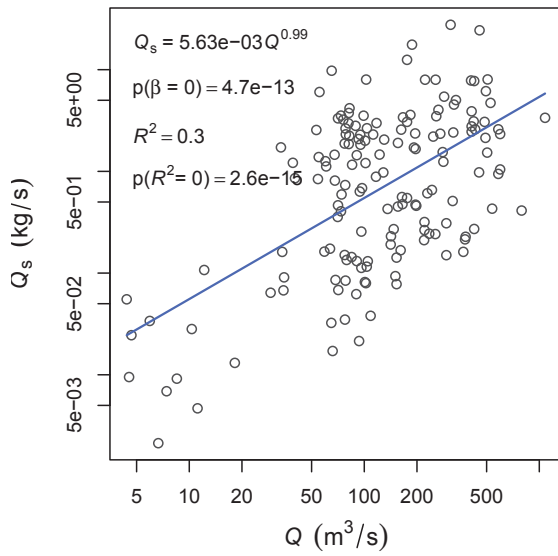
Fine Bed Sites

7374000 - Mississippi River at Baton Rouge, LA



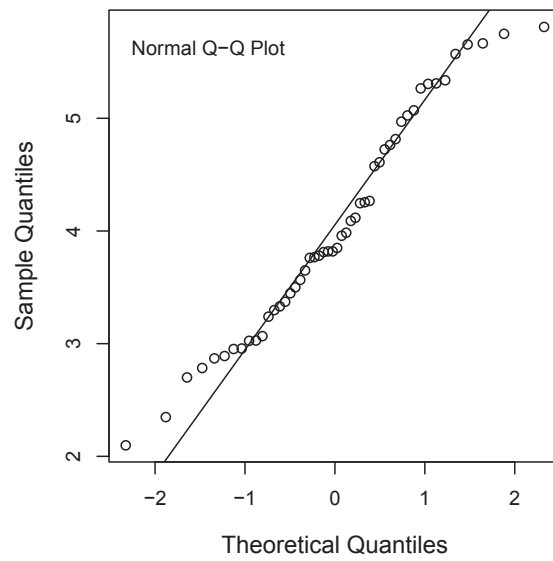
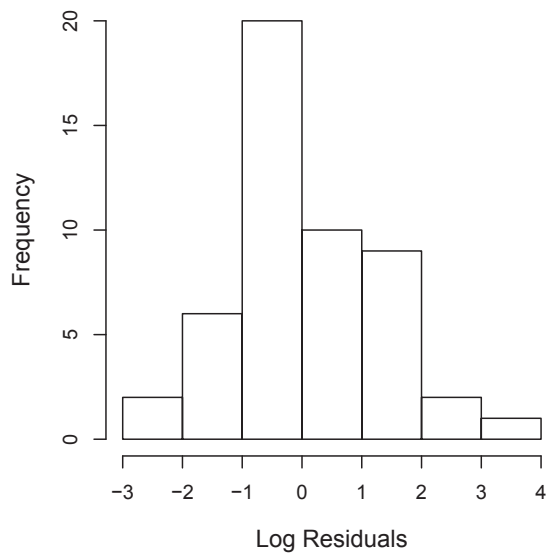
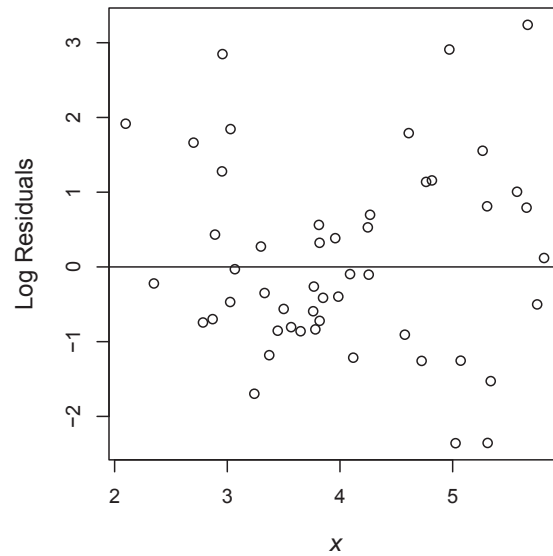
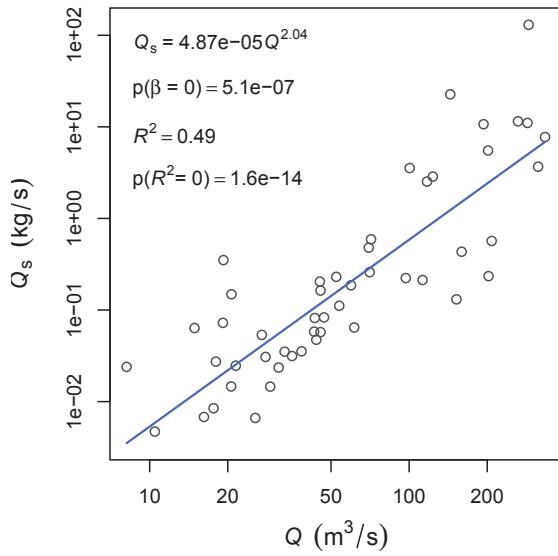
Fine Bed Sites

8041000 - Neches Rv at Evadale, TX



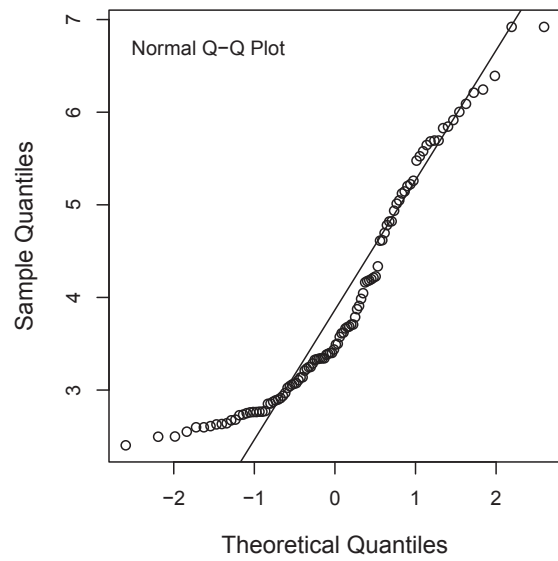
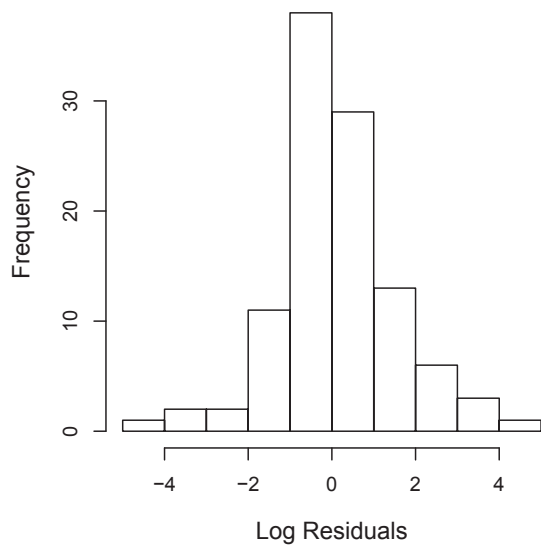
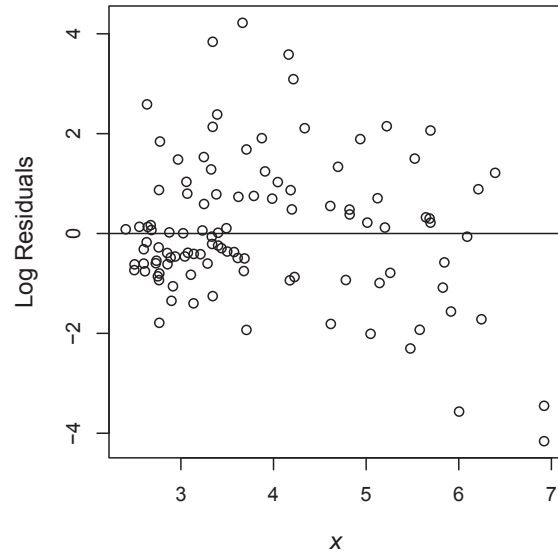
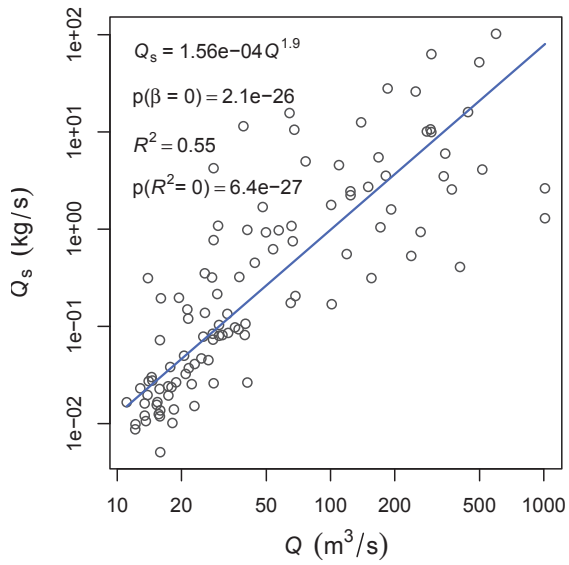
Fine Bed Sites

8057410 - Trinity Rv bl Dallas, TX



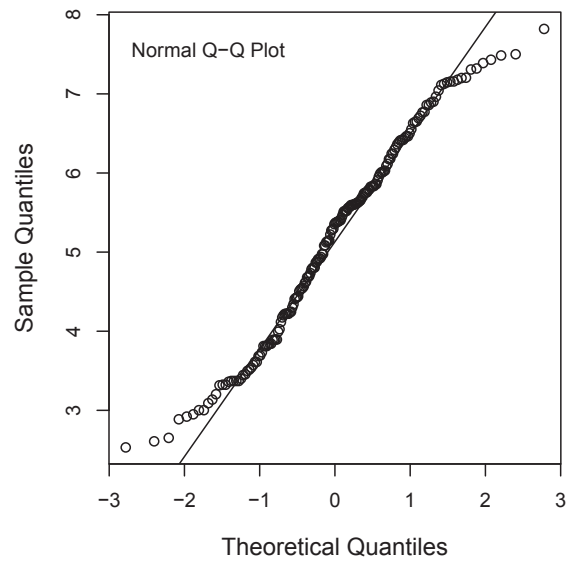
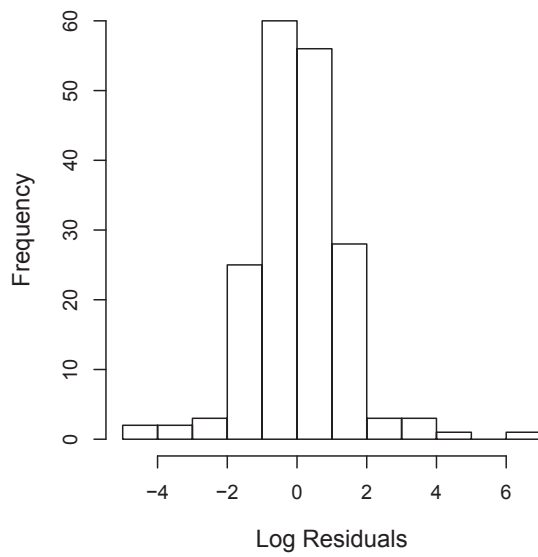
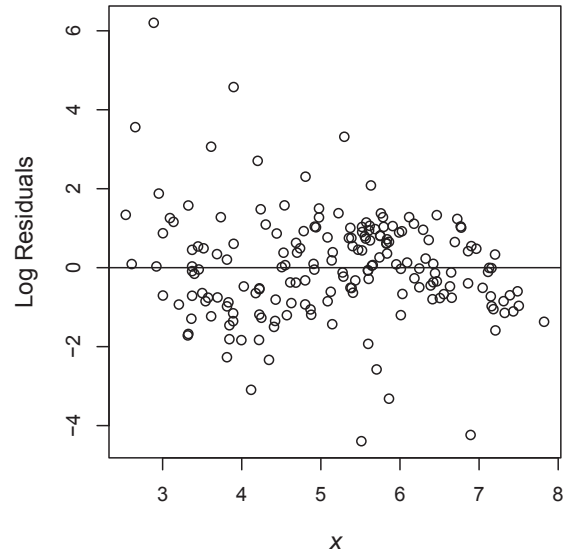
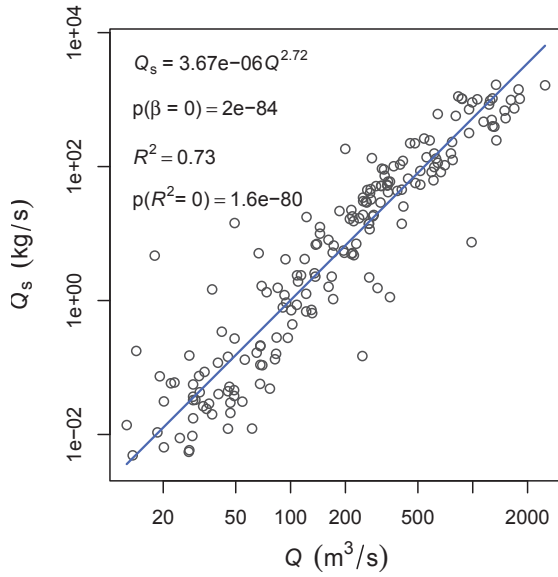
Fine Bed Sites

8062700 - Trinity Rv at Trinidad, TX



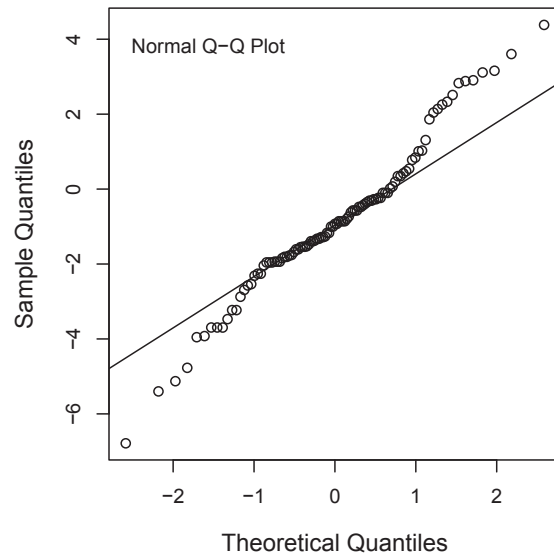
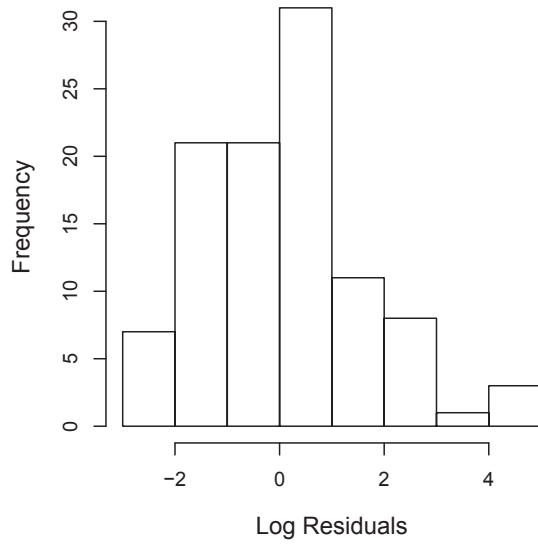
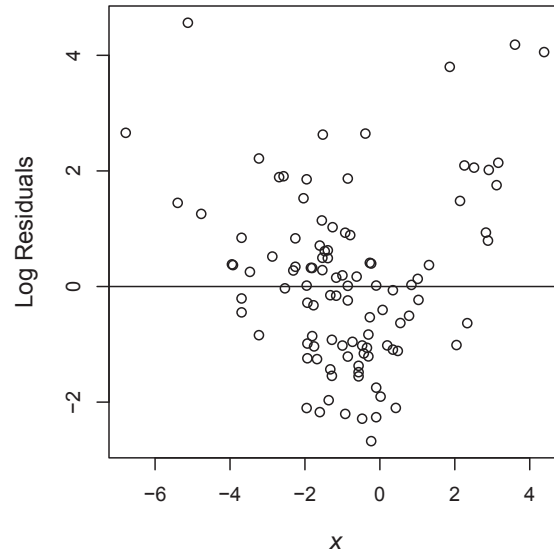
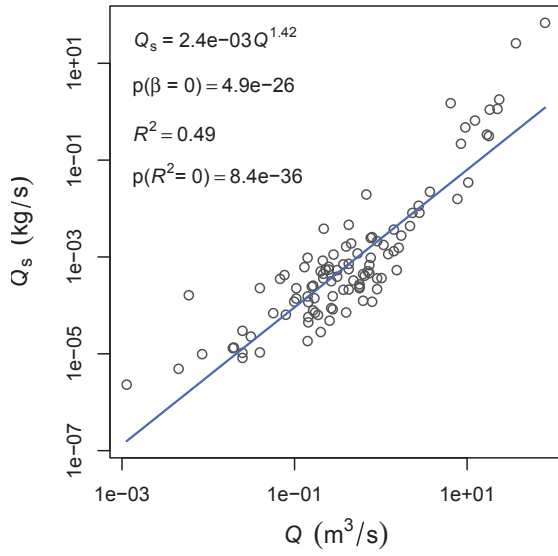
Fine Bed Sites

8114000 - Brazos Rv at Richmond, TX



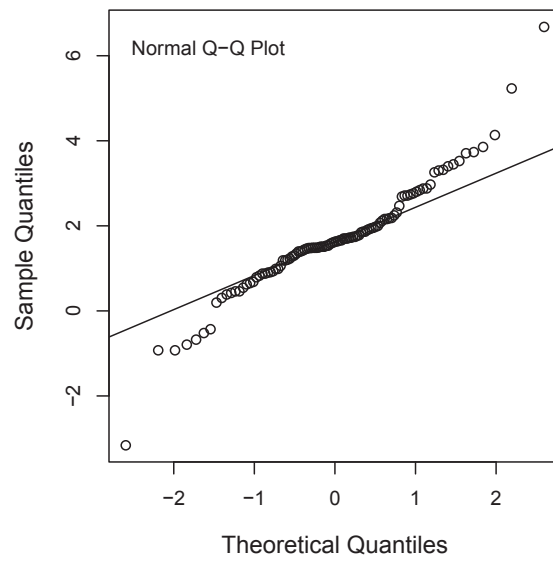
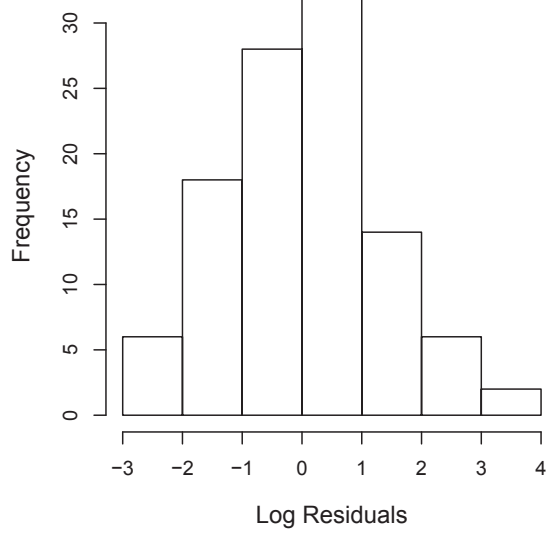
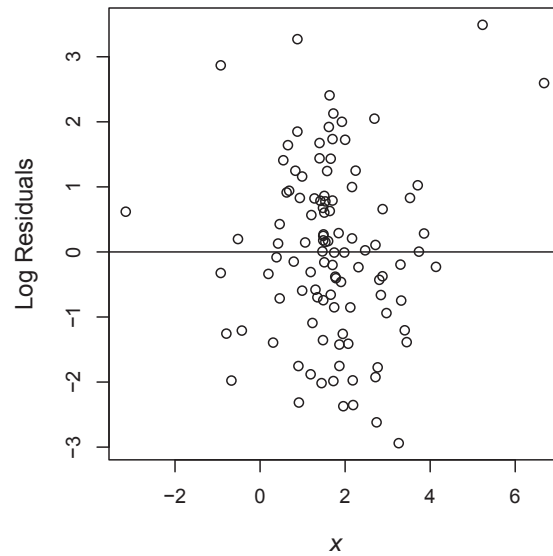
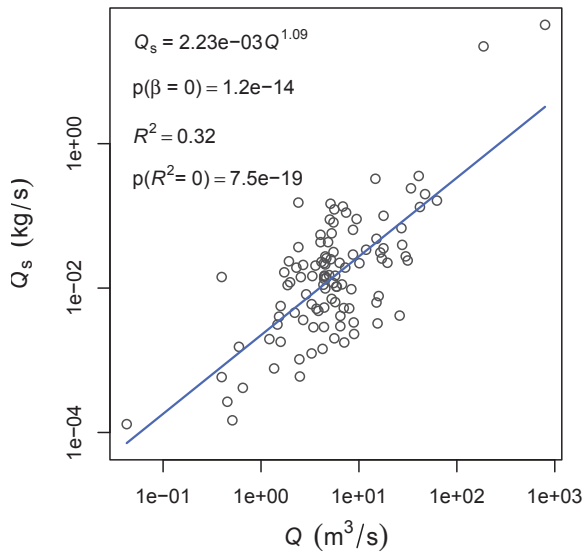
Fine Bed Sites

8123850 - Colorado Rv abv Silver, TX



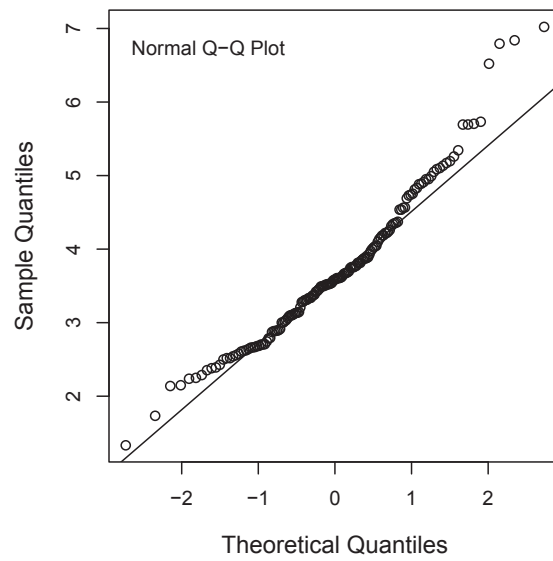
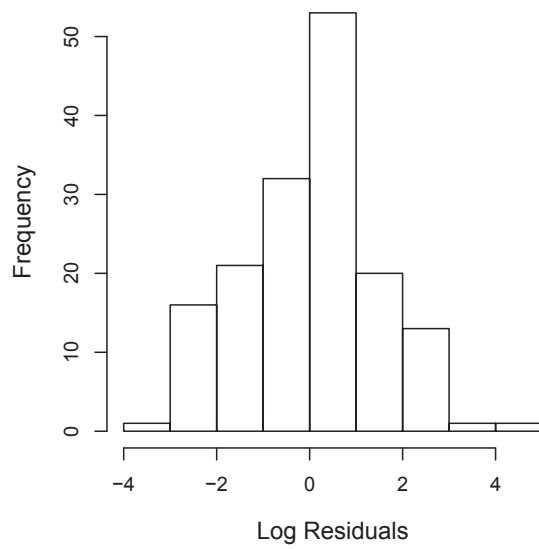
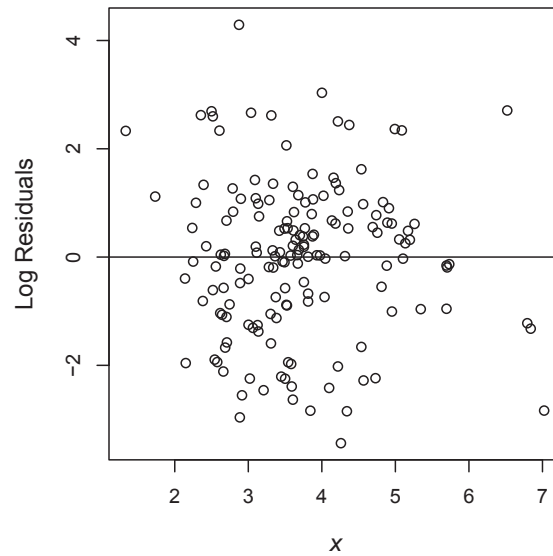
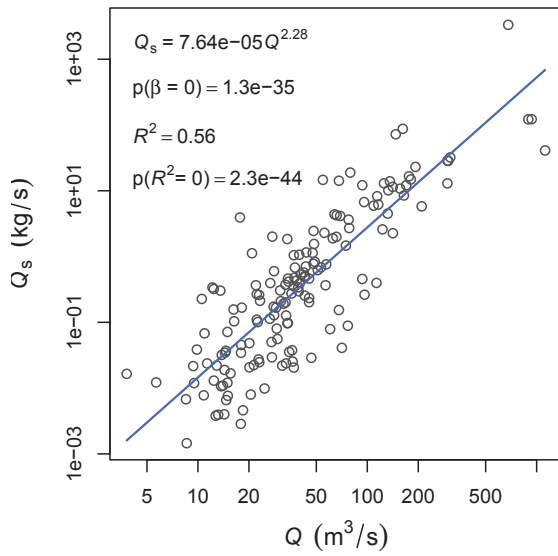
Fine Bed Sites

8147000 - Colorado Rv nr San Saba, TX



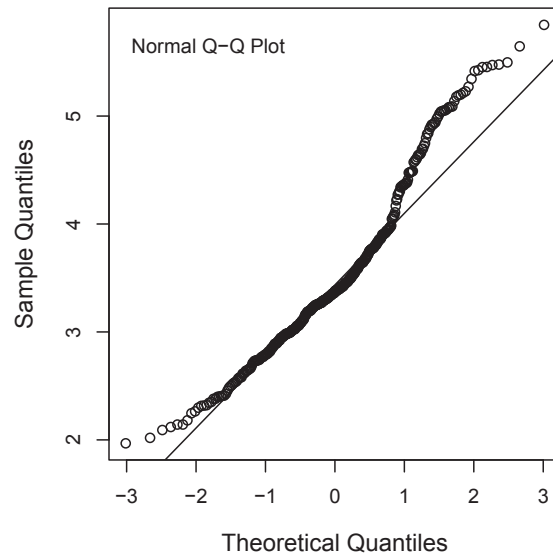
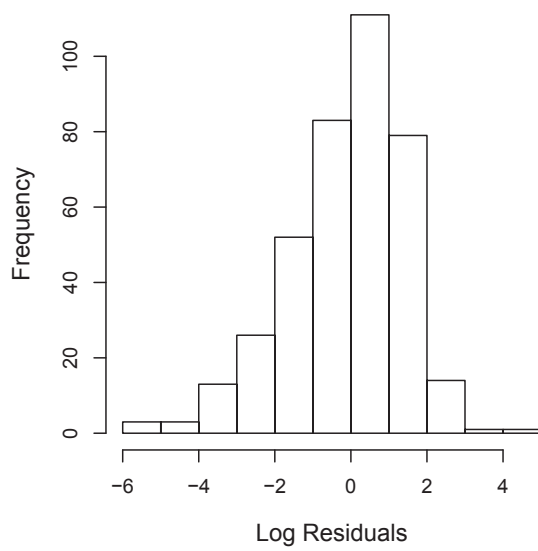
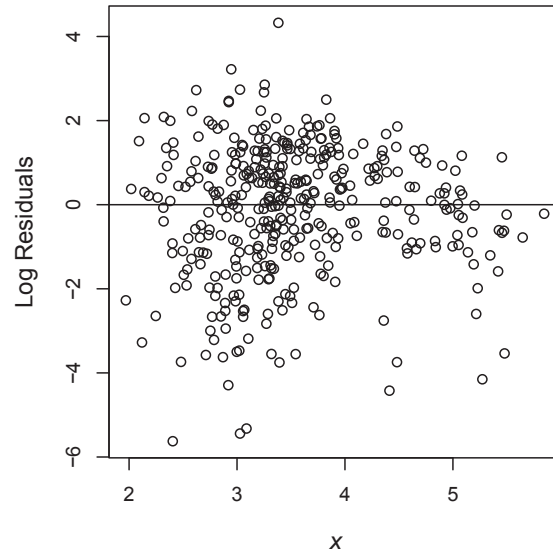
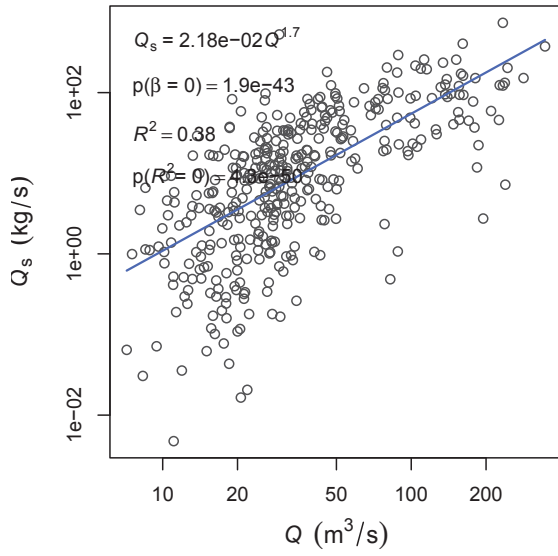
Fine Bed Sites

8162000 - Colorado Rv at Wharton, TX



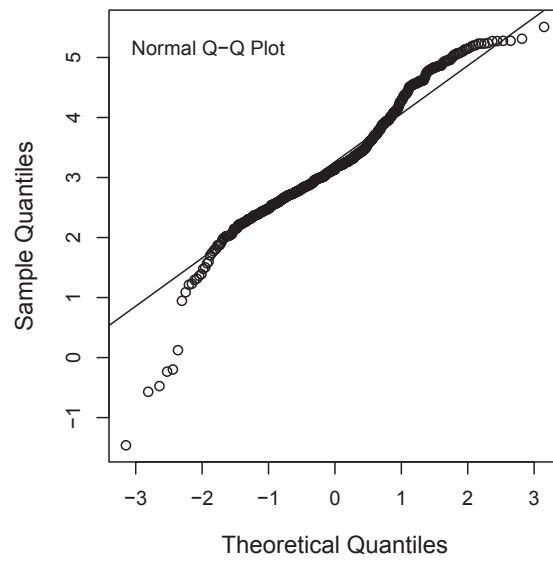
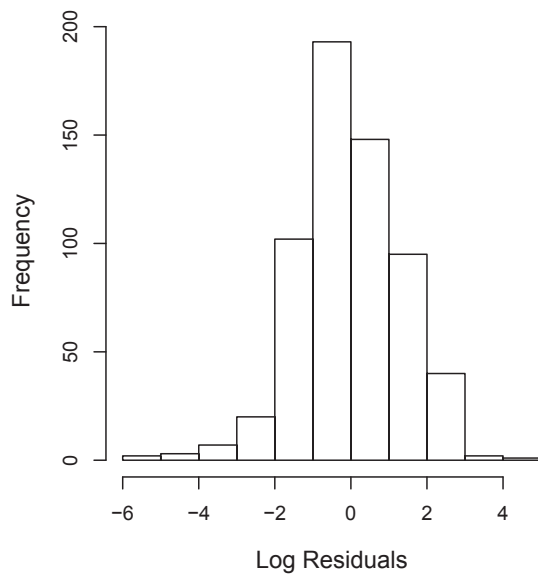
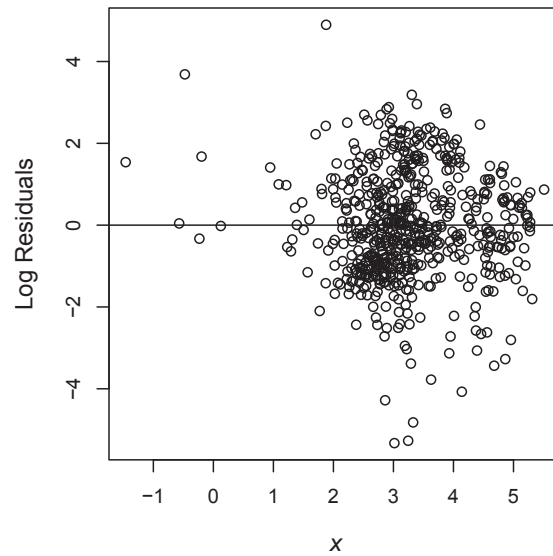
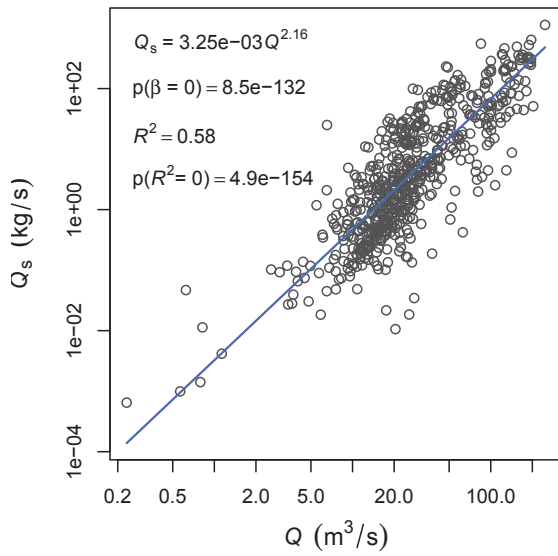
Fine Bed Sites

8313000 - RIO GRANDE AT OTOWI BRIDGE, NM



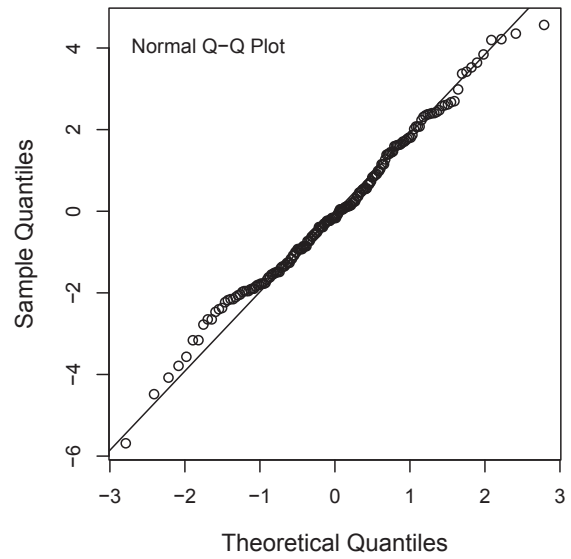
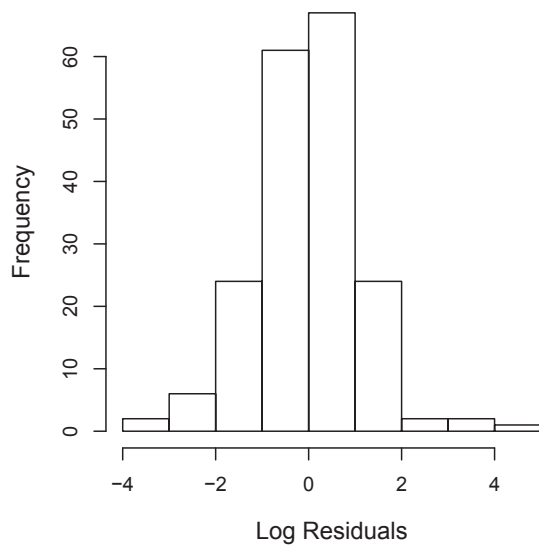
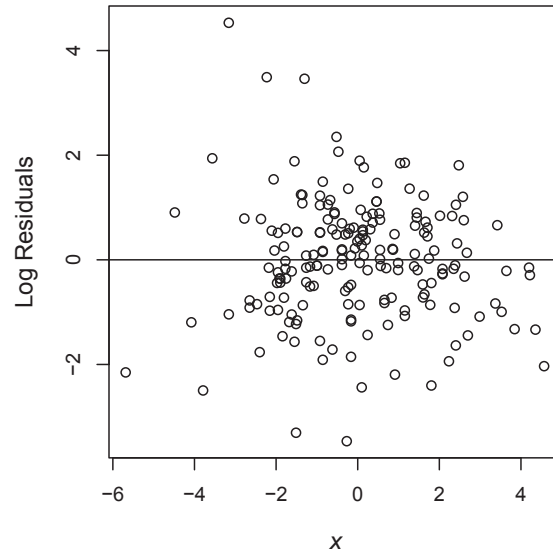
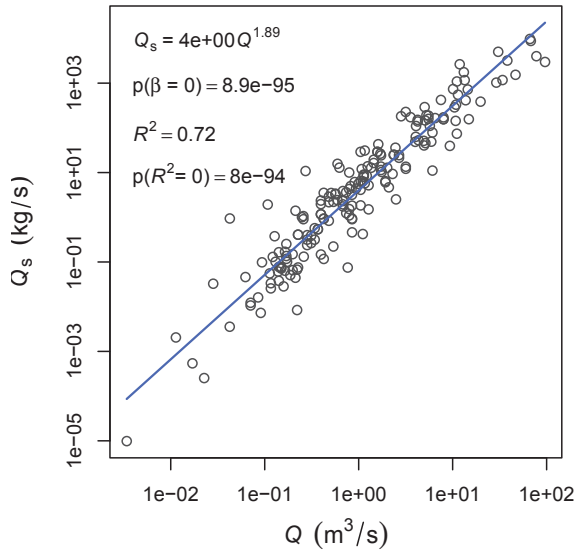
Fine Bed Sites

8330000 - RIO GRANDE AT ALBUQUERQUE, NM



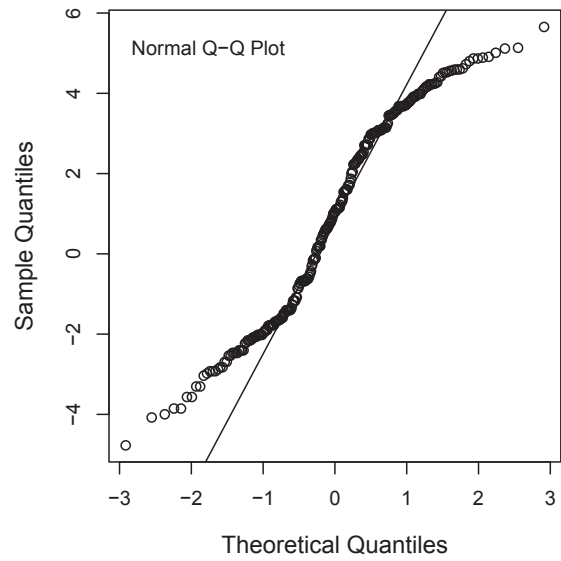
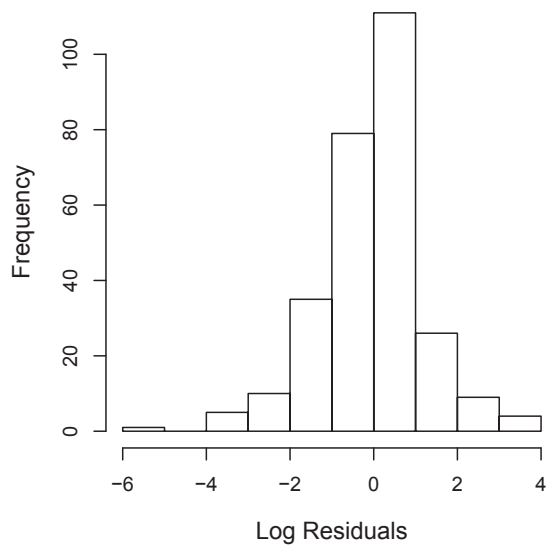
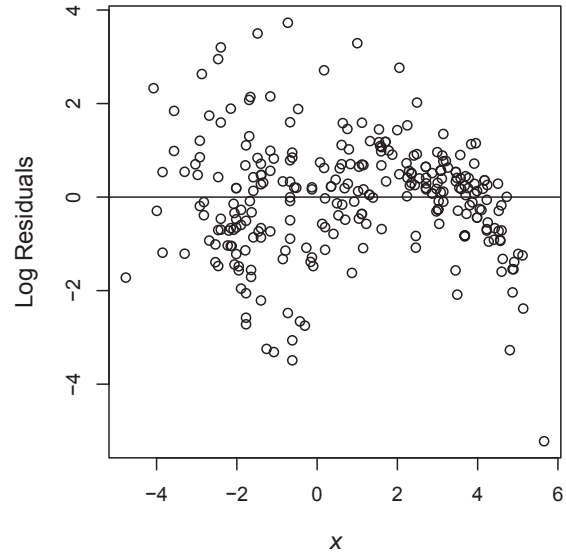
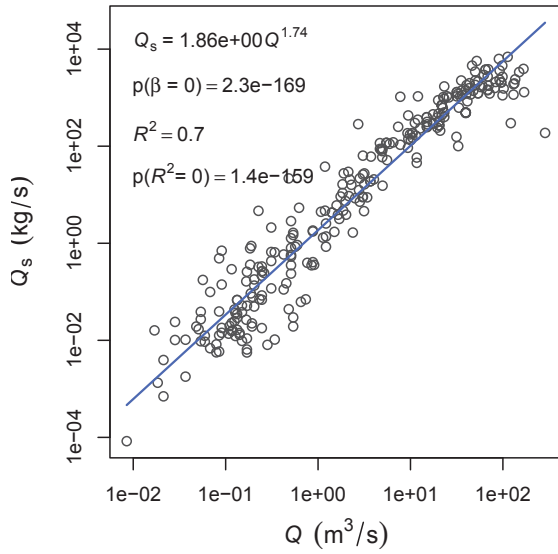
Fine Bed Sites

8334000 - RIO PUERCO ABV ARROYO CHICO NR GUADALUPE, NM



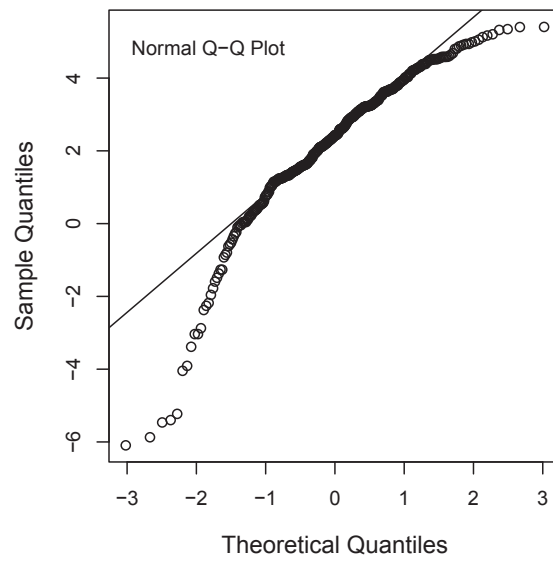
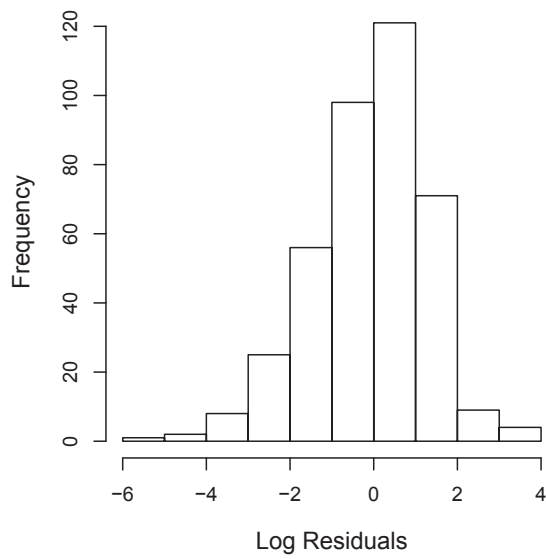
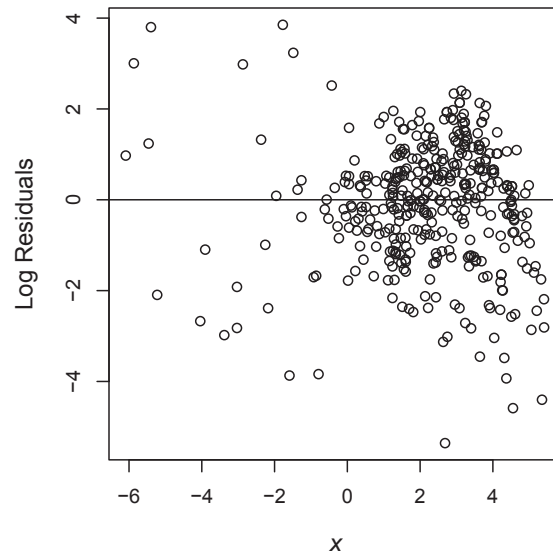
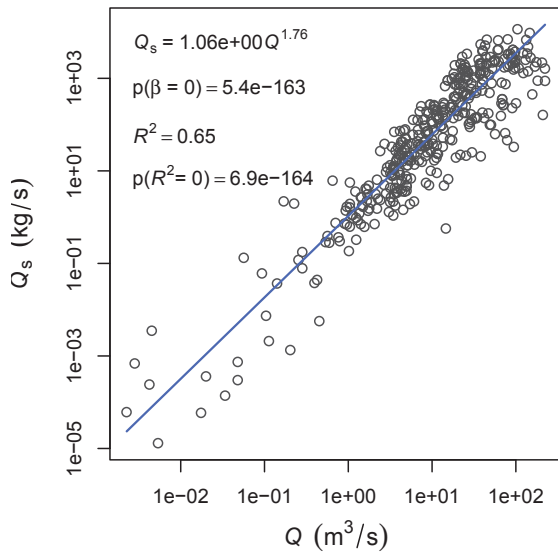
Fine Bed Sites

8340500 - ARROYO CHICO NR GUADALUPE, NM



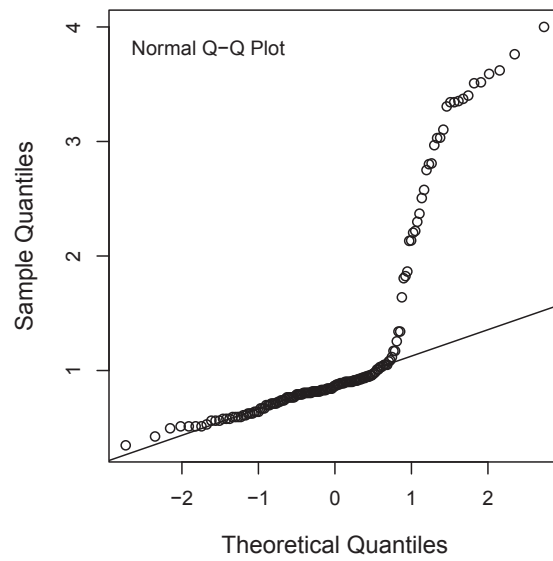
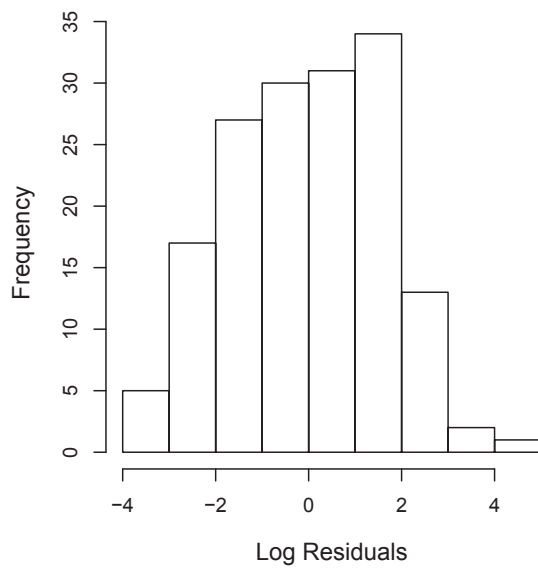
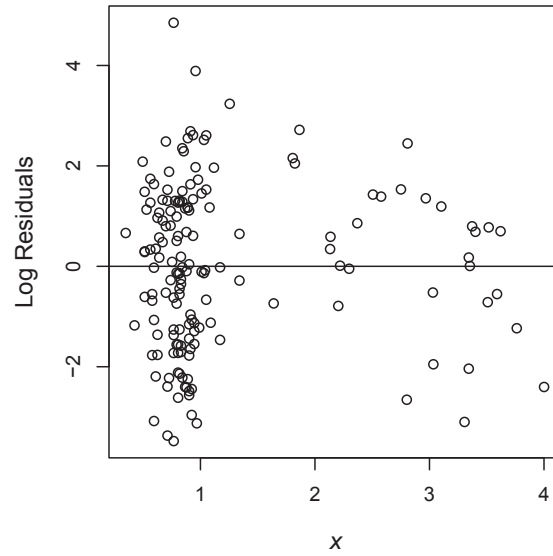
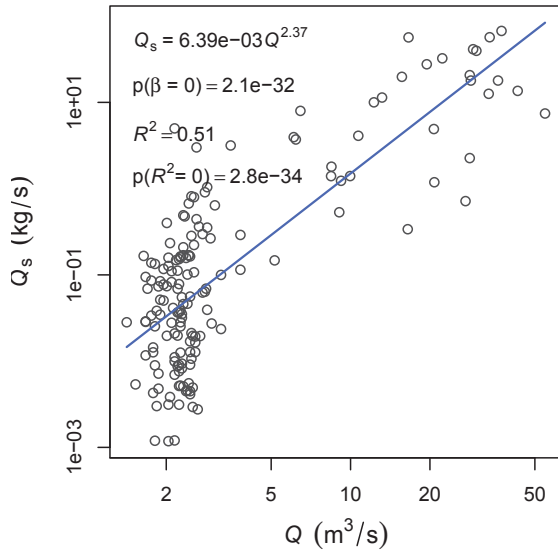
Fine Bed Sites

8353000 - RIO PUERCO NEAR BERNARDO, NM



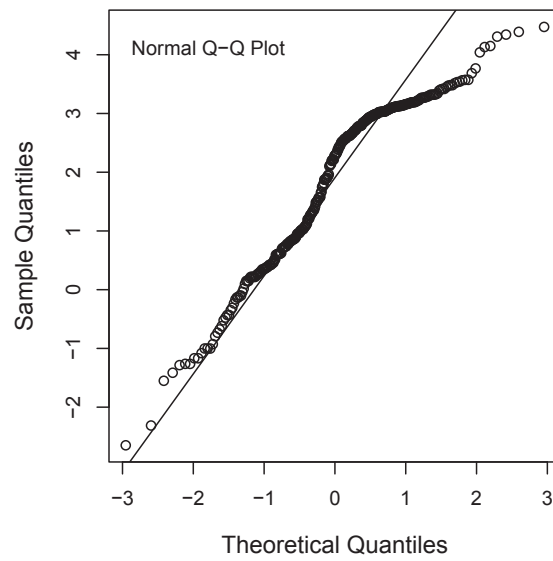
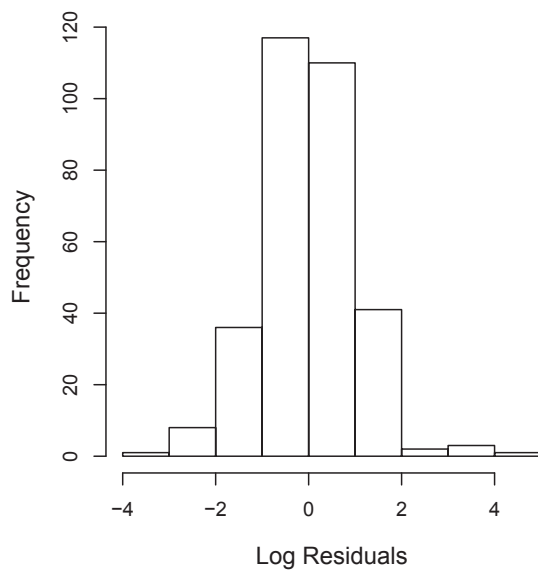
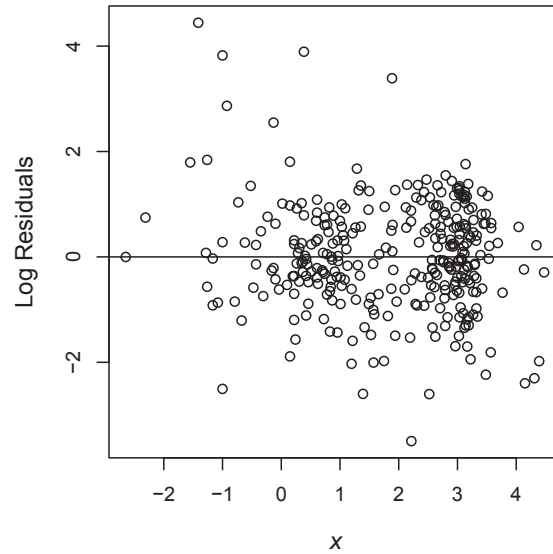
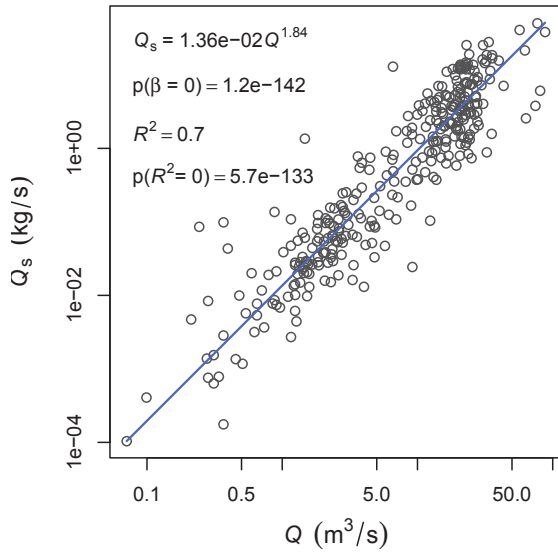
Fine Bed Sites

8383500 - PECOS RIVER NEAR PUERTO DE LUNA, NM



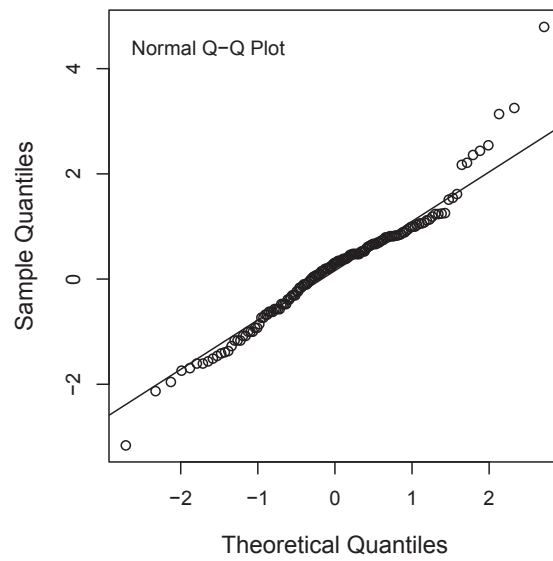
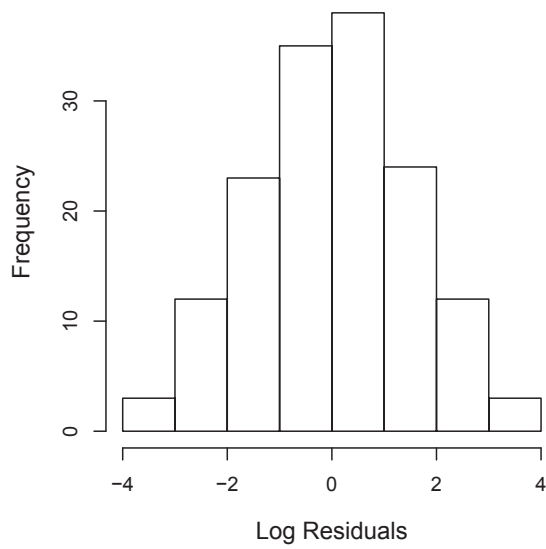
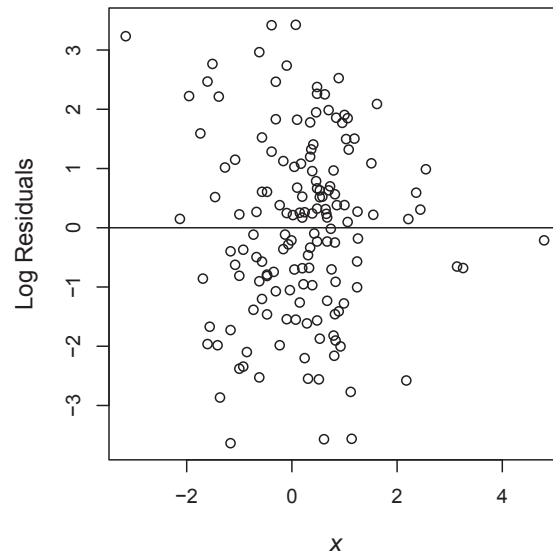
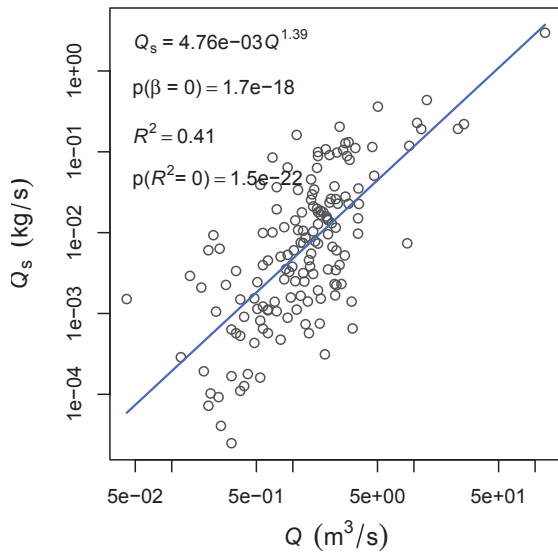
Fine Bed Sites

8396500 - PECOS RIVER NEAR ARTESIA, NM



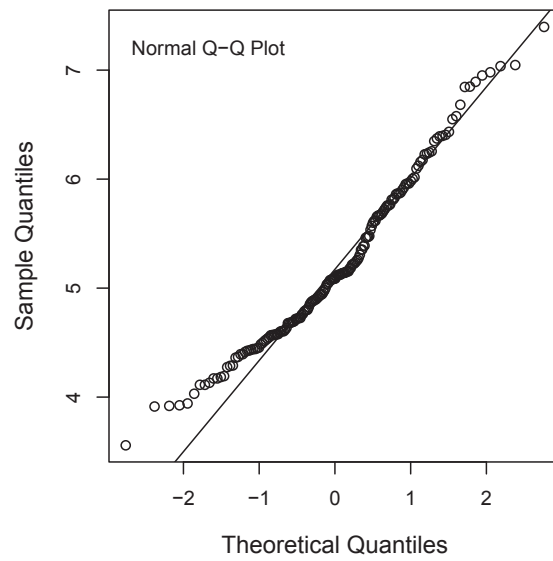
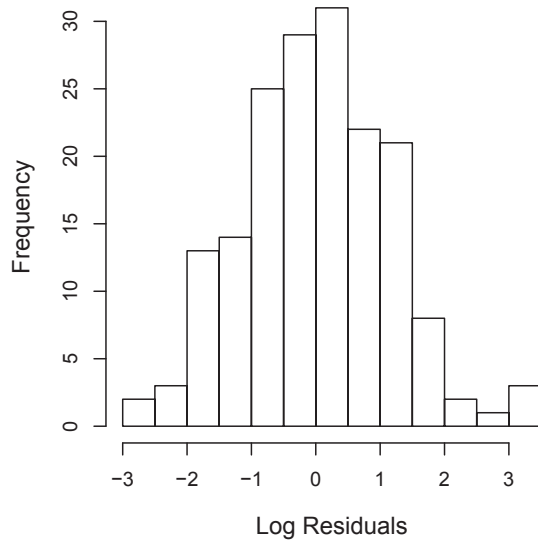
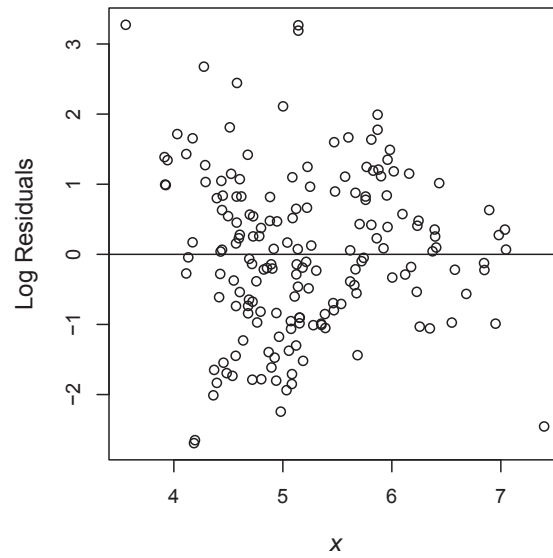
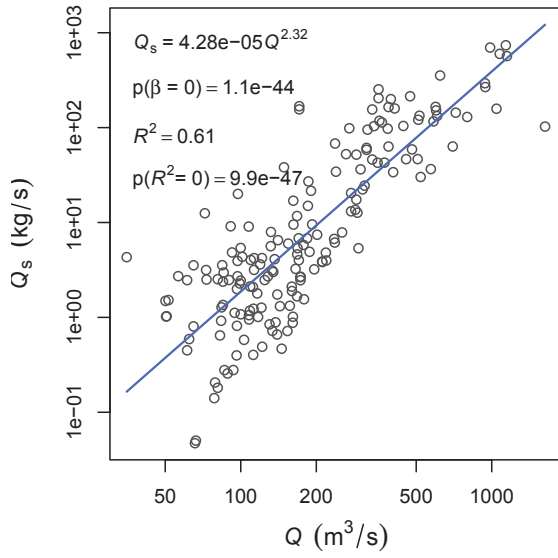
Fine Bed Sites

8407500 - PECOS RIVER AT RED BLUFF, NM



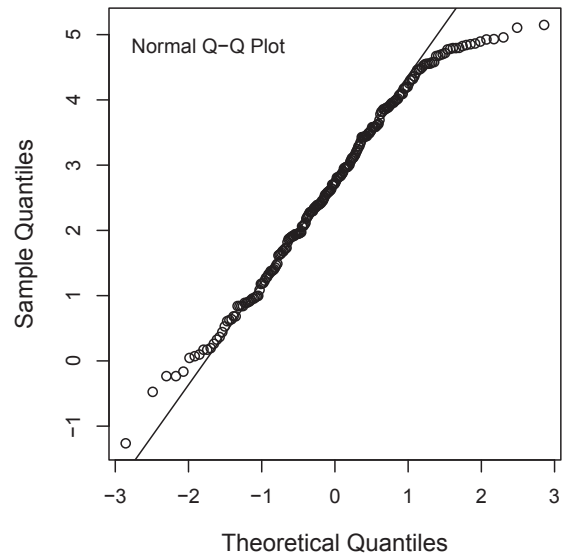
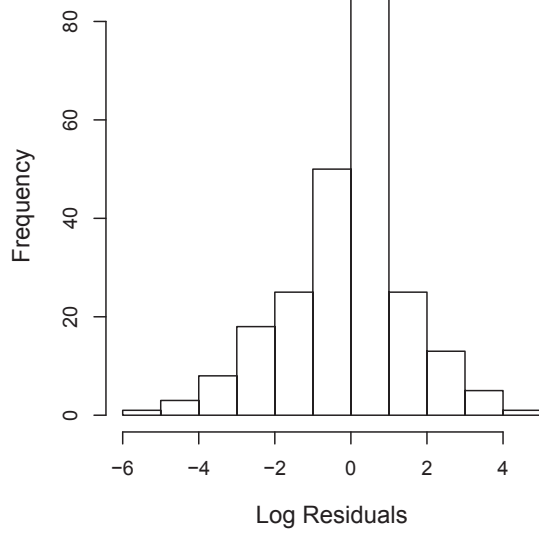
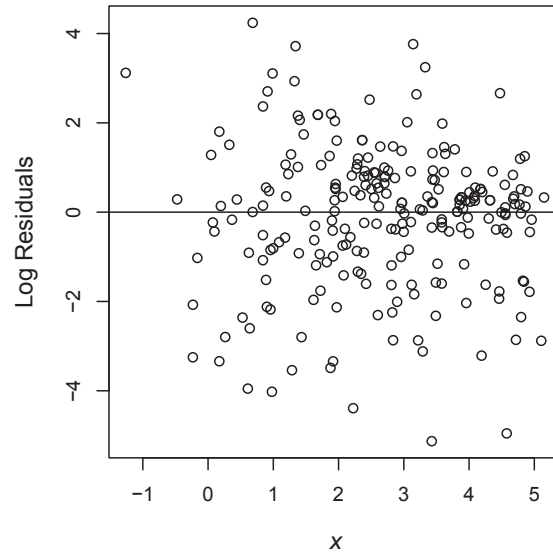
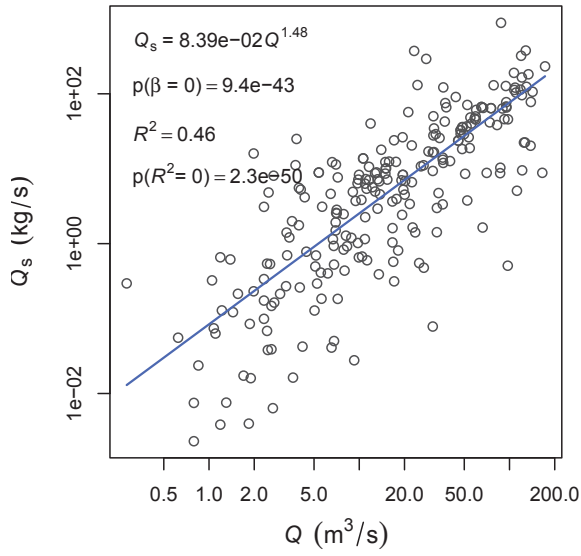
Fine Bed Sites

9163500 - COLORADO RIVER NEAR COLORADO-UTAH STATE LINE



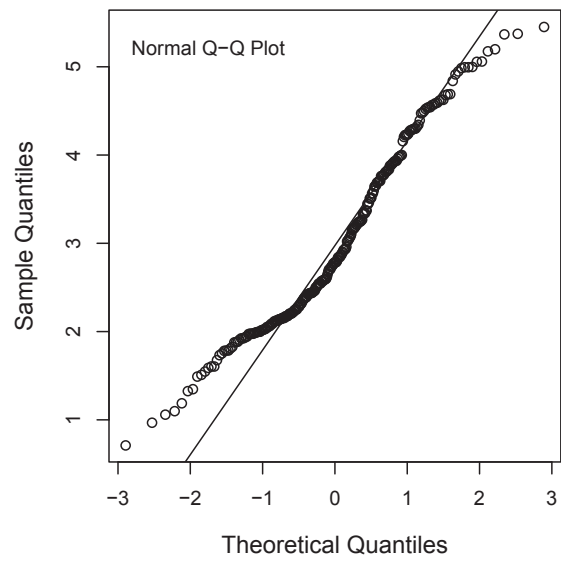
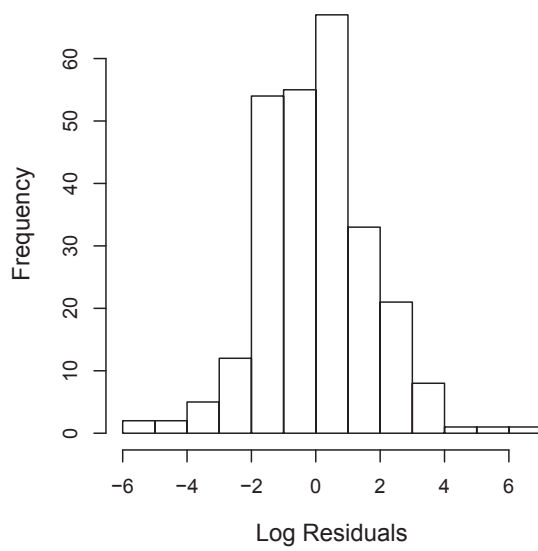
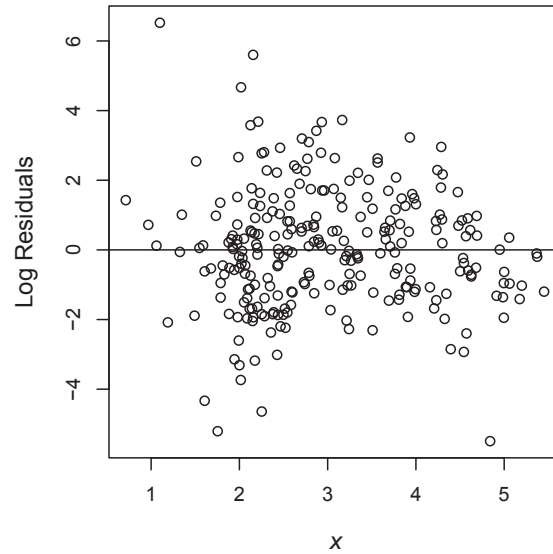
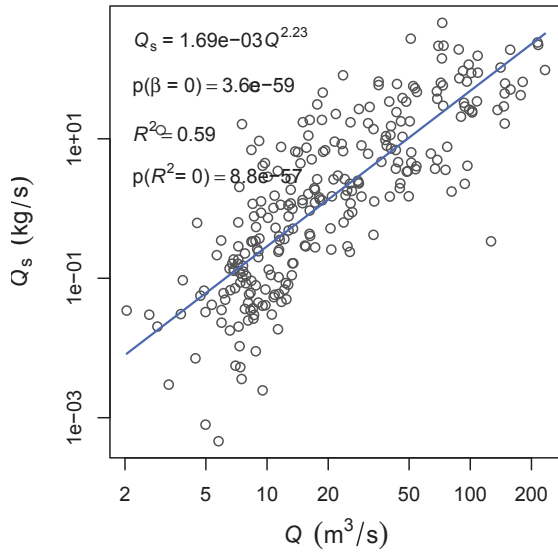
Fine Bed Sites

9260000 - LITTLE SNAKE RIVER NEAR LILY, CO



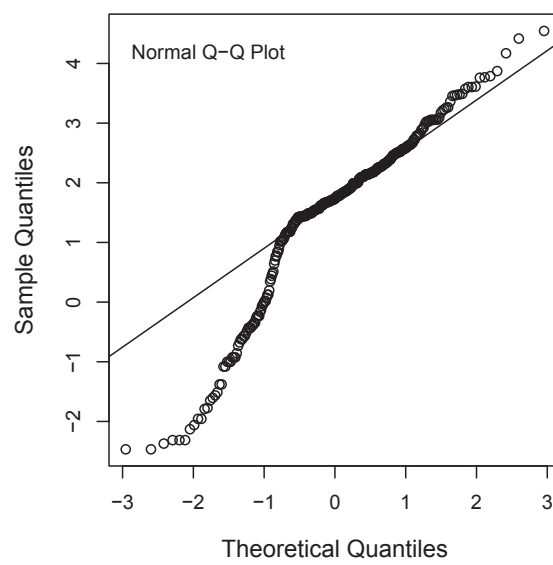
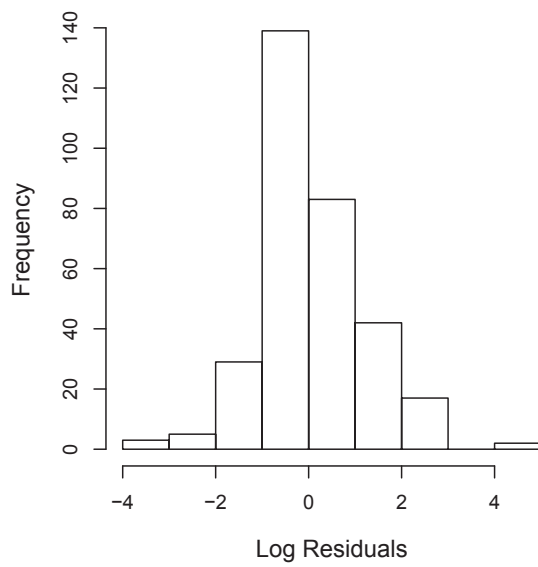
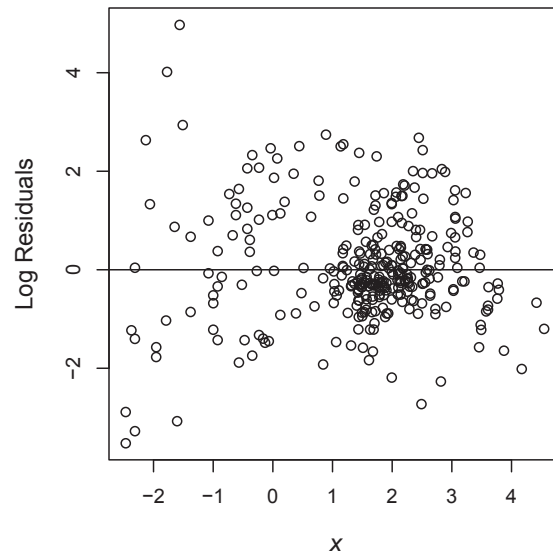
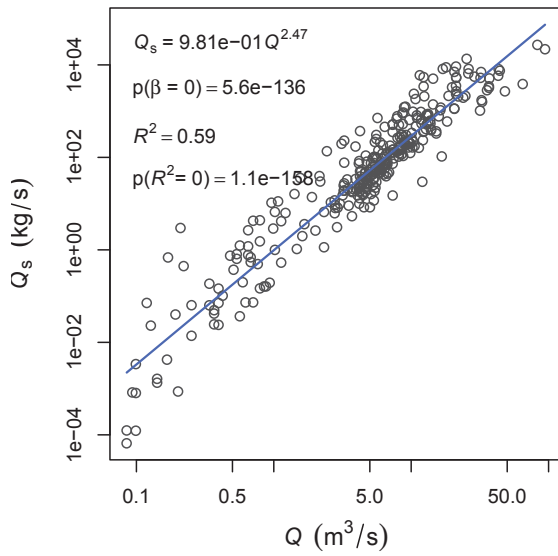
Fine Bed Sites

9364500 - ANIMAS RIVER AT FARMINGTON, NM



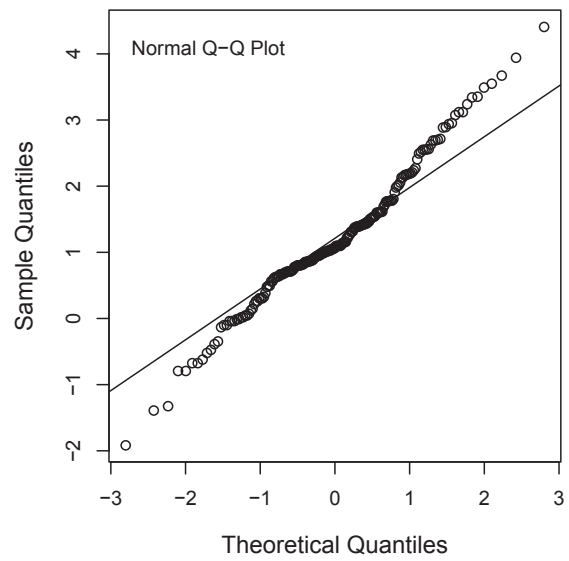
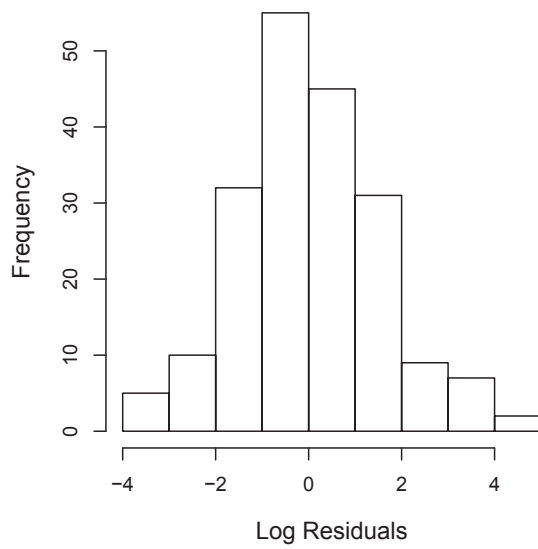
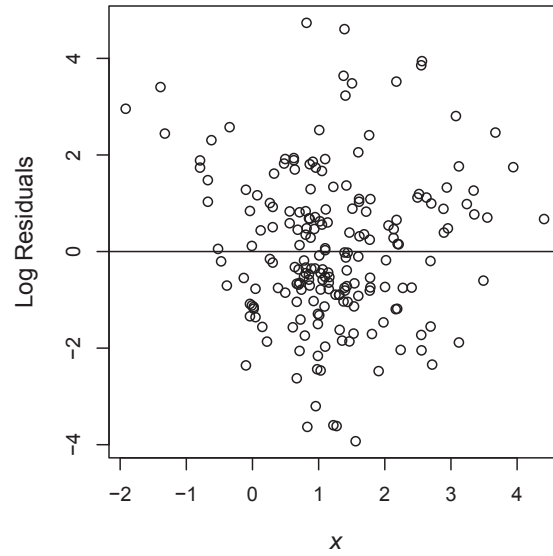
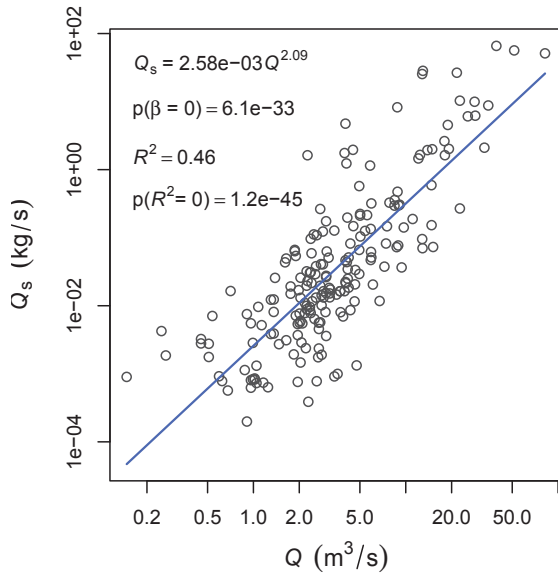
Fine Bed Sites

9382000 - PARIA RIVER AT LEES FERRY, AZ



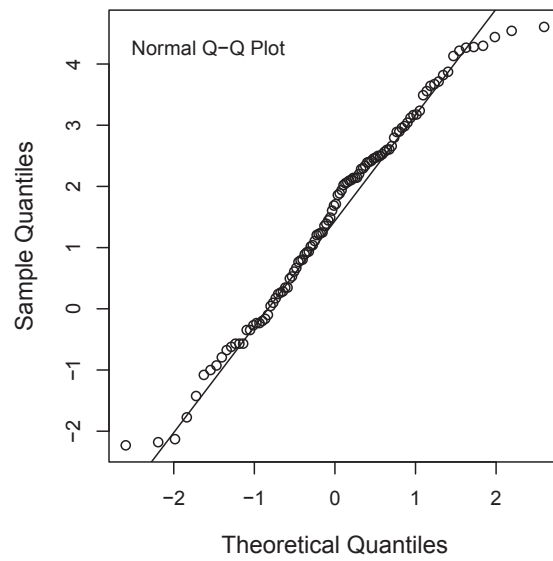
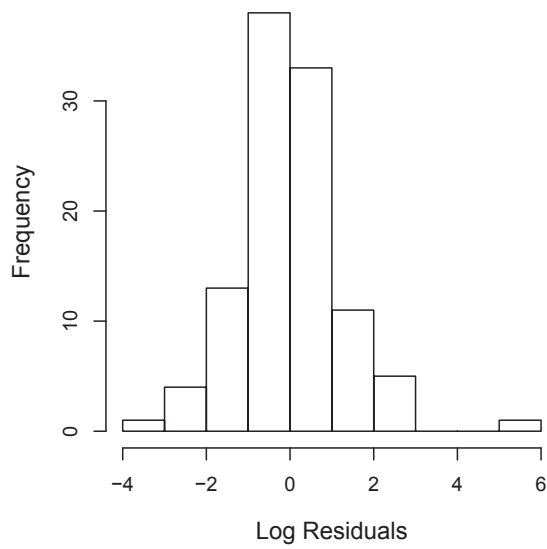
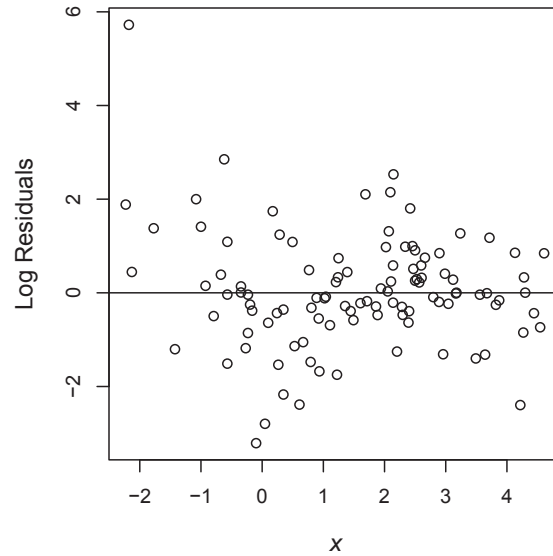
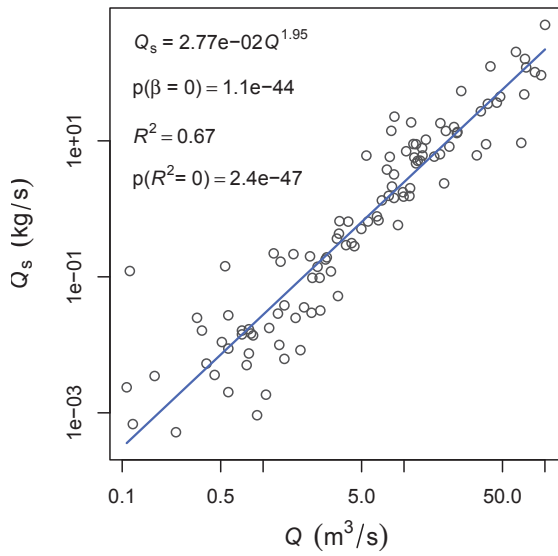
Fine Bed Sites

9431500 - GILA RIVER NEAR REDROCK, NM



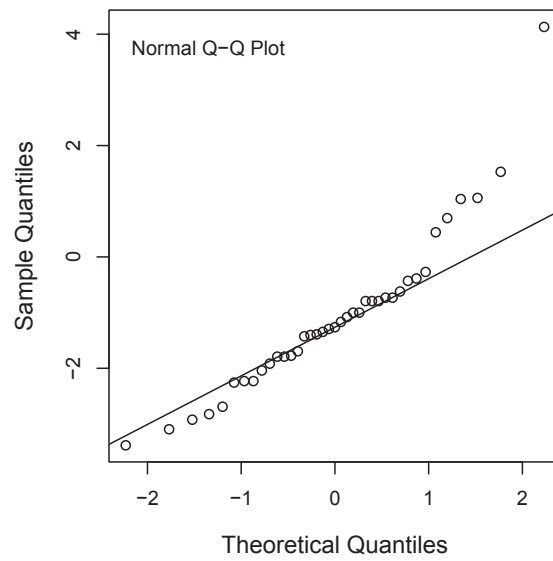
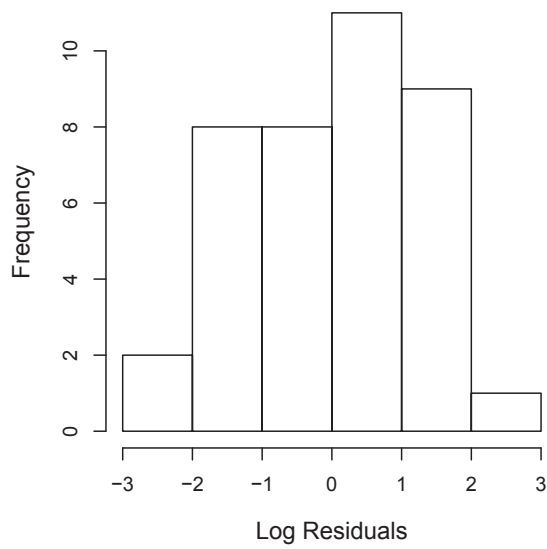
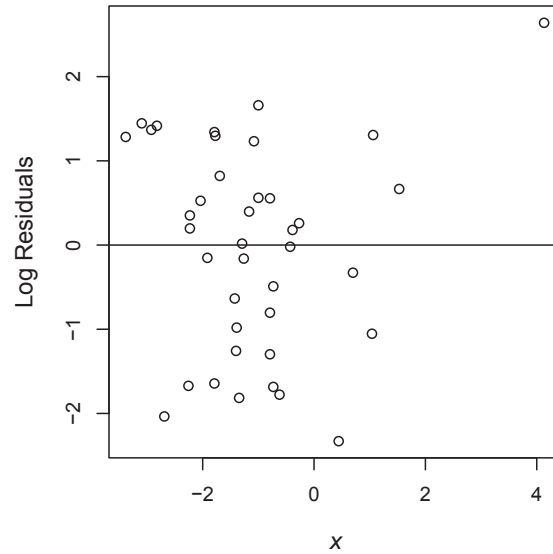
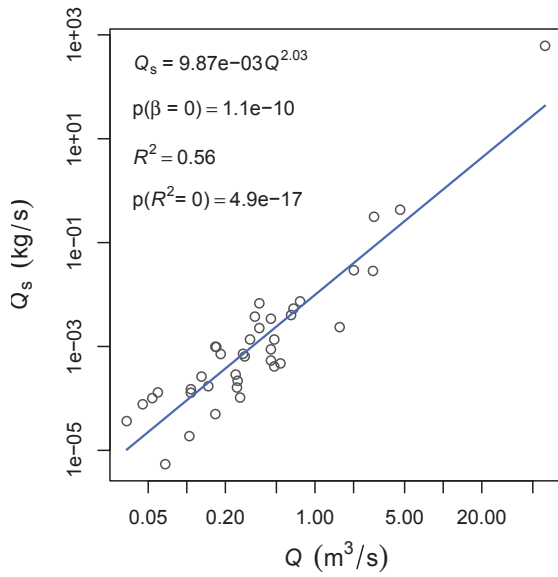
Fine Bed Sites

9466500 - GILA RIVER AT CALVA, AZ.



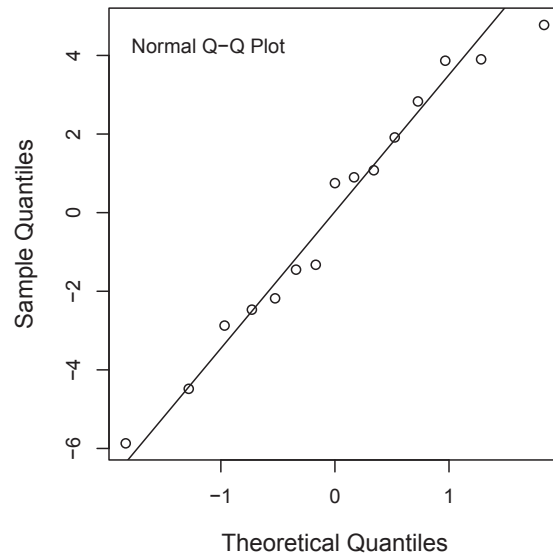
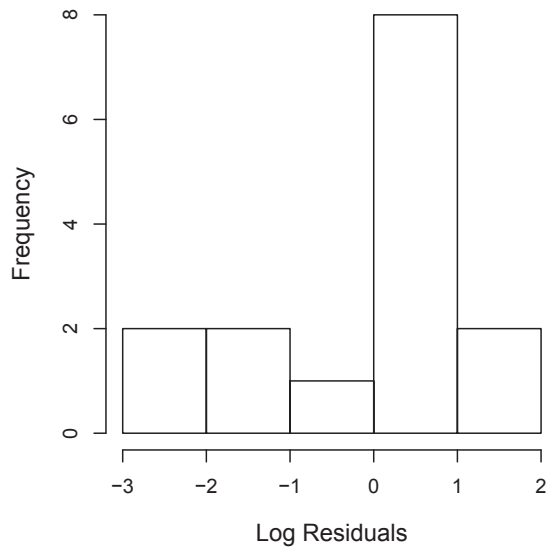
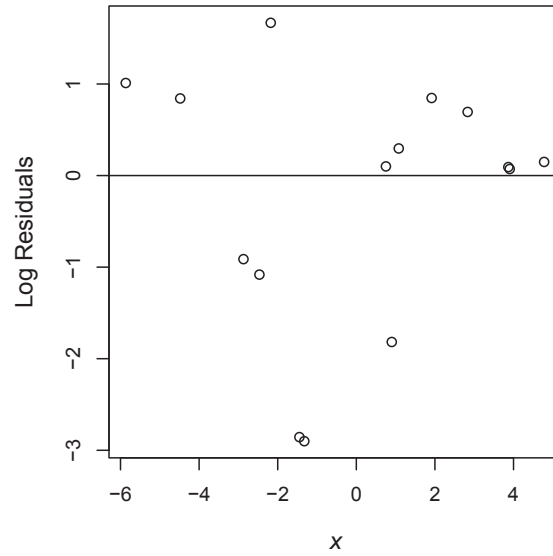
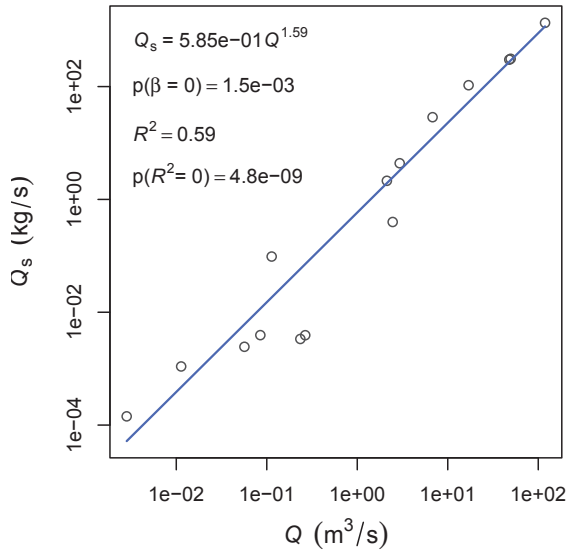
Fine Bed Sites

9471000 - SAN PEDRO RIVER AT CHARLESTON, AZ.



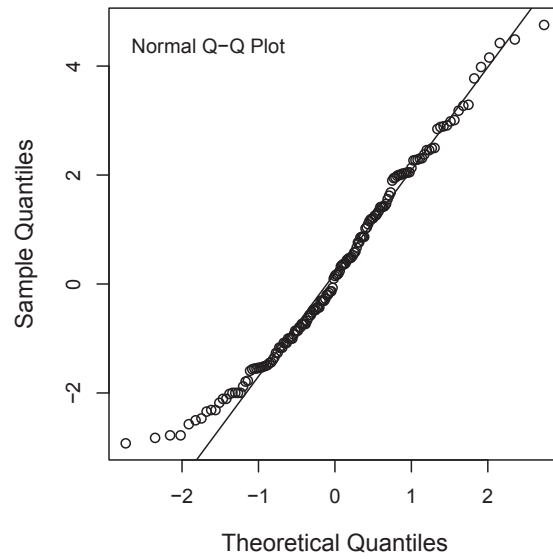
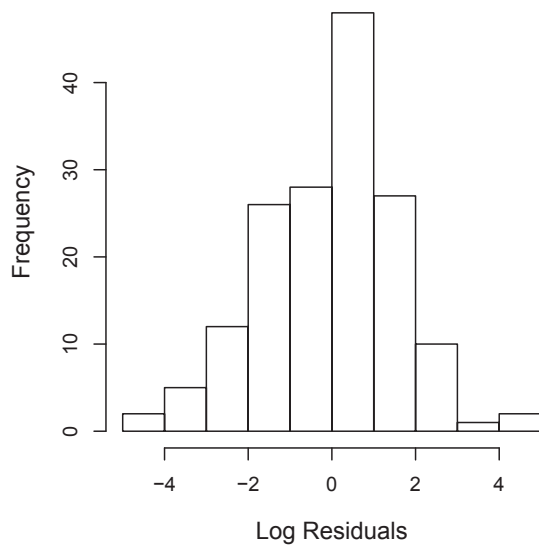
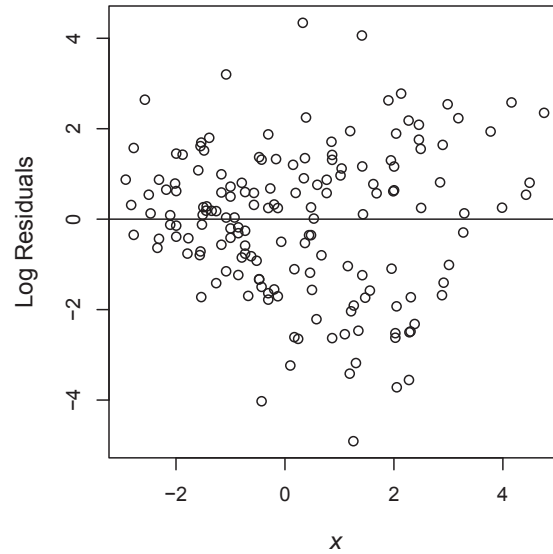
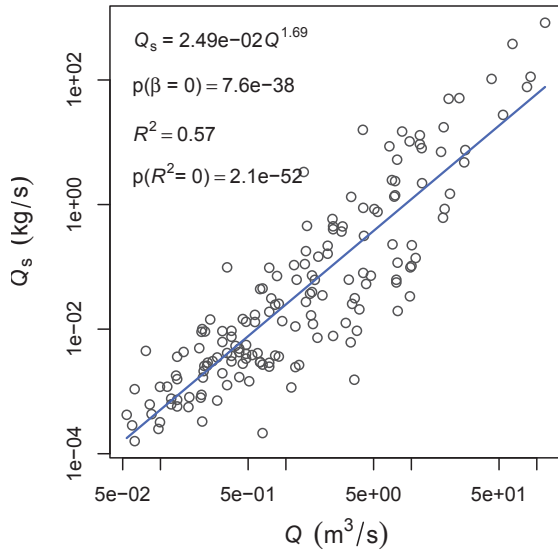
Fine Bed Sites

9473500 - SAN PEDRO R AT WINKELMAN, ARIZ.



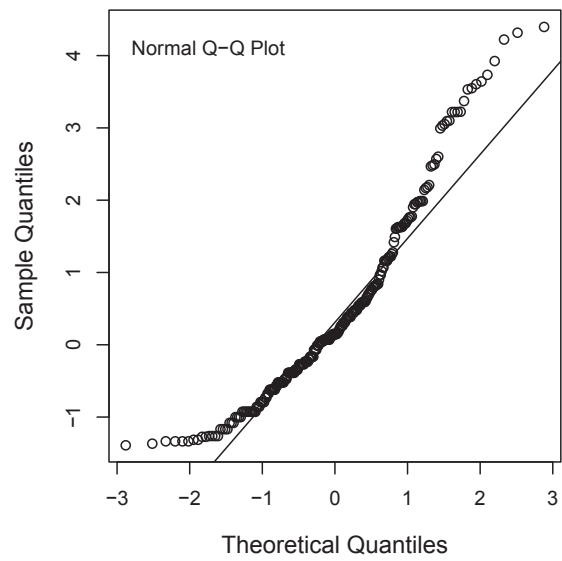
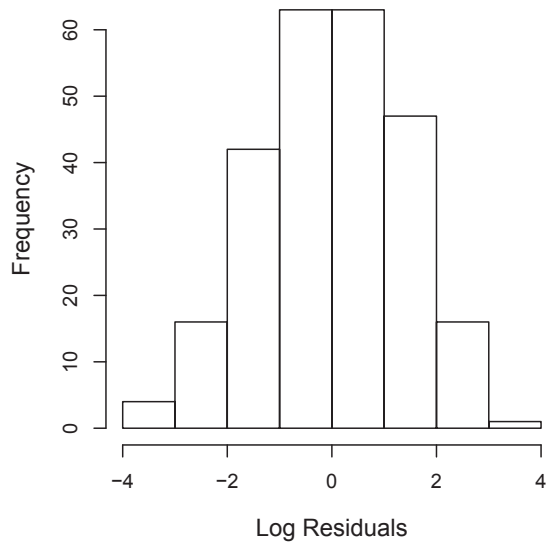
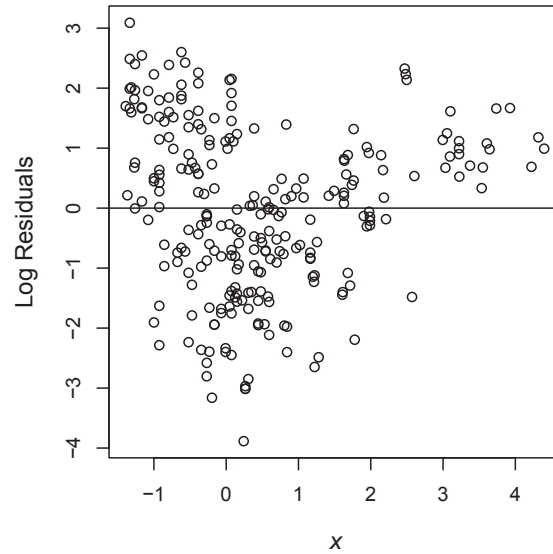
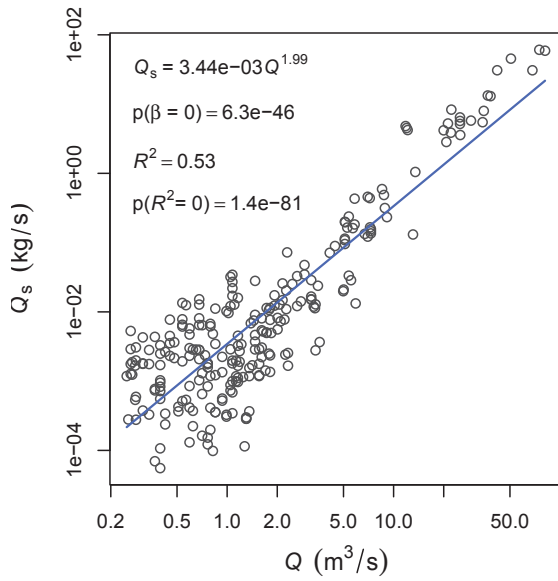
Fine Bed Sites

11042000 - SAN LUIS REY R A OCEANSIDE CA



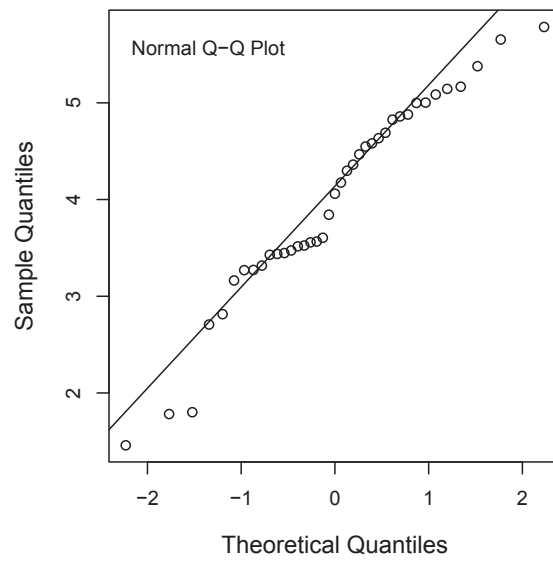
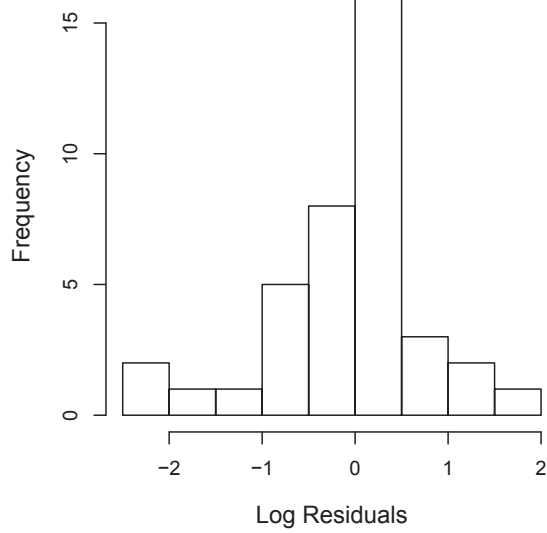
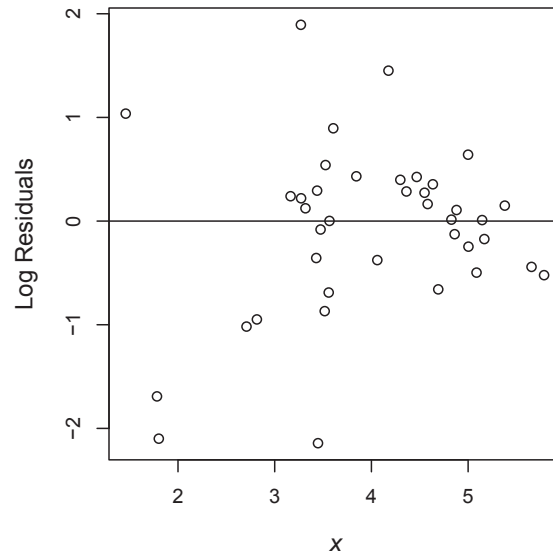
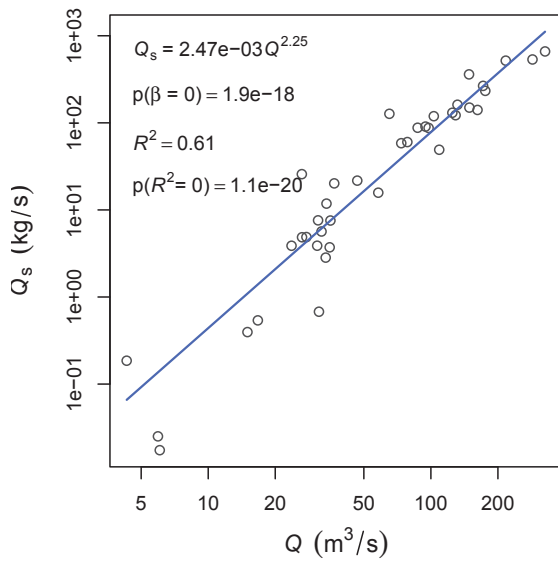
Fine Bed Sites

11176900 - ARROYO DE LA LAGUNA A VERONA CA



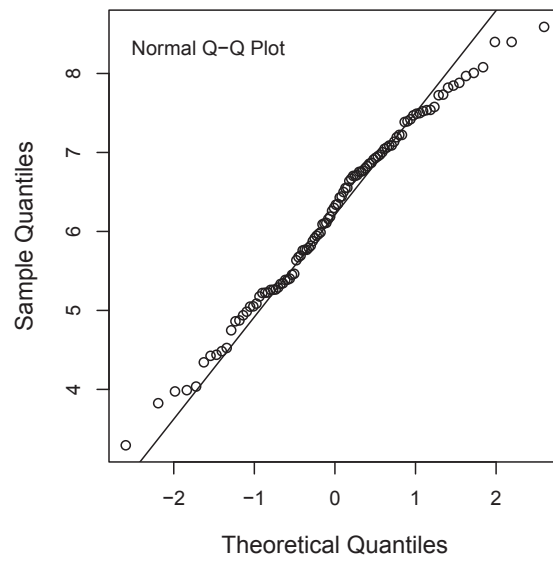
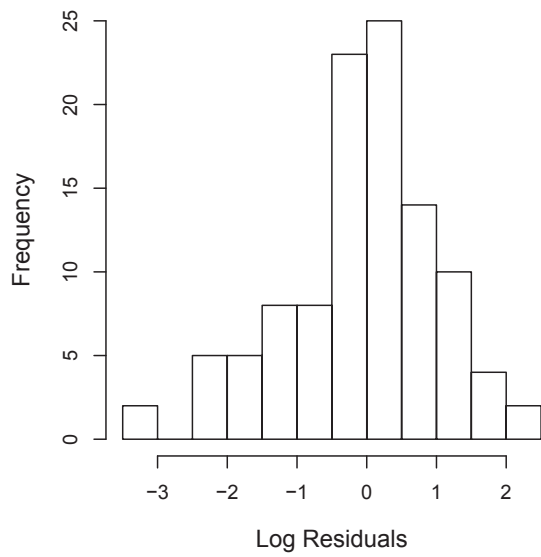
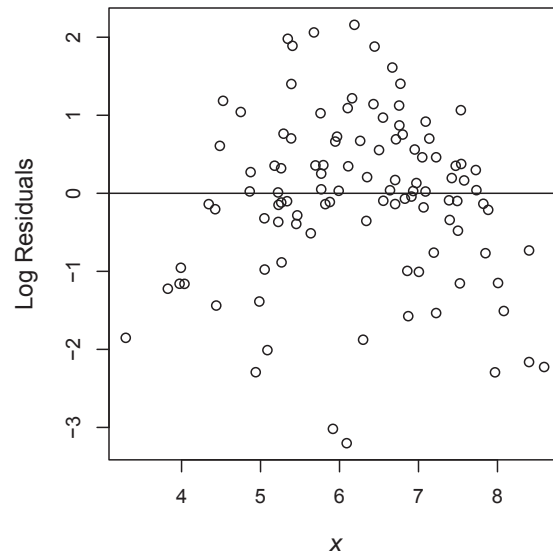
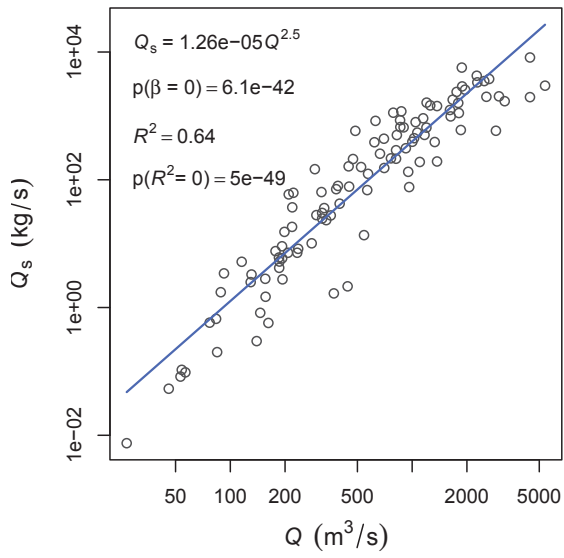
Fine Bed Sites

11382000 - THOMES C A PASKENTA CA



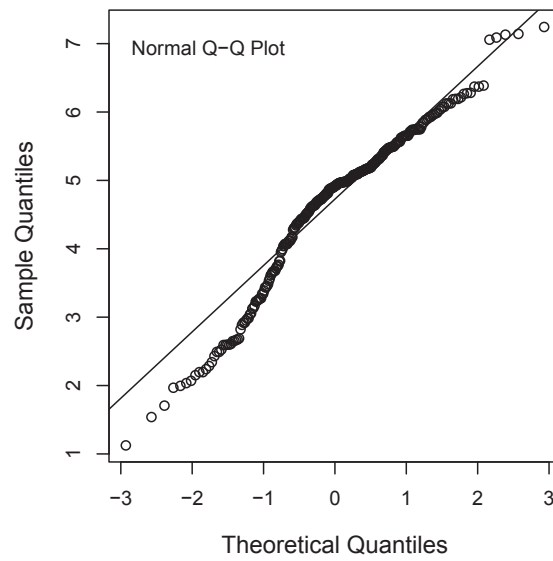
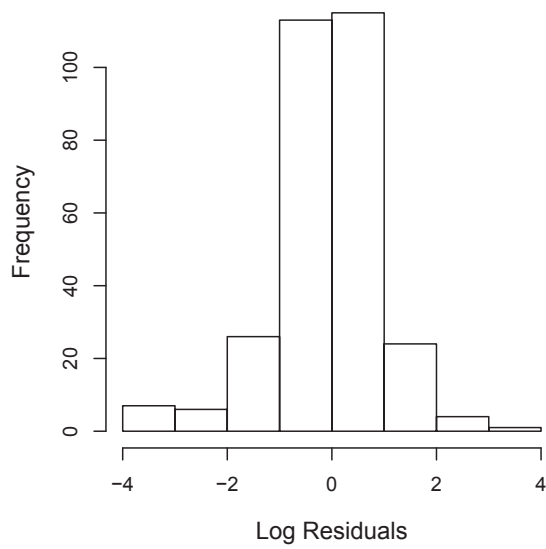
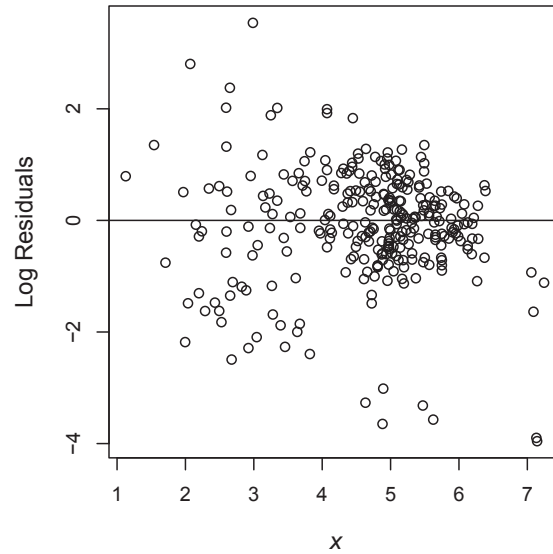
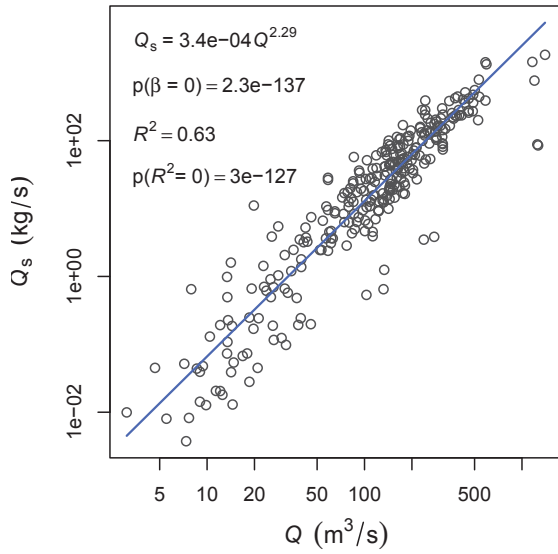
Fine Bed Sites

11475000 - EEL R A FORT SEWARD CA



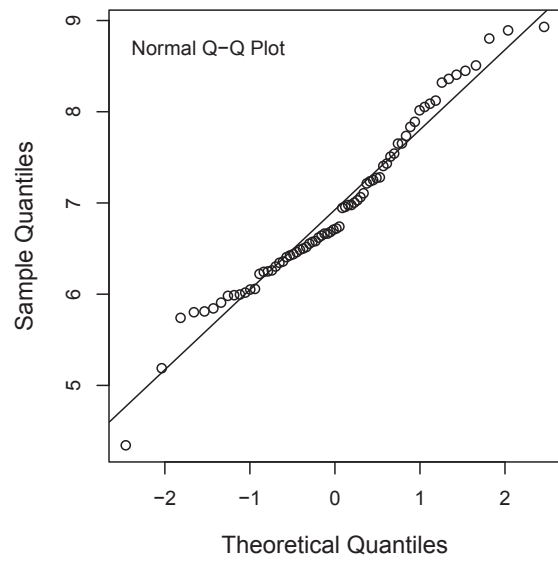
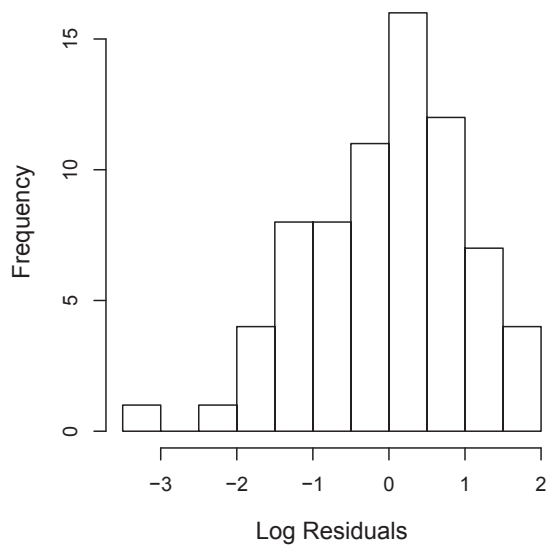
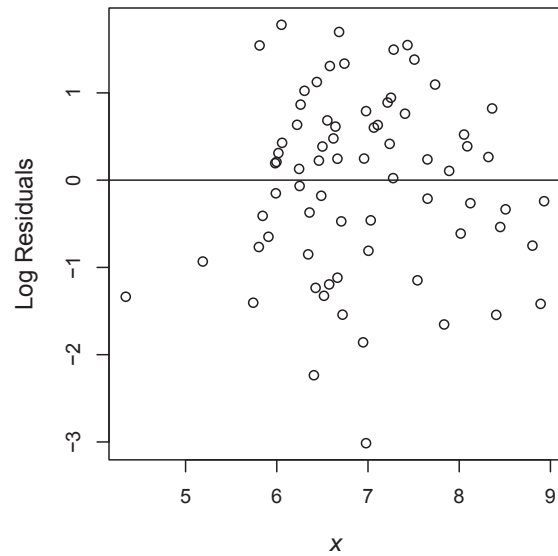
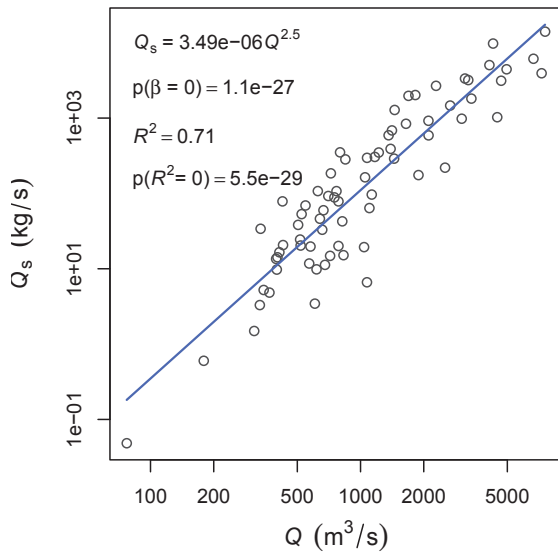
Fine Bed Sites

11482500 - REDWOOD C A ORICK CA



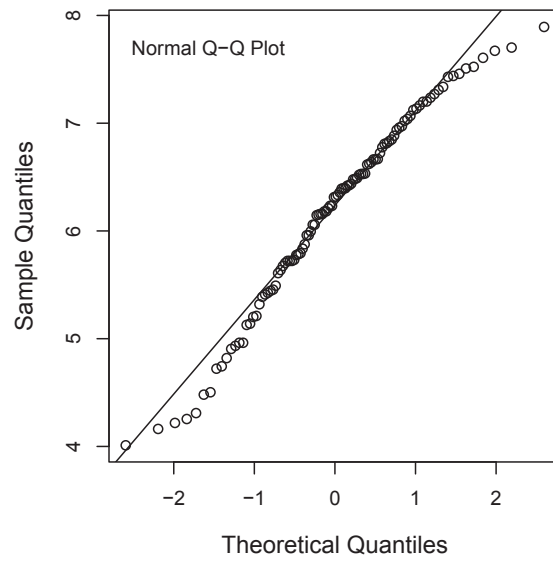
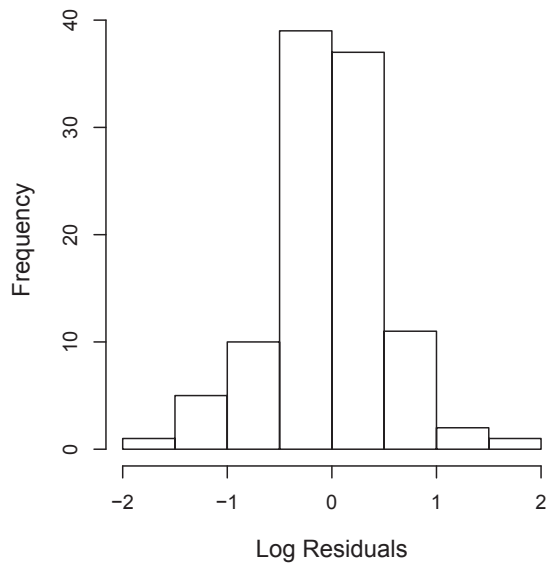
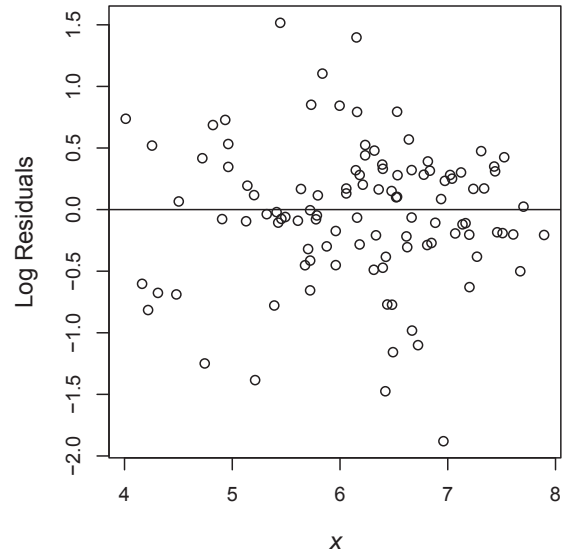
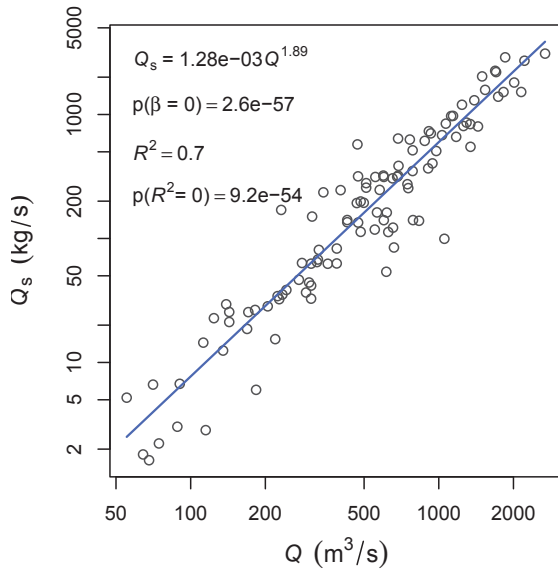
Fine Bed Sites

11523000 - KLAMATH R A ORLEANS



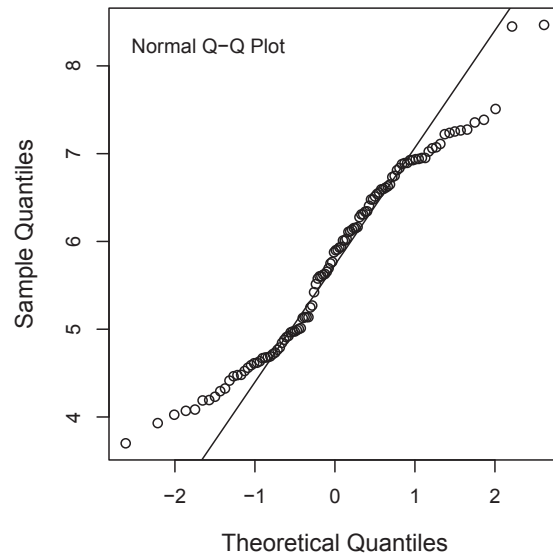
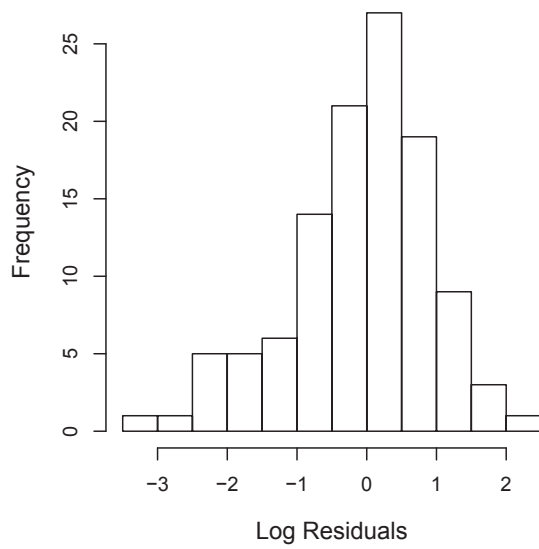
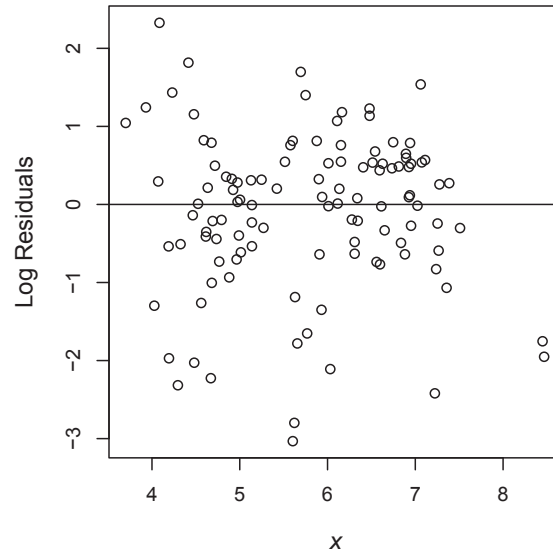
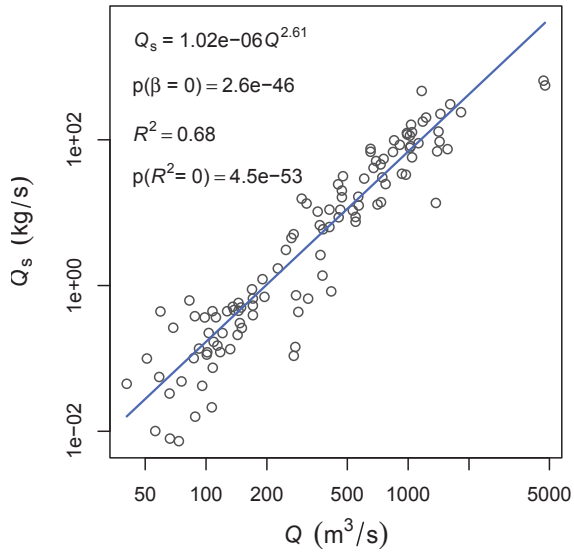
Fine Bed Sites

11530000 - TRINITY R A HOOPA CA



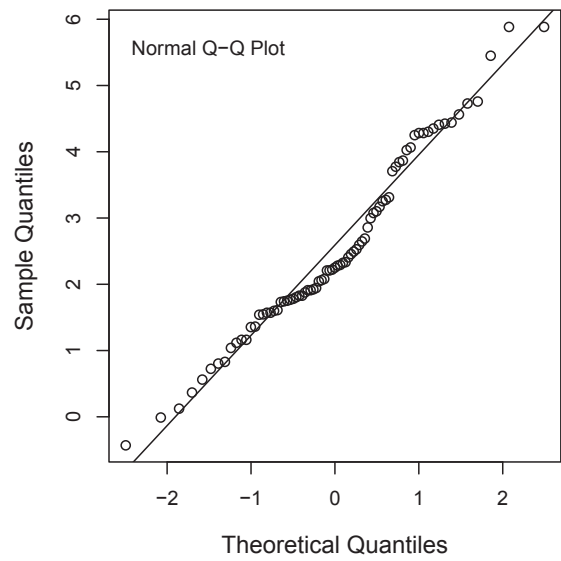
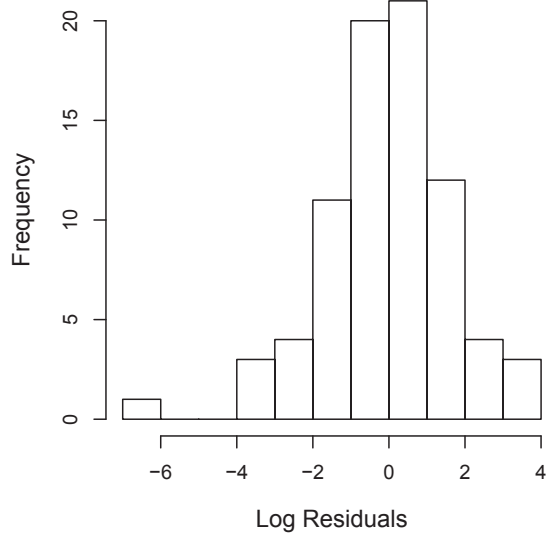
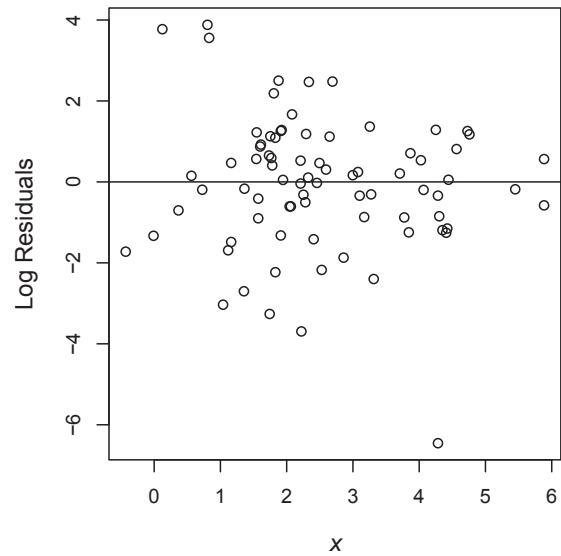
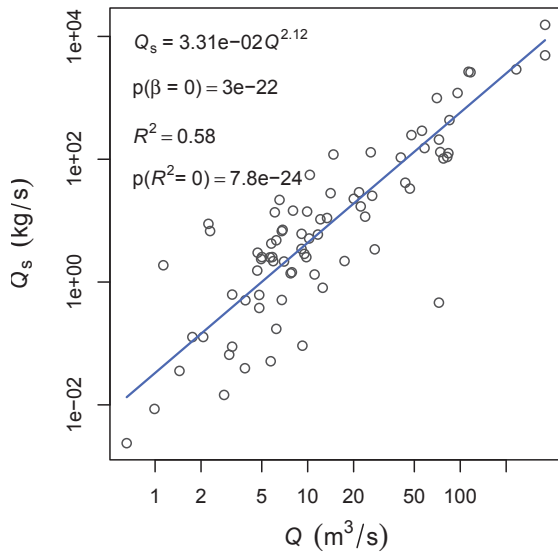
Fine Bed Sites

11530500 - KLAMATH R NR KLAMATH CA



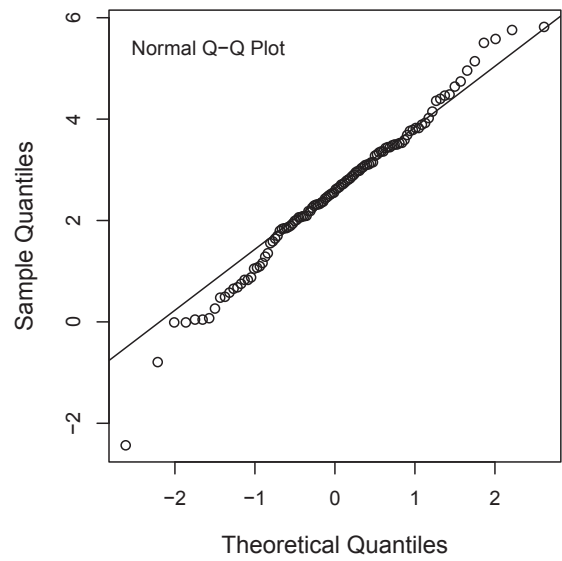
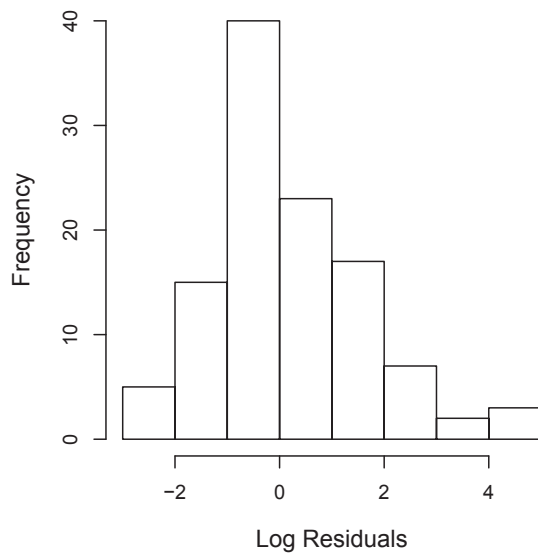
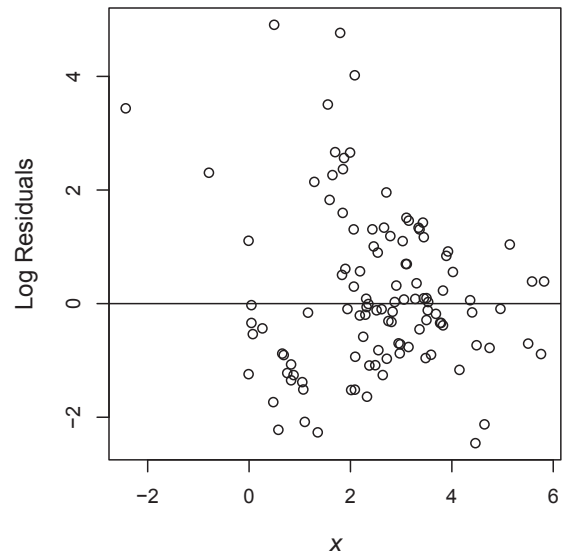
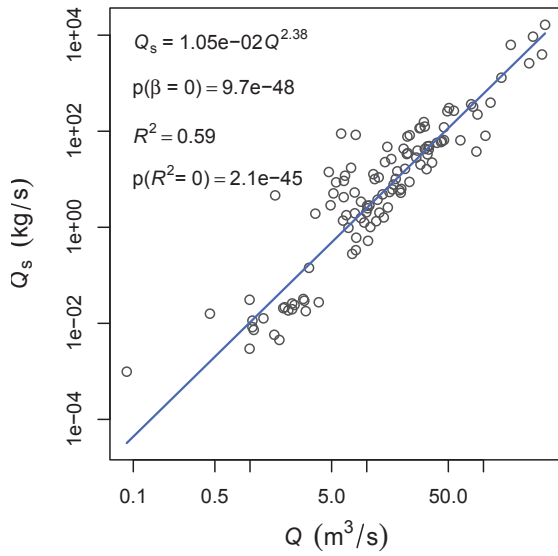
Fine Bed Sites

50024950 - RIO GRANDE DE ARECIBO BLW UTUADO, PR



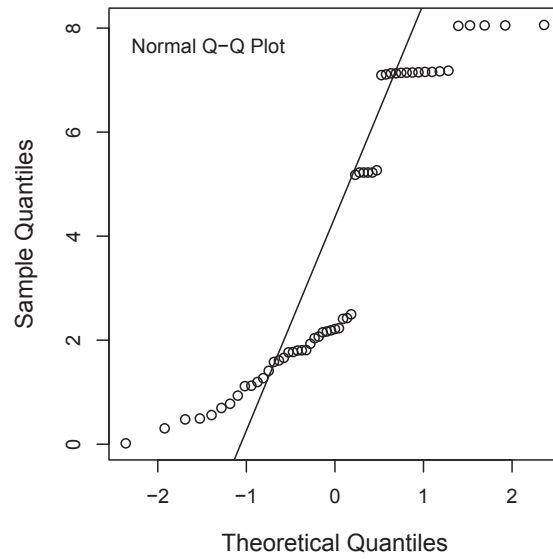
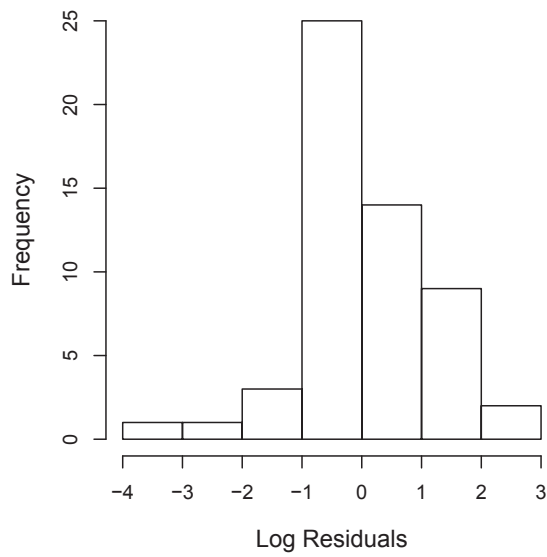
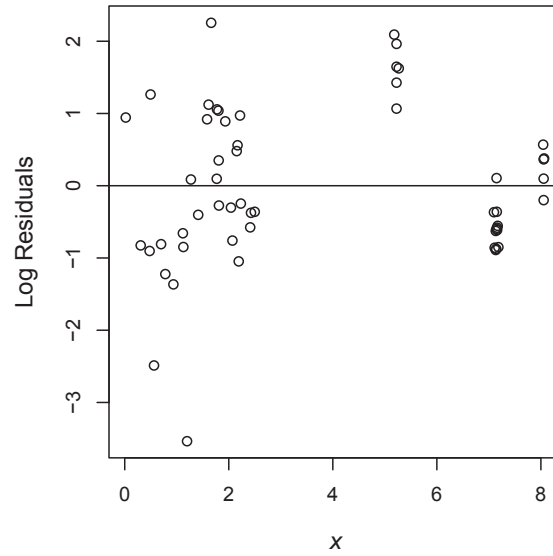
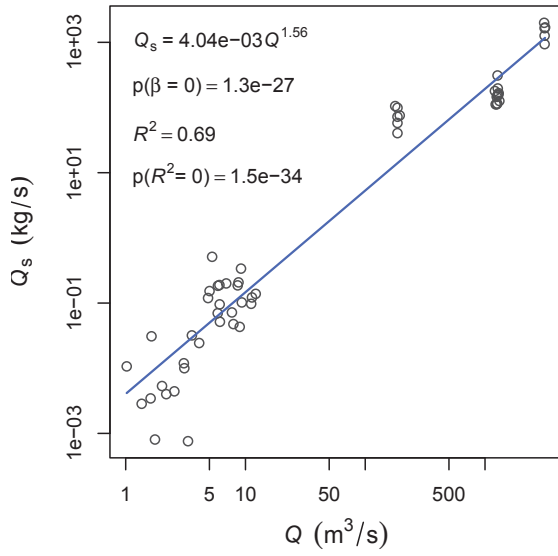
Fine Bed Sites

50028000 - RIO TANAMA NR UTUADO, PR



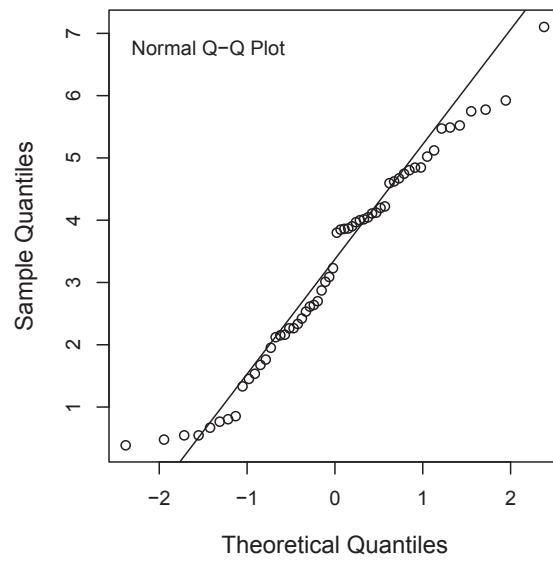
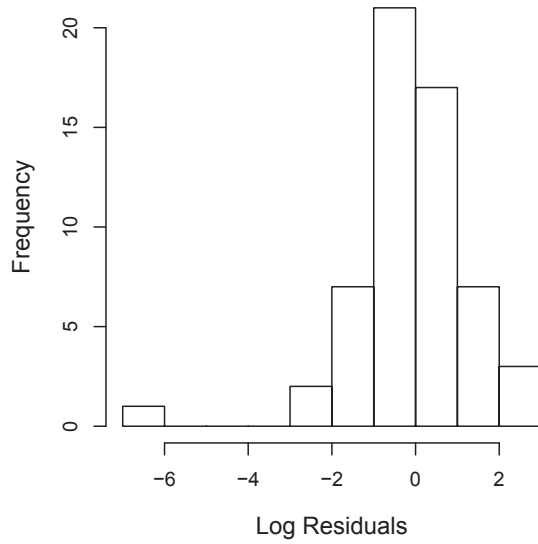
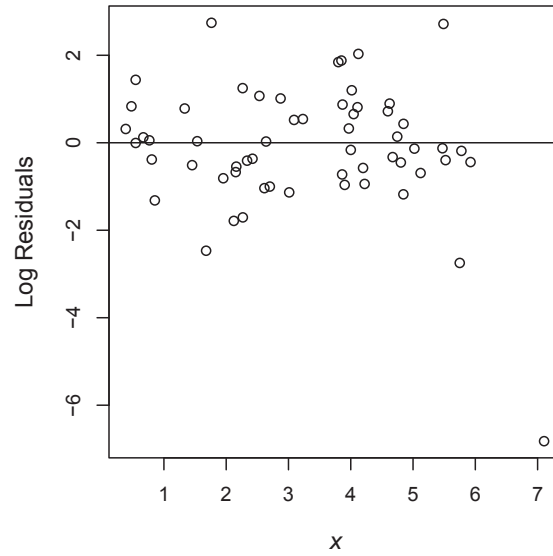
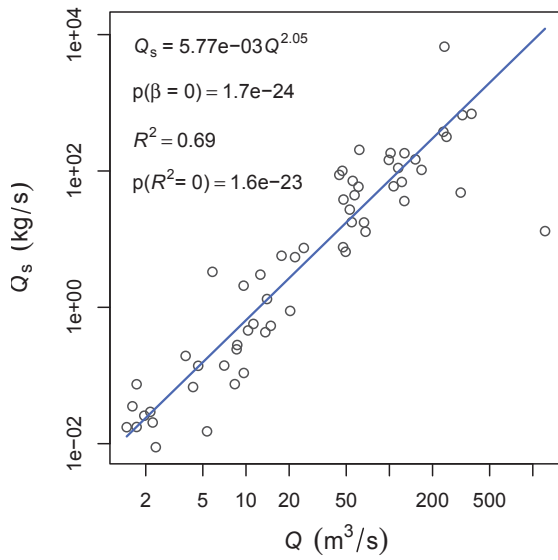
Fine Bed Sites

50038100 - RIO GRANDE DE MANATI AT HWY 2 NR MANATI, PR



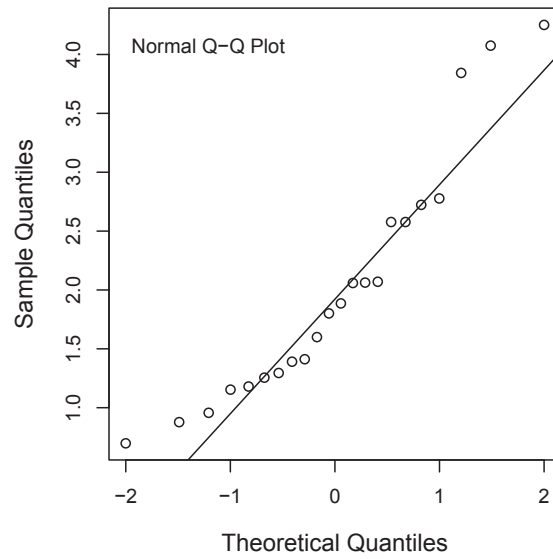
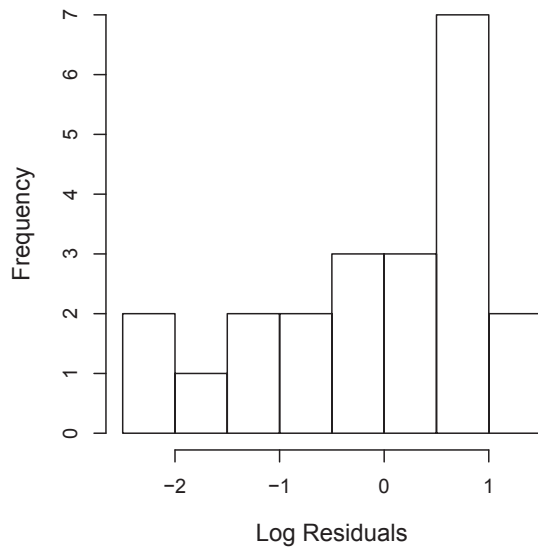
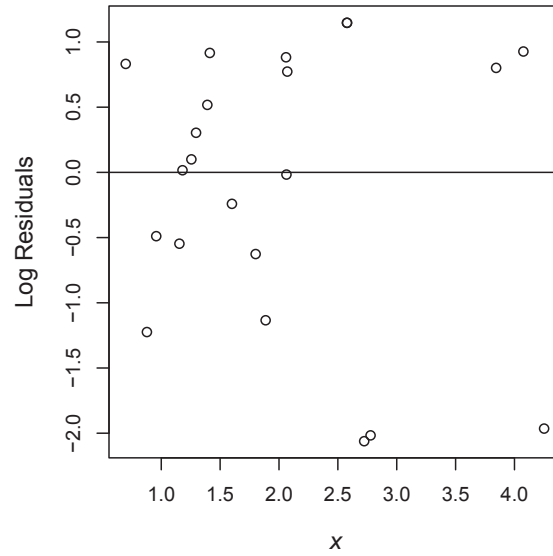
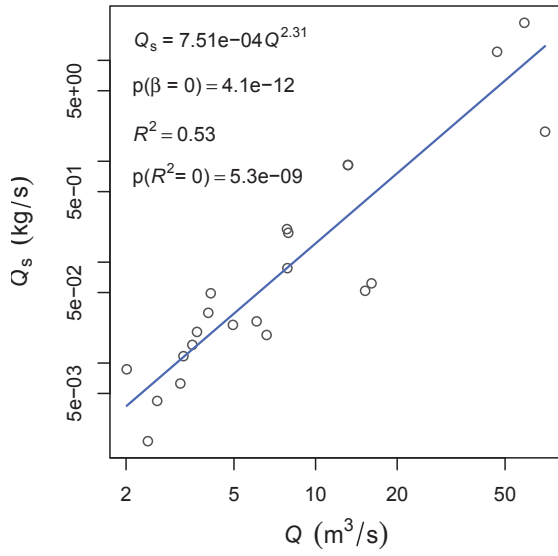
Fine Bed Sites

50051800 - RIO GRANDE DE LOIZA AT HWY 183 SAN LORENZO, PR



Fine Bed Sites

50144000 - RIO GRANDE DE ANASCO NR SAN SEBASTIAN, PR

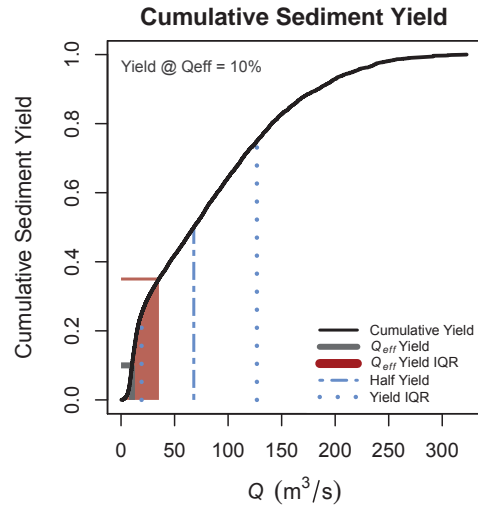
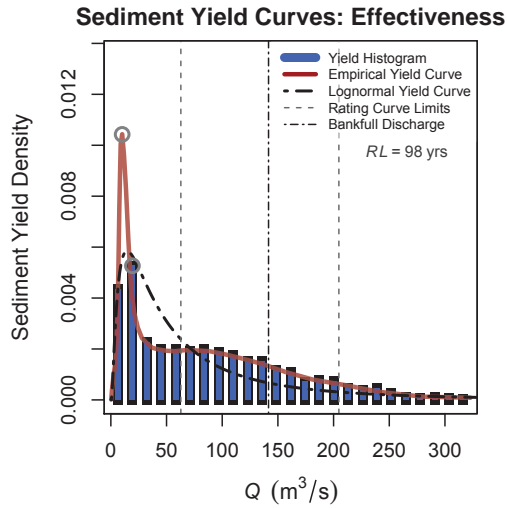
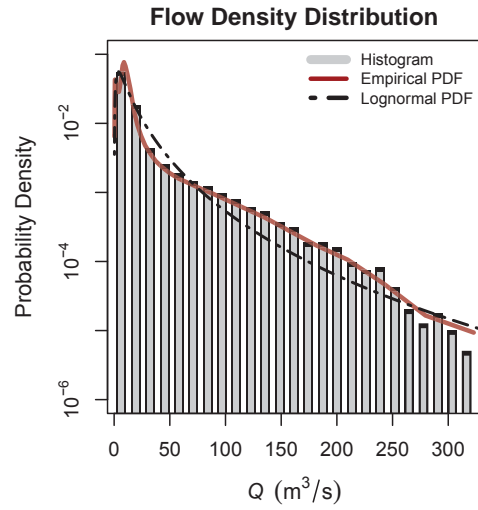
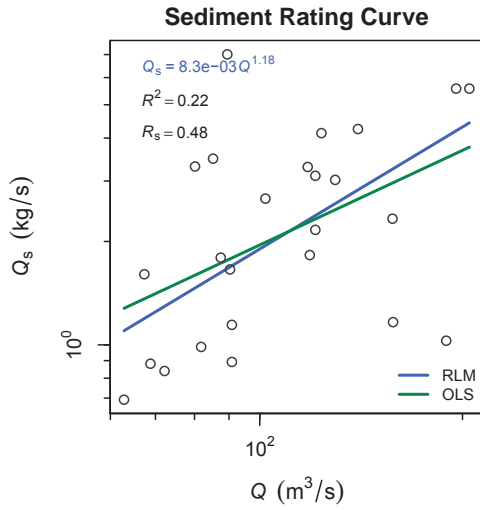


APPENDIX C – Sediment Yield Plots

Similar to Figure 2.9, in the main body of the dissertation, four plots are shown for each site: 1) the sediment rating curve, 2) various representations of the flow frequency distribution, 3) various representations of the sediment yield density curves, and 4) the cumulative sediment yield curve calculated from the sorted sediment yield record. Various flow and sediment yield metrics are indicated on the latter two plots.

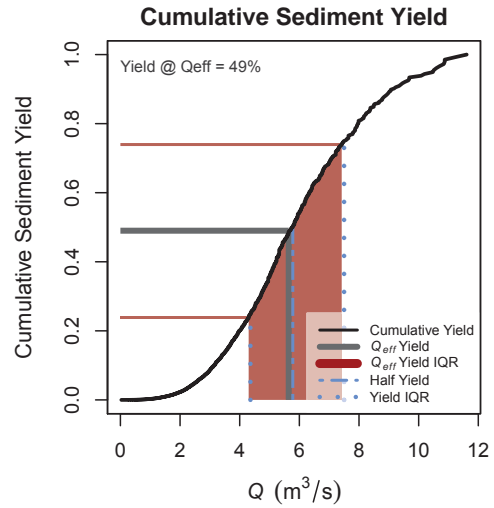
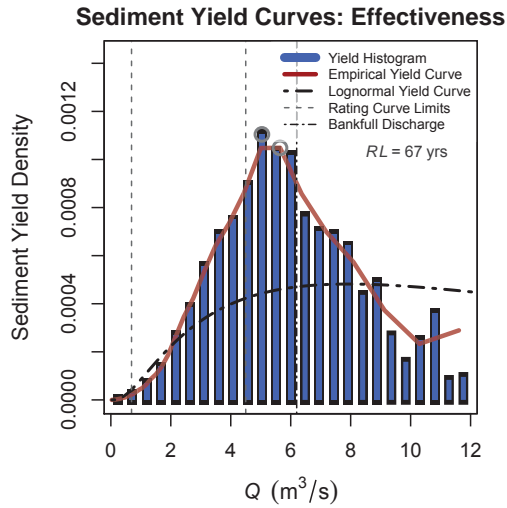
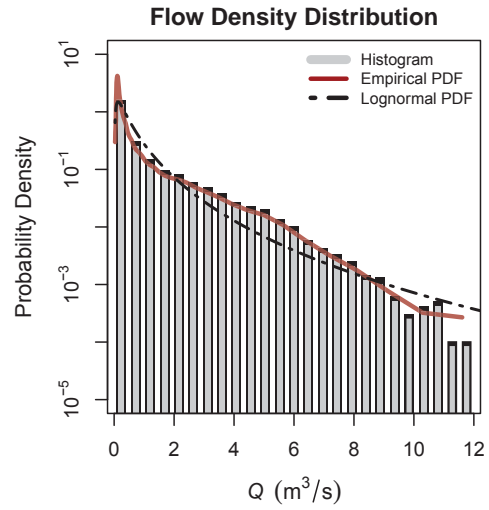
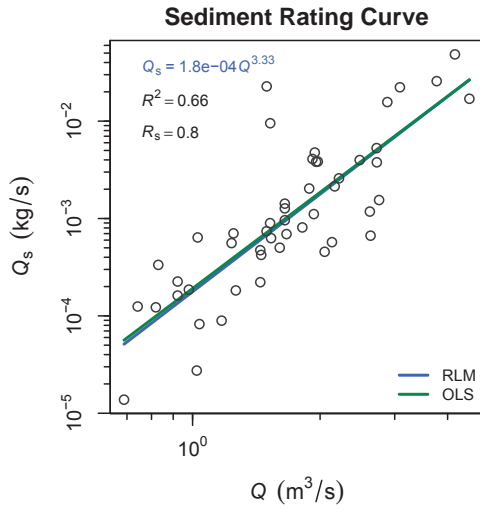
Bed Load Sites

WIND RIVER AT RIVERTON, WY: 06228000



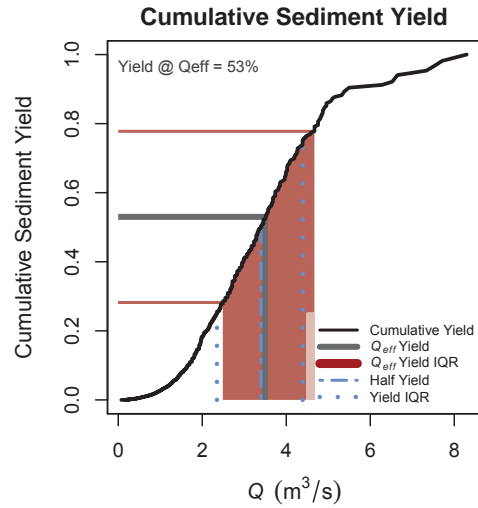
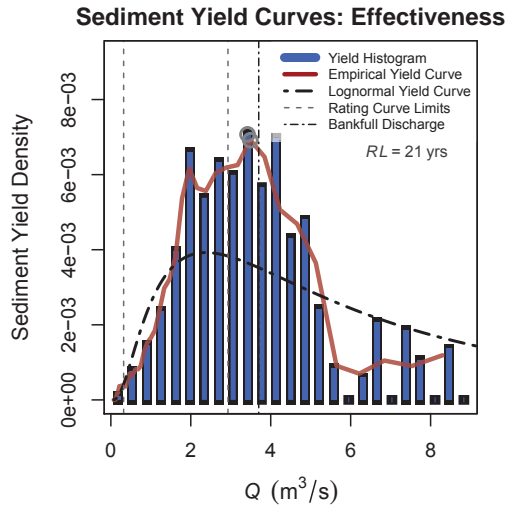
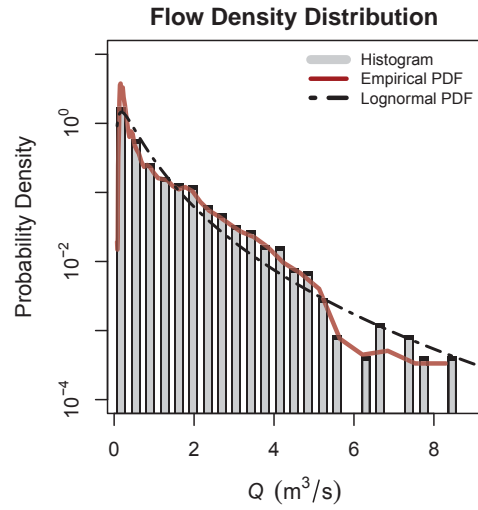
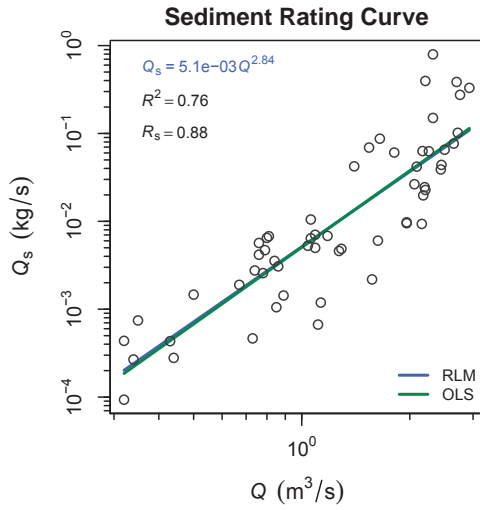
Bed Load Sites

HALFMOON CREEK NEAR MALTA, CO: 07083000



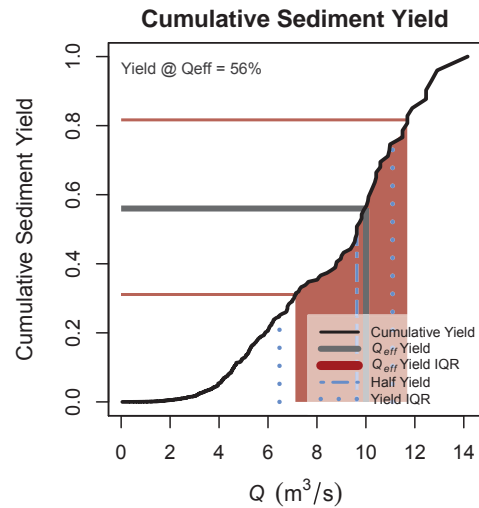
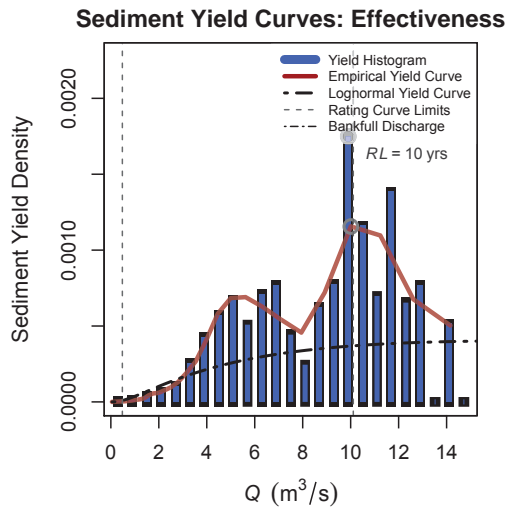
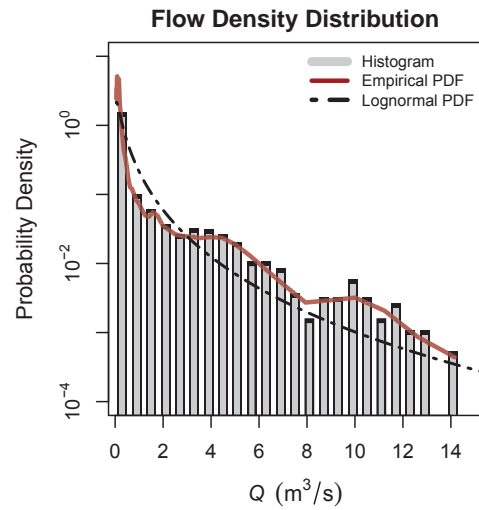
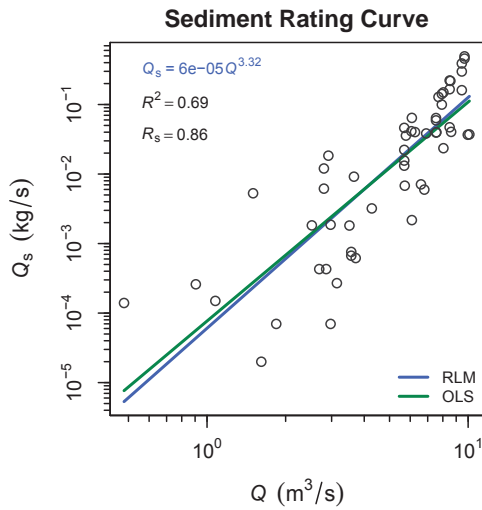
Bed Load Sites

East Fk Dallas Creek nr Ridgeway, CO: 0914650A



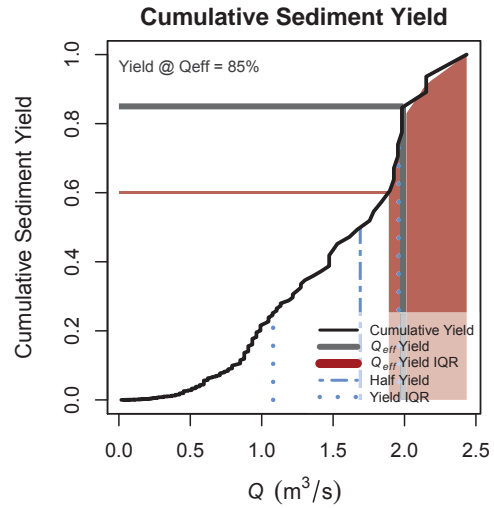
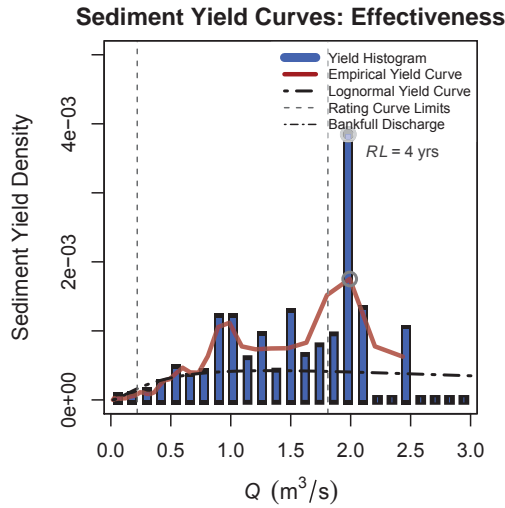
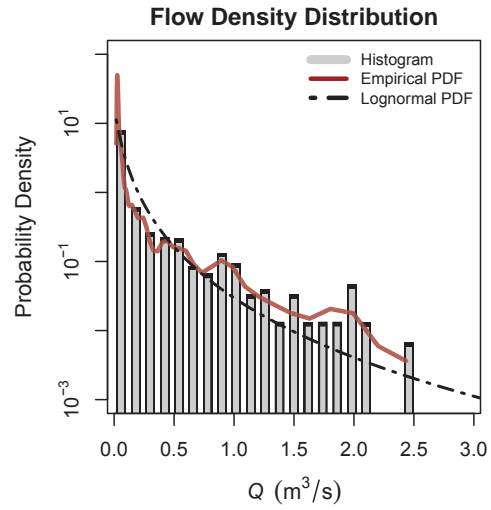
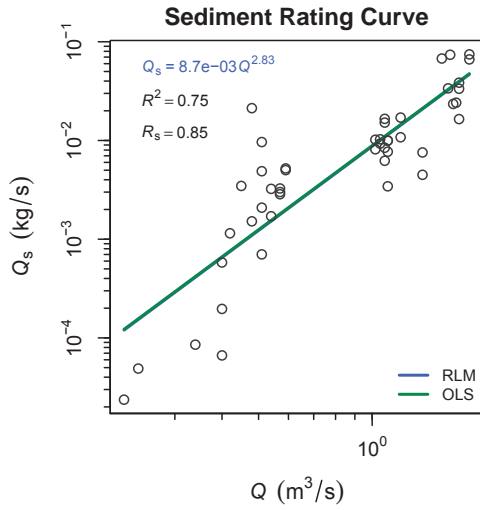
Bed Load Sites

Battle Creek near Encampment, WY: 09253400



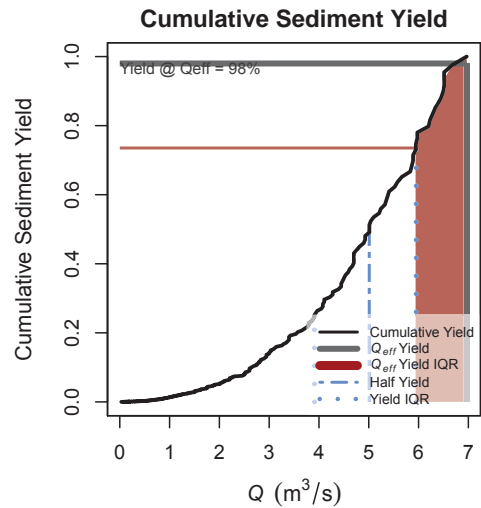
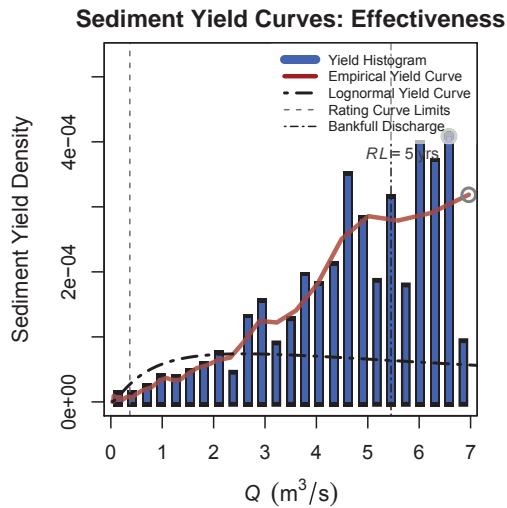
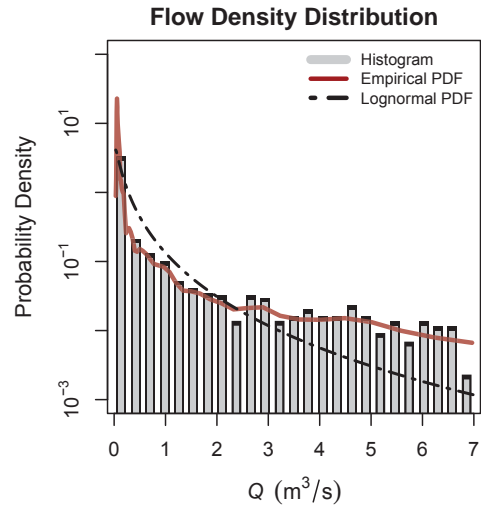
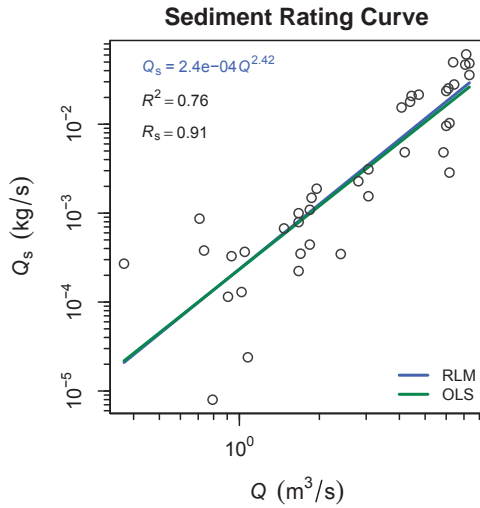
Bed Load Sites

East Fork Savery Creek near Encampment, WY: 09255400



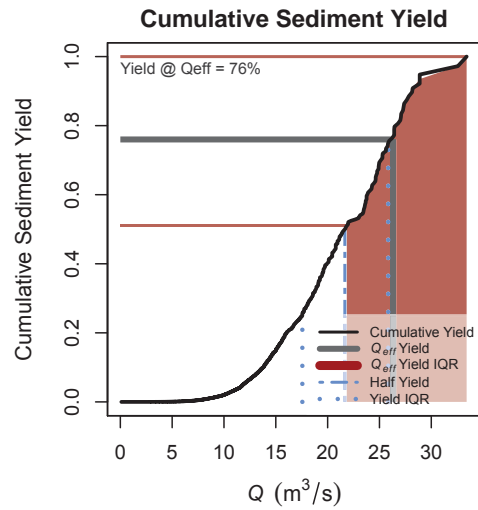
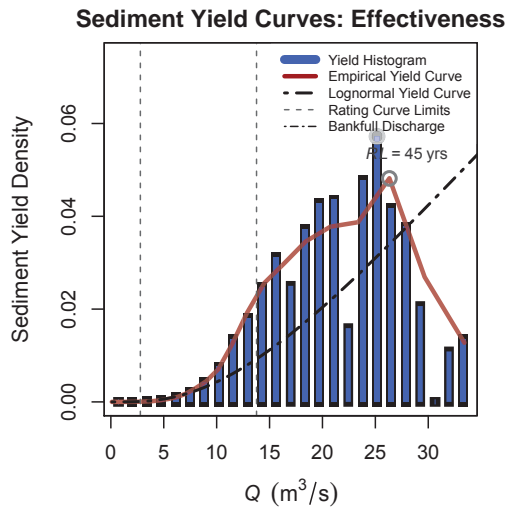
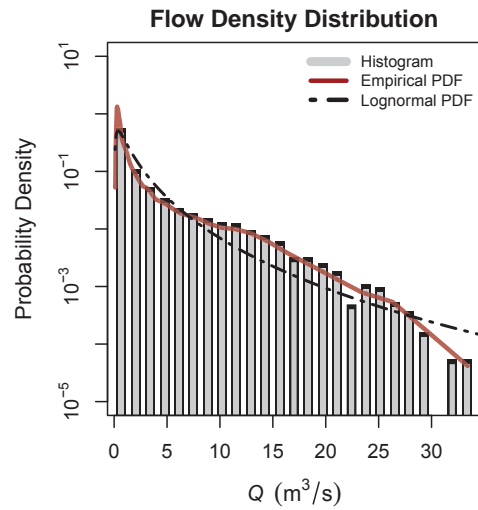
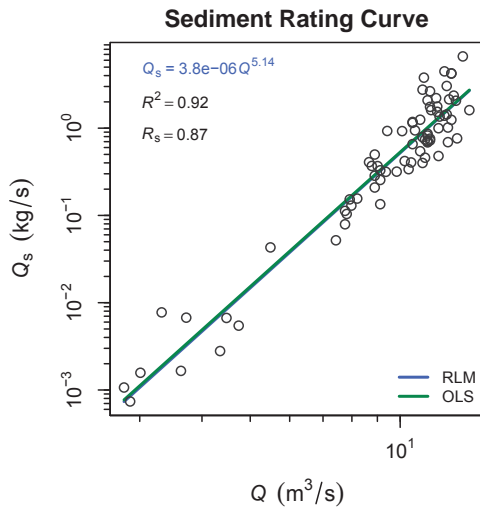
Bed Load Sites

Big Sandstone Creek near Savery, WY: 09255900



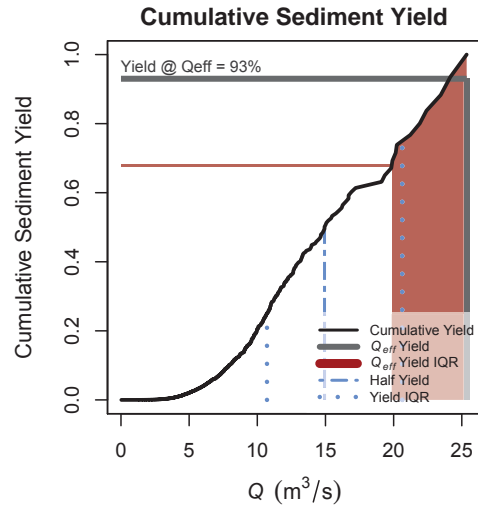
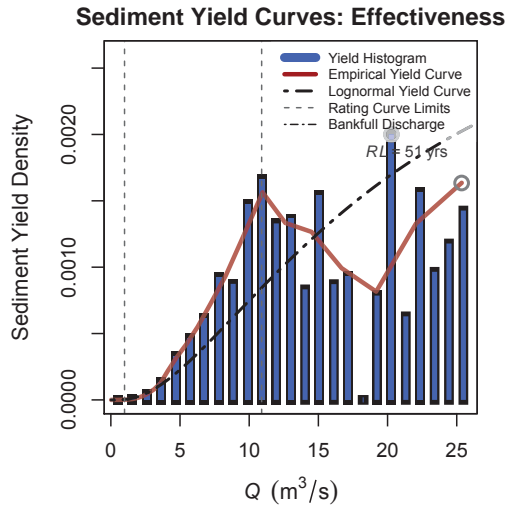
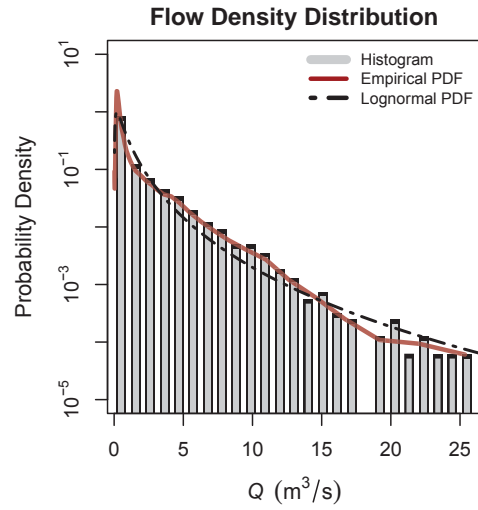
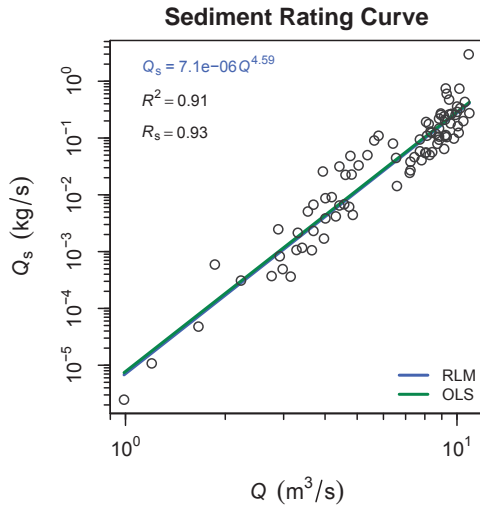
Bed Load Sites

East Fork San Juan River, CO: 09339900



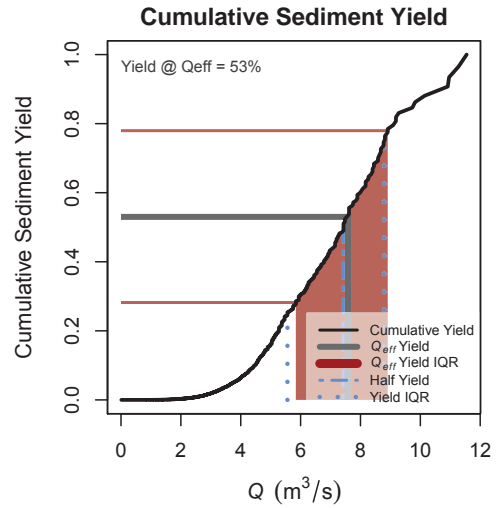
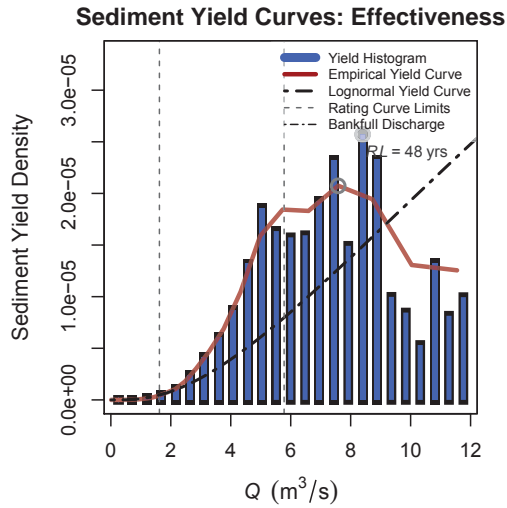
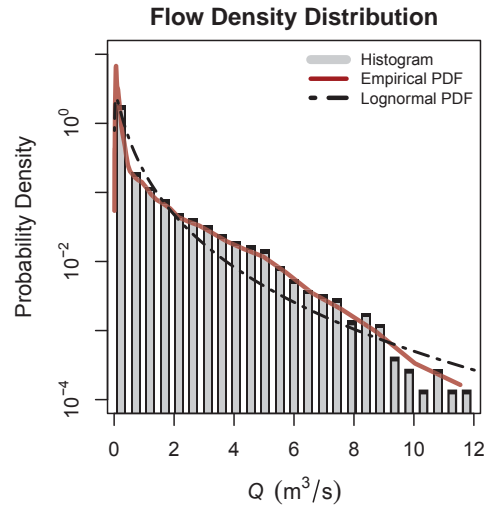
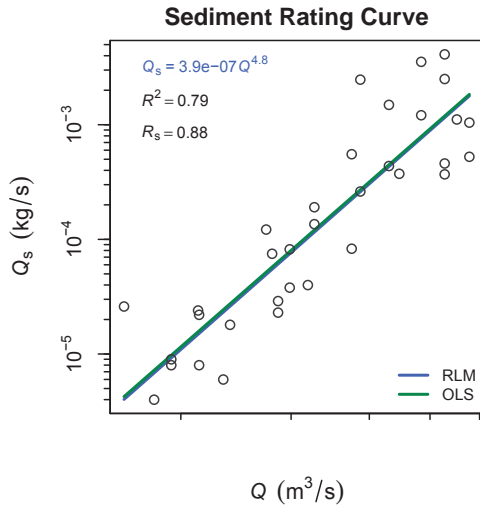
Bed Load Sites

Middle Fork Piedra River, CO: 09347200



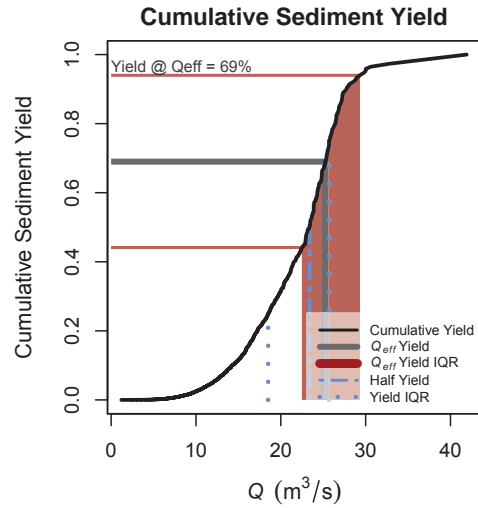
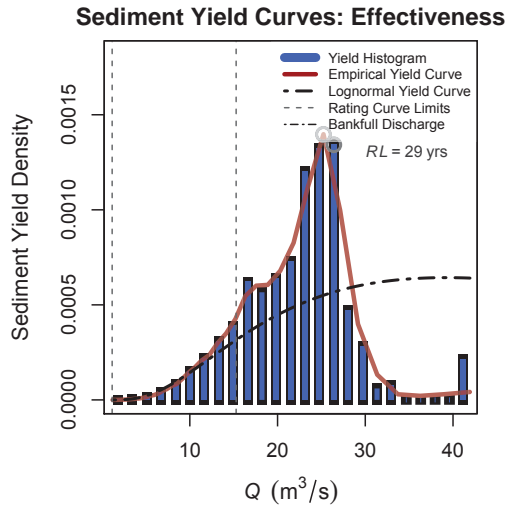
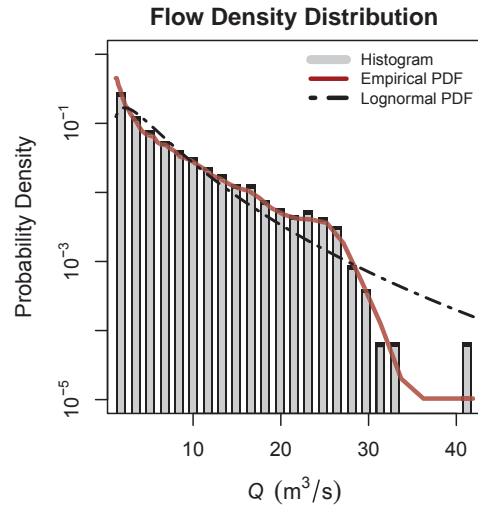
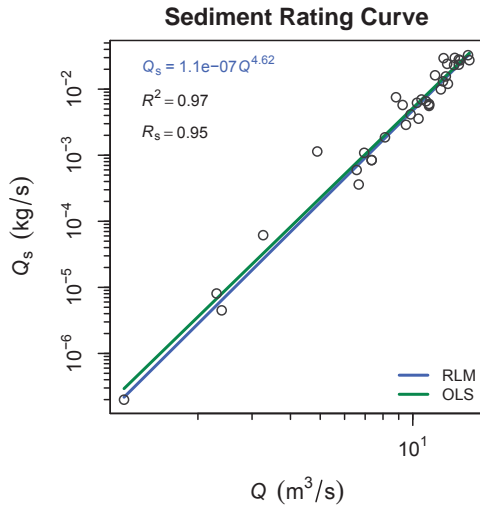
Bed Load Sites

Junction Ck nr Durango, CO: 09361400



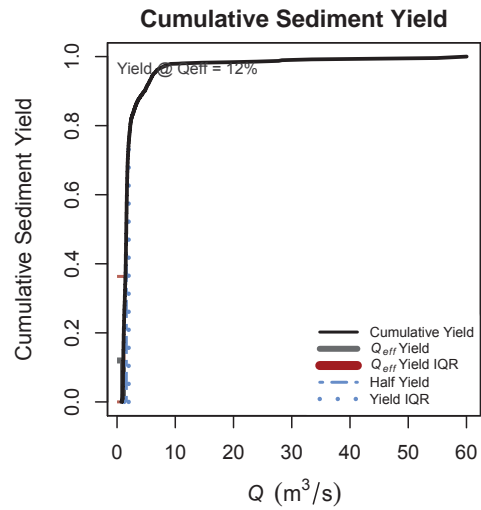
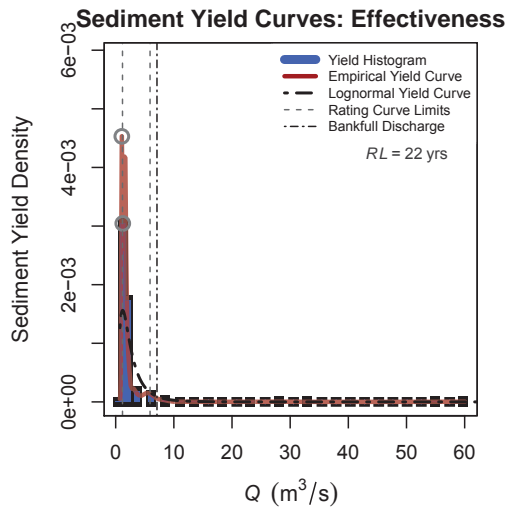
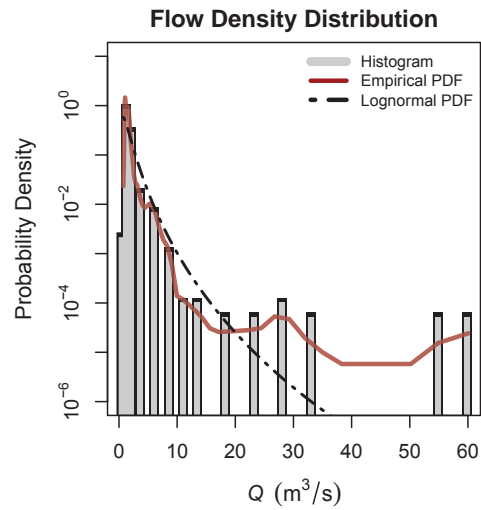
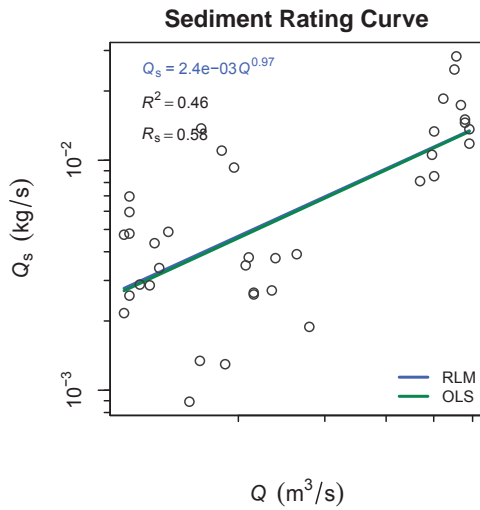
Bed Load Sites

Florida River near Lemon Reservoir, CO: 09362900



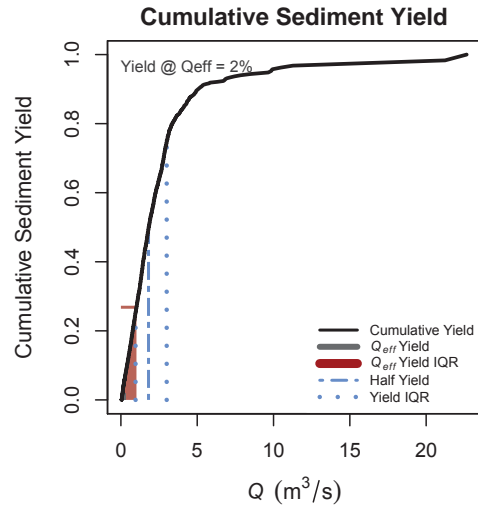
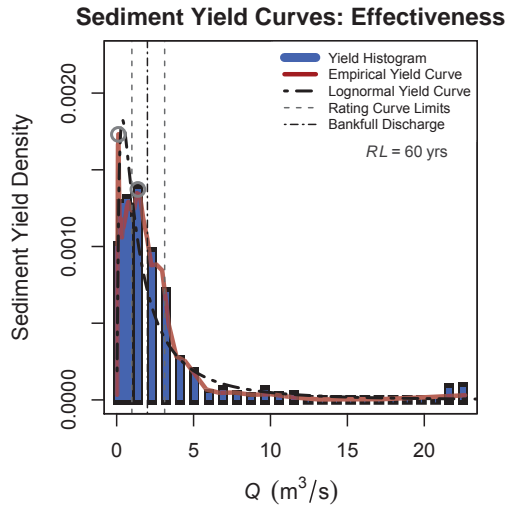
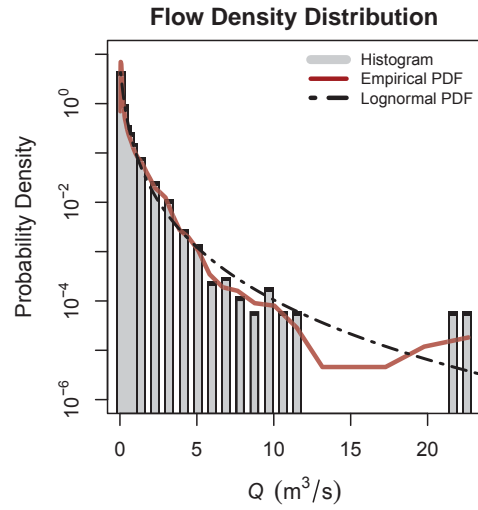
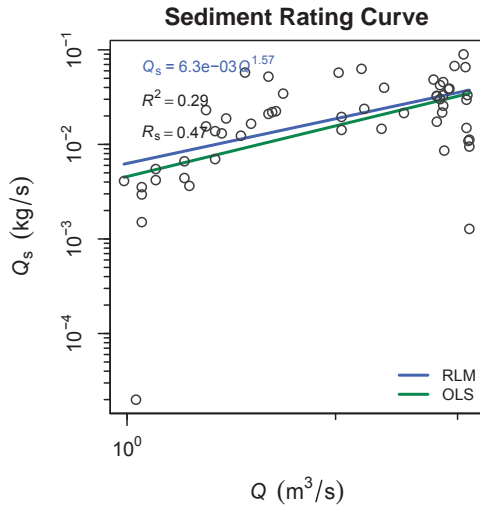
Bed Load Sites

East Fork Virgin River nr Springdale, UT: 09404900



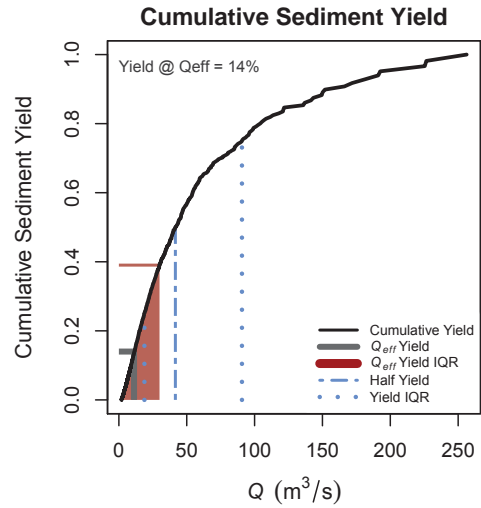
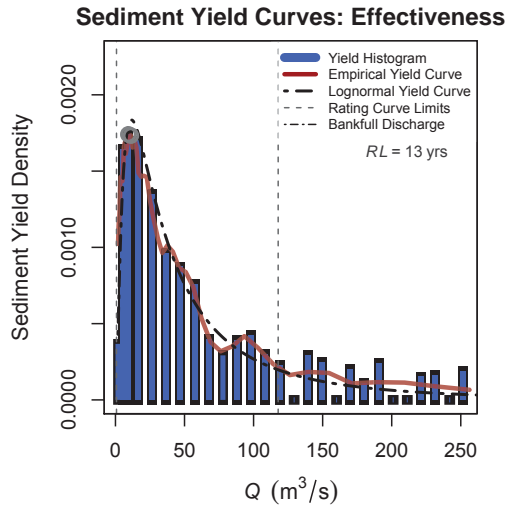
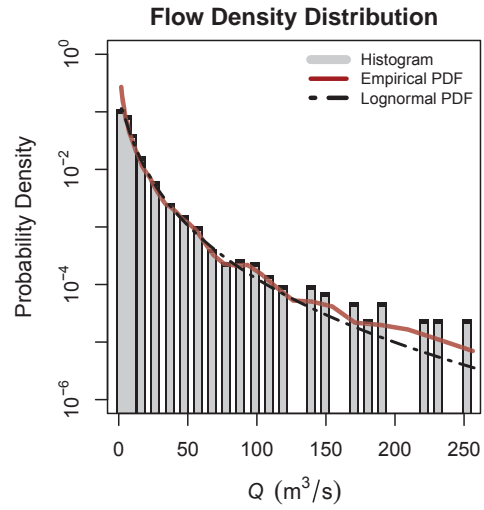
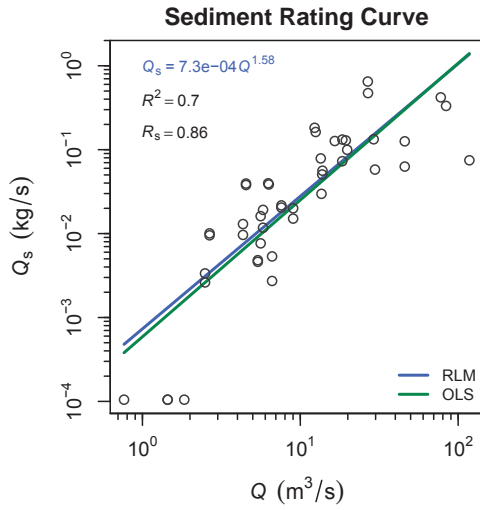
Bed Load Sites

Sagehen Creek nr Truckee, CA: 10343500



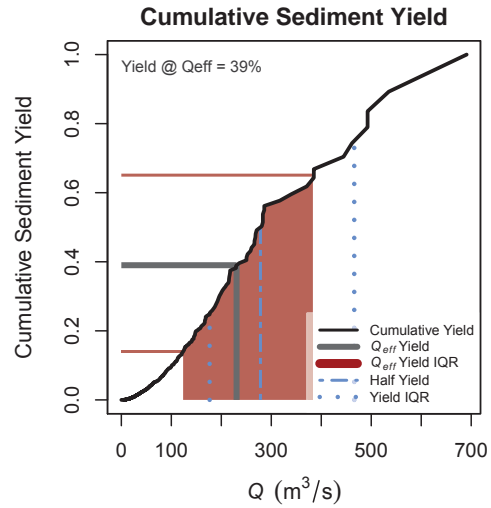
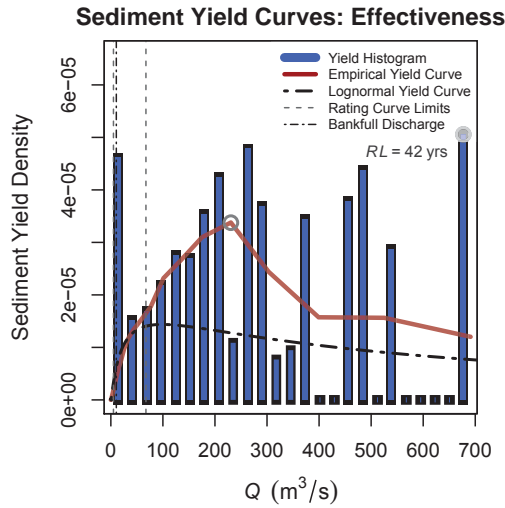
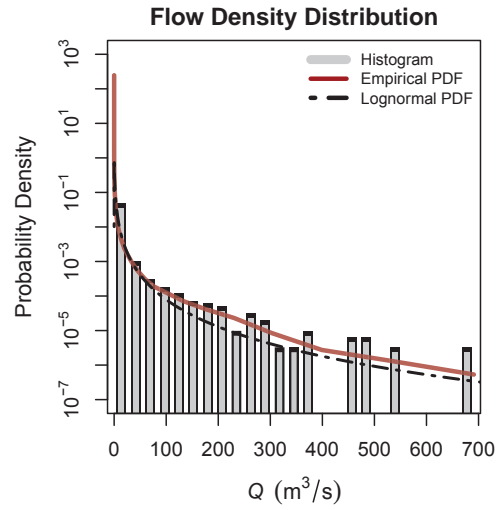
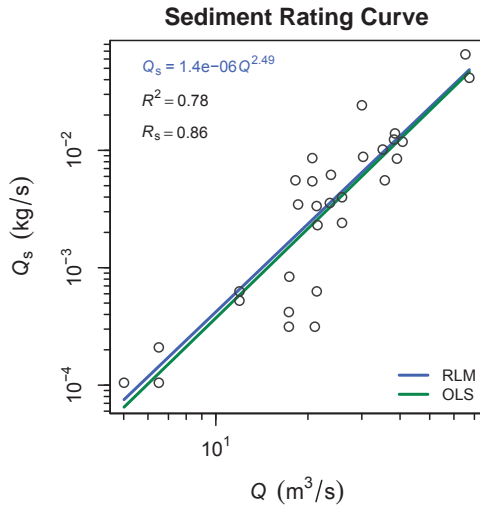
Bed Load Sites

CARMEL RIVER NR CARMEL, CA: 11143250



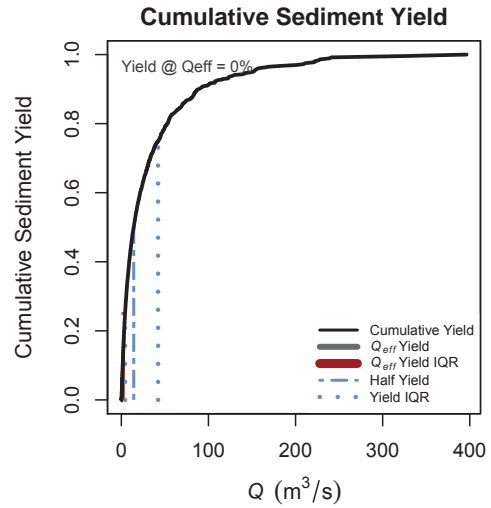
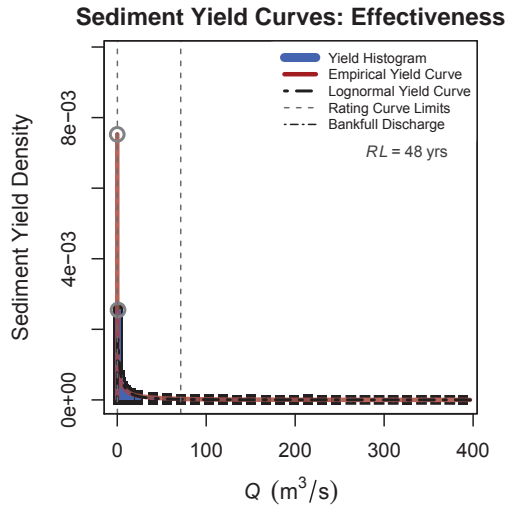
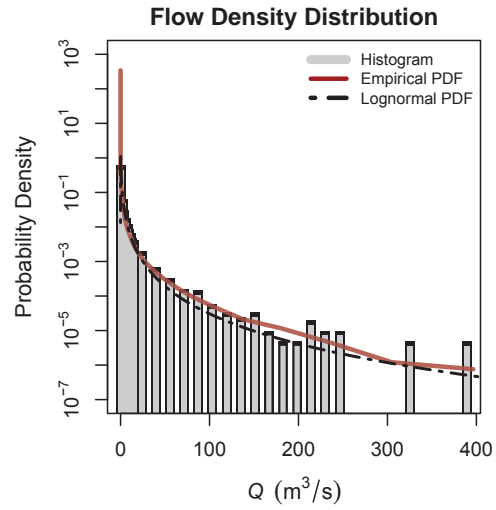
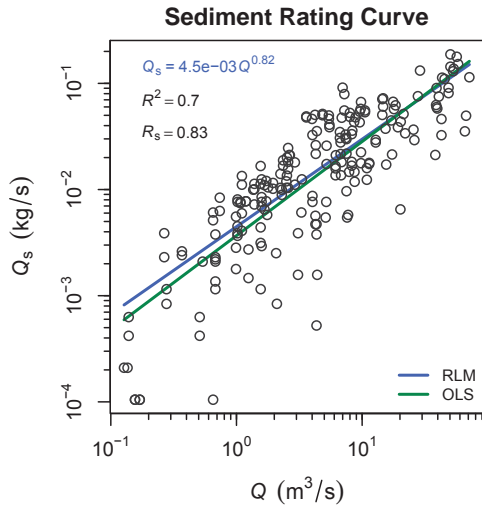
Bed Load Sites

NACIMIENTO R BL SAPAQUE C NR BRYSON, CA: 11148900



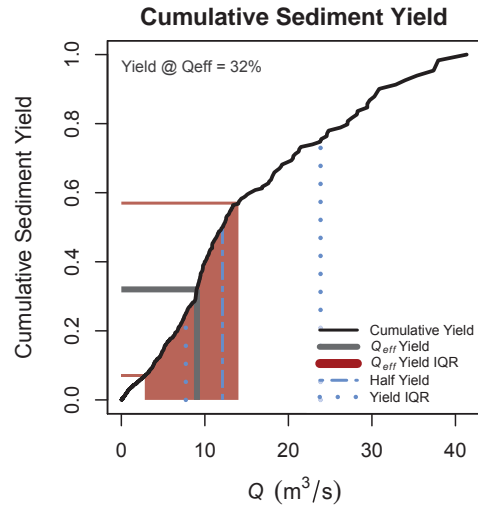
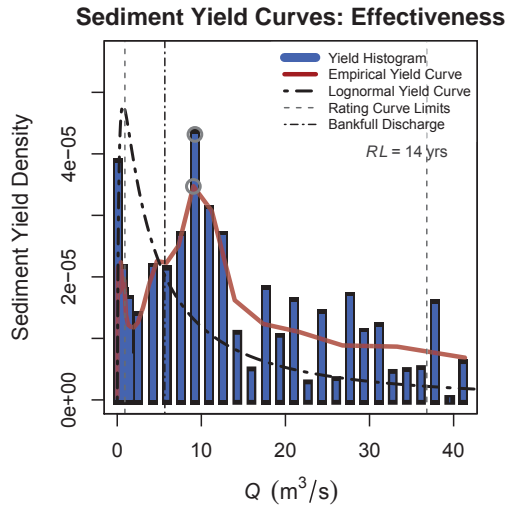
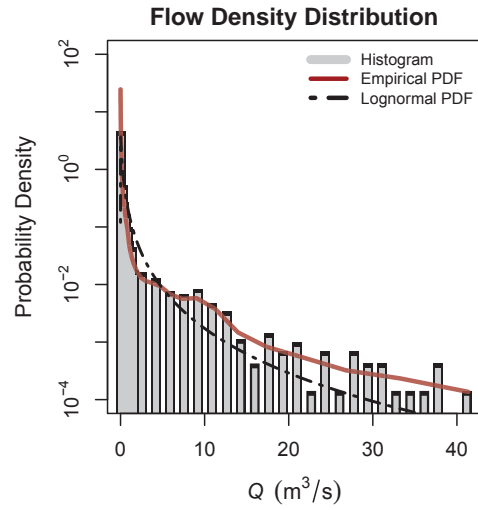
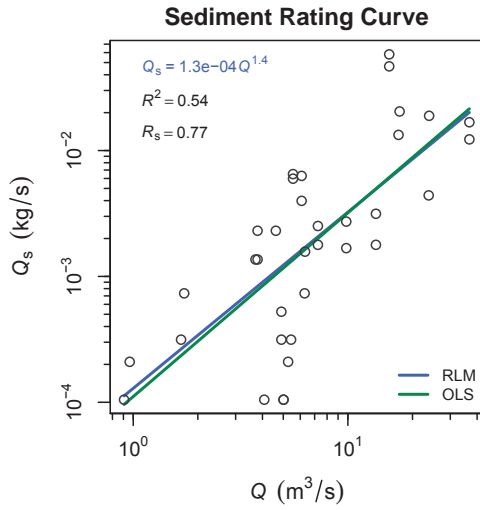
Bed Load Sites

SAN ANTONIO R NR LOCKWOOD, CA: 11149900



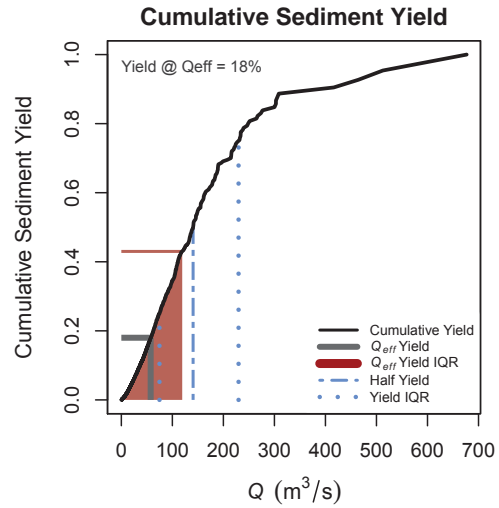
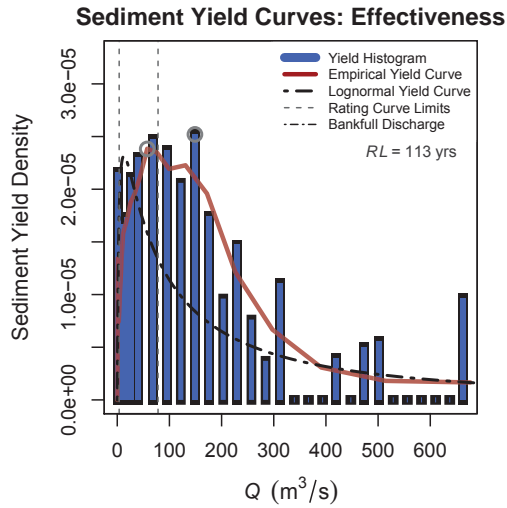
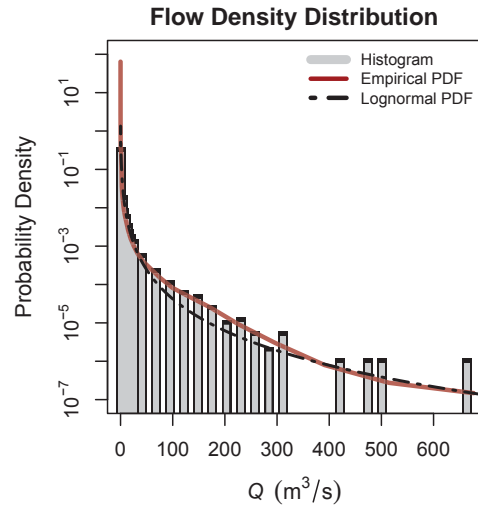
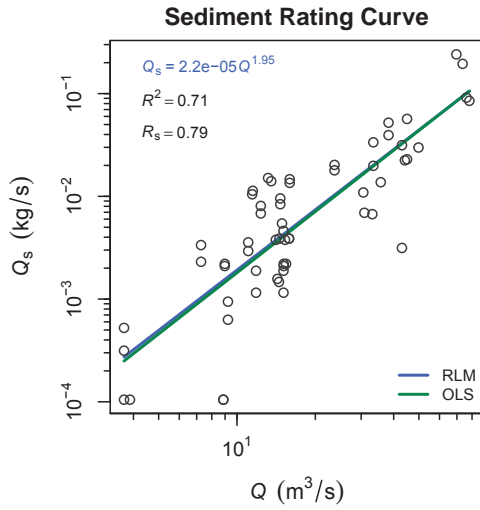
Bed Load Sites

ALAMEDA Ck BL WELCH C NR SUNOL, CA: 11173575



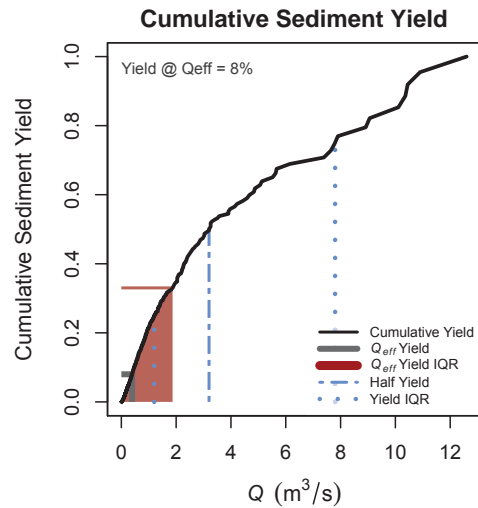
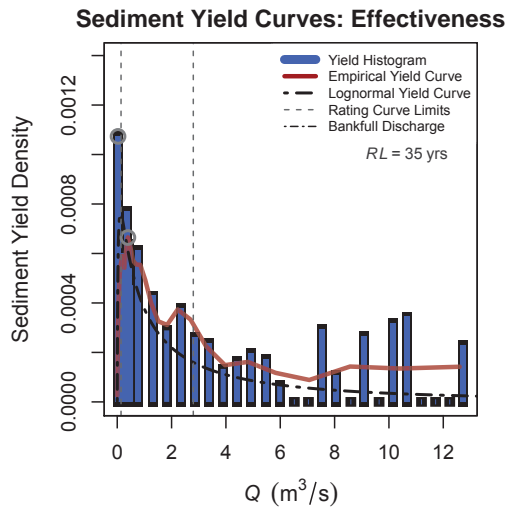
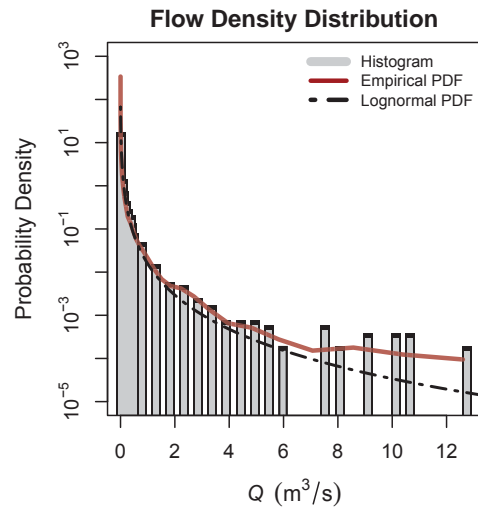
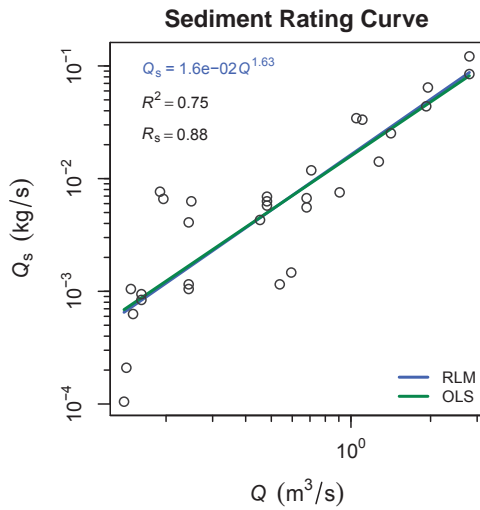
Bed Load Sites

ALAMEDA Ck NR NILES, CA: 11179000



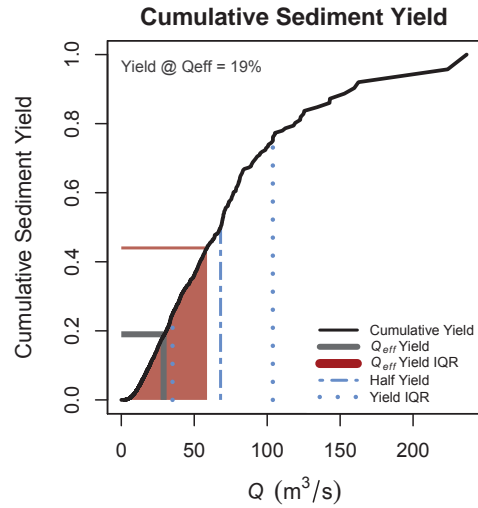
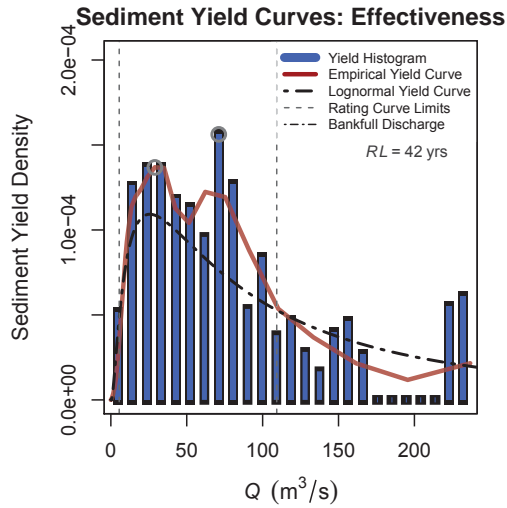
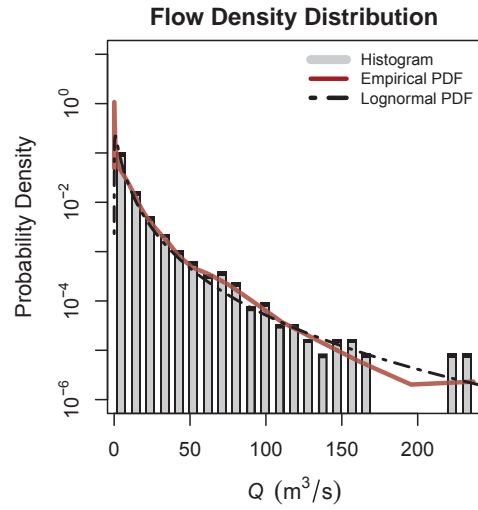
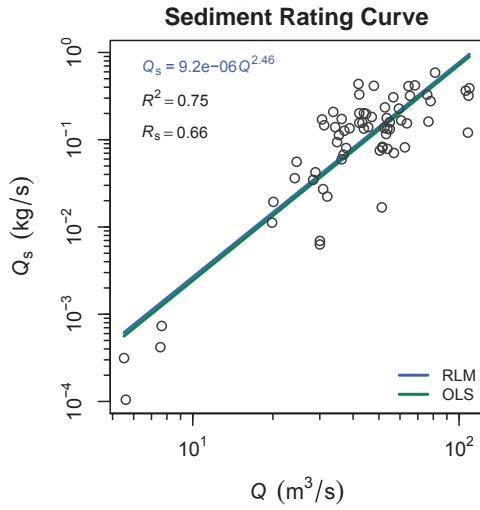
Bed Load Sites

CULL Creek ABV CULL Ck RES NR CASTRO VALLEY, CA: 11180960



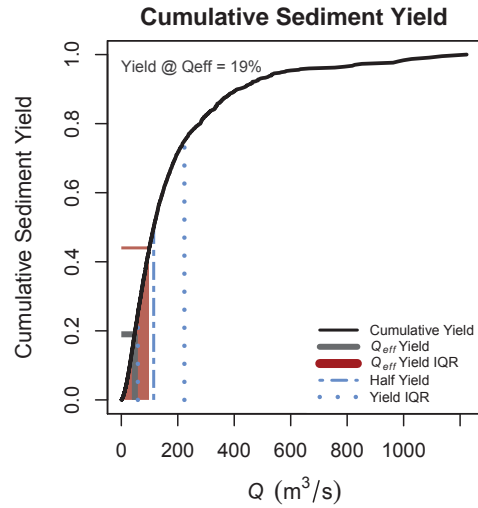
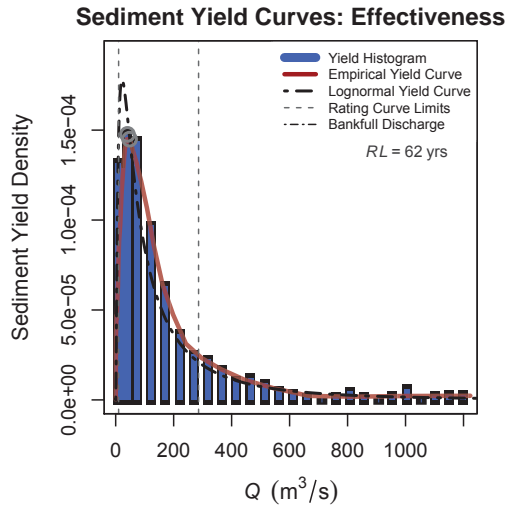
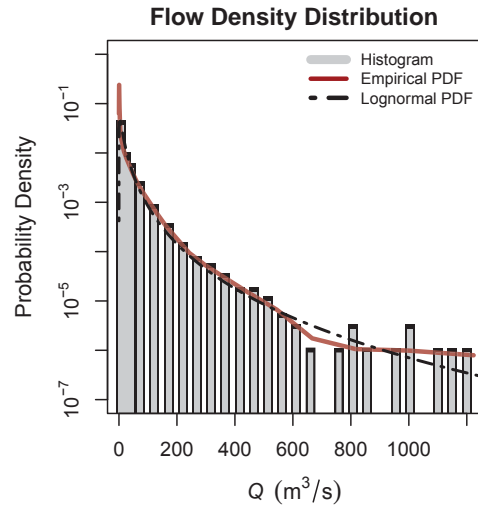
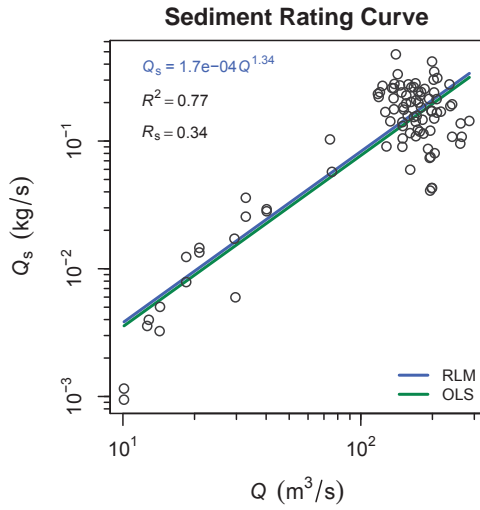
Bed Load Sites

REDWOOD C NR BLUE LAKE, CA: 11481500



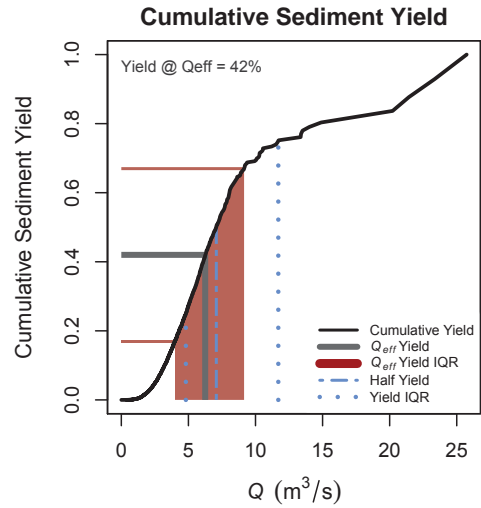
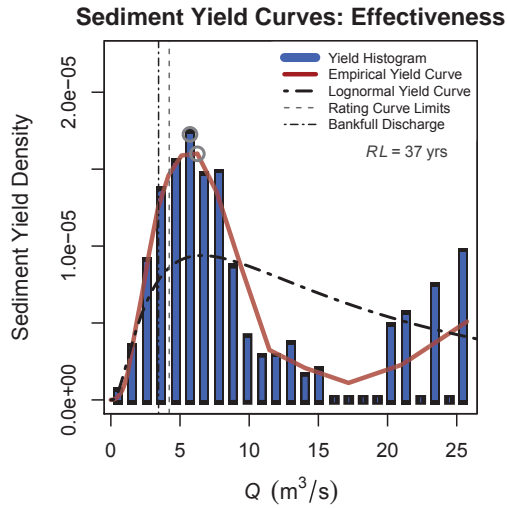
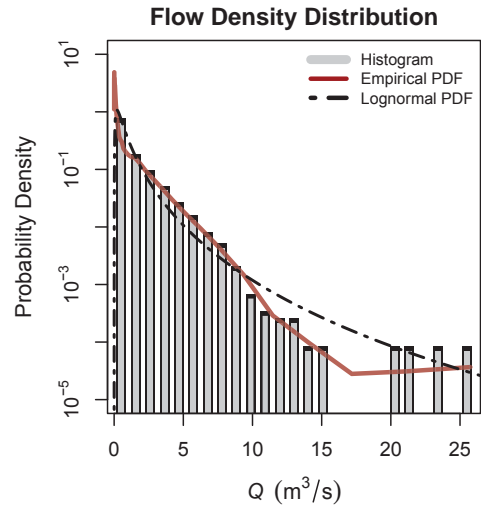
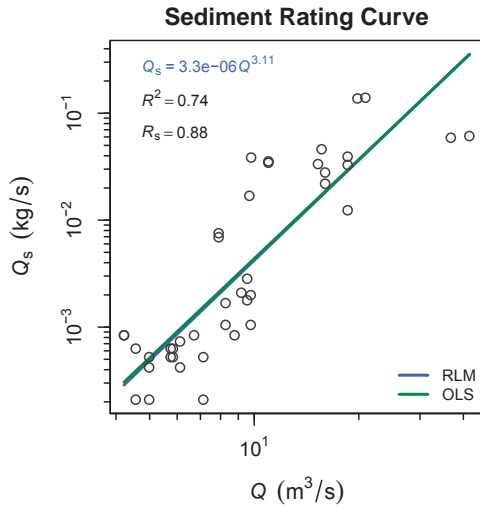
Bed Load Sites

REDWOOD C A ORICK, CA: 11482500



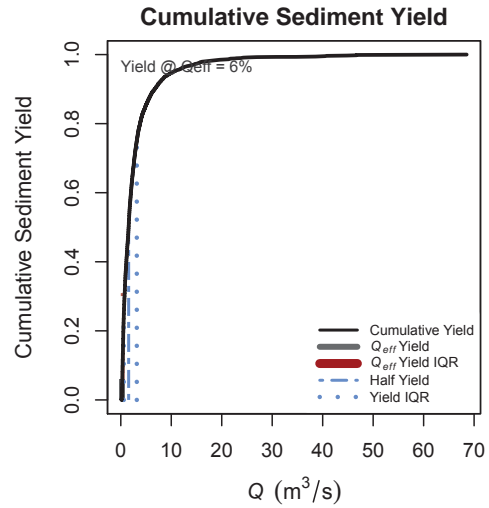
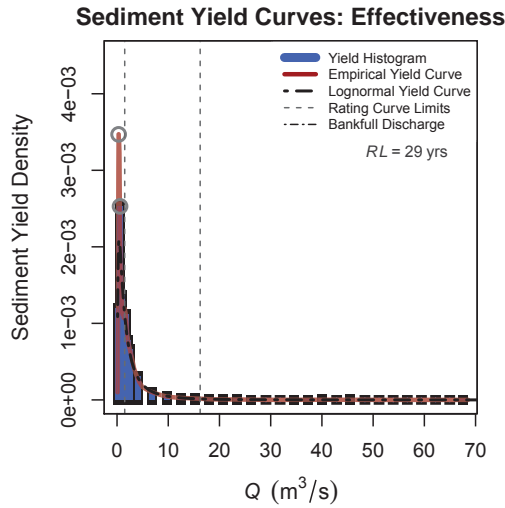
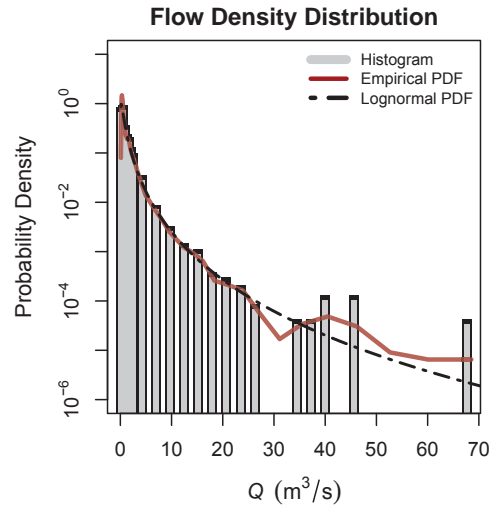
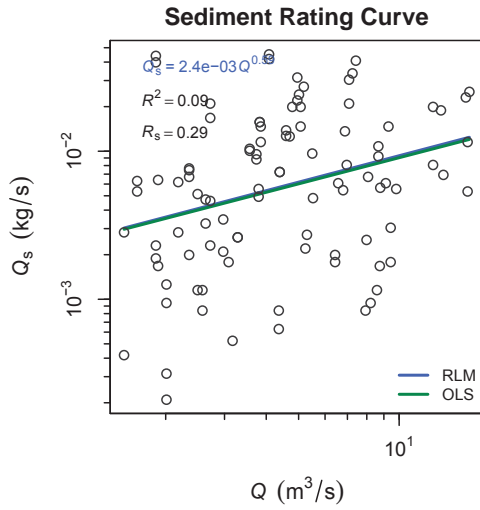
Bed Load Sites

RUSH C NR LEWISTON, CA: 11525530



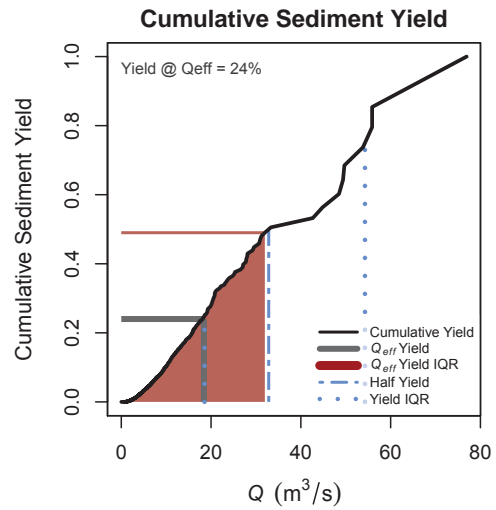
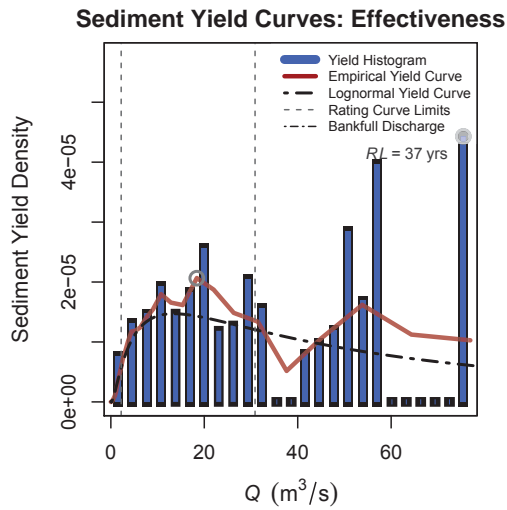
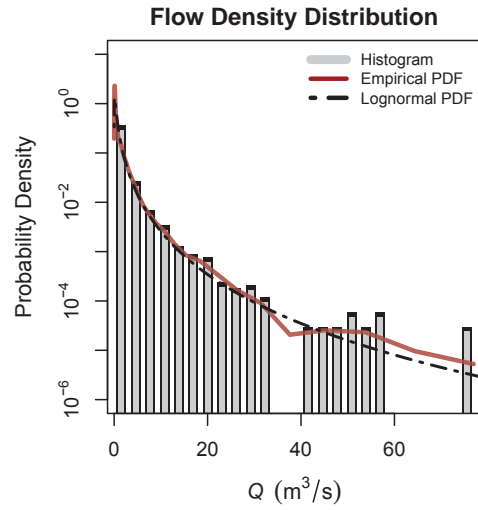
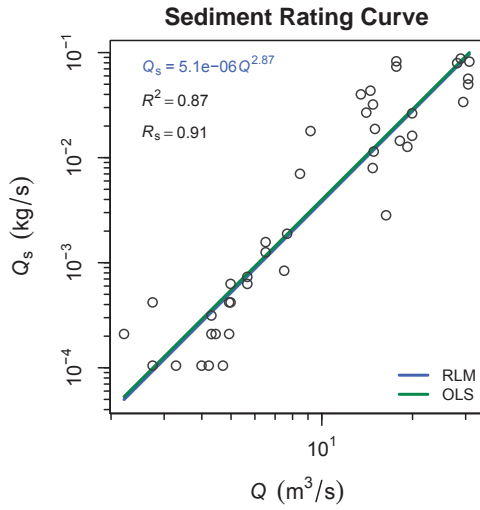
Bed Load Sites

GRASS VALLEY C A FAWN LODGE NR LEWISTON, CA: 11525600



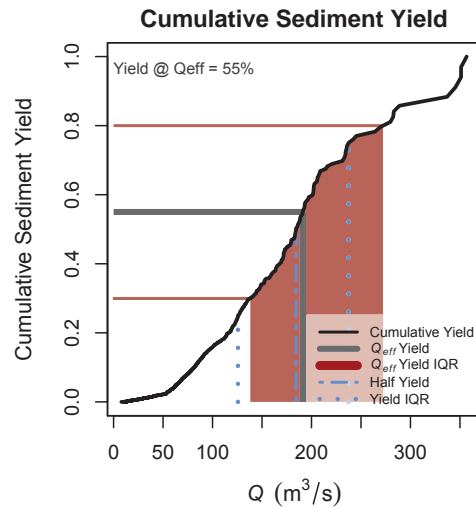
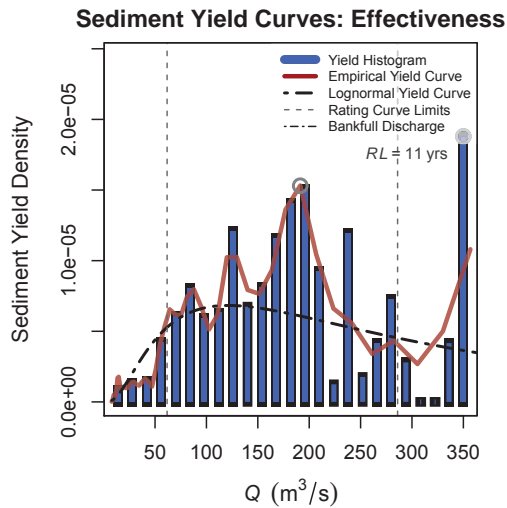
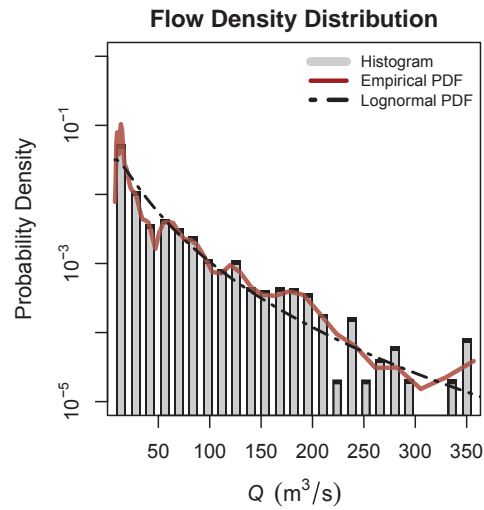
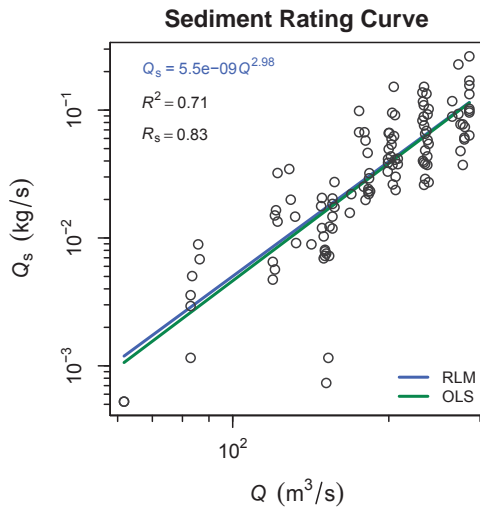
Bed Load Sites

INDIAN C NR DOUGLAS CITY, CA: 11525670



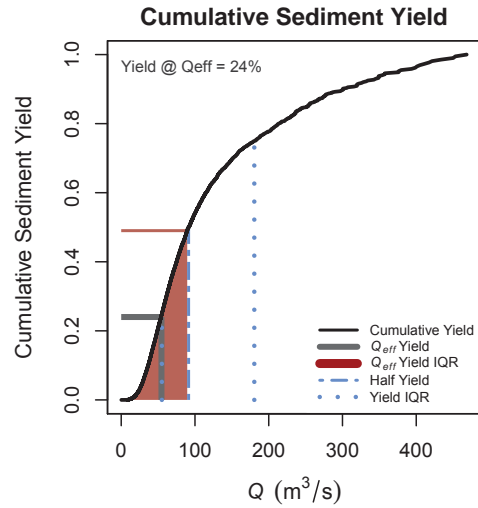
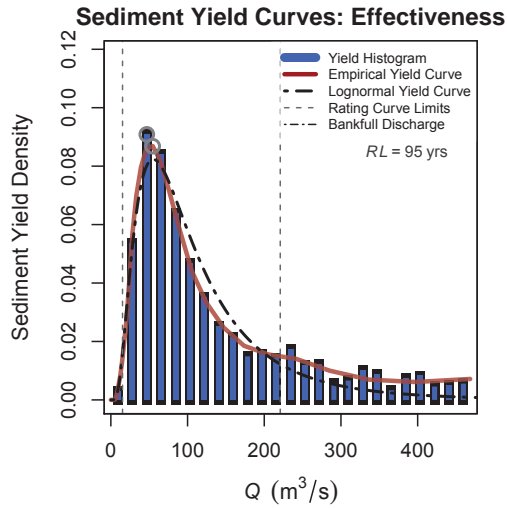
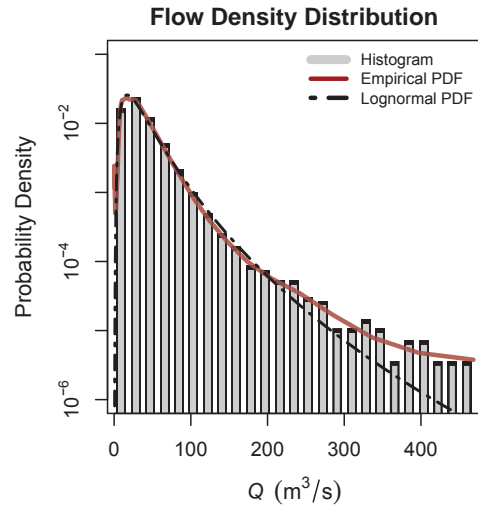
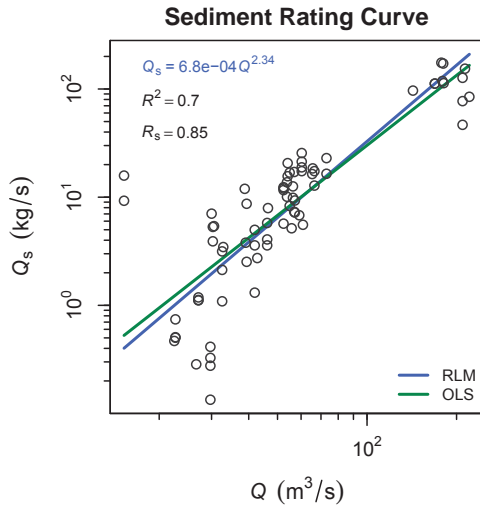
Bed Load Sites

TRINITY R A DOUGLAS CITY, CA: 11525854



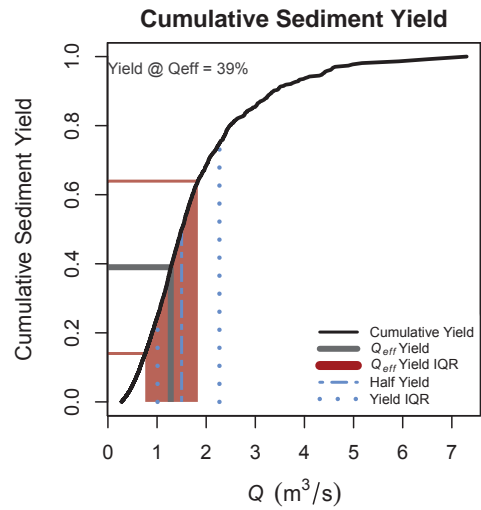
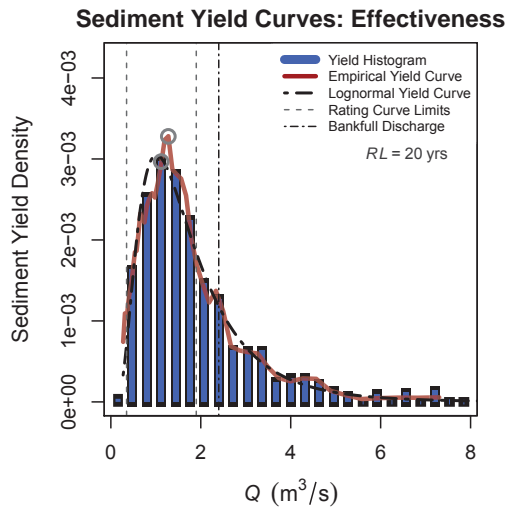
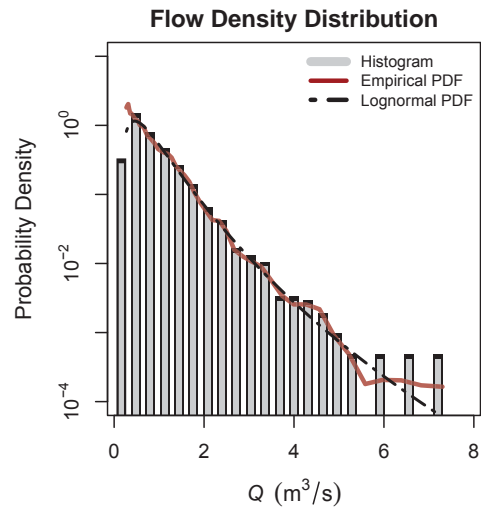
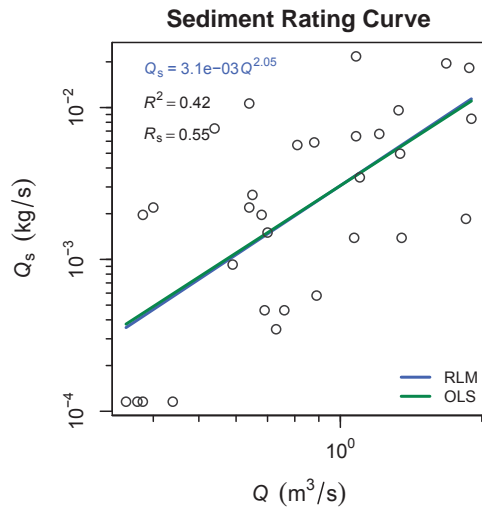
Bed Load Sites

ELWHA RIVER ABV LAKE MILLS NR PT ANGELES, WA: 12044900



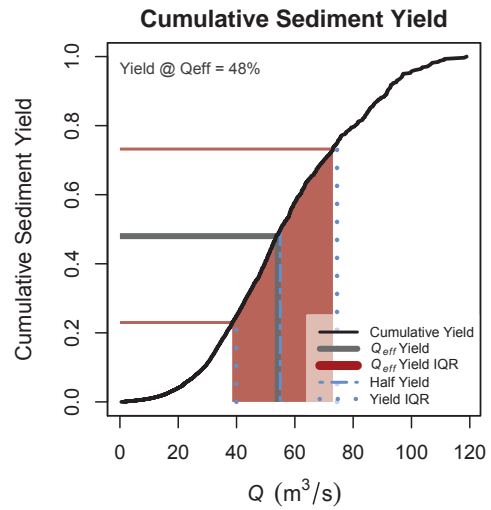
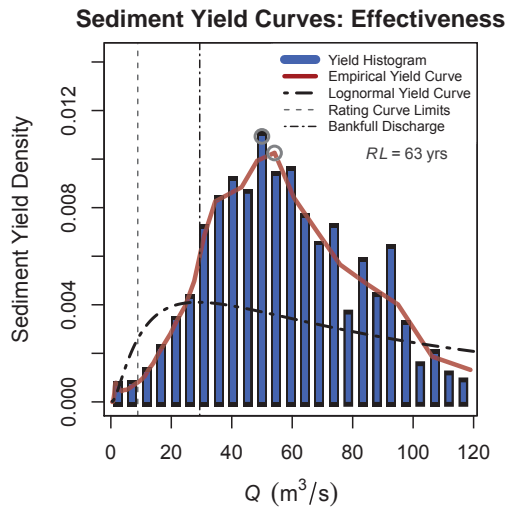
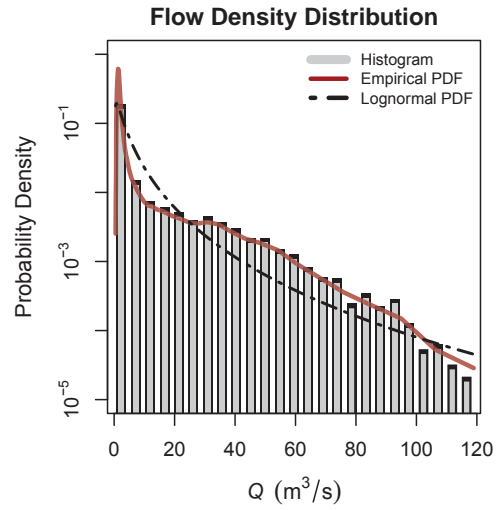
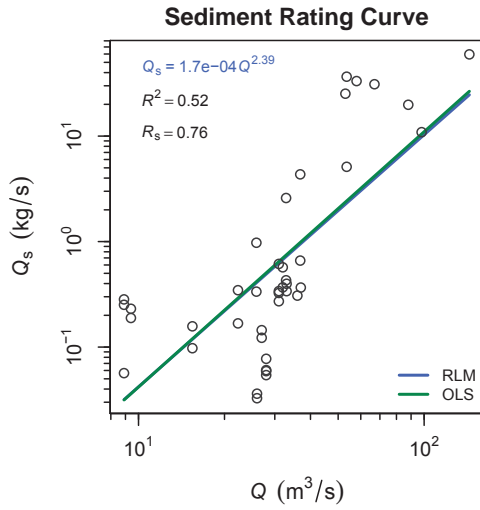
Bed Load Sites

Cat Spur Creek, ID: 1241490A



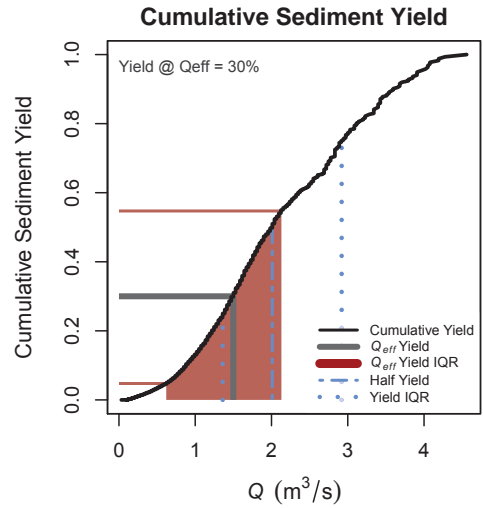
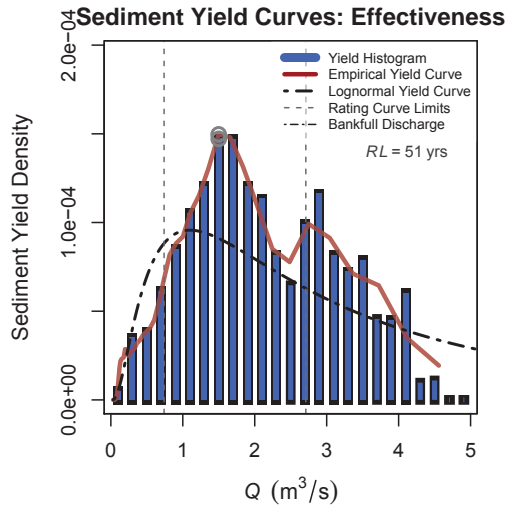
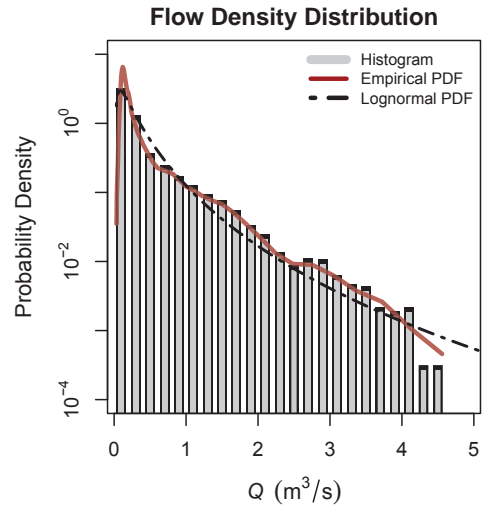
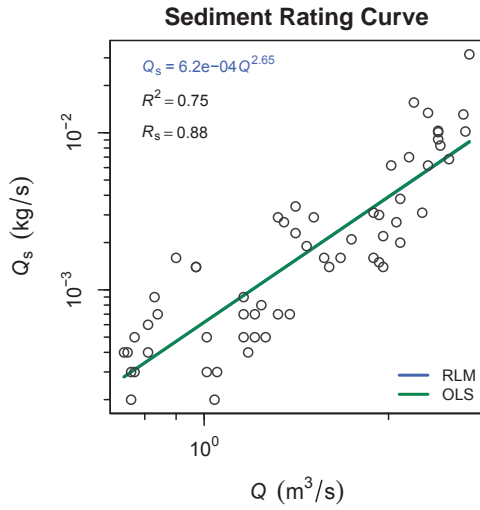
Bed Load Sites

Pacific Creek at Moran, WY: 13011500



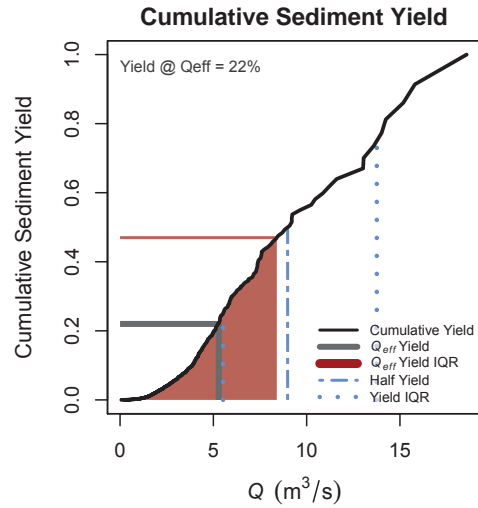
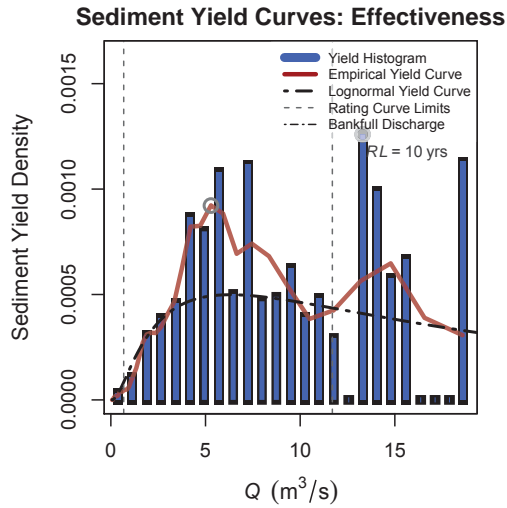
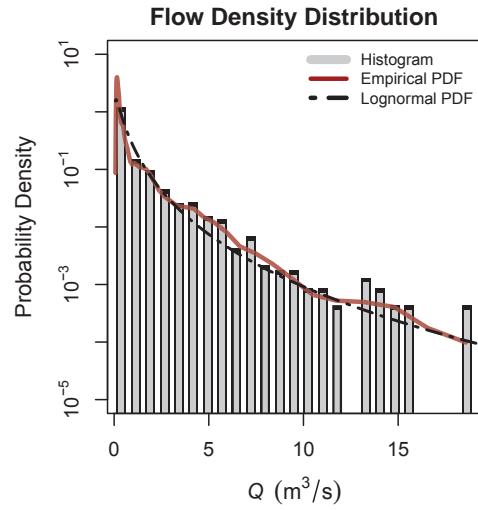
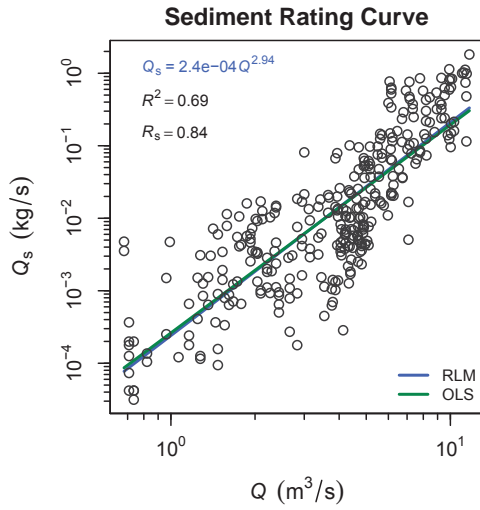
Bed Load Sites

Cache Creek, nr Jackson, WY: 13018300



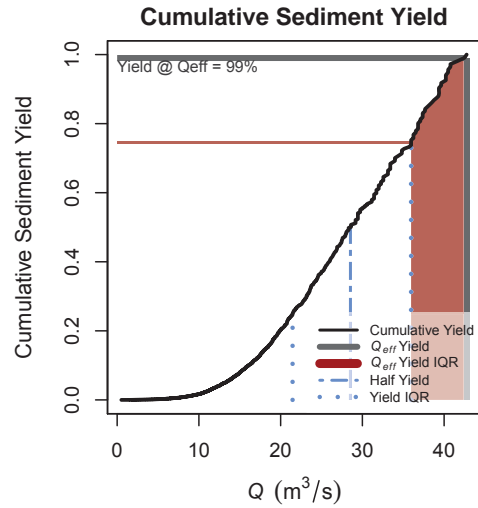
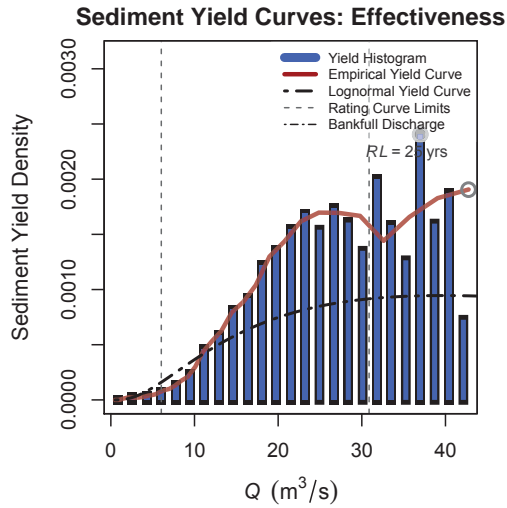
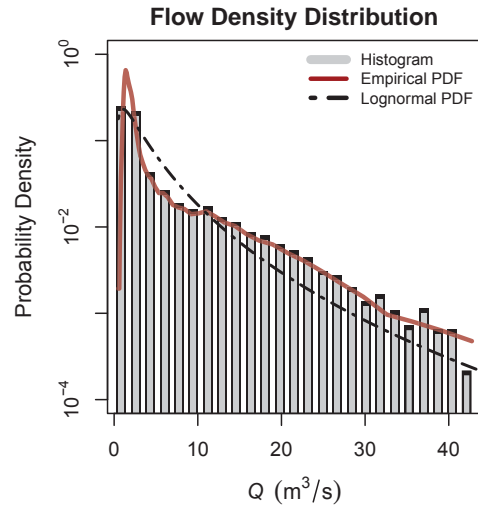
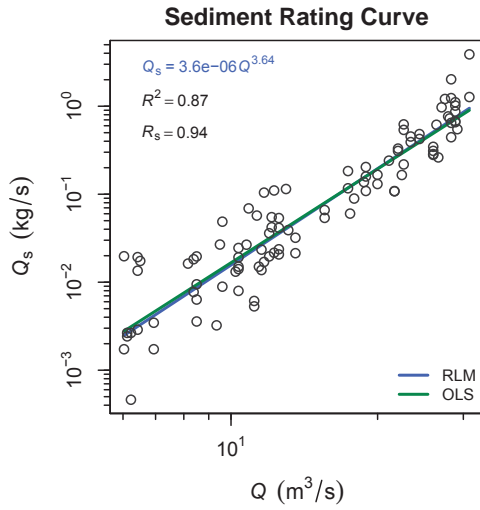
Bed Load Sites

LITTLE GRANITE CK AT MOUTH NR BONDURANT, WY: 13019438



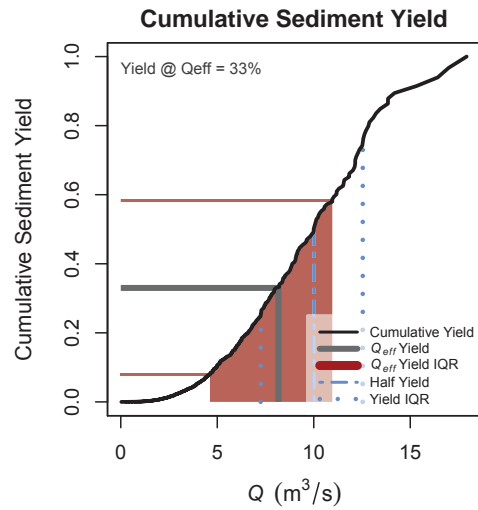
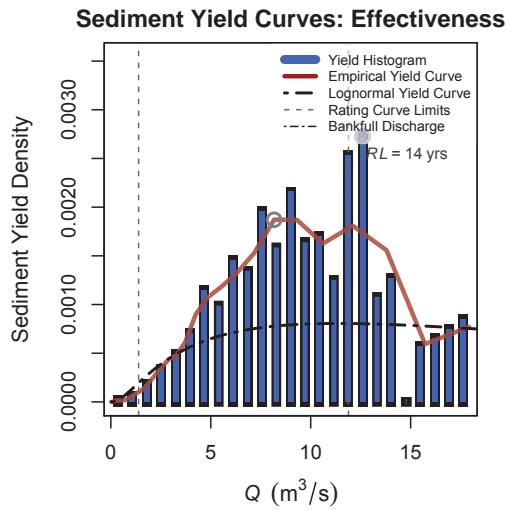
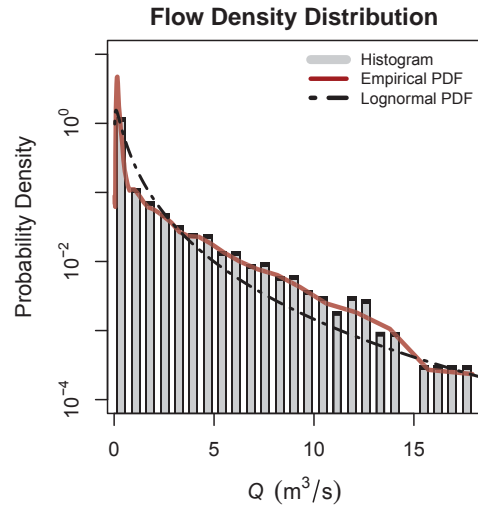
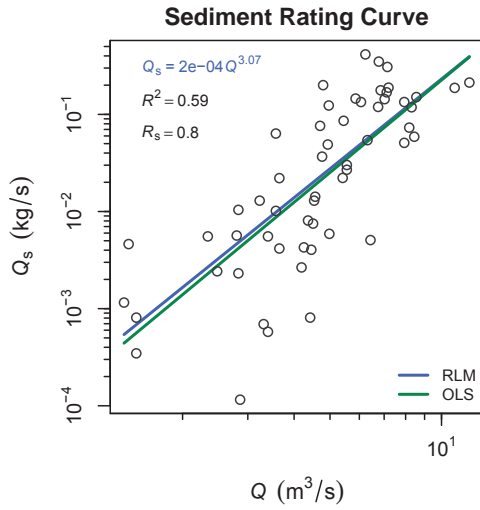
Bed Load Sites

BIG WOOD RIVER NR KETCHUM, ID: 13135500



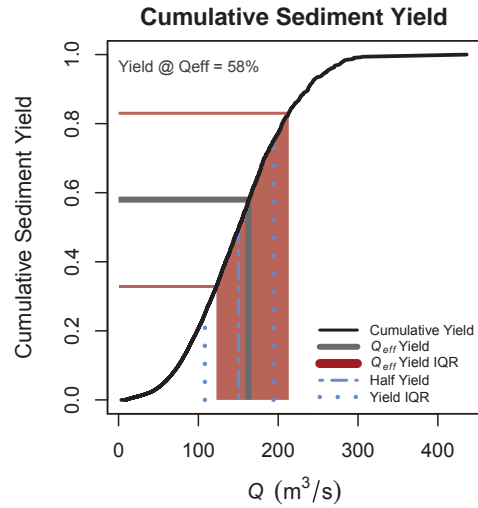
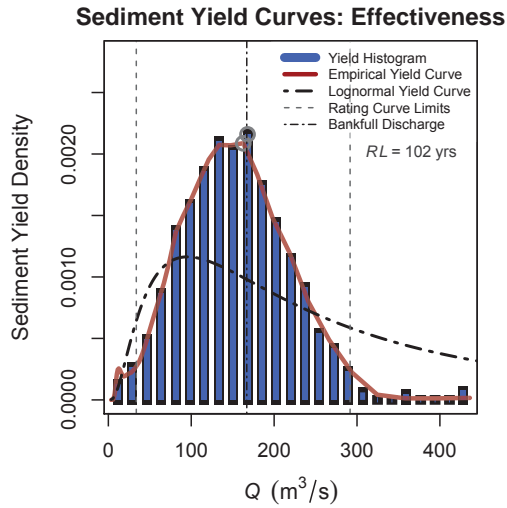
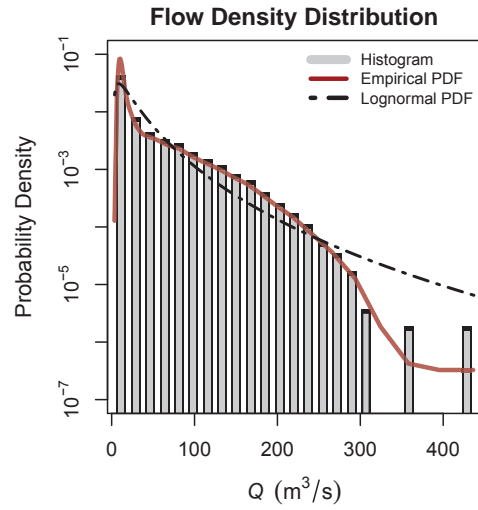
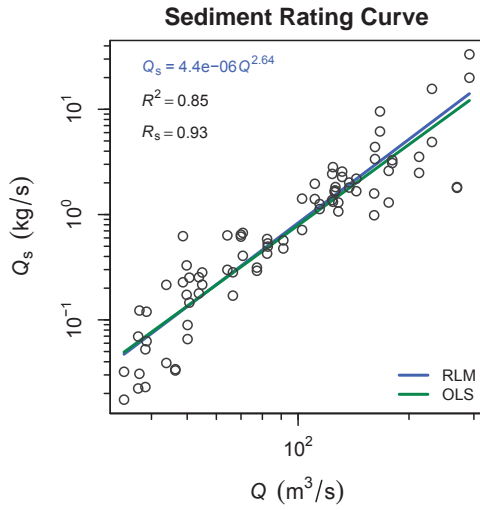
Bed Load Sites

JARBIDGE RV BLW JARBIDGE, NV: 13162225



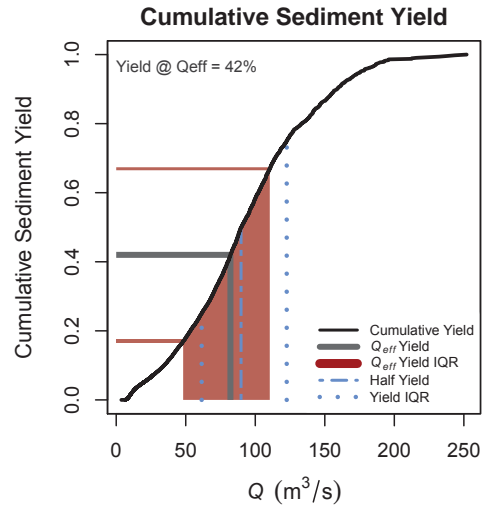
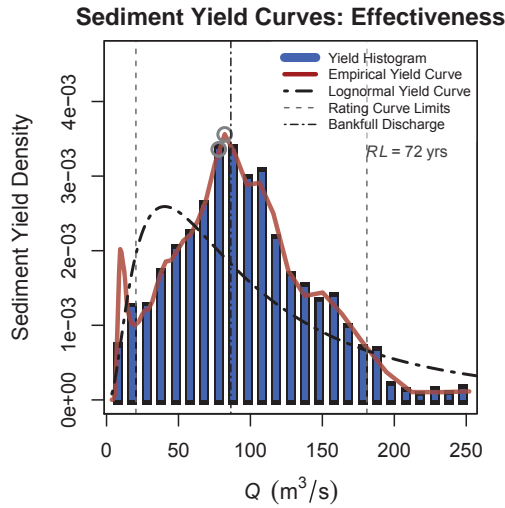
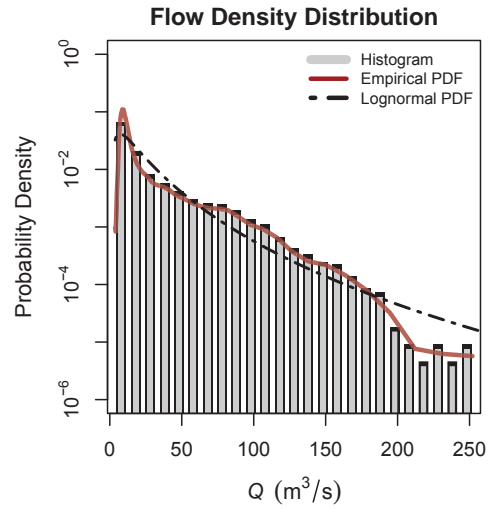
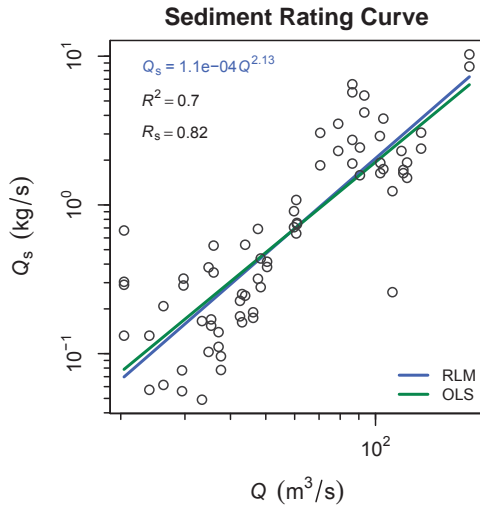
Bed Load Sites

BOISE RIVER NR TWIN SPRINGS, ID: 13185000



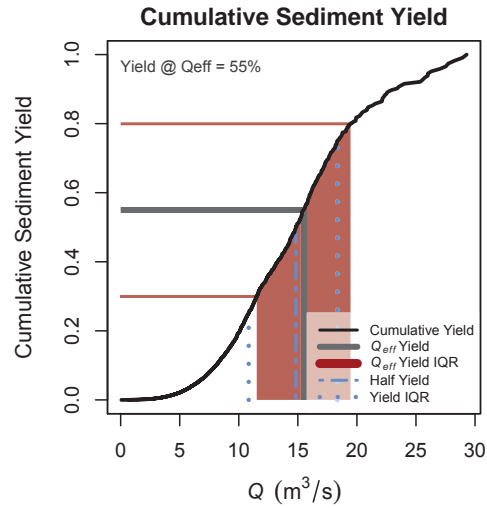
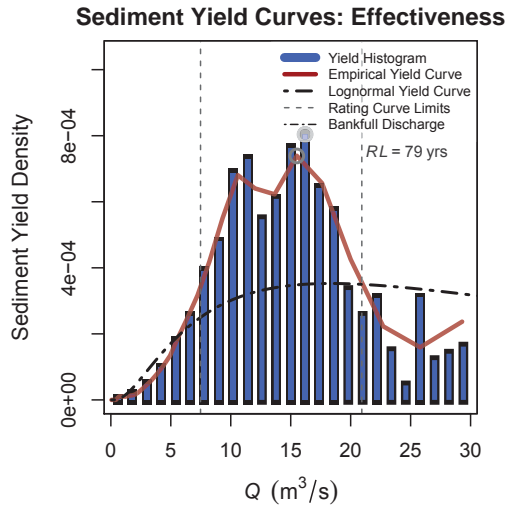
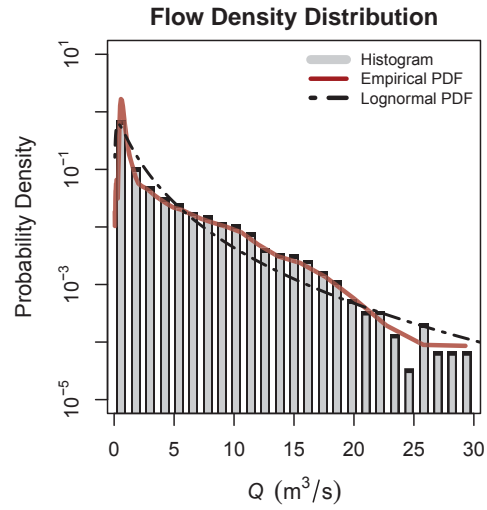
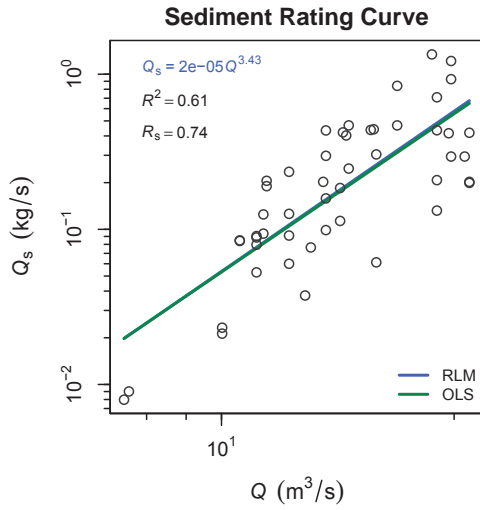
Bed Load Sites

SOUTH FORK PAYETTE RIVER AT LOWMAN, ID: 13235000



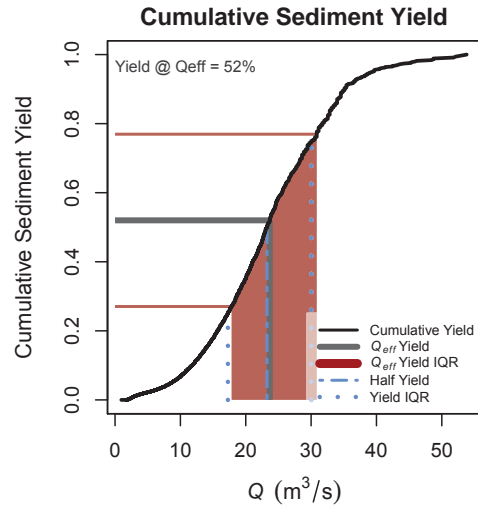
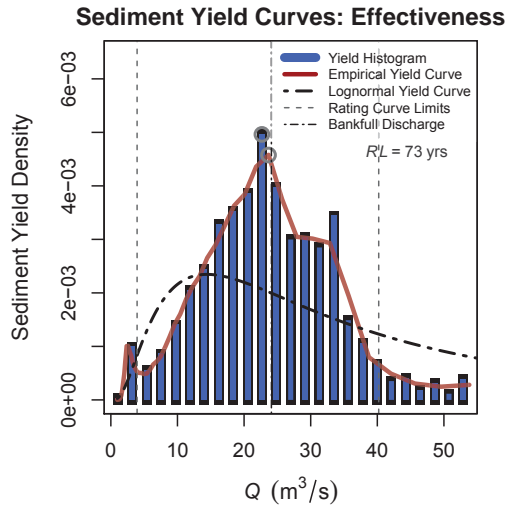
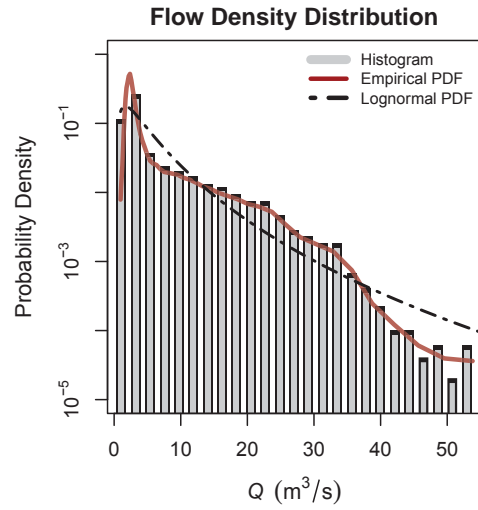
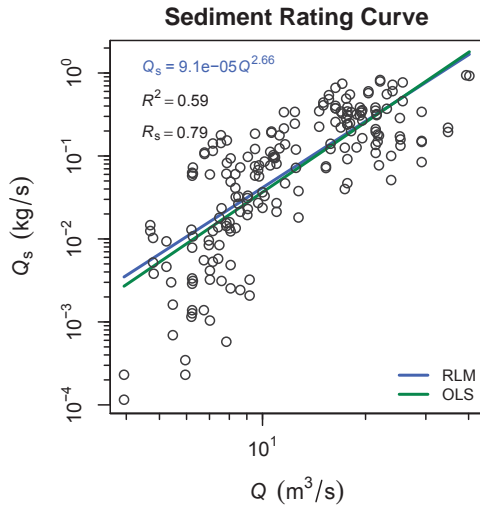
Bed Load Sites

SALMON RIVER NR OBSIDIAN, ID: 13292500



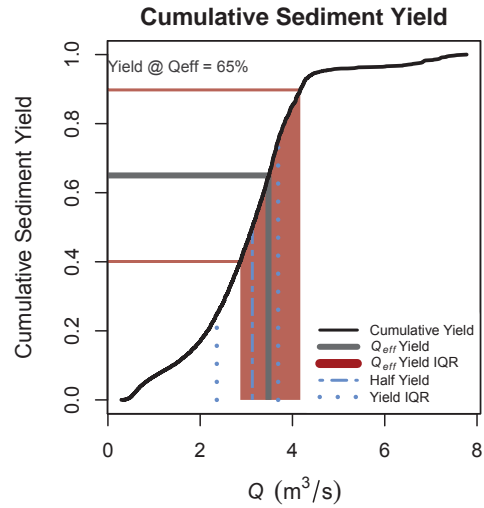
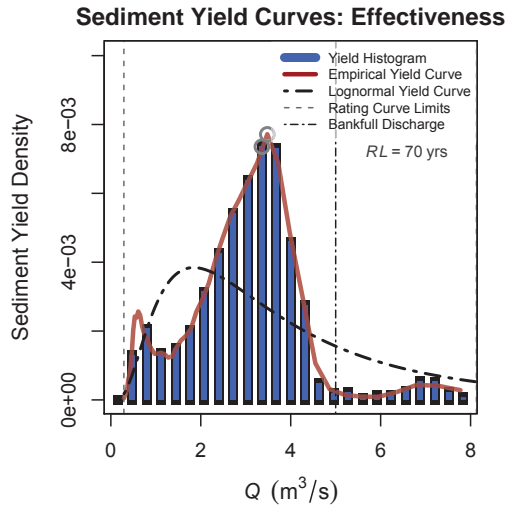
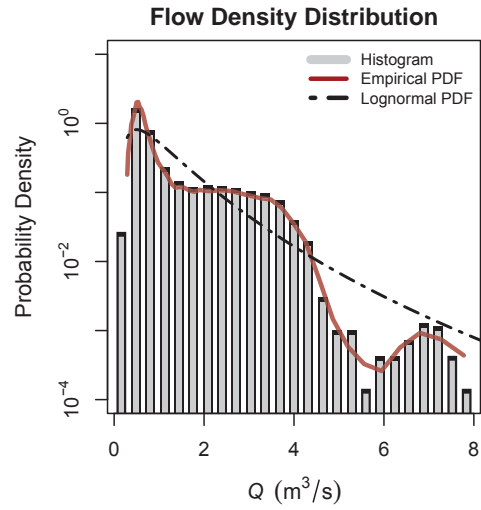
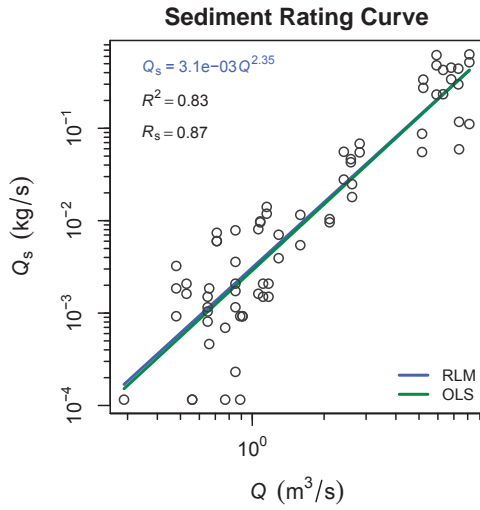
Bed Load Sites

VALLEY CREEK AT STANLEY, ID: 13295000



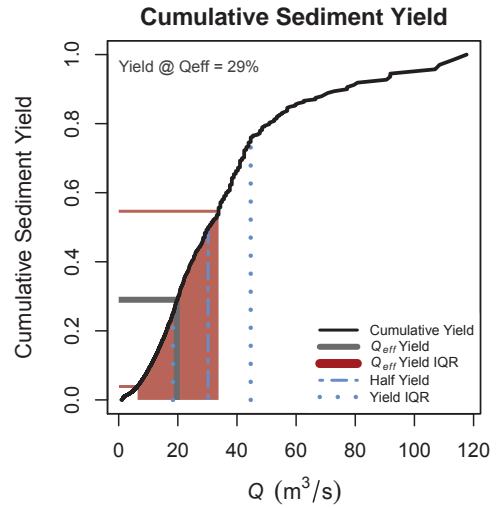
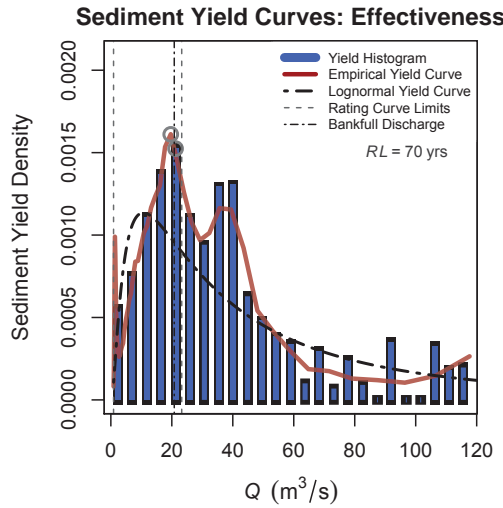
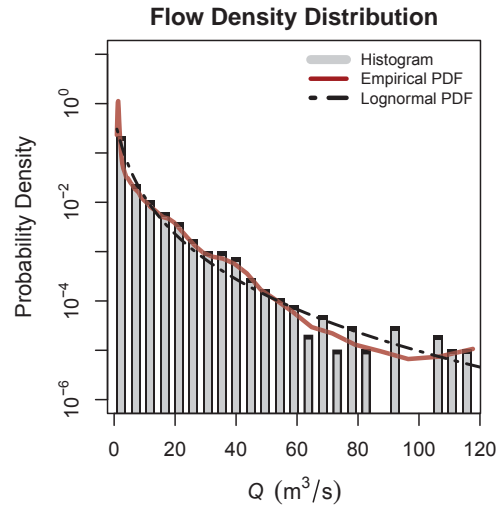
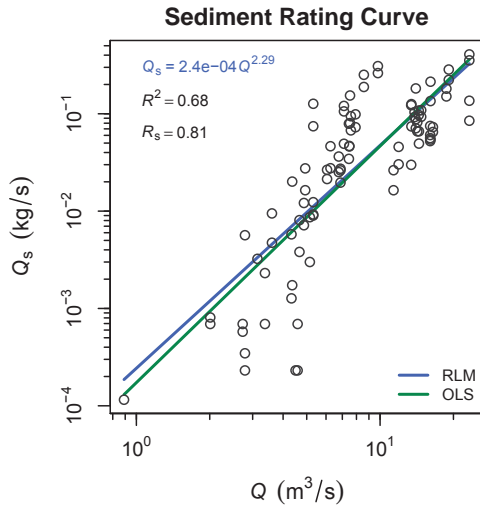
Bed Load Sites

Herd Creek, ID: 1329500B



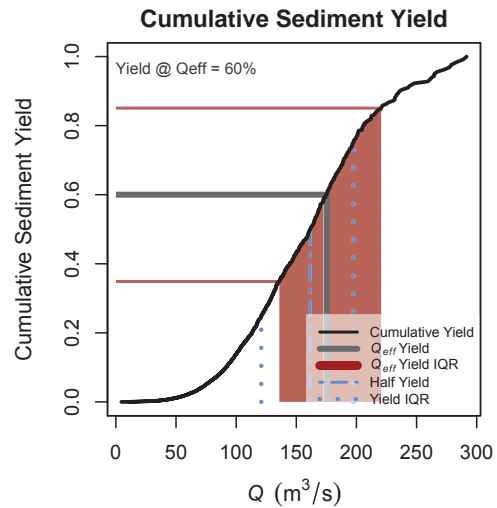
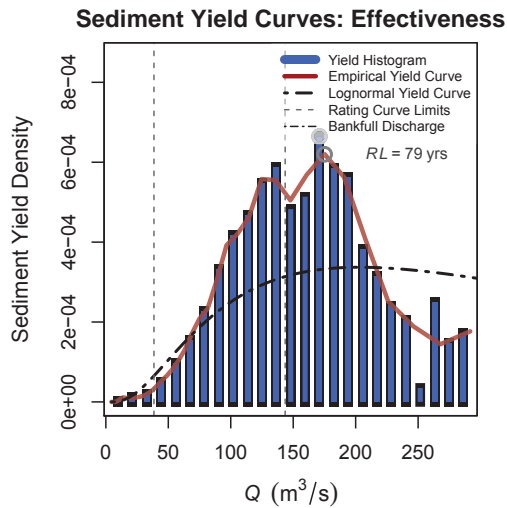
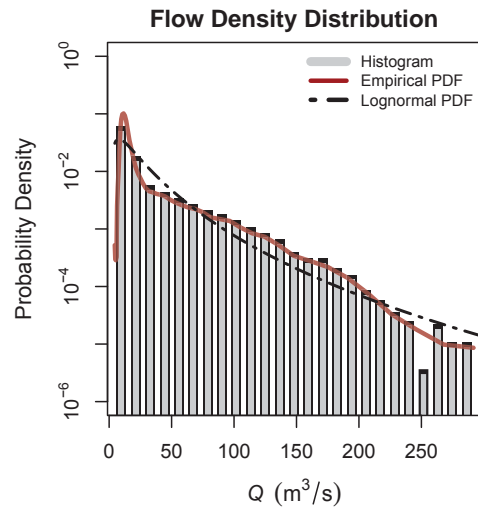
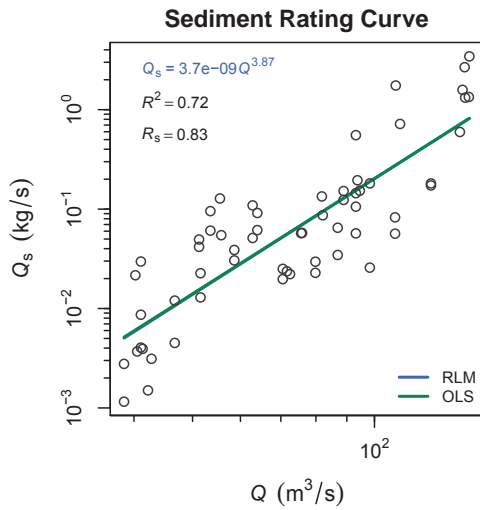
Bed Load Sites

Marsh Creek, ID: 1329500C



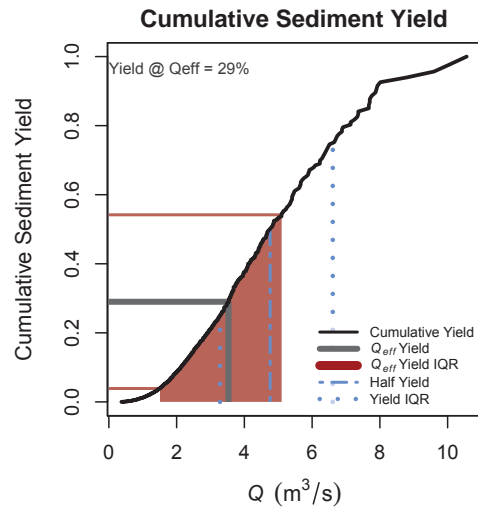
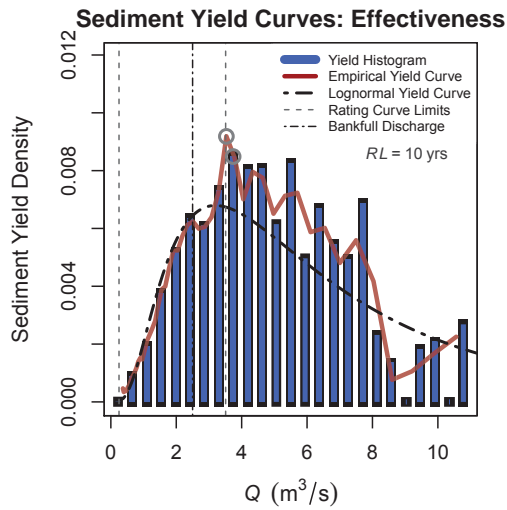
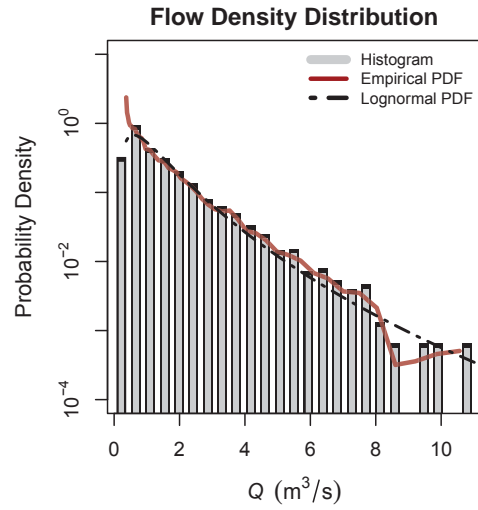
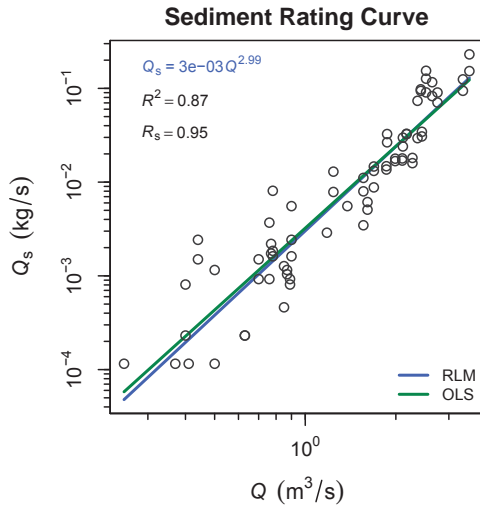
Bed Load Sites

SALMON RIVER BL YANKEE FORK NR CLAYTON, ID: 13296500



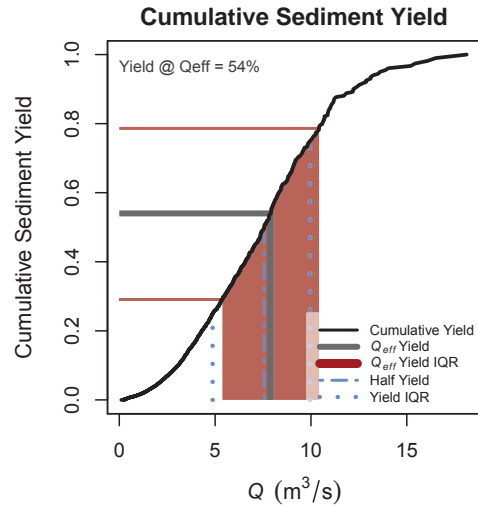
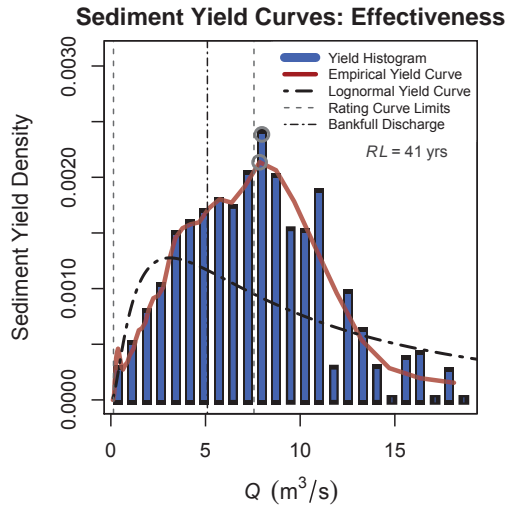
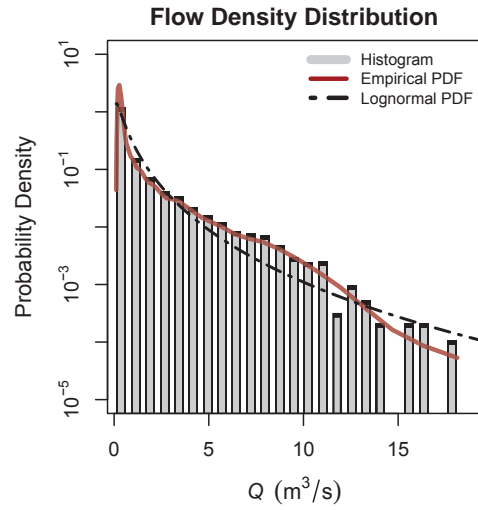
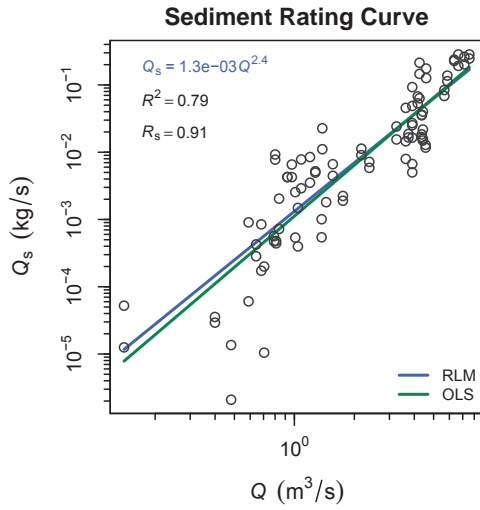
Bed Load Sites

Thompson Creek, ID: 13297330



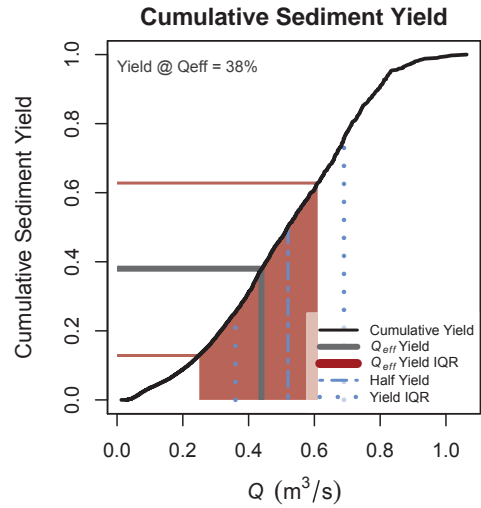
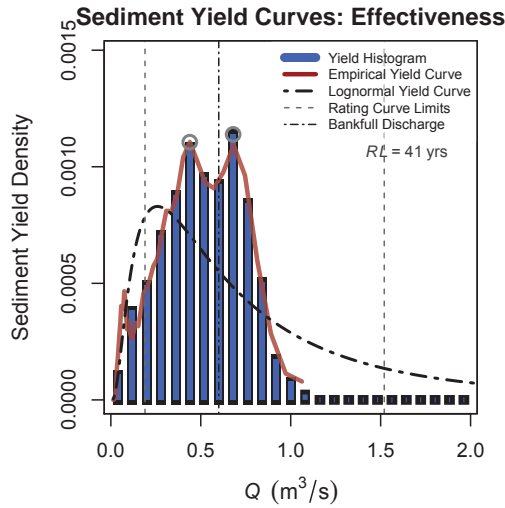
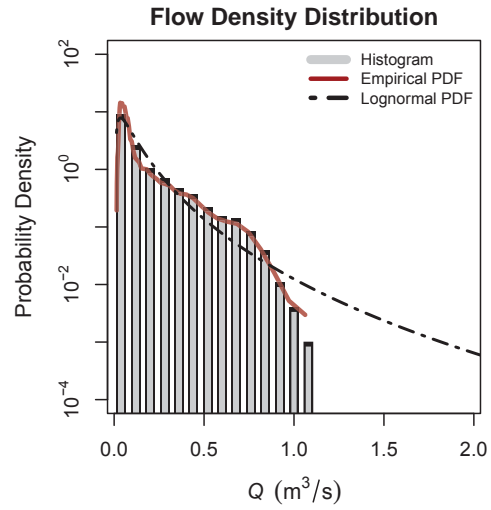
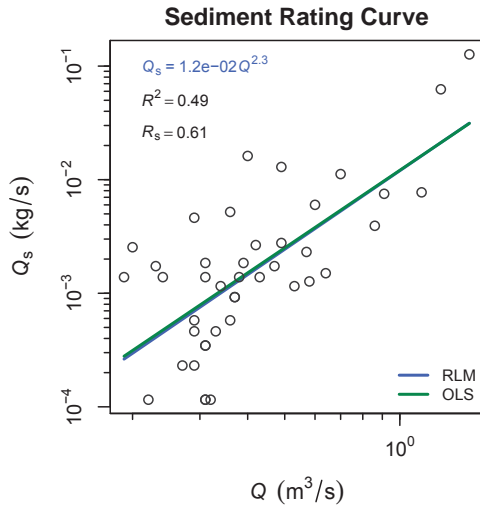
Bed Load Sites

SQUAW CREEK BL BRUNO CREEK NR CLAYTON, ID: 13297355



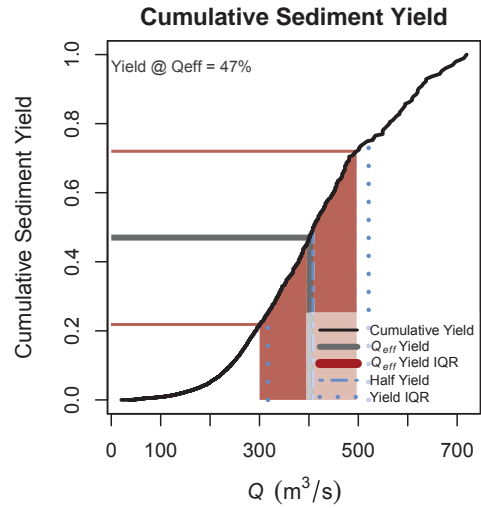
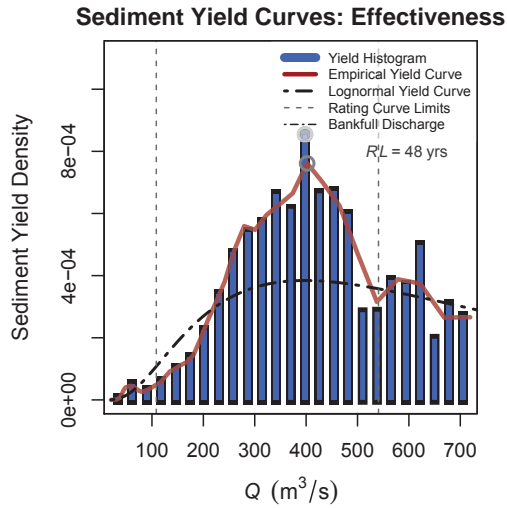
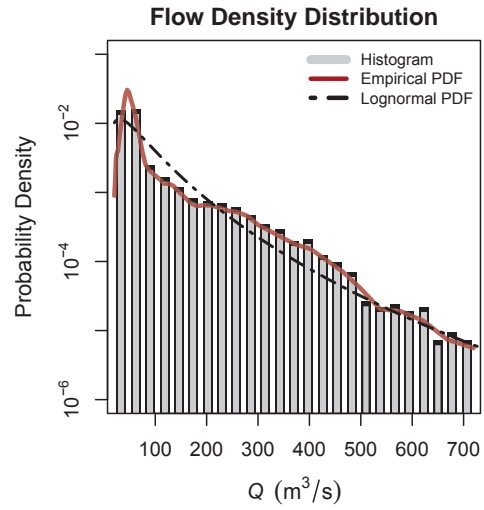
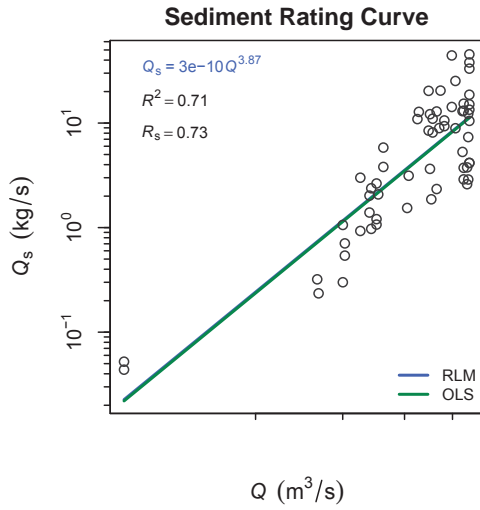
Bed Load Sites

Squaw Ck nr North Fork, ID (USFS): 1329735A



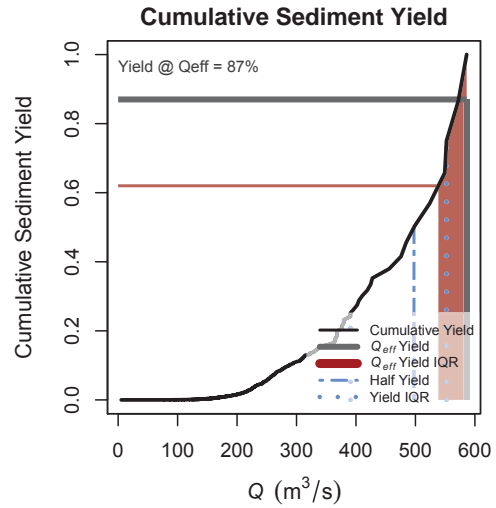
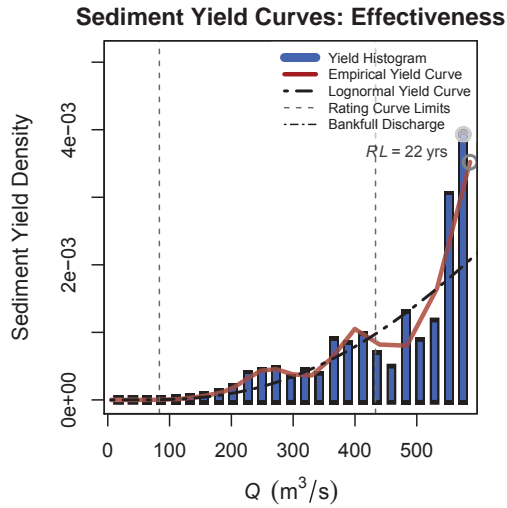
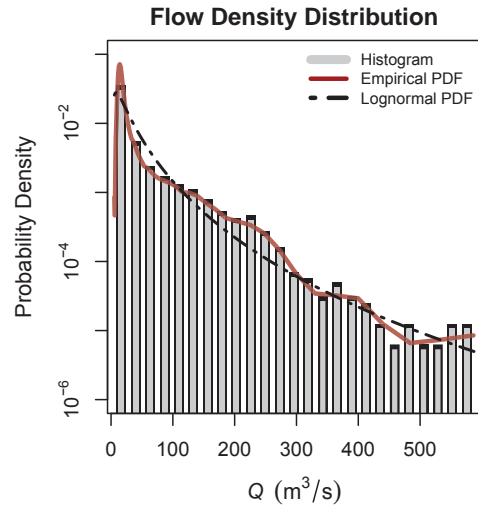
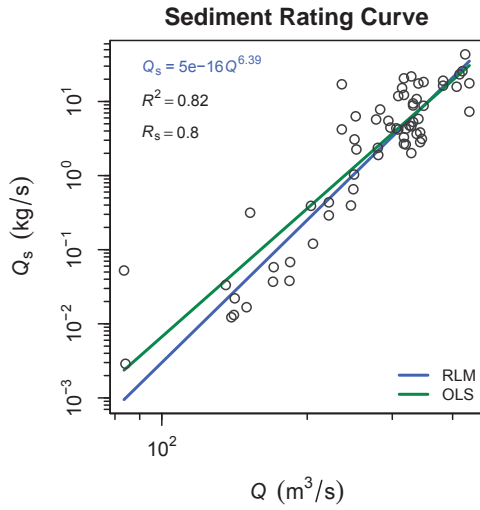
Bed Load Sites

SALMON RIVER NR SHOUP, ID: 13307000



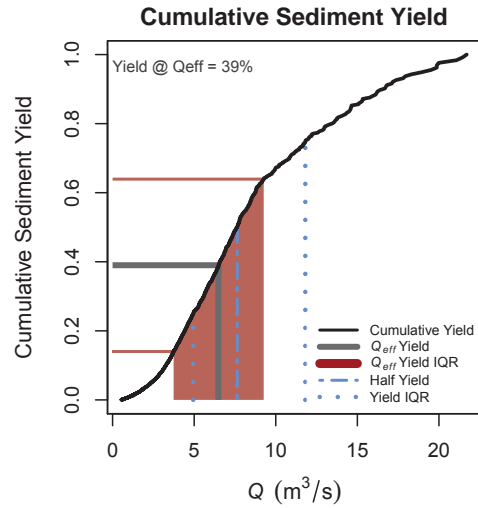
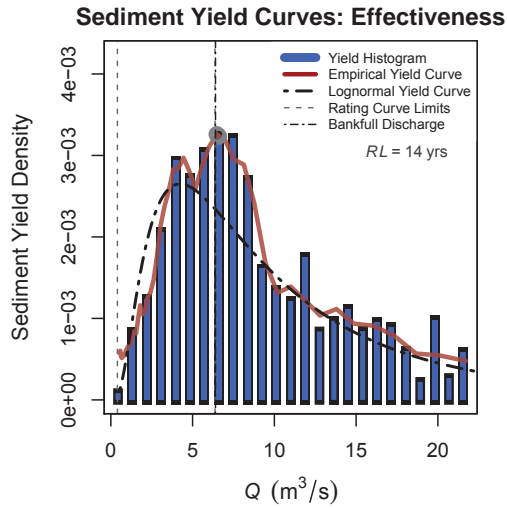
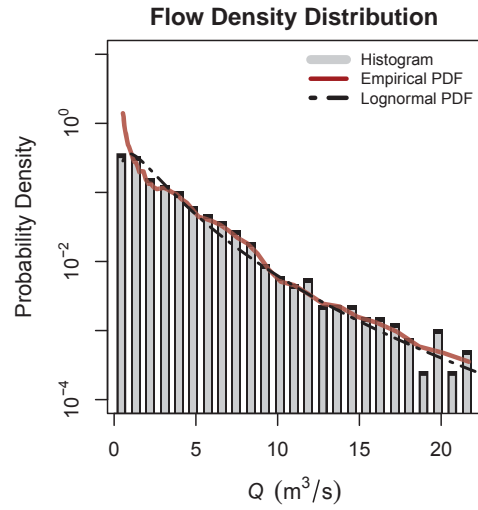
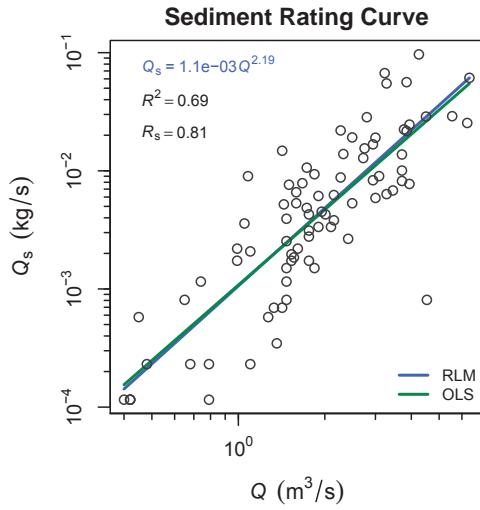
Bed Load Sites

MIDDLE FORK SALMON RIVER NR YELLOW PINE, ID: 13309220



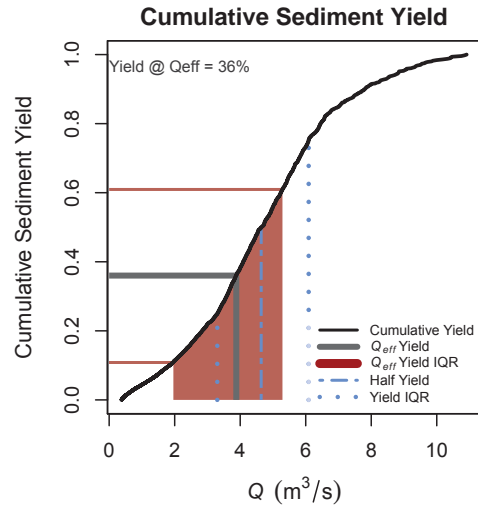
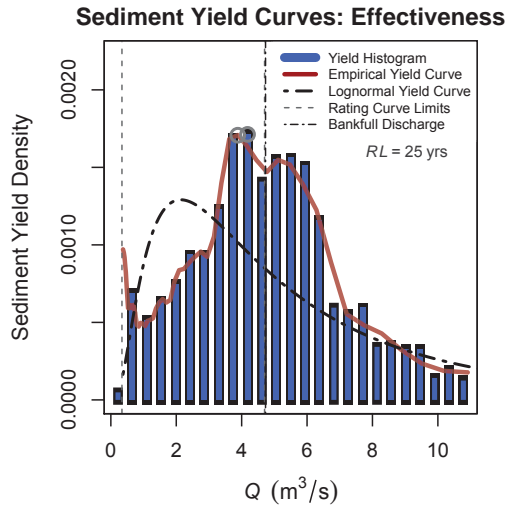
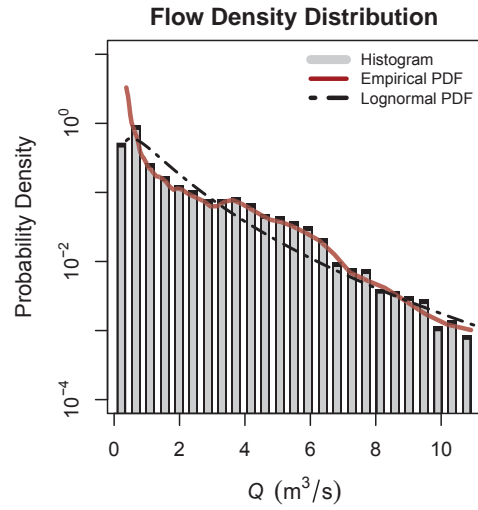
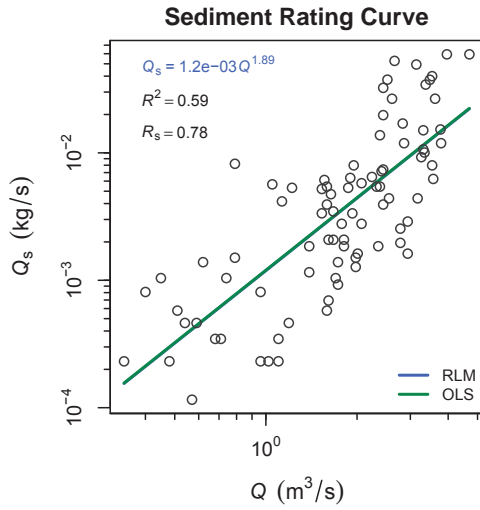
Bed Load Sites

DOLLAR CREEK NR WARM LAKE NR CASCADE, ID: 13310520



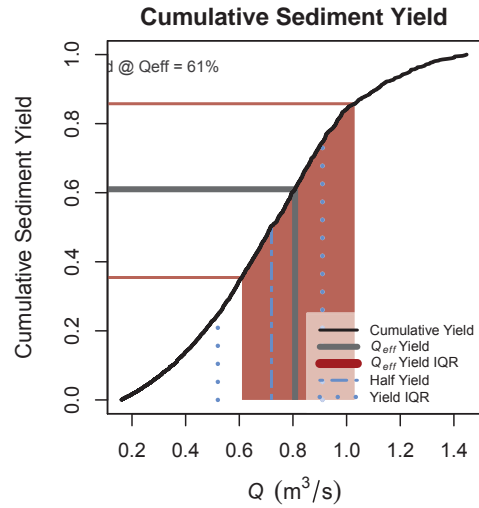
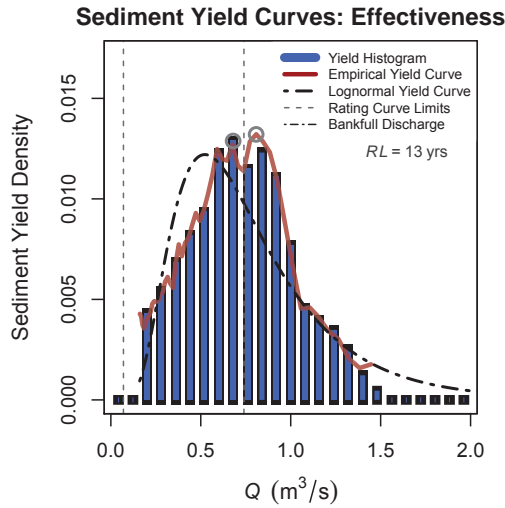
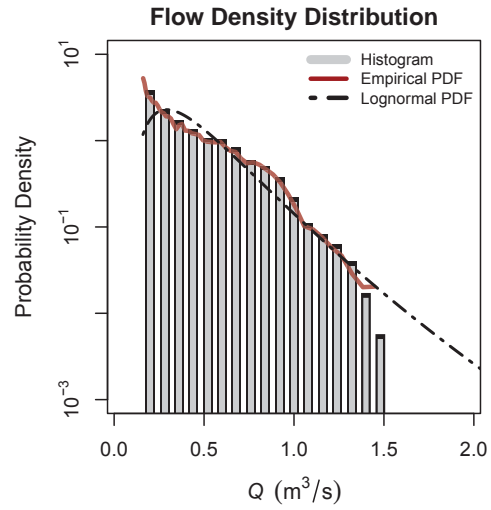
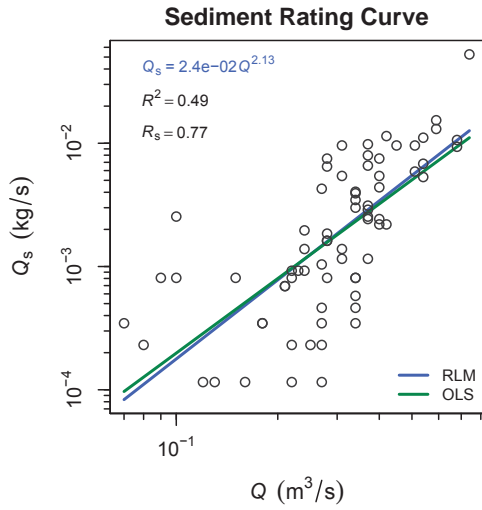
Bed Load Sites

BLACKMARE CREEK NR POVERTY FLAT NR CASCADE, ID: 13310565



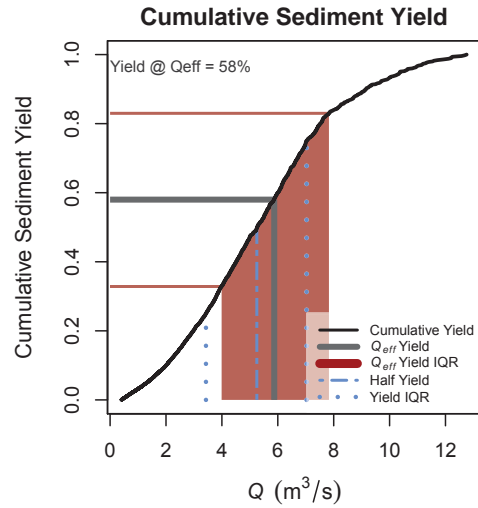
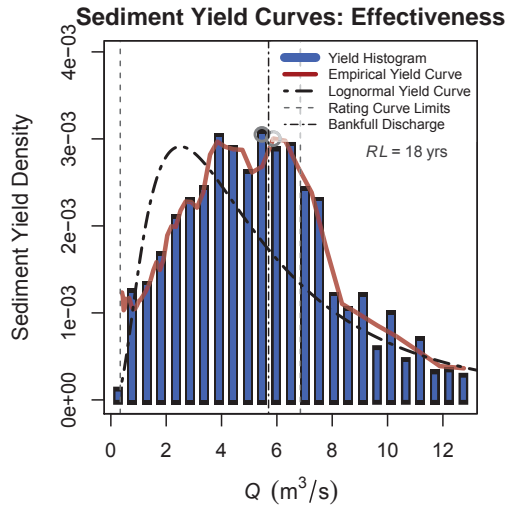
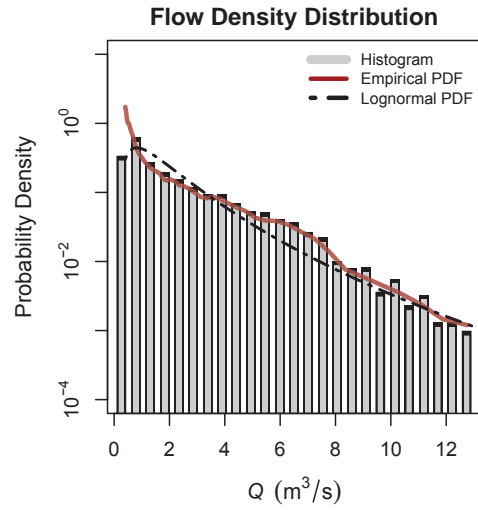
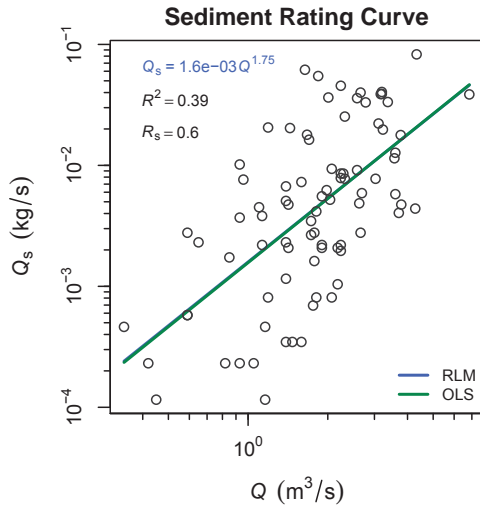
Bed Load Sites

LITTLE BUCKHORN CREEK NR KRASSEL RANGER STATION, ID: 13310660



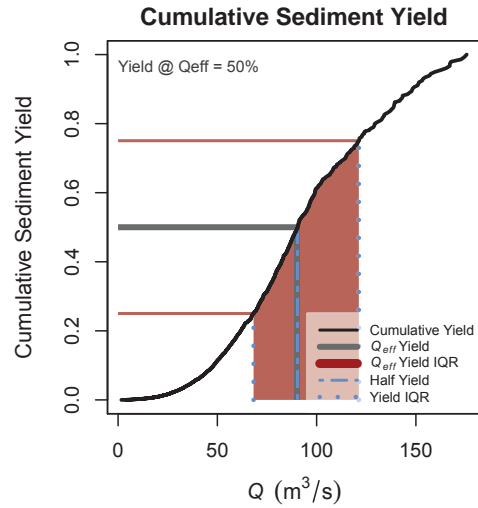
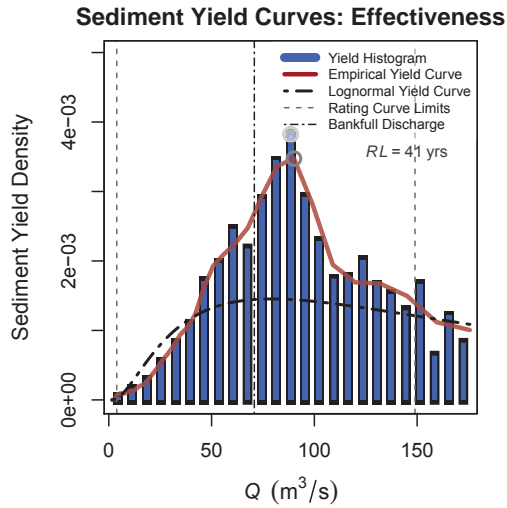
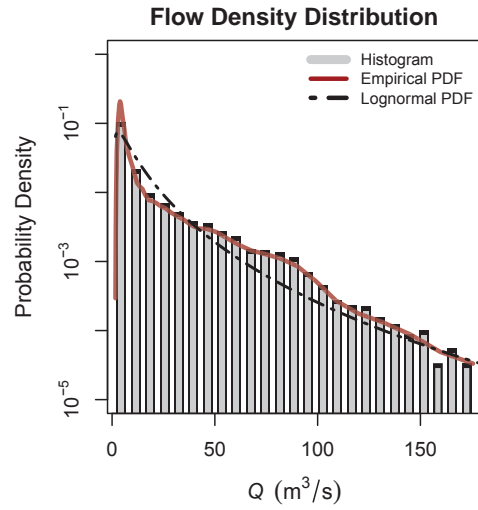
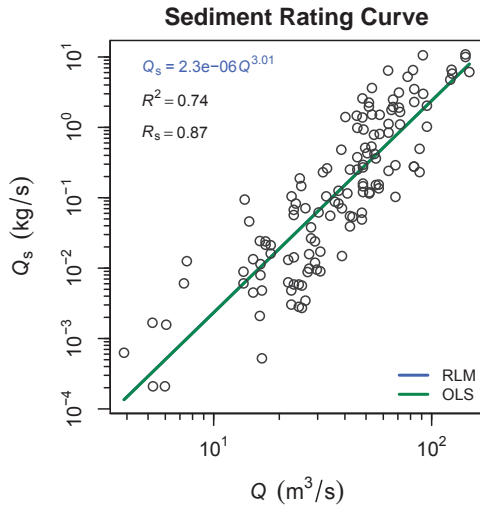
Bed Load Sites

WF BUCKHORN CREEK NR KRASSEL RANGER STATION, ID: 13310670



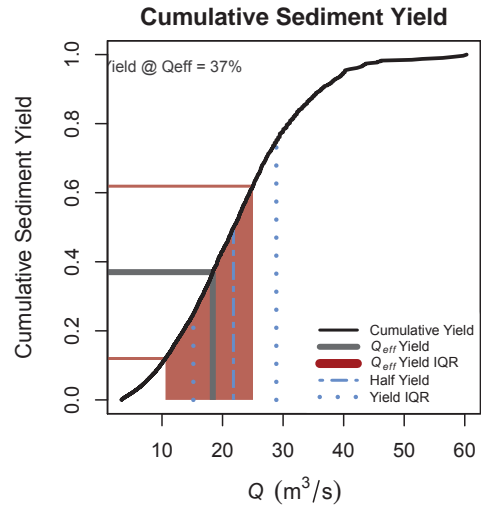
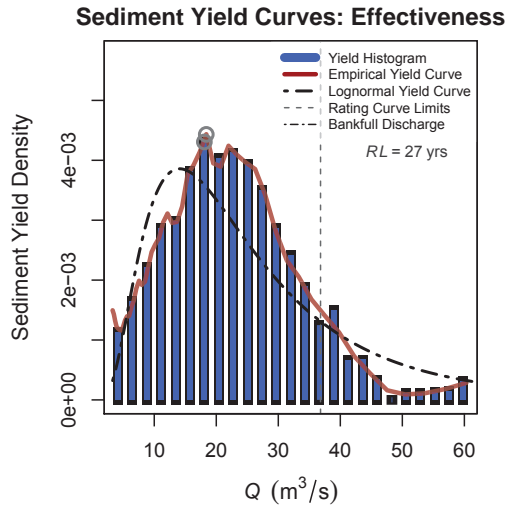
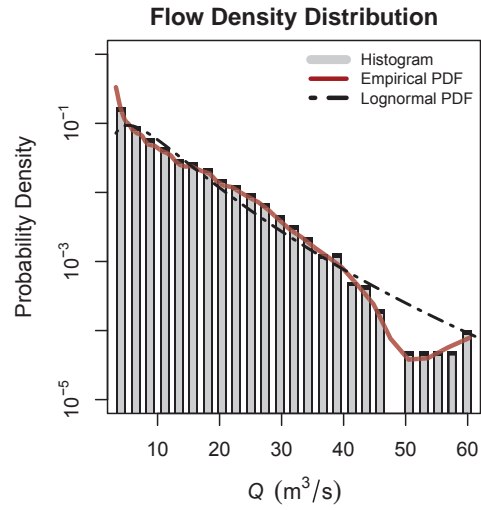
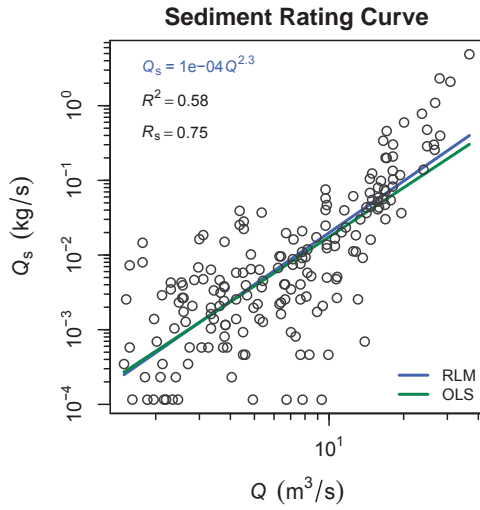
Bed Load Sites

South Fk Salmon River, ID: 13310700



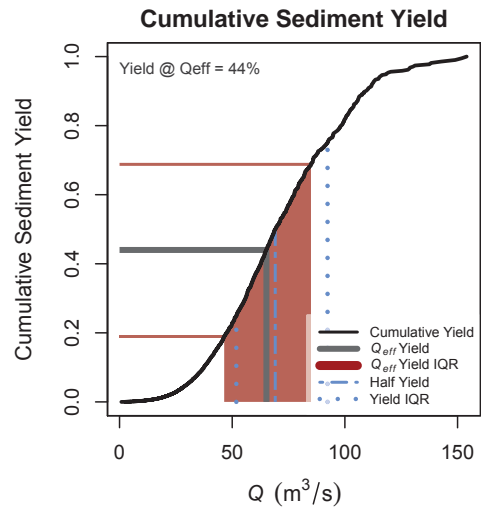
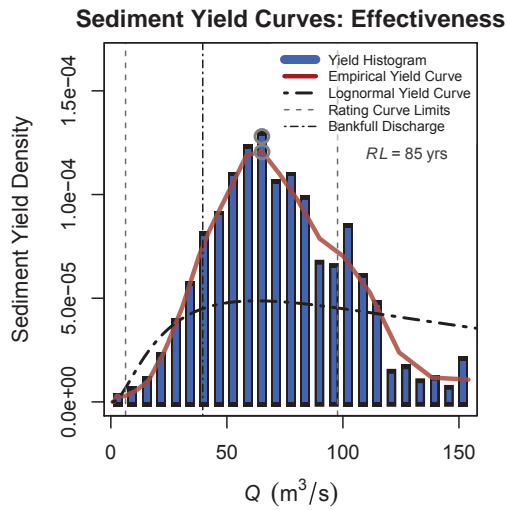
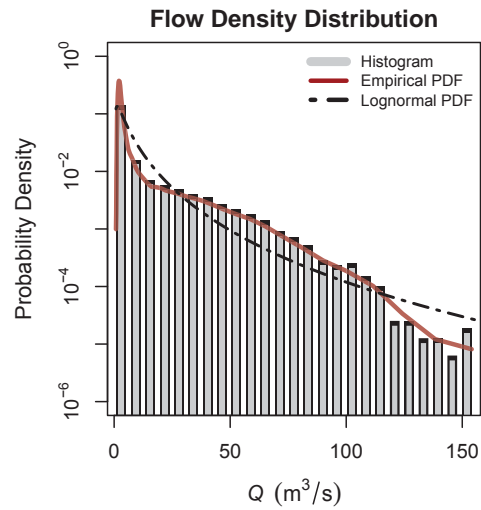
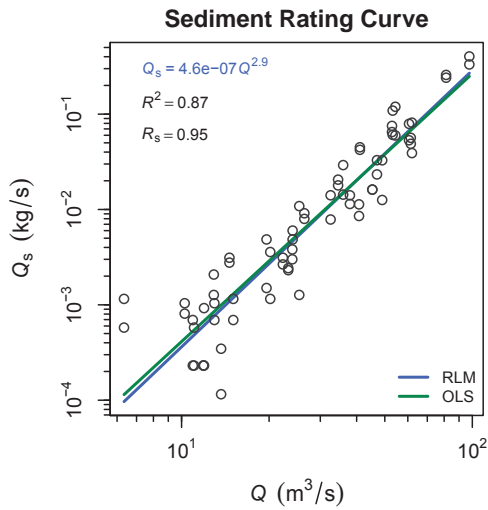
Bed Load Sites

Rapid River, ID: 1331070A



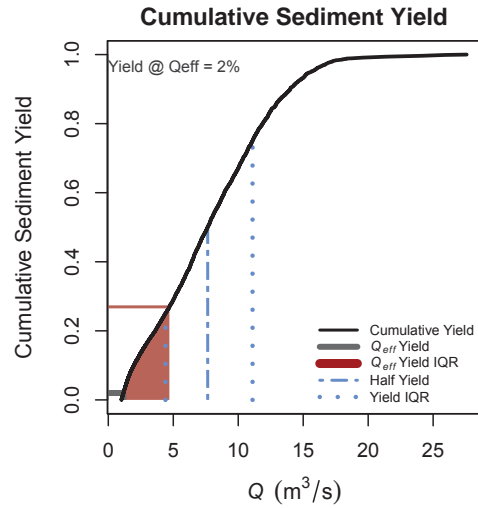
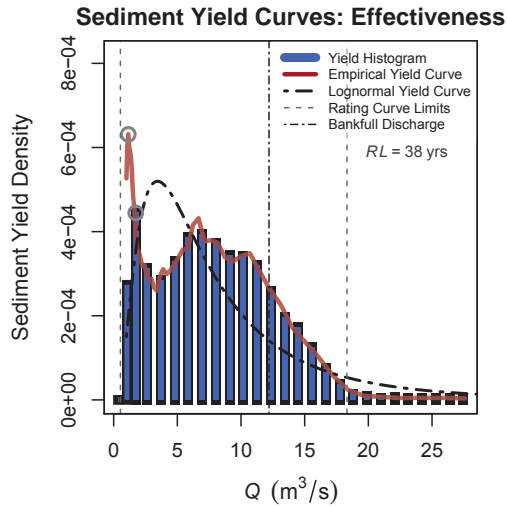
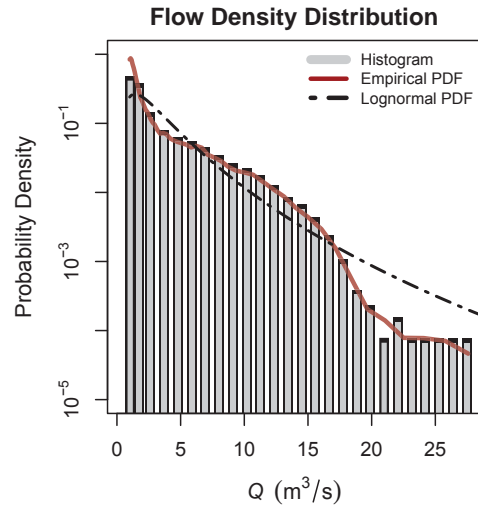
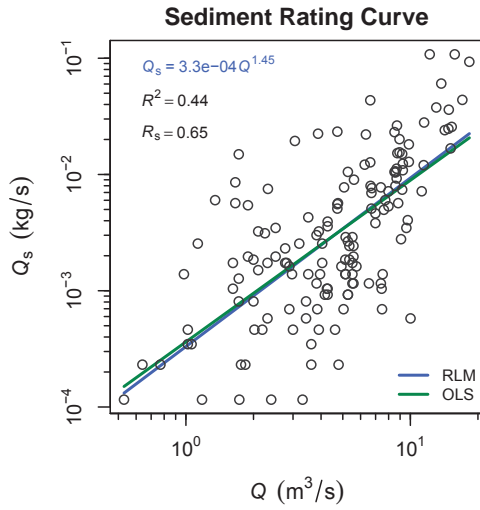
Bed Load Sites

JOHNSON CREEK AT YELLOW PINE, ID: 13313000



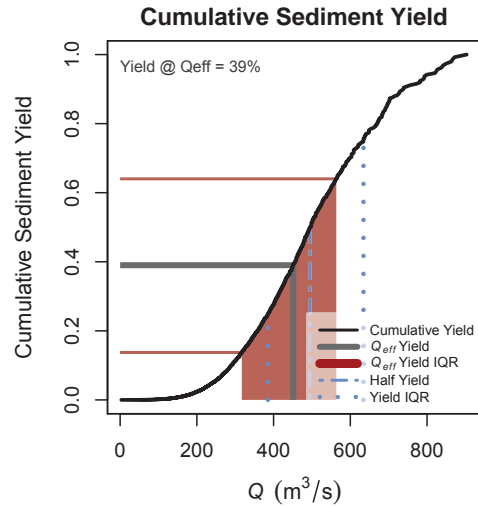
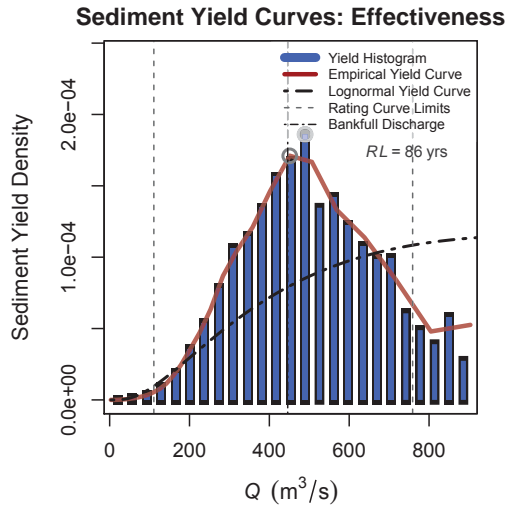
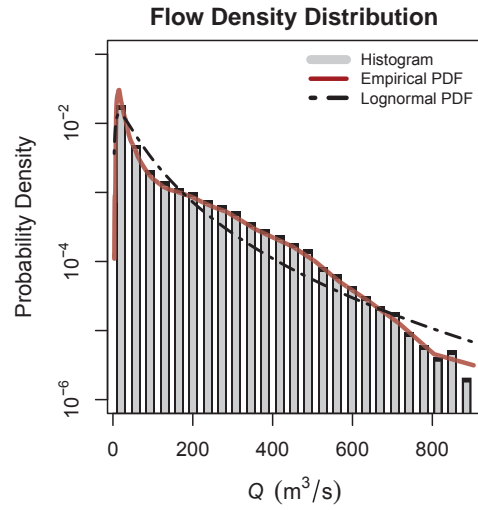
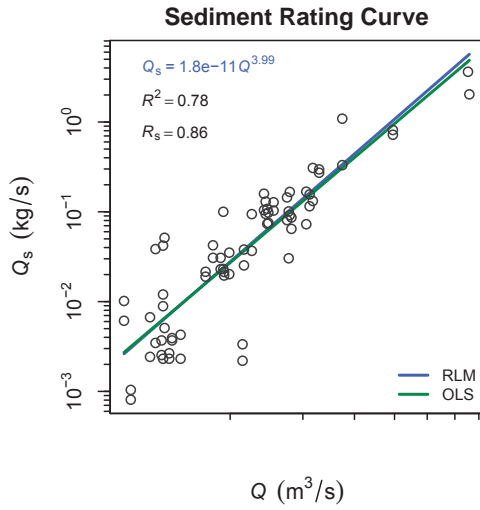
Bed Load Sites

Little Slate Creek, ID: 1331650A



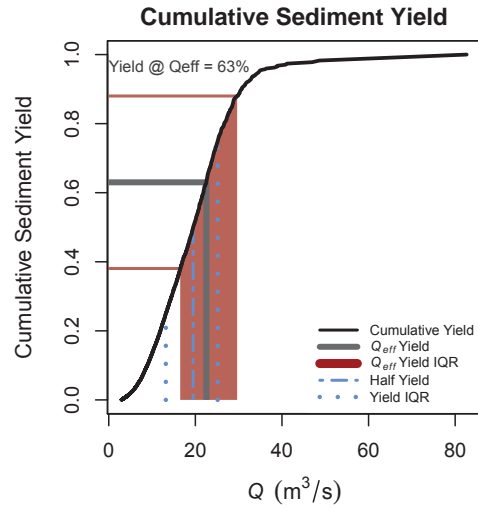
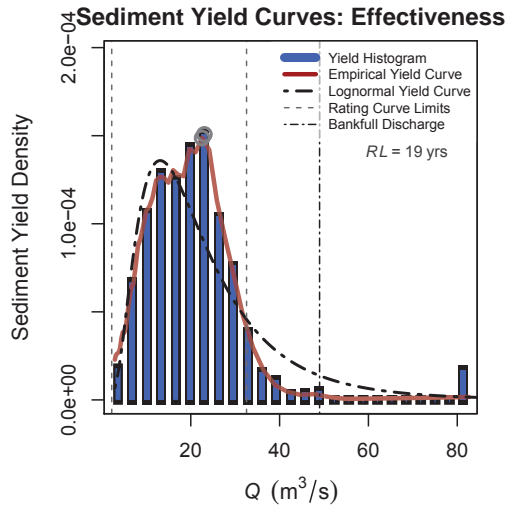
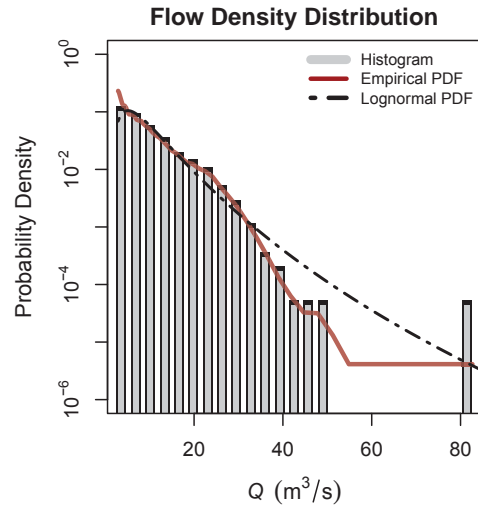
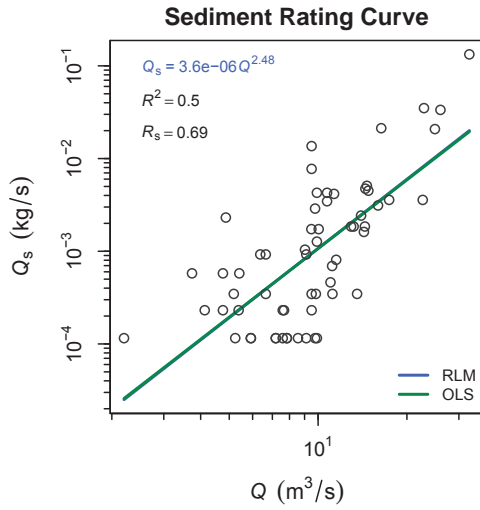
Bed Load Sites

LOCHSA RIVER NR LOWELL, ID: 13337000



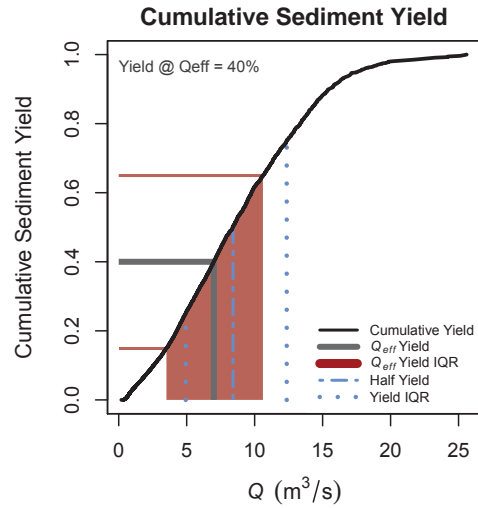
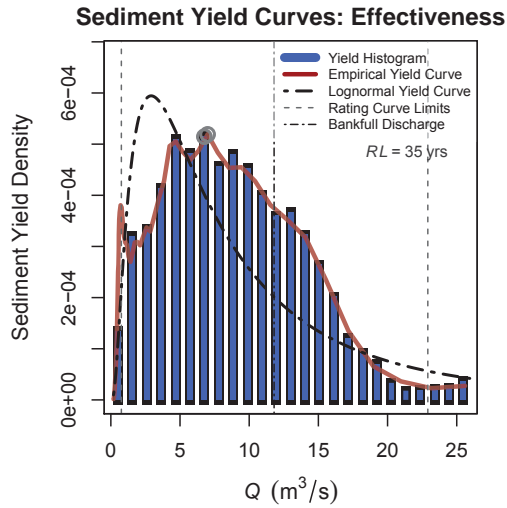
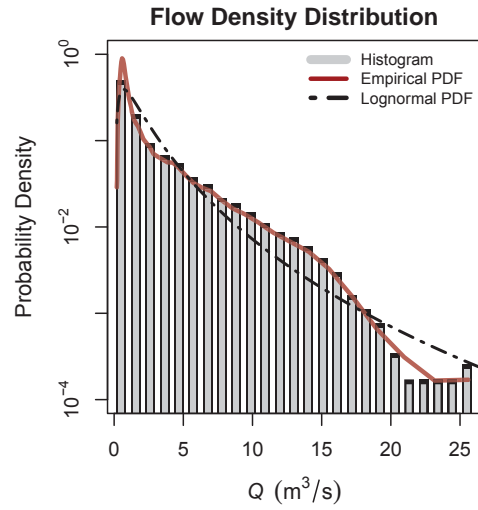
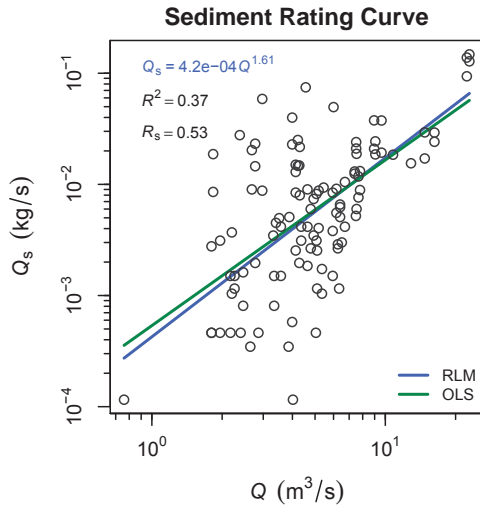
Bed Load Sites

Johns Creek, ID: 1333850A



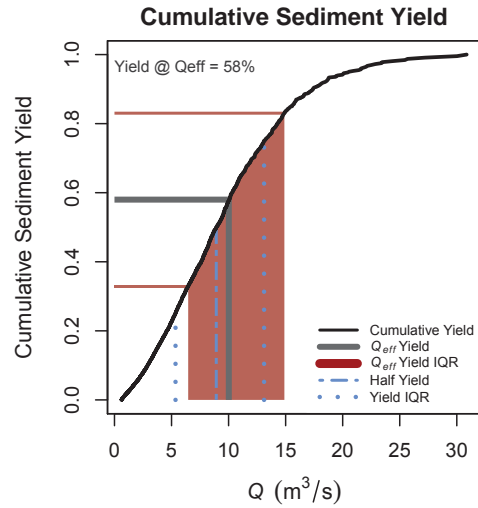
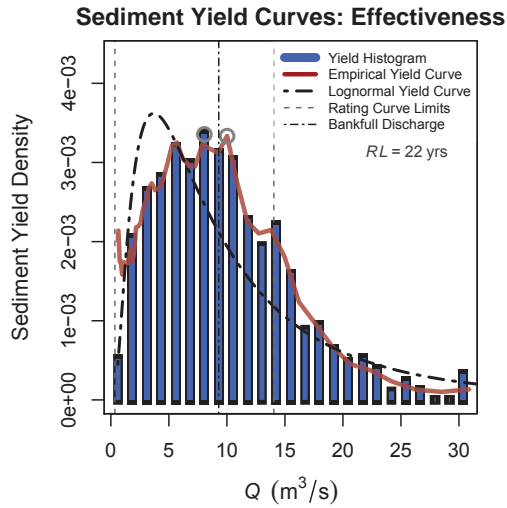
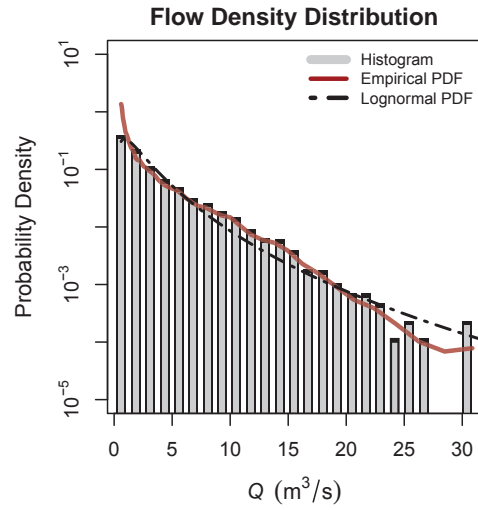
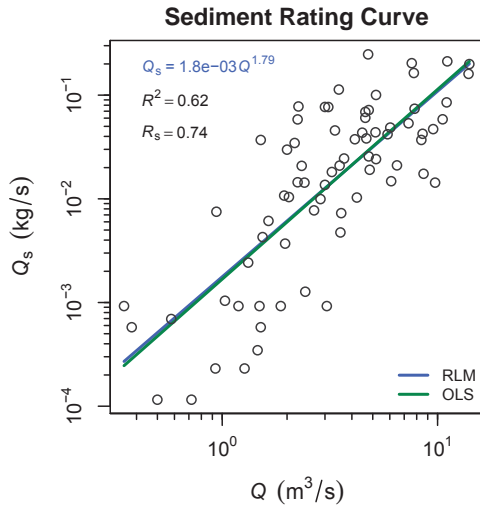
Bed Load Sites

Lolo Creek, ID: 1333850B



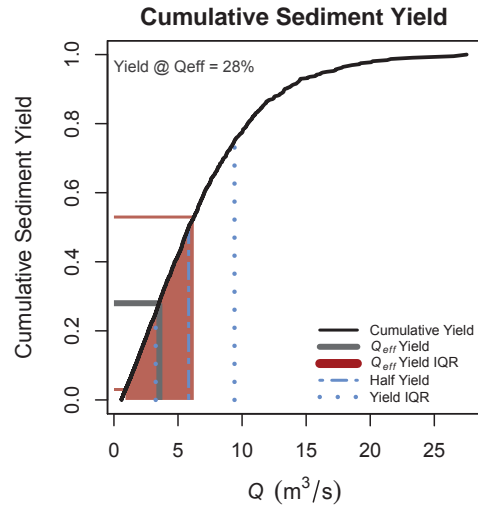
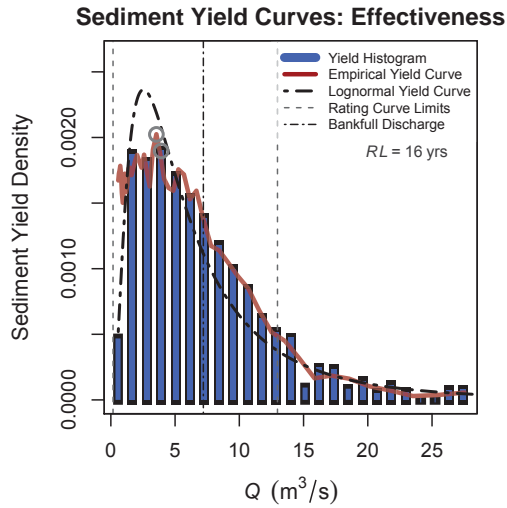
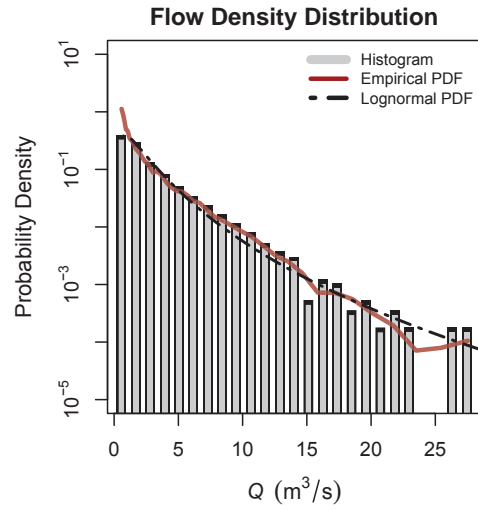
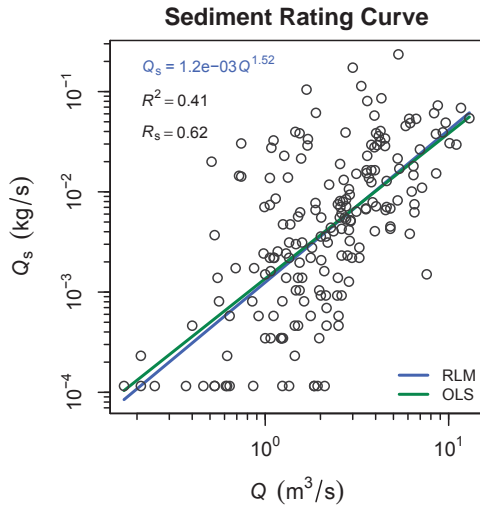
Bed Load Sites

Main Fork Red River, ID: 1333850C



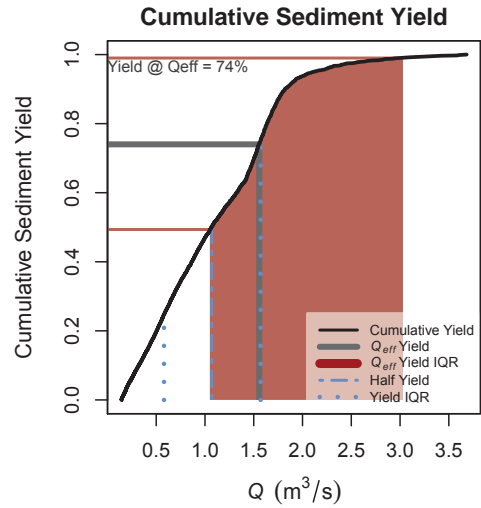
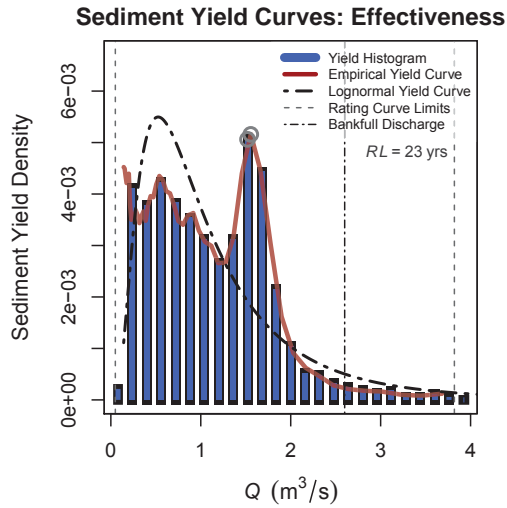
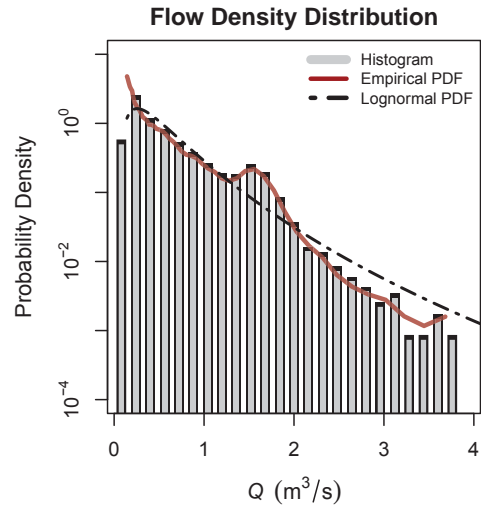
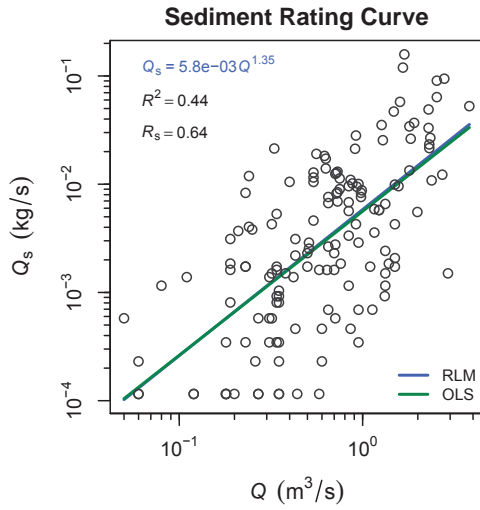
Bed Load Sites

South Fk Red River, ID: 1333850D



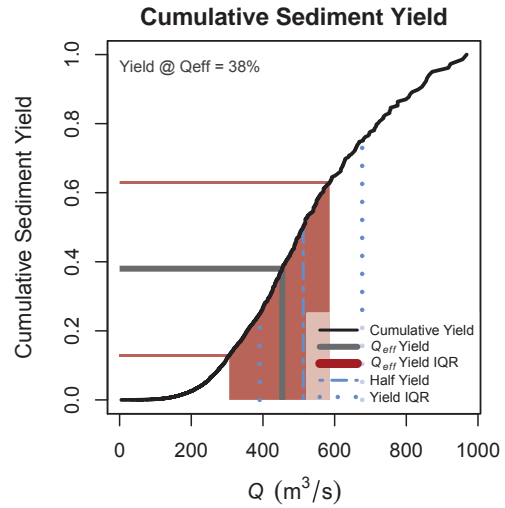
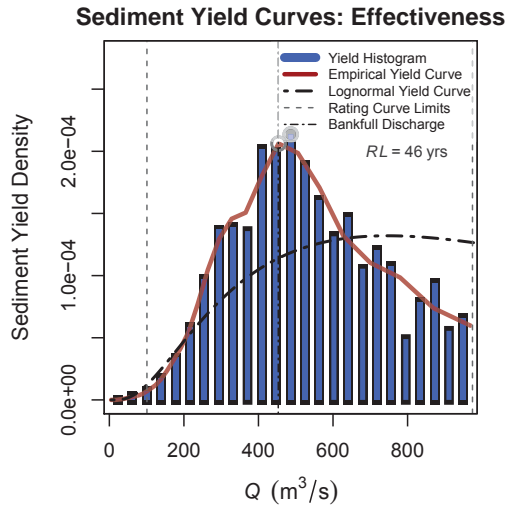
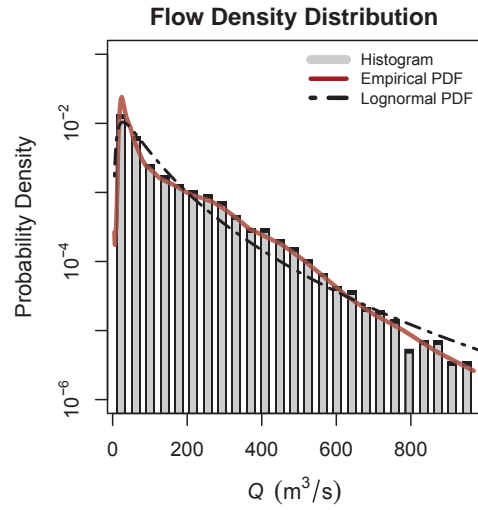
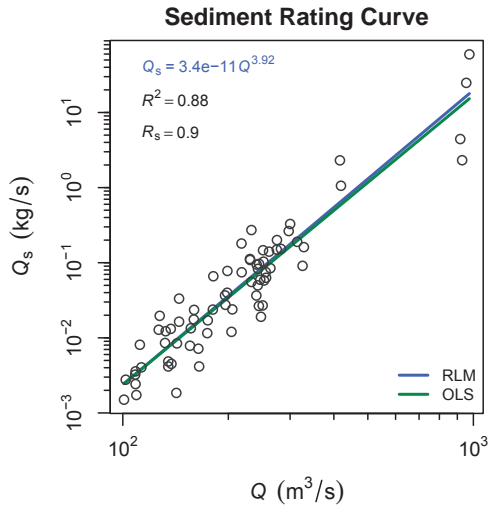
Bed Load Sites

Trapper Creek, ID: 1333850F



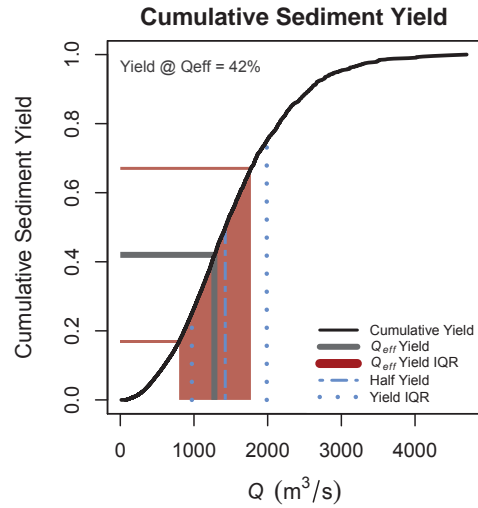
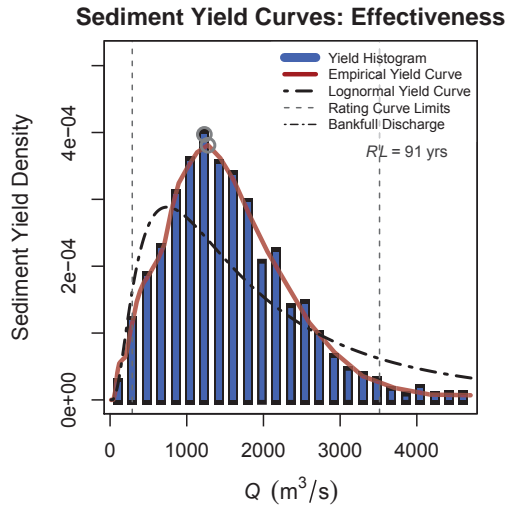
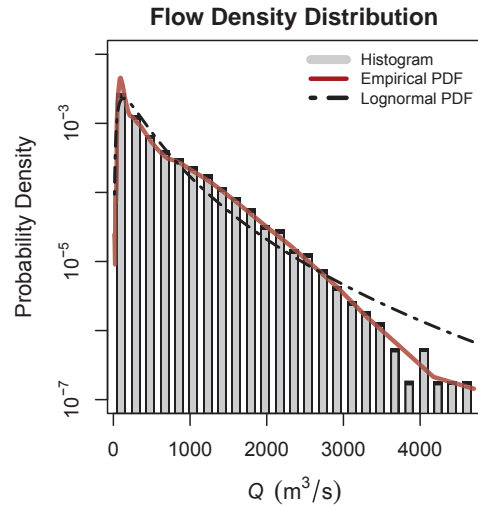
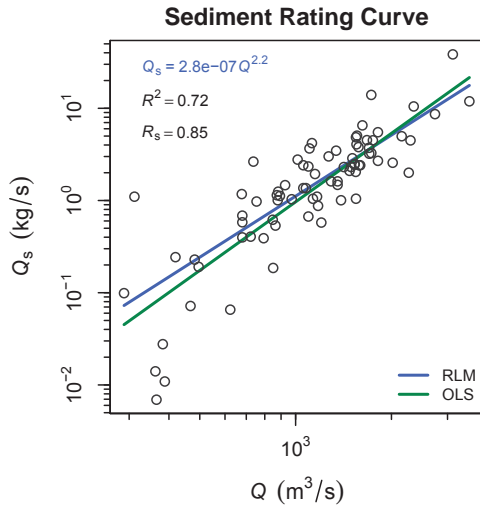
Bed Load Sites

NF CLEARWATER RIVER NR CANYON RANGER STATION, ID: 13340600



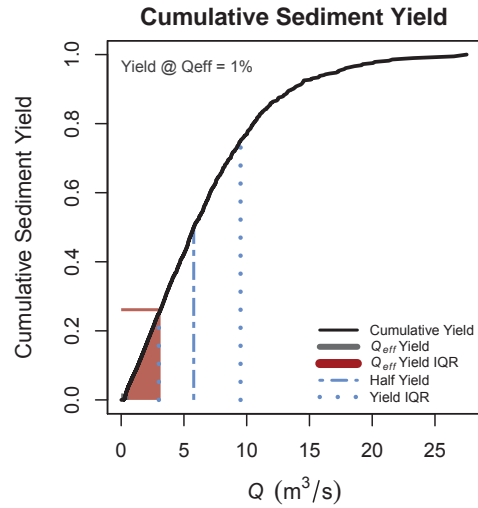
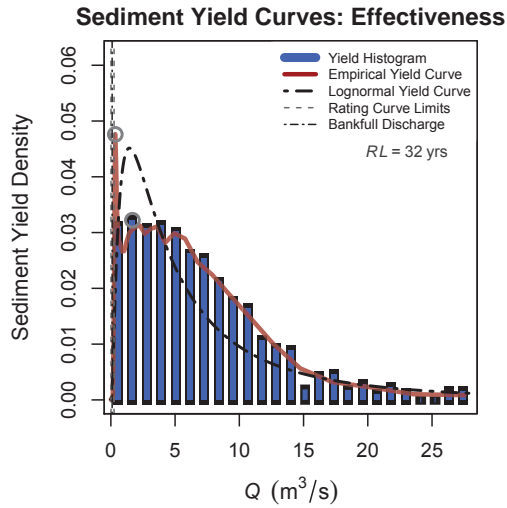
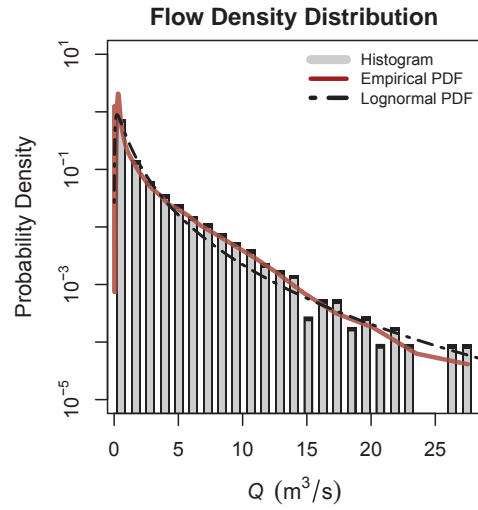
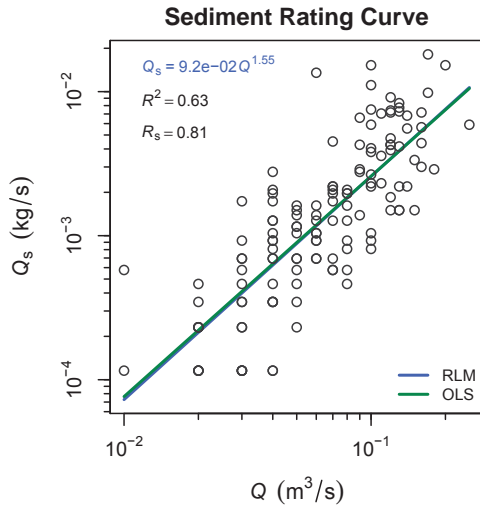
Bed Load Sites

Clearwater River at Spalding, ID: 13342500



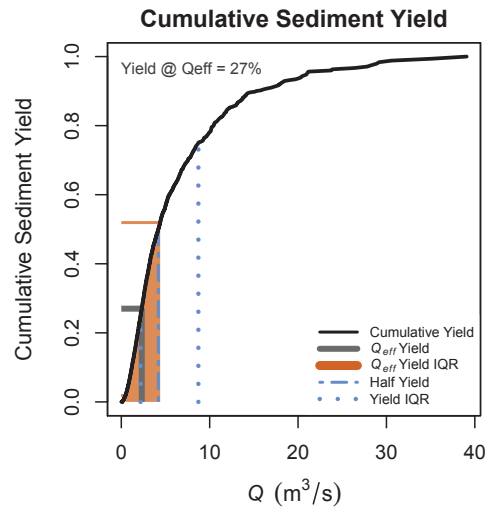
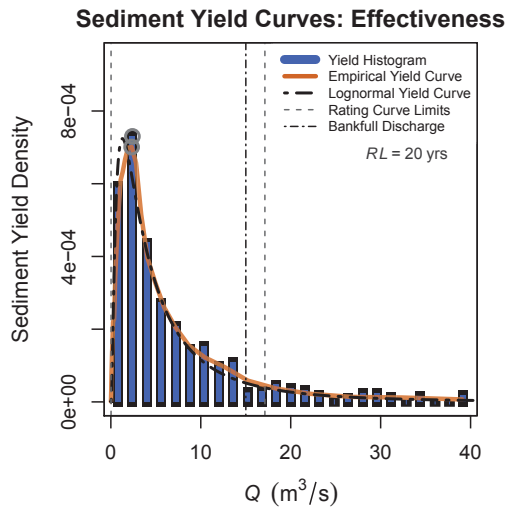
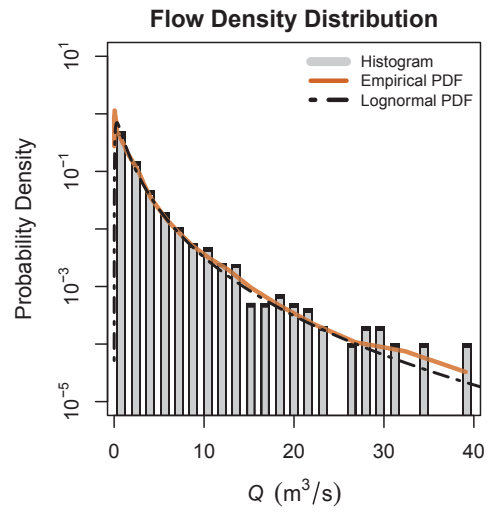
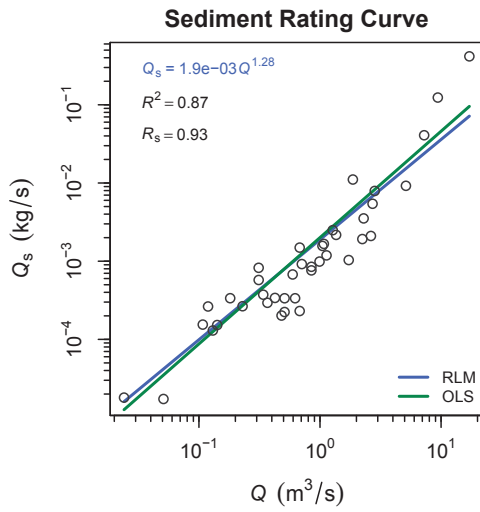
Bed Load Sites

Eggers Creek, ID: 0M332AEC



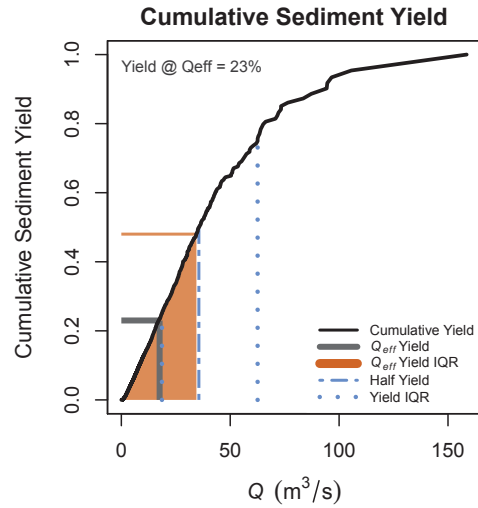
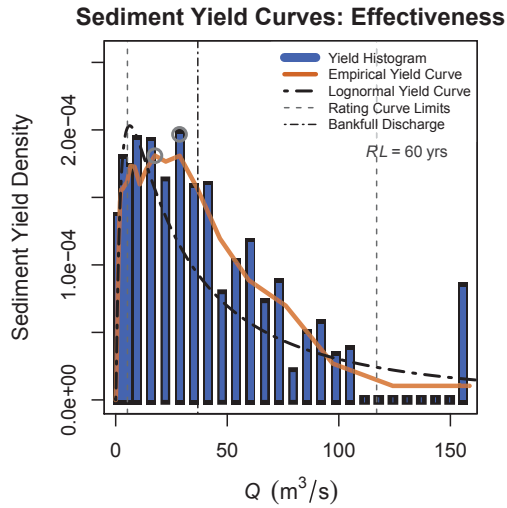
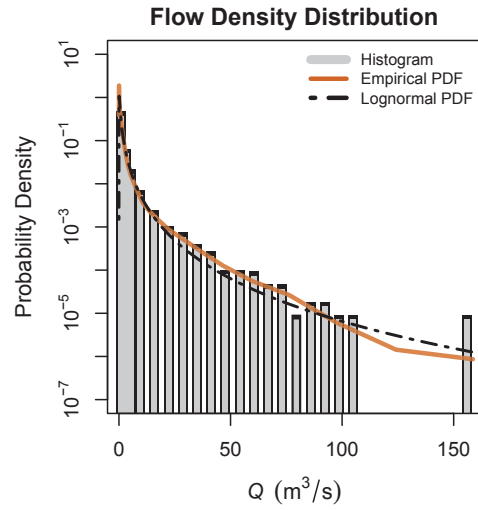
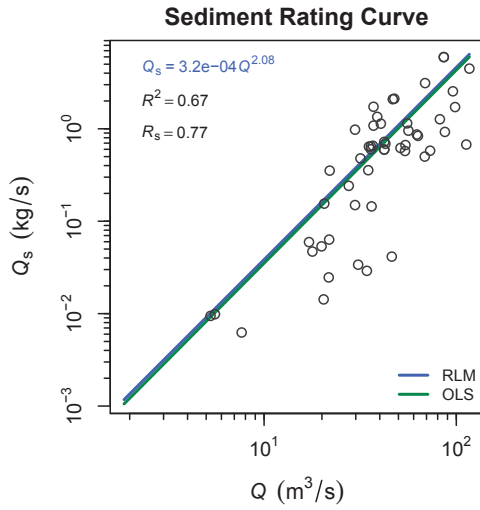
Suspended Load Sites

STILLWATER RIVER NEAR STERLING, MA: 01095220



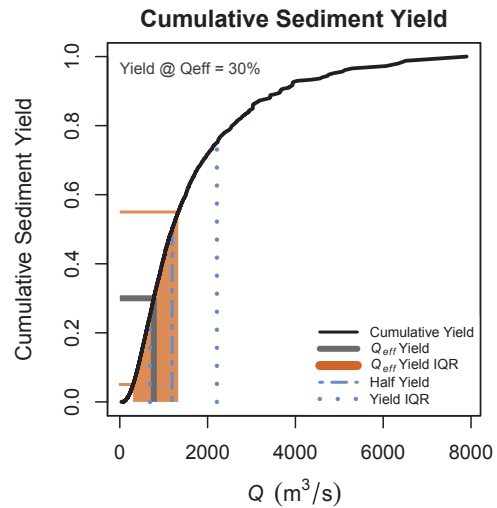
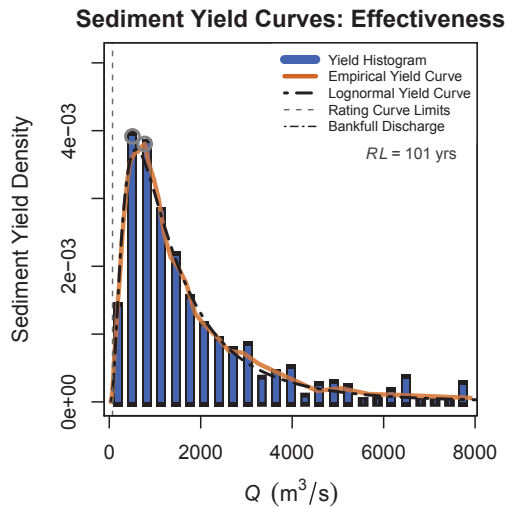
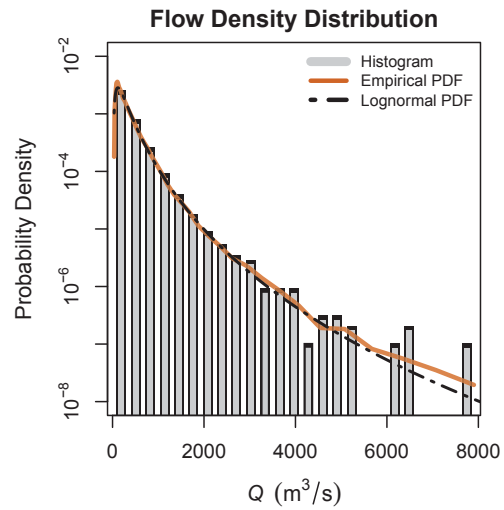
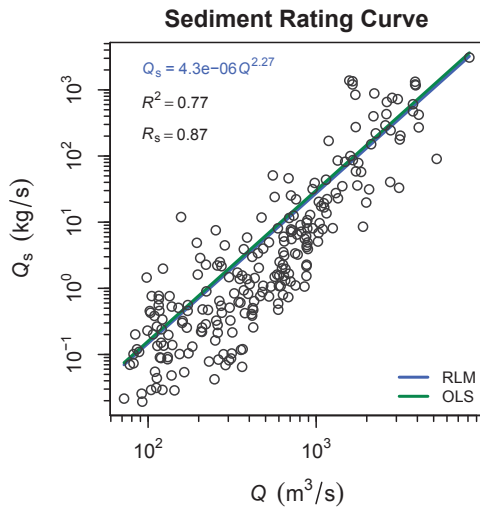
Suspended Load Sites

Stony Brook at Princeton NJ: 01401000



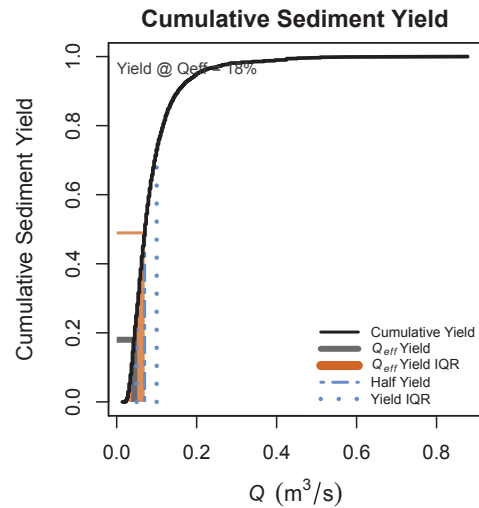
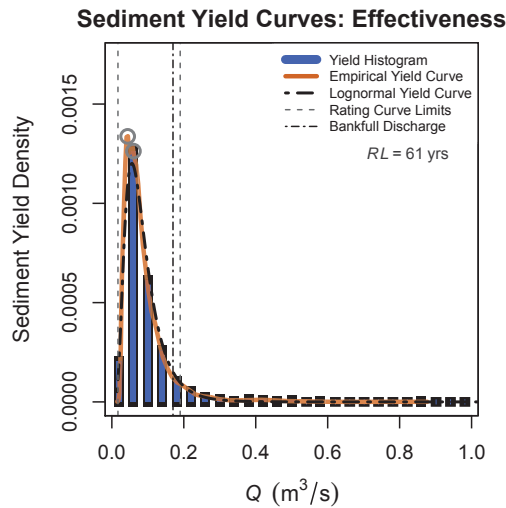
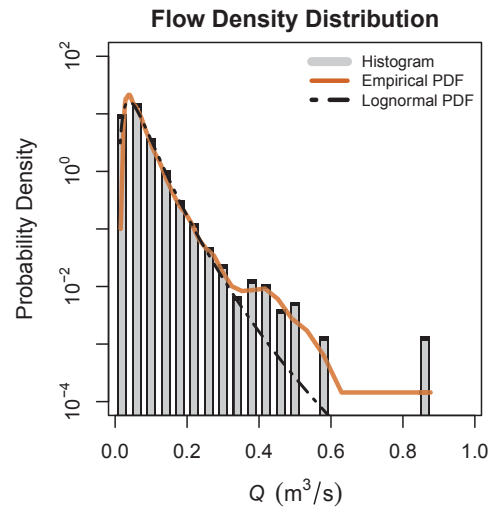
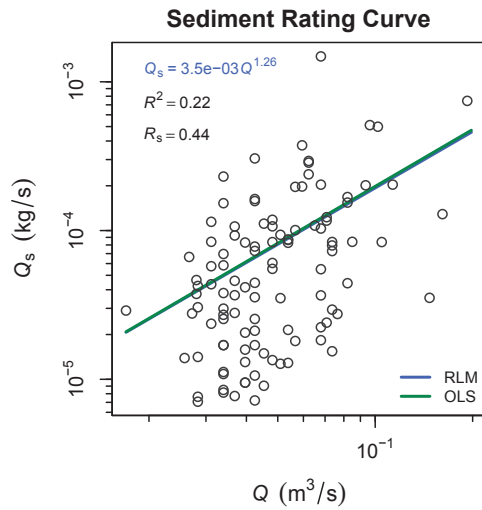
Suspended Load Sites

Delaware River at Trenton NJ: 01463500



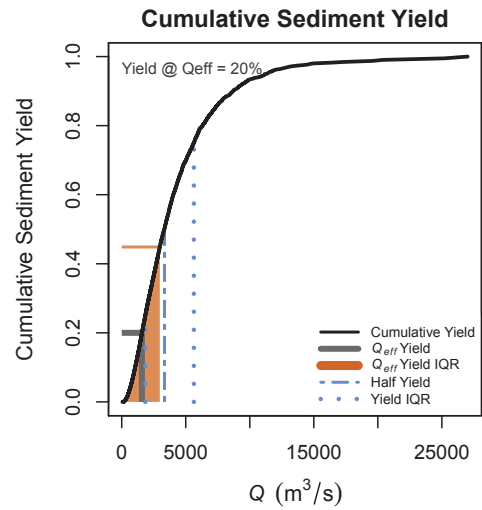
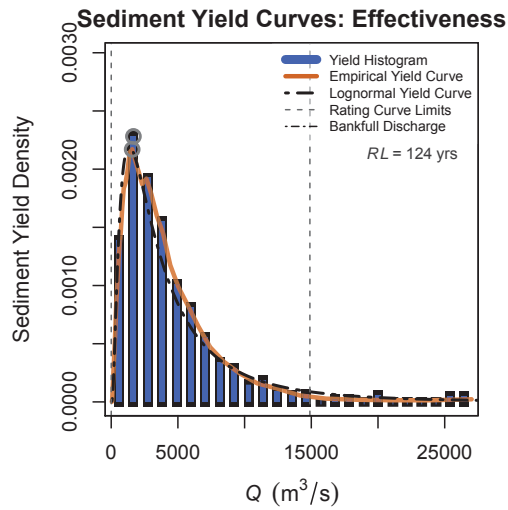
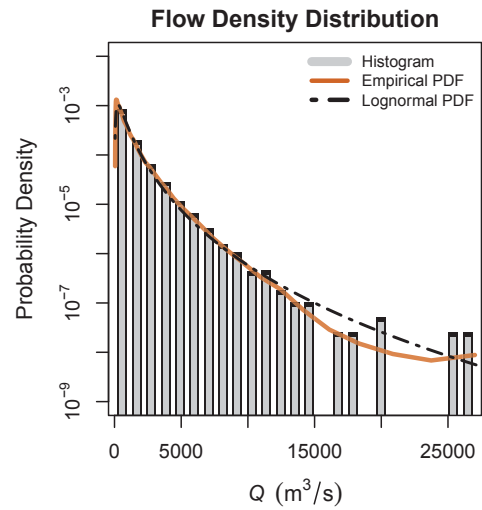
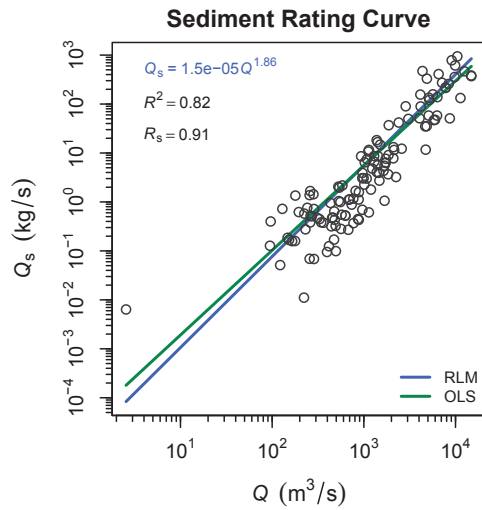
Suspended Load Sites

McDonalds Branch in Byrne State Forest NJ: 01466500



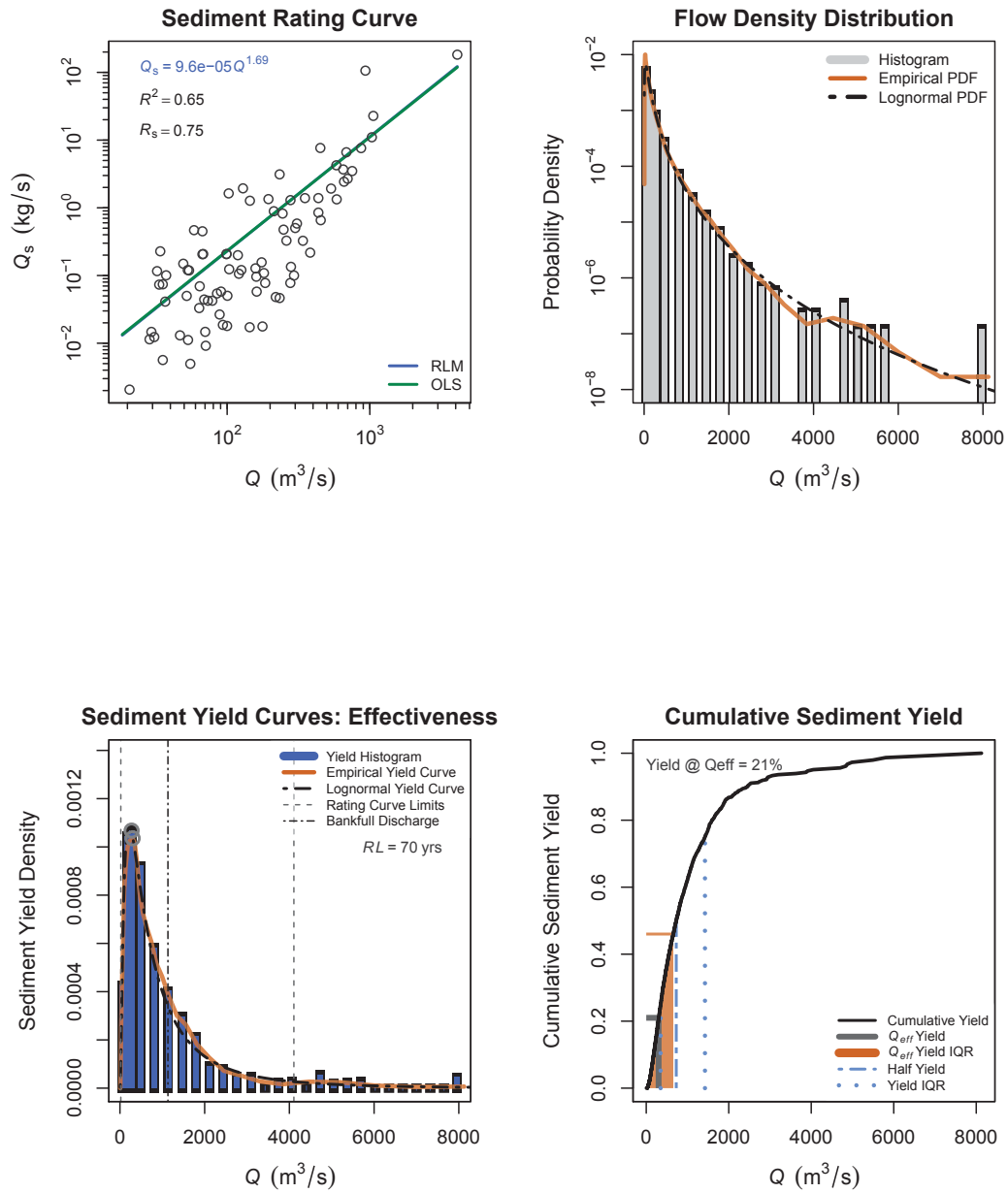
Suspended Load Sites

Susquehanna River at Harrisburg, PA: 01570500



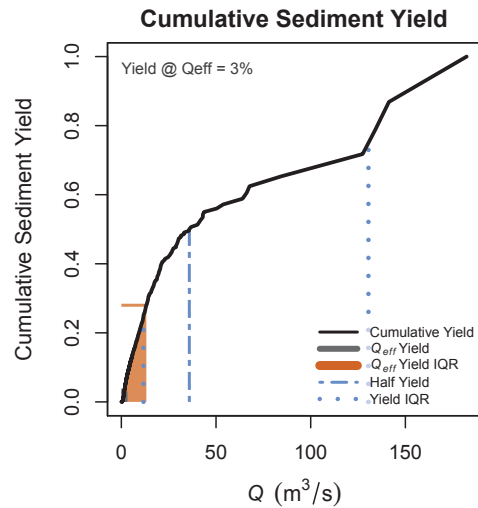
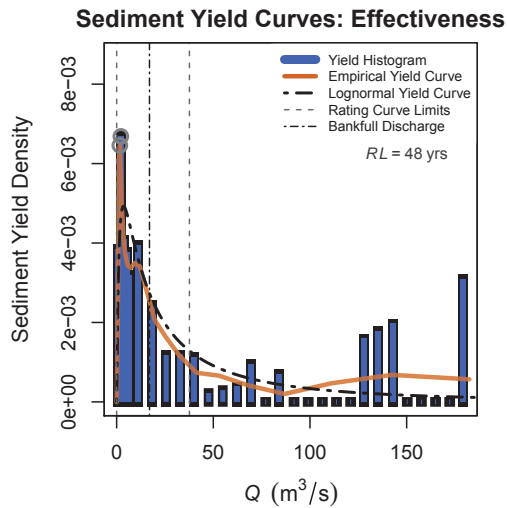
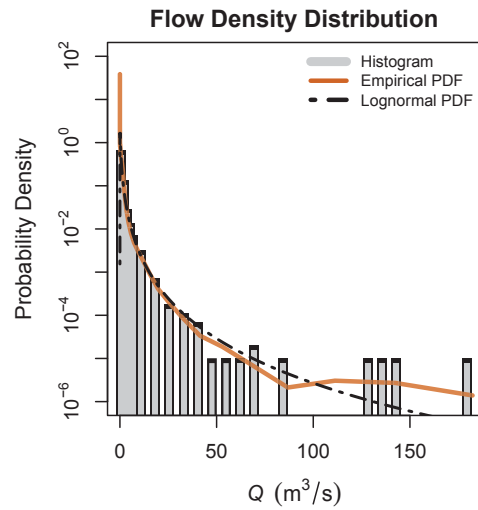
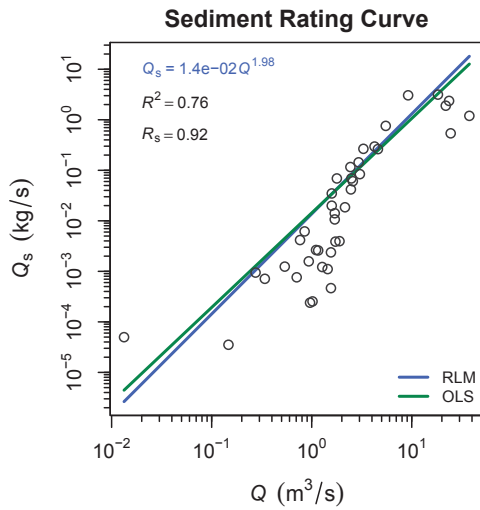
Suspended Load Sites

POTOMAC RIVER AT SHEPHERDSTOWN, WV: 01618000



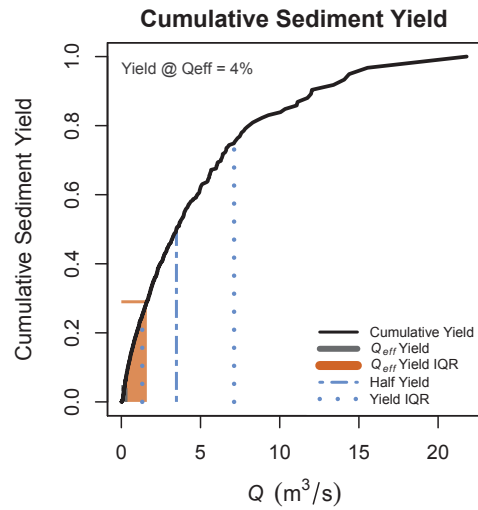
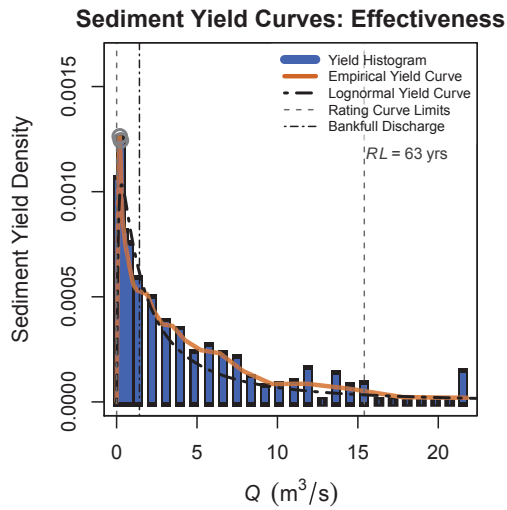
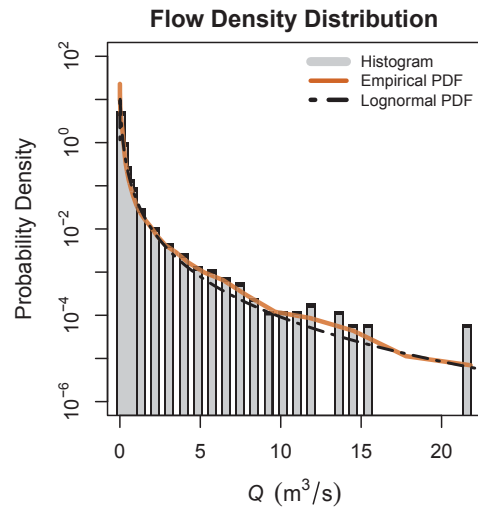
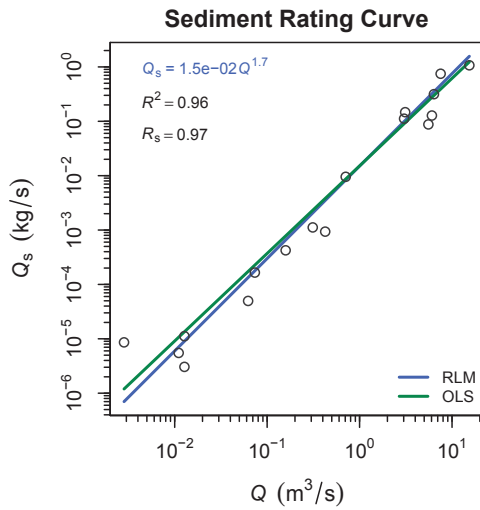
Suspended Load Sites

PISCATAWAY CREEK AT PISCATAWAY, MD: 01653600



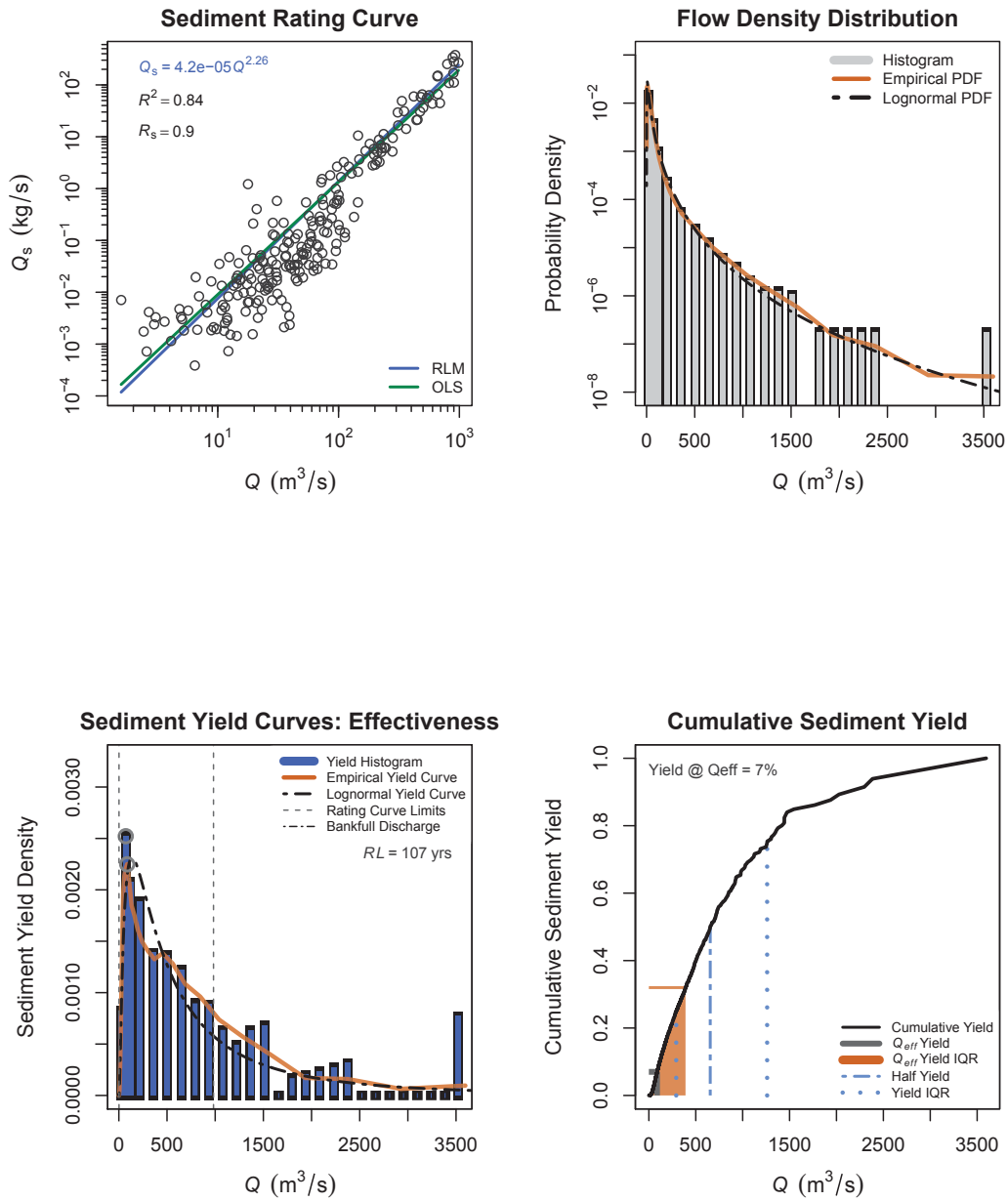
Suspended Load Sites

S F QUANTICO CREEK NEAR INDEPENDENT HILL, VA: 01658500



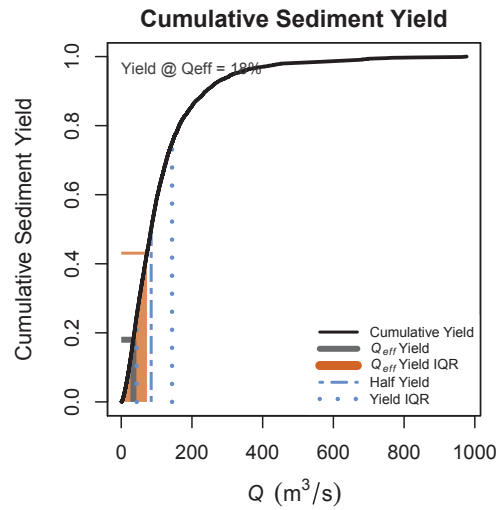
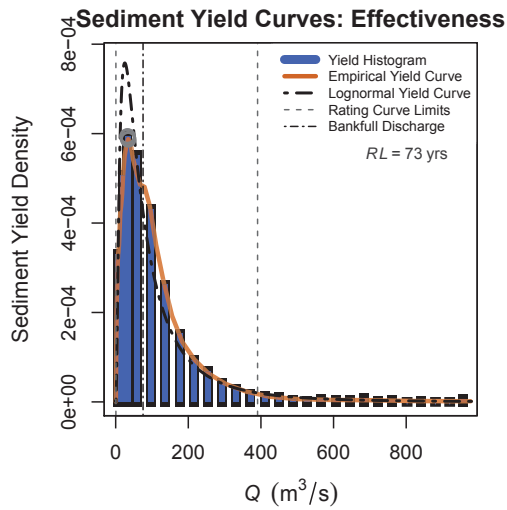
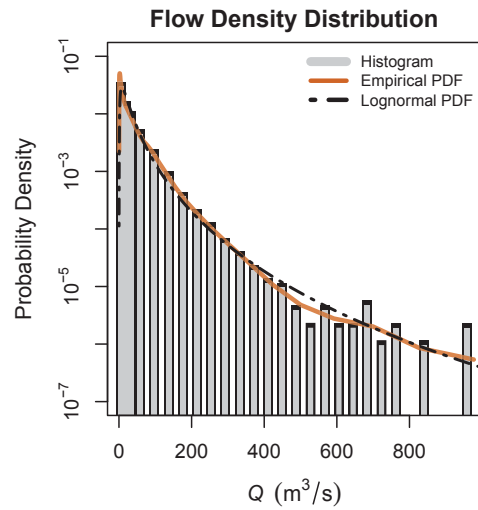
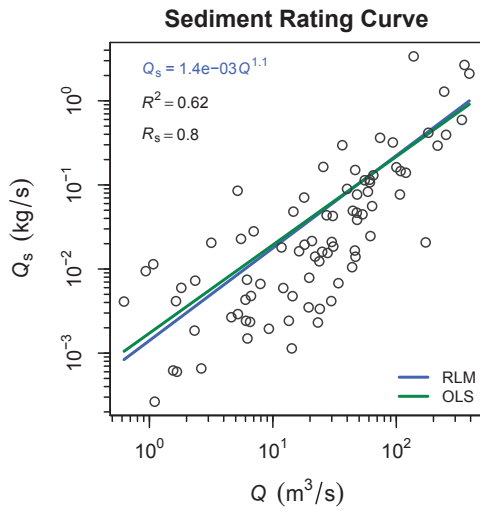
Suspended Load Sites

RAPPAHANNOCK RIVER NEAR FREDERICKSBURG, VA: 01668000



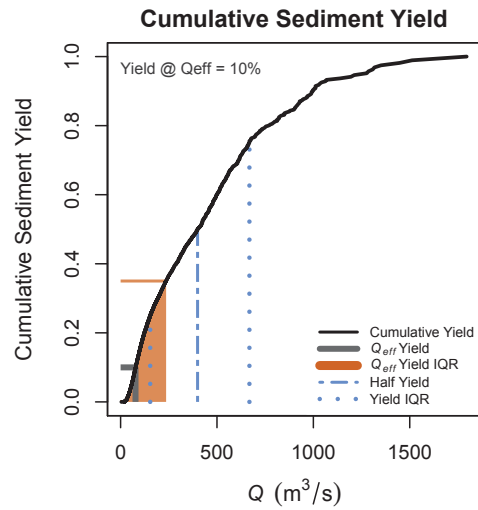
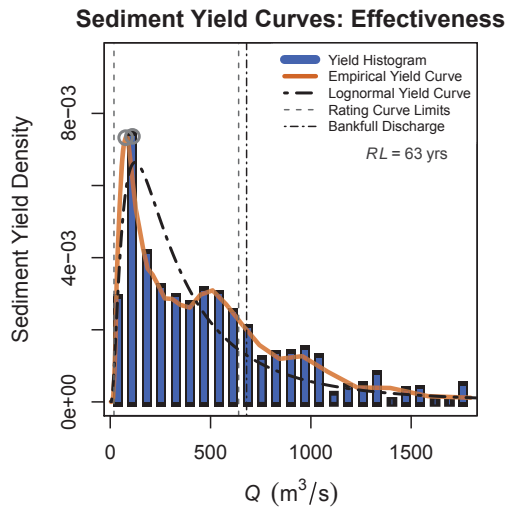
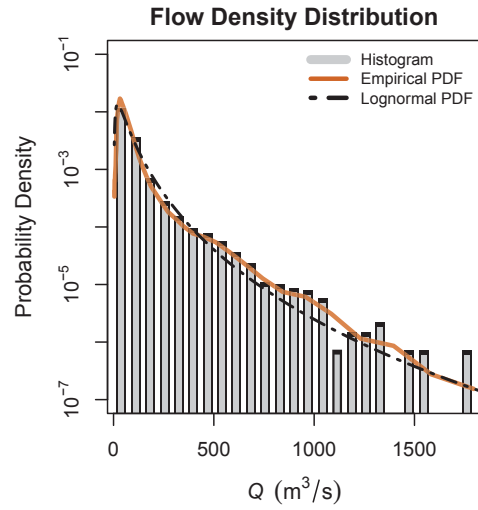
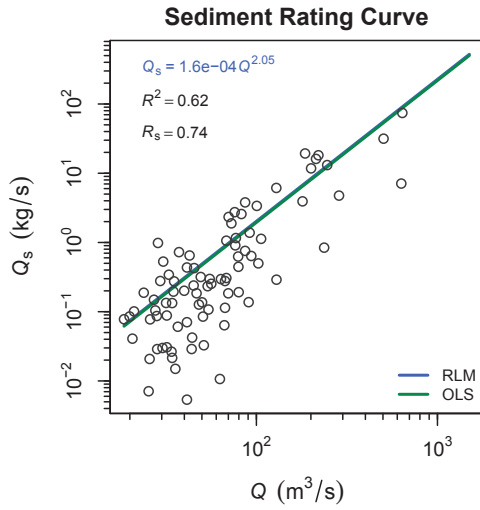
Suspended Load Sites

NOTTOWAY RIVER NEAR SEBRELL, VA: 02047000



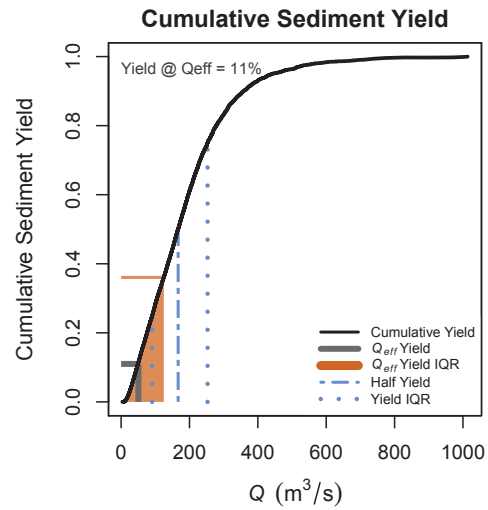
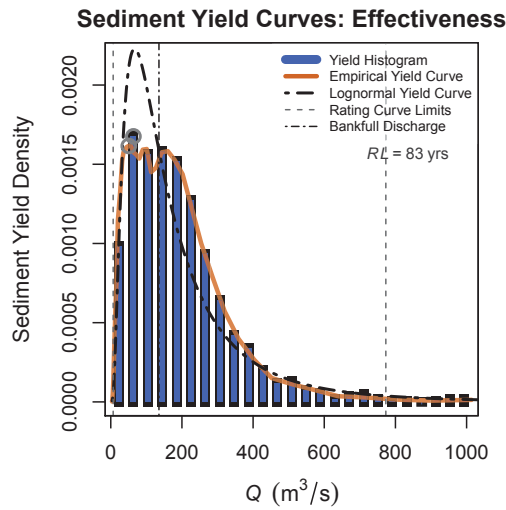
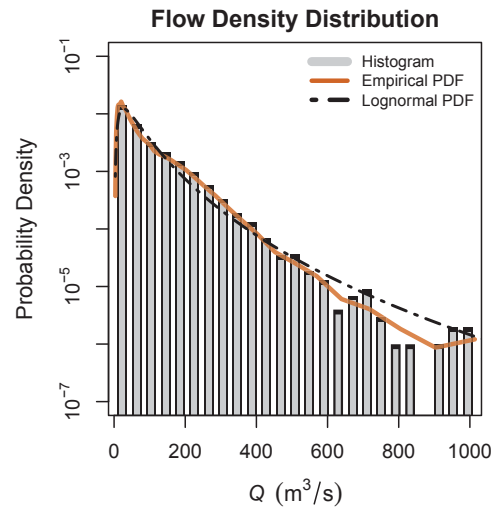
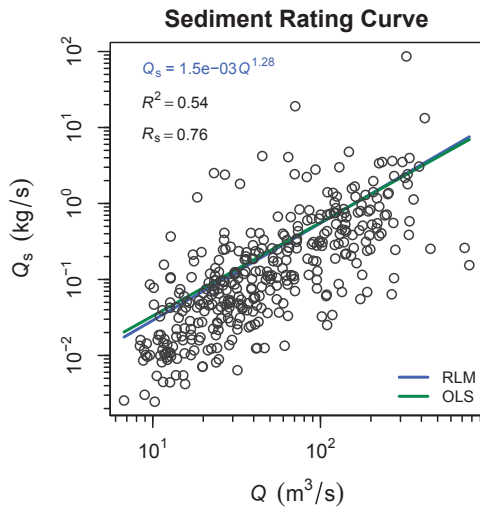
Suspended Load Sites

DAN RIVER AT PACES, VA: 02075500



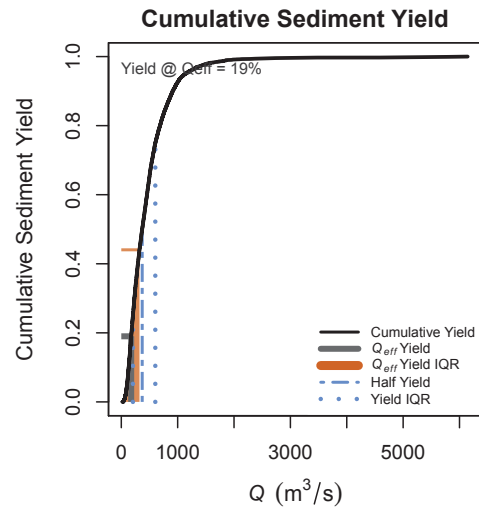
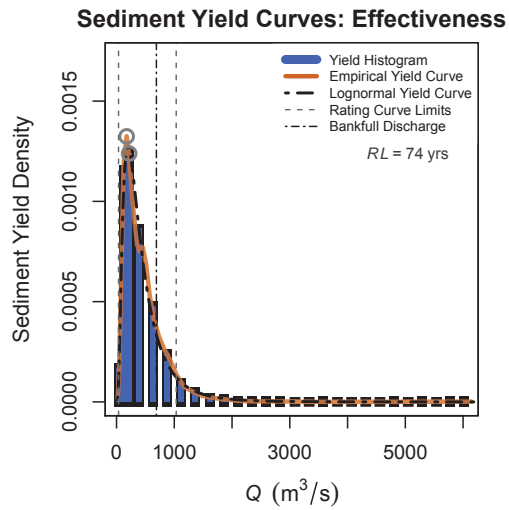
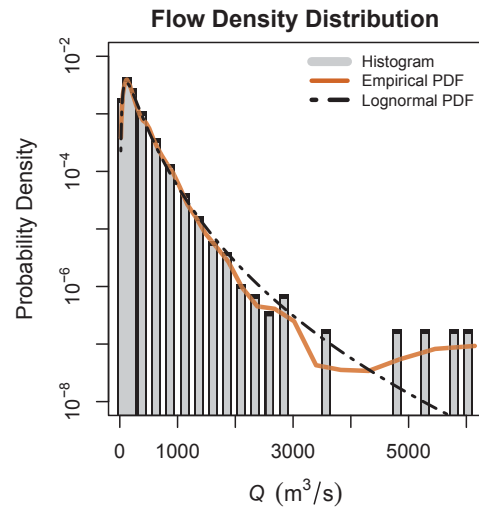
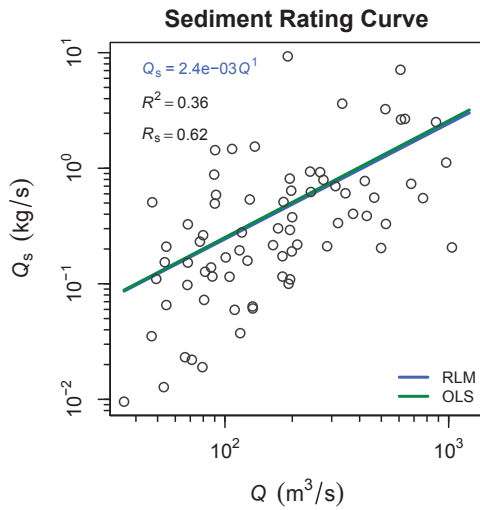
Suspended Load Sites

NEUSE RIVER AT KINSTON, NC: 02089500



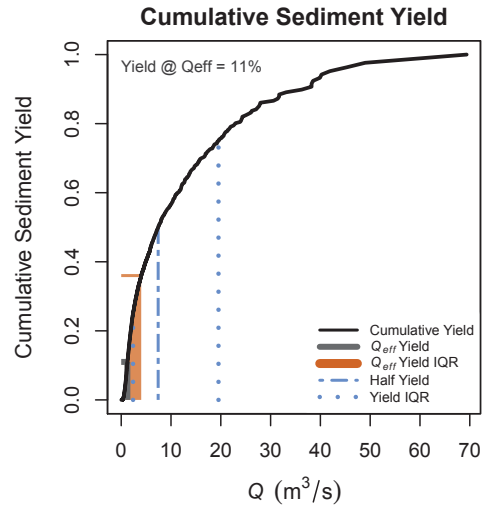
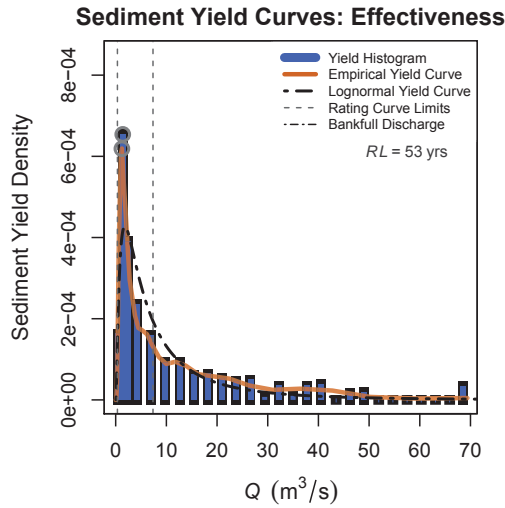
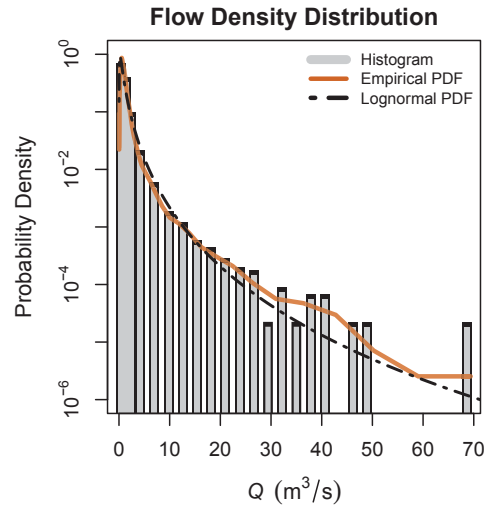
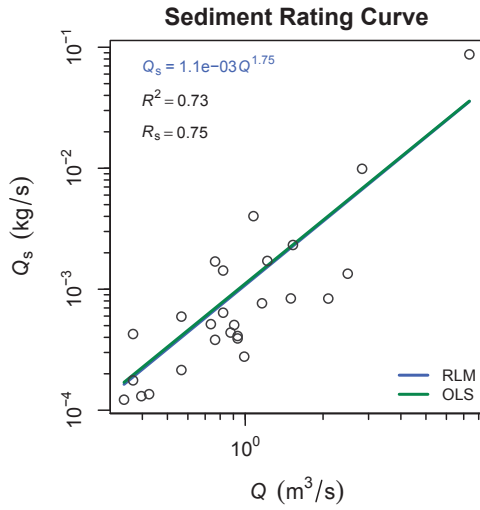
Suspended Load Sites

PEE DEE RIVER AT PEEDEE, SC: 02131000



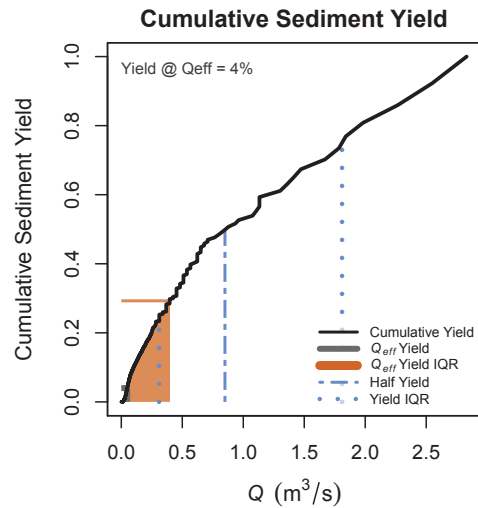
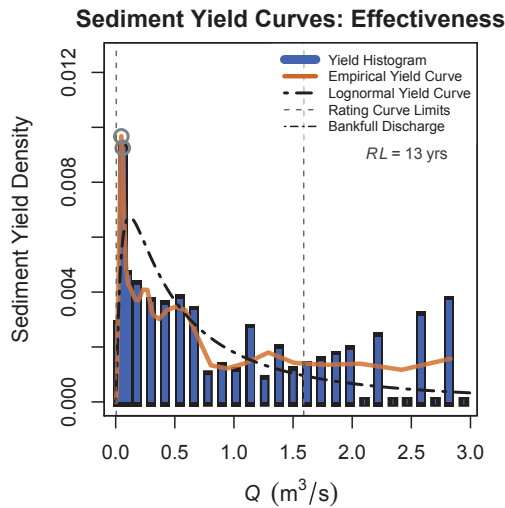
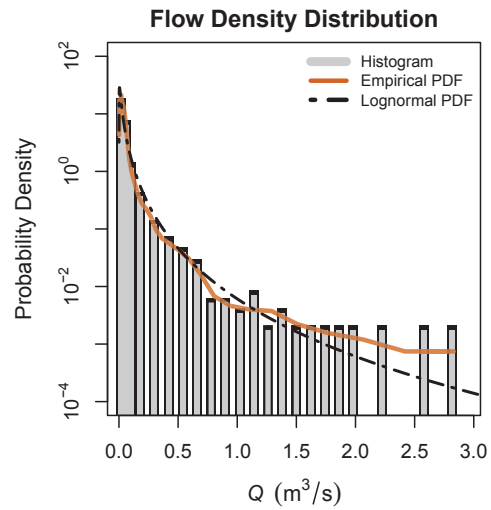
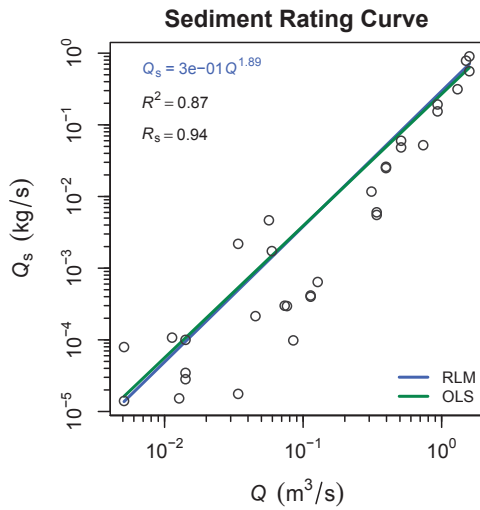
Suspended Load Sites

JACOB FORK AT RAMSEY, NC: 02143040



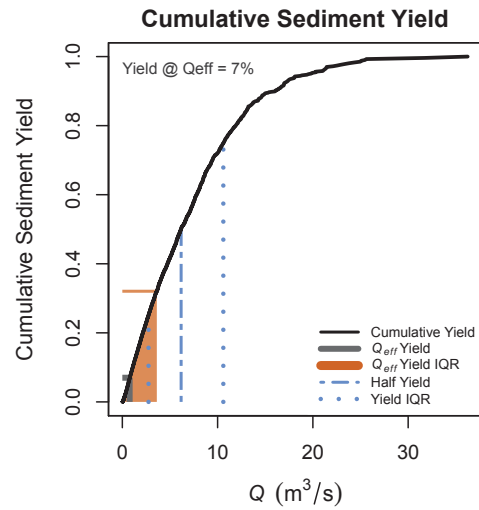
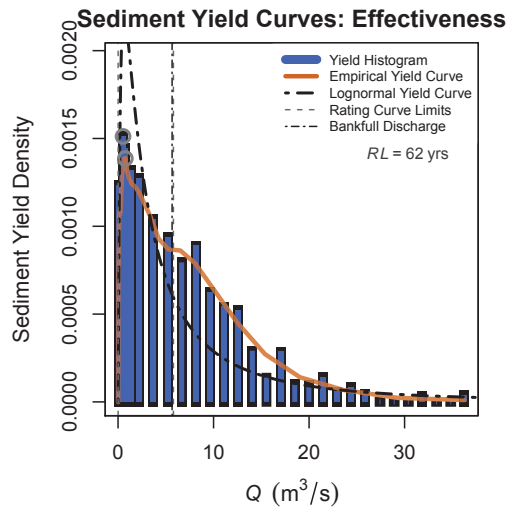
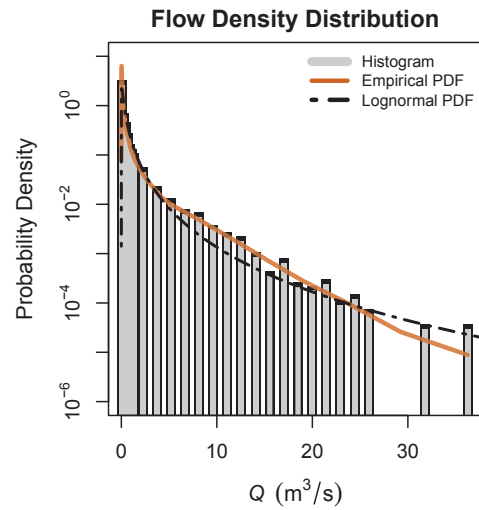
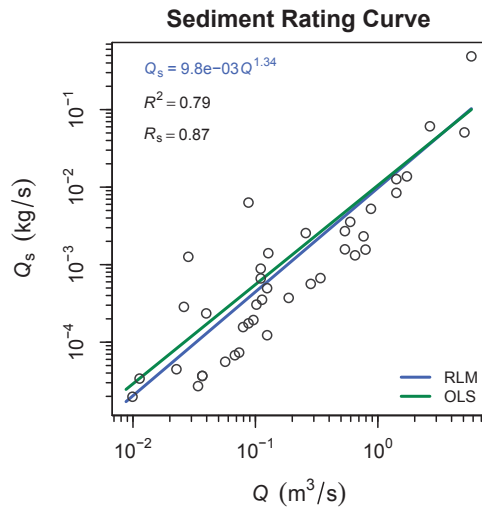
Suspended Load Sites

WHEELER CREEK AT BILL CHEEK ROAD, NEAR AUBURN, GA: 02217274



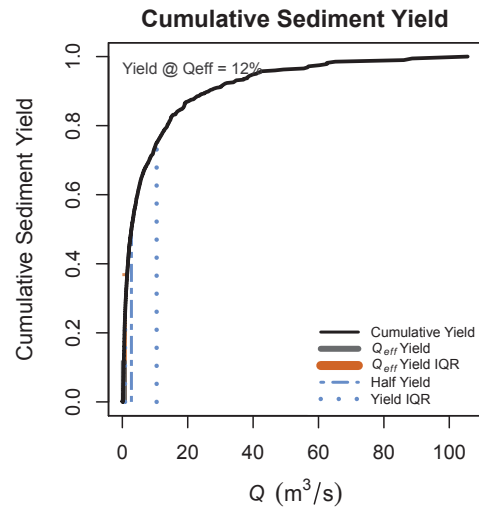
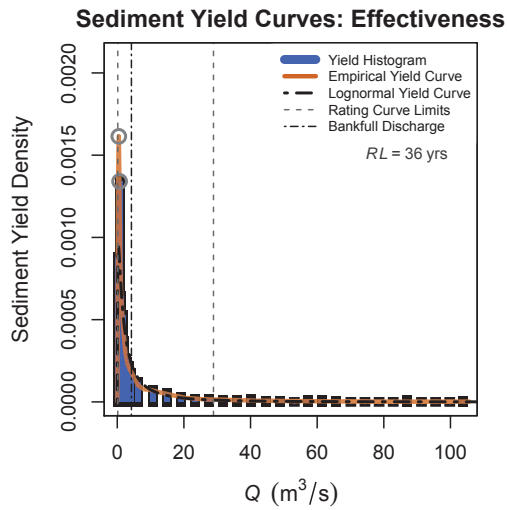
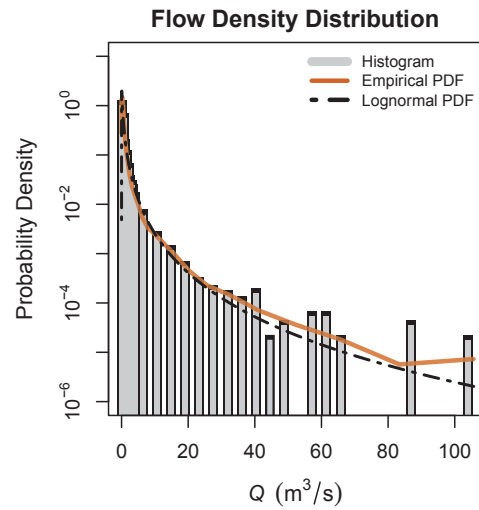
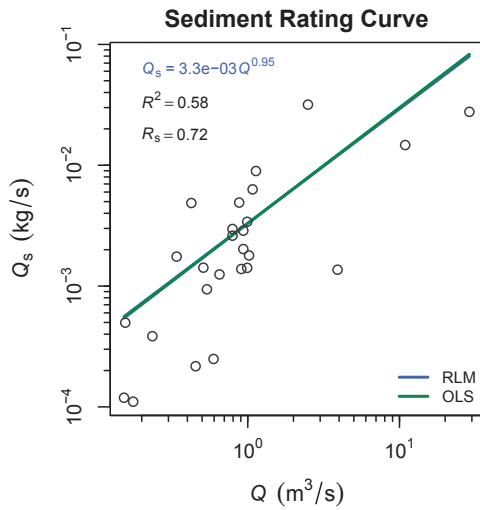
Suspended Load Sites

SPRUCE CREEK NEAR SAMSULA, FL: 02248000



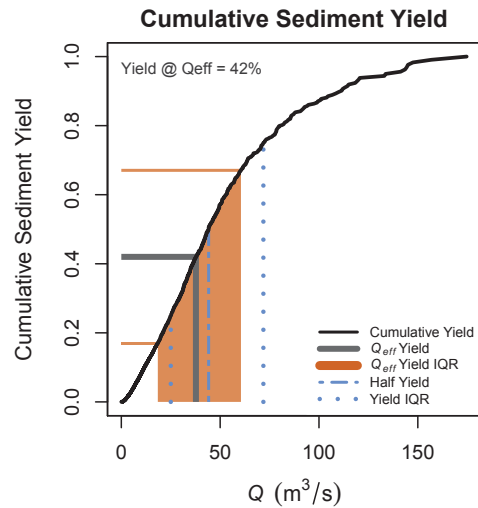
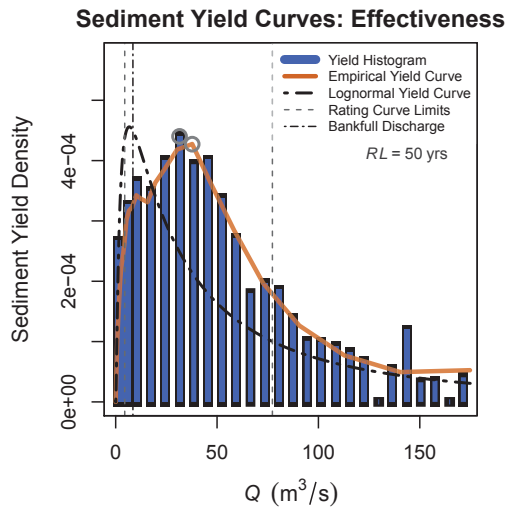
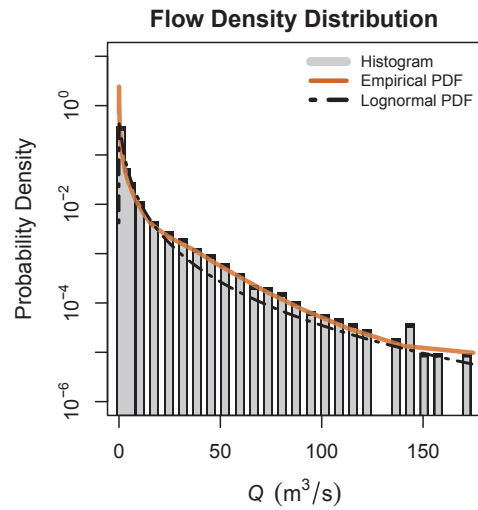
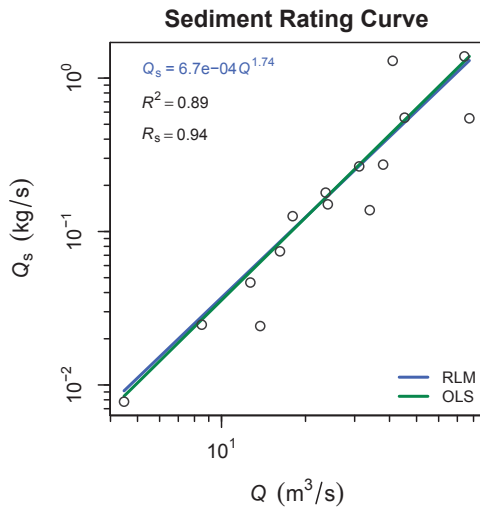
Suspended Load Sites

BULLFROG CREEK NEAR WIMAUMA FL: 02300700



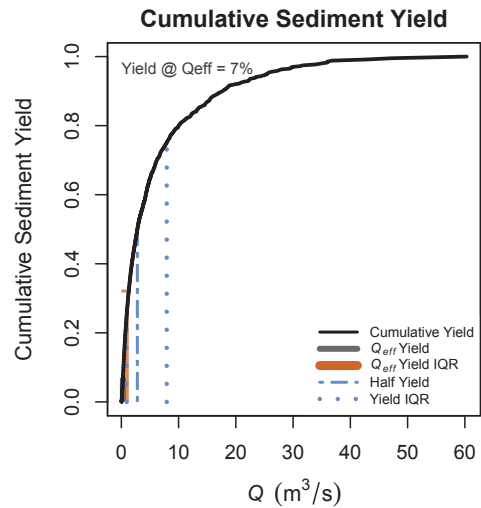
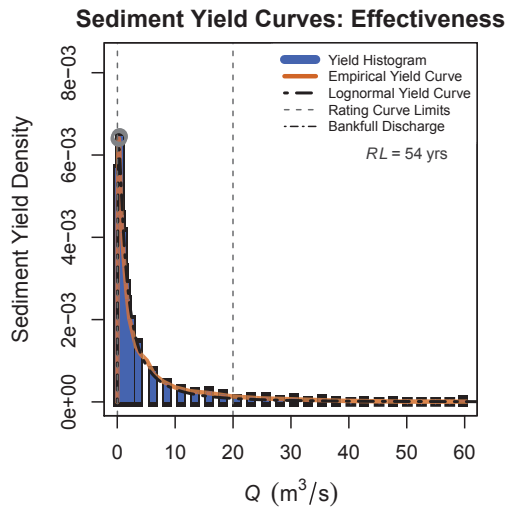
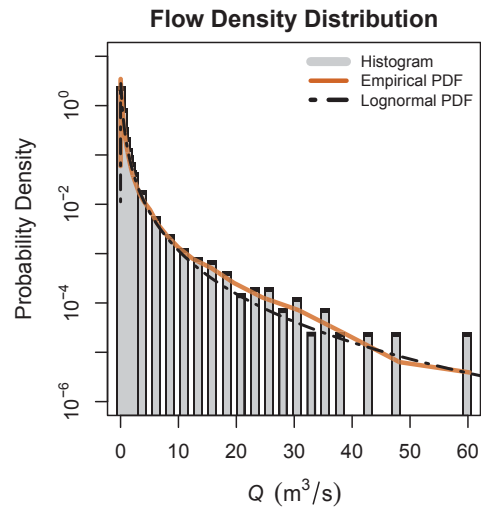
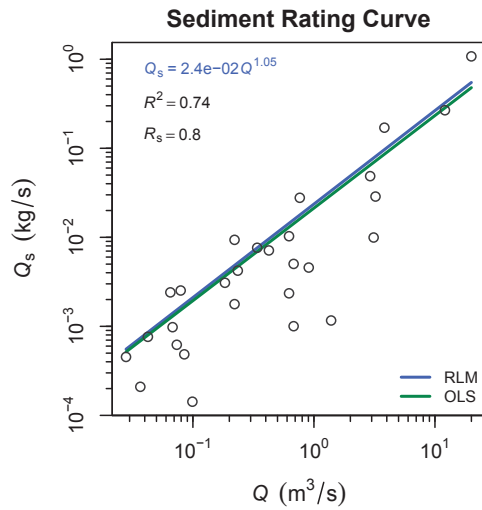
Suspended Load Sites

Loramie Creek near Newport OH: 03261950



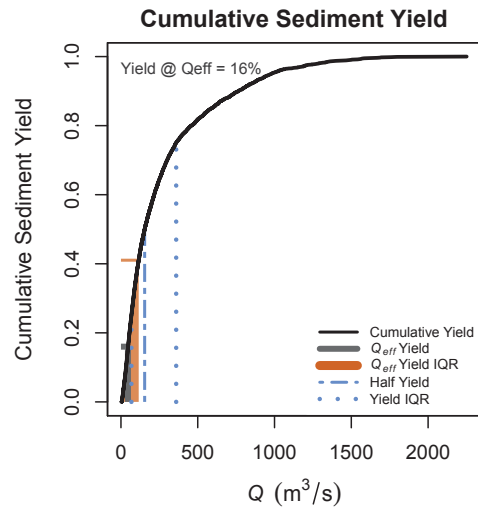
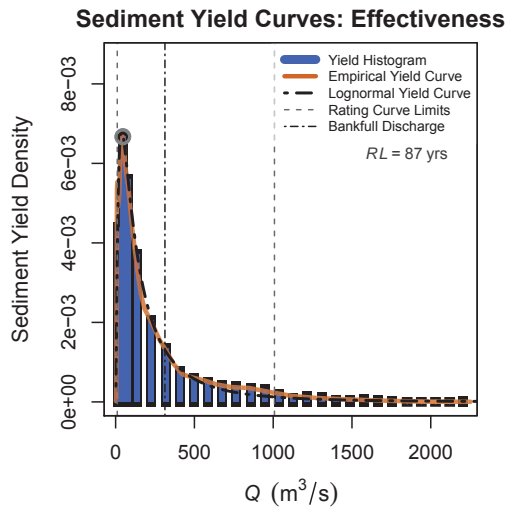
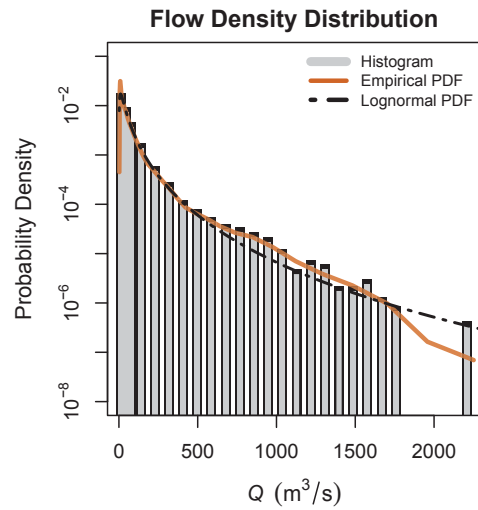
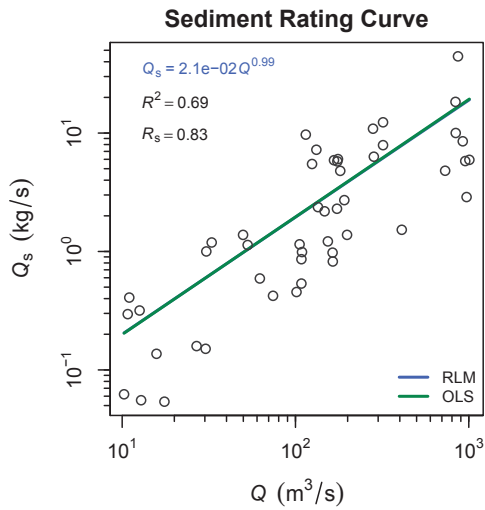
Suspended Load Sites

LITTLE EAGLE CREEK AT SPEEDWAY, IN: 03353600



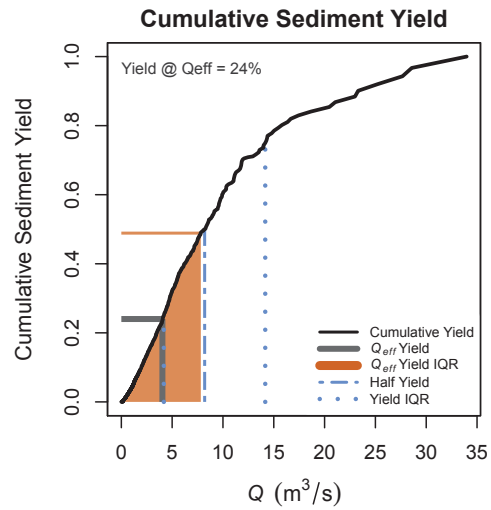
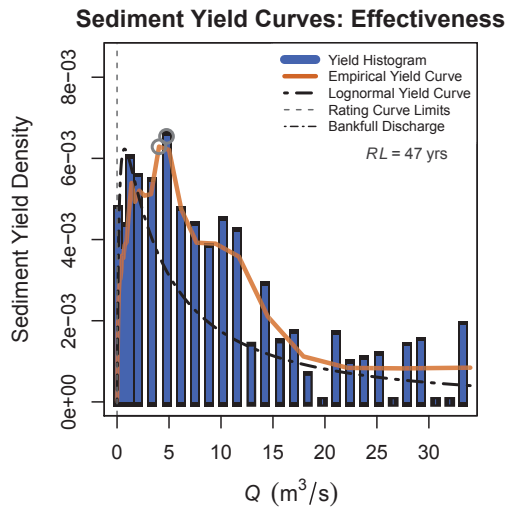
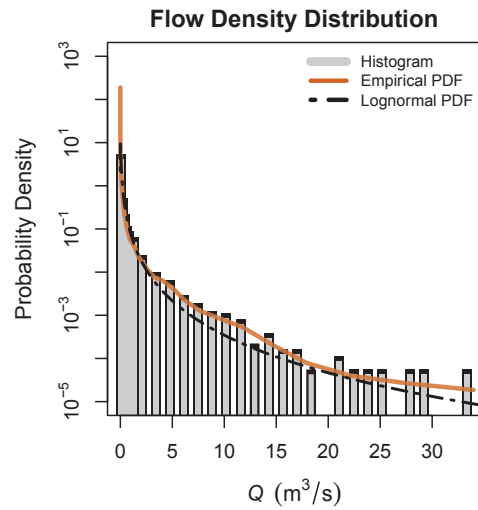
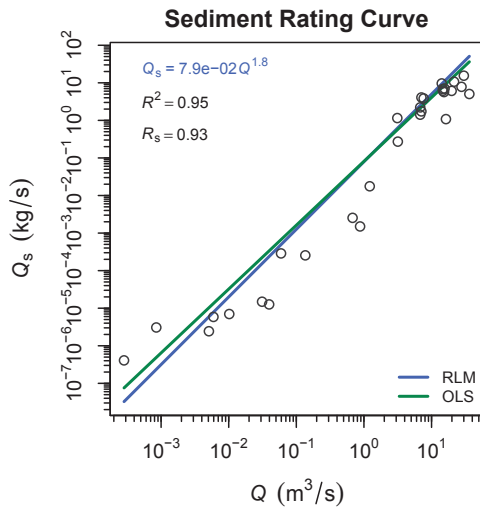
Suspended Load Sites

EAST FORK WHITE RIVER AT SEYMOUR, IN: 03365500



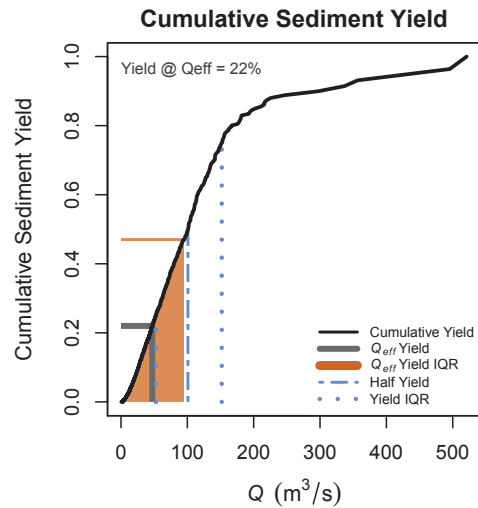
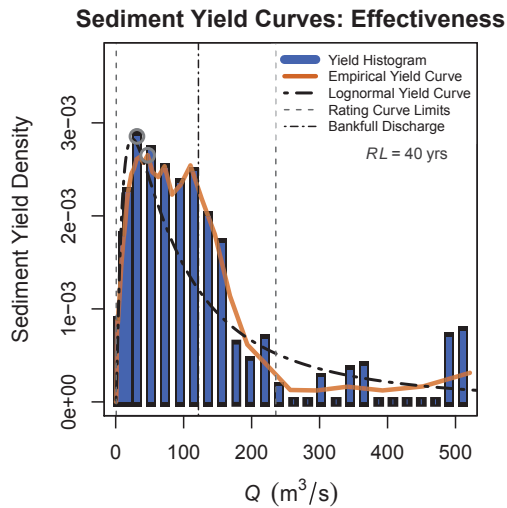
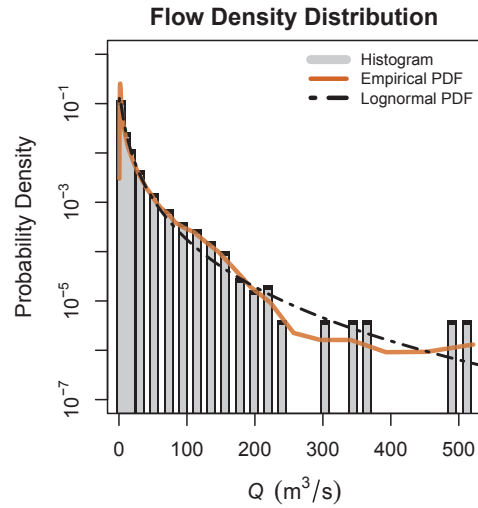
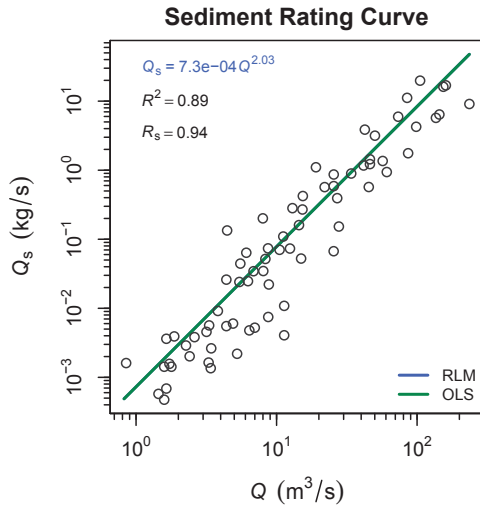
Suspended Load Sites

BRUSHY CREEK NEAR HARCO, IL: 03382170



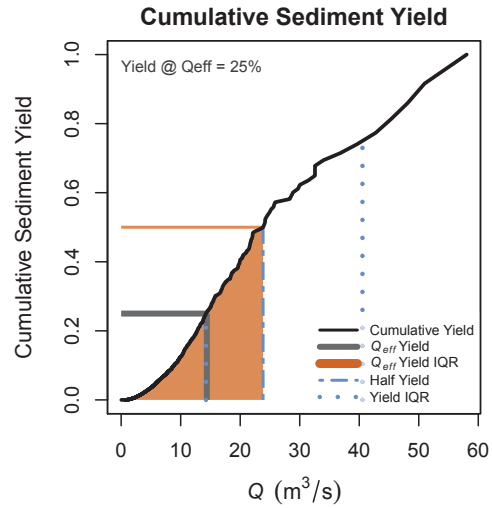
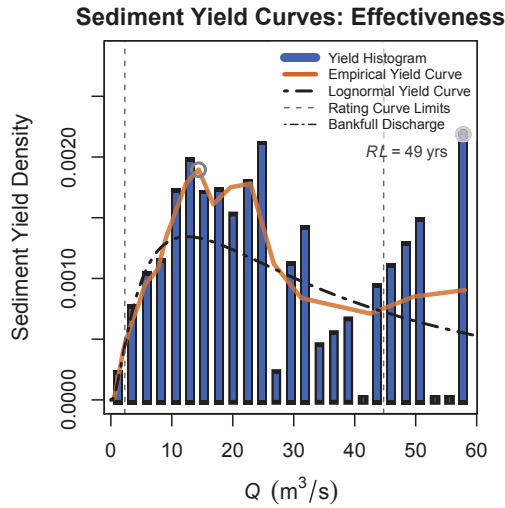
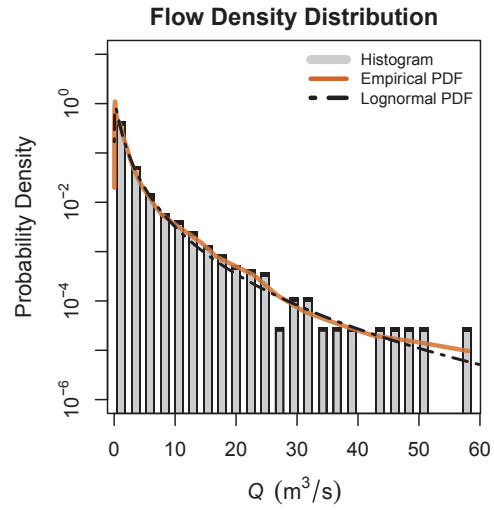
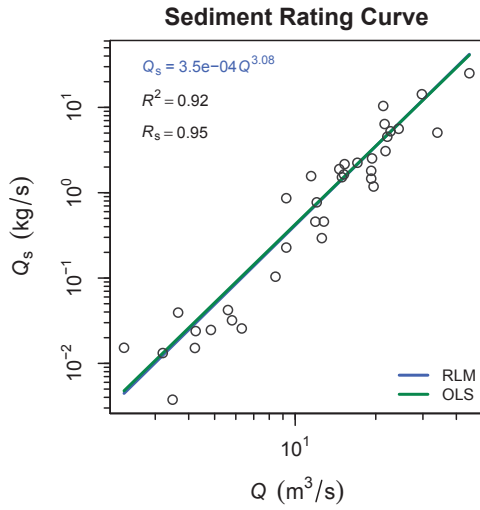
Suspended Load Sites

NEMADJI RIVER NEAR SOUTH SUPERIOR, WI: 04024430



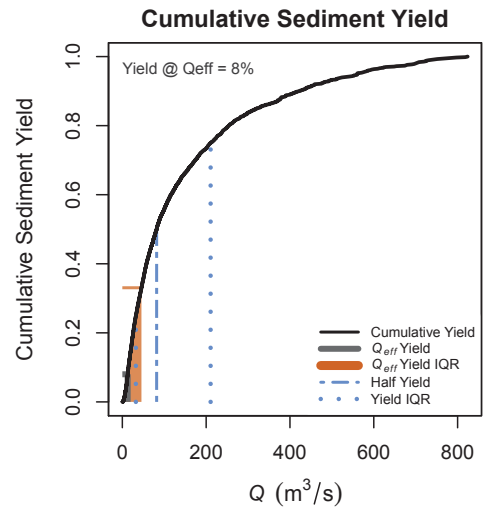
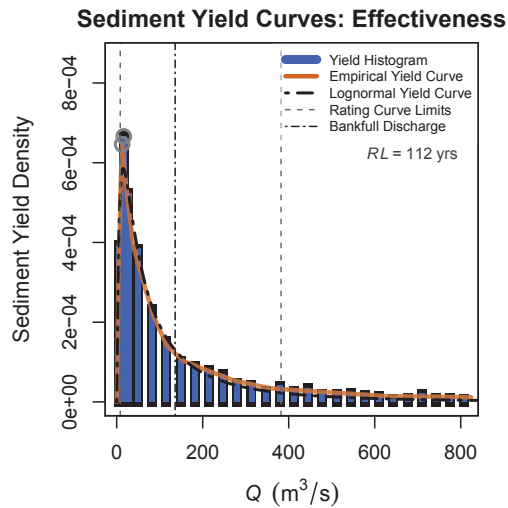
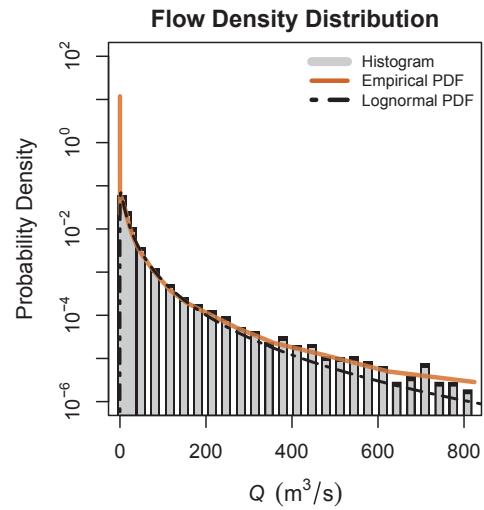
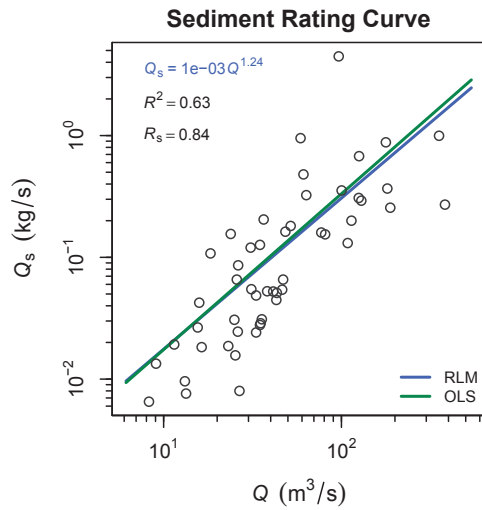
Suspended Load Sites

OATKA CREEK AT WARSAW NY: 04230380



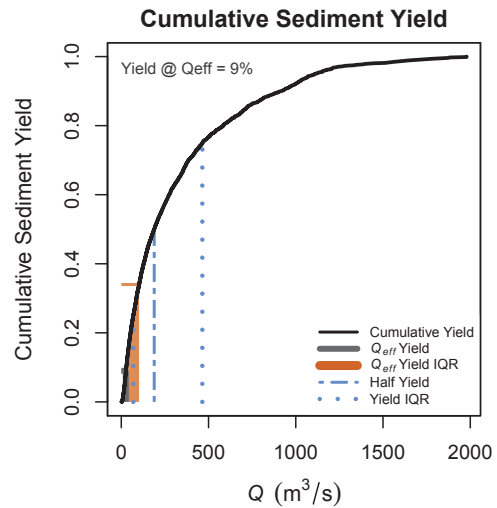
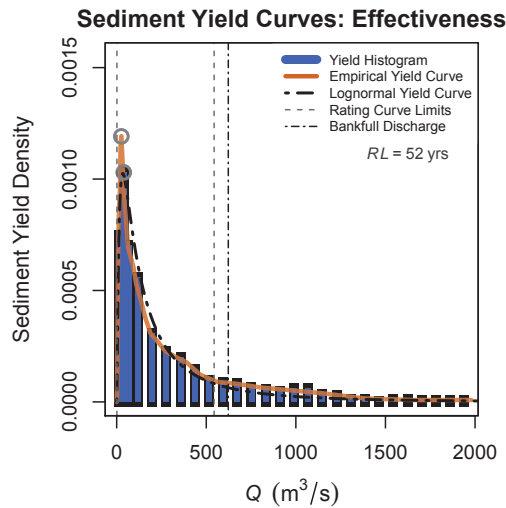
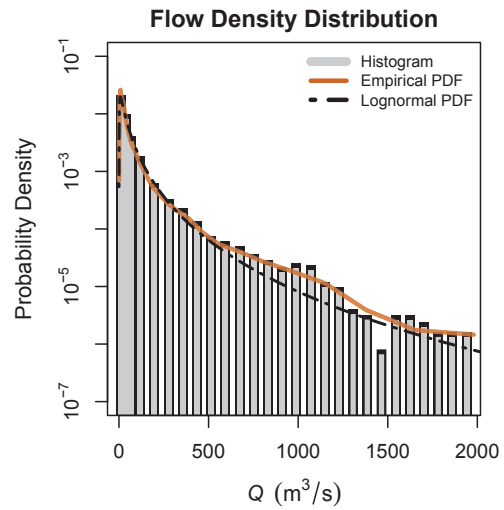
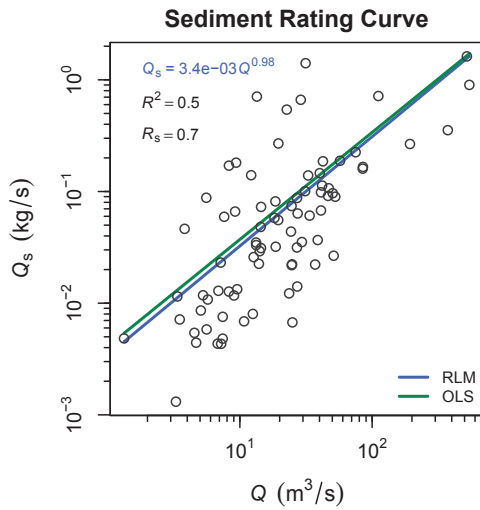
Suspended Load Sites

RED RIVER OF THE NORTH AT FARGO, ND: 05054000



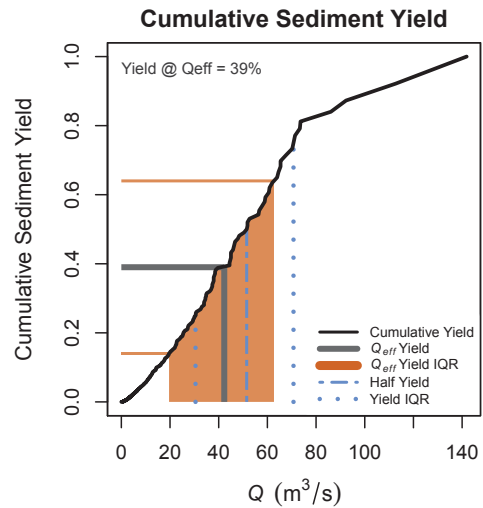
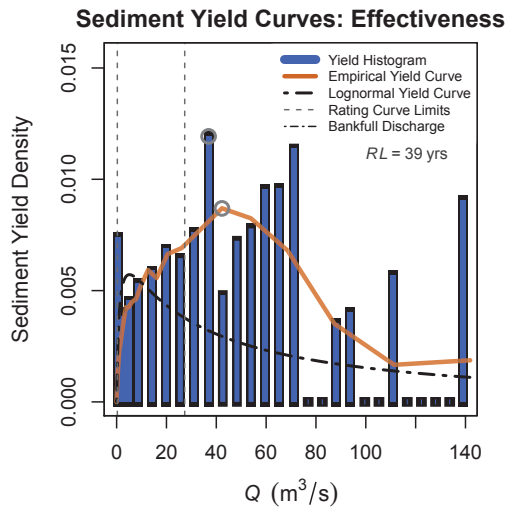
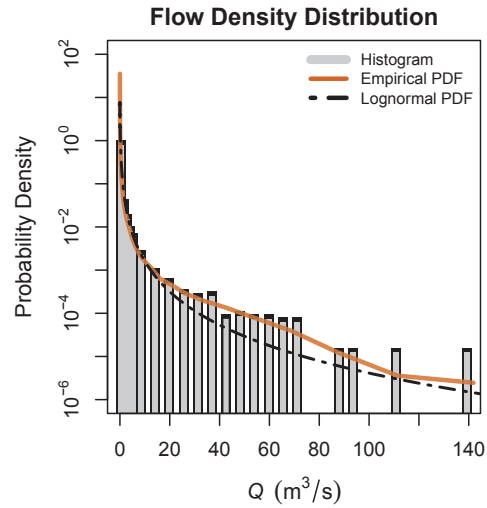
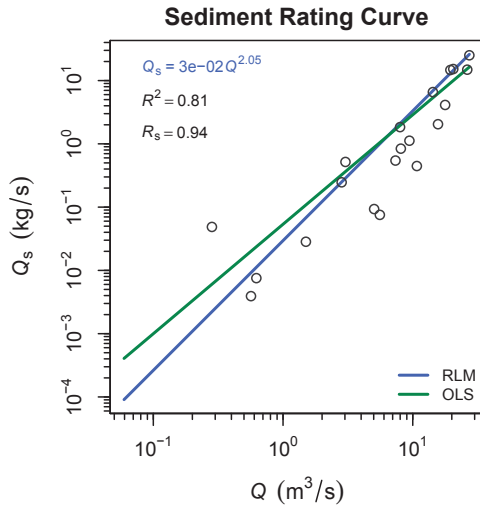
Suspended Load Sites

RED RIVER OF THE NORTH AT HALSTAD, MN: 05064500



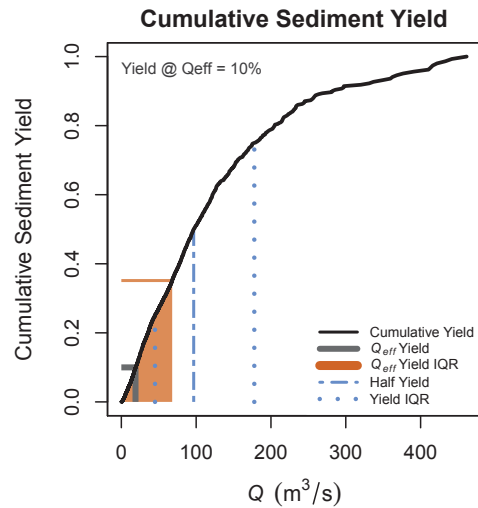
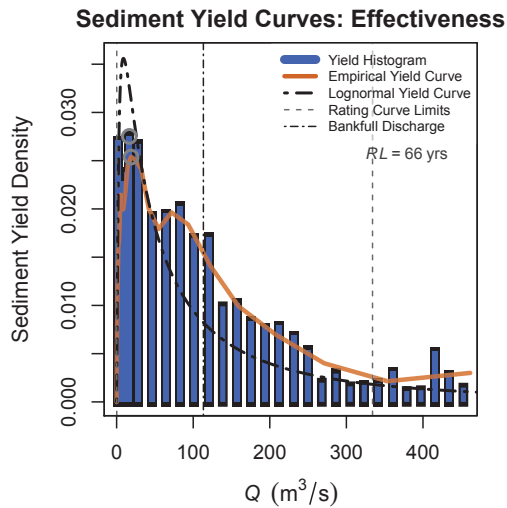
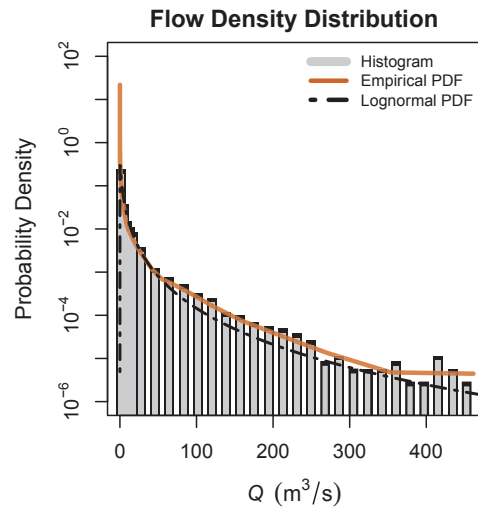
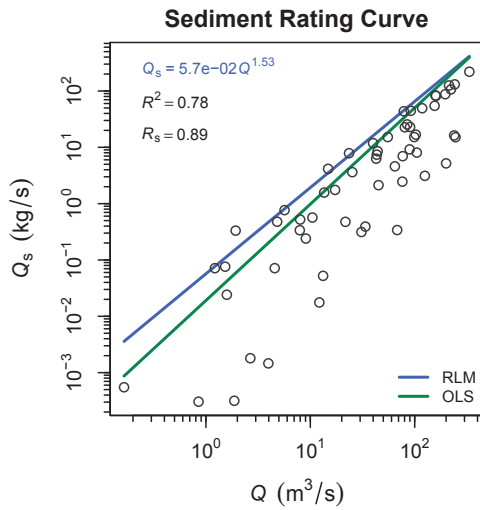
Suspended Load Sites

LITTLE SOUTH PEMBINA RIVER NR WALHALLA, ND: 05099400



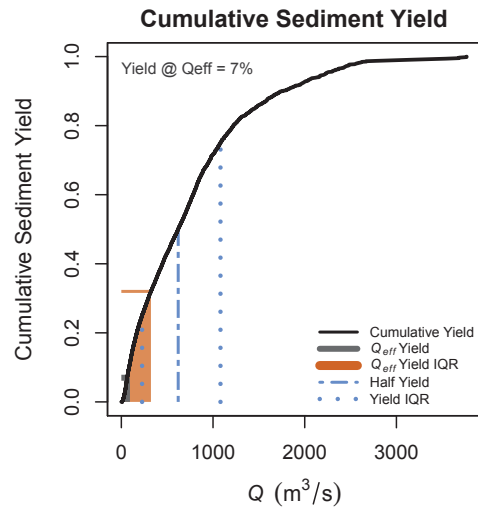
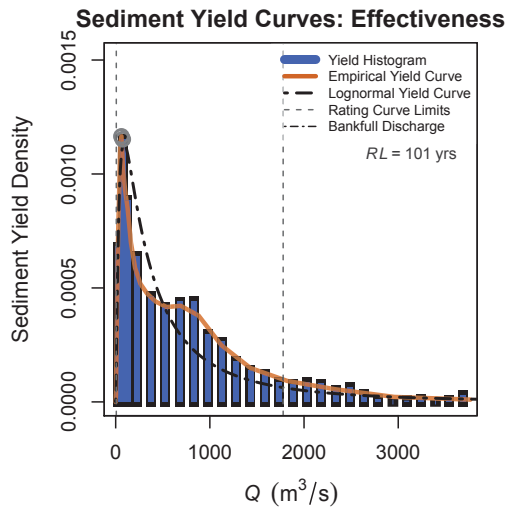
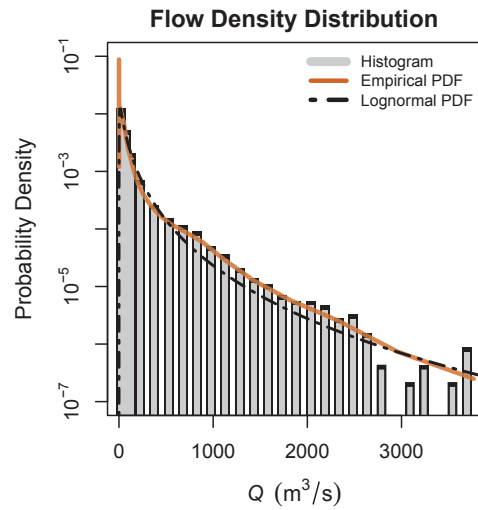
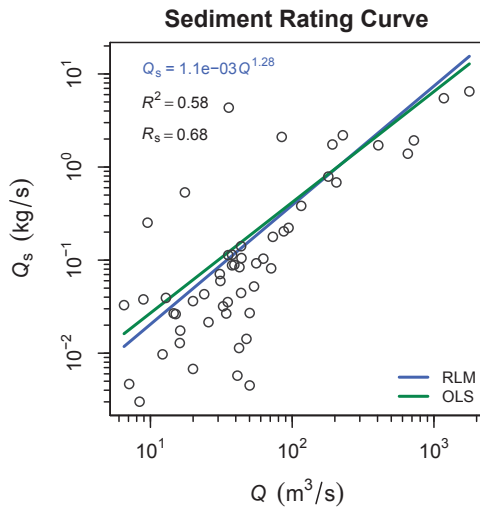
Suspended Load Sites

PEMBINA RIVER AT WALHALLA, ND: 05099600



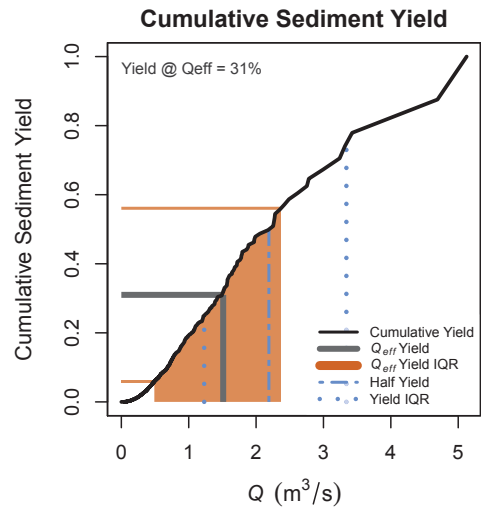
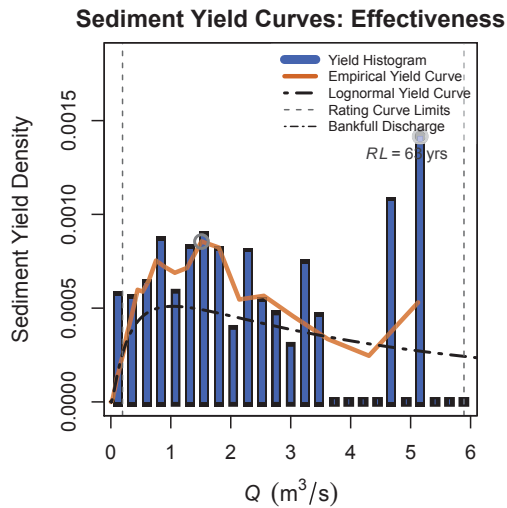
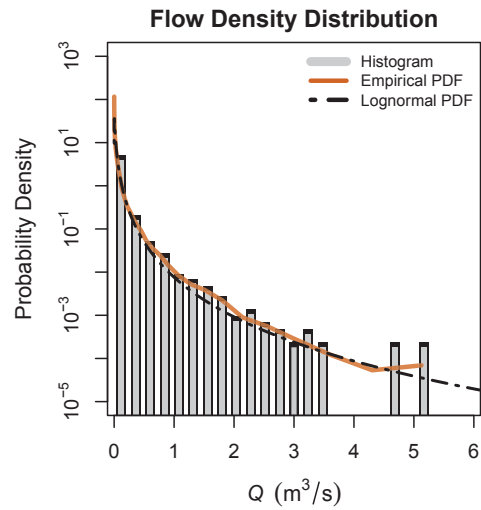
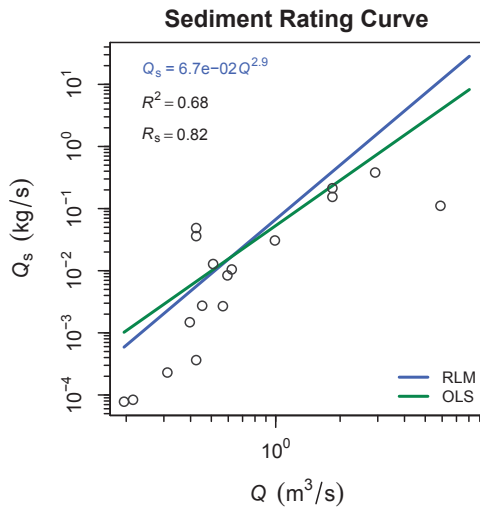
Suspended Load Sites

RED RIVER OF THE NORTH AT EMERSON, MANITOBA: 05102500



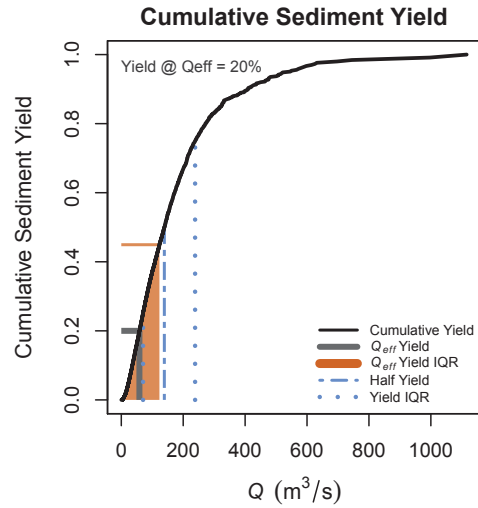
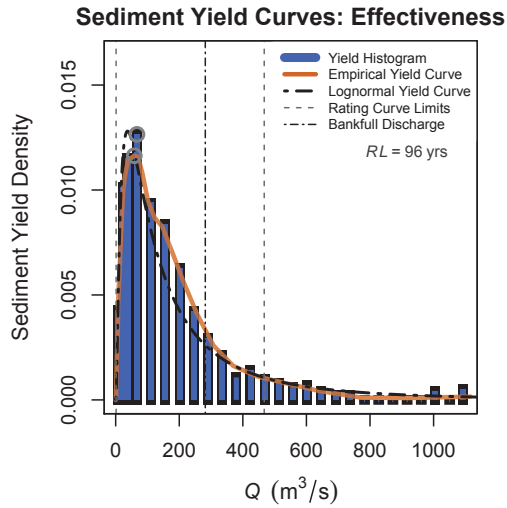
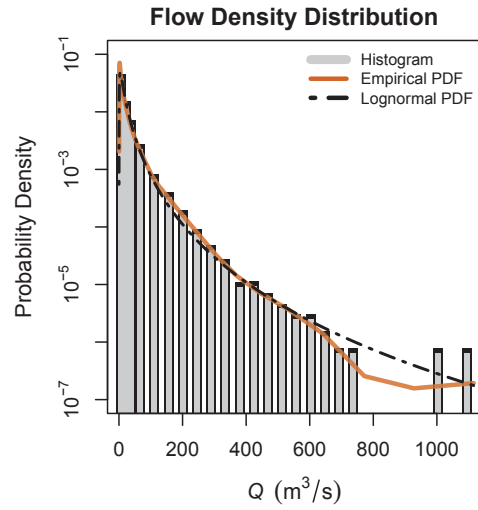
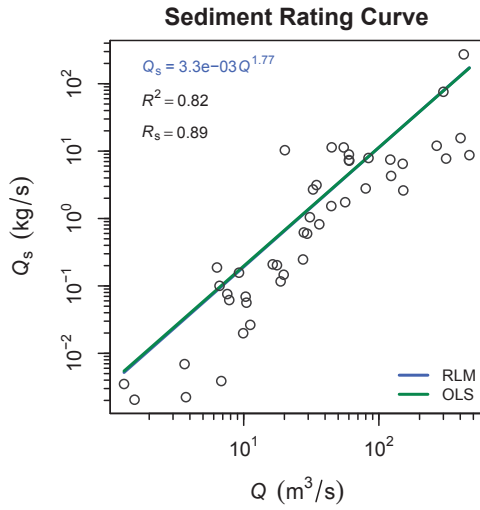
Suspended Load Sites

SPRING CR AT ROCK VALLEY COLLEGE AT ROCKFORD IL: 05437632



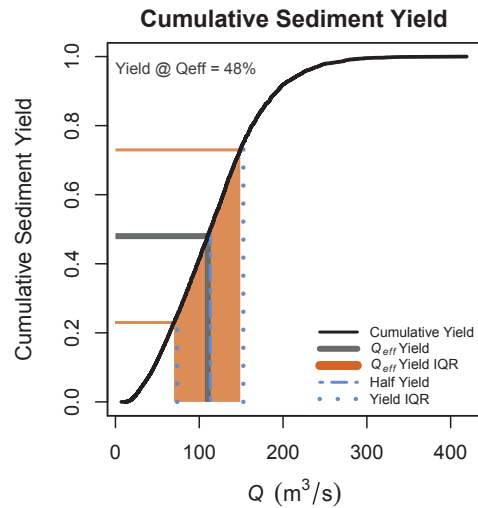
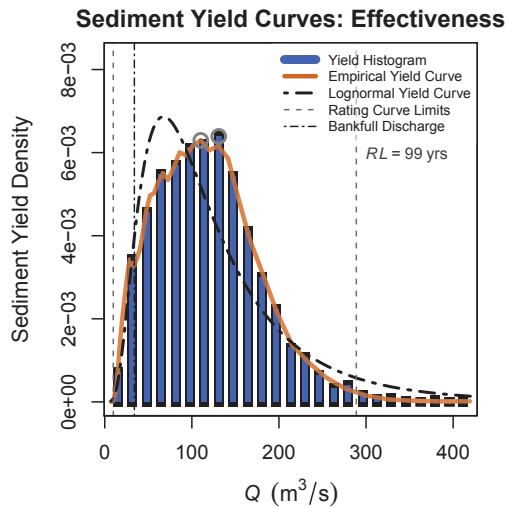
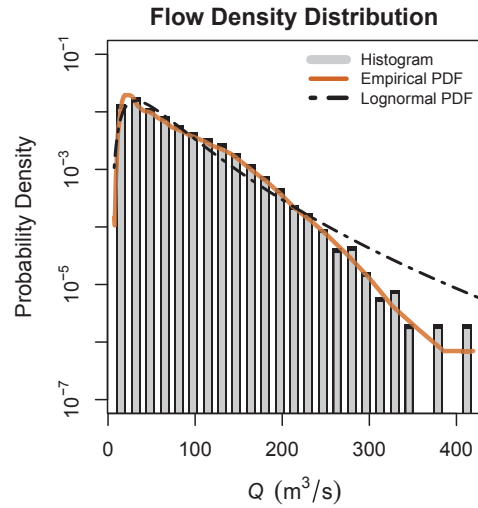
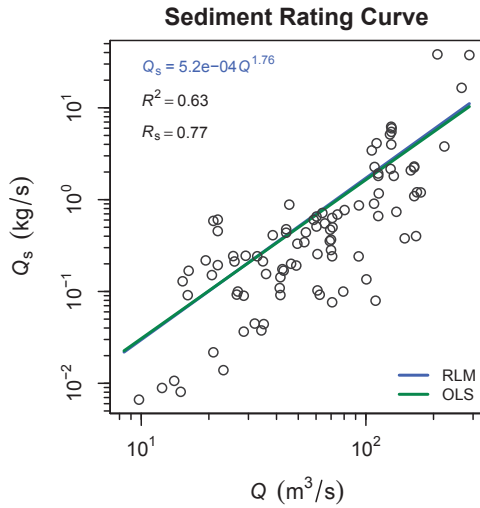
Suspended Load Sites

Iowa River at Marshalltown, IA: 05451500



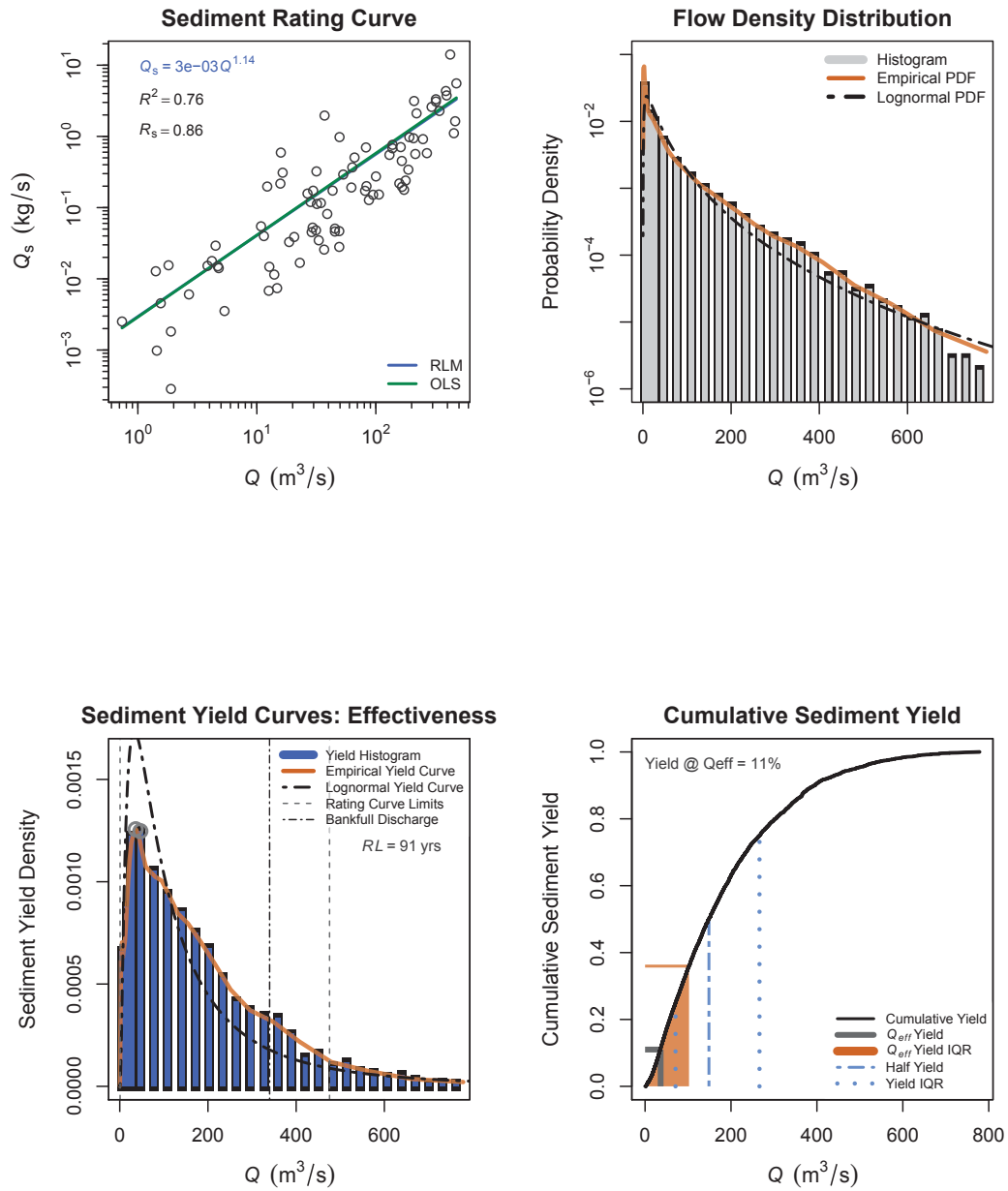
Suspended Load Sites

KANKAKEE RIVER AT MOMENCE, IL: 05520500



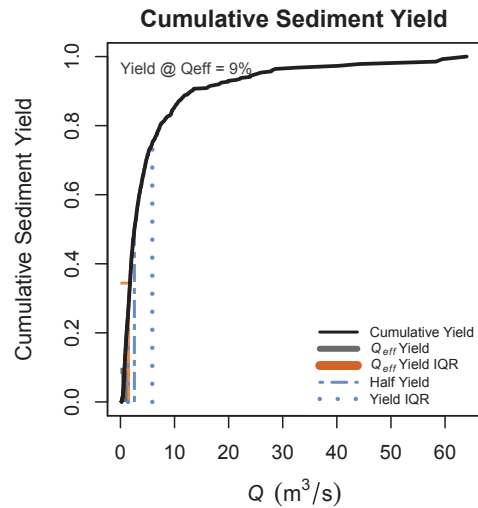
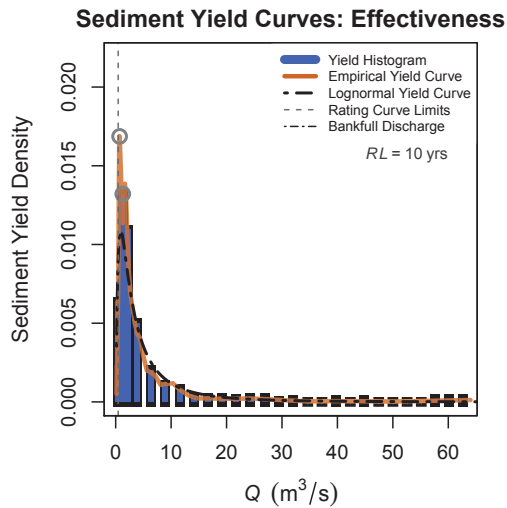
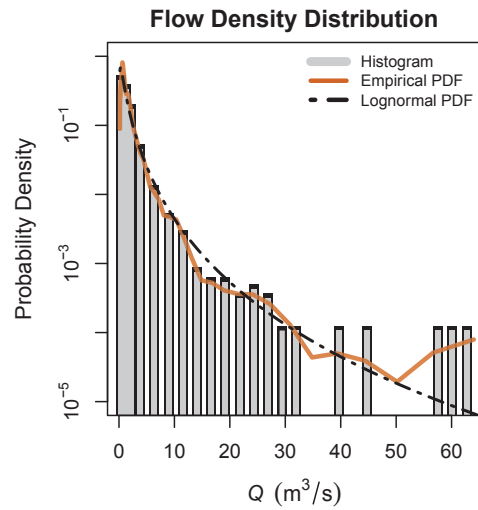
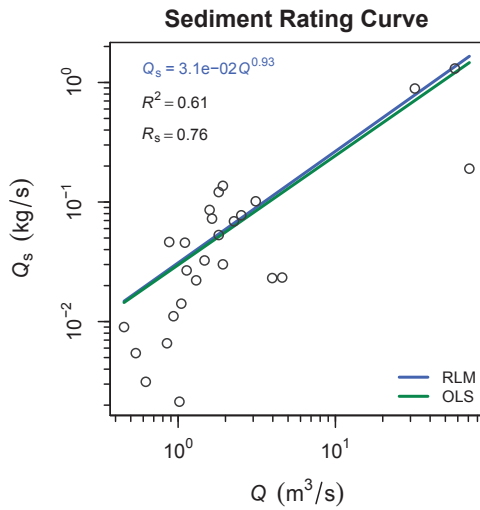
Suspended Load Sites

IROQUOIS RIVER NEAR CHEBANSE, IL: 05526000



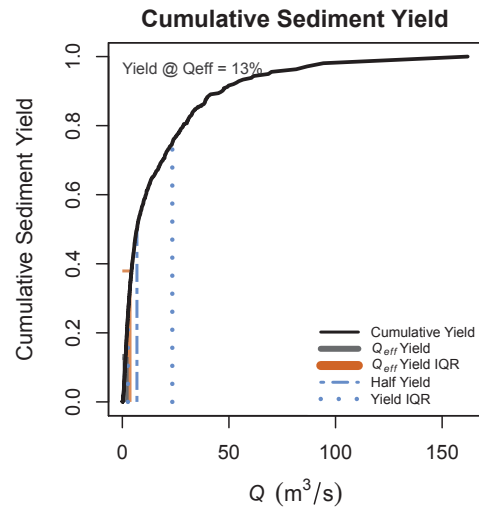
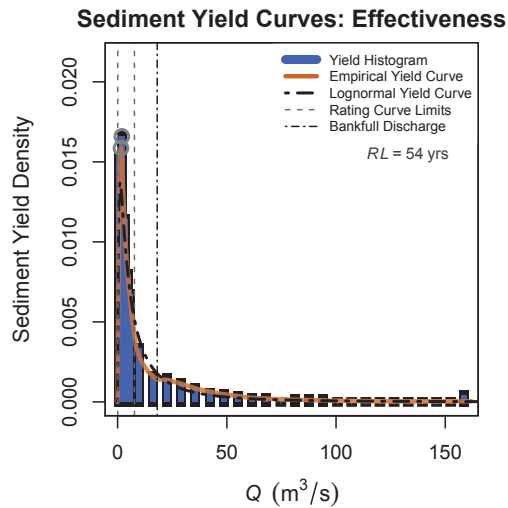
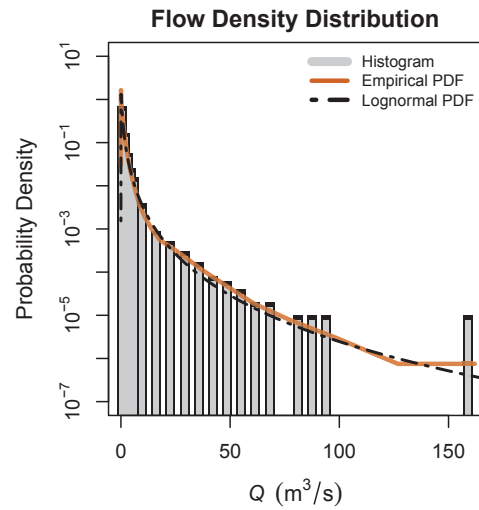
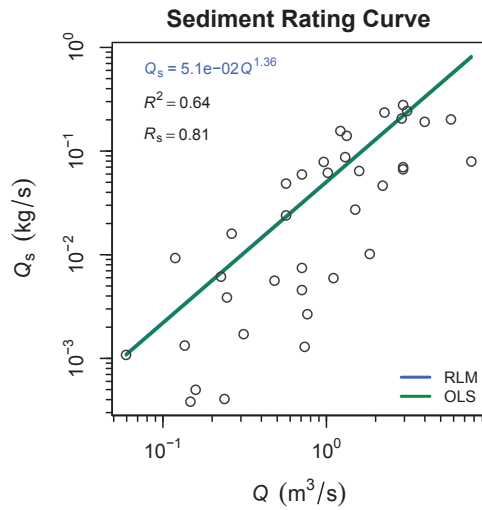
Suspended Load Sites

NIPPERSINK CREEK ABOVE WONDER LAKE, IL: 05548105



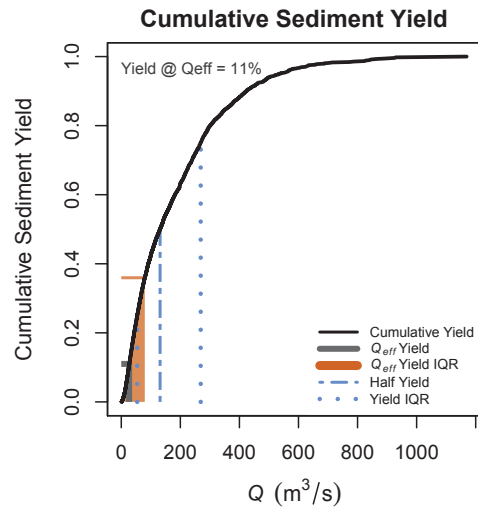
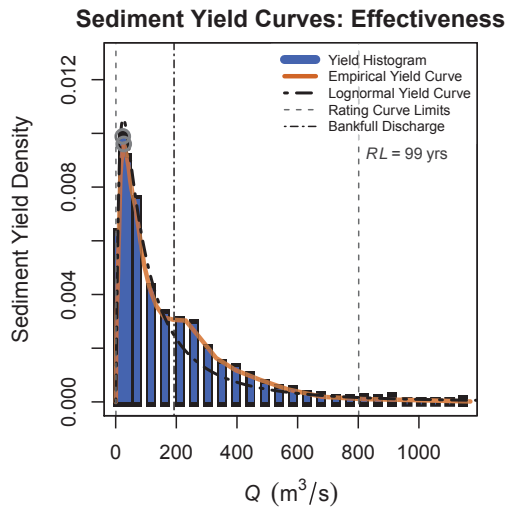
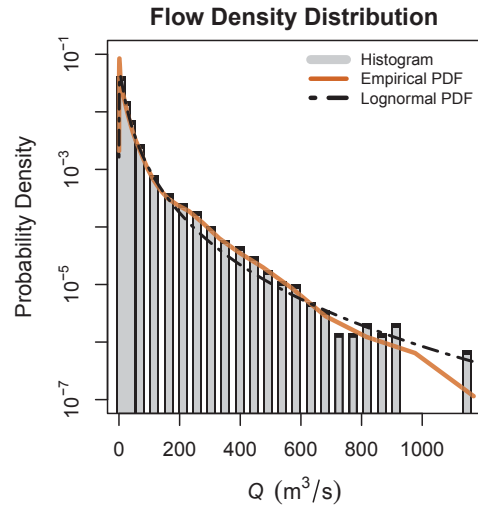
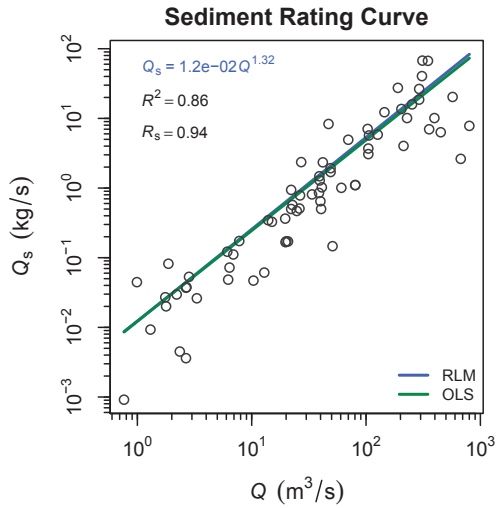
Suspended Load Sites

INDIAN CREEK NEAR WYOMING, IL: 05568800



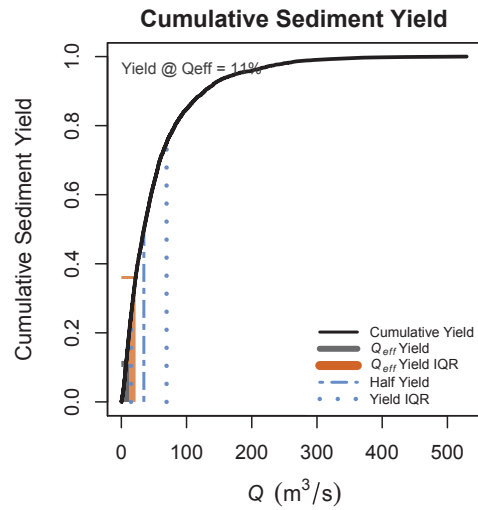
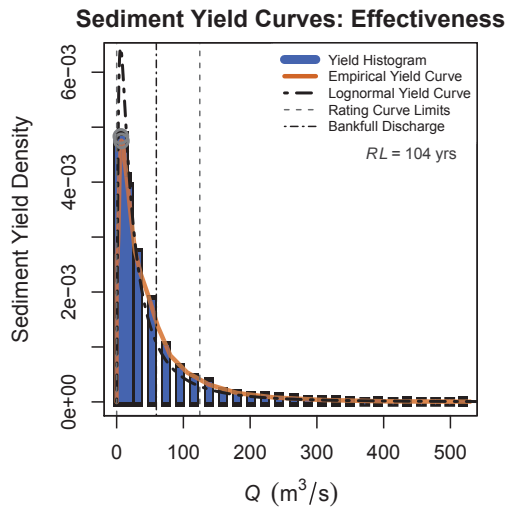
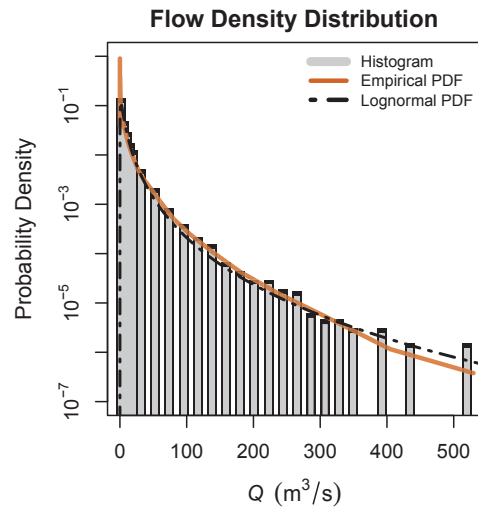
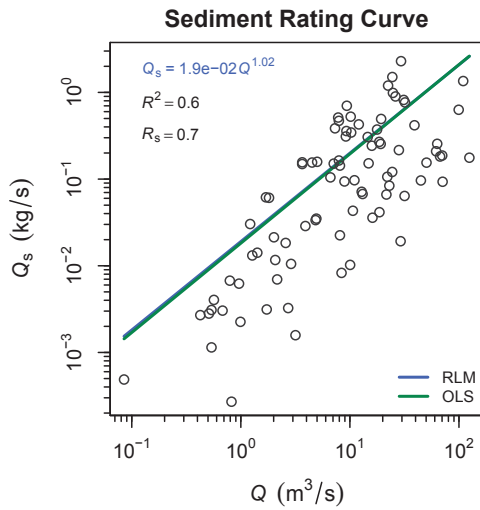
Suspended Load Sites

SPOON RIVER AT SEVILLE, IL: 05570000



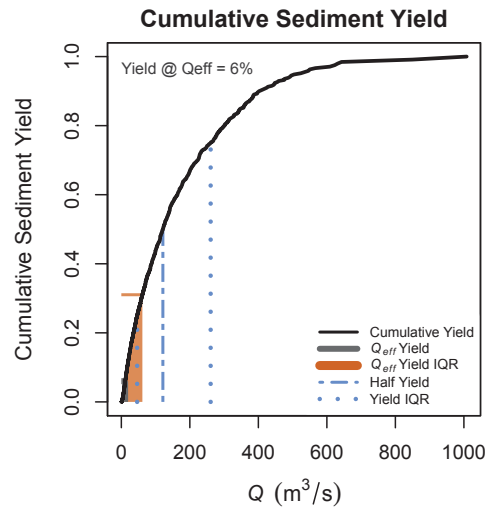
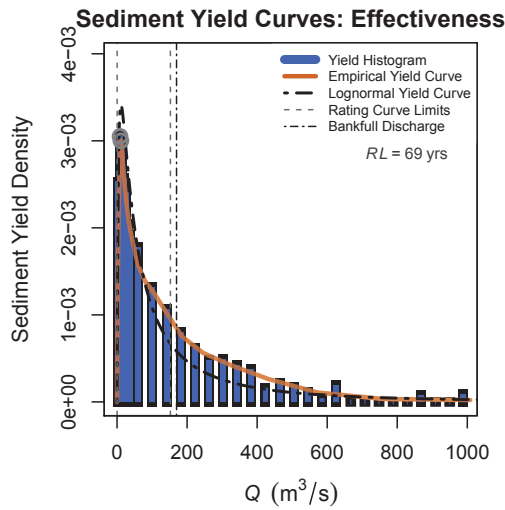
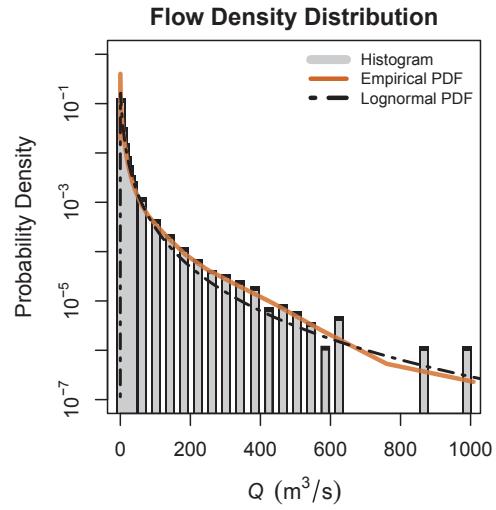
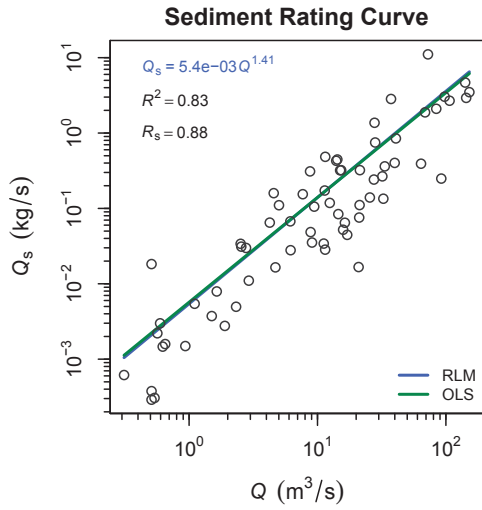
Suspended Load Sites

SANGAMON RIVER AT MONTICELLO, IL: 05572000



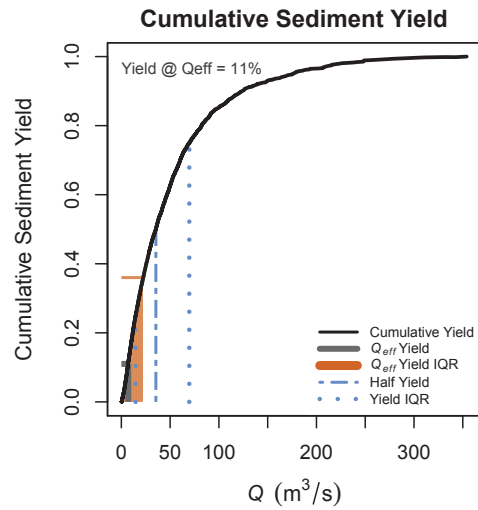
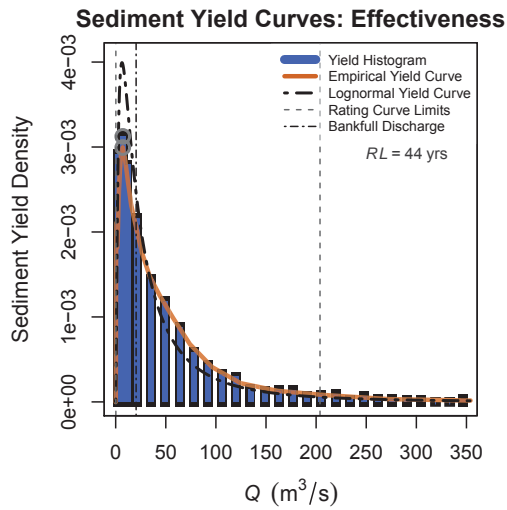
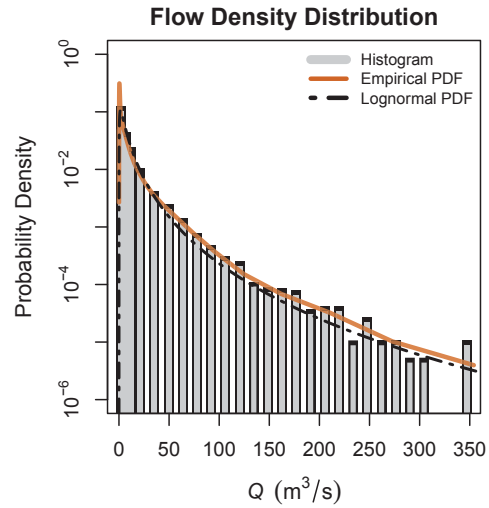
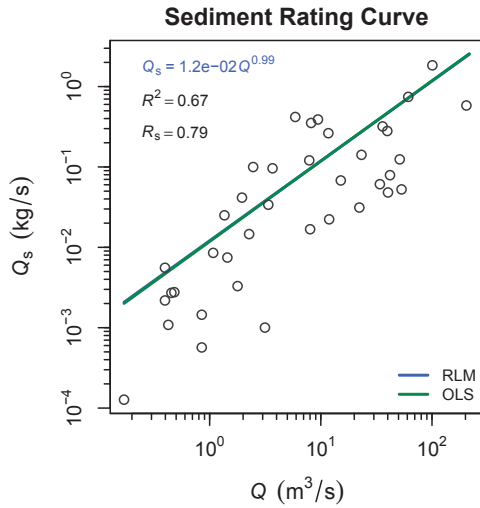
Suspended Load Sites

LA MOINE RIVER AT COLMAR, IL: 05584500



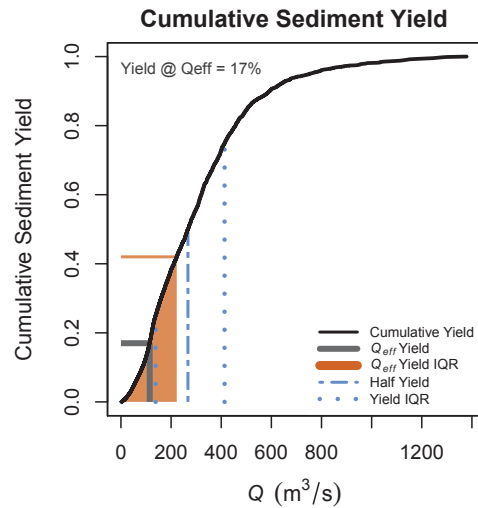
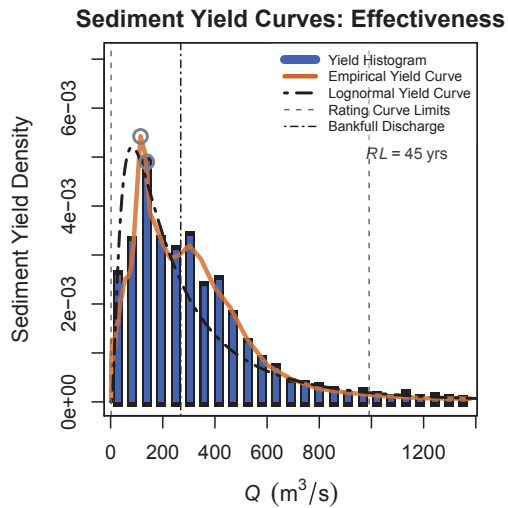
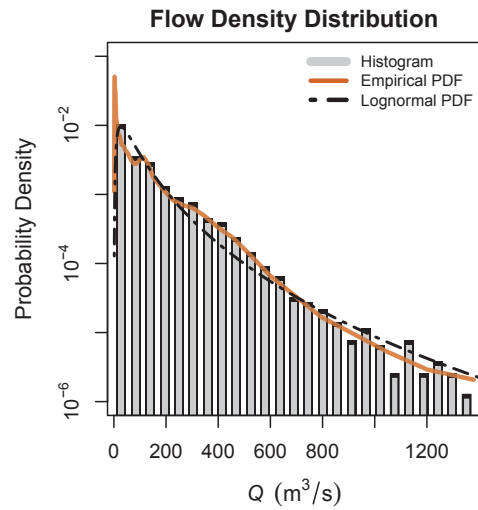
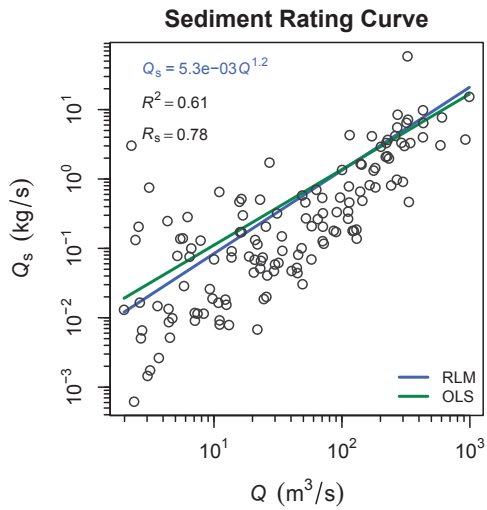
Suspended Load Sites

KASKASKIA RIVER AT COOKS MILLS, IL: 05591200



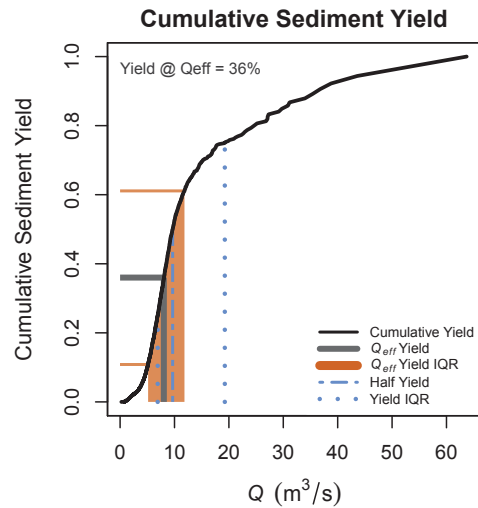
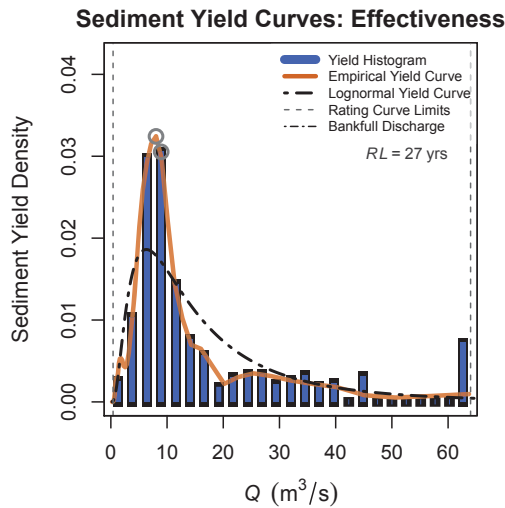
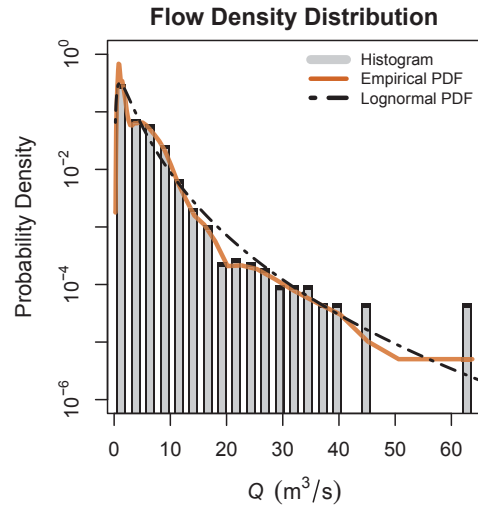
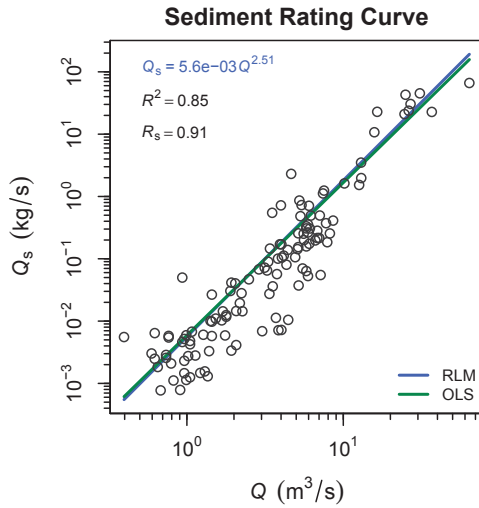
Suspended Load Sites

KASKASKIA RIVER NEAR VENEDY STATION, IL: 05594100



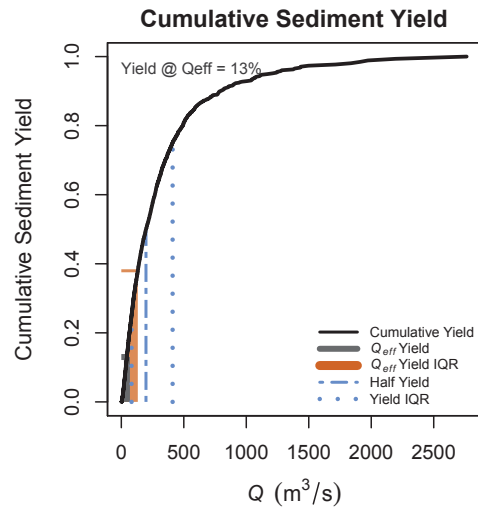
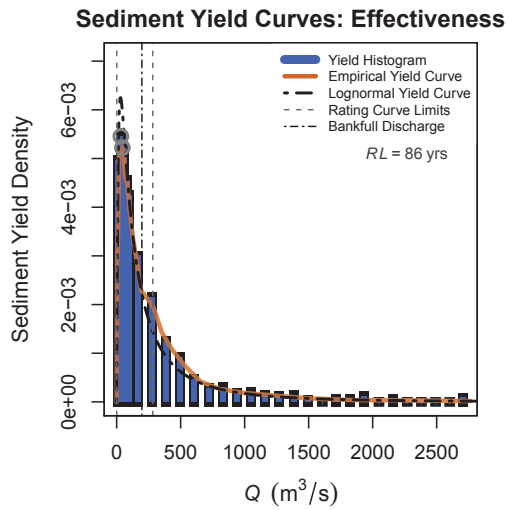
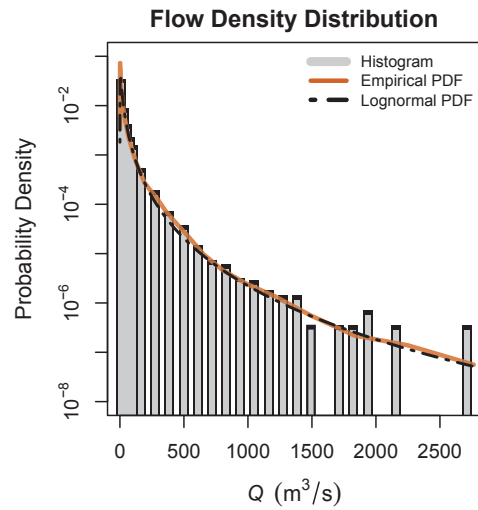
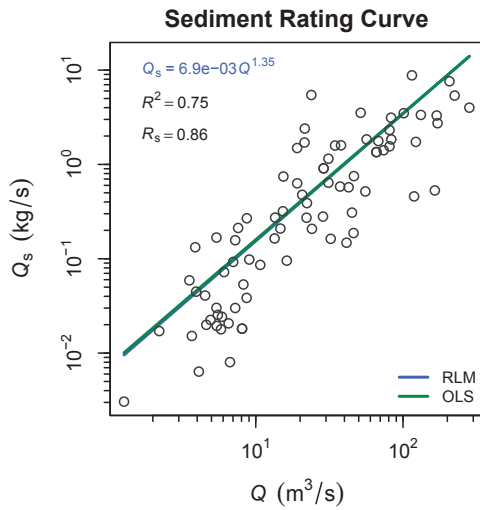
Suspended Load Sites

Muddy Creek near Vaughn MT: 06088300



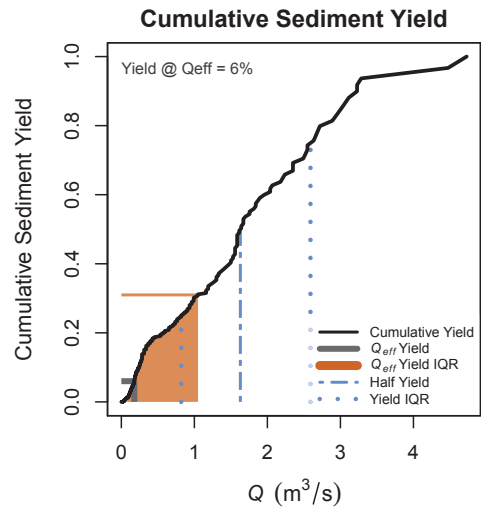
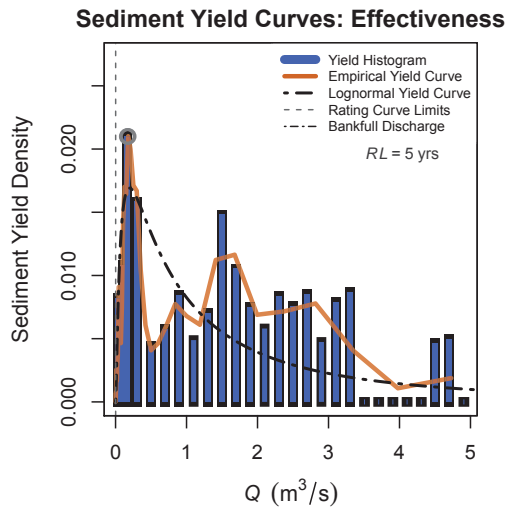
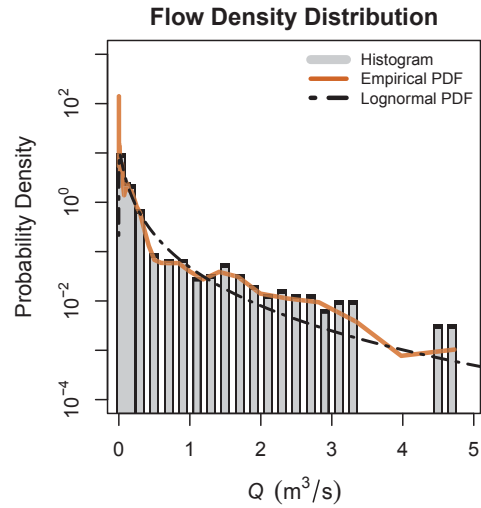
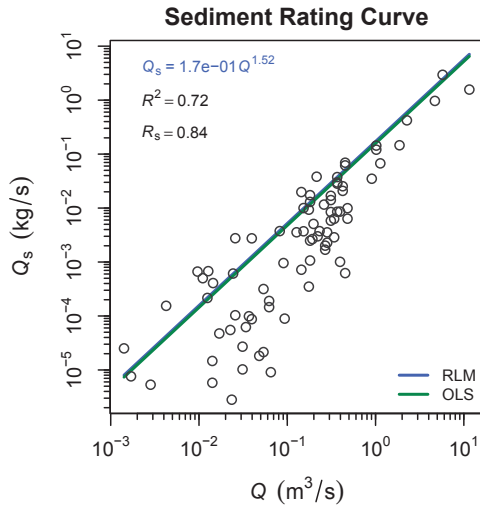
Suspended Load Sites

BIG SIOUX R AT AKRON,IA: 06485500



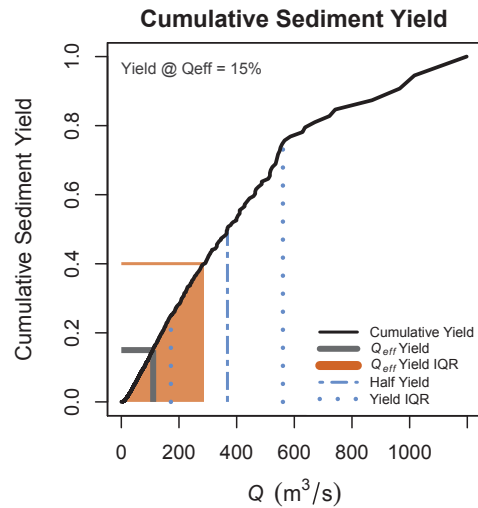
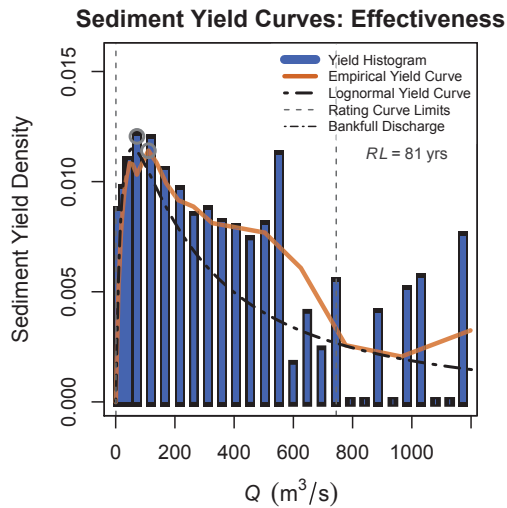
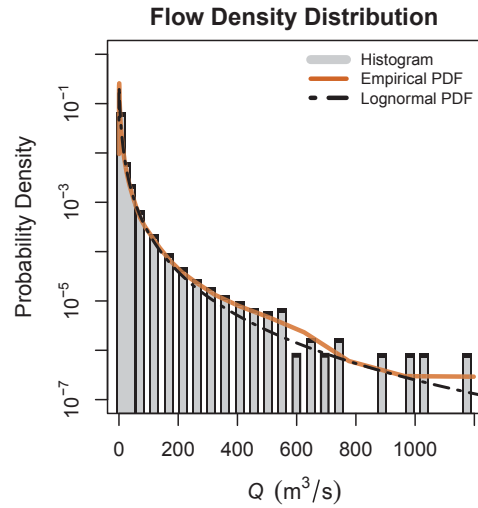
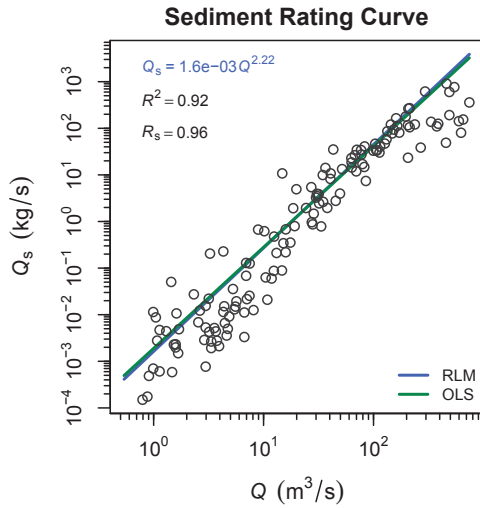
Suspended Load Sites

LONETREE CREEK NEAR GREELEY, CO.: 06753990



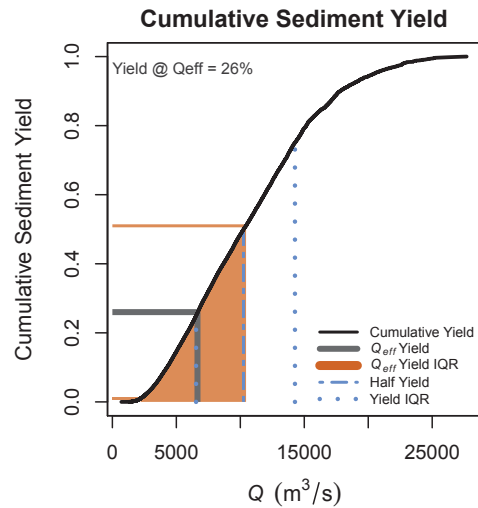
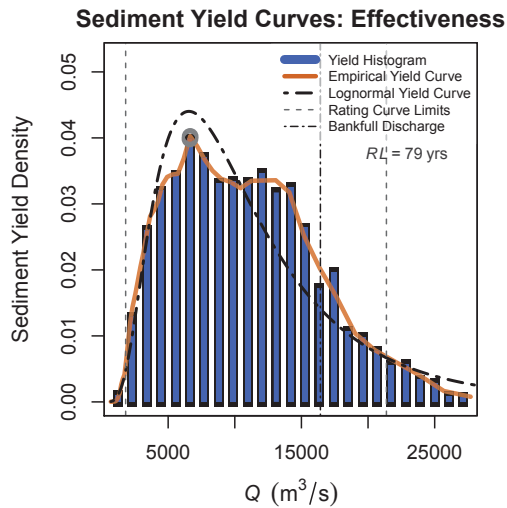
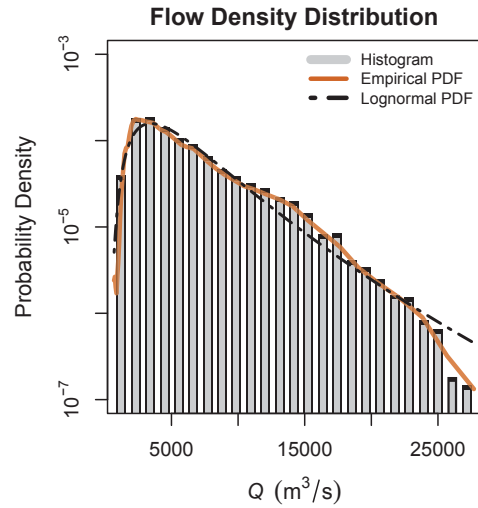
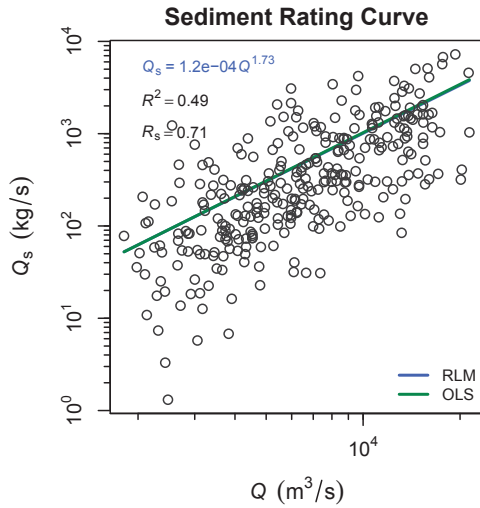
Suspended Load Sites

Nodaway River at Clarinda, IA: 06817000



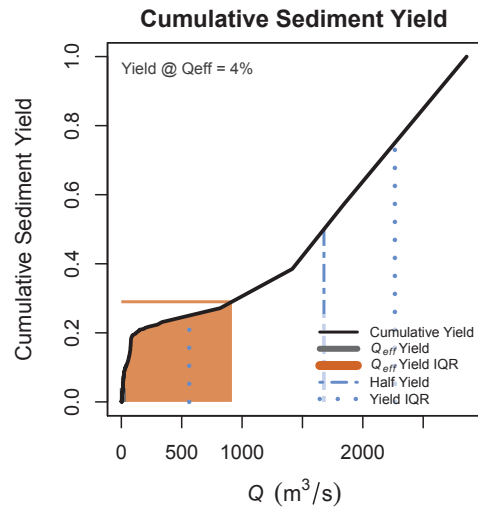
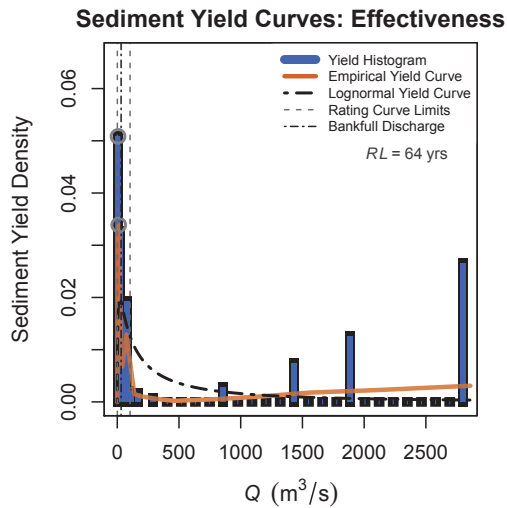
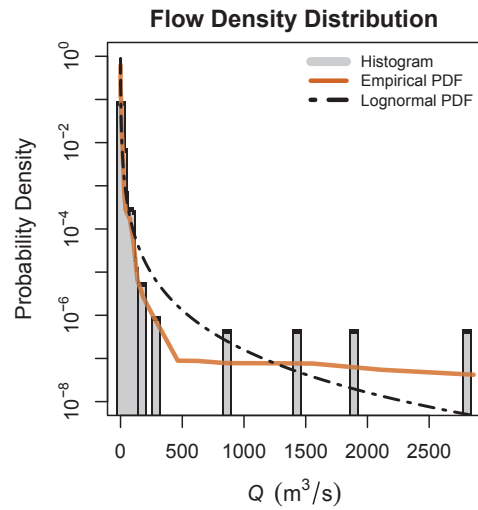
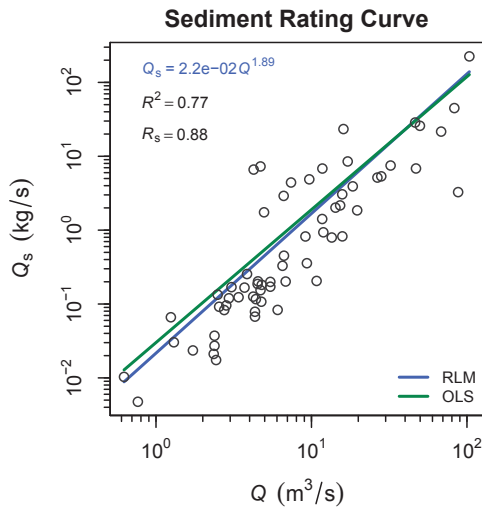
Suspended Load Sites

Mississippi River at Thebes, IL: 07022000



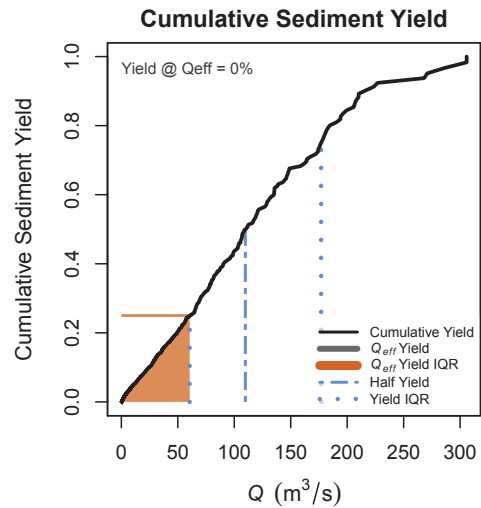
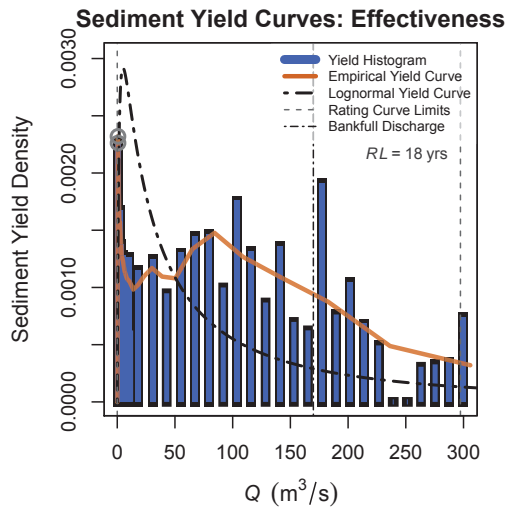
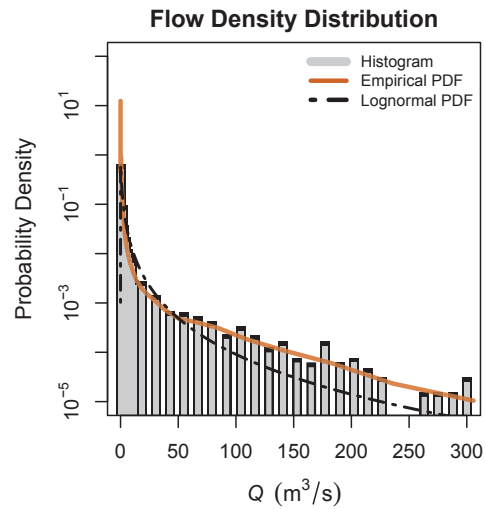
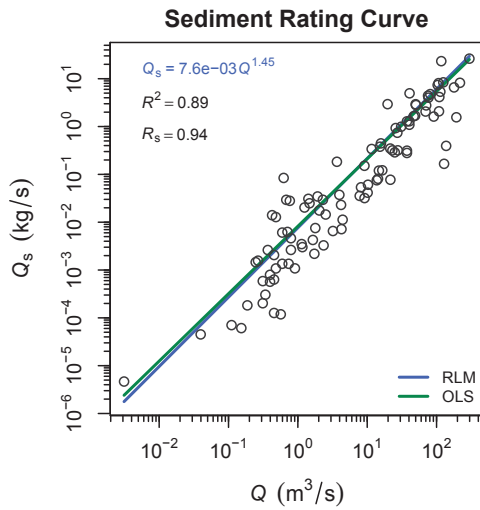
Suspended Load Sites

ARKANSAS R NR COOLIDGE, KS: 07137500



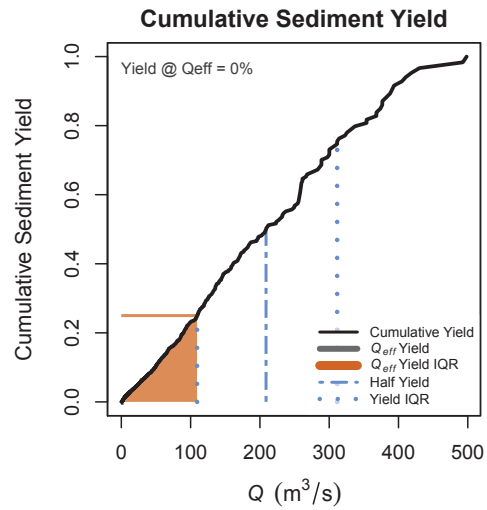
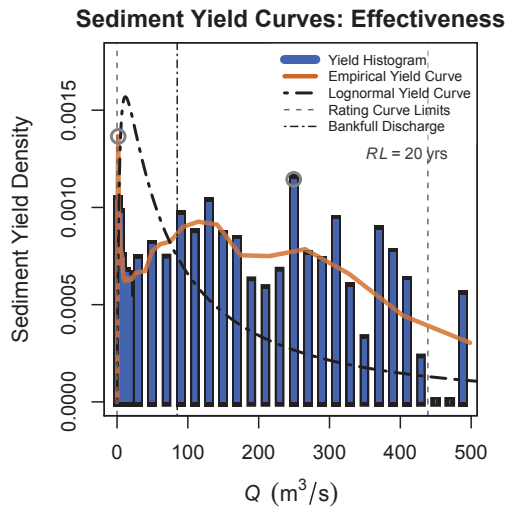
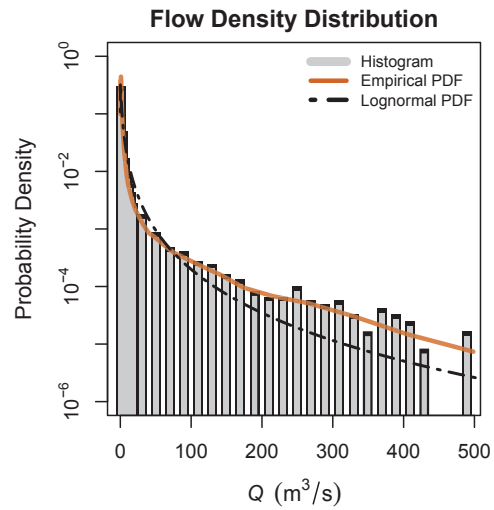
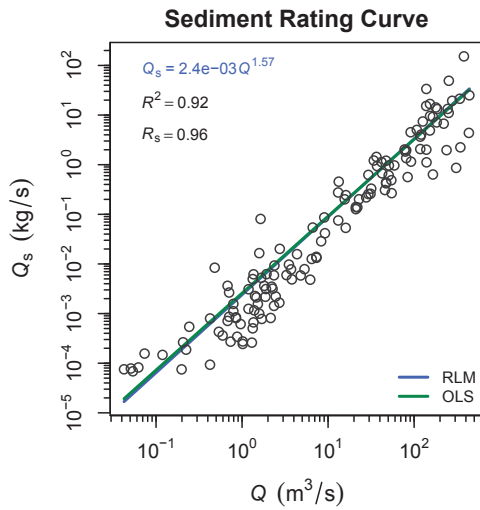
Suspended Load Sites

L ARKANSAS R AT HWY 50 NR HALSTEAD, KS: 07143672



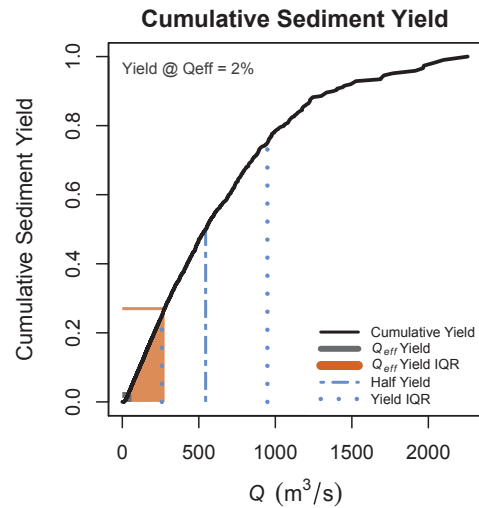
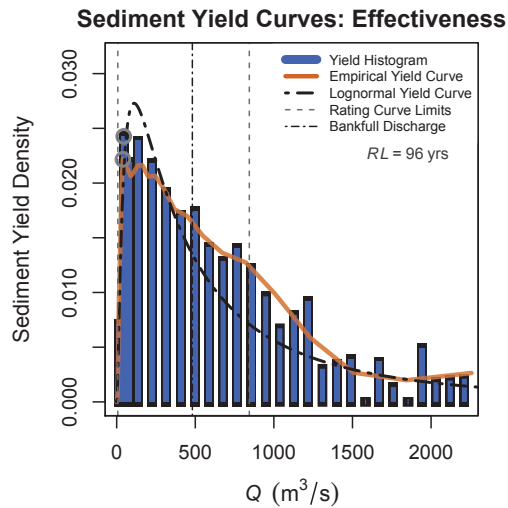
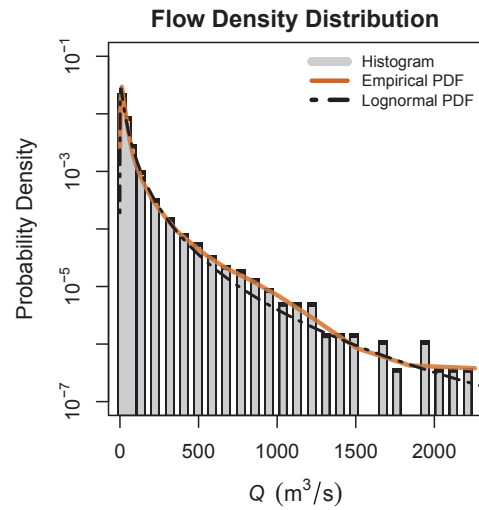
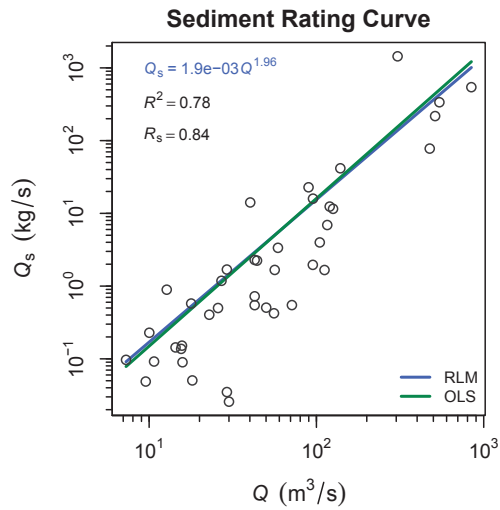
Suspended Load Sites

L ARKANSAS R NR SEDGWICK, KS: 07144100



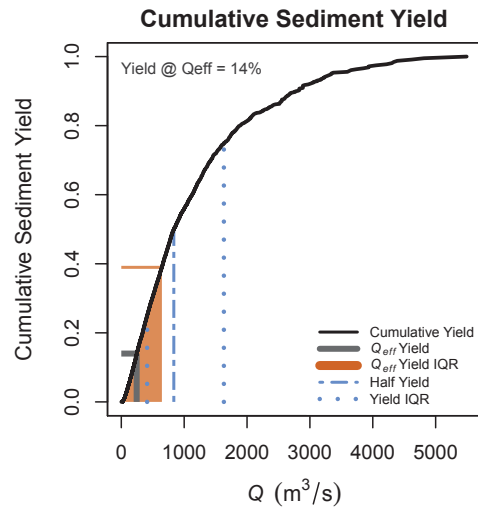
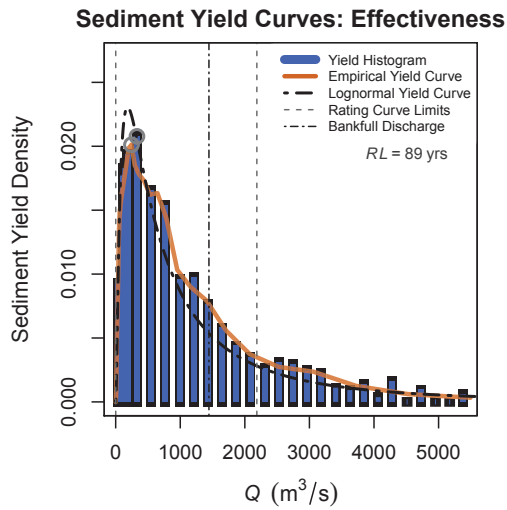
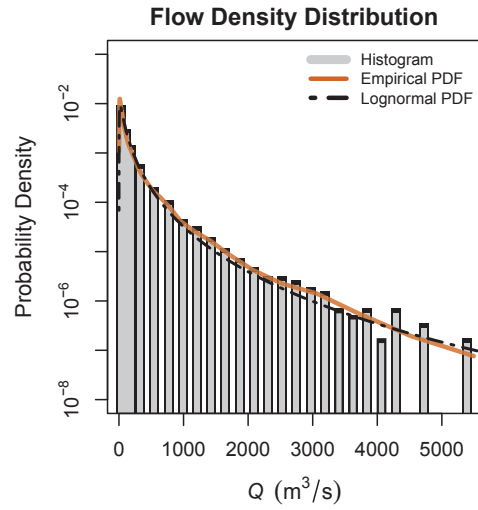
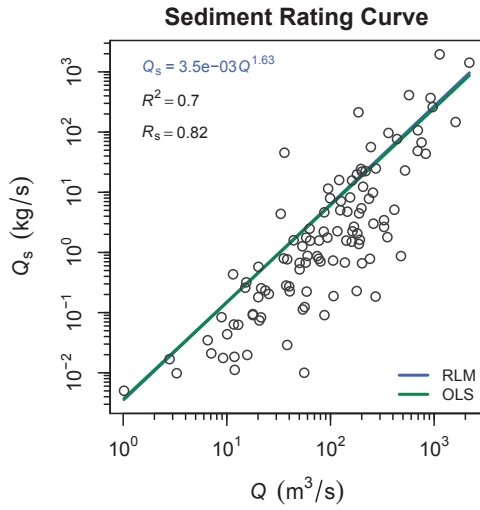
Suspended Load Sites

ARKANSAS R AT ARKANSAS CITY, KS: 07146500



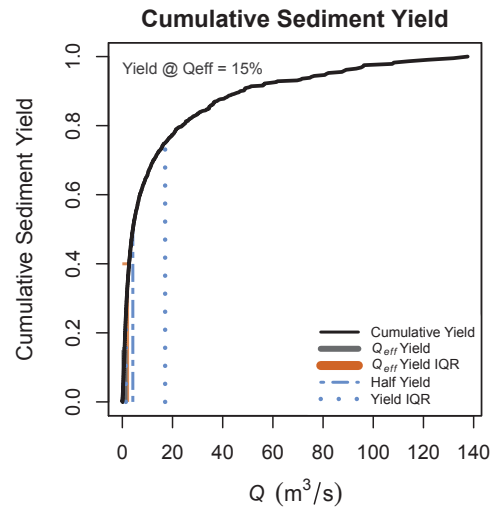
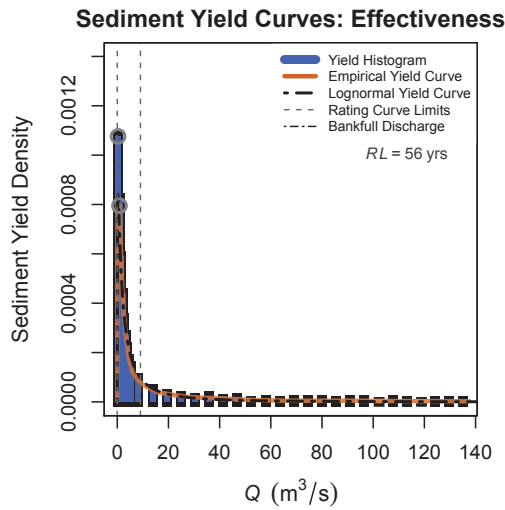
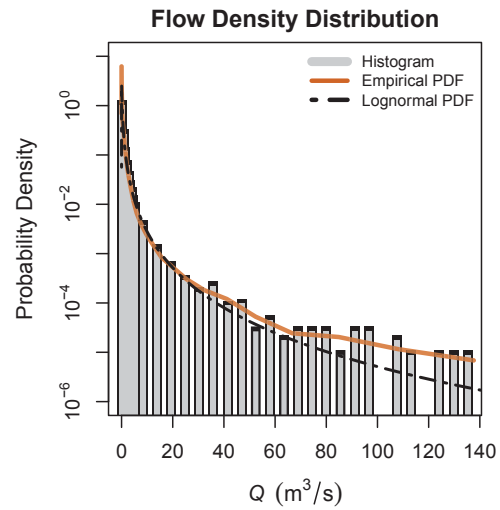
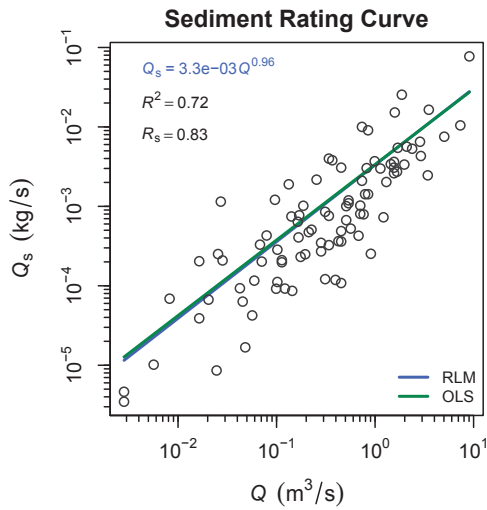
Suspended Load Sites

Arkansas River at Ralston, OK: 07152500



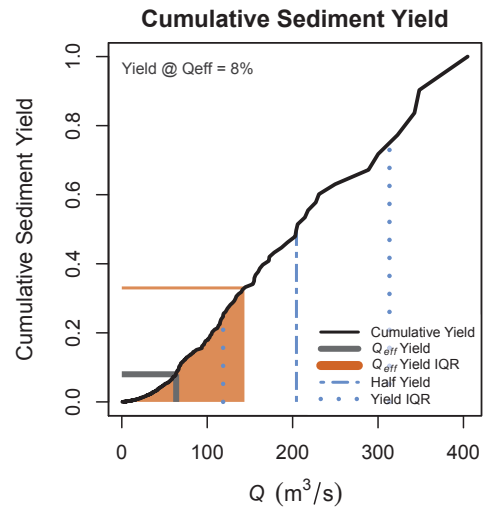
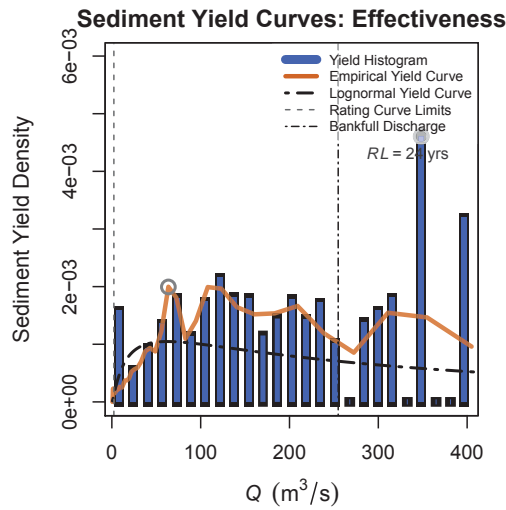
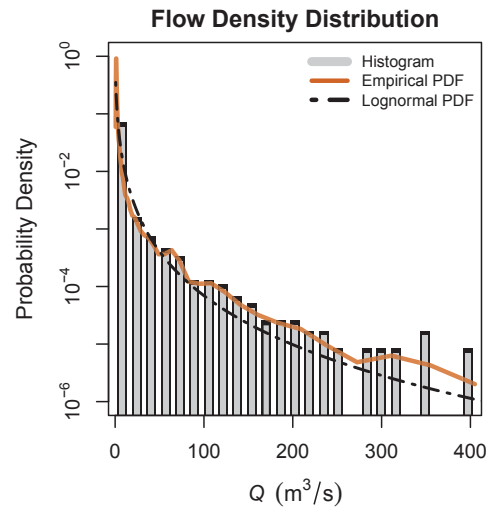
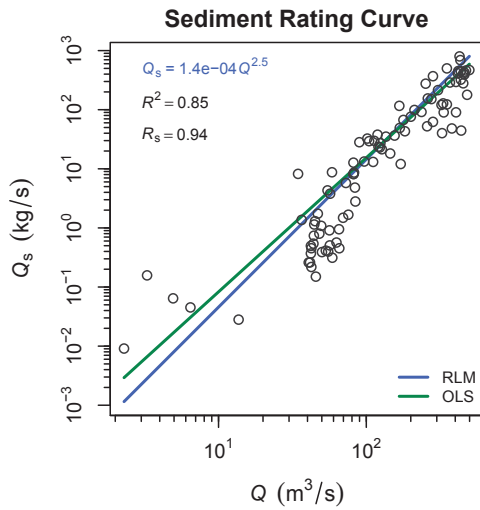
Suspended Load Sites

Baron Fork at Dutch Mills, AR: 07196900



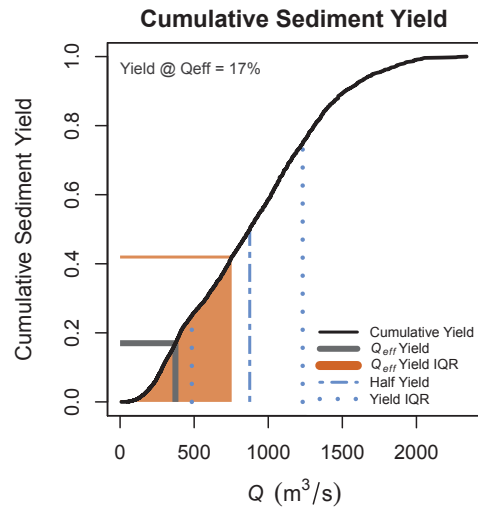
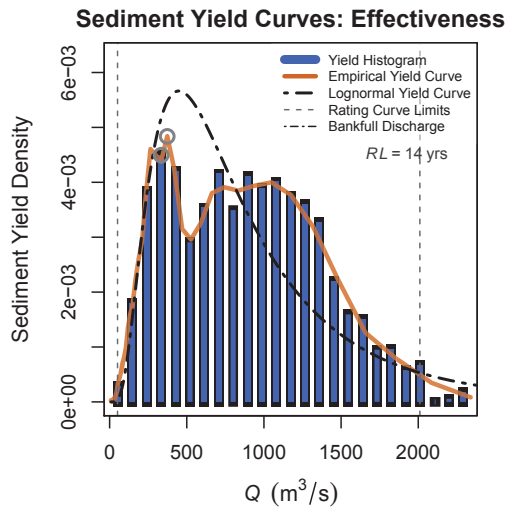
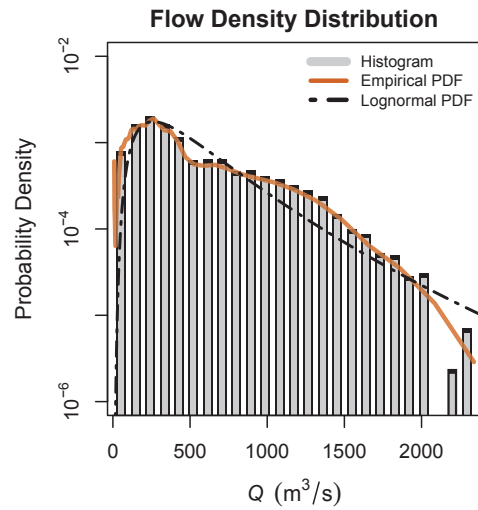
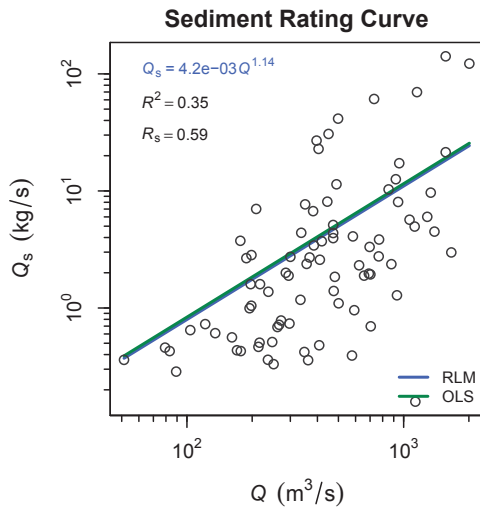
Suspended Load Sites

HICKAHALA CREEK NR SENATOBIA, MS: 07277700



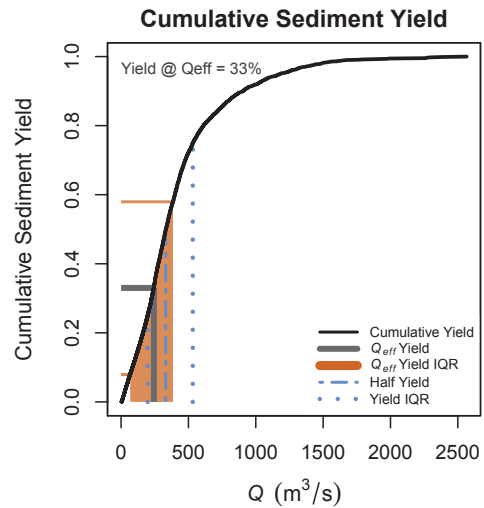
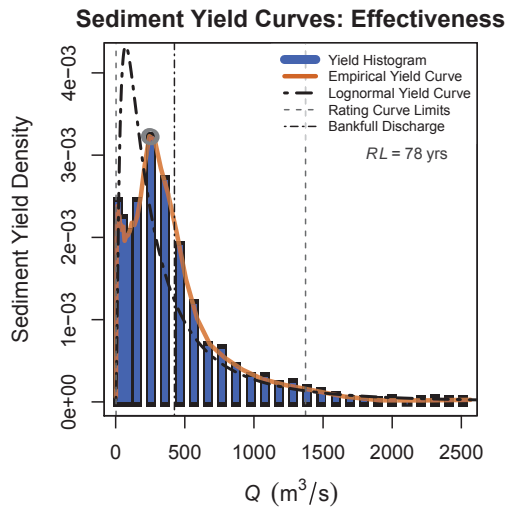
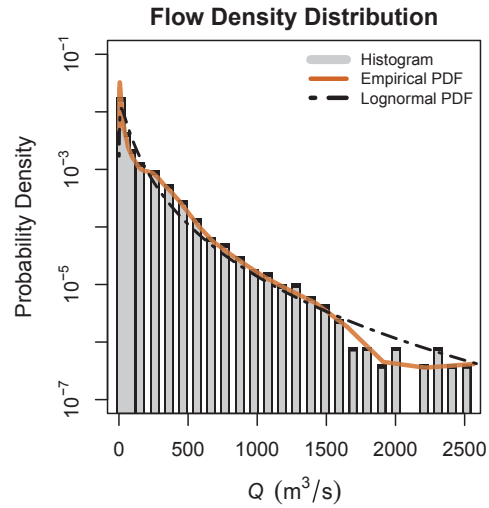
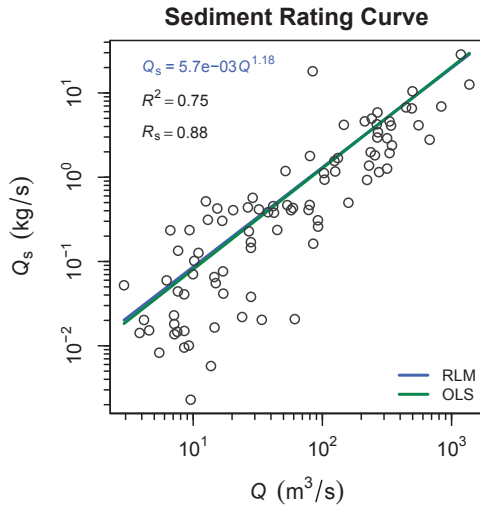
Suspended Load Sites

YAZOO RIVER BL STEELE BAYOU NR LONG LAKE, MS: 07288955



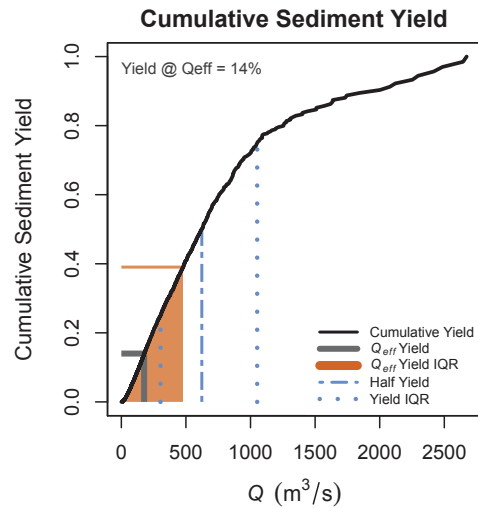
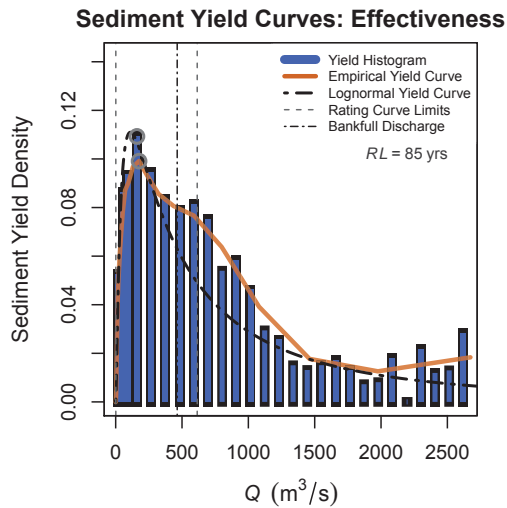
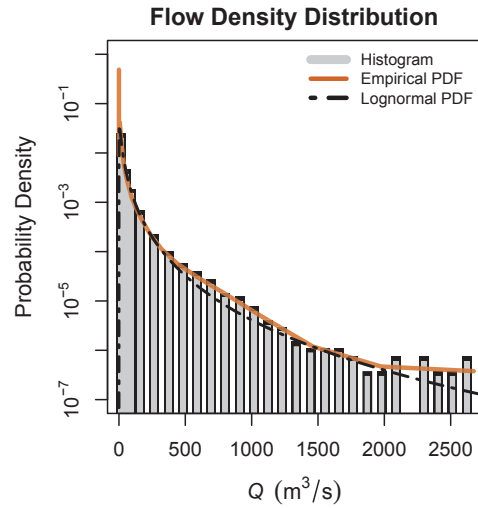
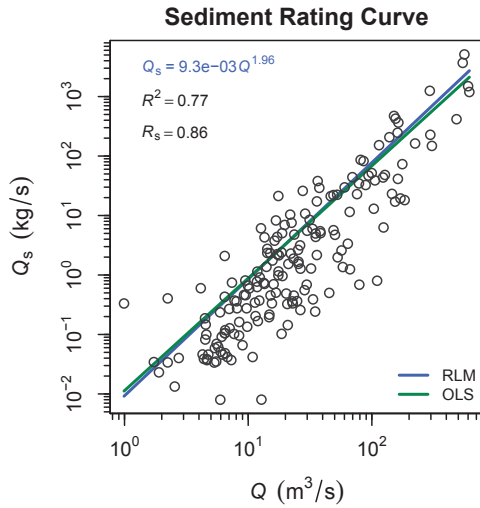
Suspended Load Sites

BIG BLACK RIVER NR BOVINA, MS: 07290000



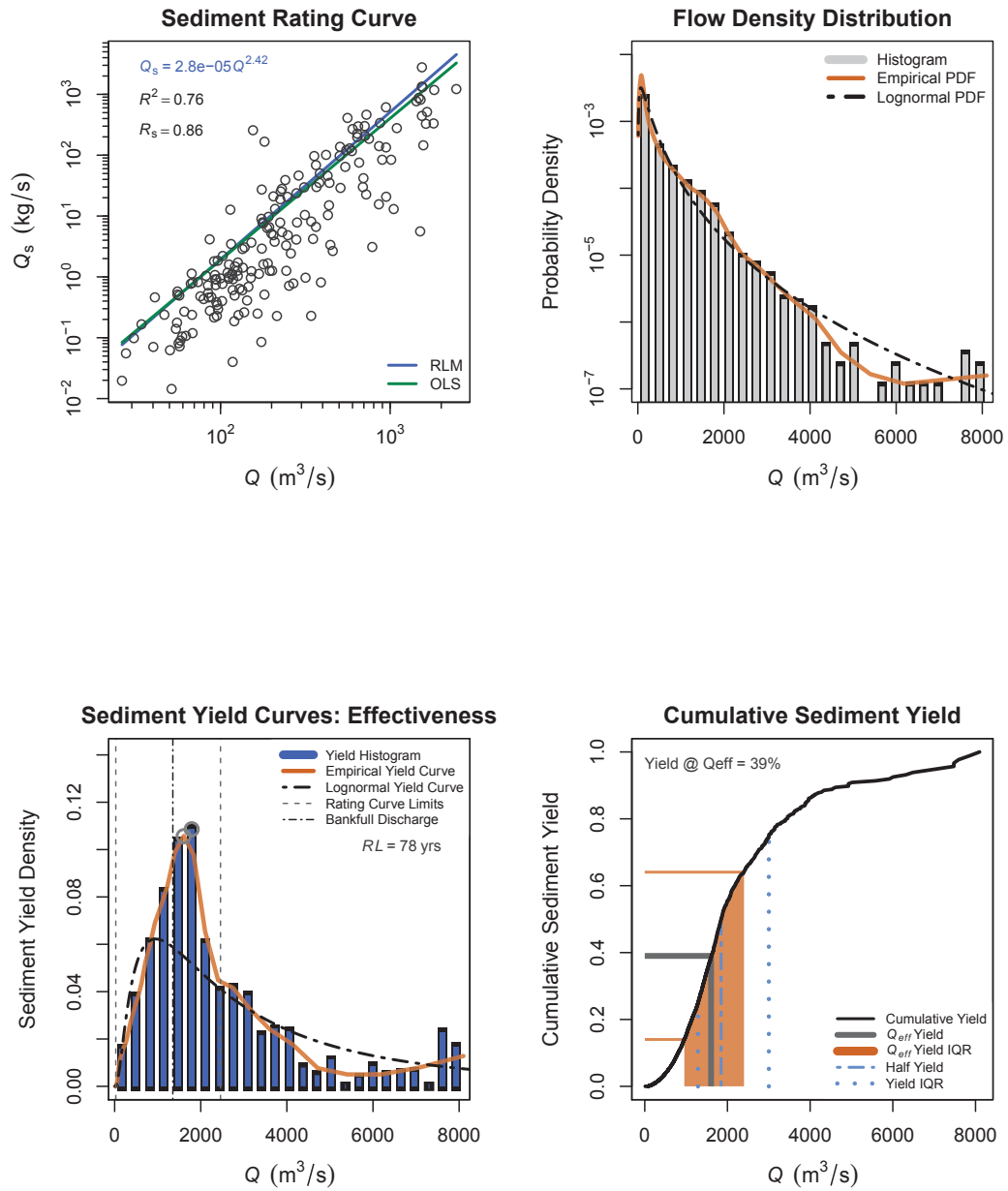
Suspended Load Sites

Washita River near Dickson, OK: 07331000



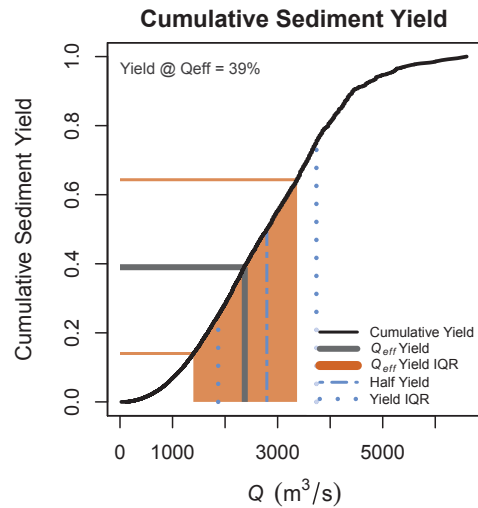
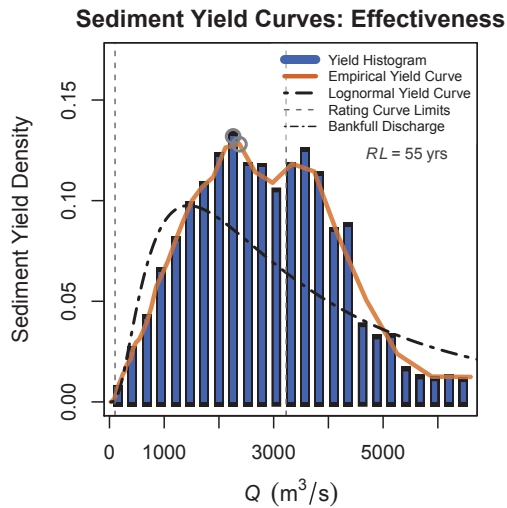
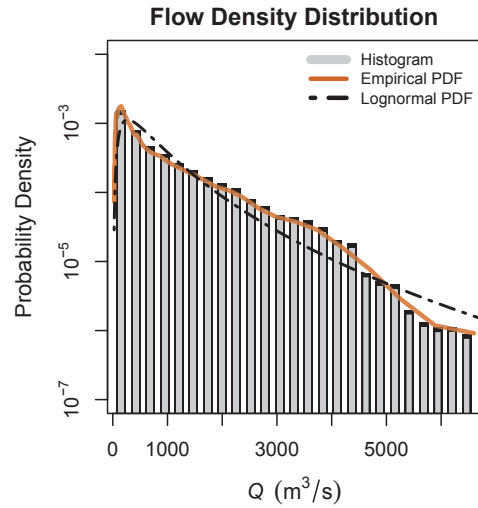
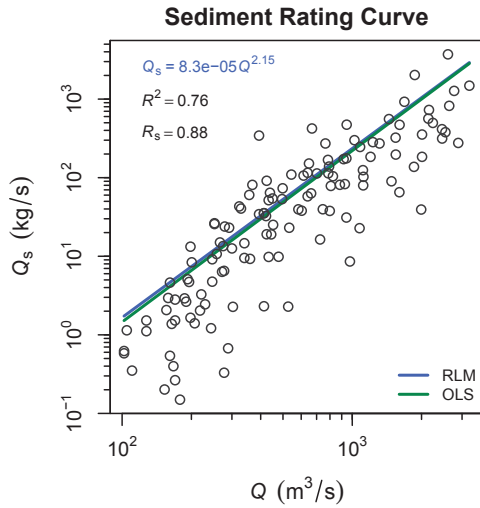
Suspended Load Sites

Red River at Index, AR: 07337000



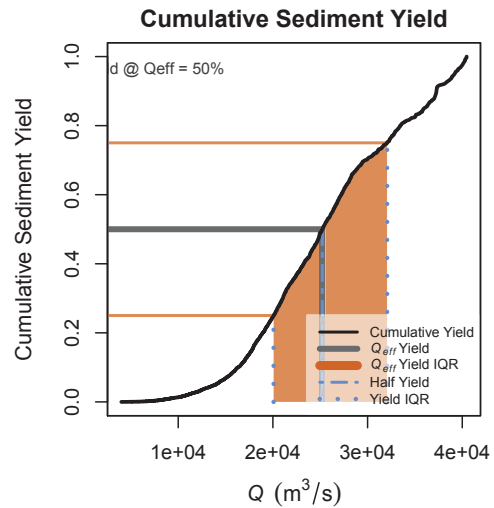
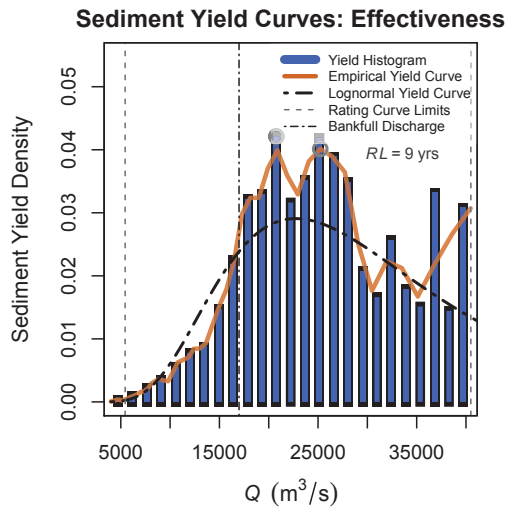
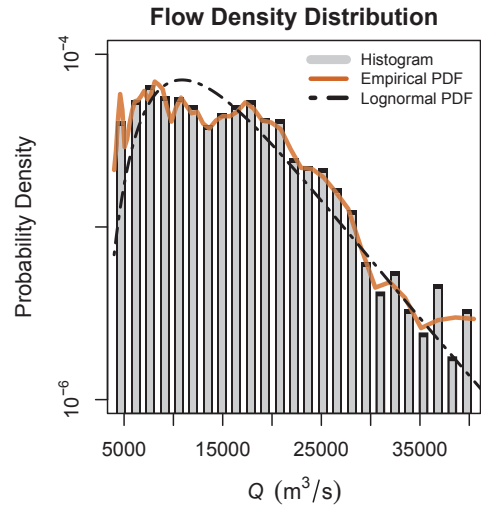
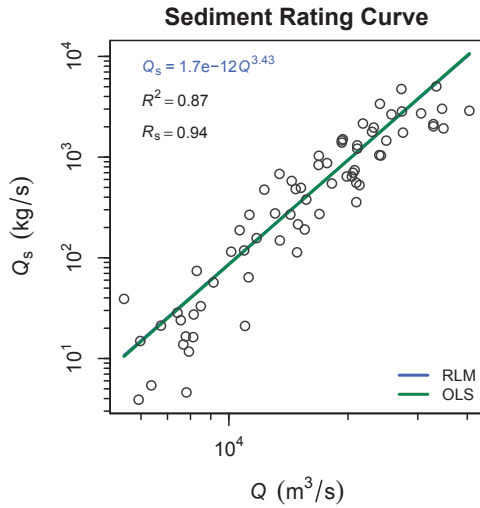
Suspended Load Sites

RED R @ ALEXANDRIA, LA: 07355500



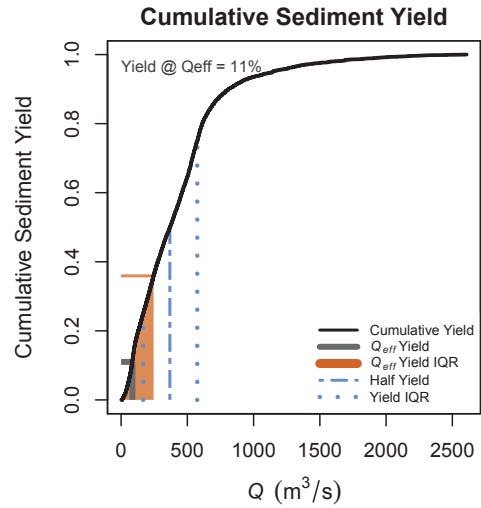
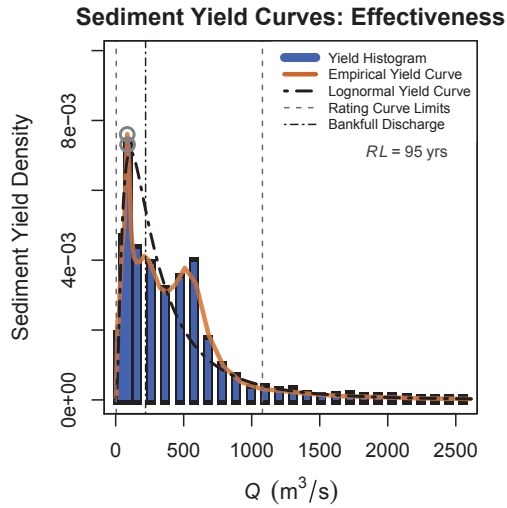
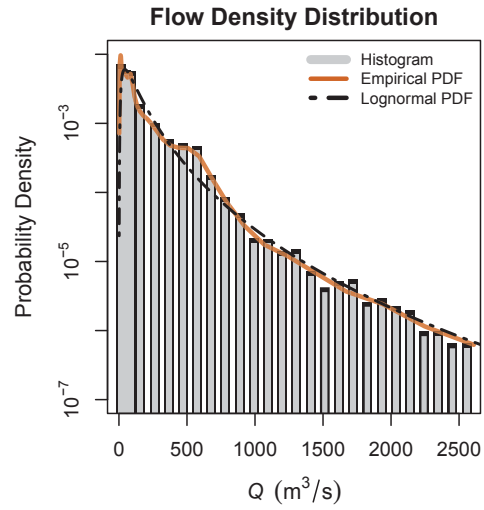
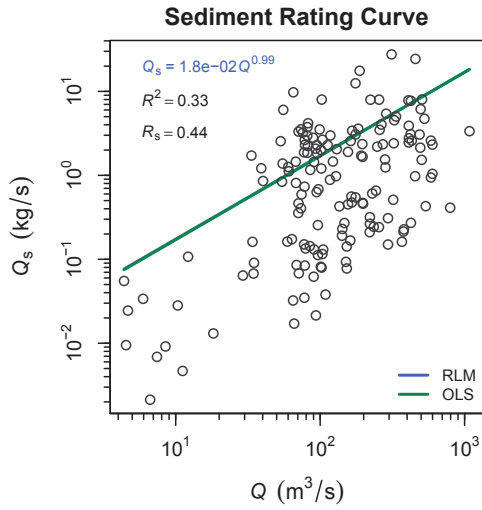
Suspended Load Sites

Mississippi River at Baton Rouge, LA: 07374000



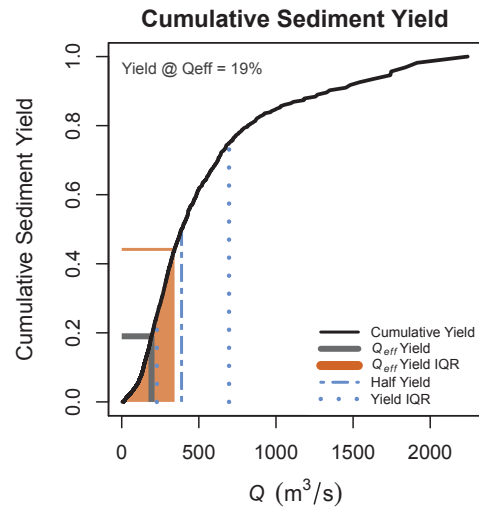
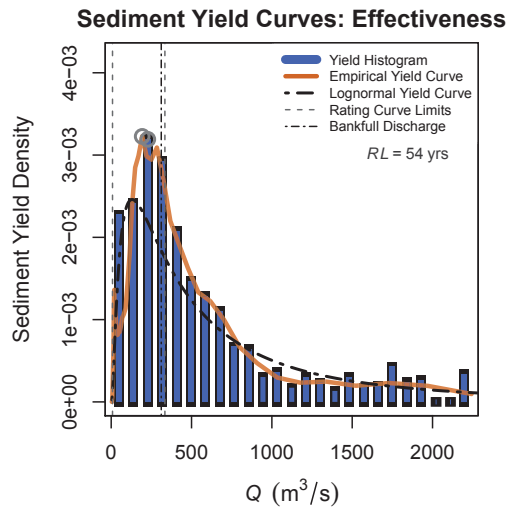
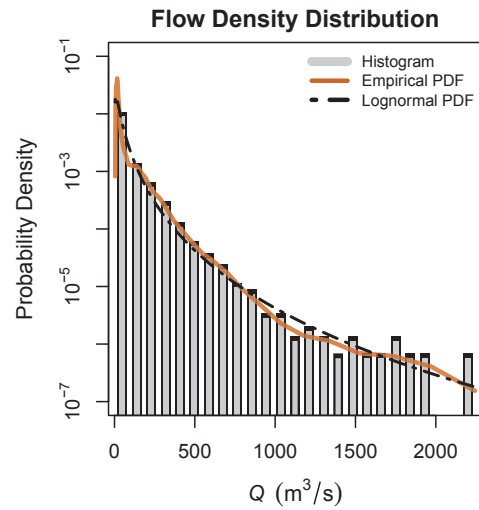
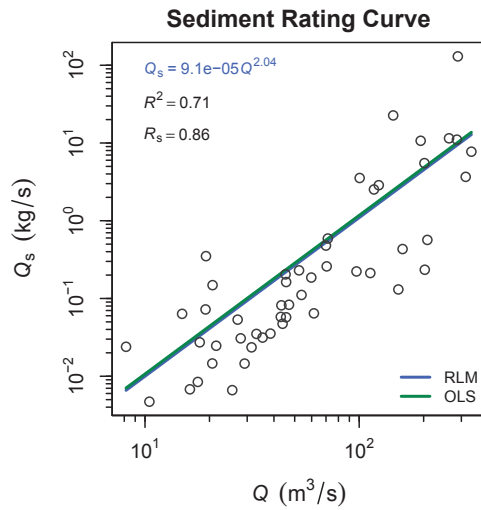
Suspended Load Sites

Neches Rv at Evadale, TX: 08041000



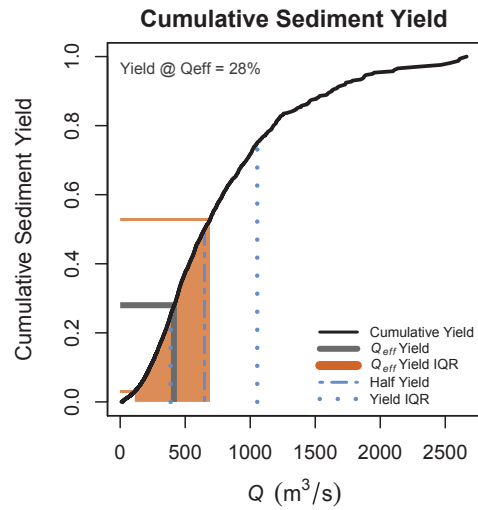
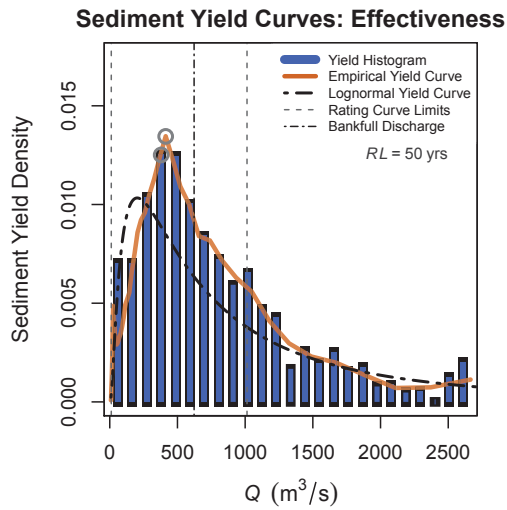
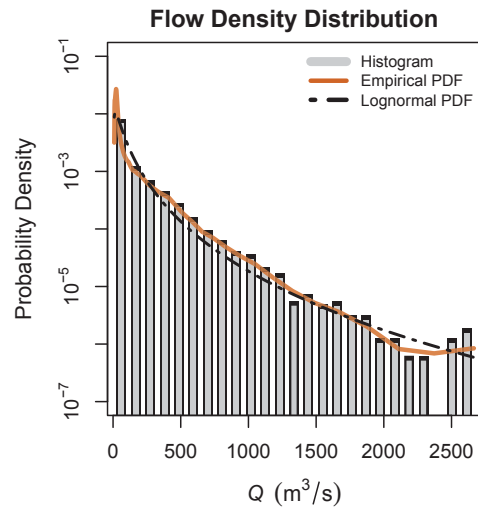
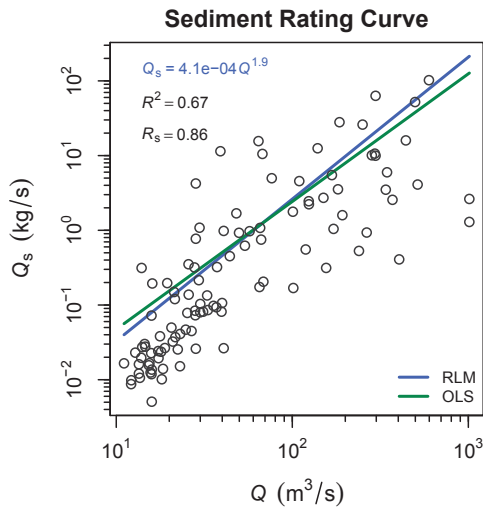
Suspended Load Sites

Trinity Rv bl Dallas, TX: 08057410



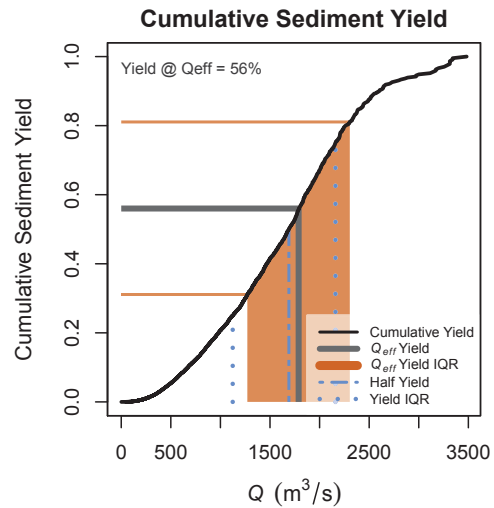
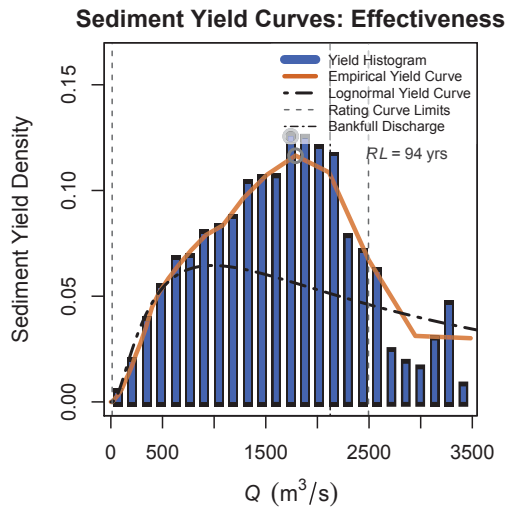
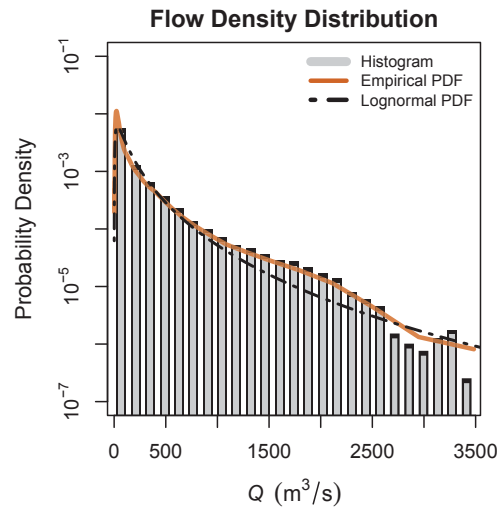
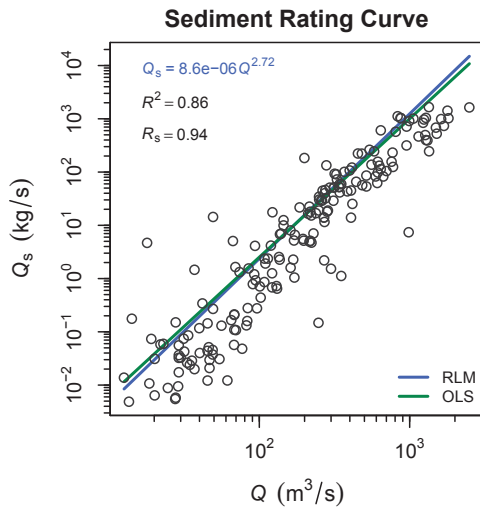
Suspended Load Sites

Trinity Rv at Trinidad, TX: 08062700



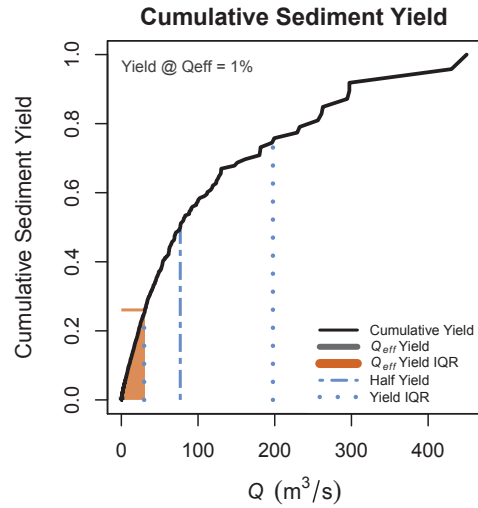
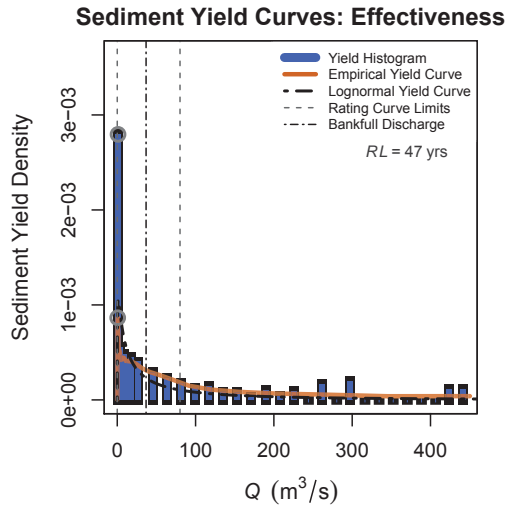
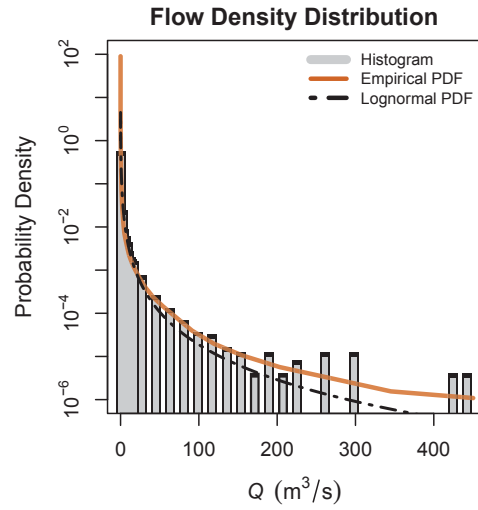
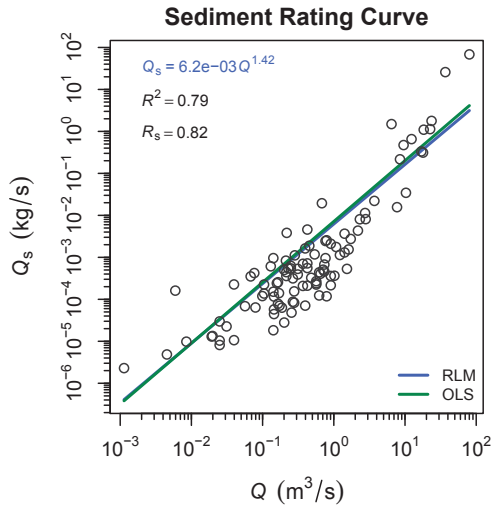
Suspended Load Sites

Brazos Rv at Richmond, TX: 08114000



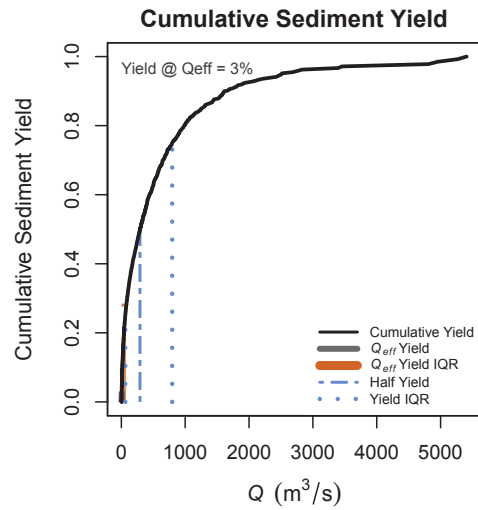
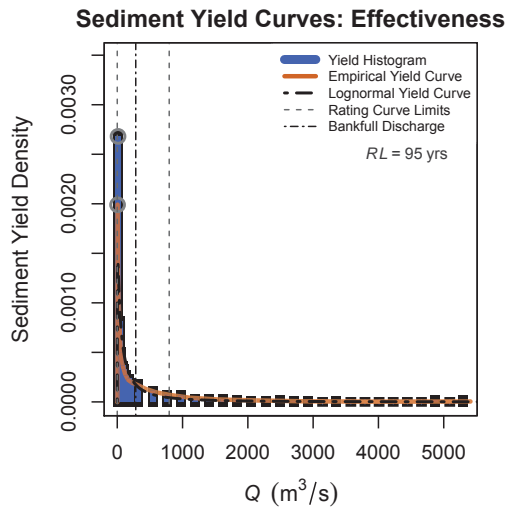
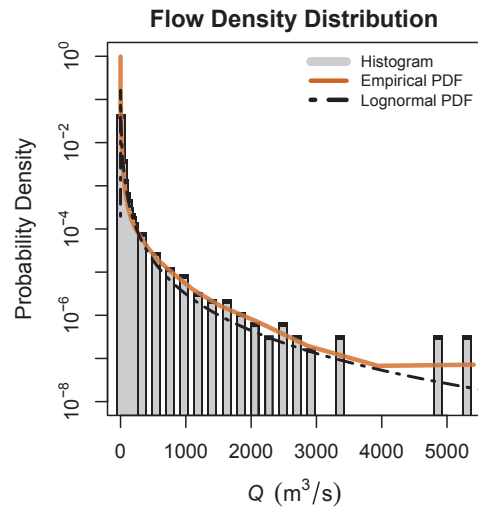
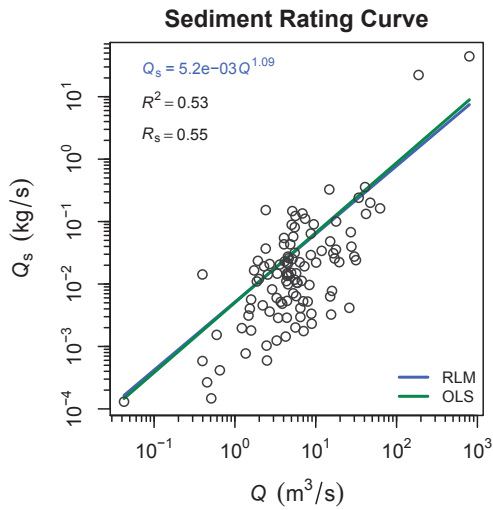
Suspended Load Sites

Colorado Rv abv Silver, TX: 08123850



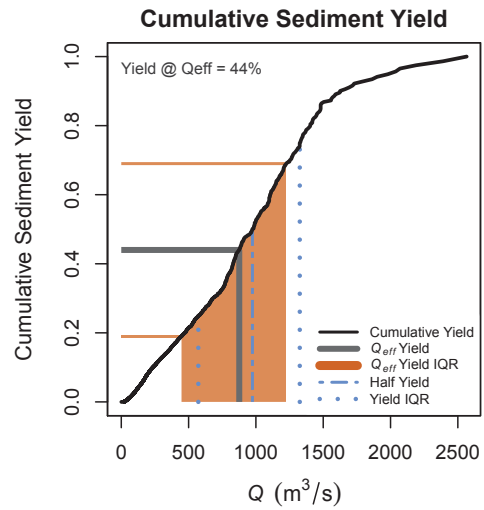
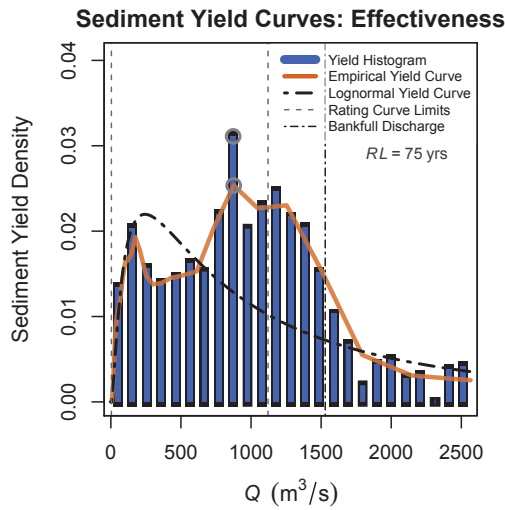
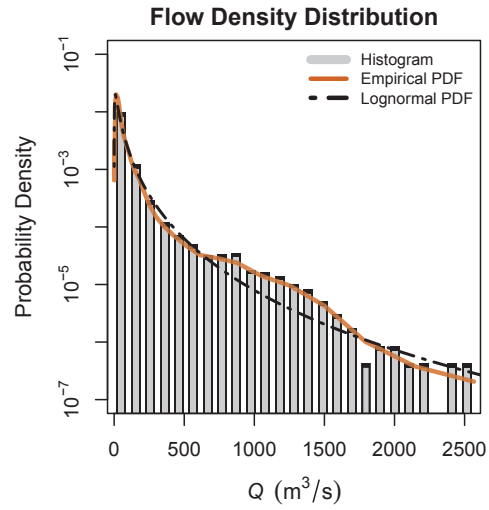
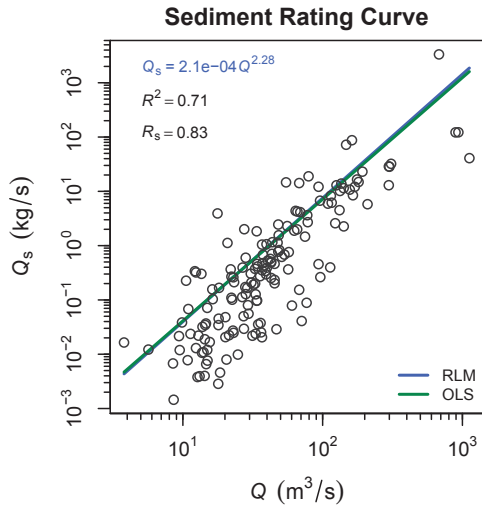
Suspended Load Sites

Colorado Rv nr San Saba, TX: 08147000



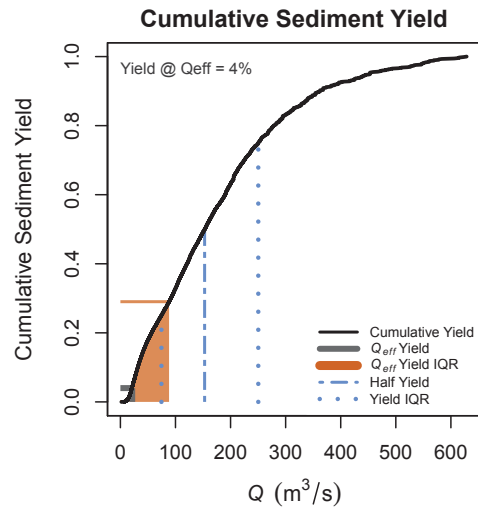
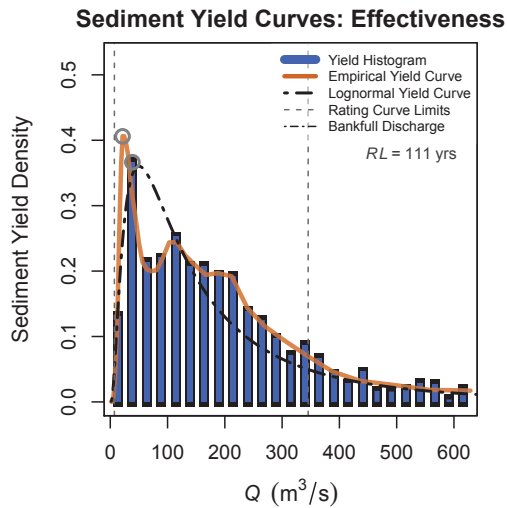
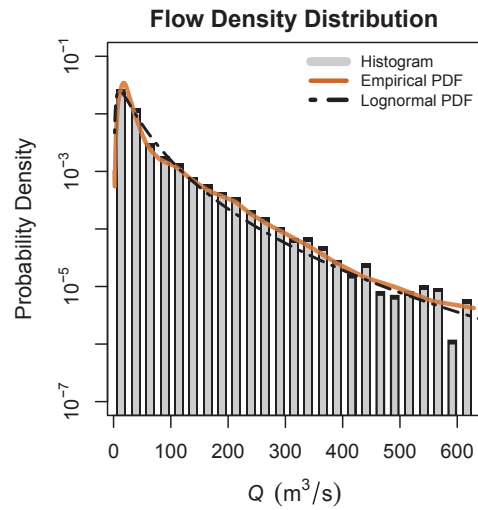
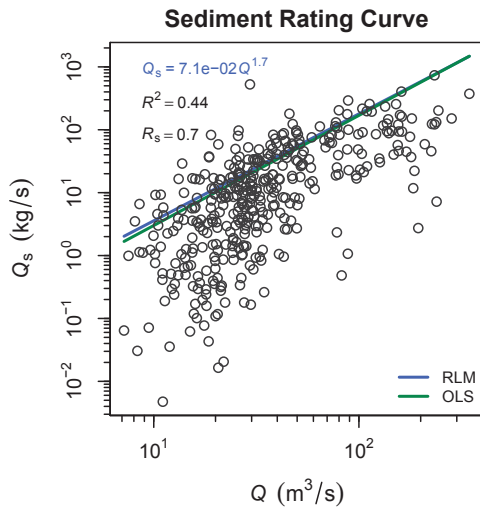
Suspended Load Sites

Colorado Rv at Wharton, TX: 08162000



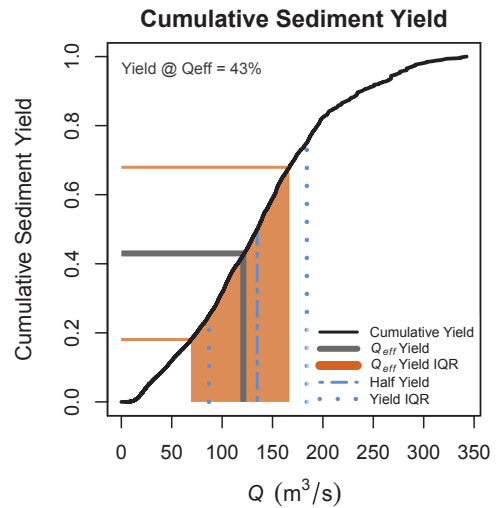
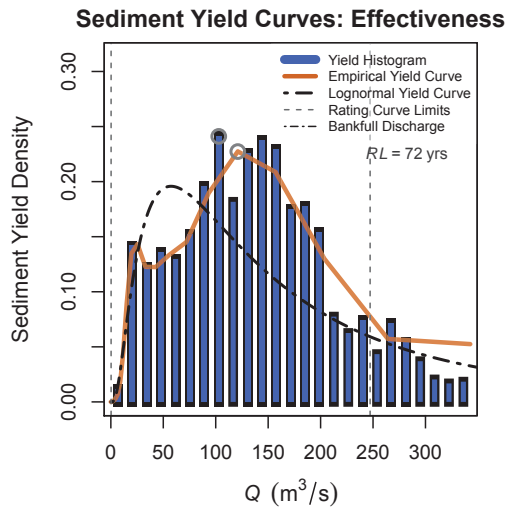
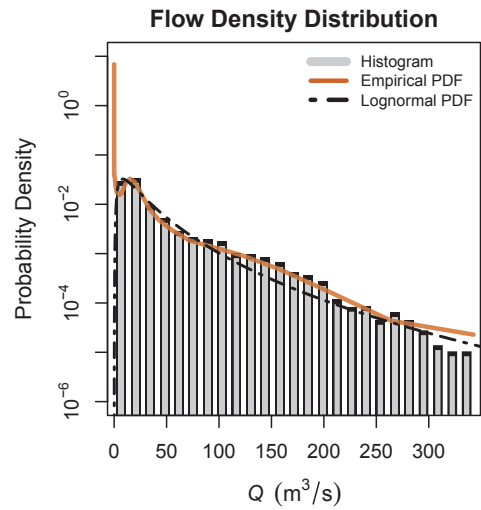
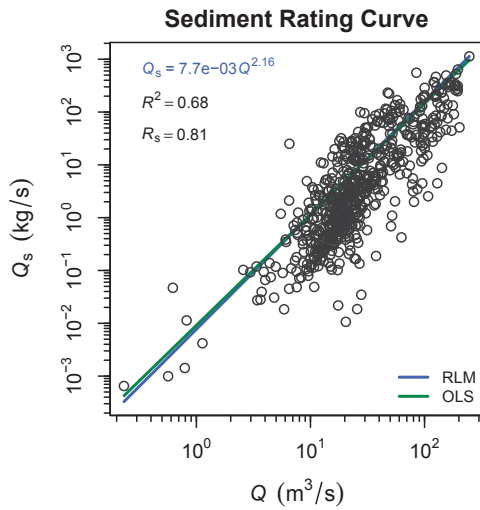
Suspended Load Sites

RIO GRANDE AT OTOWI BRIDGE, NM: 08313000



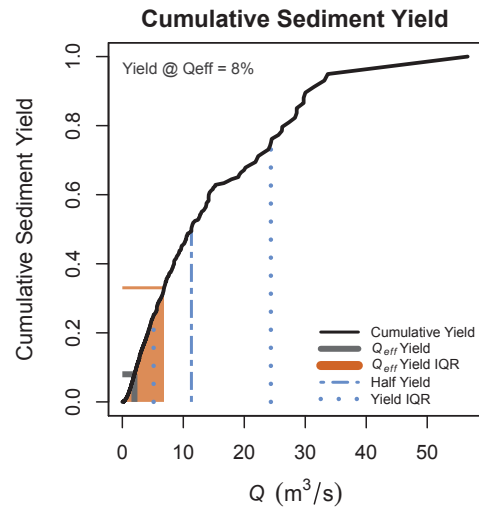
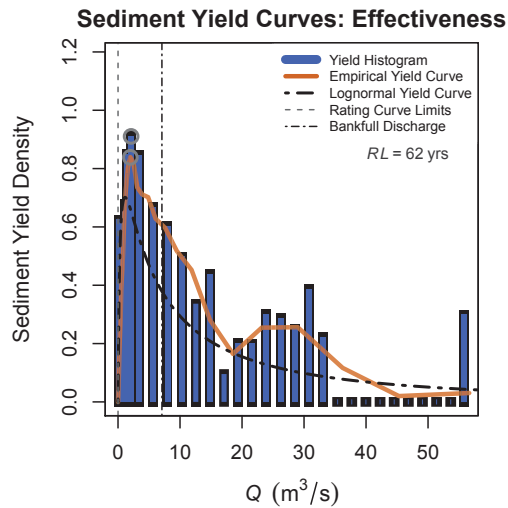
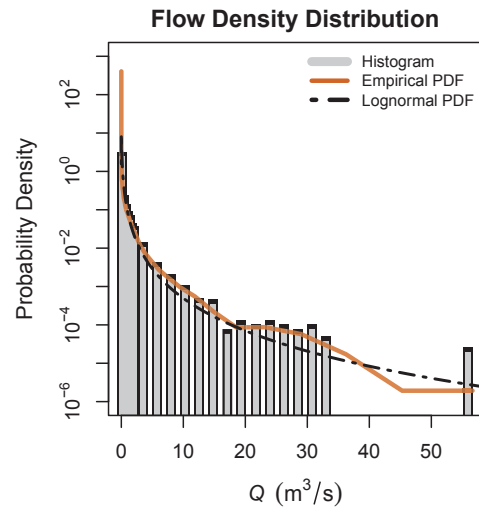
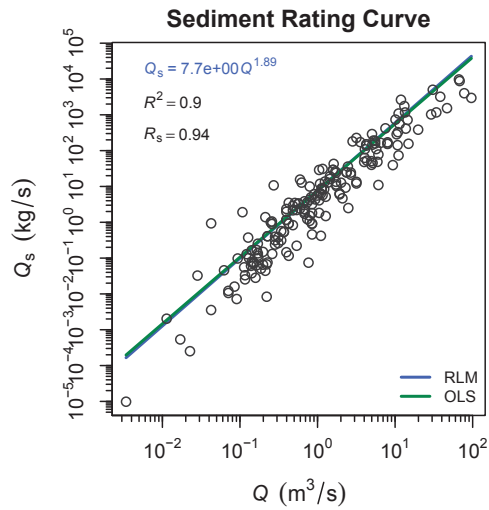
Suspended Load Sites

RIO GRANDE AT ALBUQUERQUE, NM: 08330000



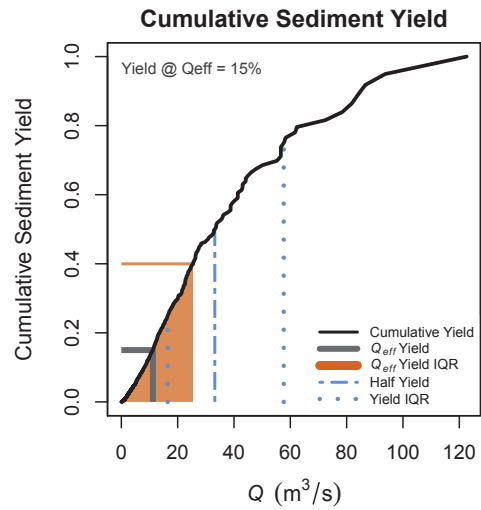
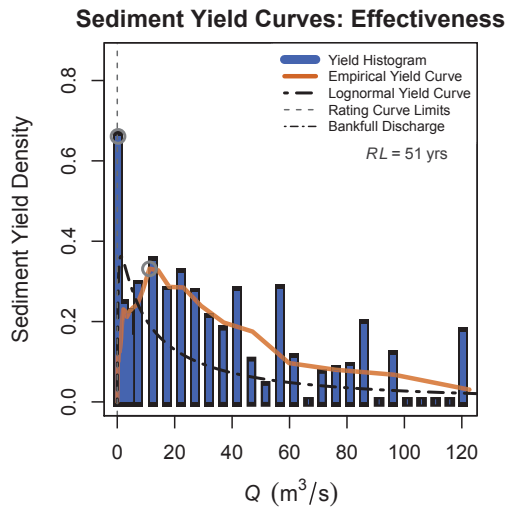
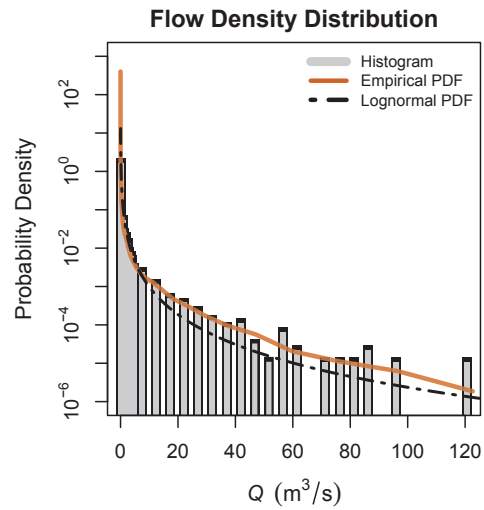
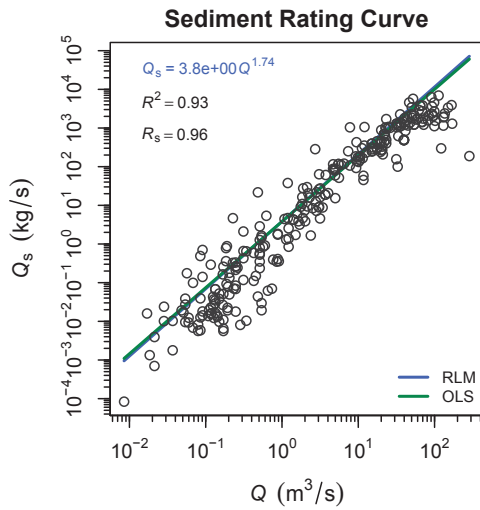
Suspended Load Sites

RIO PUERCO ABV ARROYO CHICO NR GUADALUPE, NM: 08334000



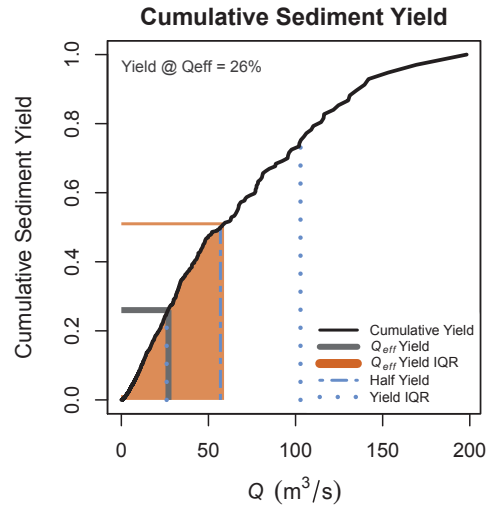
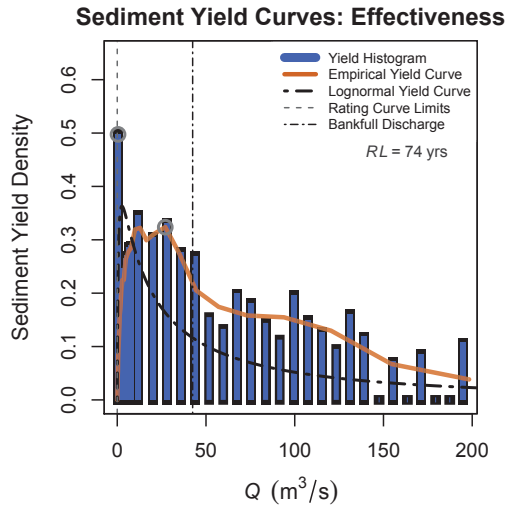
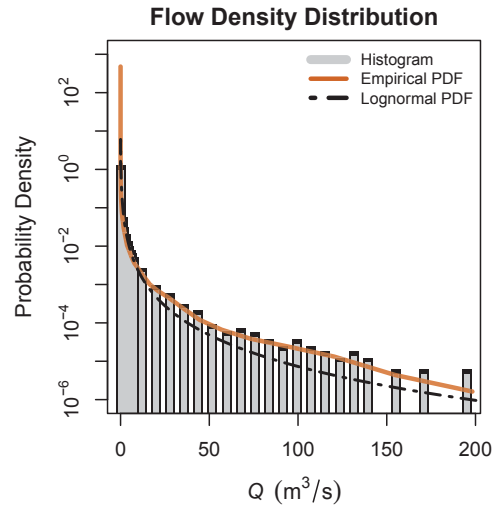
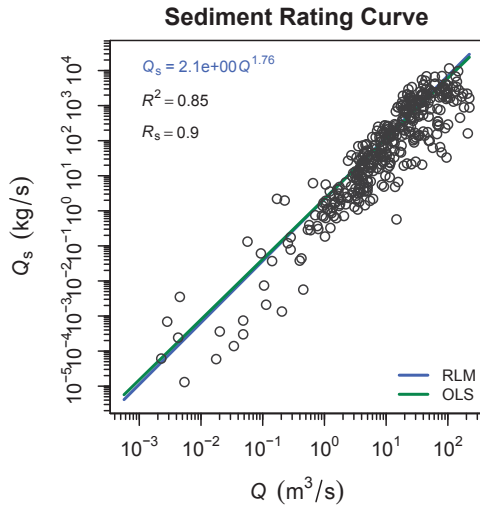
Suspended Load Sites

ARROYO CHICO NR GUADALUPE, NM: 08340500



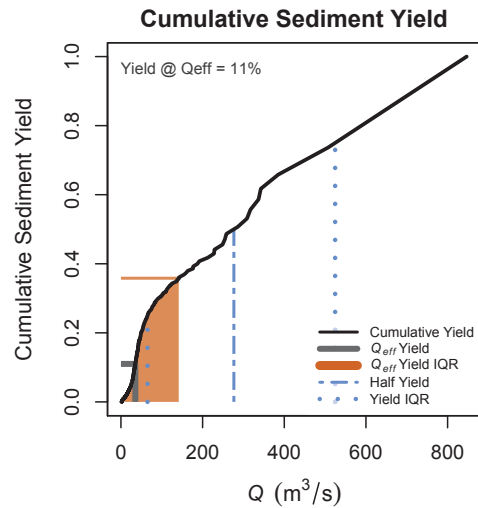
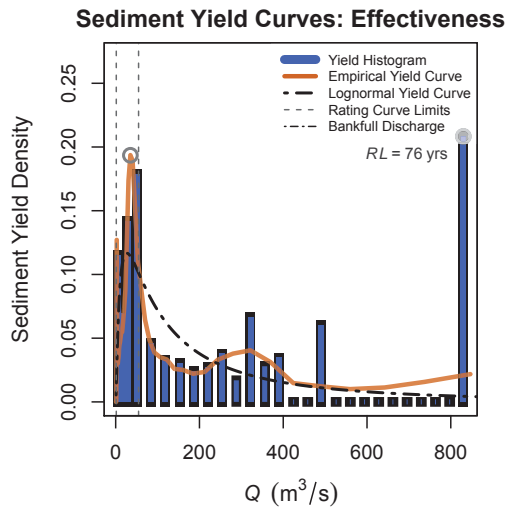
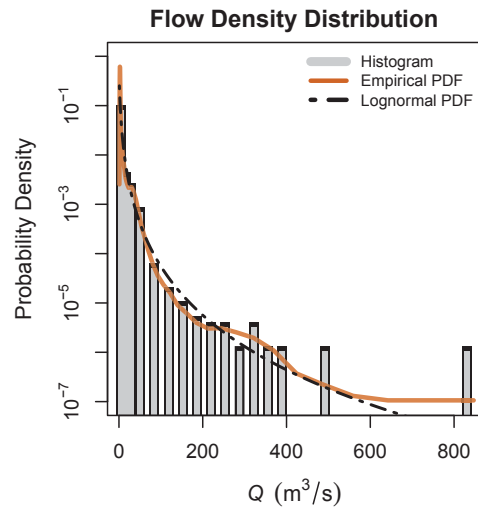
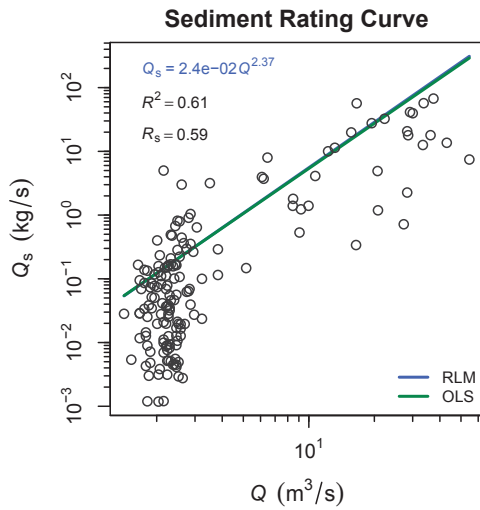
Suspended Load Sites

RIO PUERCO NEAR BERNARDO, NM: 08353000



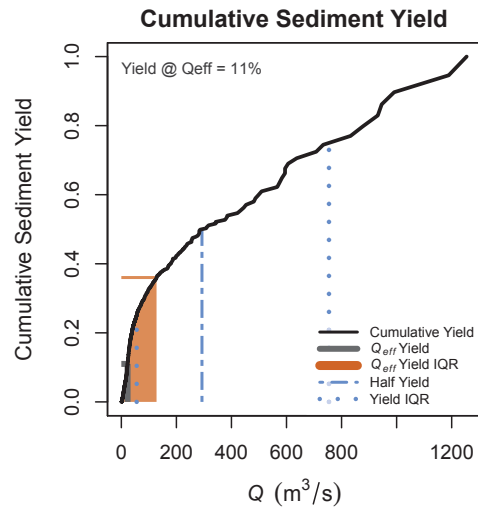
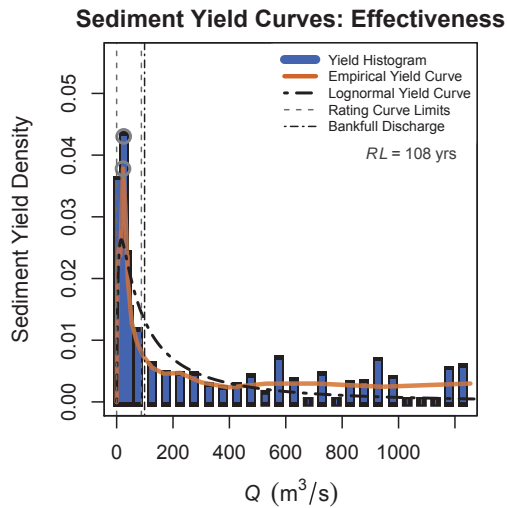
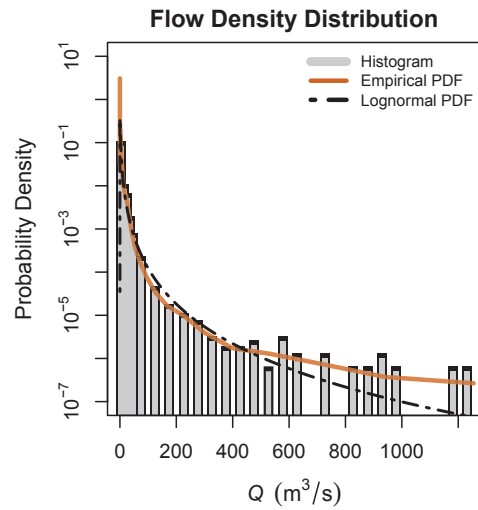
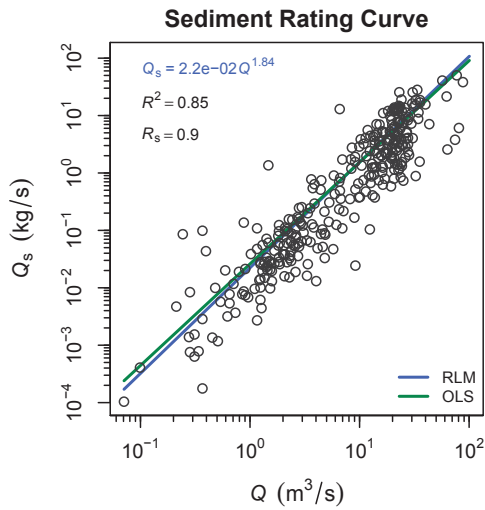
Suspended Load Sites

PECOS RIVER NEAR PUERTO DE LUNA, NM: 08383500



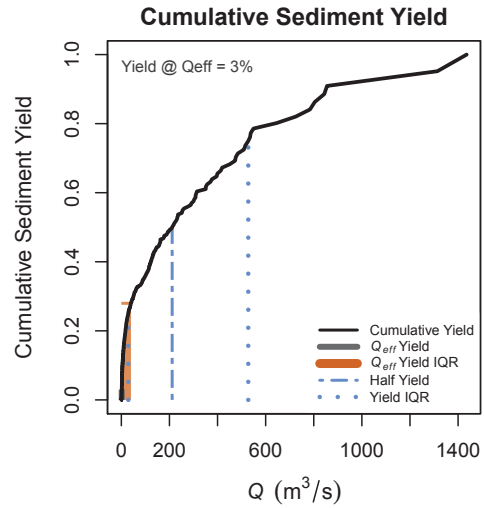
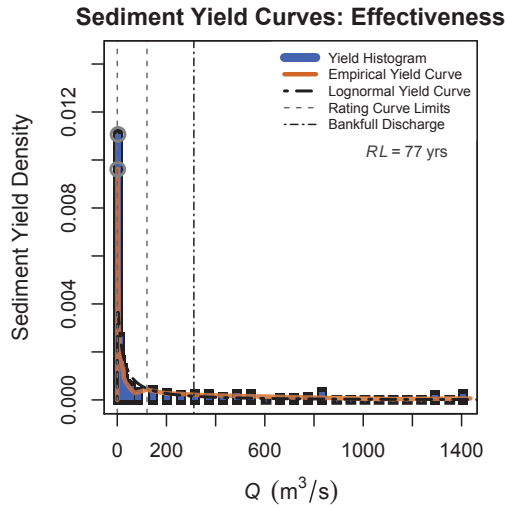
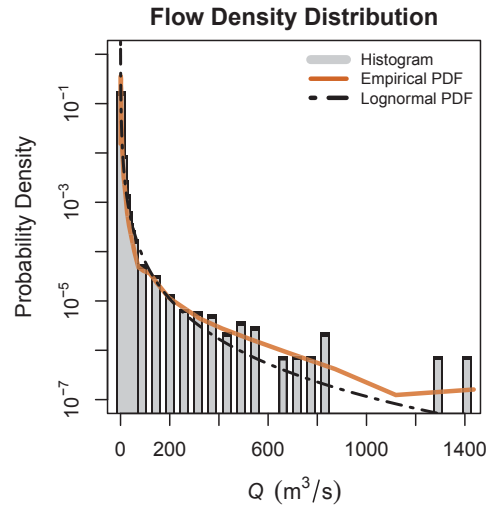
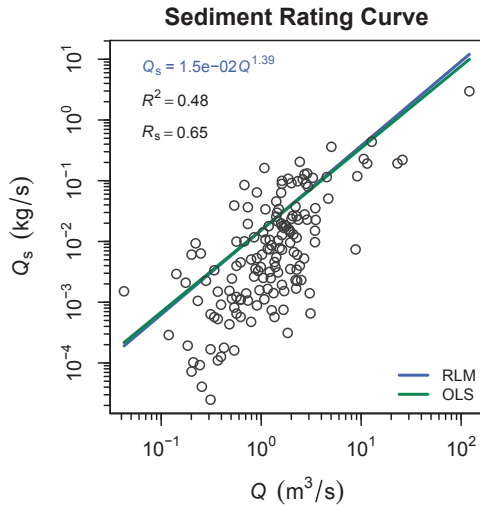
Suspended Load Sites

PECOS RIVER NEAR ARTESIA, NM: 08396500



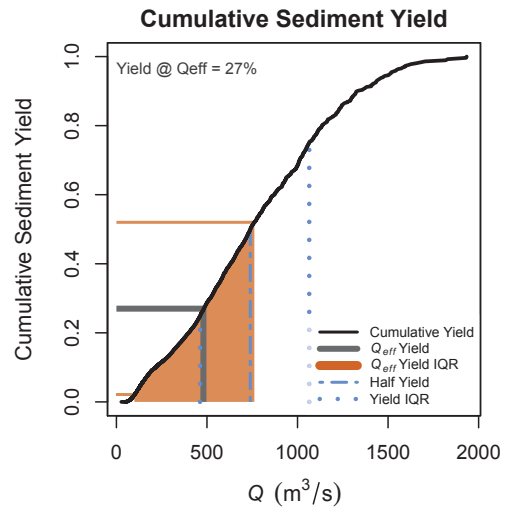
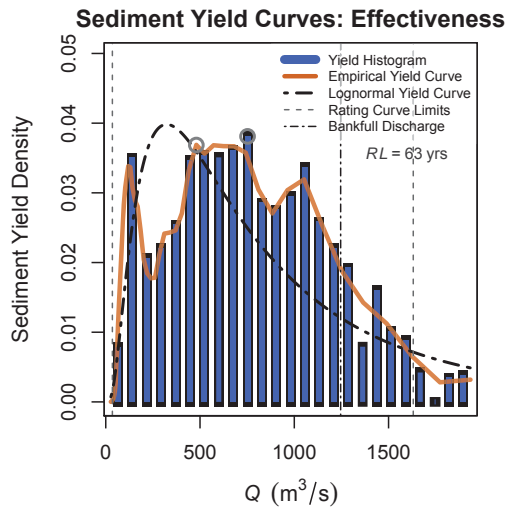
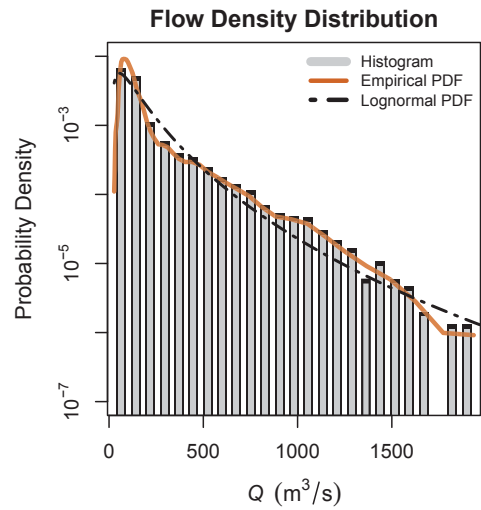
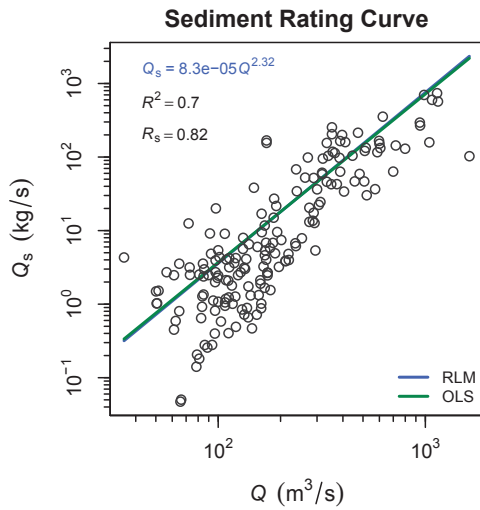
Suspended Load Sites

PECOS RIVER AT RED BLUFF, NM: 08407500



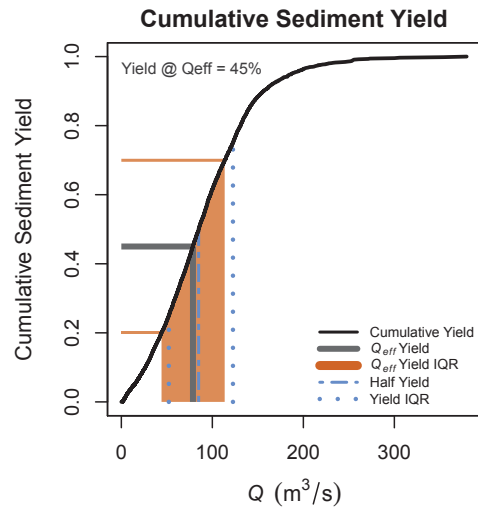
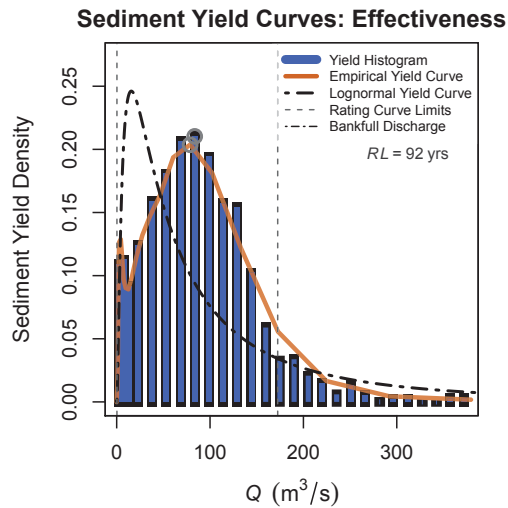
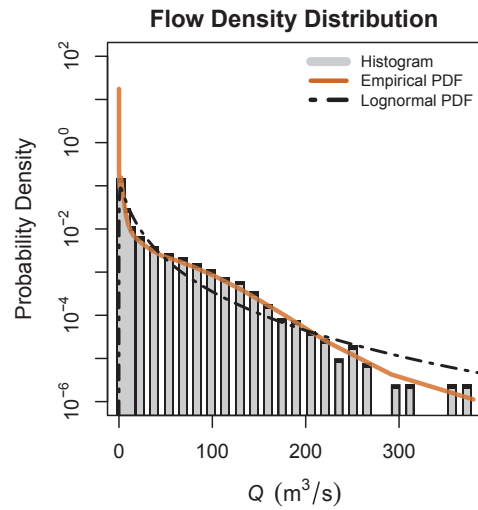
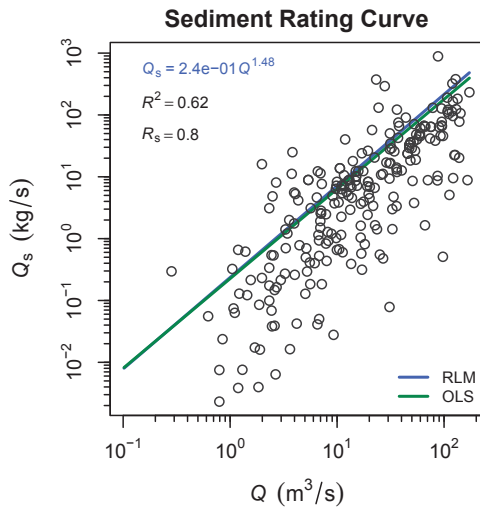
Suspended Load Sites

COLORADO RIVER NEAR COLORADO-UTAH STATE LINE: 09163500



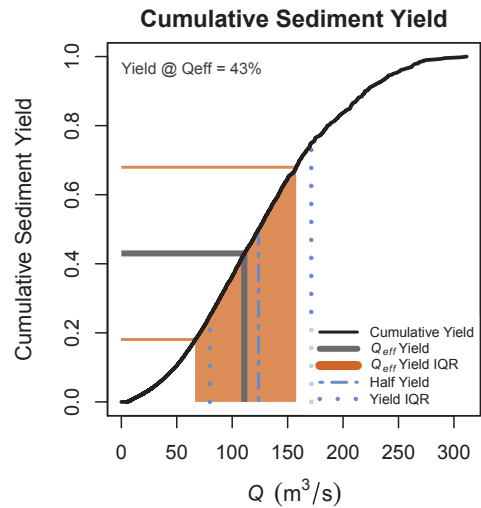
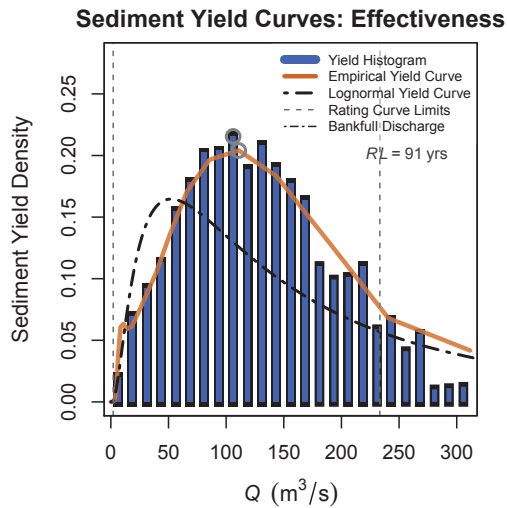
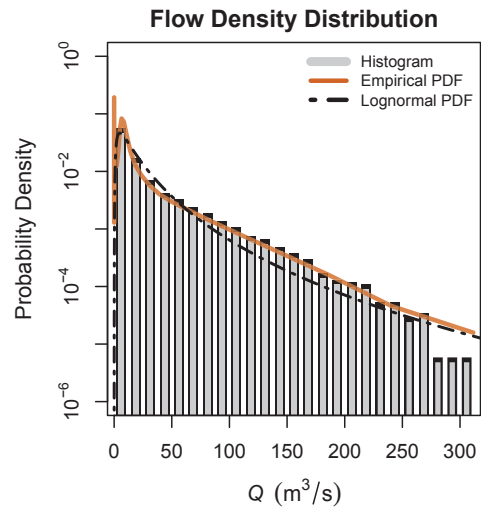
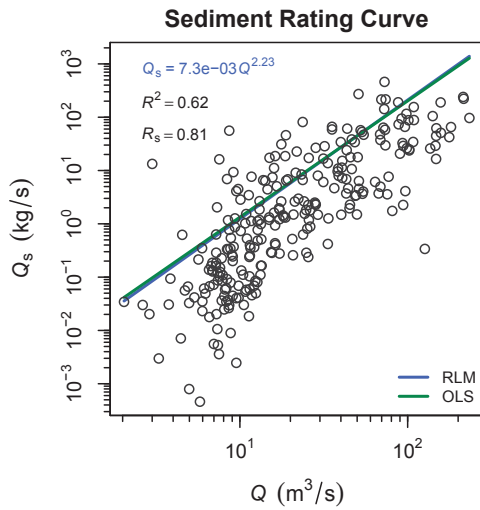
Suspended Load Sites

LITTLE SNAKE RIVER NEAR LILY, CO: 09260000



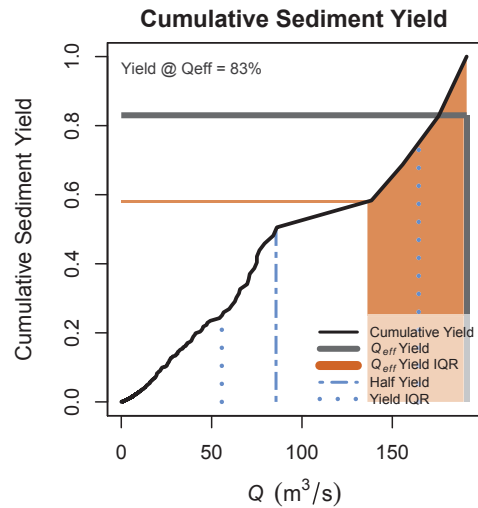
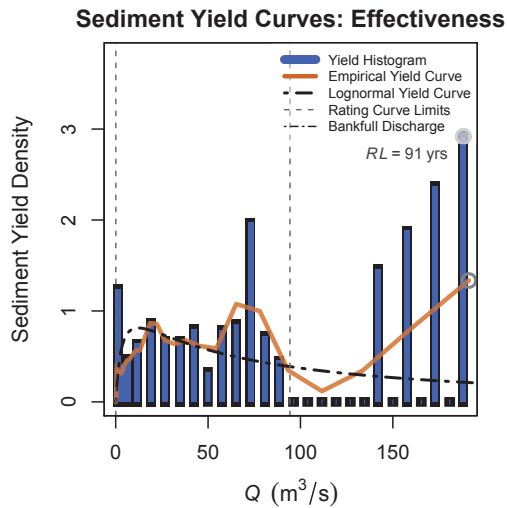
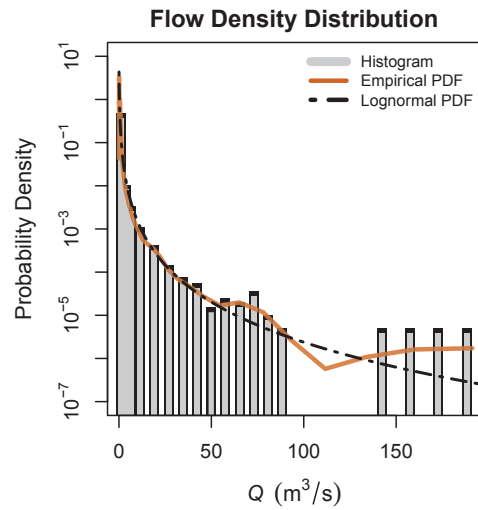
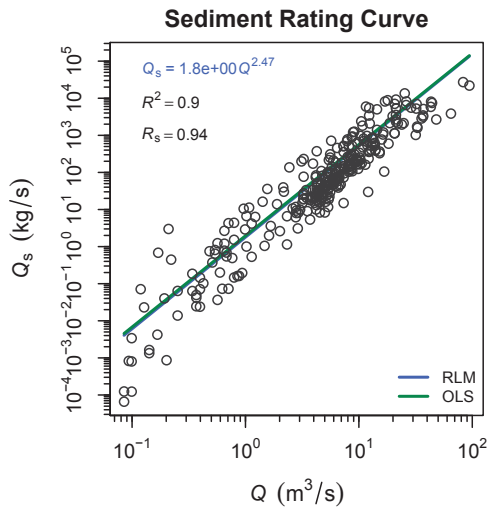
Suspended Load Sites

ANIMAS RIVER AT FARMINGTON, NM: 09364500



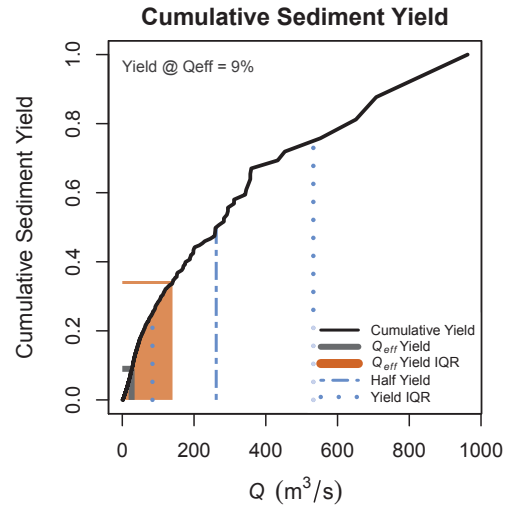
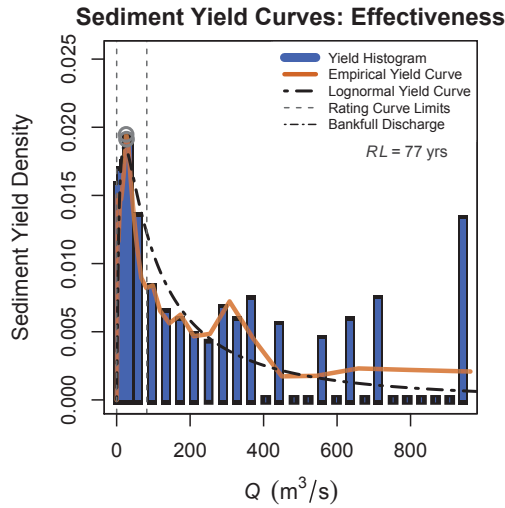
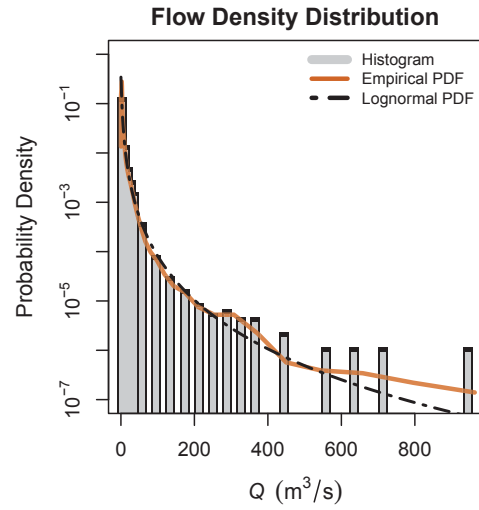
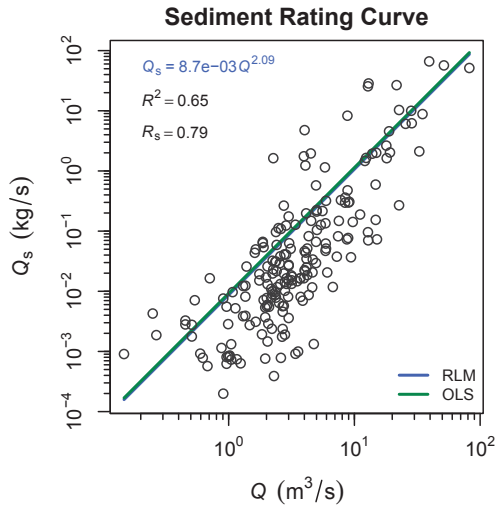
Suspended Load Sites

PARIA RIVER AT LEES FERRY, AZ: 09382000



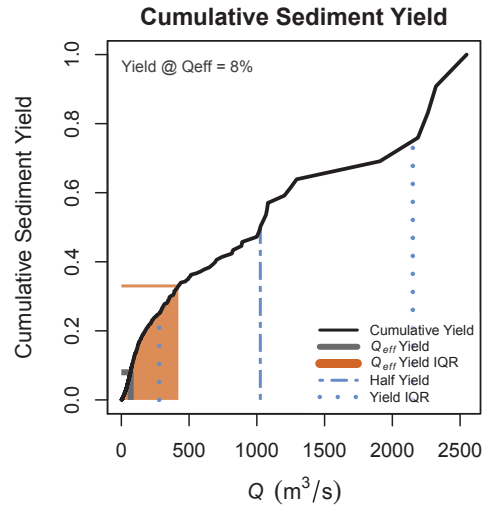
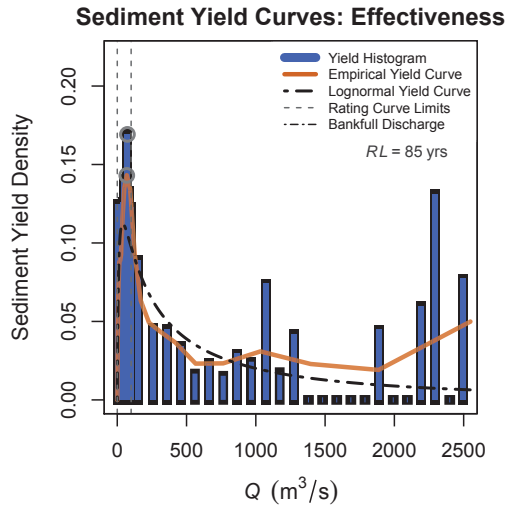
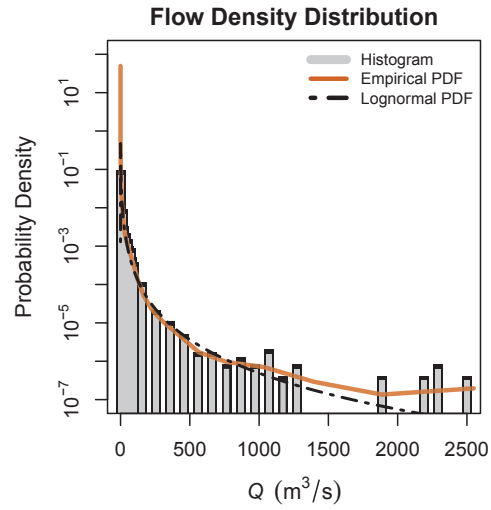
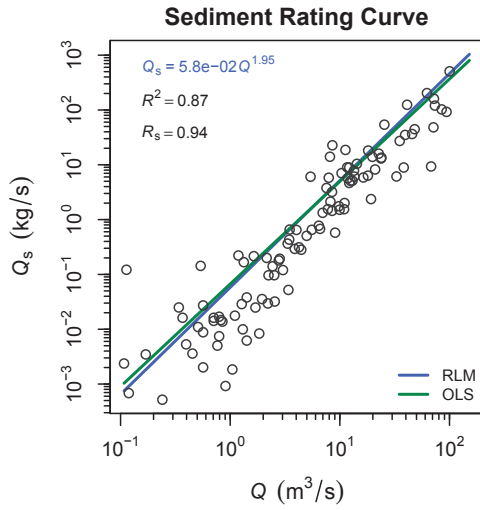
Suspended Load Sites

GILA RIVER NEAR REDROCK, NM: 09431500



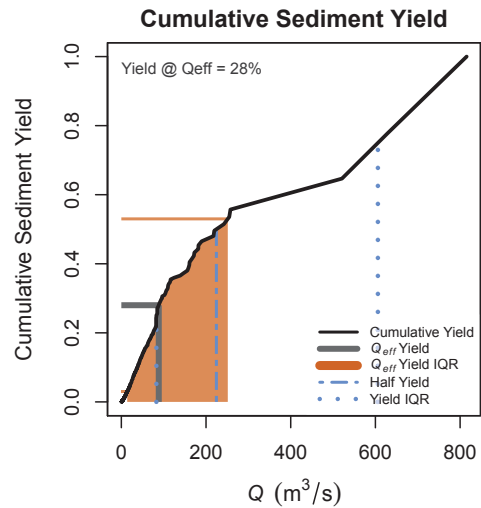
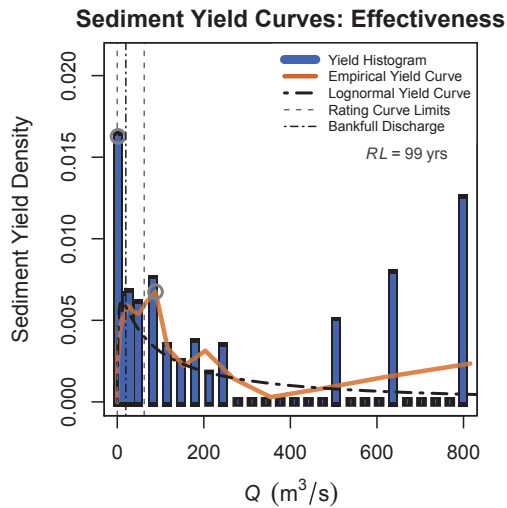
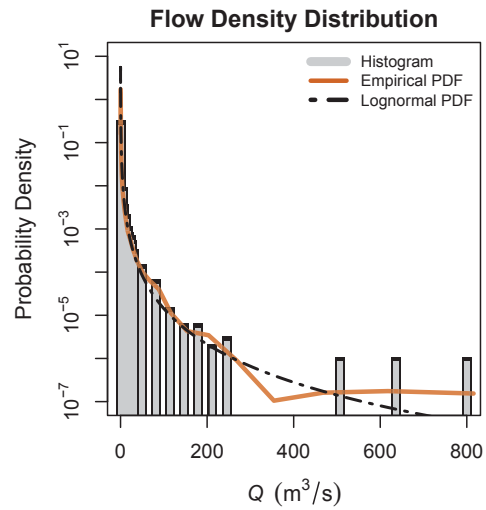
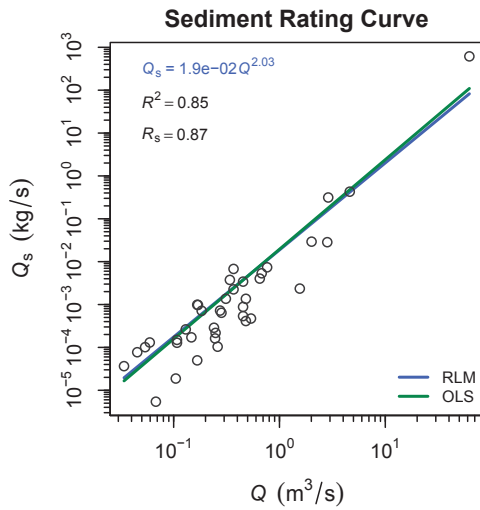
Suspended Load Sites

GILA RIVER AT CALVA, AZ.: 09466500



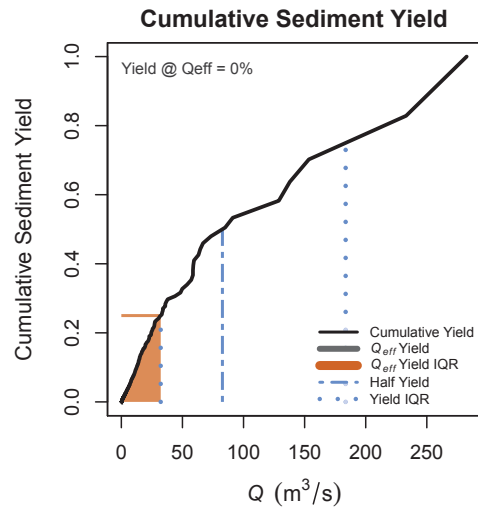
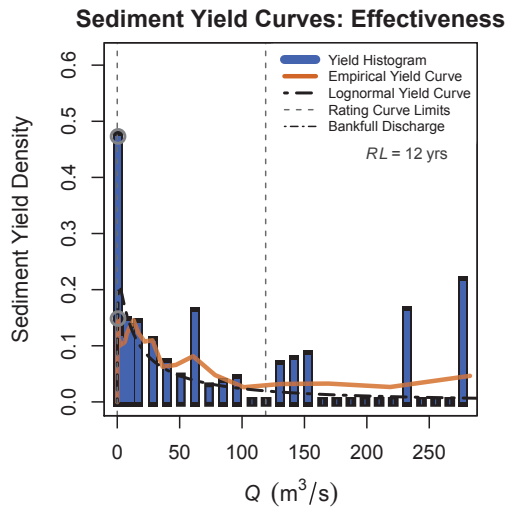
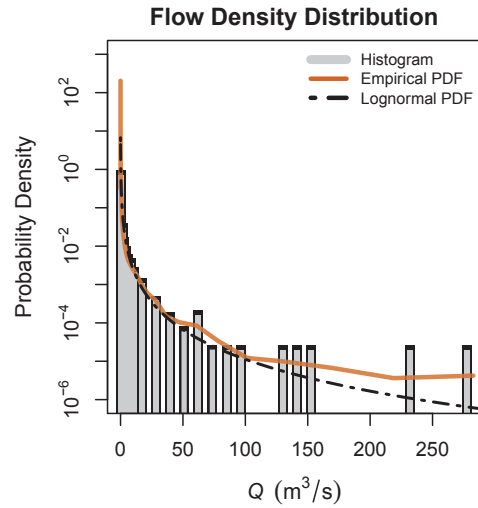
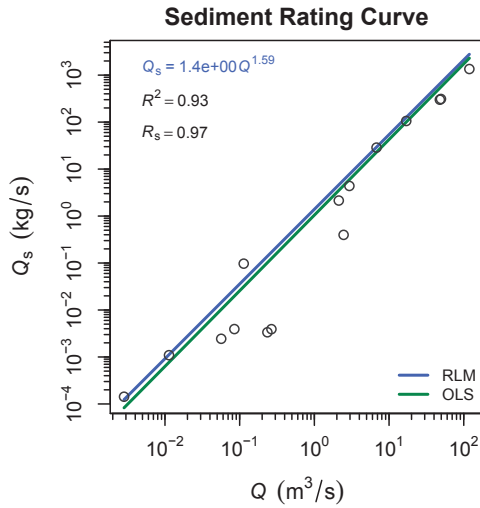
Suspended Load Sites

SAN PEDRO RIVER AT CHARLESTON, AZ.: 09471000



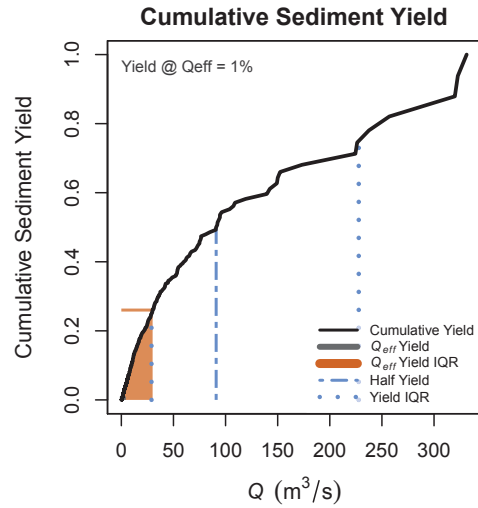
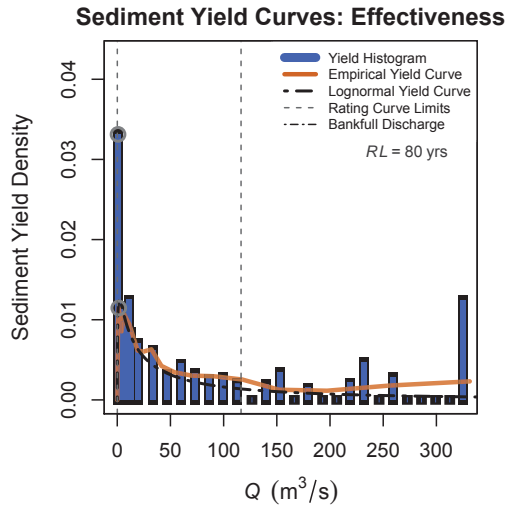
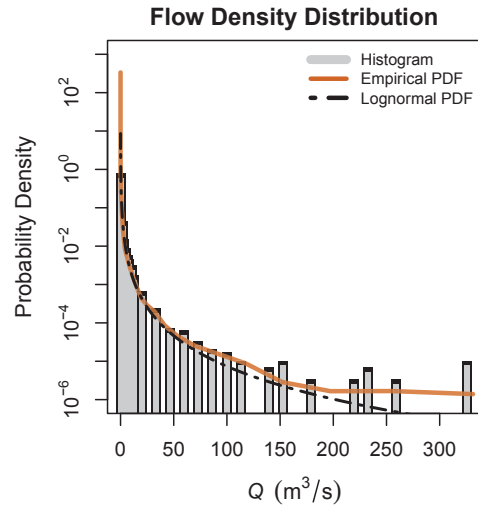
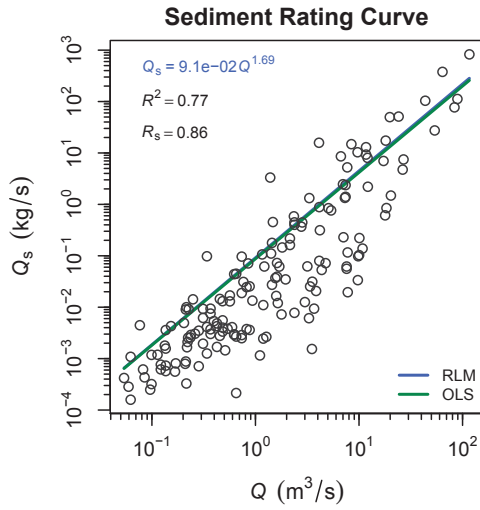
Suspended Load Sites

SAN PEDRO R AT WINKELMAN, ARIZ.: 09473500



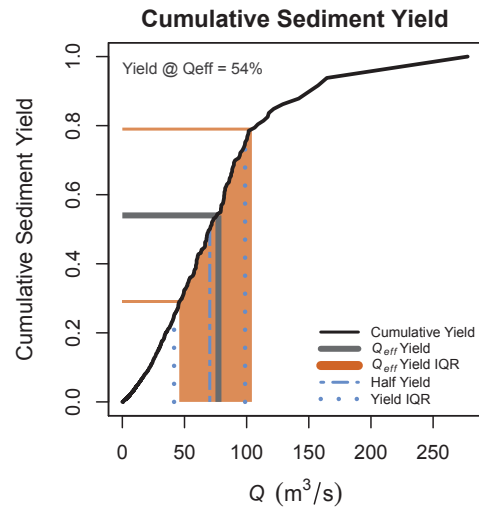
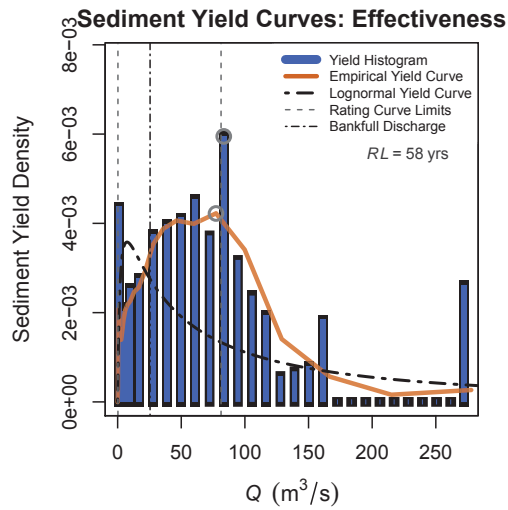
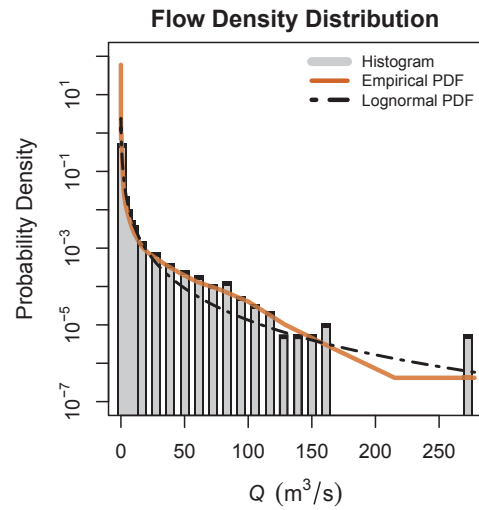
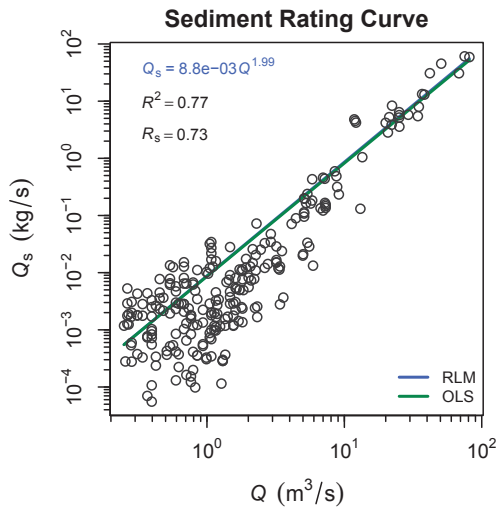
Suspended Load Sites

SAN LUIS REY R A OCEANSIDE CA: 11042000



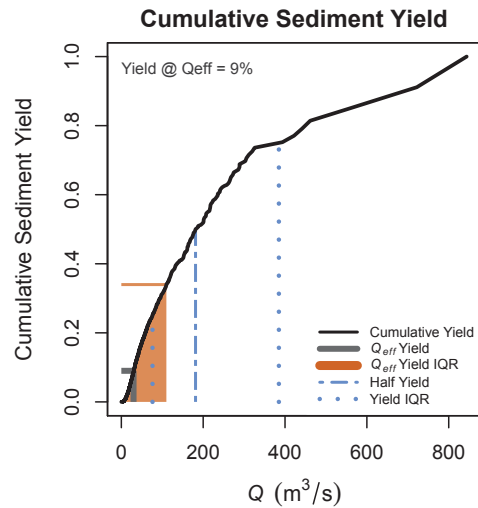
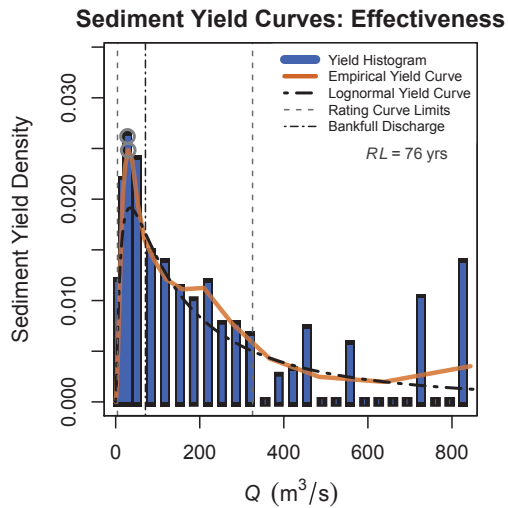
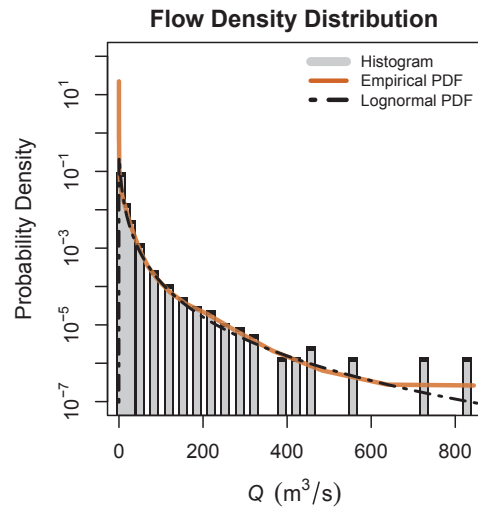
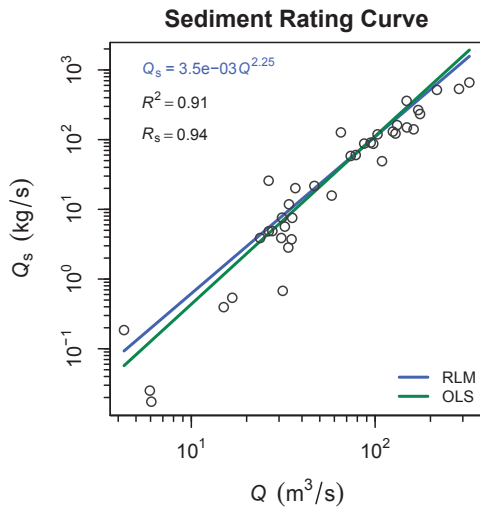
Suspended Load Sites

ARROYO DE LA LAGUNA A VERONA CA: 11176900



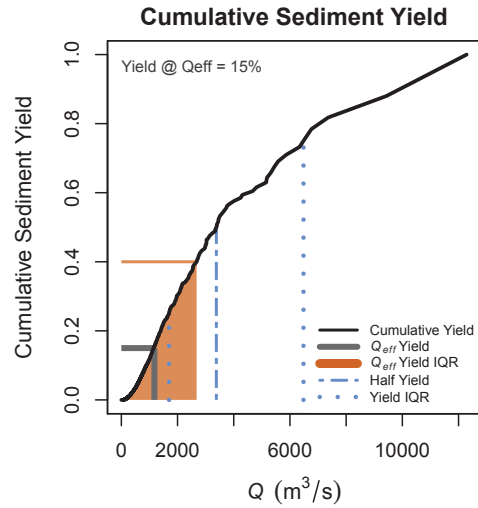
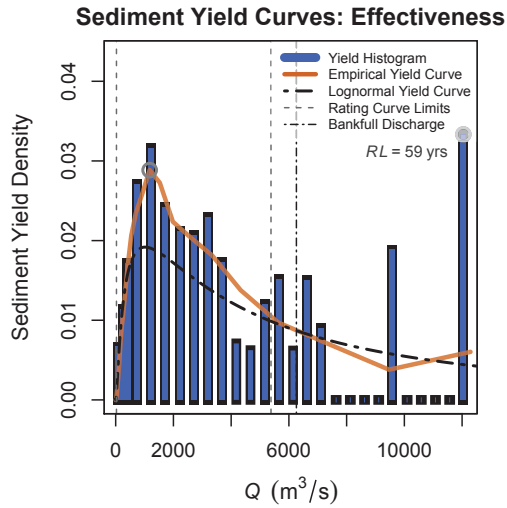
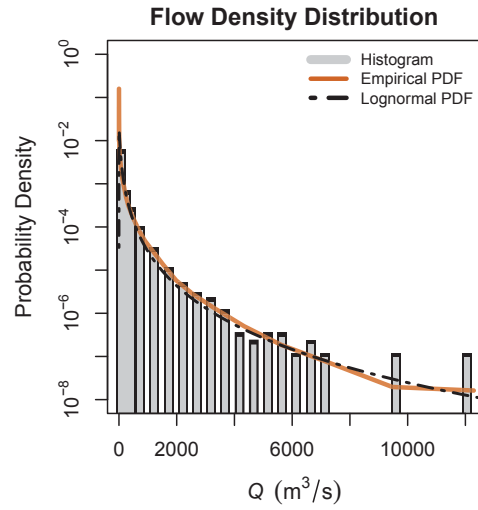
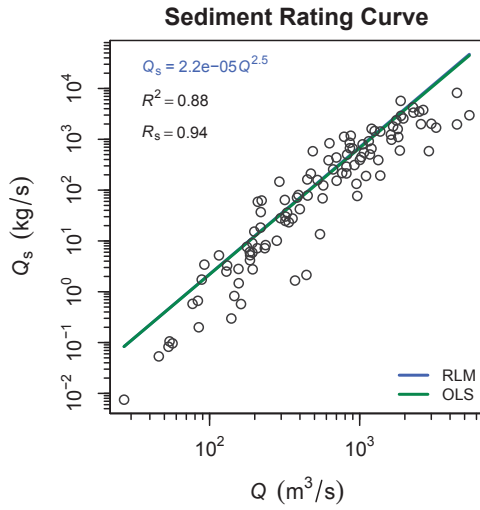
Suspended Load Sites

THOMES C A PASKENTA CA: 11382000



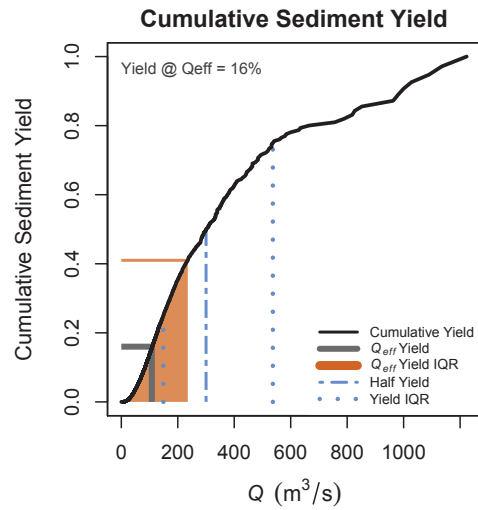
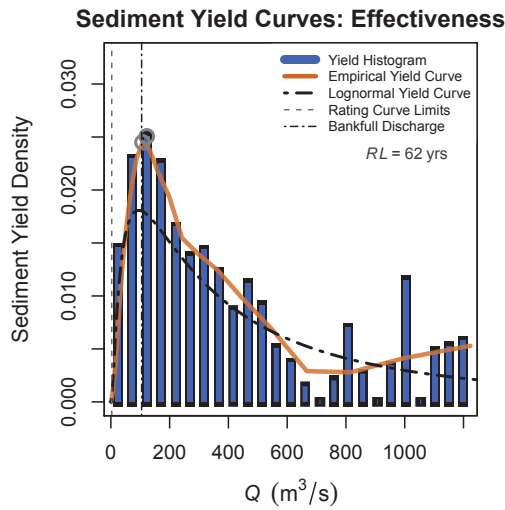
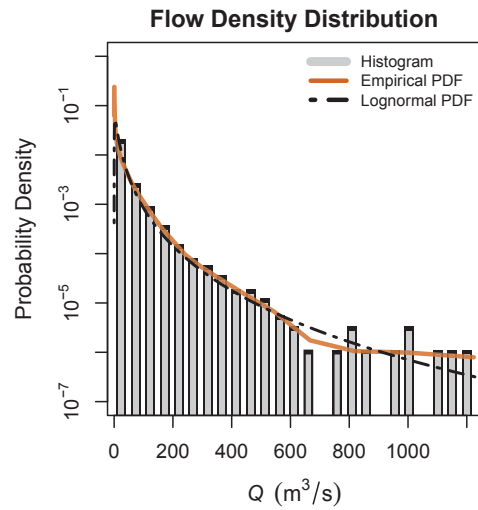
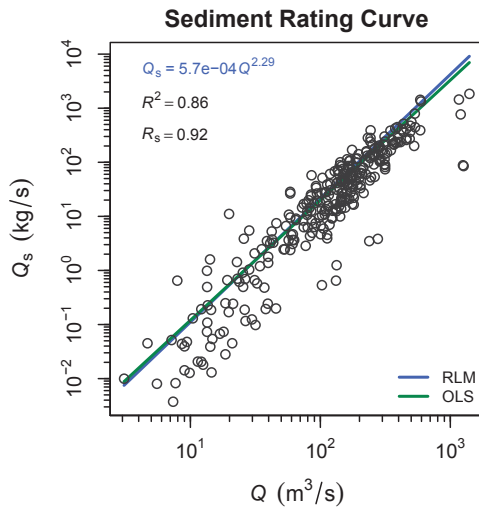
Suspended Load Sites

EEL R A FORT SEWARD CA: 11475000



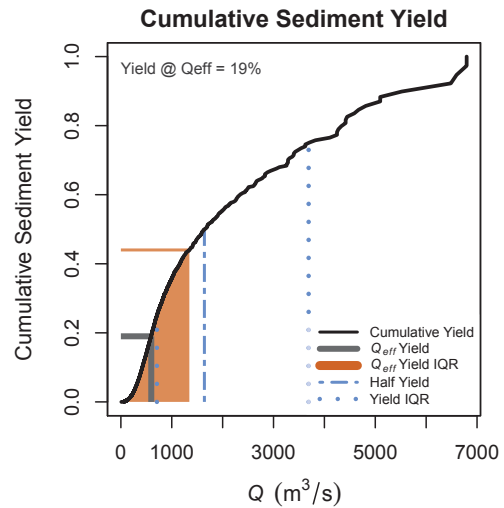
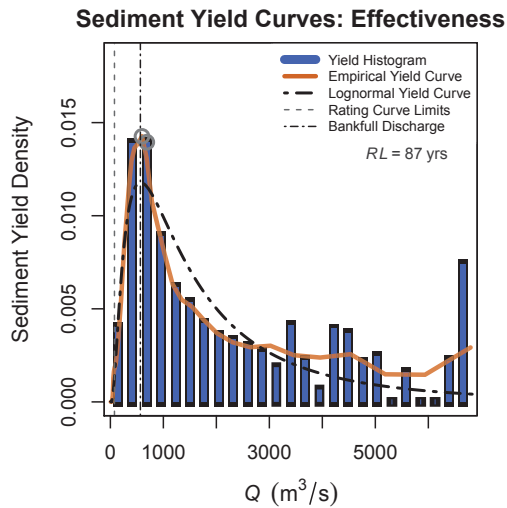
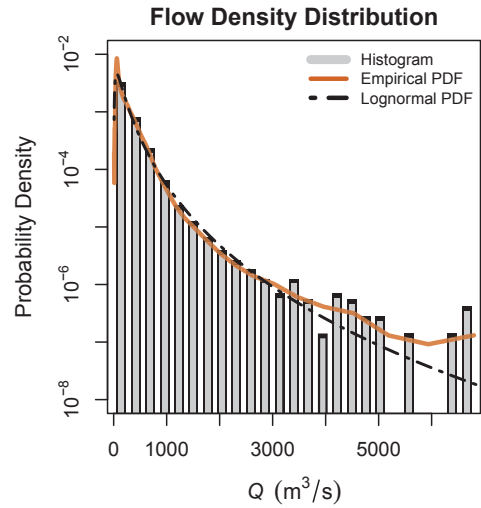
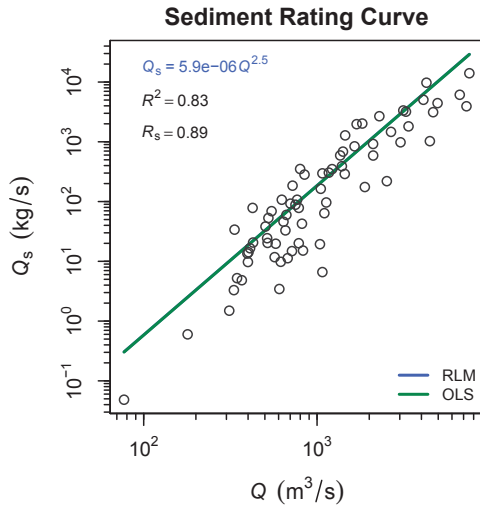
Suspended Load Sites

REDWOOD C A ORICK CA: 11482500



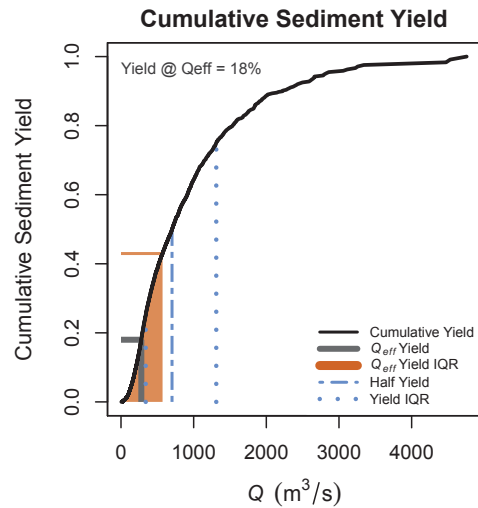
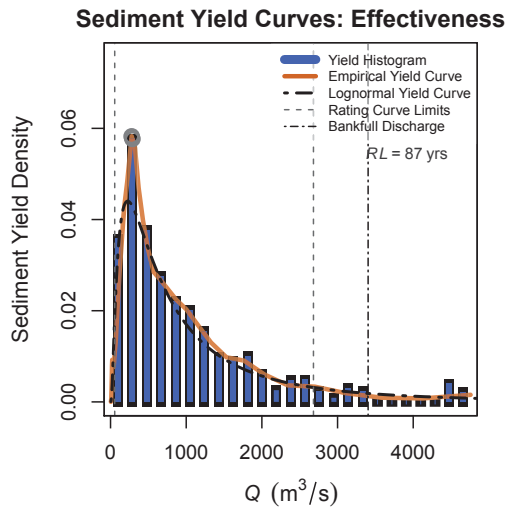
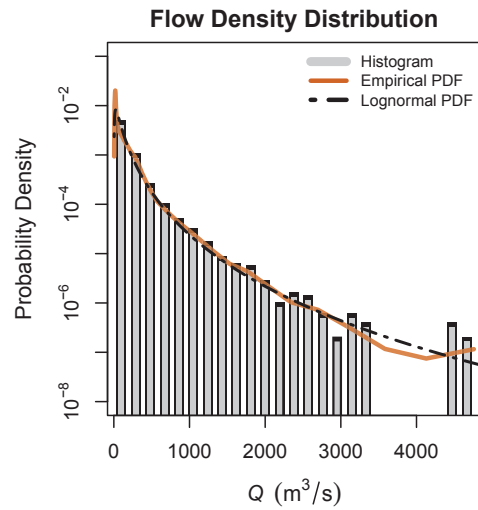
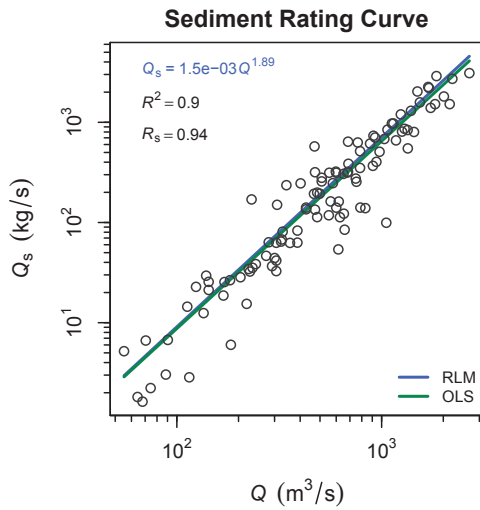
Suspended Load Sites

KLAMATH R A ORLEANS: 11523000



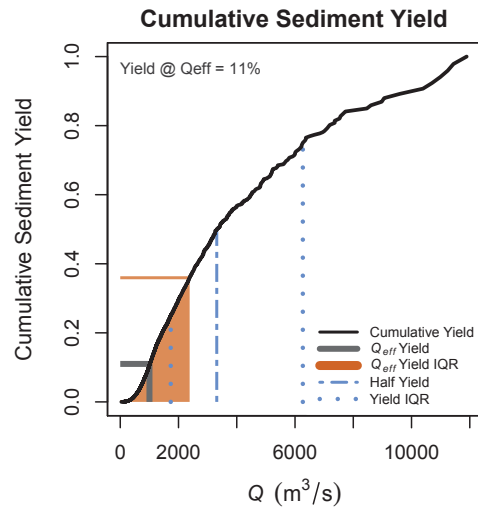
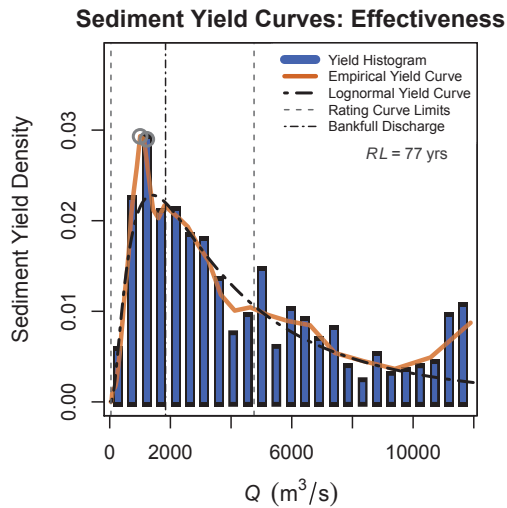
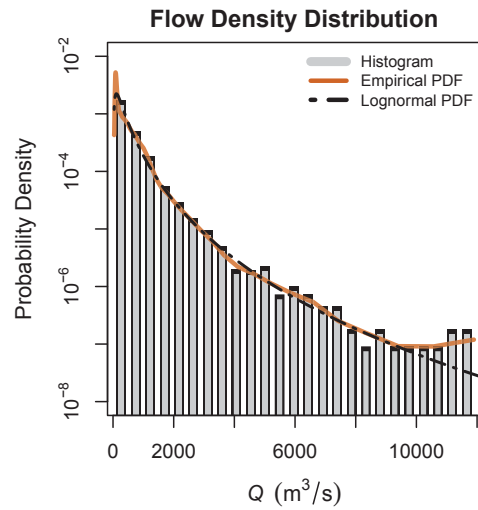
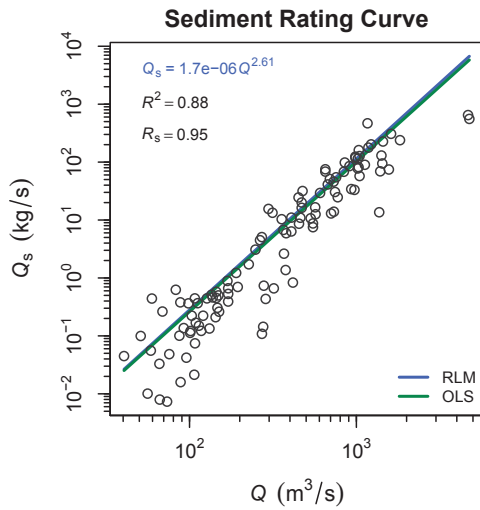
Suspended Load Sites

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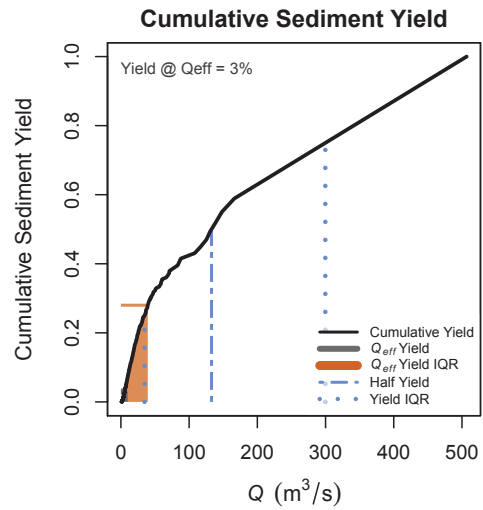
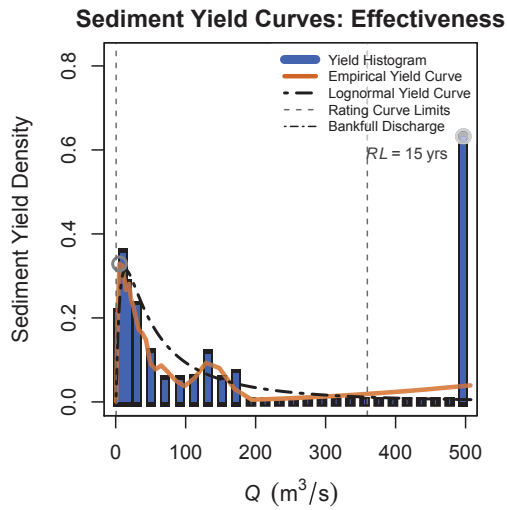
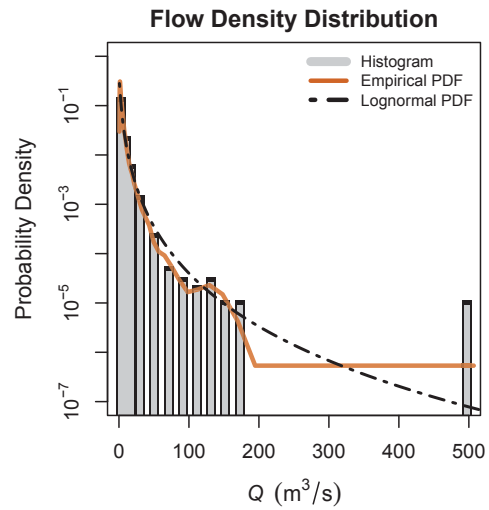
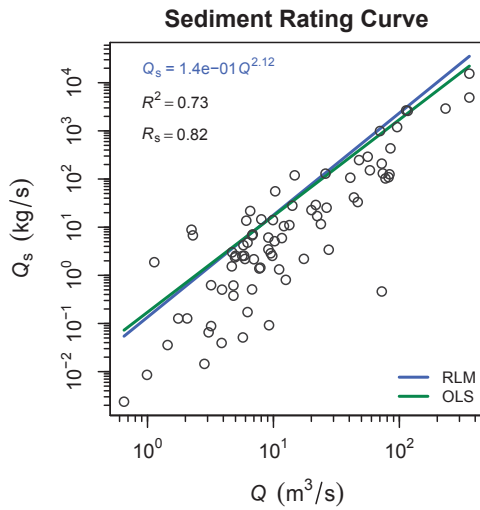
Suspended Load Sites

KLAMATH R NR KLAMATH CA: 11530500



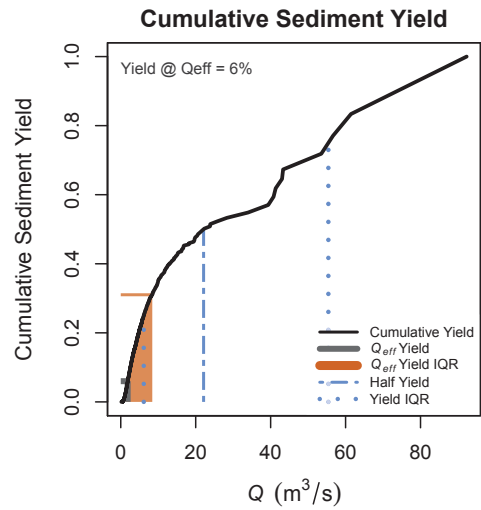
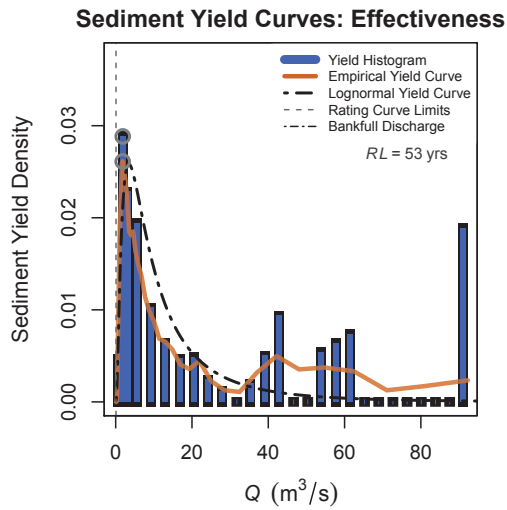
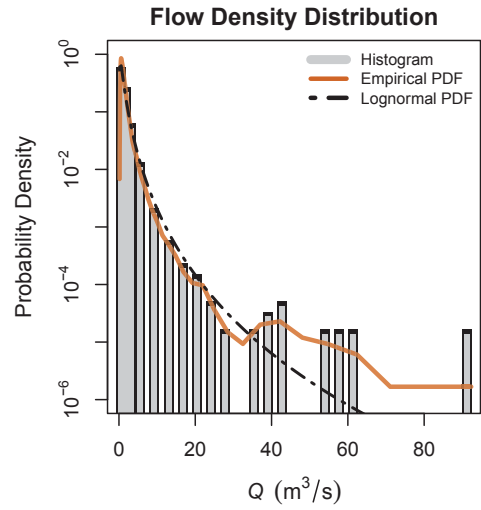
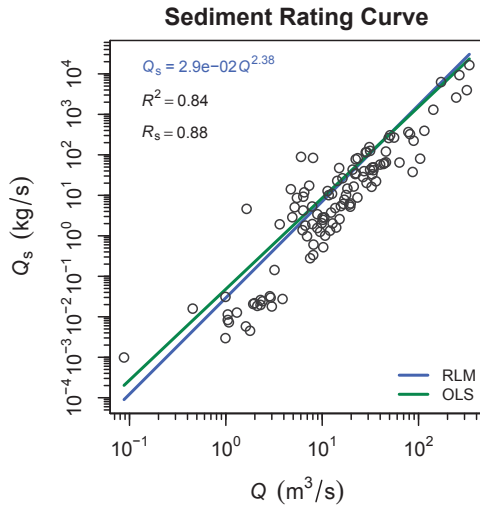
Suspended Load Sites

RIO GRANDE DE ARECIBO BLW UTUADO, PR: 50024950



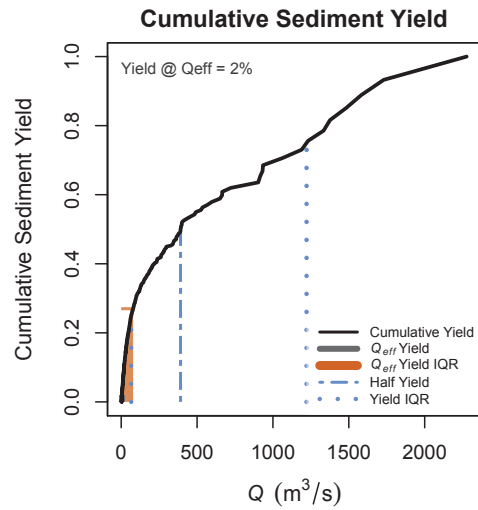
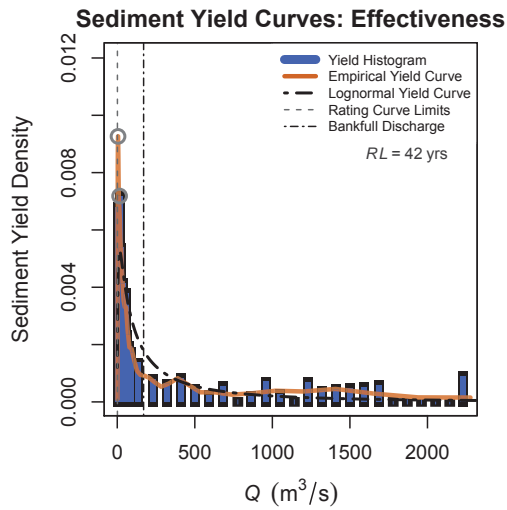
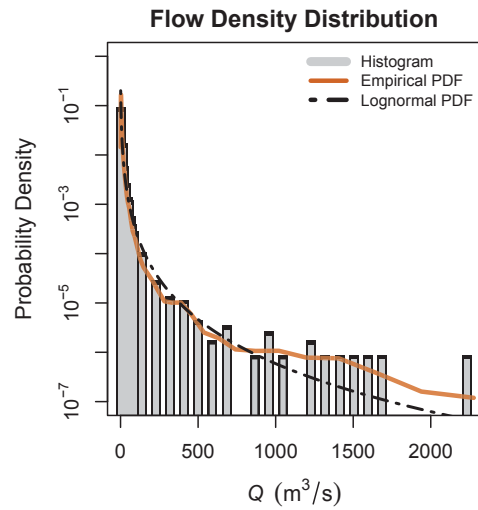
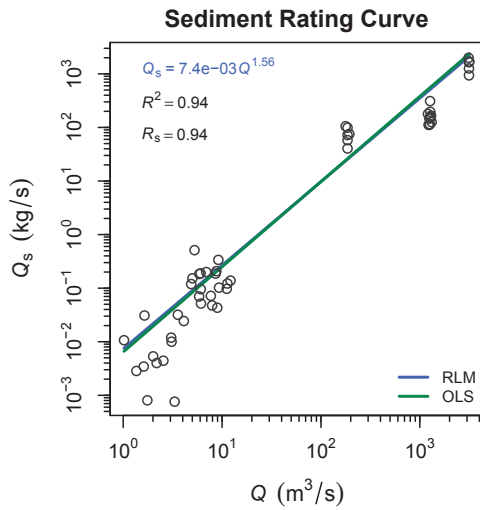
Suspended Load Sites

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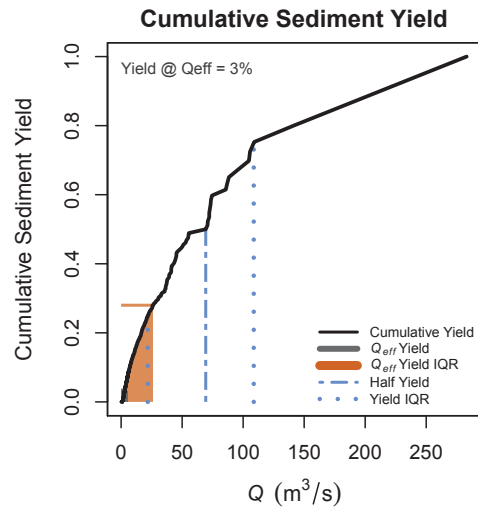
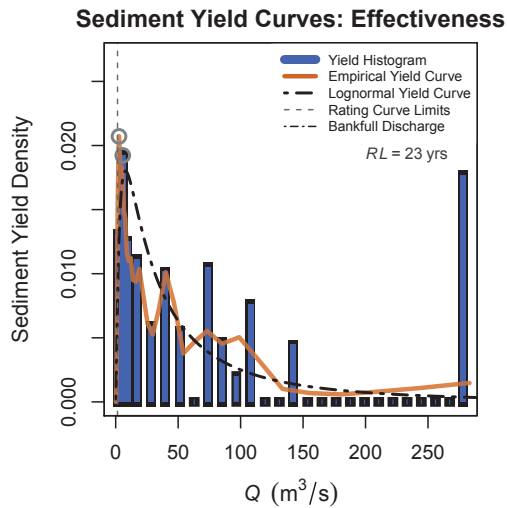
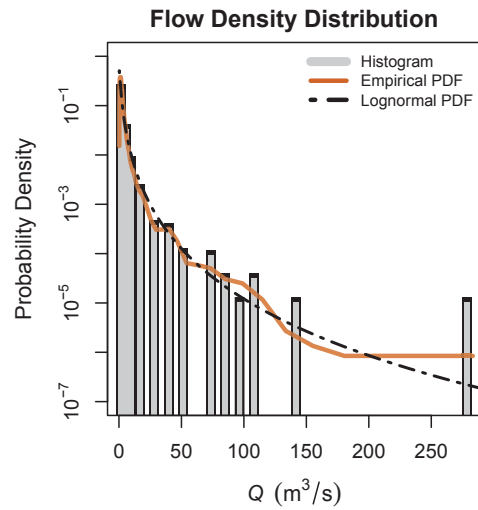
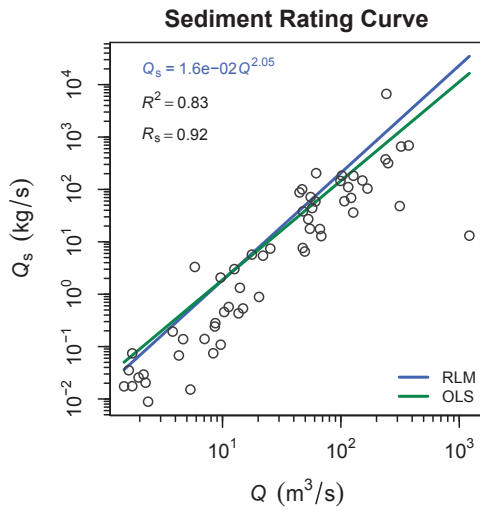
Suspended Load Sites

RIO GRANDE DE MANATI AT HWY 2 NR MANATI, PR: 50038100



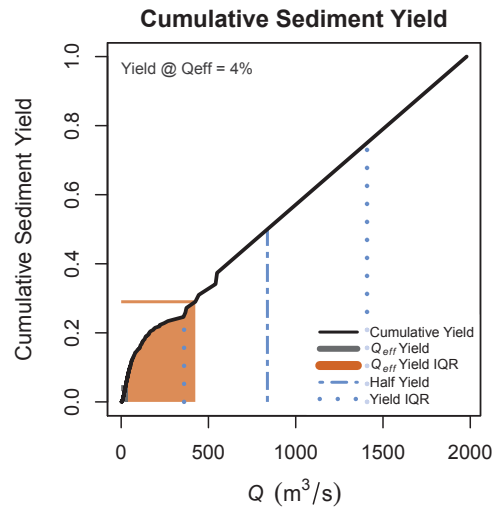
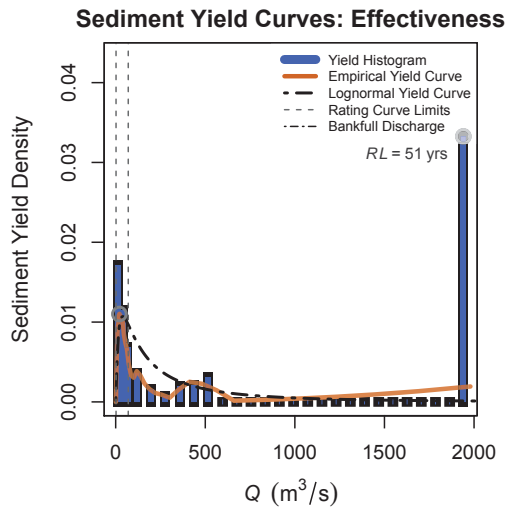
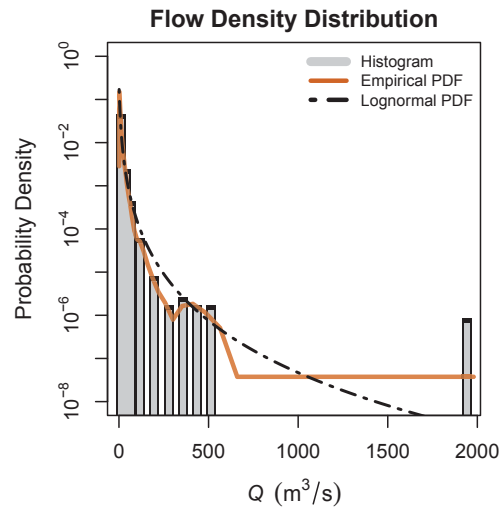
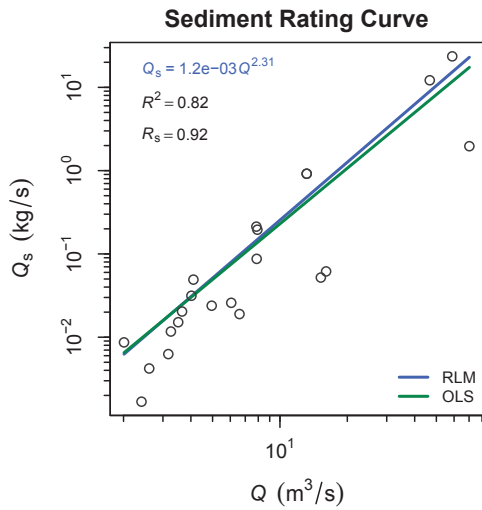
Suspended Load Sites

RIO GRANDE DE LOIZA AT HWY 183 SAN LORENZO, PR: 50051800



Suspended Load Sites

RIO GRANDE DE ANASCO NR SAN SEBASTIAN, PR: 50144000



APPENDIX D – Record Extension Methods and Plots

Flow record extension methods are provided below. Plots of various aspects of the flow record extension procedure, described below, are given for each site in which the flow record was extended. These include plots of: 1) concurrent daily flow data for visual comparison, 2) the extended flow record for the site along with its short term record super-imposed, 3) contours of the sum of squared errors for linear regressions between transformed flow records as a function of the values of the Box-Cox transformation variable λ for short term site gage and a nearby long term gage used to extend its flow record, and 4) plots of the linear or segmented regression lines fit to the transformed, concurrent flow data.

D.1 Flow Record Extension Methods

Some sites with bed material load data had relatively short record lengths (<10 yr). Generally, longer-term flow records are desirable in MFA to capture a better sample of flow variability at a site [*Biedenharn et al.*, 2000; *Soar and Thorne*, 2001]. To extend the flow records, I first identified USGS stream gages located near gages with shorter records that had coincidental and longer-term flow records. Using the `RecordExtension.R` script created for this purpose, I used the modified MOVE method described by Moog et al. [1999] to extend short term flow records at a sediment measurement site using a statistical relationship between transformed, concurrent flow data at the site and at a nearby gage with a longer record (Figure D.1a,b).

The flow record extension method described by Moog et al. [1999] uses a generalized Box-Cox (BC) scaled power transformation procedure along with the Maintenance of Variance Extension (MOVE) equations discussed by Hirsch [1982]. This method is best suited for extending the sample of the flow distribution at a site and ignores serial correlation, which is generally not considered in MFA. Box-Cox transformation involves a scaled power transformation of the variable of interest:

$$Q' \equiv \begin{cases} \frac{Q^\lambda - 1}{\lambda} & \lambda \neq 0 \\ \ln Q & \lambda = 0 \end{cases} \quad (\text{D.1})$$

where Q is the BC scaled discharge value and λ is the BC power scaling coefficient. By non-dimensionalizing Q' and converting it into v , a non-dimensional form of Q' , using equation D.2:

$$v \equiv Q' / [G(Q)^{\lambda-1}] \quad (\text{D.2})$$

the maximum log likelihood procedure for determining the optimal values of λ to transform the flow data is reduced to determining the pair of λ values that minimizes the sum of squares of the residuals of the ordinary least squares regression between v calculated for concurrent flow data sets from each gage subject to the constraints discussed by Moog et al. [1999] (Figure D.1c). The MOVE equation used to extend the short-term record is:

$$\hat{y}'_E = m(y'_C) + \frac{S(y'_C)}{S(x'_C)} [x'_E - m(x'_C)] \quad (\text{D.3})$$

where \hat{y}'_E is the transformed estimate of the extended record, and y'_C and x'_C are the BC transformed concurrent flow data from the short-term and long-term flow records, respectively. Equation D.3 is the OLS equation with the correlation coefficient set to unity for improved representation of flow variability[Hirsch, 1982]. Once the transformed value of flow is calculated for a site, it is untransformed using the inverse for equation D.1. In some cases, this BC linear regression model can over-estimate larger discharges due to a break in slope in the x'_C and y'_C scatterplot (Figure D.1d). This break in slope often occurs at some large discharge threshold. In these cases, a piecewise linear regression model was created between x'_C and y'_C using the `segmented` package and function in **R**. I extended the flow record for 19 coarse bed sites and 2 fine bed sites based on goodness of fit of transformed concurrent flow records as well as availability of gages with concurrent flow records near gages with short-term records. Graphical results from this analysis for all sites are presented in the next section.

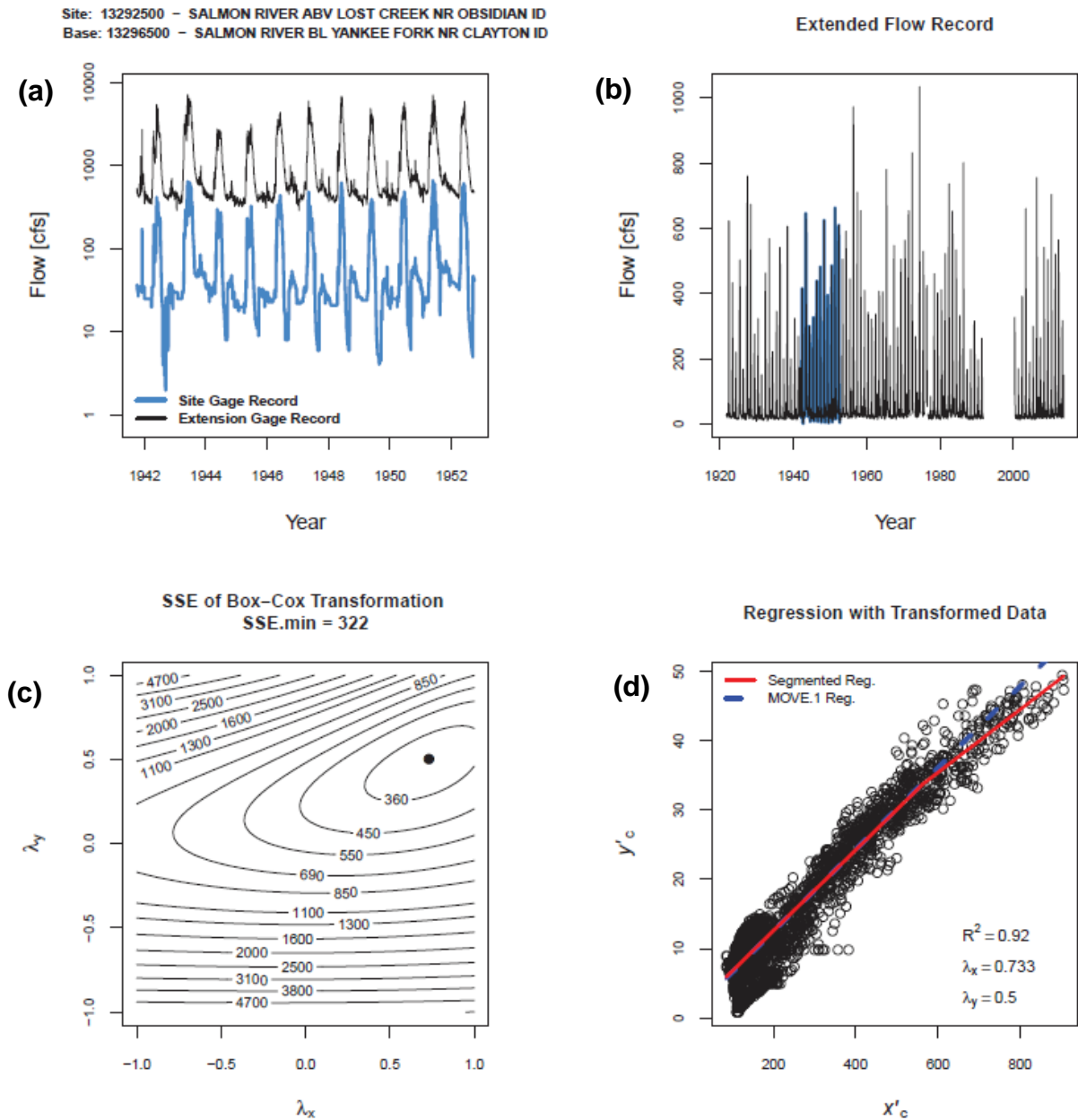
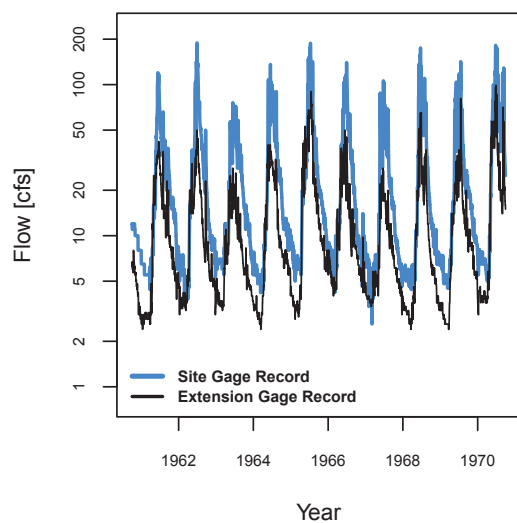


Figure D.1 Example of flow record extension process. (a) Concurrent flow records for the site (blue) and the gage used to extend (black). (b) Extended flow record (black) plotted with the original flow record (blue). (c) Contour plot of the sum of square errors as a function of Box-Cox transformation parameters with the optimal parameter combination shown. (d) Plot of segmented regression relationship of transformed concurrent flow record data.

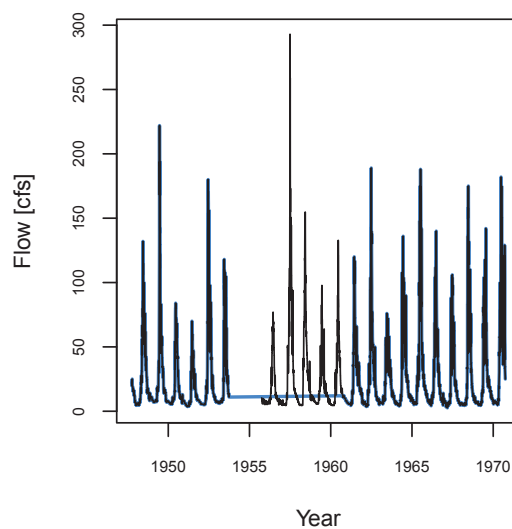
D.2 Plots of Flow Record Extension Results

Below, I provide plots showing the flow record extension process and outputs for each site in which the flow record was extended. Note that for many sites, a reasonable statistical relationship (fit) was not achieved between the short-term gage record and a nearby gage with a longer record. Sites with poor fits were not included in this study or below in the provided plots.

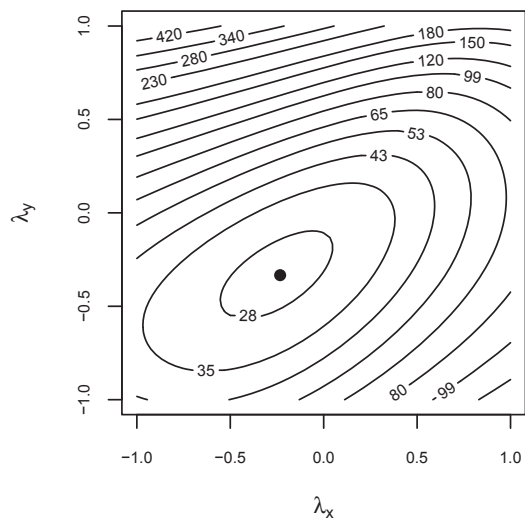
Site: 09146500 - East Fk Dallas Creek
Base: 09146400 - WEST FORK DALLAS CREEK NEAR RIDGWAY, CO.



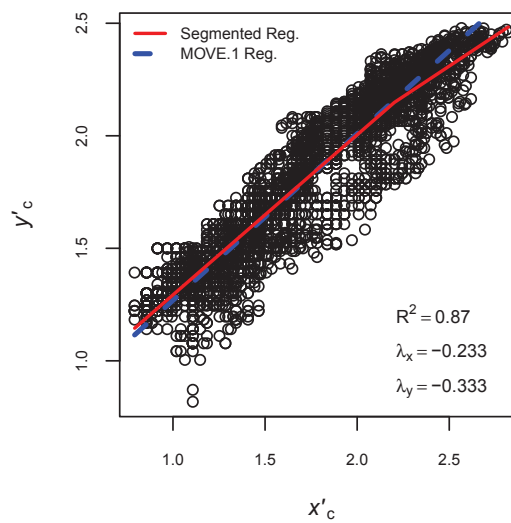
Extended Flow Record



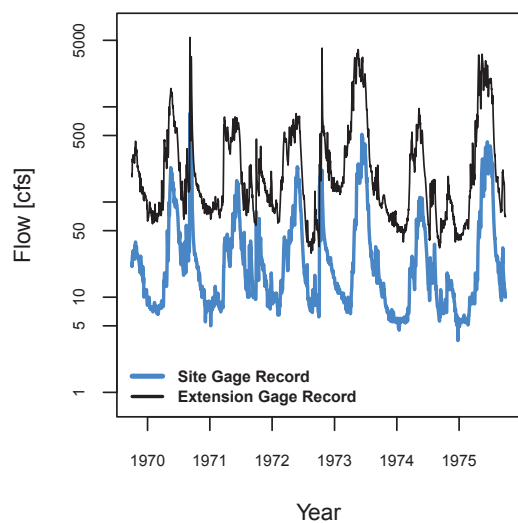
SSE of Box-Cox Transformation
SSE.min = 26.3



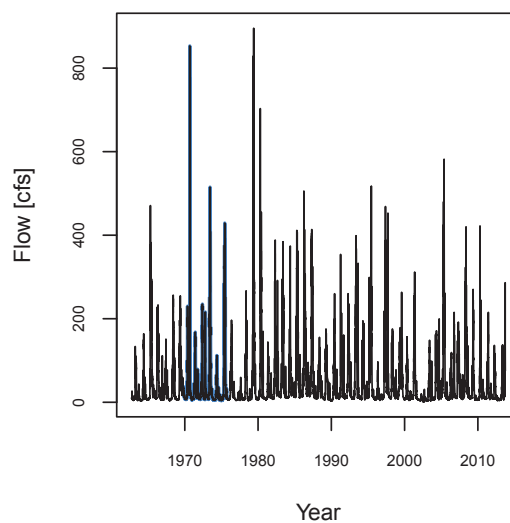
Regression with Transformed Data



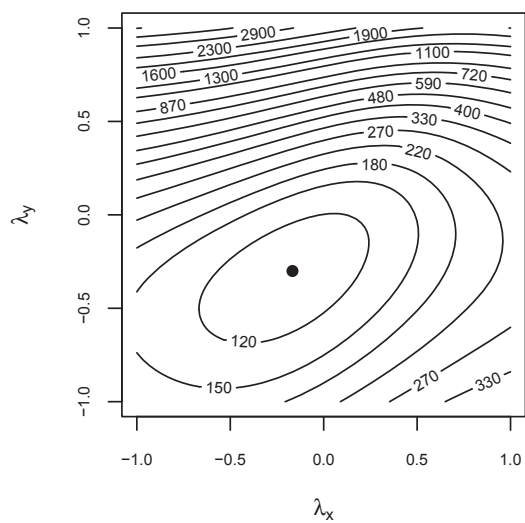
Site: 09347200 - Middle Fork Piedra River, CO
Base: 09349800 - PIEDRA RIVER NEAR ARBOLES, CO.



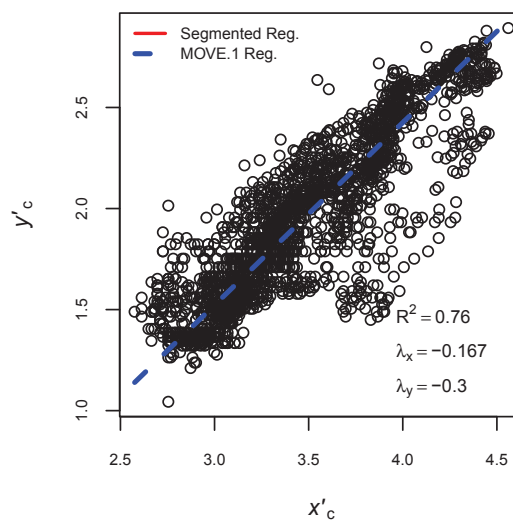
Extended Flow Record



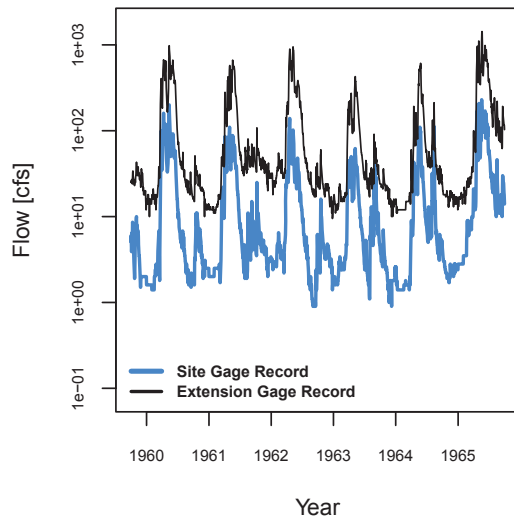
SSE of Box-Cox Transformation
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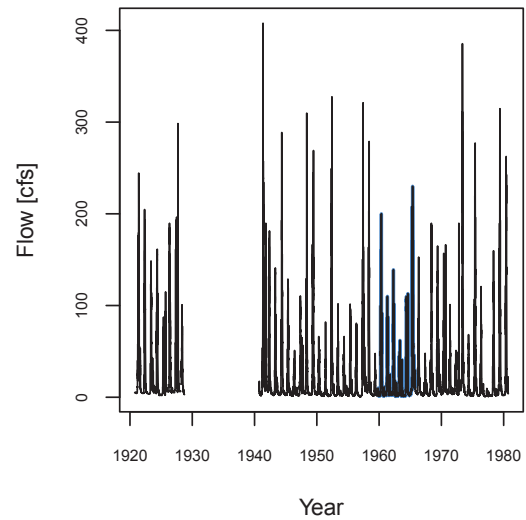
Regression with Transformed Data



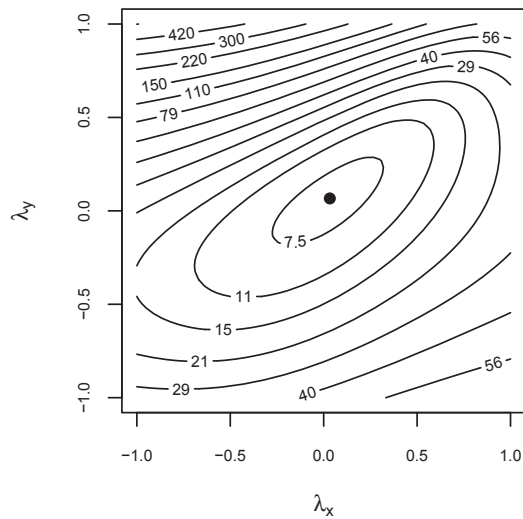
Site: 09361400 - Junction Ck
Base: 09361000 - HERMOSA CREEK NEAR HERMOSA, CO.



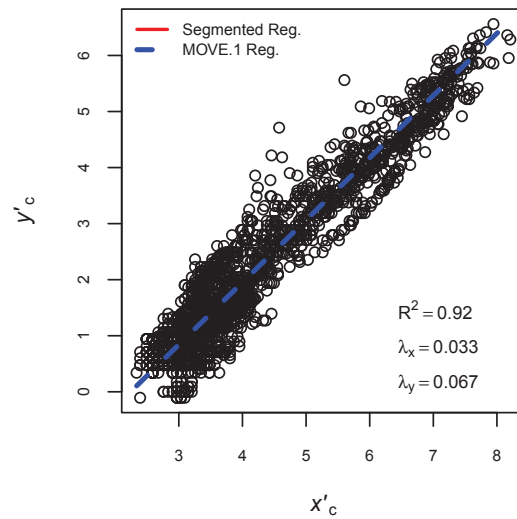
Extended Flow Record



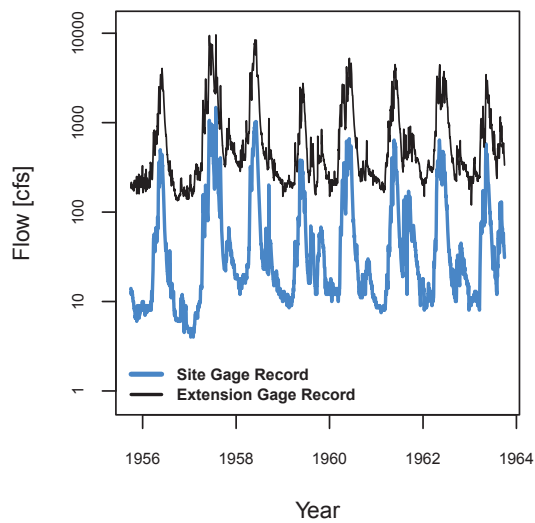
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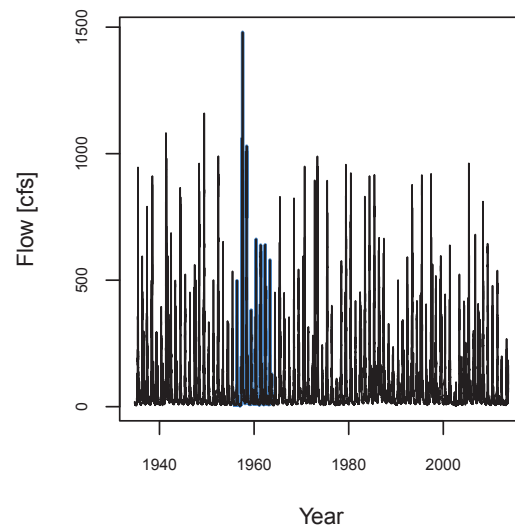
Regression with Transformed Data



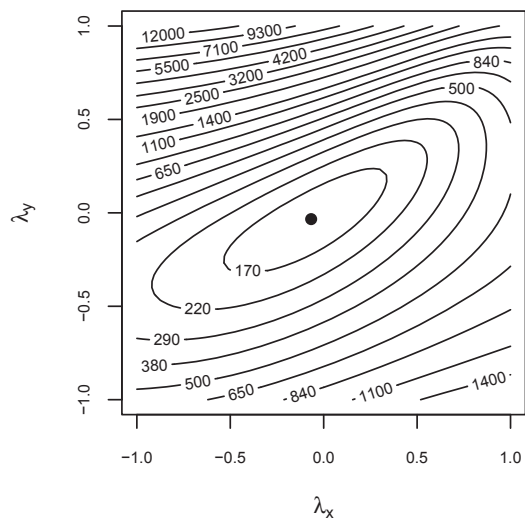
Site: 09362900 - Upper Florida River near Lemon Reservoir, CO
 Base: 09363500 - ANIMAS RIVER NEAR CEDAR HILL, NM



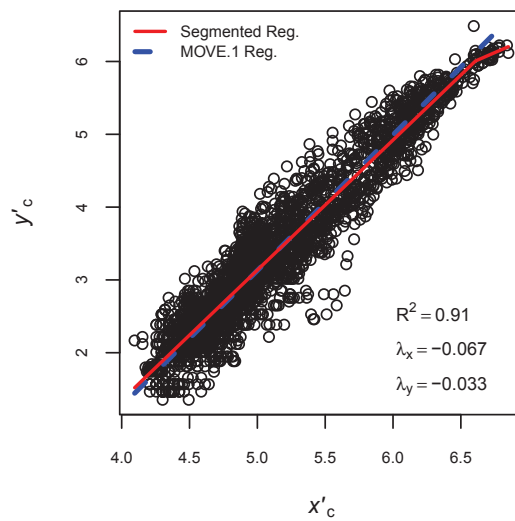
Extended Flow Record



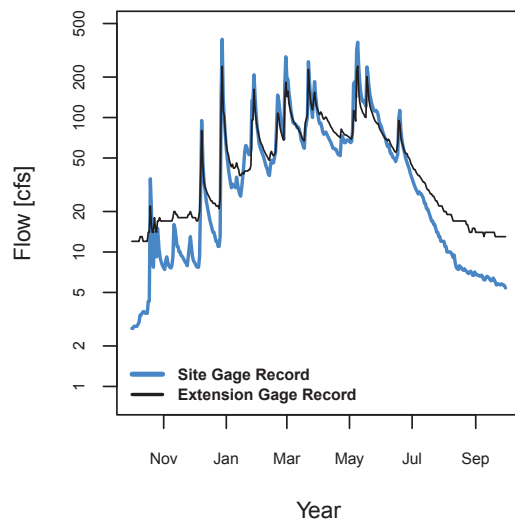
SSE of Box-Cox Transformation
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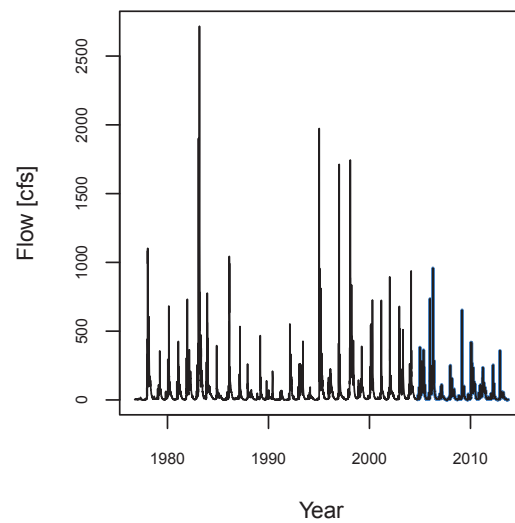
Regression with Transformed Data



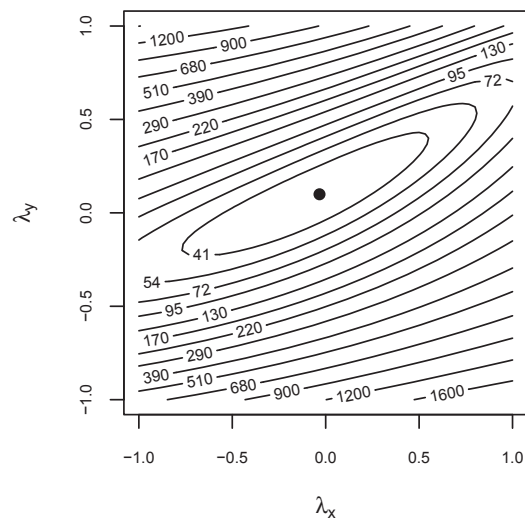
Site: 11525670 - INDIAN C NR DOUGLAS CITY CA
 Base: 11525600 - GRASS VALLEY C A FAWN LODGE NR LEWISTON CA



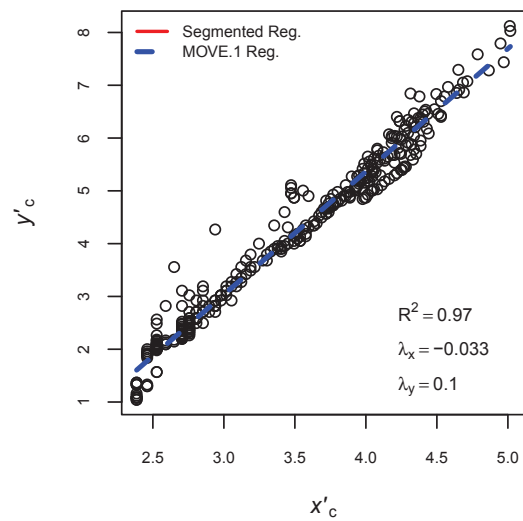
Extended Flow Record



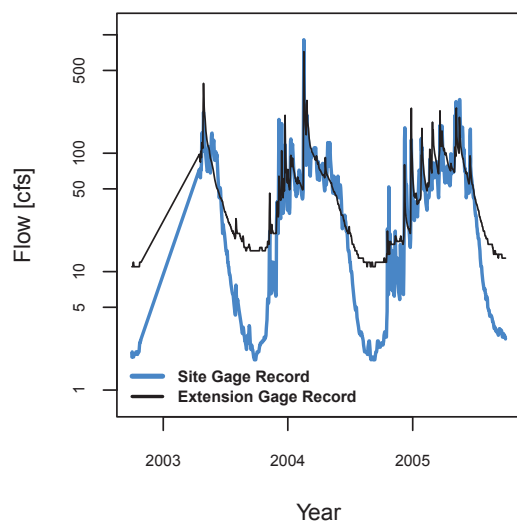
SSE of Box-Cox Transformation
 SSE.min = 31.1



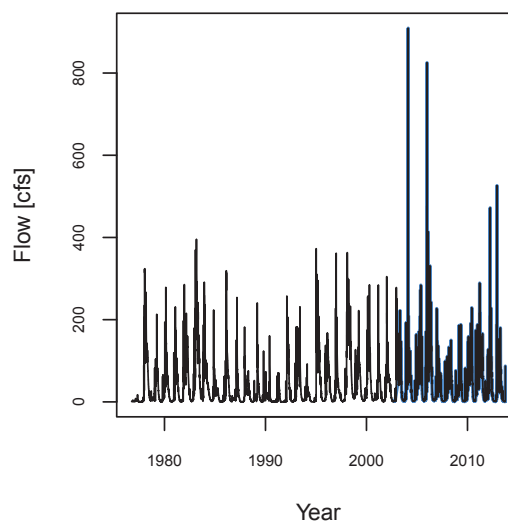
Regression with Transformed Data



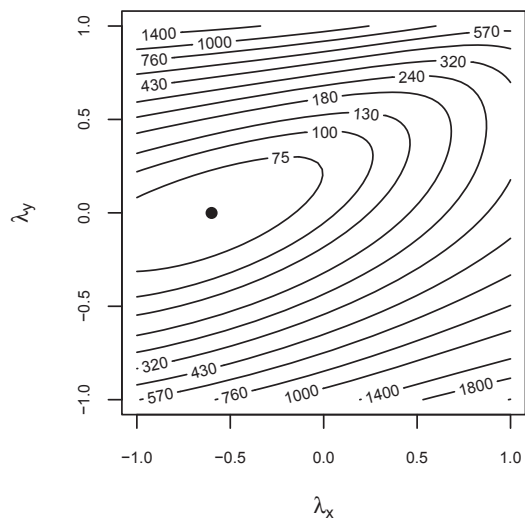
Site: 11525530 - RUSH C NR LEWISTON CA
 Base: 11525600 - GRASS VALLEY C A FAWN LODGE NR LEWISTON CA



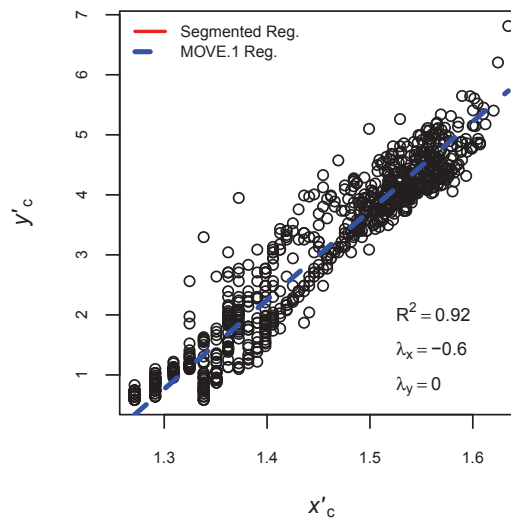
Extended Flow Record



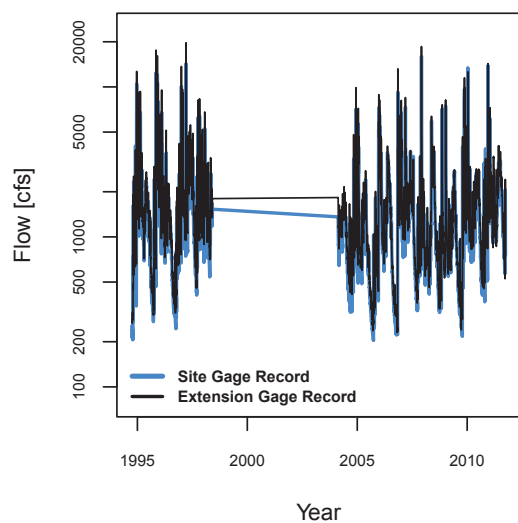
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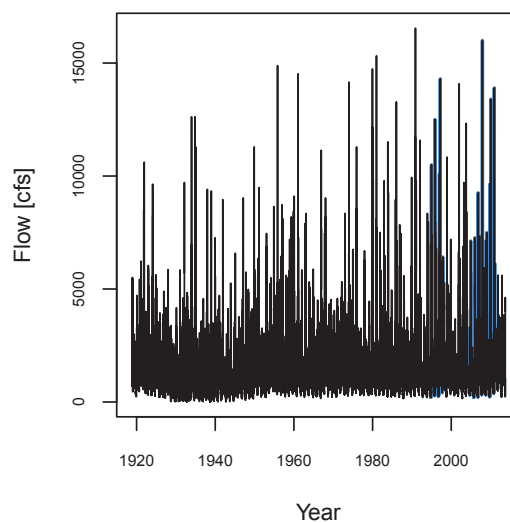
Regression with Transformed Data



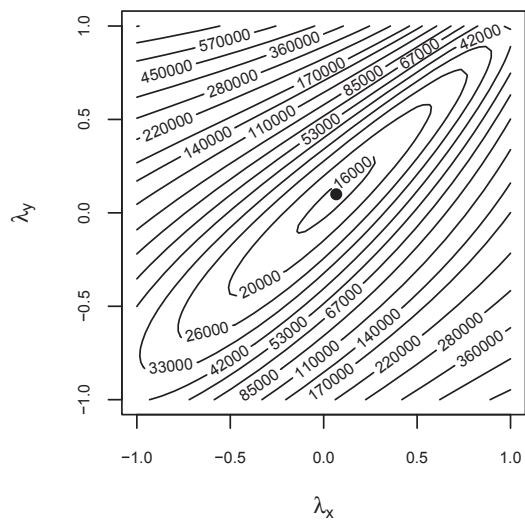
Site: 12044900 - ELWHA RIVER ABV LAKE MILLS NR PT ANGELES, WA
 Base: 12045500 - ELWHA RIVER AT MCDONALD BR NEAR PORT ANGELES, W.



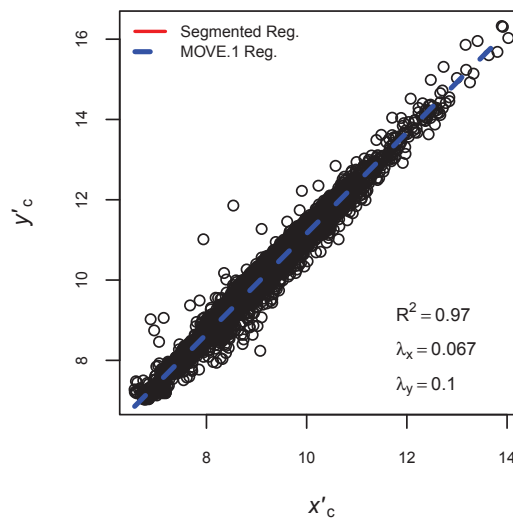
Extended Flow Record



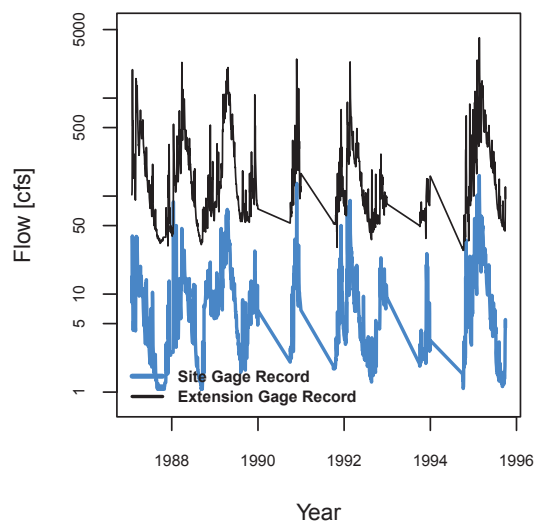
SSE of Box-Cox Transformation
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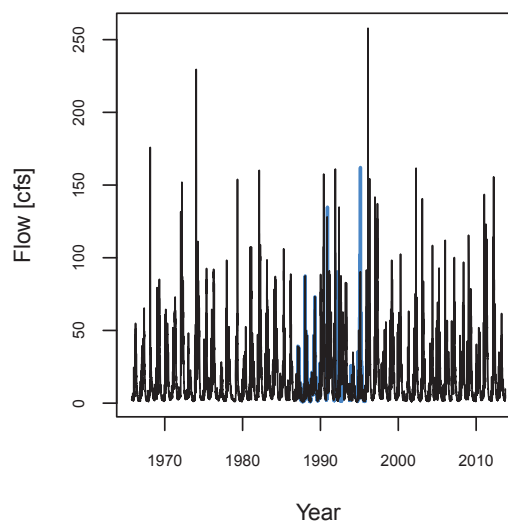
Regression with Transformed Data



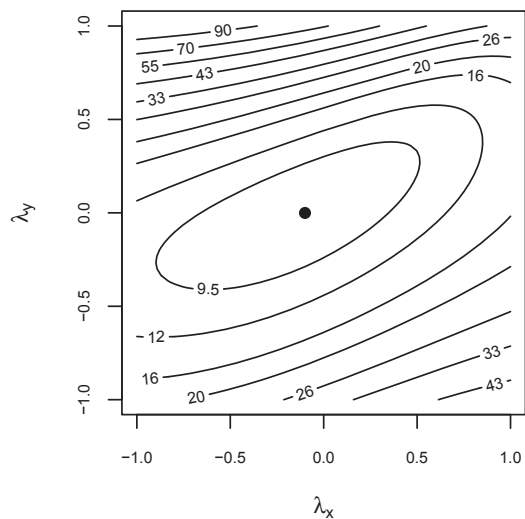
Site: 1241490A - Cat Spur Creek
Base: 12414900 - ST MARIES RIVER NR SANTA ID



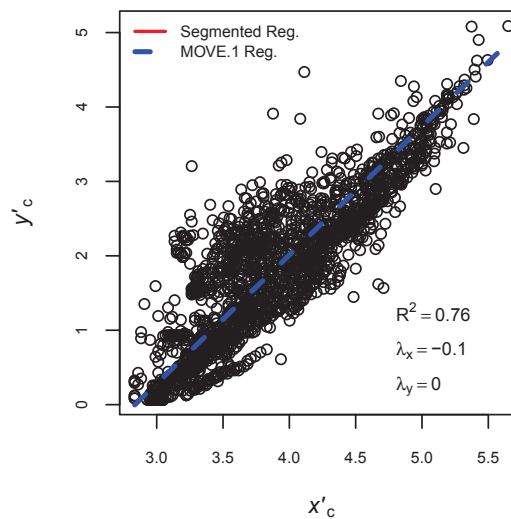
Extended Flow Record



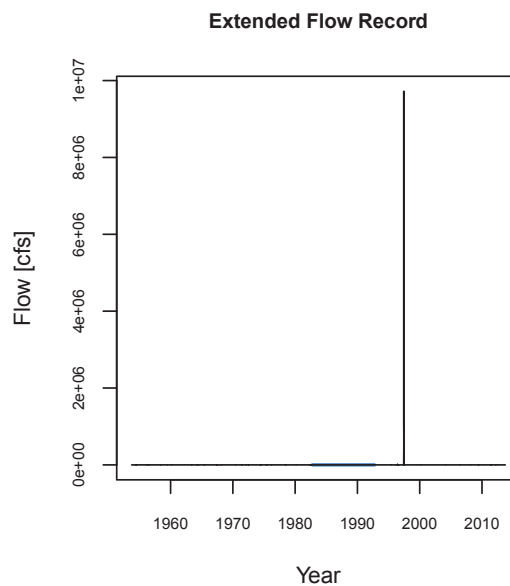
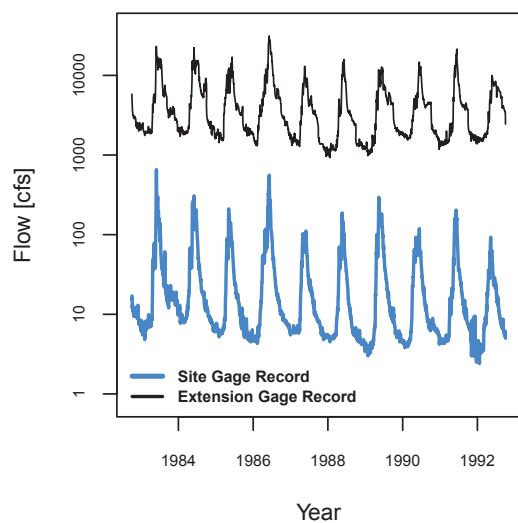
SSE of Box-Cox Transformation
SSE.min = 8.11



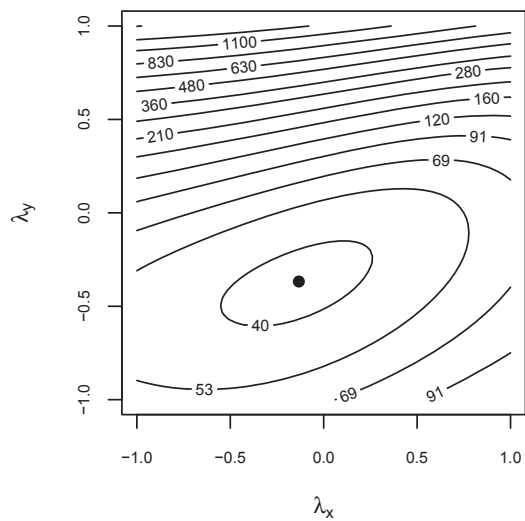
Regression with Transformed Data



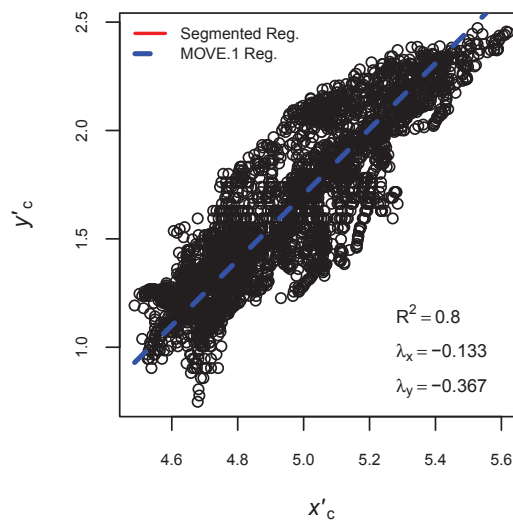
Site: 13019438 - LITTLE GRANITE CK AT MOUTH NR BONDURANT, WY
 Base: 13022500 - SNAKE RIVER AB RESERVOIR NR ALPINE WY



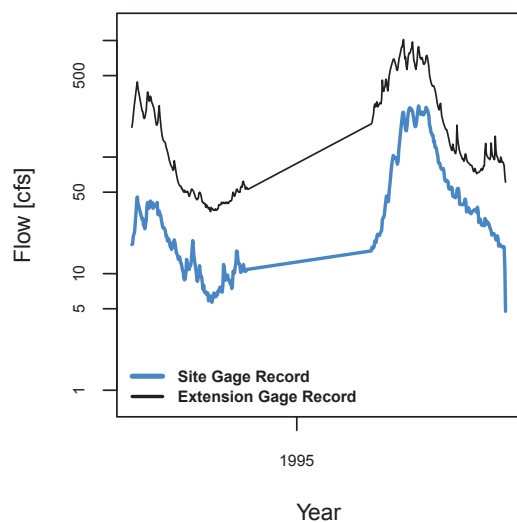
SSE of Box-Cox Transformation
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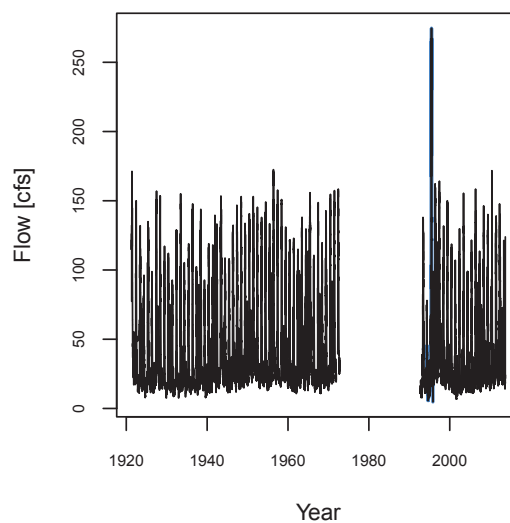
Regression with Transformed Data



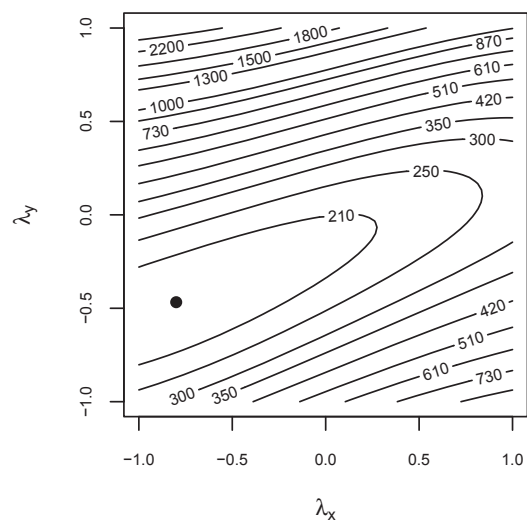
Site: 1329500B - Herd Creek
Base: 13295000 - VALLEY CREEK AT STANLEY ID



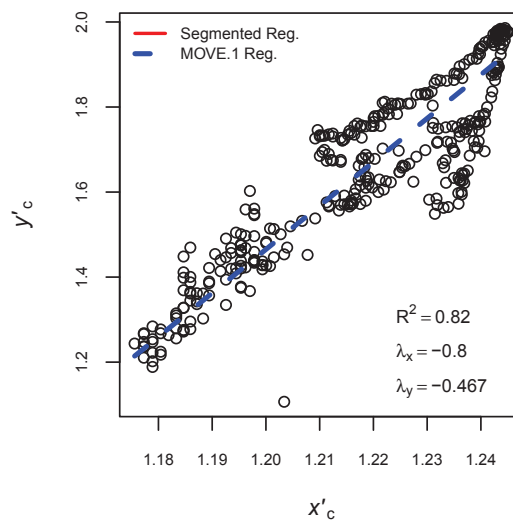
Extended Flow Record



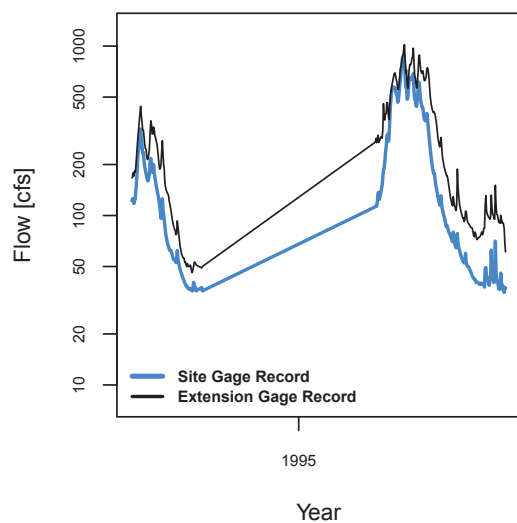
SSE of Box-Cox Transformation
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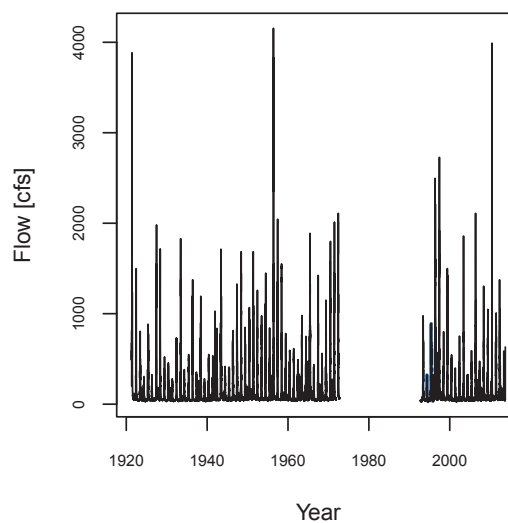
Regression with Transformed Data



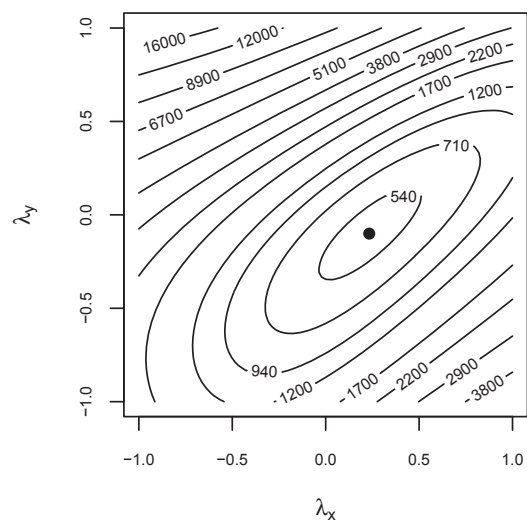
Site: 1329500C - Marsh Creek
Base: 13295000 - VALLEY CREEK AT STANLEY ID



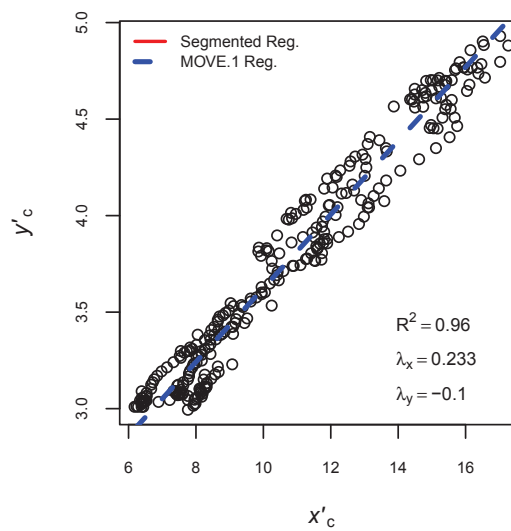
Extended Flow Record



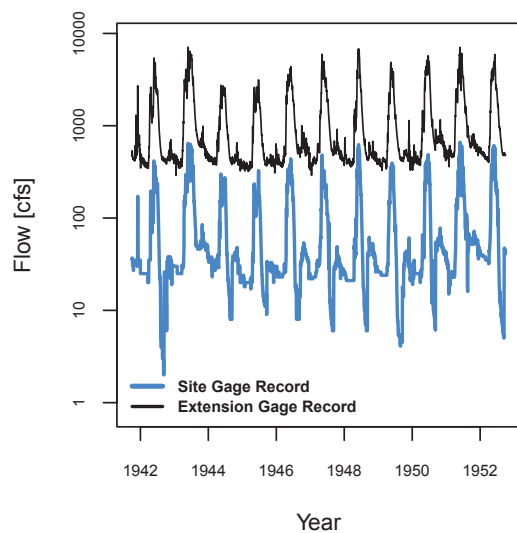
SSE of Box-Cox Transformation
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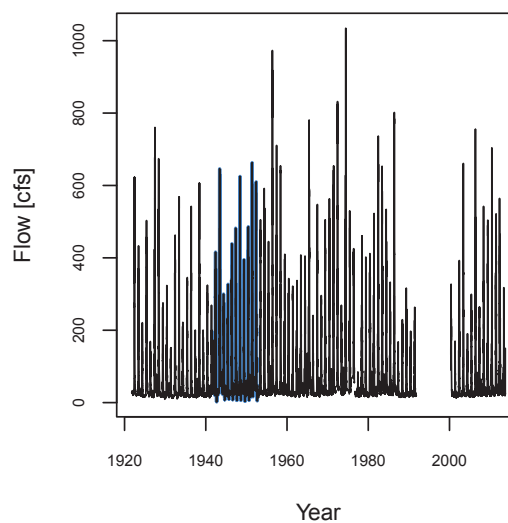
Regression with Transformed Data



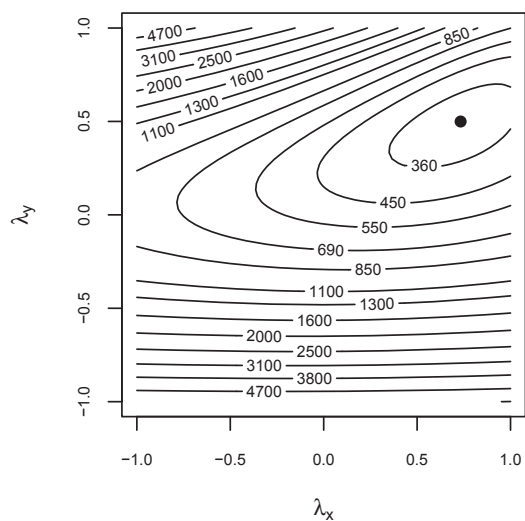
Site: 13292500 - SALMON RIVER ABV LOST CREEK NR OBSIDIAN ID
 Base: 13296500 - SALMON RIVER BL YANKEE FORK NR CLAYTON ID



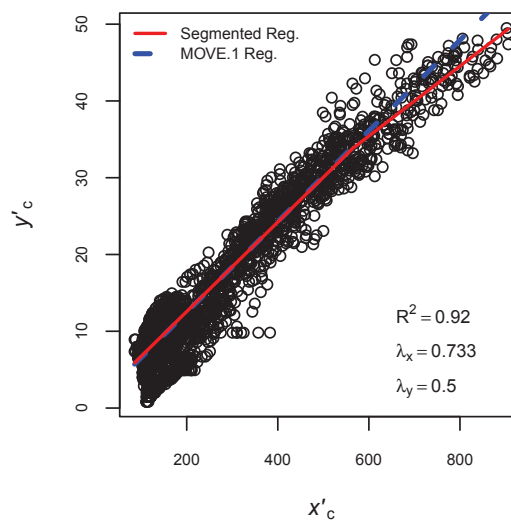
Extended Flow Record



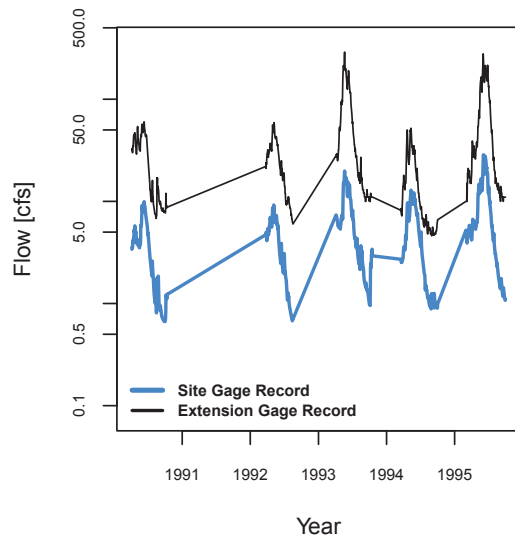
SSE of Box-Cox Transformation
 SSE.min = 322



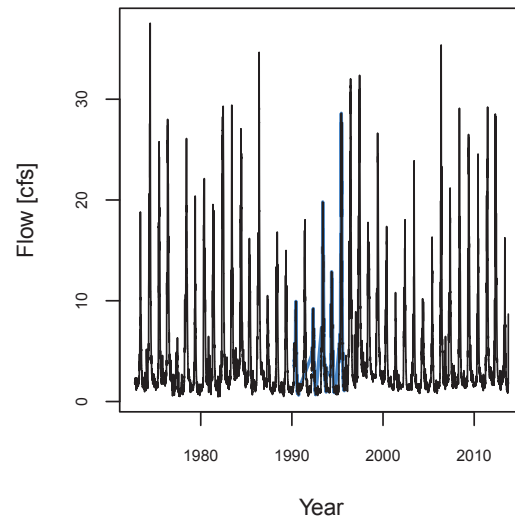
Regression with Transformed Data



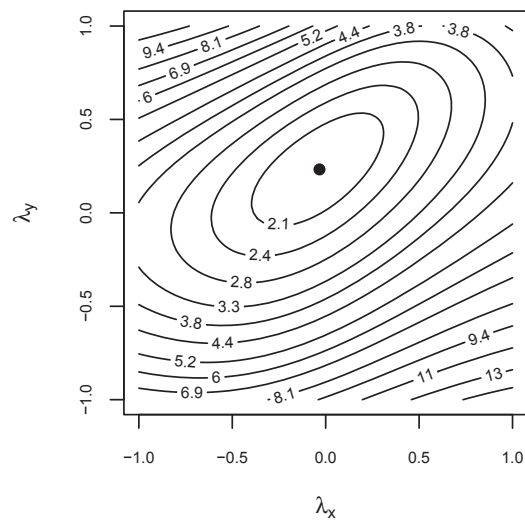
Site: 1329735A - Squaw Ck nr North Fork, ID (USFS)
 Base: 13297355 - SQUAW CREEK BL BRUNO CREEK NR CLAYTON ID



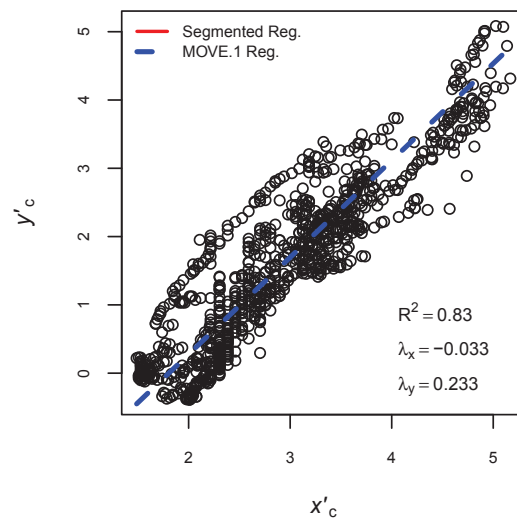
Extended Flow Record



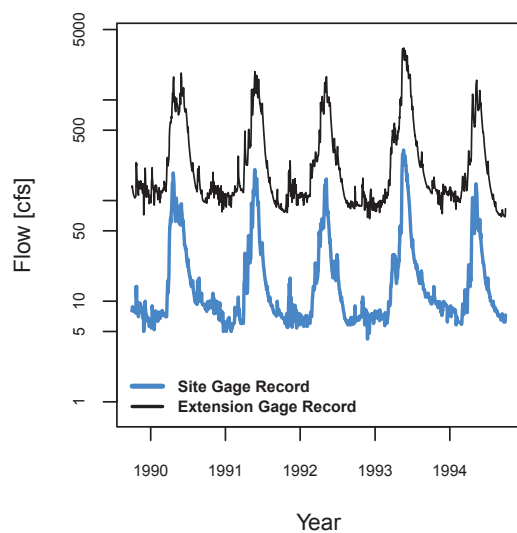
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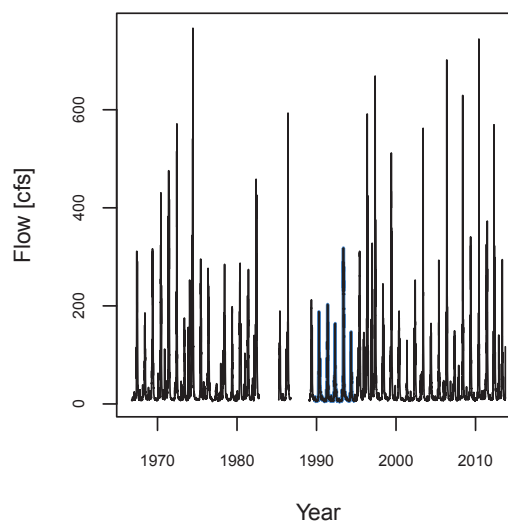
Regression with Transformed Data



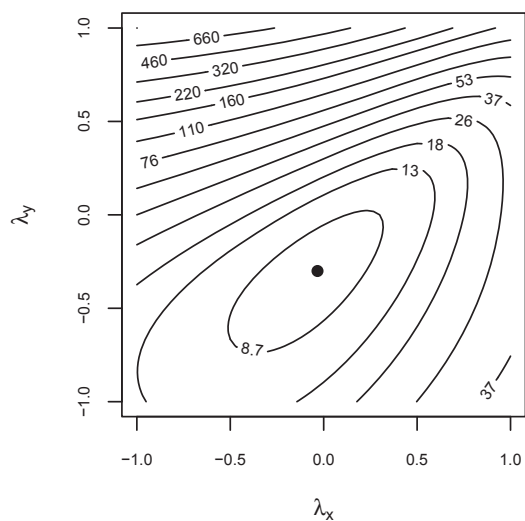
Site: 13310520 - DOLLAR CREEK NR WARM LAKE NR CASCADE ID
 Base: 13310700 - SF SALMON RIVER NR KRASSEL RANGER STATION ID



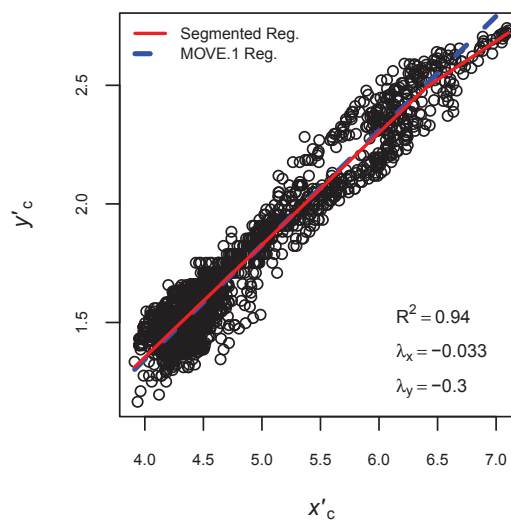
Extended Flow Record



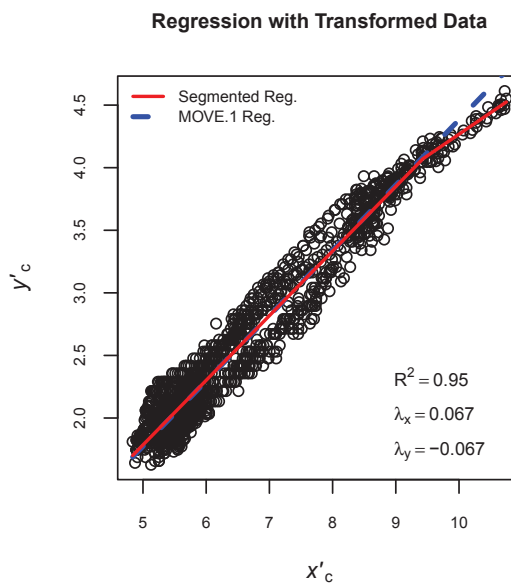
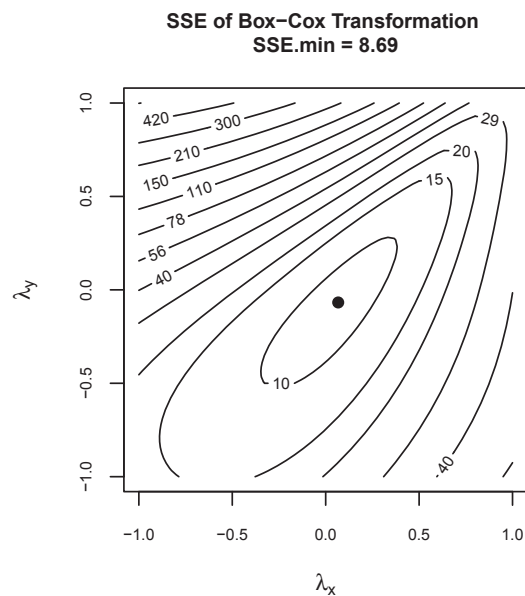
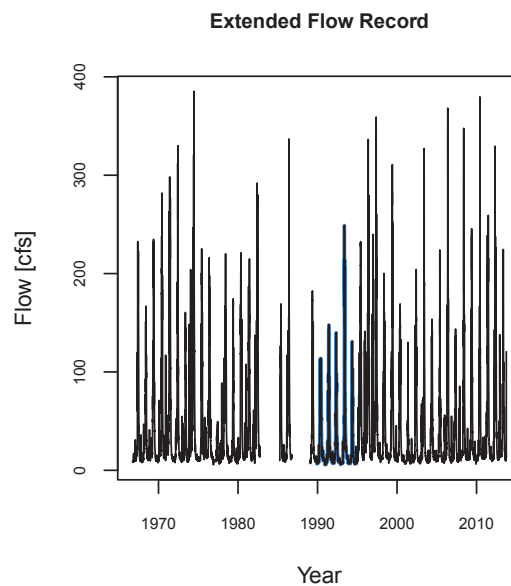
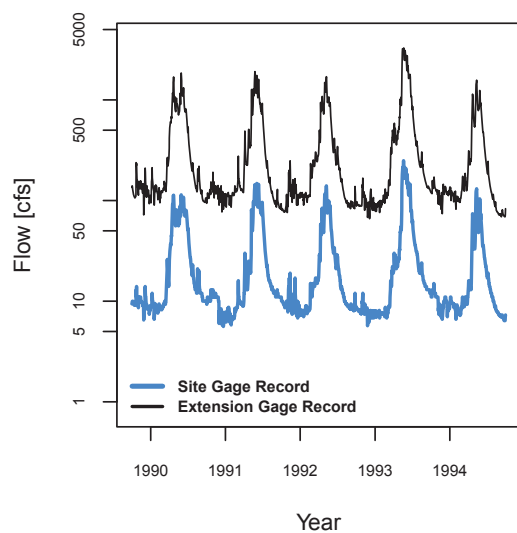
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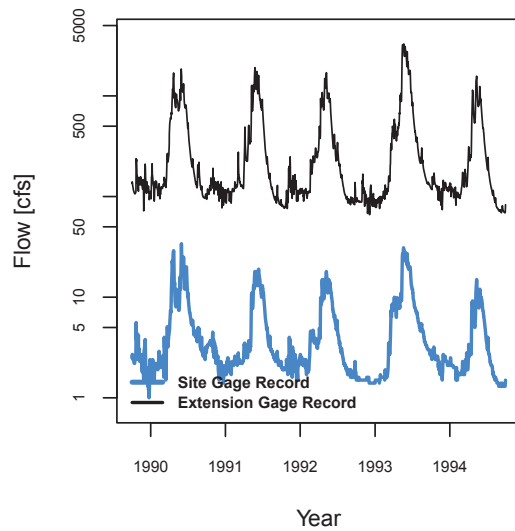
Regression with Transformed Data



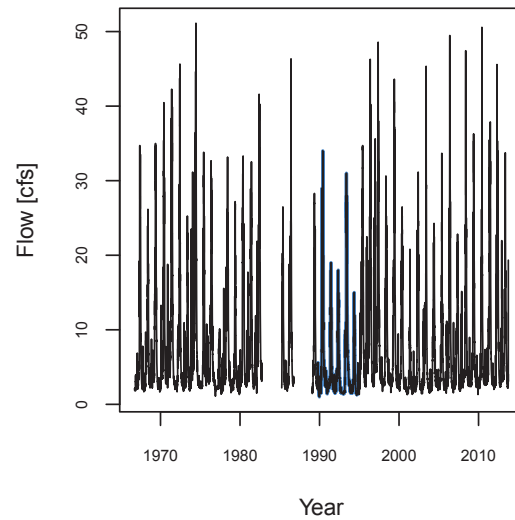
Site: 13310565 - BLACKMARE CREEK NR POVERTY FLAT NR CASCADE ID
 Base: 13310700 - SF SALMON RIVER NR KRASSEL RANGER STATION ID



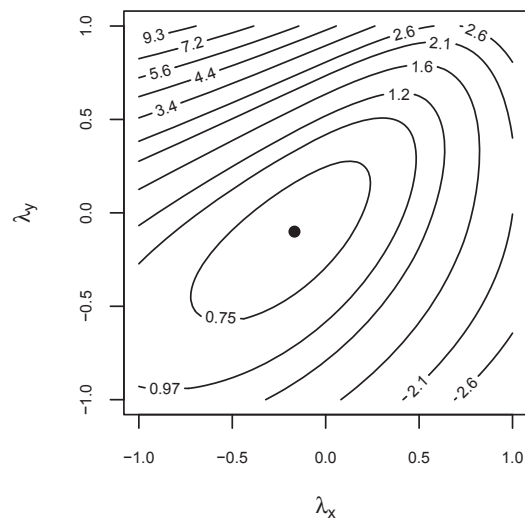
Site: 13310660 - LTL BUCKHORN CREEK NR KRASSEL RANGER STATION ID
 Base: 13310700 - SF SALMON RIVER NR KRASSEL RANGER STATION ID



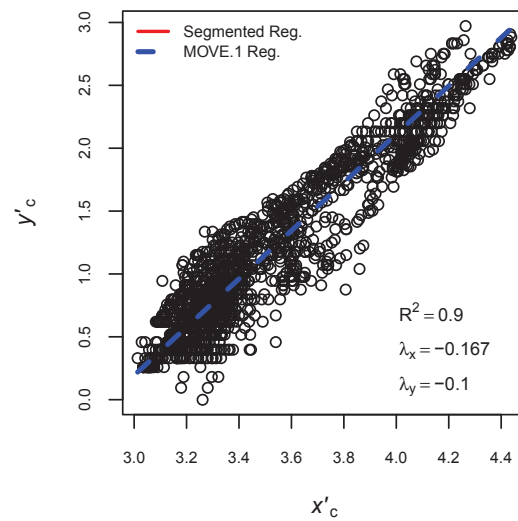
Extended Flow Record



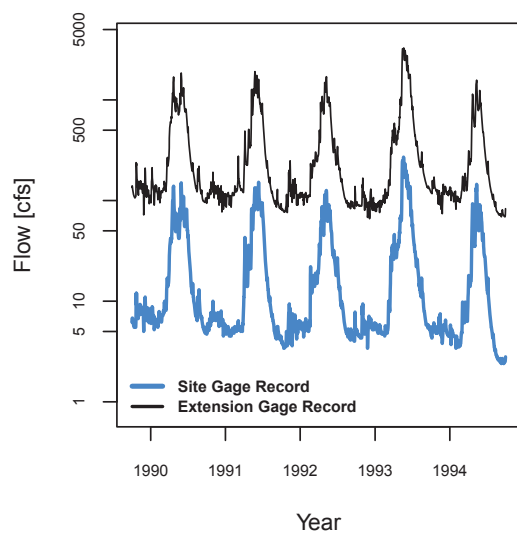
SSE of Box-Cox Transformation
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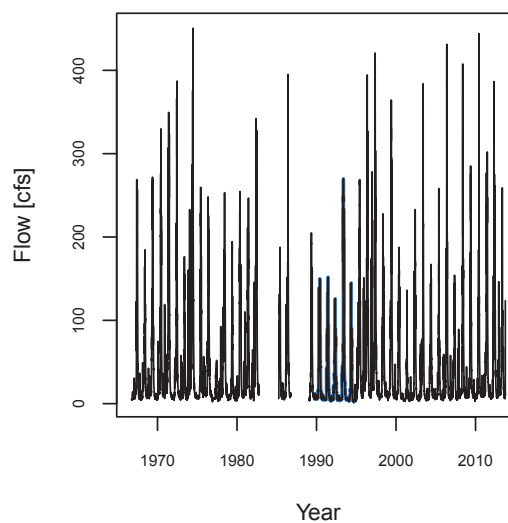
Regression with Transformed Data



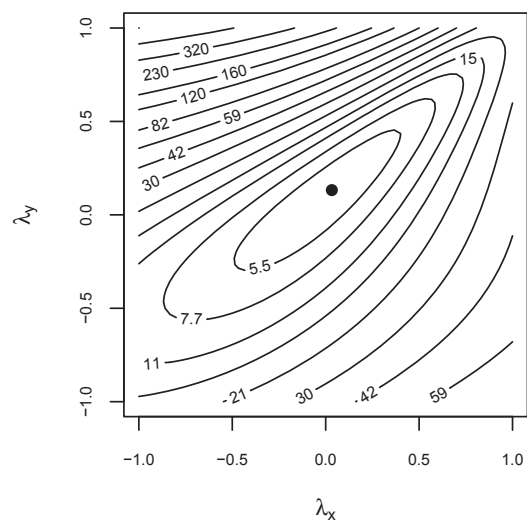
Site: 13310670 - WF BUCKHORN CREEK NR KRASSEL RANGER STATION ID
 Base: 13310700 - SF SALMON RIVER NR KRASSEL RANGER STATION ID



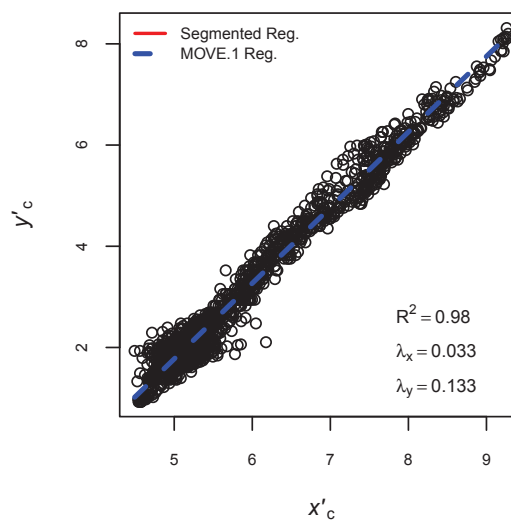
Extended Flow Record



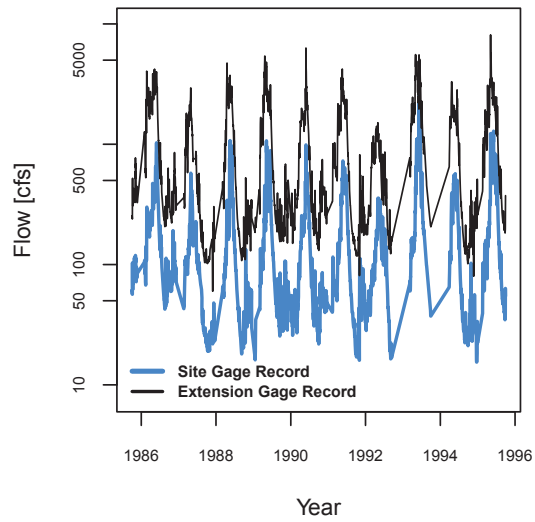
SSE of Box-Cox Transformation
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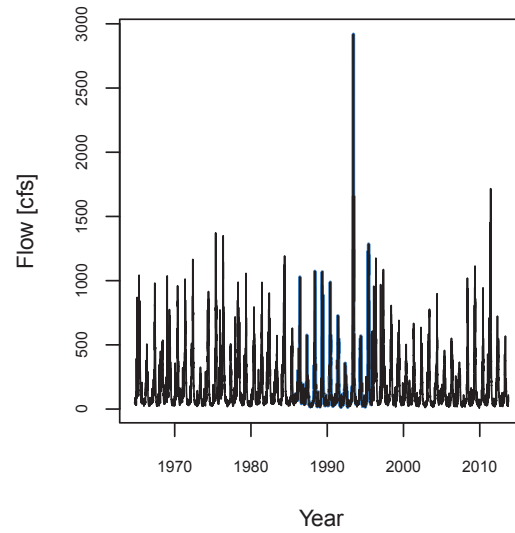
Regression with Transformed Data



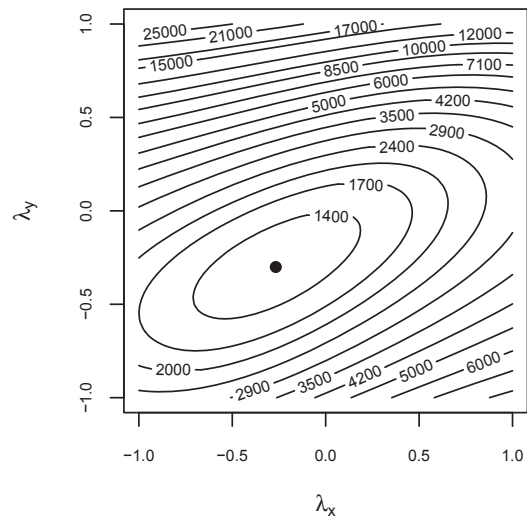
Site: 1333850A - Johns Creek
Base: 13338500 - SF CLEARWATER RIVER AT STITES ID



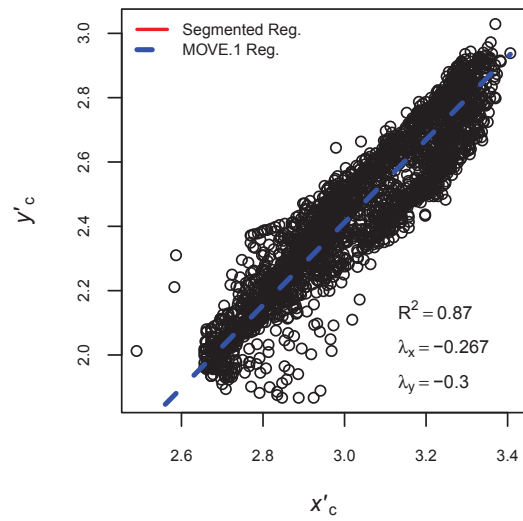
Extended Flow Record

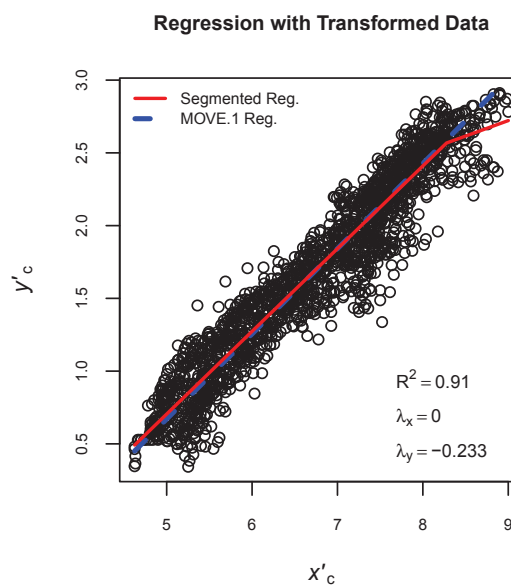
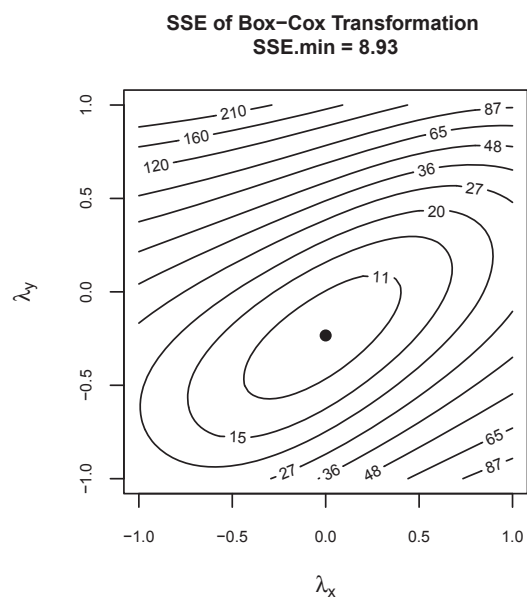
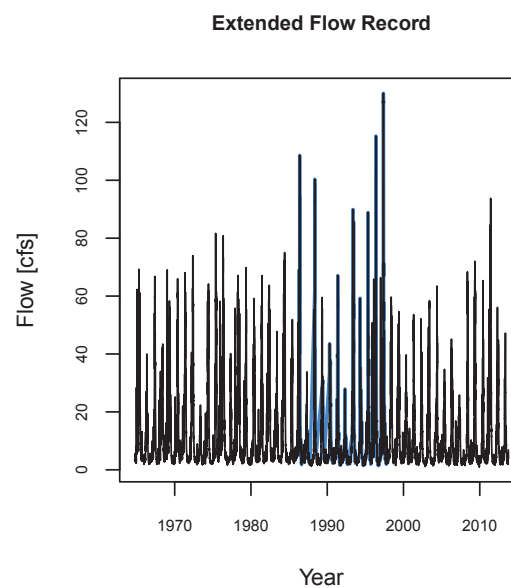
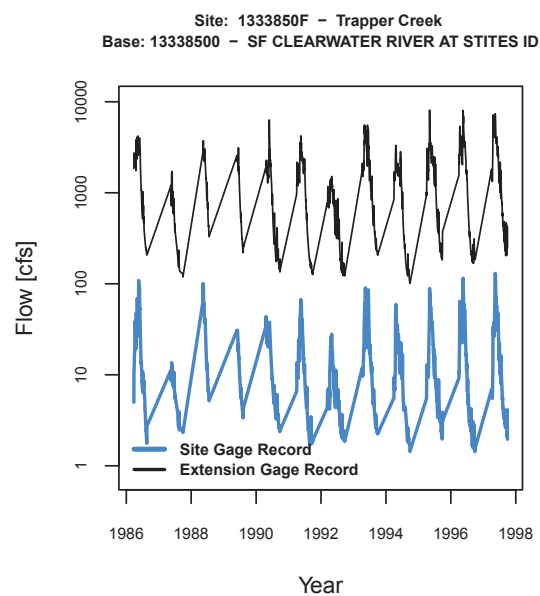


SSE of Box-Cox Transformation
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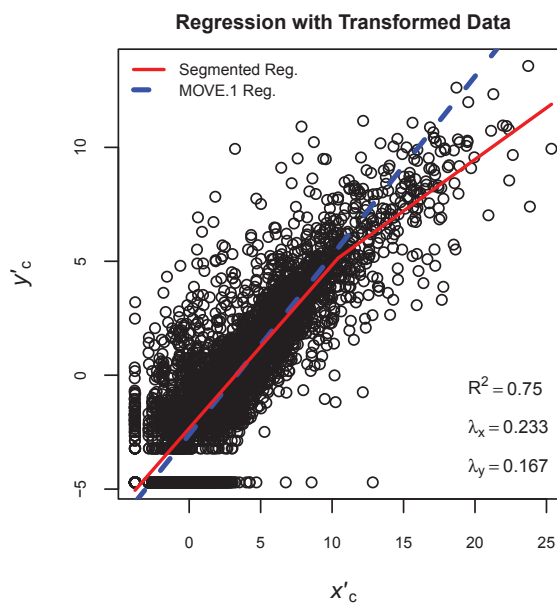
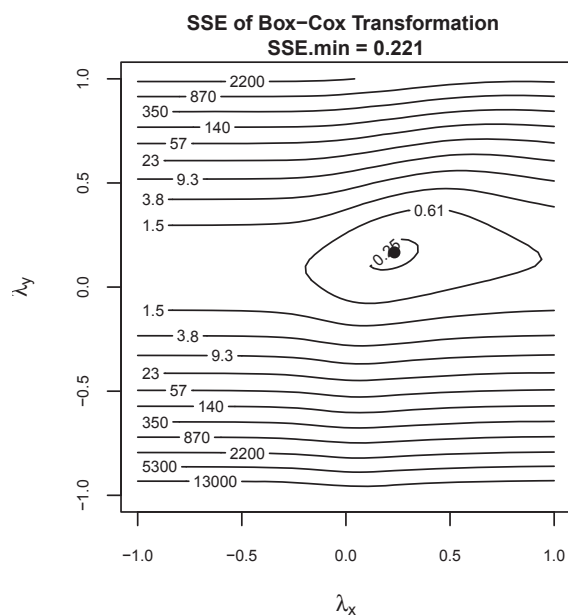
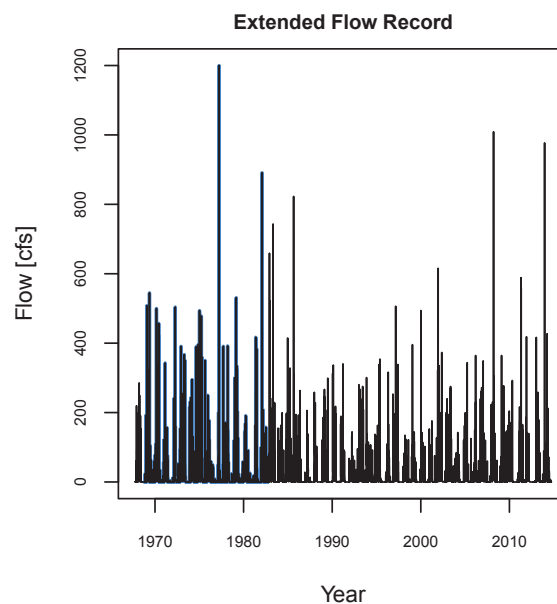
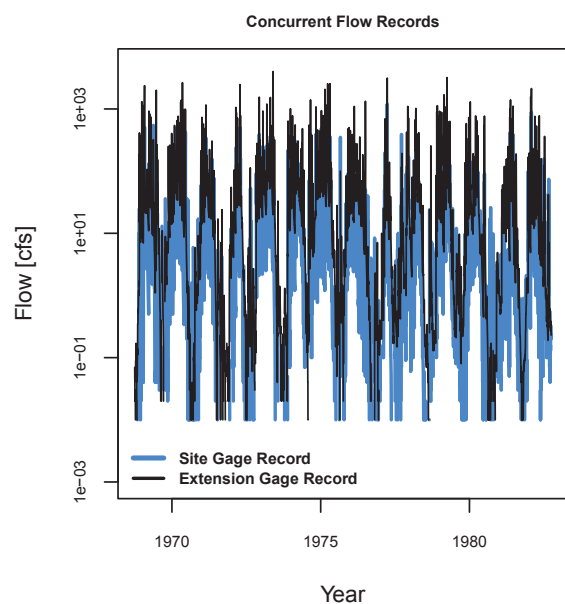


Regression with Transformed Data

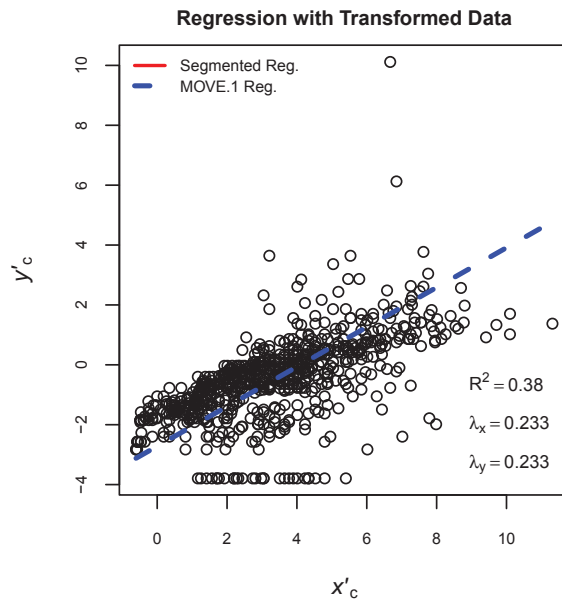
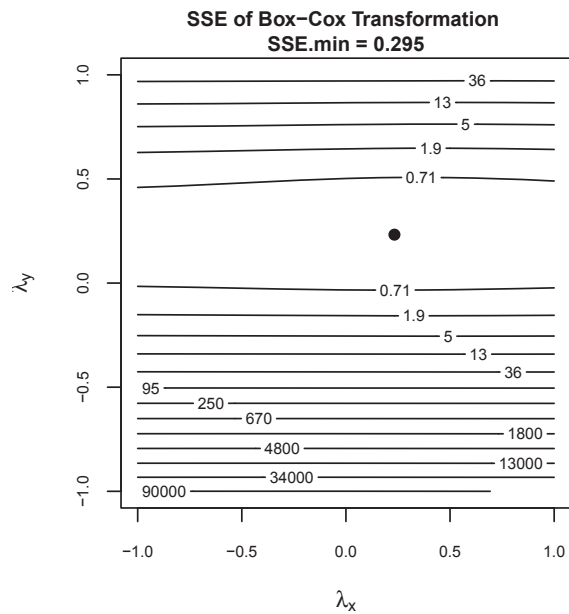
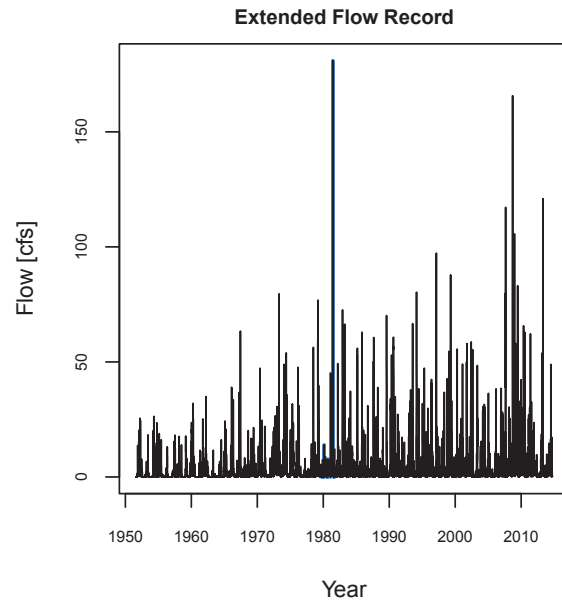
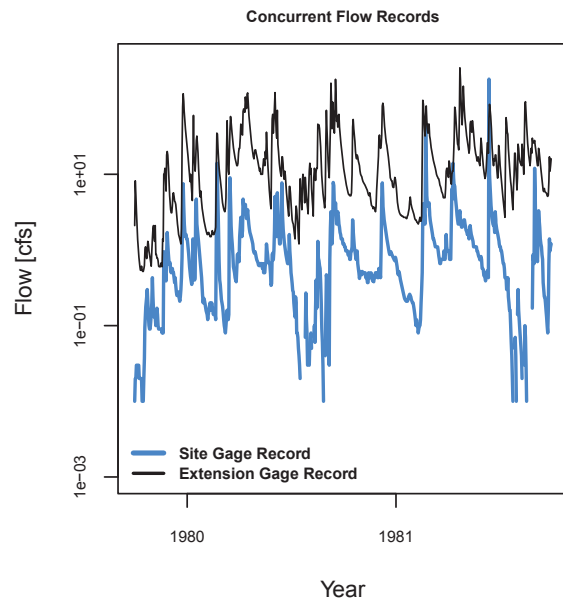




Site: 3382170 - BRUSHY CREEK NEAR HARCO, IL
 Base: 3384450 - LUSK CREEK NEAR EDDYVILLE, IL



Site: 5437632 - SPRING CR AT ROCK VALLEY COLLEGE AT ROCKFORD IL
 Base: 5550500 - POPLAR CREEK AT ELGIN, IL



APPENDIX E – Bankfull Discharge Prediction Results Tables

Table E.1 Bankfull Discharge Prediction Site Information, Coarse Bed Sites

Site ID	Site Name	Sed. Src.	Q_{bf} Met.	Q_{bf} (m^3/s)	$Q_{1.5}$ (m^3/s)	Q_{eff} (m^3/s)	Q_h (m^3/s)	D_{50} (mm)	Drainage (km^2)	Latitude	Longitude
11173575	Alameda Ck nr Sunol, CA	1	2	5.7	44	9.1	12.1	15	386	37.5404908	-121.856345
09255900	Big Sandstone Ck nr Savery, WY	3	3	3.7	5.6	7	5	60	26	41.19996287	-107.1756107
13310565	Blackmare Ck nr Cascade, ID	2	1	4.7	4.1	3.9	4.6	98	46	44.8218446	-115.70484
13185000	Boise River nr Twin Springs, ID	2	1	167.1	162.2	162.7	150.7	70	2,155	43.66805556	-115.7252778
13018300	Cache Creek nr Jackson, WY	4	3	3.9	1.7	1.5	2	46	27	43.45215258	-110.7040913
1241490A	Cat Spur Creek, ID	2	1	2.4	2.4	1.3	1.5	27	28	46.963802	-116.252564
13310520	Dollar Creek nr Cascade, ID	2	1	6.4	5.3	6.5	7.6	88	43	44.7201774	-115.6956723
0914650A	E.F. Dallas Creek nr Ridgeway, CO	5	1	3.7	3.3	3.5	3.4	58	44	38.0933249	-107.8136727
09255400	E.F. Savery Ck nr Encampment, WY	3	3	2.4	1.7	2	1.7	45	14	41.2721841	-107.1589432
M332AEC	Eggers Creek, ID	2	1	0.1	6.2	0.3	5.8	23	1	44.367804	-115.770893
07083000	Halfmoon Creek nr Malta, CO	5	1	6.2	6	5.6	5.8	49	61	39.17221259	-106.3891926
1329500B	Herd Creek, ID	2	1	5.5	3.5	3.5	3.1	67	285	44.132743	-114.276901
1333850A	Johns Creek, ID	2	1	49	19.6	22.6	19.5	197	293	45.822149	-115.888507
13313000	Johnson Creek at Yellow Pine, ID	2	1	39.6	70.5	65.2	69.1	190	565	44.96166667	-115.5000000
13019438	Little Granite Ck nr Bondurant, WY	4	1	6.4	5.7	5.3	9	155	55	43.2986111	-110.5177778
1331650A	Little Slate Creek, ID	2	1	12.2	12.2	1.1	7.7	125	162	45.618482	-116.066725
13337000	Lochsa River nr Lowell, ID	2	1	446	455.9	451.2	495.5	131	3,051	46.1508333	-115.5872222
1333850B	Lolo Creek, ID	2	1	11.8	10.5	7	8.4	74	106	46.313229	-115.748878
1333850C	Main Fork Red River, ID	2	1	9.3	10.6	10	8.9	55	129	45.709631	-115.340969
1329500C	Marsh Creek, ID	2	1	20.8	17.4	19.7	30.2	62	206	44.396773	-115.16927
11148900	Nacimiento R. nr Bryson, CA	1	2	10.5	100	230.5	278.3	78	420	35.78857918	-121.0938048
13340600	N.F. Clearwater R. nr Rngr Sta, ID	2	1	453.1	430.4	453.9	512.5	86	3,357	46.84055556	-115.621111
13011500	Pacific Creek at Moran, WY	6	3	29.4	56.4	54.1	55	79	438	43.85027778	-110.5177778
11481500	Redwood Ck nr Blue Lake, CA	1	2	28.3	113.2	29	68.1	22	175	40.90596479	-123.815335
11482500	Redwood Creek at Orick, CA	1	2	127.4	455.7	48	114.7	7	717	41.2992896	-124.0511825
11525530	Rush Ck nr Lewiston, CA	1	2	3.5	8.7	6.3	7.1	-	58	40.7245899	-122.8347458
10343500	Sagehen Creek nr Truckee, CA	7	1	2	1.8	0.1	1.8	58	27	39.43157246	-120.2379793
13235000	S.F. Payette River at Lowman, ID	2	1	86.4	99.1	82.1	89.8	95	1,155	44.08527778	-115.6222222
1333850D	S.F. Red River, ID	2	1	7.2	6.7	3.5	5.8	104	99	45.70764	-115.343817
13310700	S.F. Salmon River, ID	2	1	70.8	77.2	90.1	90.4	14	855	44.9869444	-115.725
13297355	Squaw Ck bl Bruno Ck nr Clayton, ID	2	1	5.1	5.1	7.9	7.6	46	185	44.2908333	-114.4716667
1329735A	Squaw Ck nr North Fork, ID (USFS)	2	1	0.6	0.5	0.4	0.5	27	37	45.410828	-114.200566
13297330	Thompson Creek, ID	2	1	2.5	2.4	3.5	4.8	63	75	44.27027778	-114.5166667
1333850F	Trapper Creek, ID	2	1	2.6	1.5	1.6	1.1	79	21	45.671602	-115.326708
11525854	Trinity R at Douglas City, CA	1	2	113.3	176.7	191.3	184.3	-	2,411	40.64527778	-122.9566667
13295000	Valley Creek at Stanley, ID	2	1	24.1	24.9	23.7	23.3	63	381	44.2225	-114.931111
13310670	W.F. Buckhorn Ck nr Rngr Sta, ID	2	1	5.7	4.1	5.9	5.3	180	59	44.9168443	-115.7434535
06228000	Wind River at Riverton, WY	9	1	141.6	130.6	10.2	68	22	5,980	43.01051478	-108.3767701

Sediment Data Sources (Coarse Bed Sites): 1: [U.S.G.S., 2014], 2: [U.S.F.S. Boise Adjudication Team, 2014], 3: [Rankl and Smalley, 1992], 4: [U.S.F.S., 2014], 5: [Bunte and Abt, 2009], 6: [Erwin et al., 2011], 7: [Andrews, 1994], 8: [Andrews, 2000], 9: [Smalley et al., 1994], 10: [Williams and Krupkin, 1984], 11: [Jones and Seitz, 1980].

Bankfull Discharge Estimation Method: 1: Direct on-site estimate (same source as sediment data source), 2: At-a-station hydraulic geometry relation from NWIS discharge field measurements following Williams [1978], 3: Regional downstream hydraulic geometry relation, [Foster, 2012].

Table E.2 Bankfull Discharge Prediction Site Information, Fine Bed Sites

Site ID	Site Name	Q_{bf} Met.	Q_{bf} (m^3/s)	$Q_{1.5}$ (m^3/s)	Q_{eff} (m^3/s)	Q_h (m^3/s)	D_{50} (mm)	Drainage (km^2)	Latitude	Longitude
07137500	Arkansas River nr Coolidge, KS	4	31.2	33.8	12.2	1,678	0.53	65,812	38.0275129	-102.0115706
07146500	Arkansas River at Arkansas City, KS	4	481	429	39.8	545	0.43	113,216	37.05641799	-97.0580939
07152500	Arkansas River at Ralston, OK	4	1,444	1,019	244	835	-	140,398	36.50421677	-96.7283672
11176900	Arroyo de la Laguna at Verona, CA	4	25.5	89.6	77.3	70.4	2.91	1,044	37.62659915	-121.8830126
07290000	Big Black River nr Bovina, MS	1	425	525	244	3,314	0.38	7,283	32.34777778	-90.6969444
06485500	Big Sioux R. at Akron, IA	1	197	197	44.9	1,977	0.59	20,407	42.83752049	-96.5619219
08114000	Brazos River at Richmond, TX	4	2,124	1,240	1,789	1,691	0.21	116,827	29.5824589	-95.7577275
02300700	Bullfrog Creek nr Wimauma FL	4	4.3	19.7	0.5	2.8	-	75	27.79197208	-82.3520369
08123850	Colorado River abv Silver, TX	4	36.8	56.9	0.6	76.8	-	38,617	32.05374399	-100.762052
08162000	Colorado River at Wharton, TX	4	1,529	575	876	974	-	108,787	29.30913668	-96.1038482
08147000	Colorado River nr San Saba, TX	4	283	504	5.1	292	-	80,852	31.21794515	-98.564484
09163500	Colorado River nr State Line, CO	4	1,246	5,292	481	7,391	-	46,229	39.13276047	-109.0270546
02075500	Dan River at Paces, VA	4	680	586	77.2	399	-	6,700	36.64236056	-79.089459
03365500	E.F. White River at Seymour, IN	1	313	7,831	45.5	1,541	1.63	6,063	38.982553	-85.8991444
11475000	Eel River at Fort Seward, CA	2	6,260	1,895	1,177	3,382	2.93	5,457	40.2182	-123.63253
07277700	Hickahala Creek nr Senatobia, MS	3	255	280	63.7	205	0.43	313	34.63194444	-89.9244444
05568800	Indian Creek nr Wyoming, IL	4	18.1	36.2	1.5	6.9	1	162	41.01888889	-89.8355556
05451500	Iowa River at Marshalltown, IA	1	282	183	58.5	139	0.47	3,968	42.06582096	-92.9076997
05526000	Iroquois River nr Chebanse, IL	4	340	316	36.2	149	-	5,416	41.0089215	-87.8233719
05520500	Kankakee River at Momence, IL	4	34	174	110	113	-	5,941	41.16003338	-87.6686483
05591200	Kaskaskia River at Cooks Mills, IL	4	20.4	120	7.1	35.4	0.91	1,225	39.5833666	-88.4133842
05594100	Kaskaskia River nr Venedy Sta., IL	4	269	493	115	2,677	0.32	11,378	38.45060486	-89.6275926
11523000	Klamath River at Orleans, CA	4	566	1,356	597	1,642	3.58	21,950	41.3034599	-123.5345036
11530500	Klamath River nr Klamath, CA	4	1,841	27,691	1,003	33,131	-	31,339	41.5109543	-123.9795164
07143672	L. Arkansas R. 50 nr Halstead, KS	4	170	95	0.6	110	-	1,966	38.0286223	-97.540597
07144100	L. Arkansas R. nr Sedgwick, KS	4	85	188	1.7	209	0.86	3,209	37.88306739	-97.4244864
05584500	La Moine River at Colmar, IL	4	170	180	11	121	0.38	1,696	40.33032166	-90.8962451
03261950	Loramie Creek nr Newport, OH	3	8.5	67.4	37.7	44.2	0.38	394	40.30699246	-84.3838383
01466500	McDonalds Br in Byrne State Frst., NJ	4	0.2	0.2	0.04	0.1	-	6	39.885	-74.50527778
07374000	Mississippi R. at Baton Rouge, LA	4	16,990	27,146	25,224	25,222	-	2,915,837	30.44566667	-91.1915556
07022000	Mississippi River at Thebes, IL	4	16,424	13,459	6,651	10,251	0.44	1,847,181	37.2216	-89.462975
08041000	Neches River at Evadale, TX	1	220	548	85.3	368	0.23	20,593	30.35576378	-94.0932373
04024430	Nemadji River nr South Superior, WI	4	122	127	47.1	101	0.45	1,088	46.63327388	-92.0940803
02089500	Neuse River at Kinston, NC	1	135	278	50.6	167	0.57	6,972	35.25777778	-77.5855556
02047000	Nottoway River nr Sebrell, VA	1	75.4	187	34.5	84.7	1.28	3,732	36.7704276	-77.1660778
08407500	Pecos River at Red Bluff, NM	4	312	30.9	1.7	2,111	-	50,608	32.07519167	-104.0394361

Table E.2 cont. Bankfull Discharge Prediction Site Information, Fine Bed Sites

Site ID	Site Name	Q_{bf} Met.	Q_{bf} (m^3/s)	$Q_{1.5}$ (m^3/s)	Q_{eff} (m^3/s)	Q_h (m^3/s)	D_{50} (mm)	Drainage (km^2)	Latitude	Longitude
08396500	Pecos River nr Artesia, NM	4	99.1	62.9	22.7	293	-	39,627	32.8408611	-104.3238333
02131000	Pee Dee River at Peedee, SC	1	691	897	176	371	0.62	22,870	34.20432518	-79.5483896
05099600	Pembina River at Walhalla, ND	4	113	40	18.9	96.7	1.47	8,676	48.9133284	-97.9170369
01653600	Piscataway Creek at Piscataway, MD	4	17	23.5	1.7	35.9	-	102	38.70577778	-76.9661944
01618000	Potomac River at Shepardstown, WV	4	1,133	1,776	300	728	-	15,382	39.43472	-77.80139
07337000	Red River at Index, AR	1	1,352	1,727	1,604	1,846	0.26	124,320	33.55194444	-94.0411111
05054000	Red River of the North at Fargo, ND	4	136	71.9	12.7	81.8	-	17,612	46.861075	-96.7836924
05064500	Red River of the North at Halstad, MN	4	623	265	26	189	0.62	56,462	47.351918	-96.843691
11482500	Redwood Ck. at Orick, CA	4	105	456	108	300	5	717	41.2992896	-124.0511825
50038100	Rio Grande de Manati nr Manati, PR	4	170	447	5.1	391	-	510	18.42911367	-66.5265608
08353000	Rio Puerco nr Bernardo, NM	4	42.5	39.6	27.1	56.9	2.64	19,036	34.41027778	-106.8544444
08334000	Rio Puerco nr Guadalupe, NM	4	7.1	30.4	2	11.3	-	1,088	35.60088889	-107.1666111
01658500	S.F. Quantico Ck nr Indp. Hill, VA	4	1.4	12.5	0.2	3.5	-	20	38.5873427	-77.4285958
09471000	San Pedro River at Charleston, AZ	4	19.8	113	88.4	225	0.48	3,196	31.62592644	-110.1745226
05572000	Sangamon River at Monticello, IL	4	59.5	110	7.2	34.6	0.49	1,424	40.03086735	-88.58895419
05570000	Spoon River at Seville, IL	4	193	285	26.6	131	0.46	4,237	40.49004077	-90.3404025
02248000	Spruce Creek nr Samsula, FL	4	5.7	12.5	0.8	6.2	-	87	29.05081845	-81.0464455
01095220	Stillwater River nr Sterling, MA	4	15	22.7	2.3	4.2	-	82	42.41092507	-71.7911829
01401000	Stony Brook at Princeton, NJ	4	36.8	86.6	17.6	35.6	-	115	40.33305556	-74.6819444
11382000	Thomes Ck. at Paskenta, CA	4	70.8	129	29.8	181	5.43	526	39.88765496	-122.5291655
11530000	Trinity River at Hoopa, CA	2	3,404	1,048	280	7,021	2	7,389	41.049852	-123.673668
08062700	Trinity River at Trinidad, TX	4	623	718	413	649	-	22,113	32.14765255	-96.1024708
08057410	Trinity River blw Dallas, TX	4	312	396	193	388	0.34	16,260	32.70763139	-96.7358319
07331000	Washita River nr Dickson, OK	1	464	549	176	623	0.16	18,575	34.23342725	-96.9758447

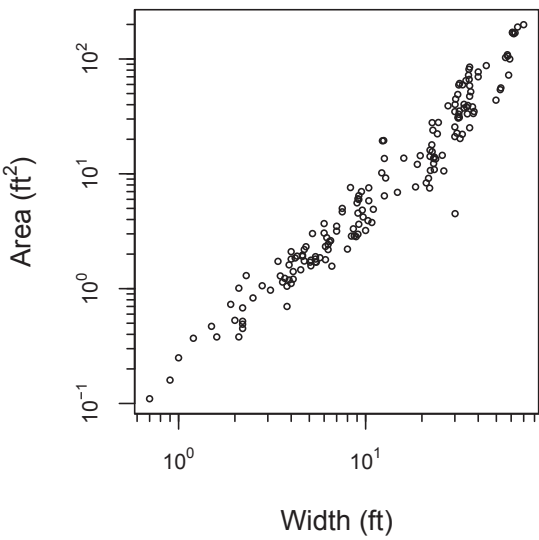
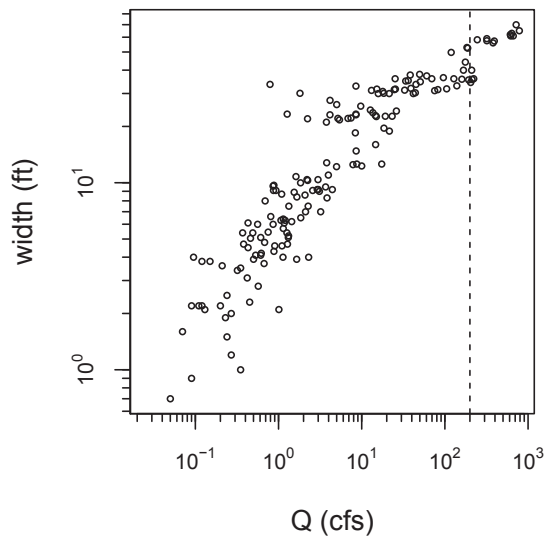
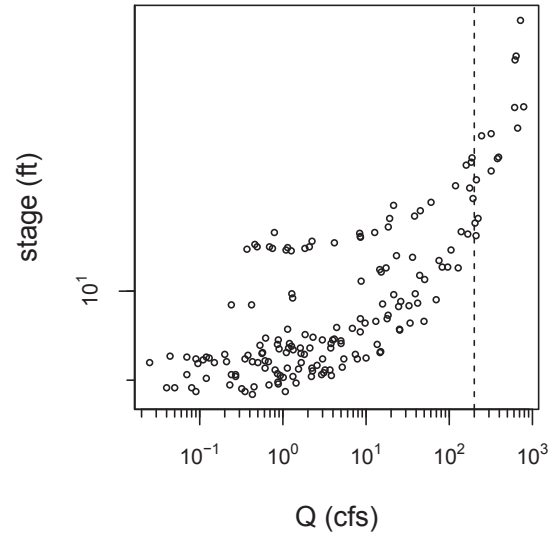
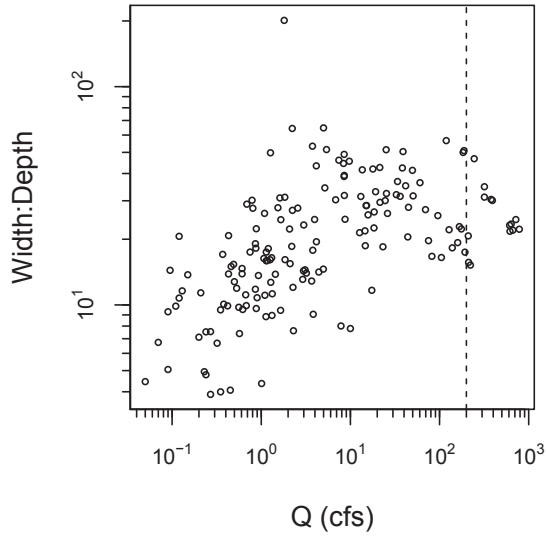
Sediment Data Source (Fine Bed Sites): U.S.G.S Center for Integrated Data Analytics, Sediment Data Portal: Discrete Measurements, <http://cida.usgs.gov/sediment>, Accessed 2014-11-14.

Bankfull Discharge Estimation Method: 1: Direct on-site estimate as reported by Soar and Thorne [2001], 2: Direct on-site estimate [Nolan et al., 1987], 3: Direct on-site estimate [Powell et al., 2006], 4: At-a-station hydraulic geometry relation from NWIS discharge field measurements following Williams [1978].

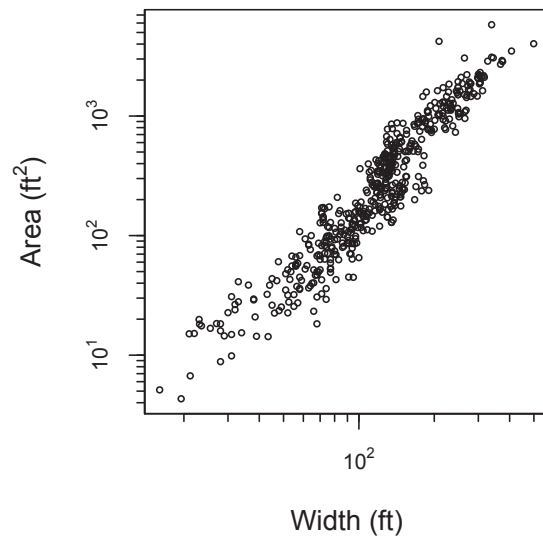
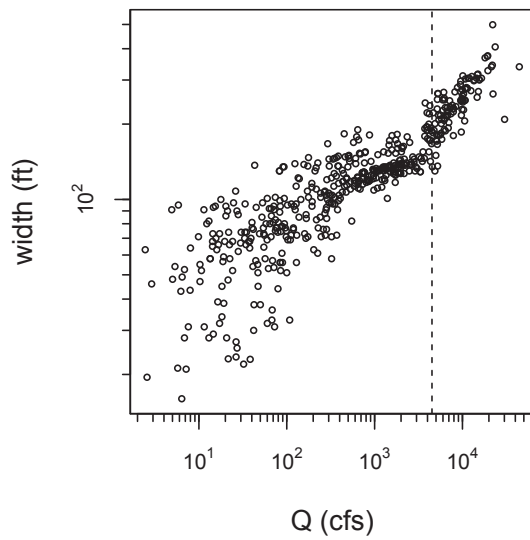
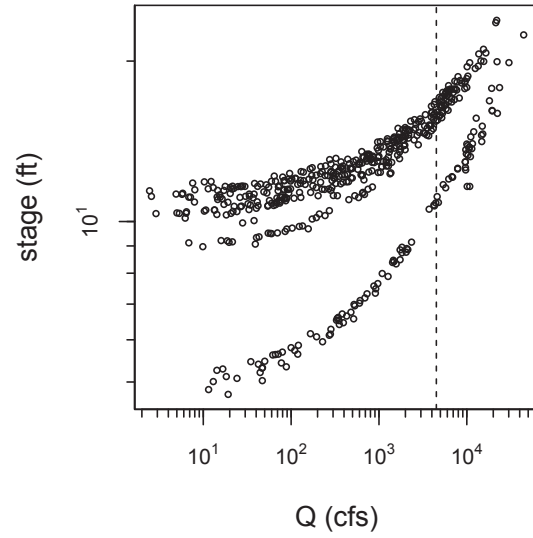
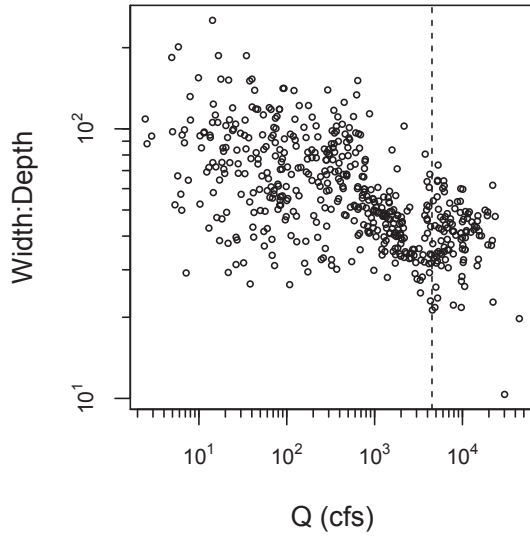
APPENDIX F – At-a-station Hydraulic Geometry Plots for
Bankfull Discharge Determination

Below are plots for all sites used in Chapter 3, where the bankfull discharge was estimated using at-a-station hydraulic geometry relationships following Williams [1978]. I plot four relationships using these data: 1) the flow top width to average flow depth ratio as a function of discharge (top left), 2) the stage-discharge relationship (top right), 3) the flow top width discharge relationship (bottom left), and 4) the flow area to top width relationship (bottom right). Here, I plot field measurements collected from the USGS at each gage location and look for breaks that might occur at the transition between in-channel and out-of-channel flow. A clear break did not exist at all gages and therefore I was not able to estimate bankfull discharge at all locations. Where a break was found to be useful in estimating bankfull discharge, a vertical dashed line is plotted identifying the estimated value of bankfull discharge.

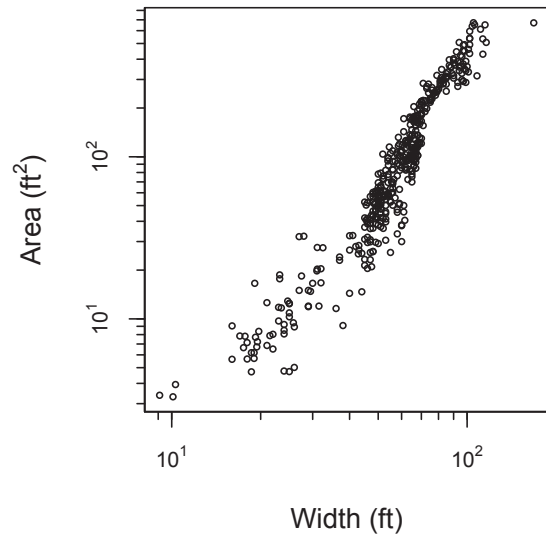
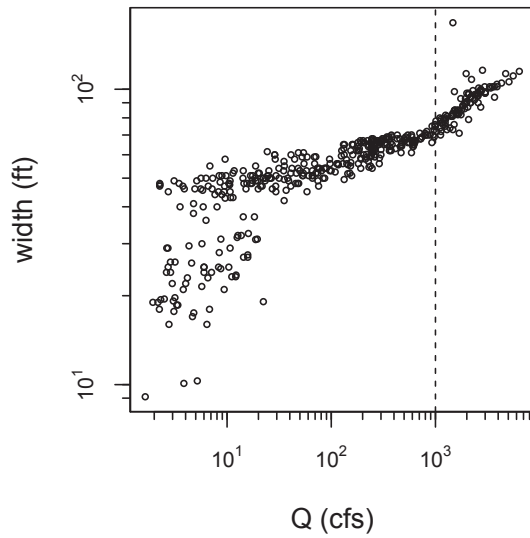
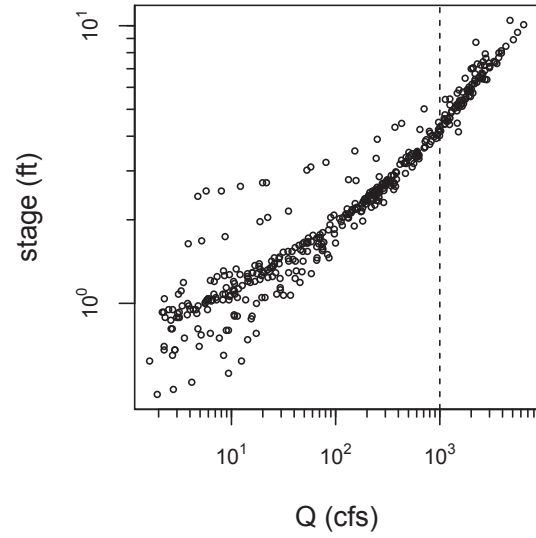
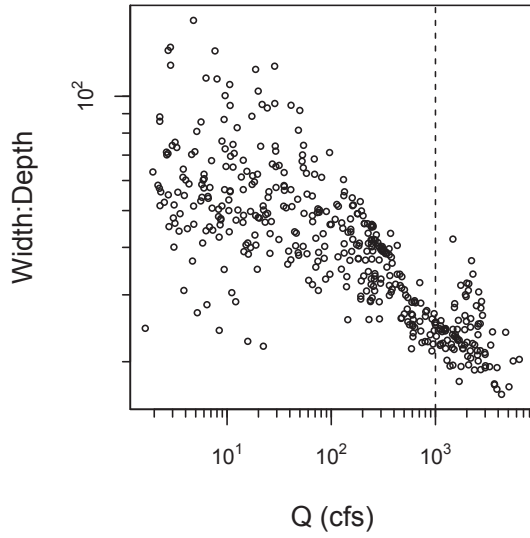
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11173575



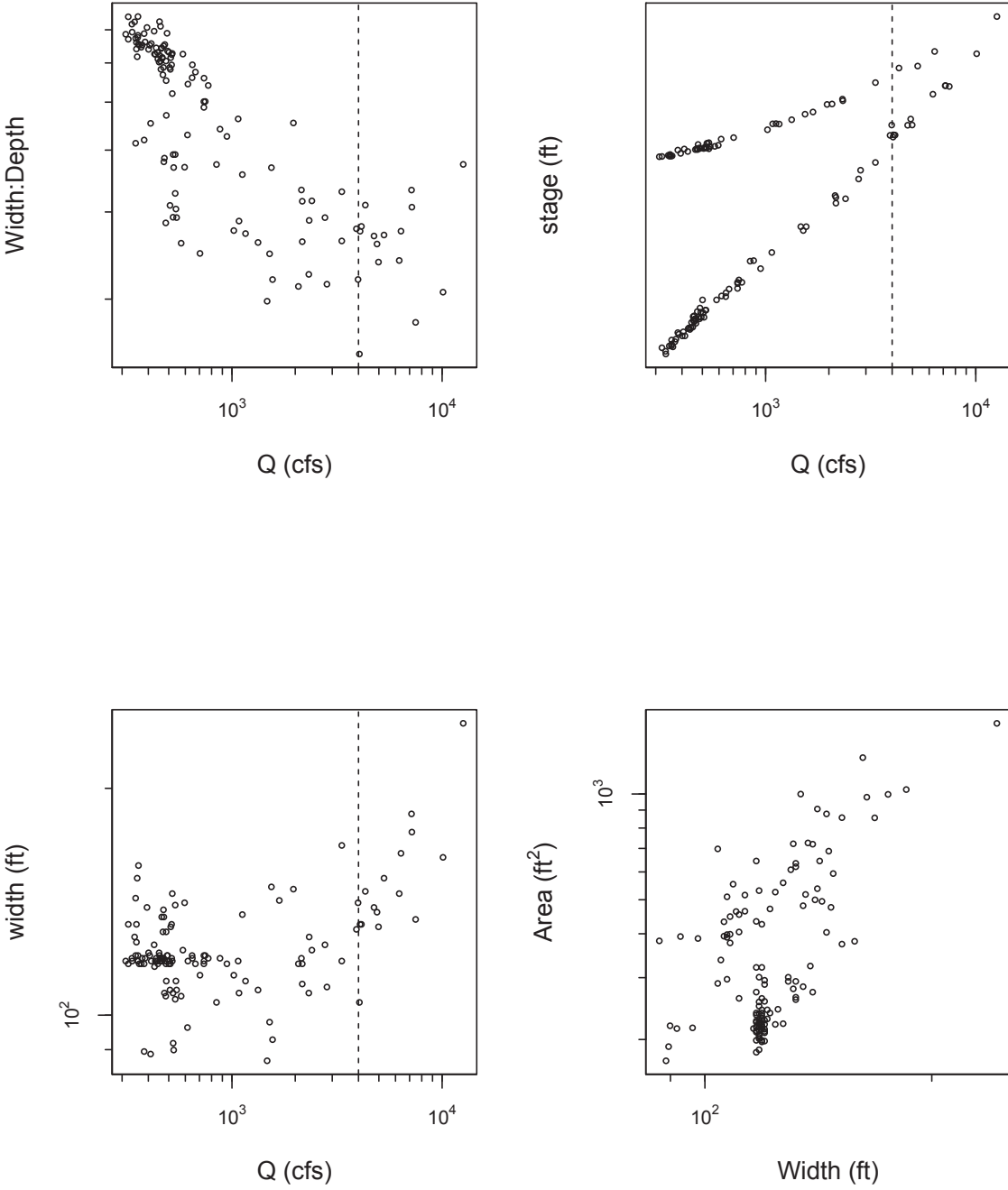
REDWOOD C A ORICK, CA
11482500



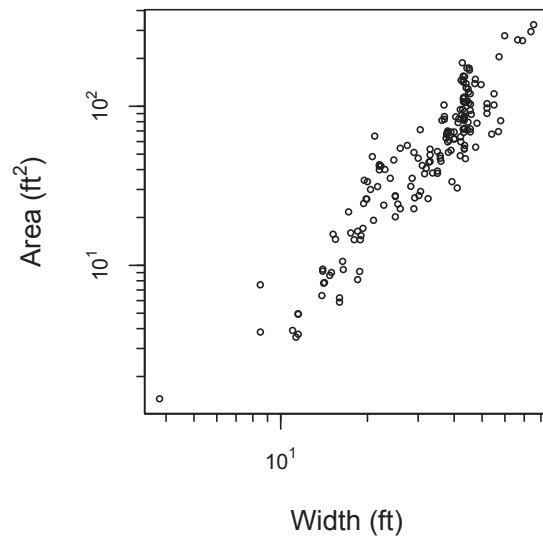
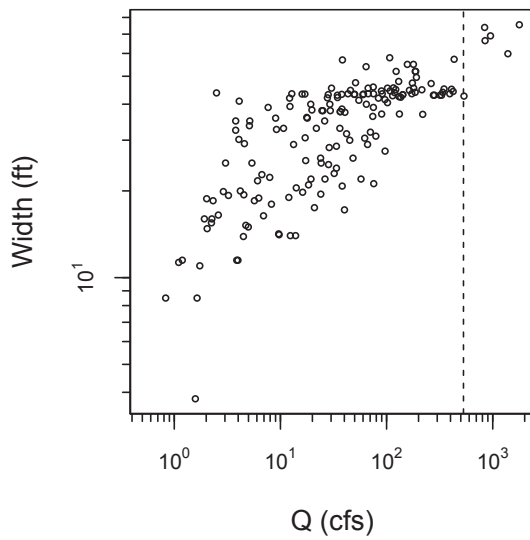
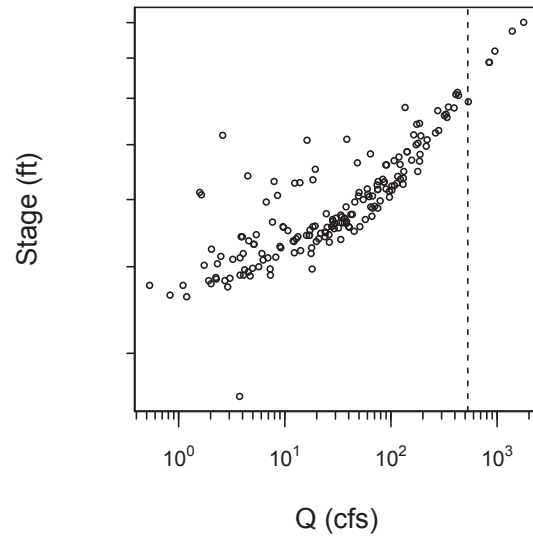
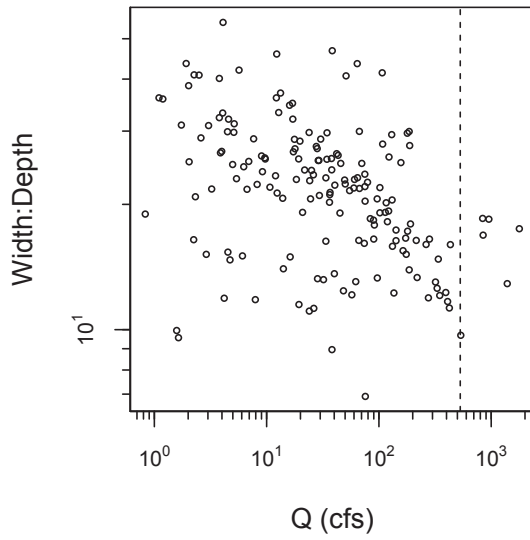
REDWOOD C NR BLUE LAKE, CA
11481500



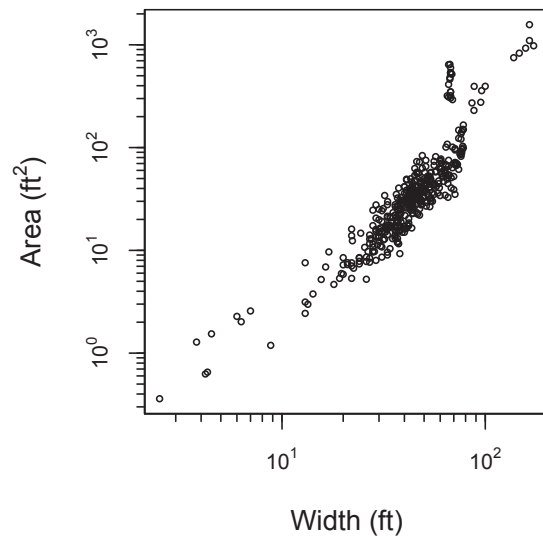
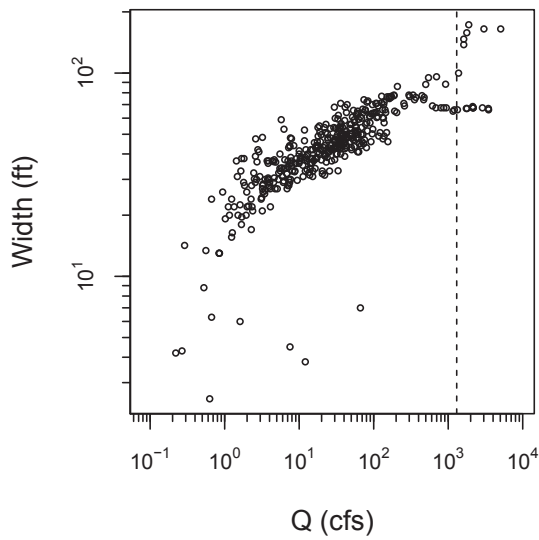
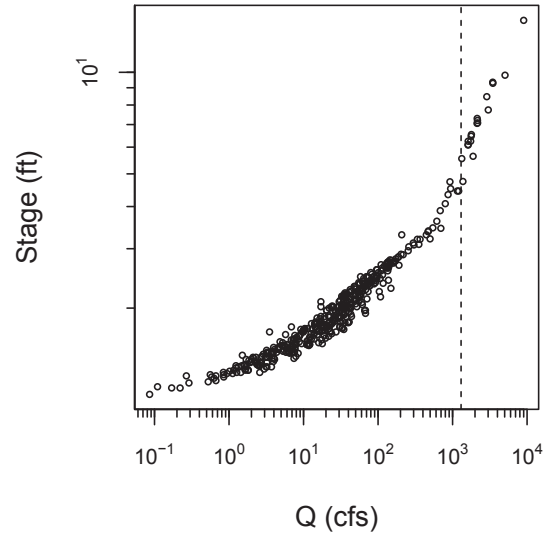
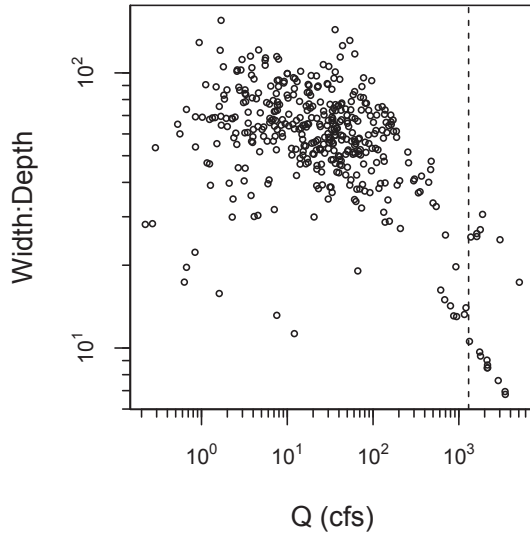
TRINITY R A DOUGLAS CITY, CA
11525854



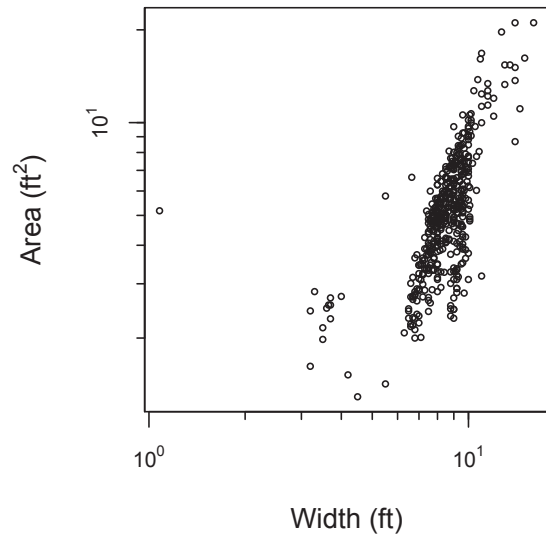
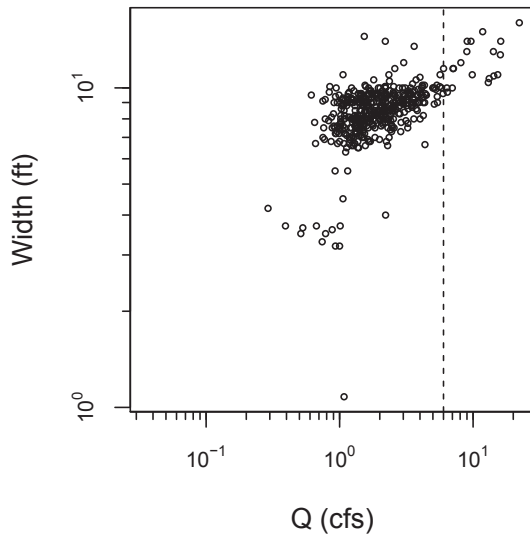
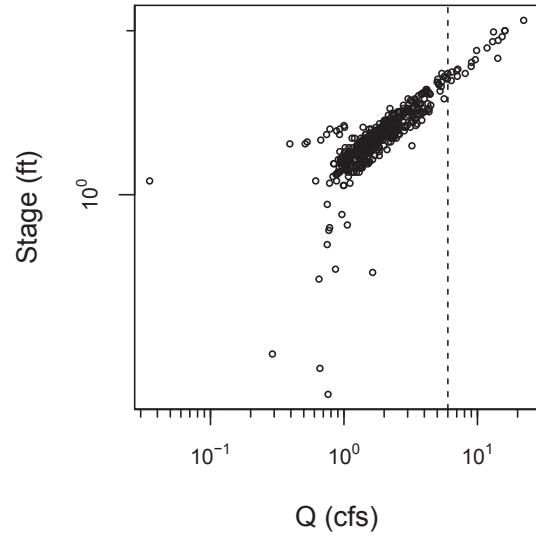
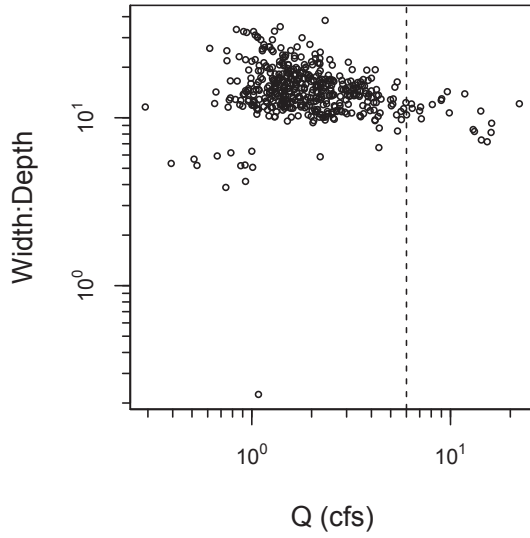
STILLWATER RIVER NEAR STERLING, MA
01095220



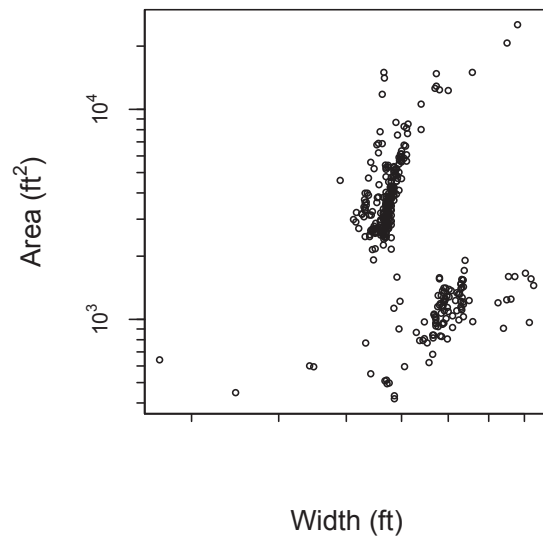
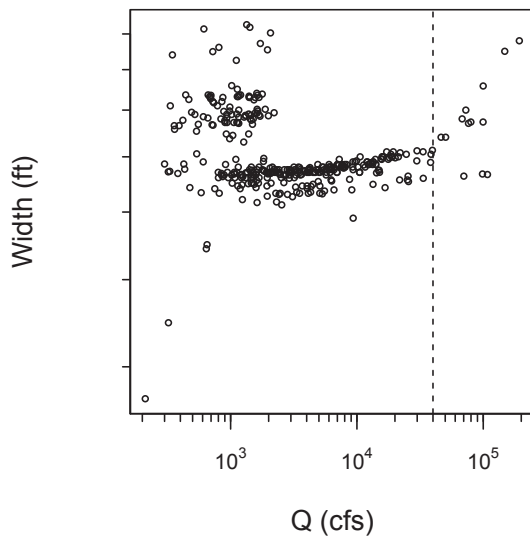
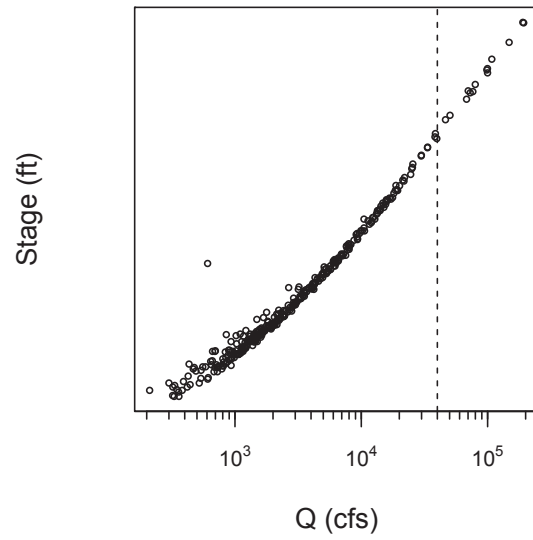
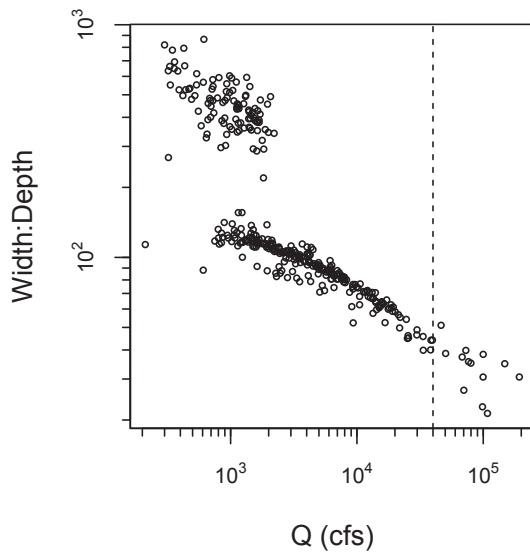
Stony Brook at Princeton NJ
01401000



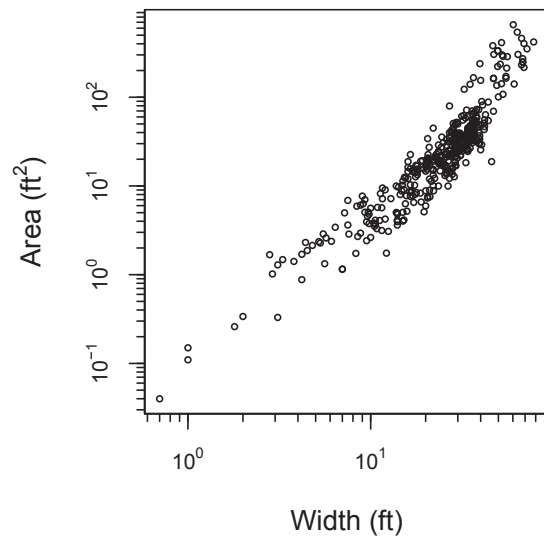
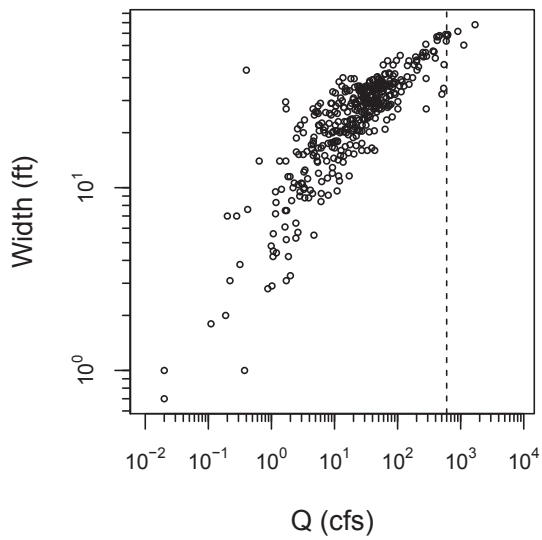
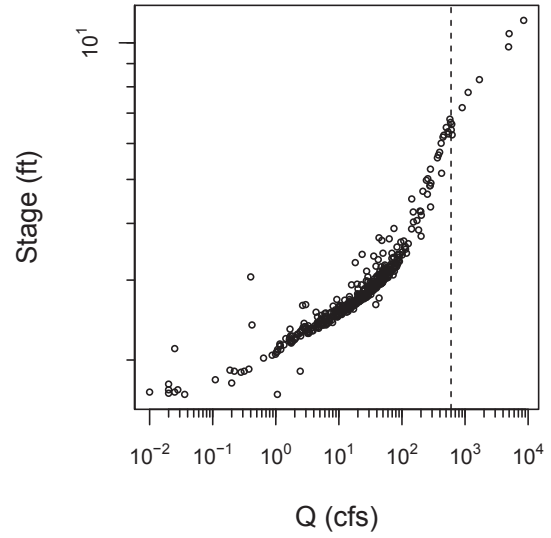
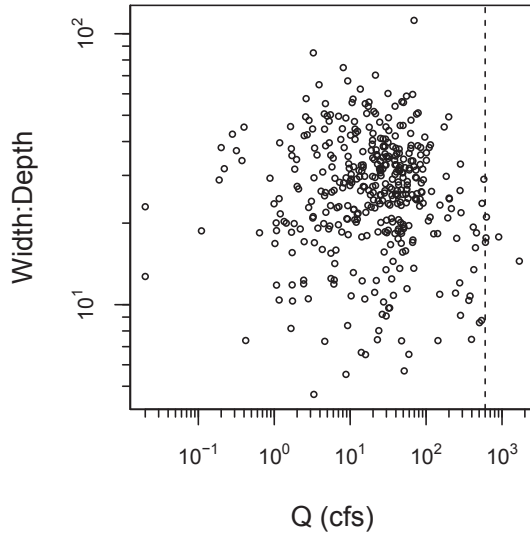
McDonalds Branch in Byrne State Forest NJ
01466500



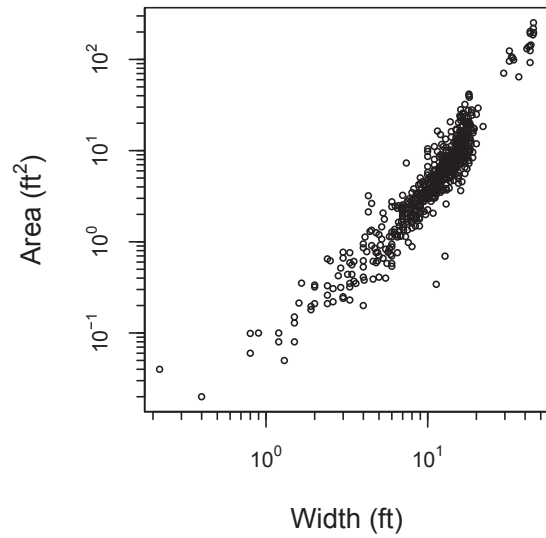
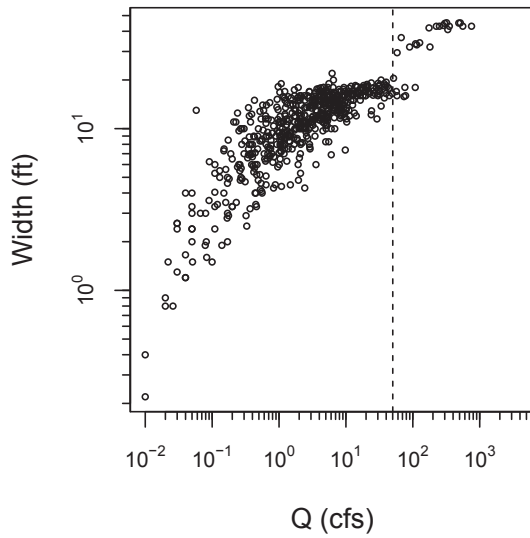
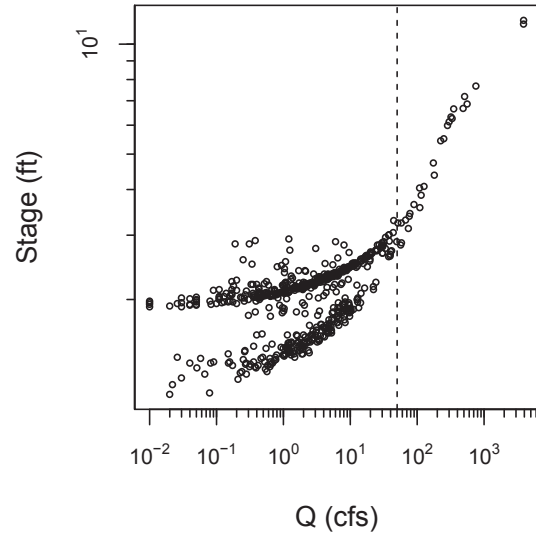
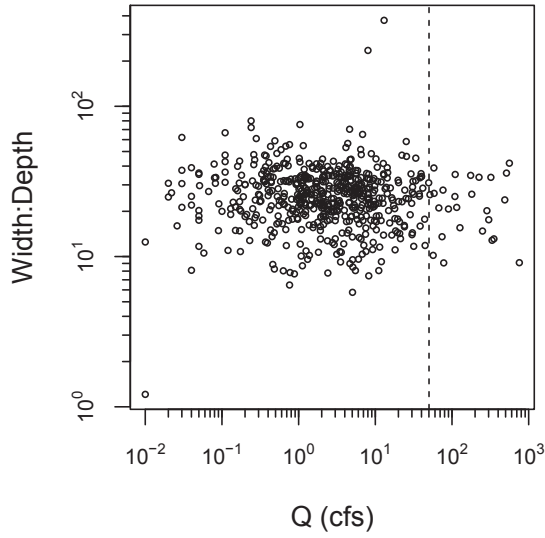
POTOMAC RIVER AT SHEPHERDSTOWN, WV
01618000



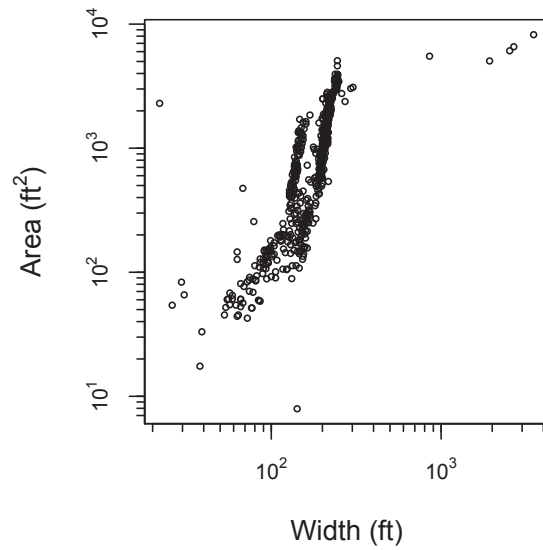
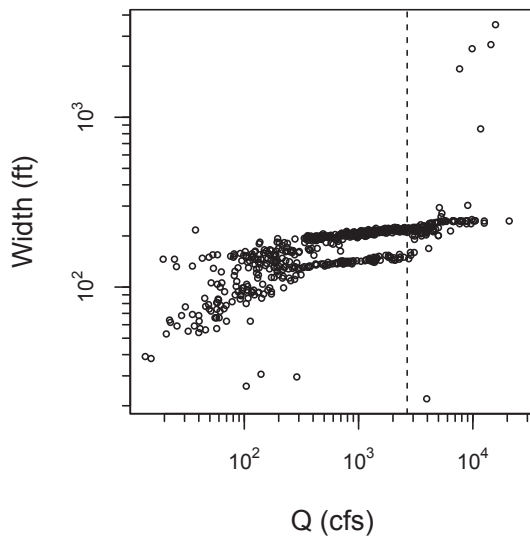
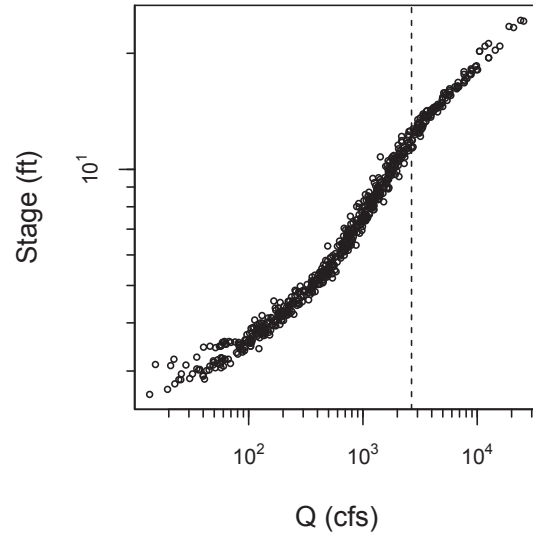
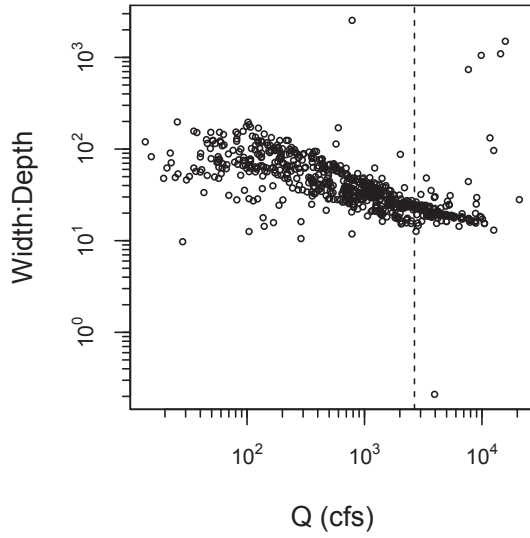
PISCATAWAY CREEK AT PISCATAWAY, MD
01653600



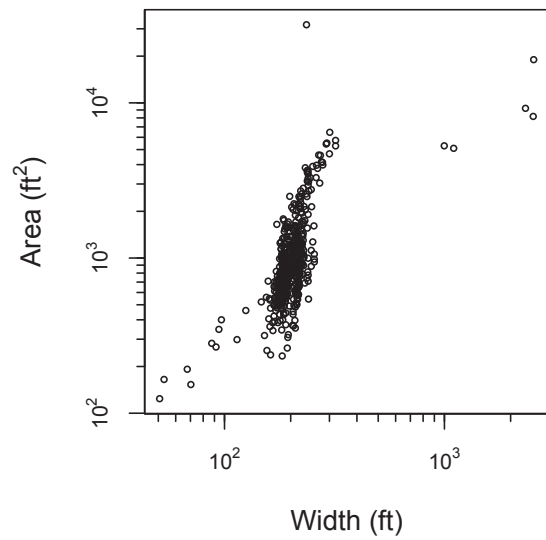
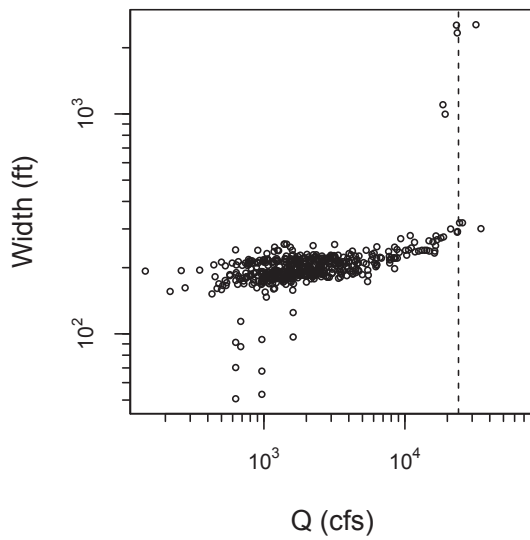
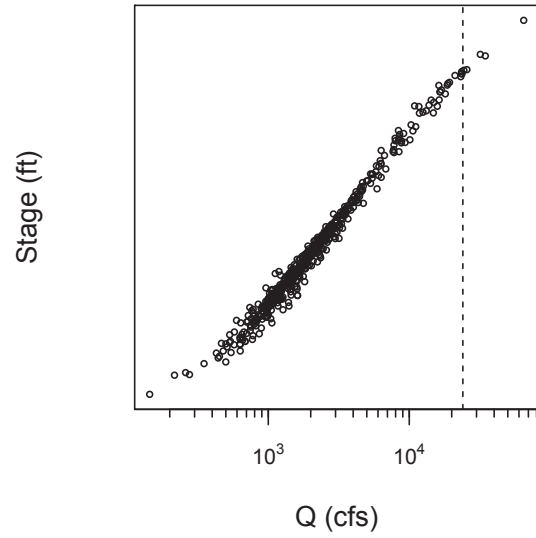
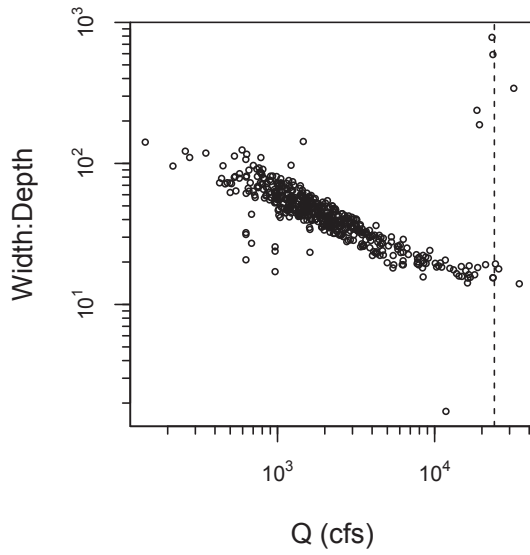
S F QUANTICO CREEK NEAR INDEPENDENT HILL, VA
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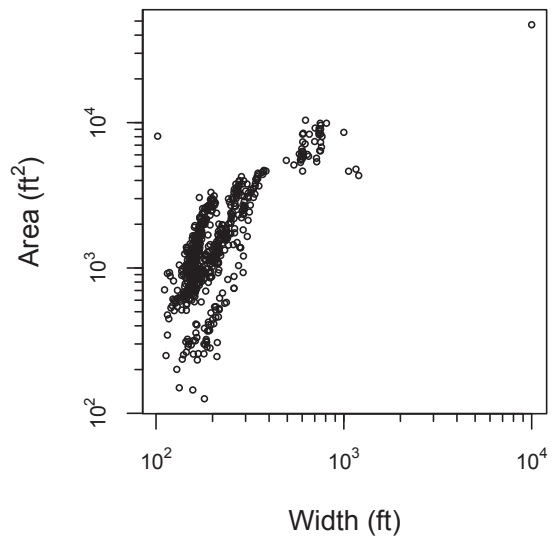
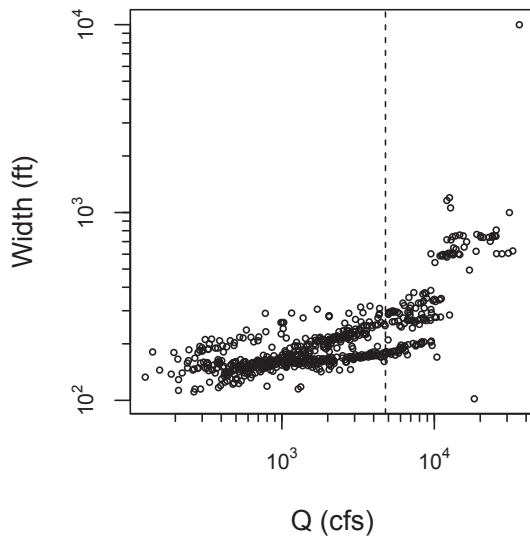
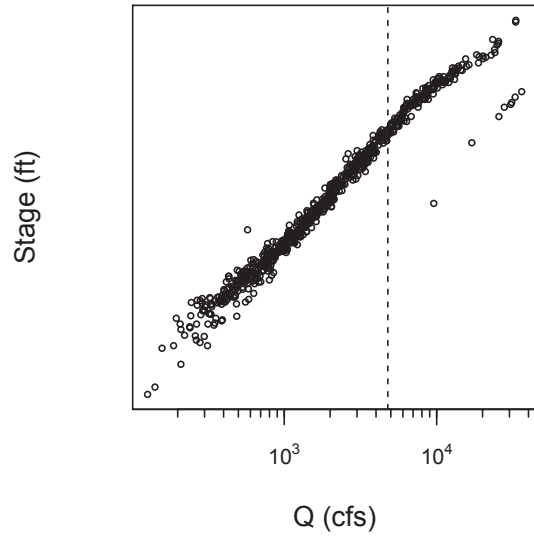
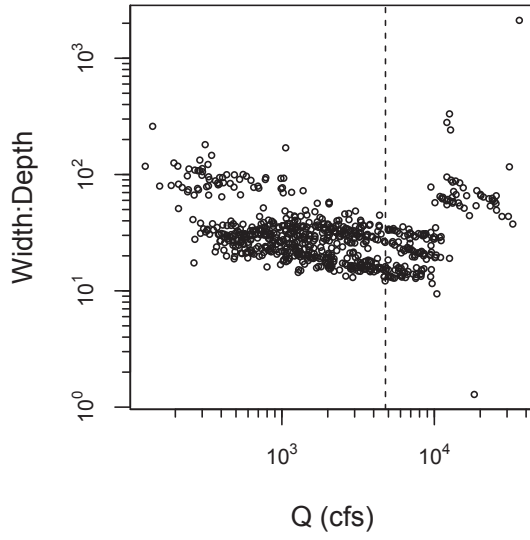
NOTTOWAY RIVER NEAR SEBRELL, VA
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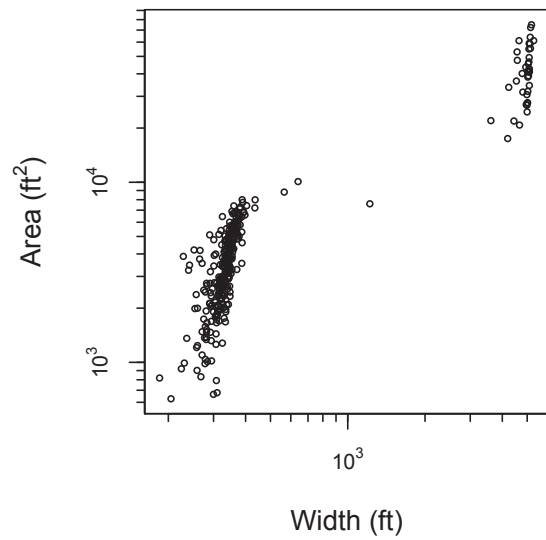
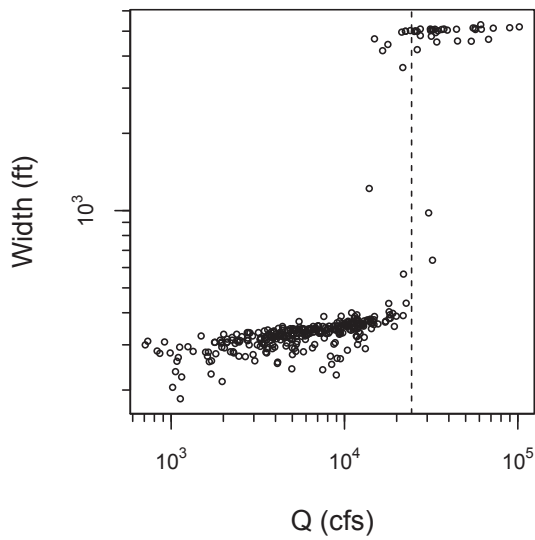
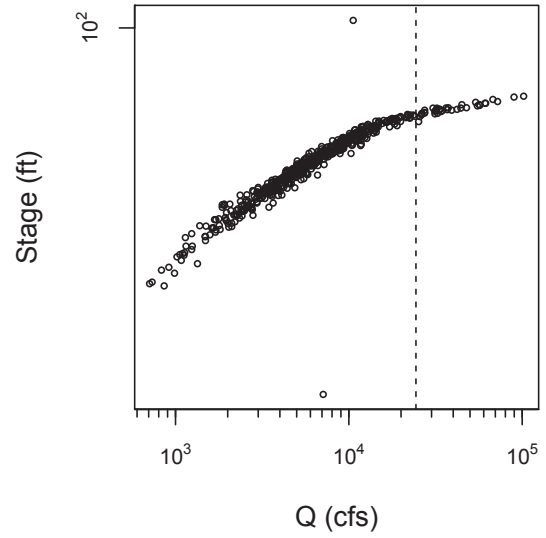
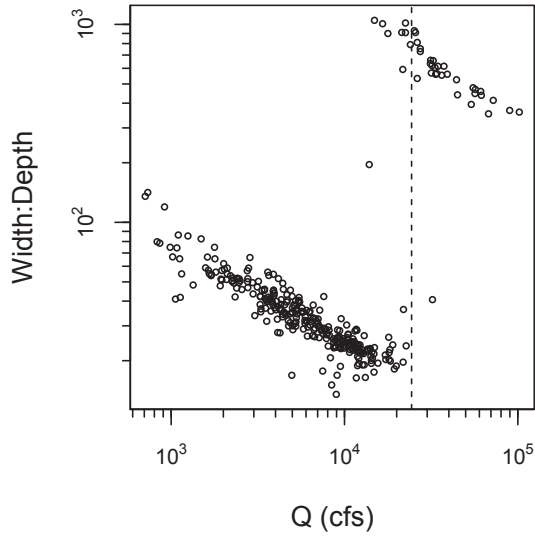
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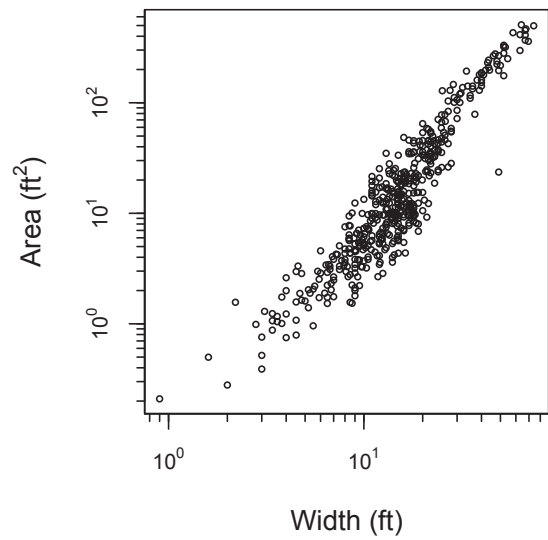
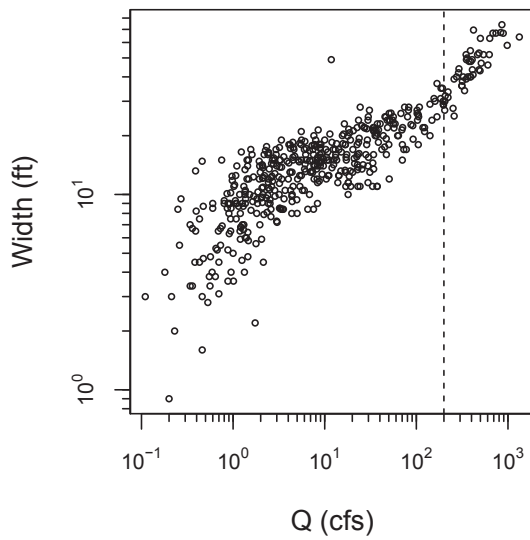
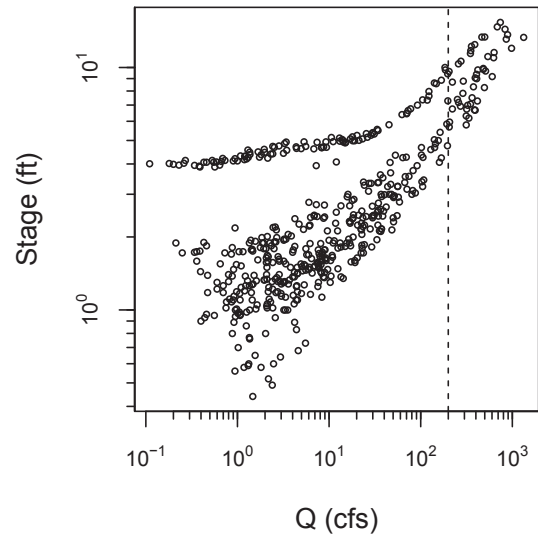
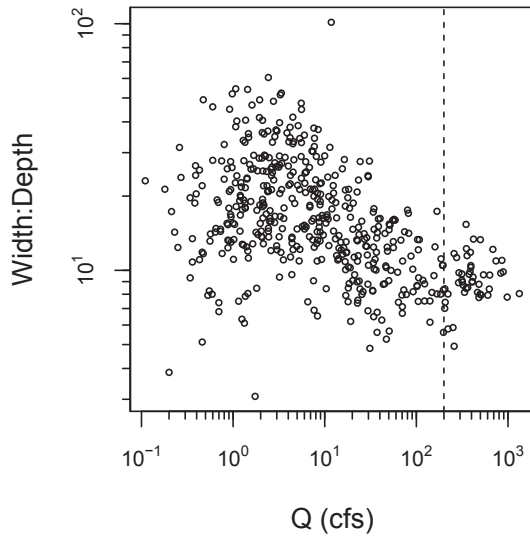
NEUSE RIVER AT KINSTON, NC
02089500



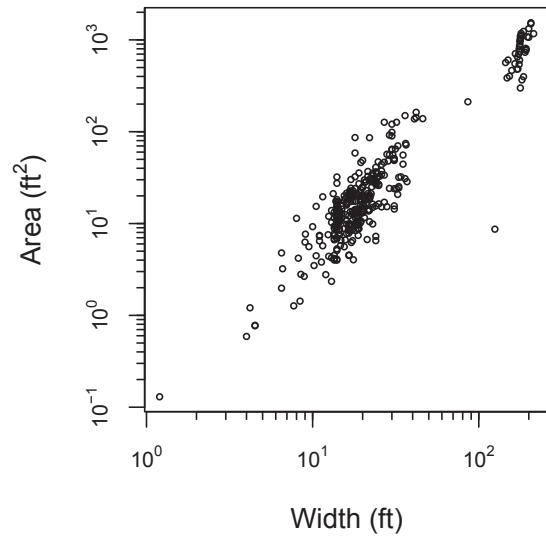
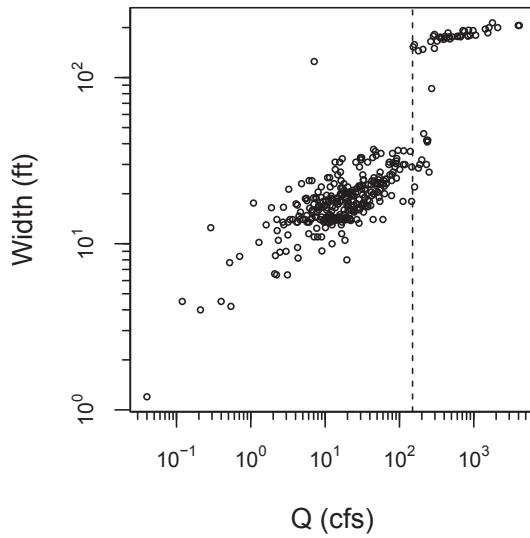
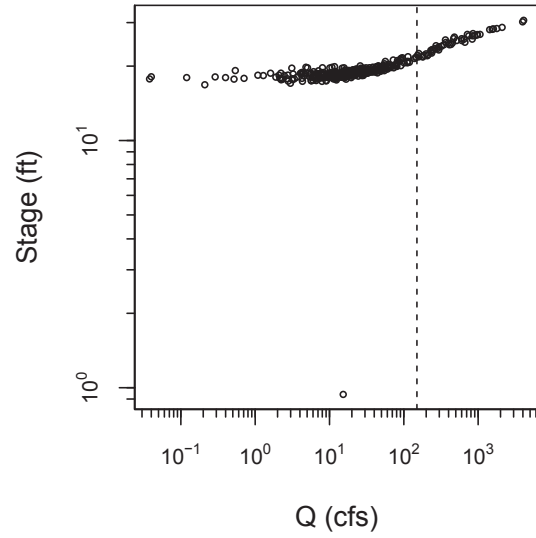
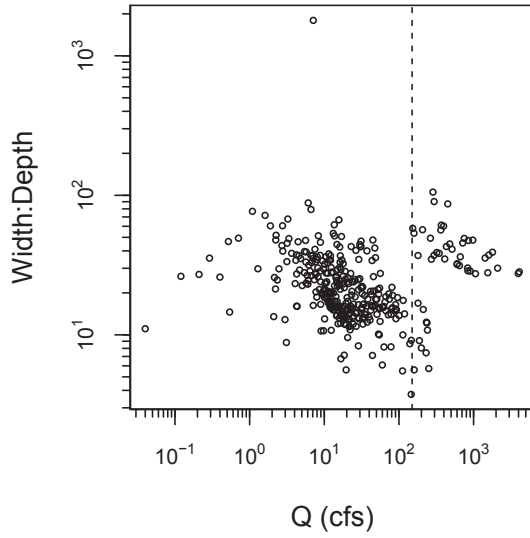
PEE DEE RIVER AT PEEDEE, SC
02131000



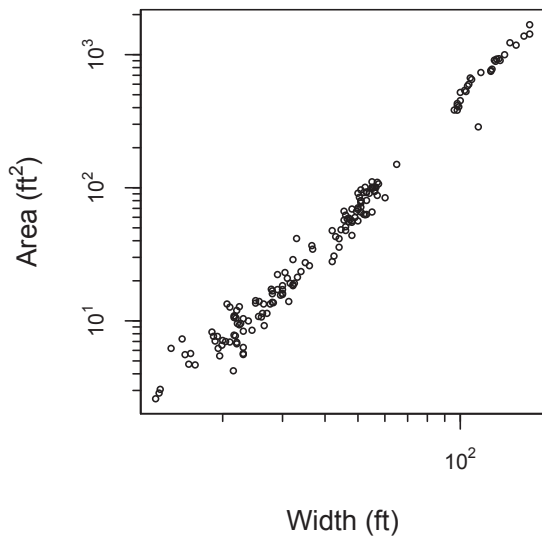
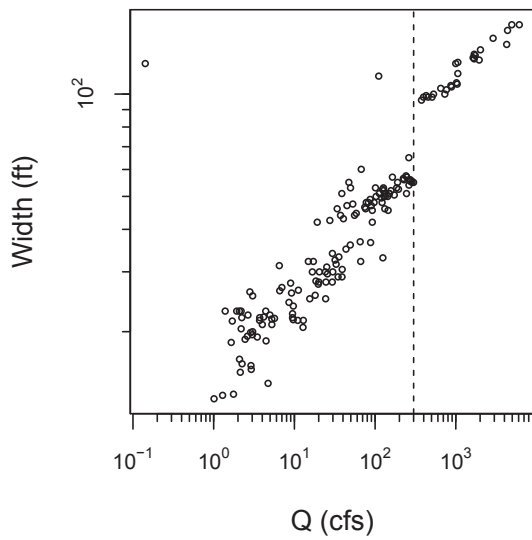
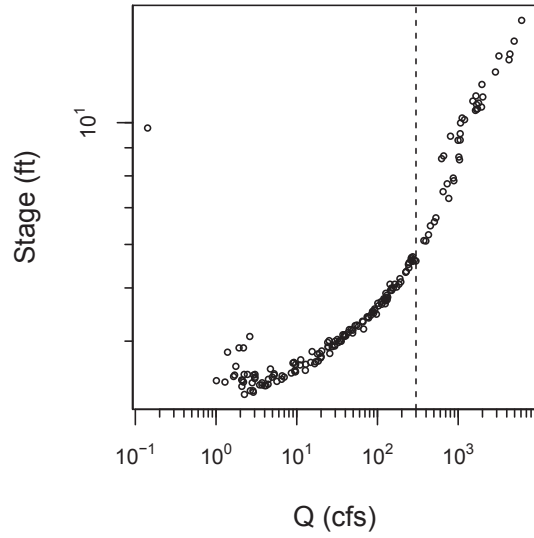
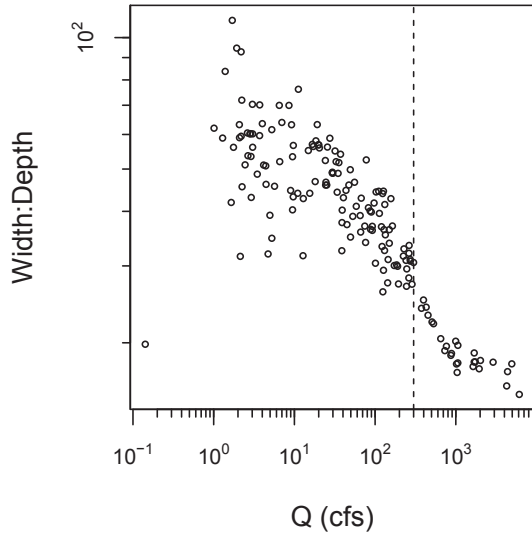
SPRUCE CREEK NEAR SAMSULA, FL
02248000



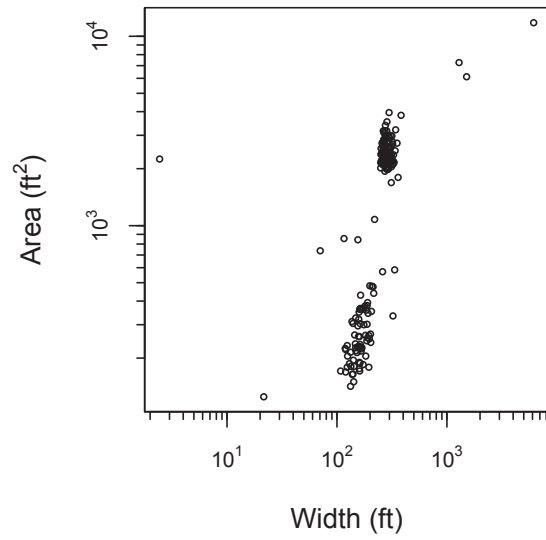
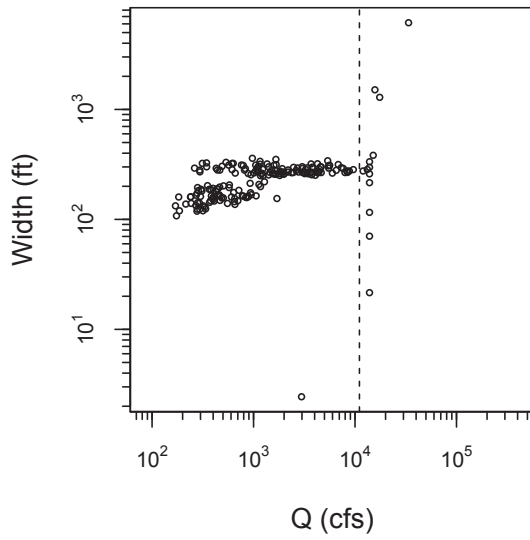
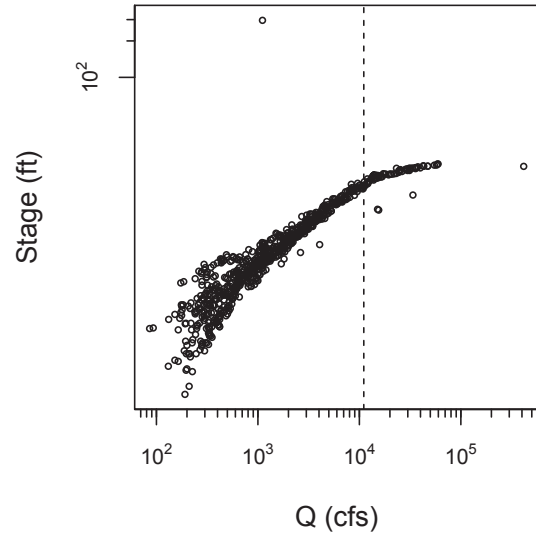
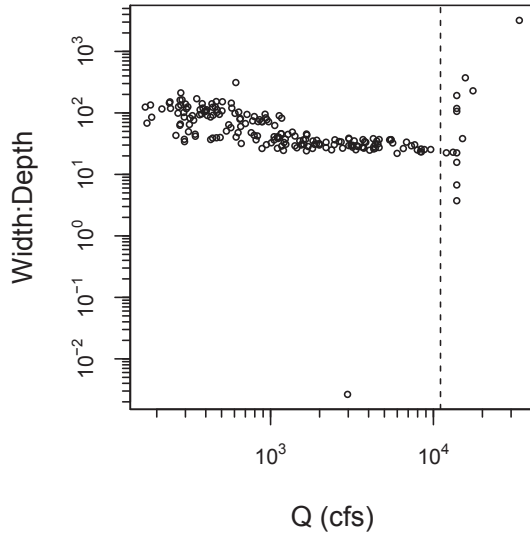
BULLFROG CREEK NEAR WIMAUMA FL
02300700



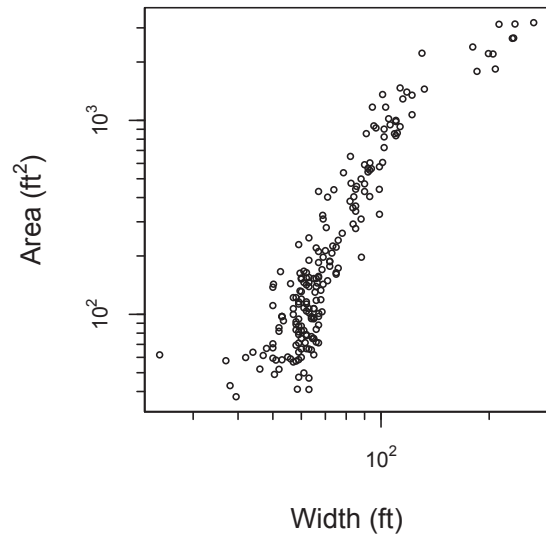
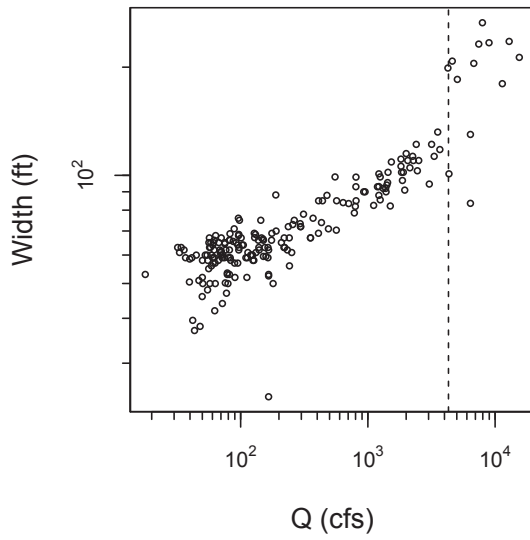
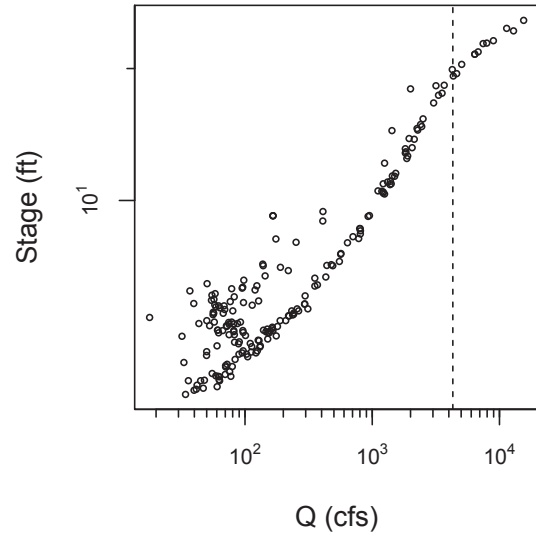
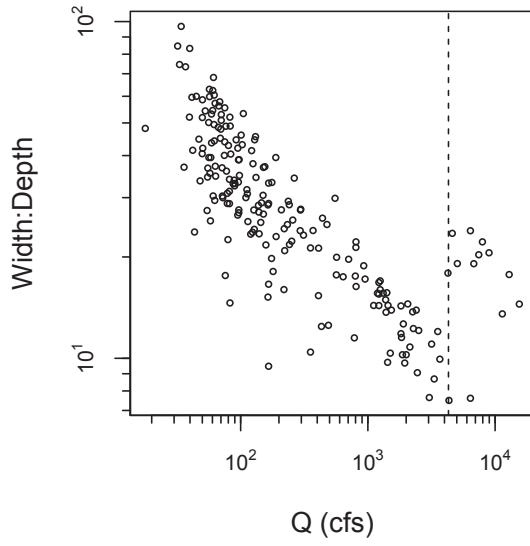
Loramie Creek near Newport OH
03261950



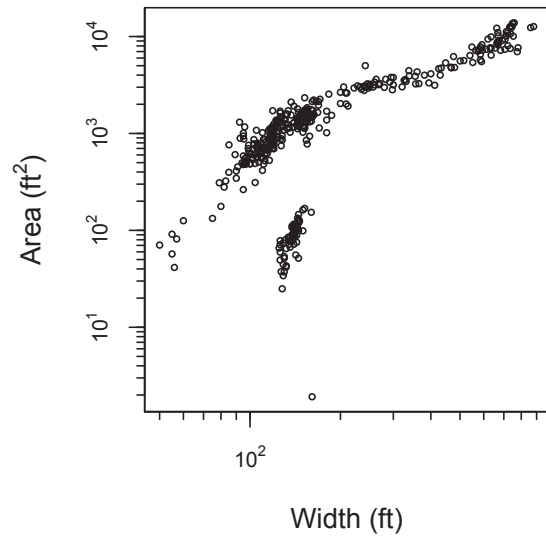
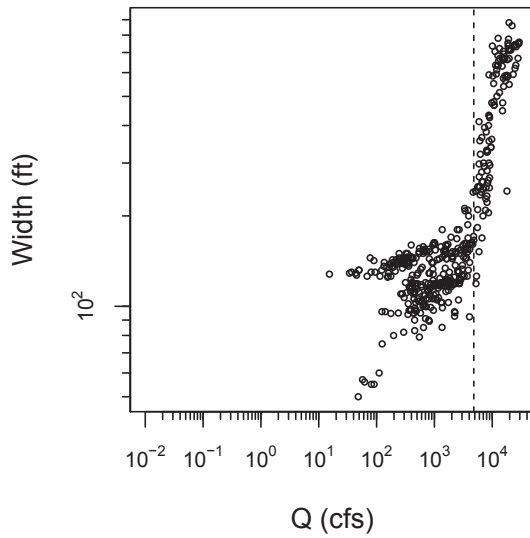
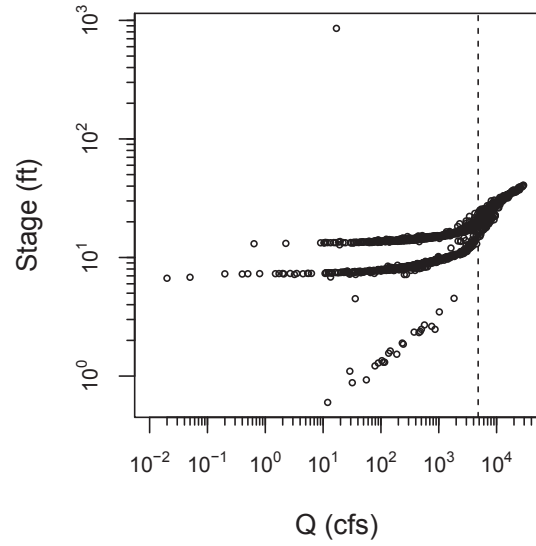
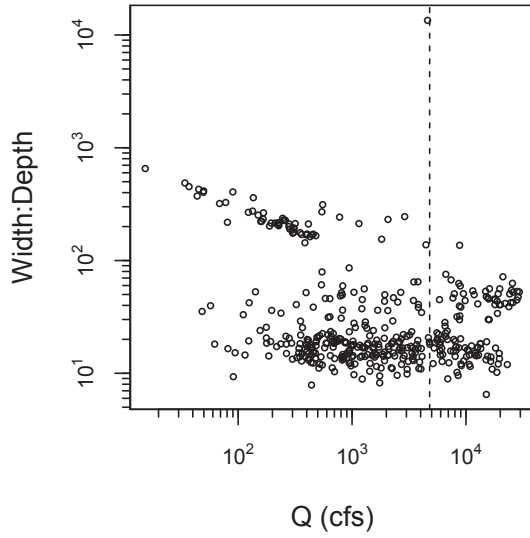
EAST FORK WHITE RIVER AT SEYMOUR, IN
03365500



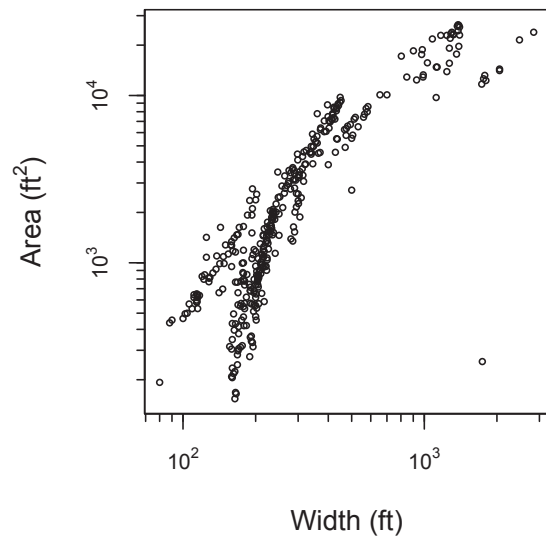
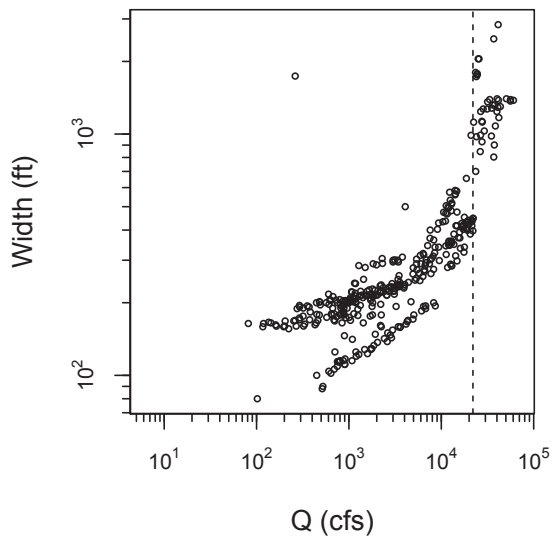
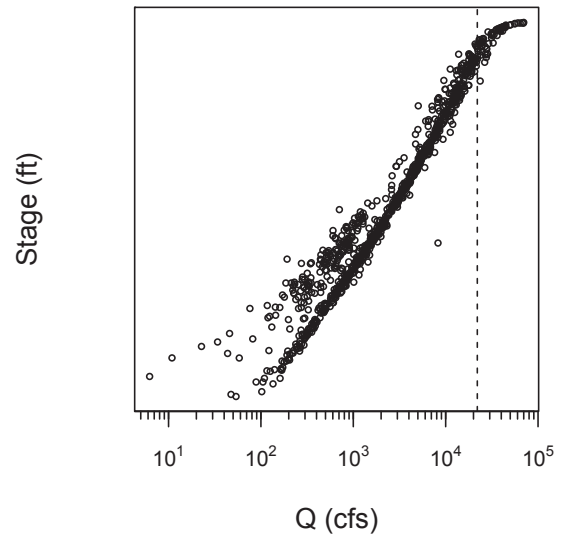
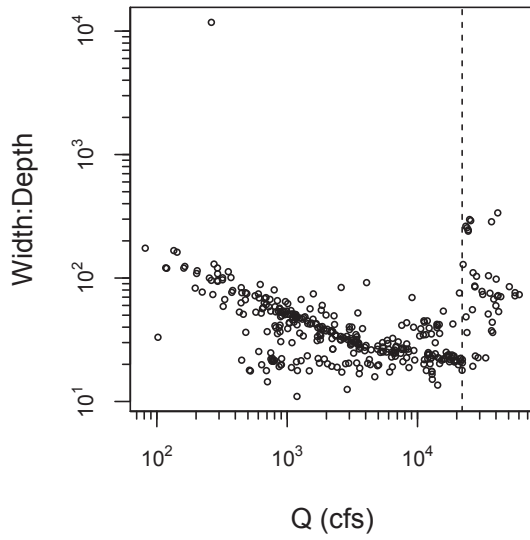
NEMADJI RIVER NEAR SOUTH SUPERIOR, WI
04024430



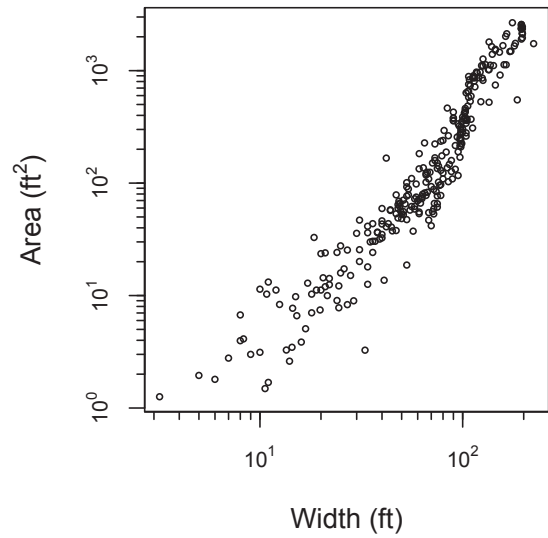
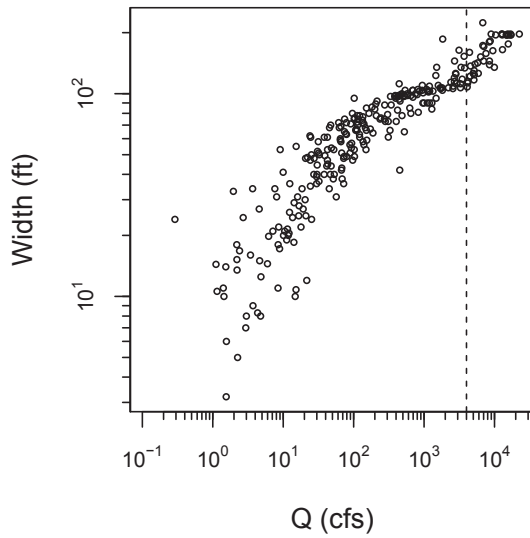
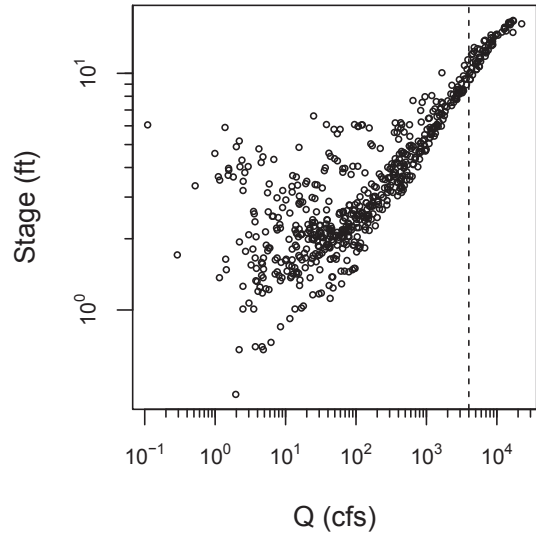
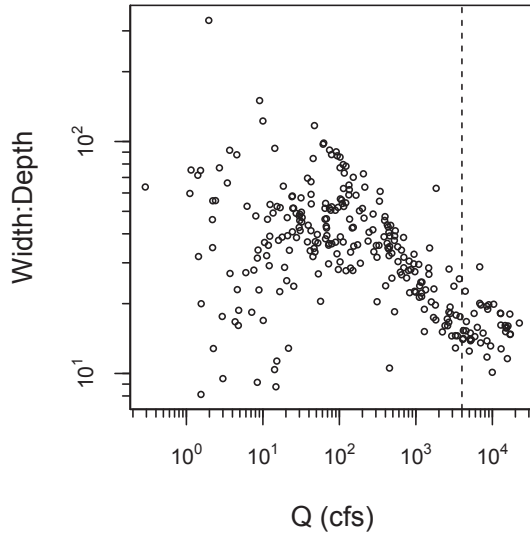
RED RIVER OF THE NORTH AT FARGO, ND
05054000



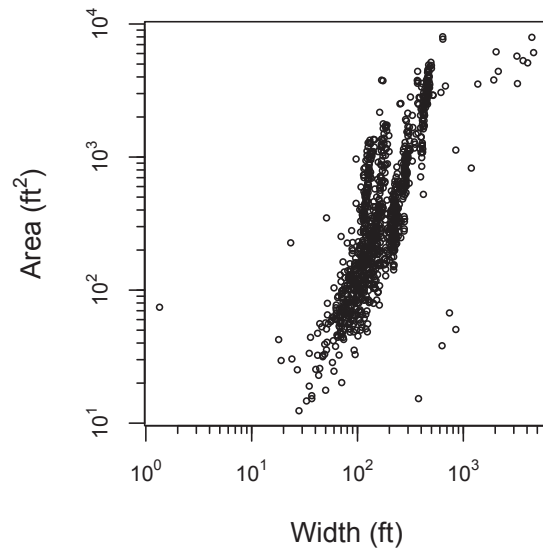
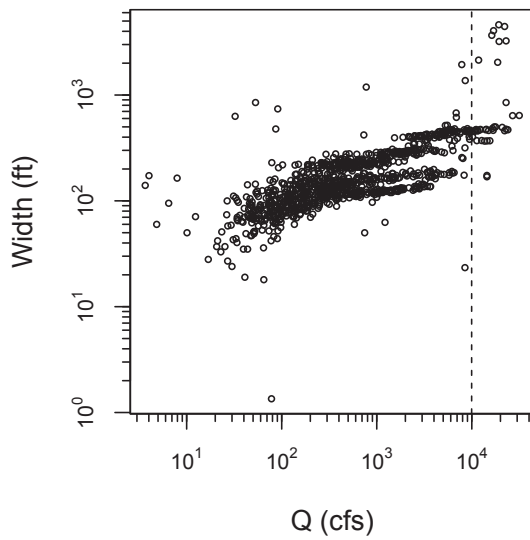
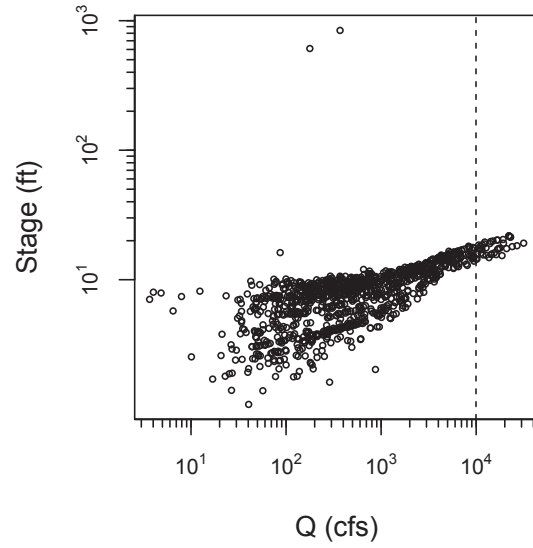
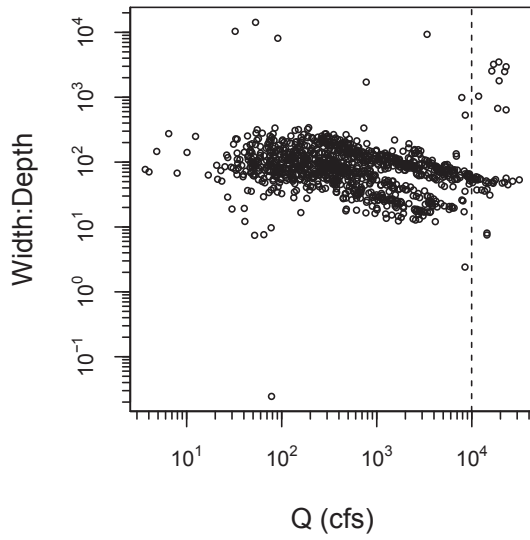
RED RIVER OF THE NORTH AT HALSTAD, MN
05064500



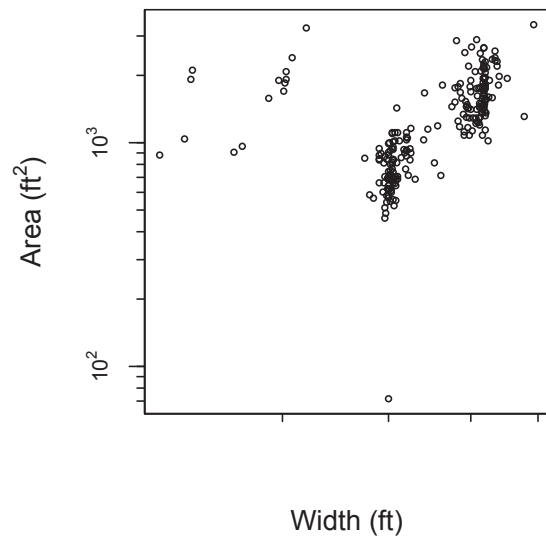
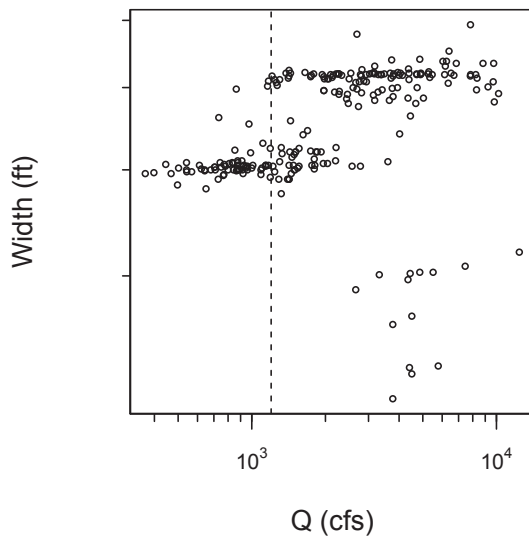
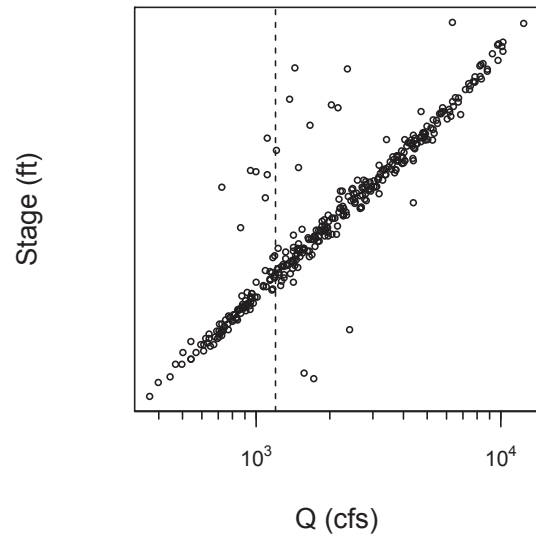
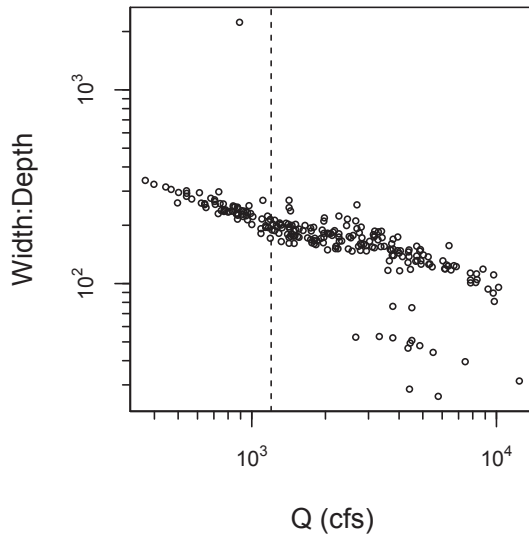
PEMBINA RIVER AT WALHALLA, ND
05099600



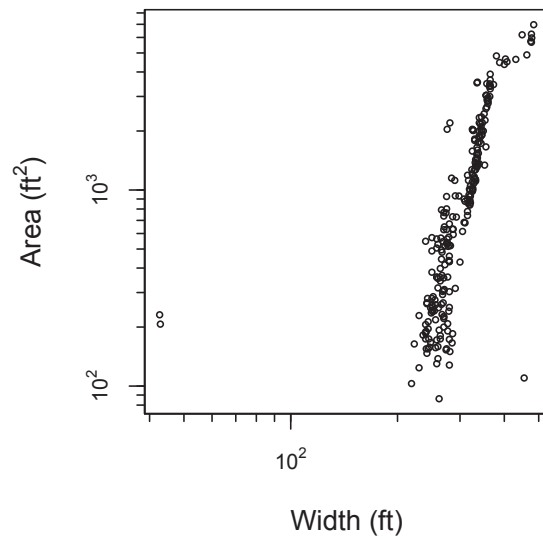
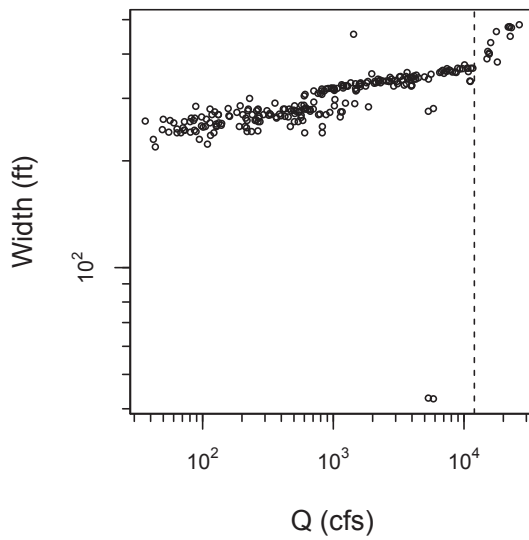
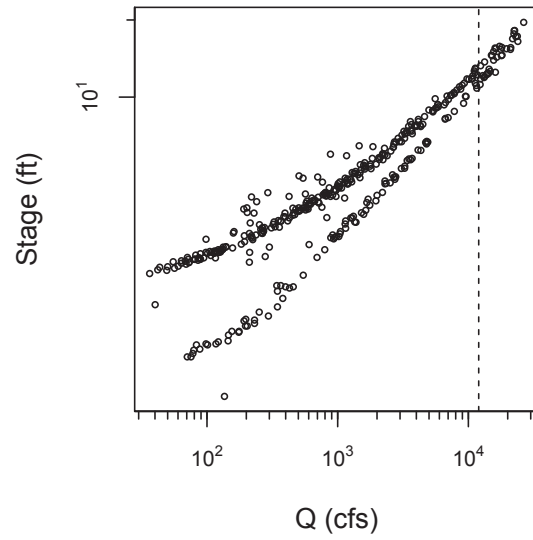
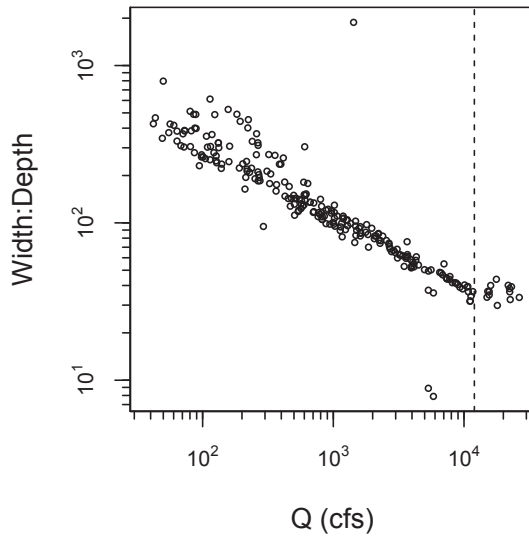
Iowa River at Marshalltown, IA
05451500



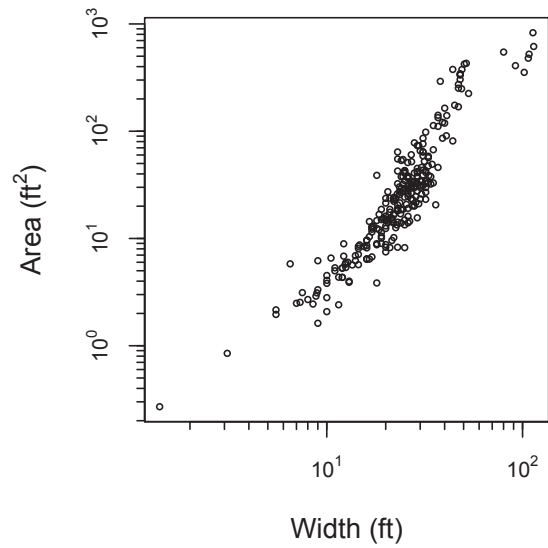
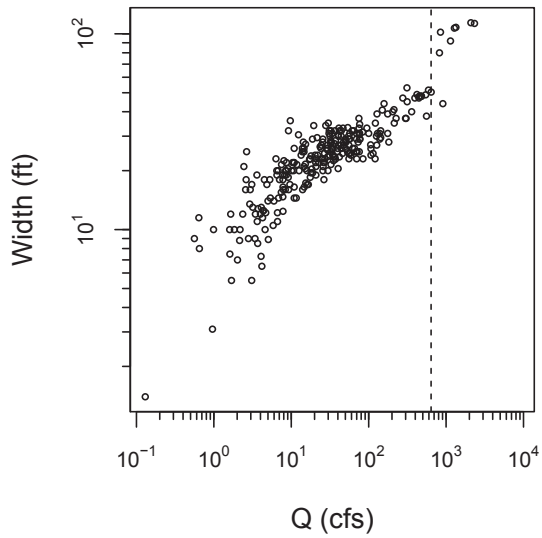
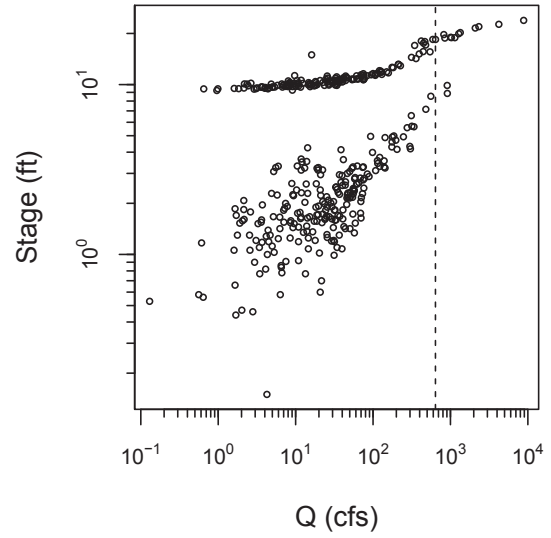
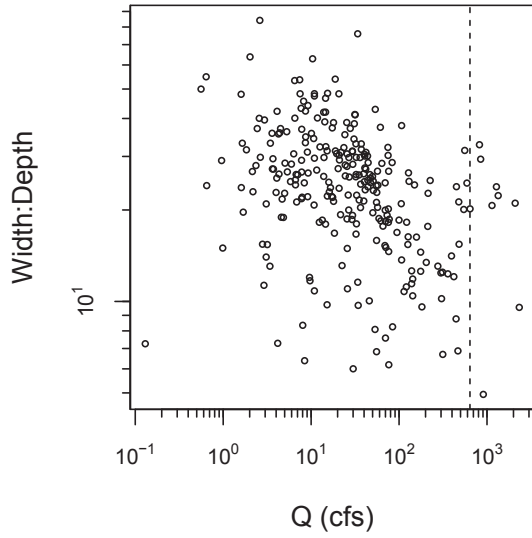
KANKAKEE RIVER AT MOMENCE, IL
05520500



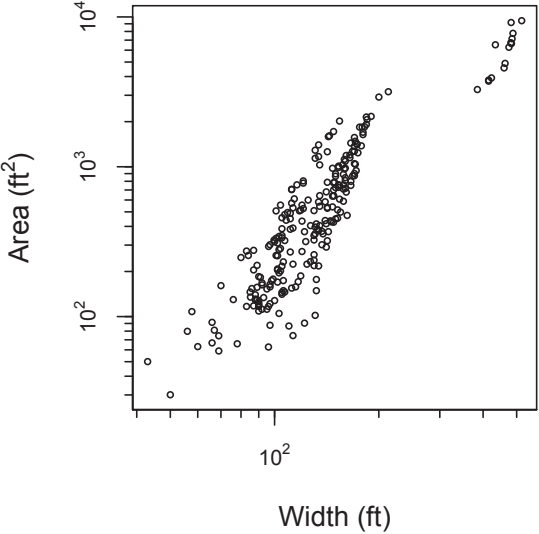
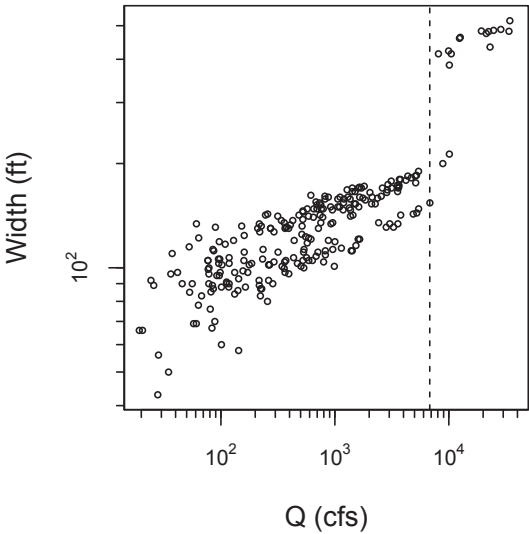
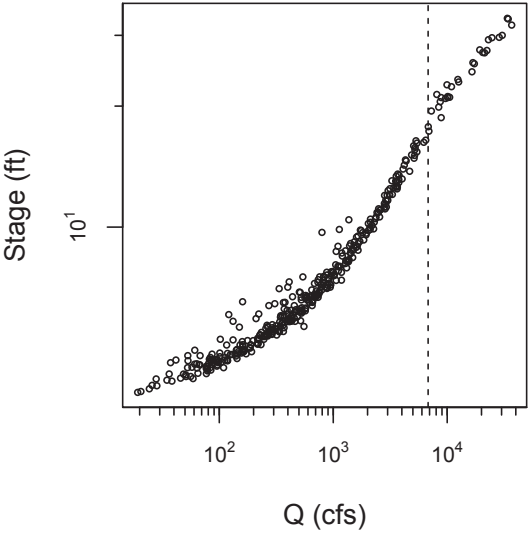
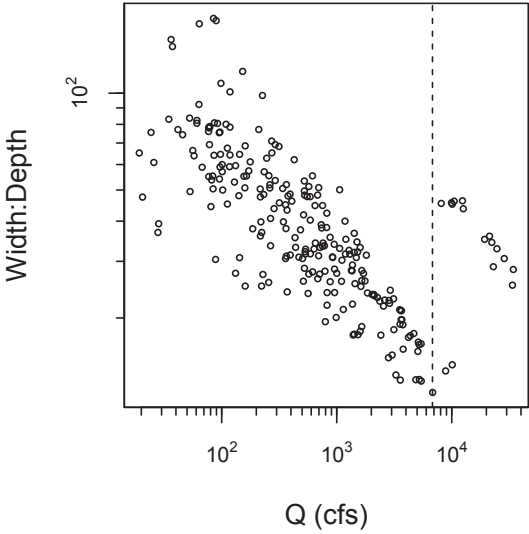
IROQUOIS RIVER NEAR CHEBANSE, IL
05526000



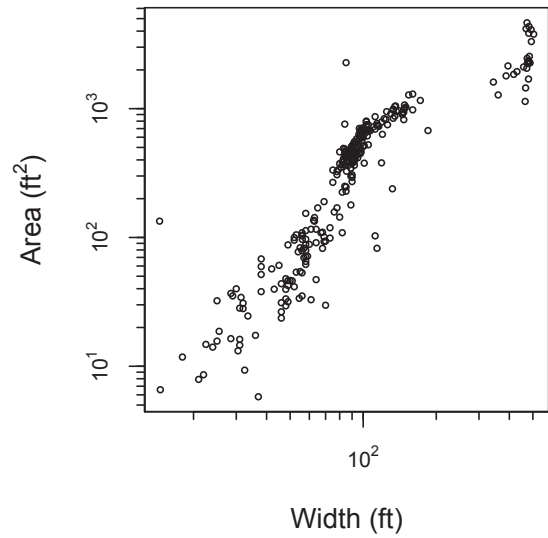
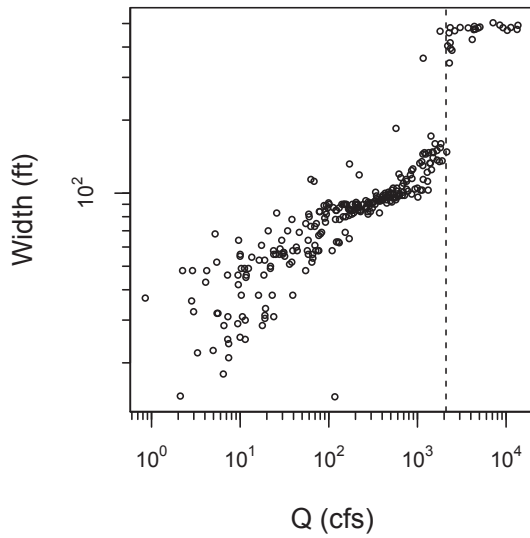
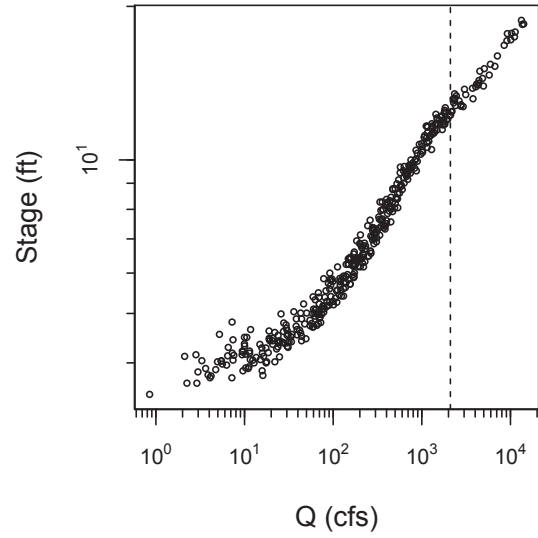
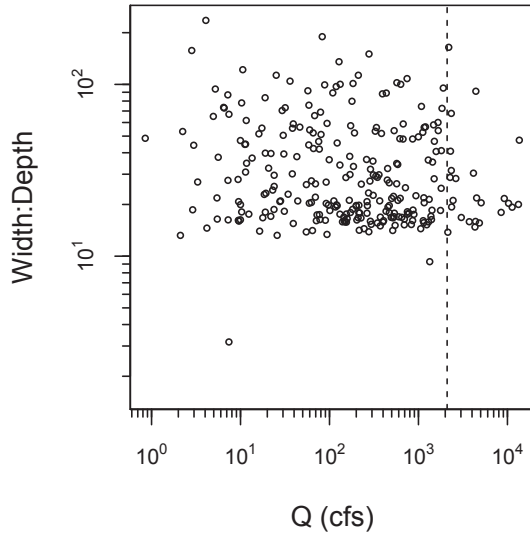
INDIAN CREEK NEAR WYOMING, IL
05568800



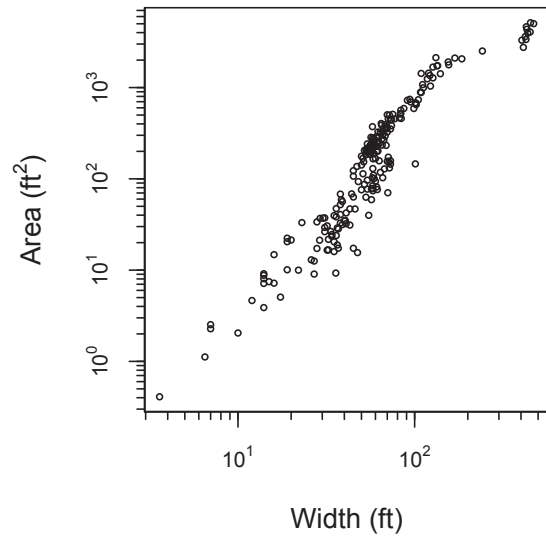
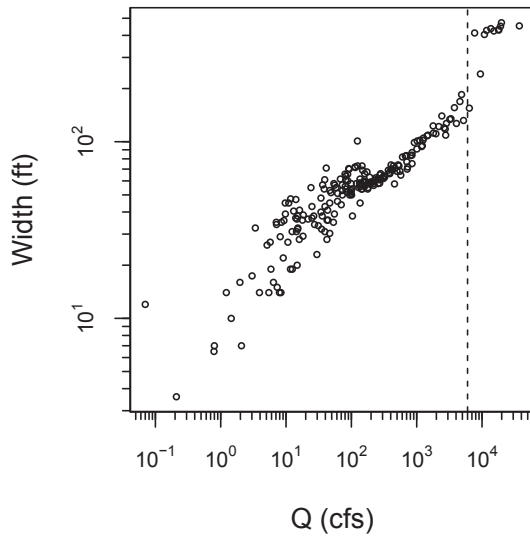
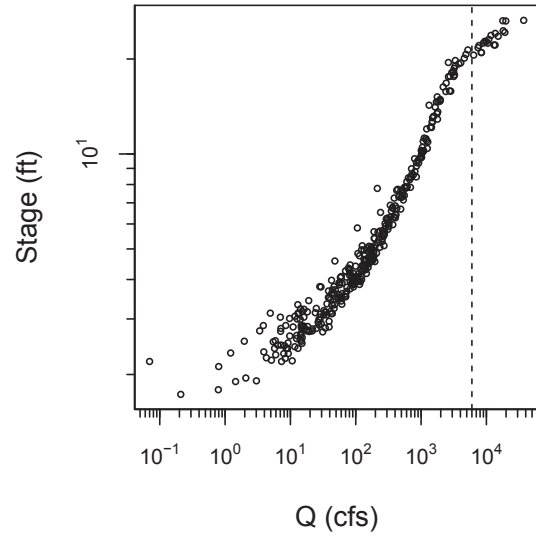
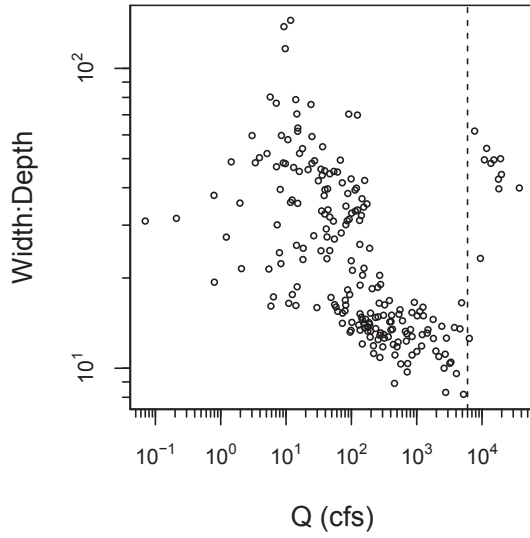
SPOON RIVER AT SEVILLE, IL
05570000



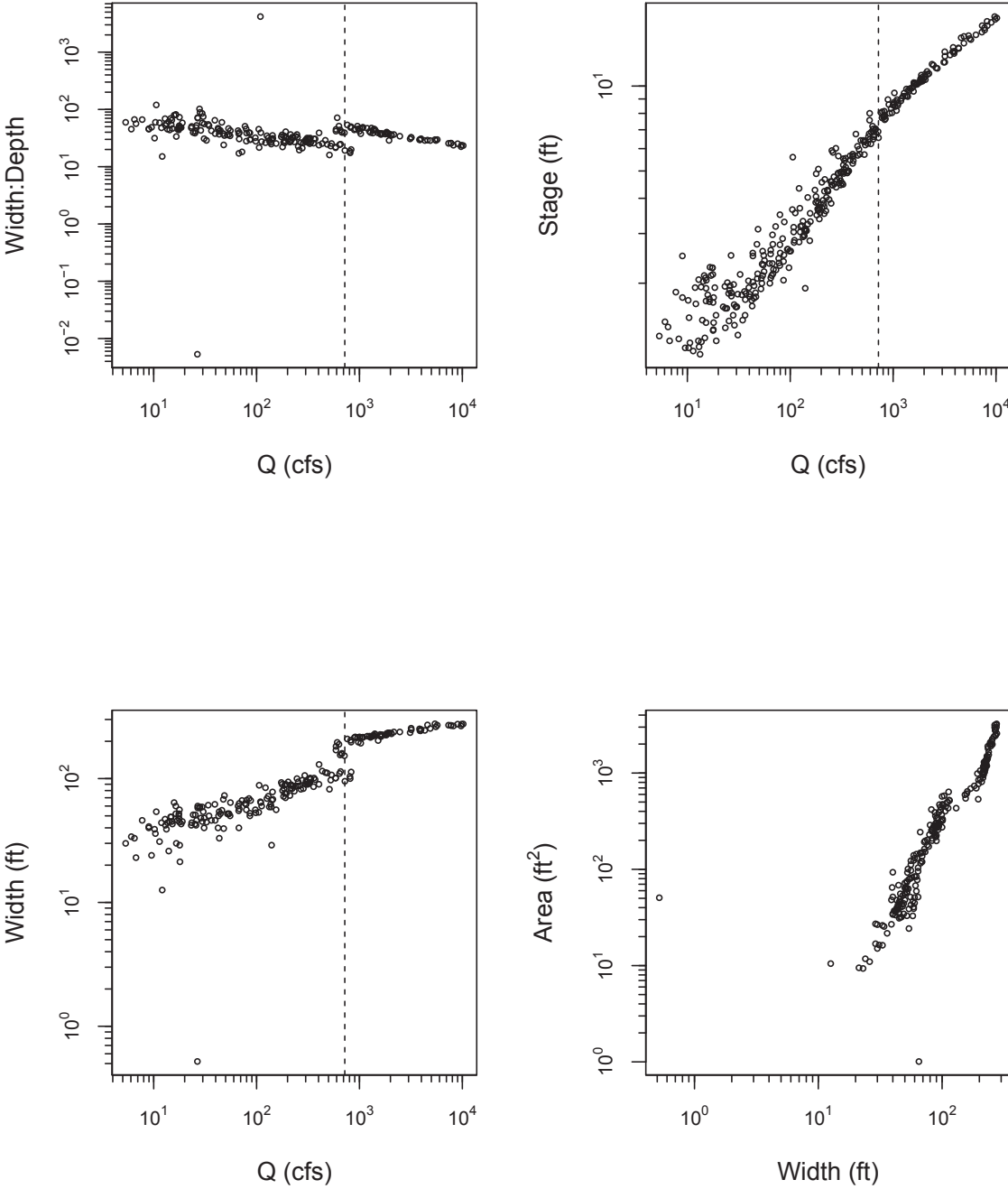
SANGAMON RIVER AT MONTICELLO, IL
05572000



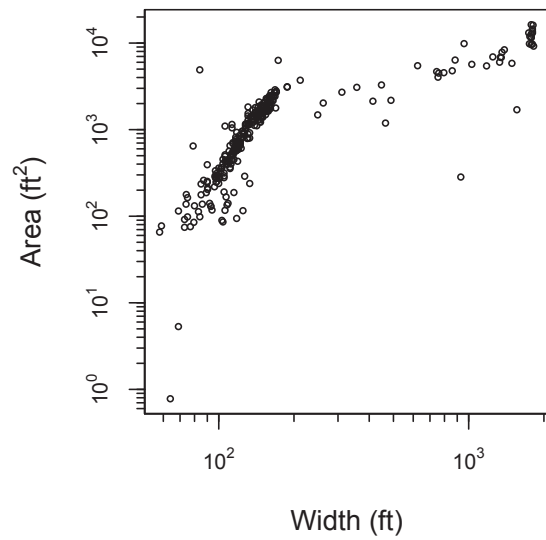
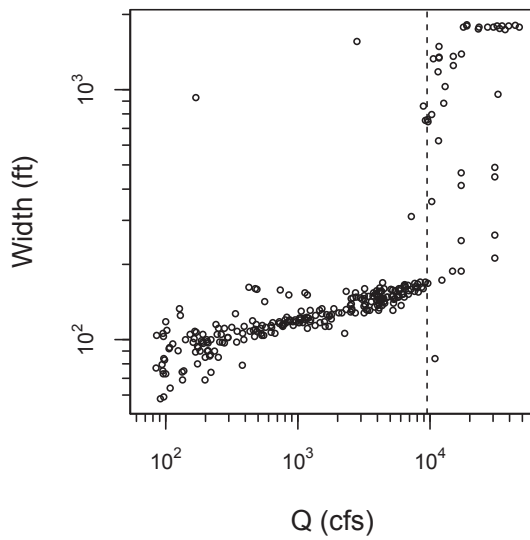
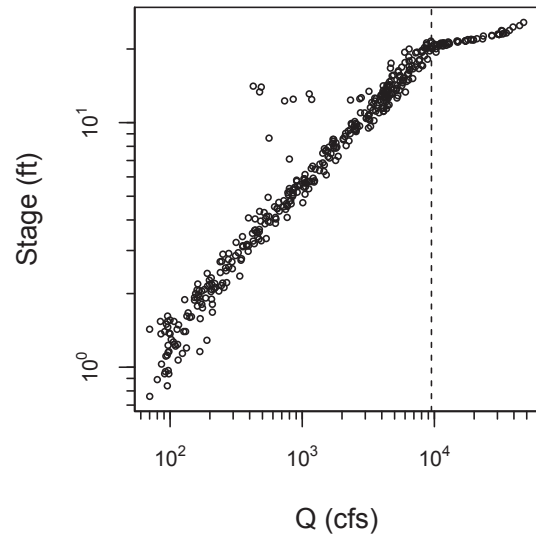
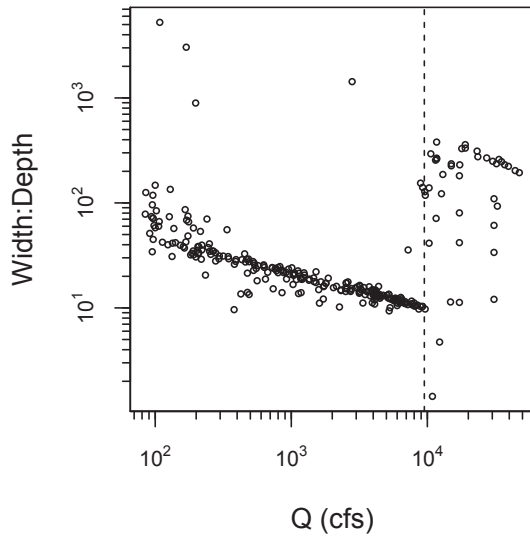
LA MOINE RIVER AT COLMAR, IL
05584500



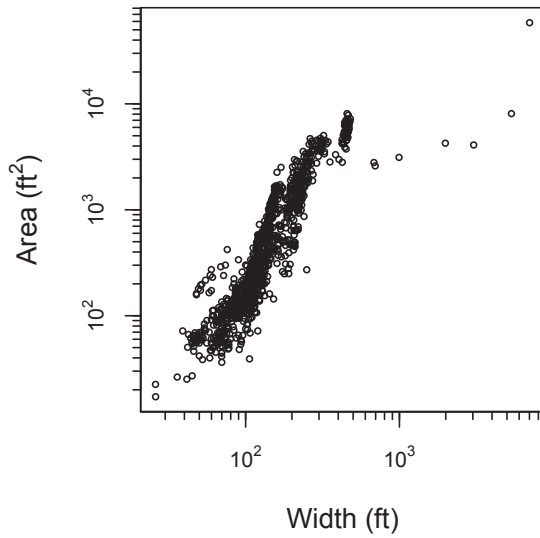
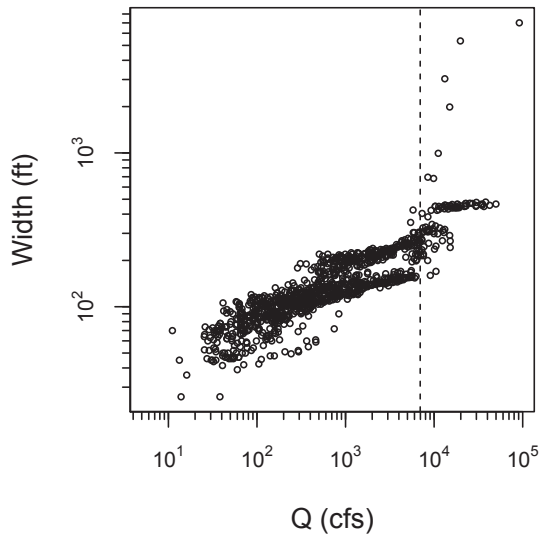
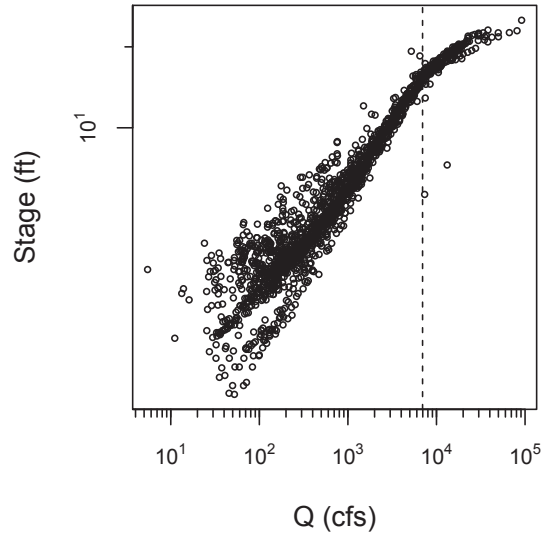
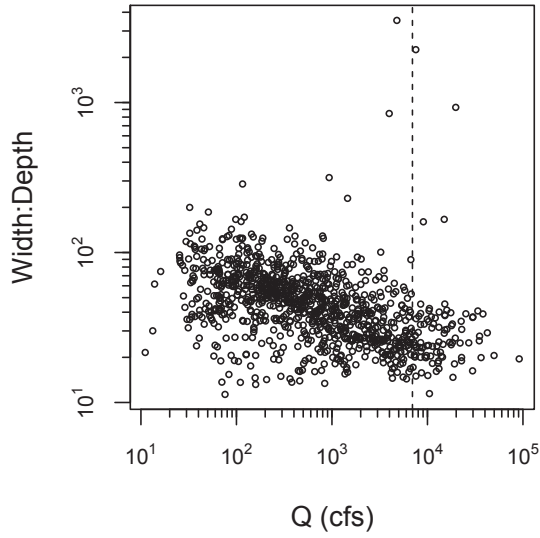
KASKASKIA RIVER AT COOKS MILLS, IL
05591200



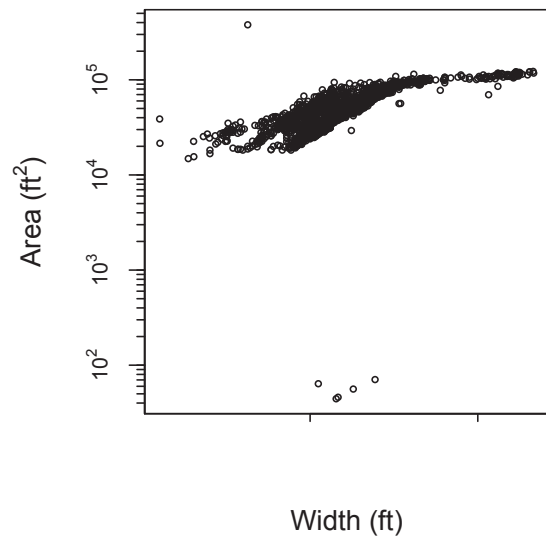
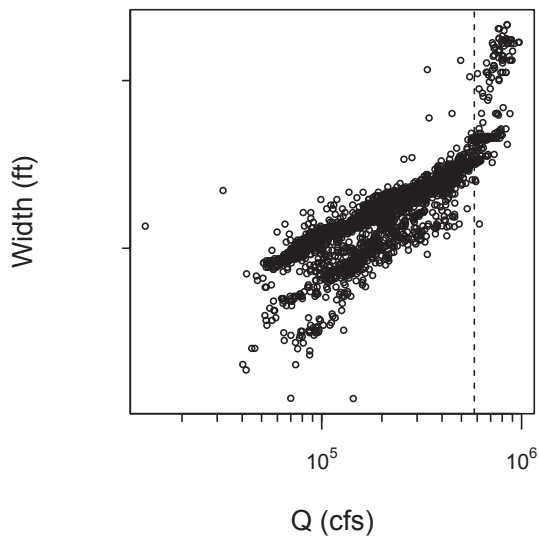
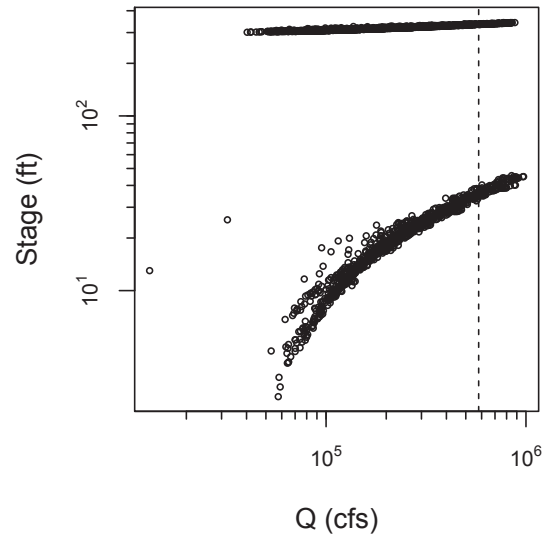
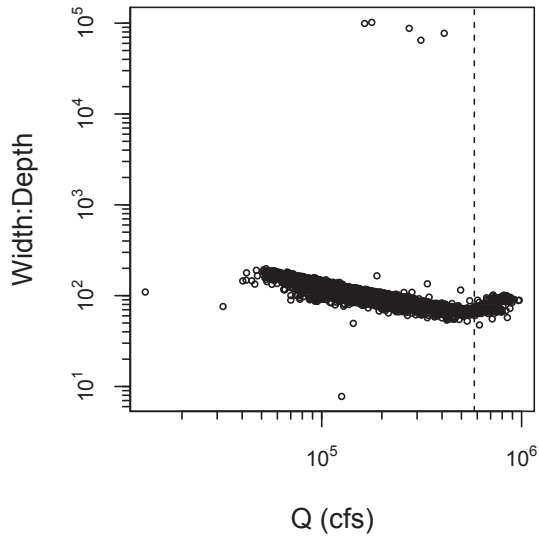
KASKASKIA RIVER NEAR VENEDY STATION, IL
05594100



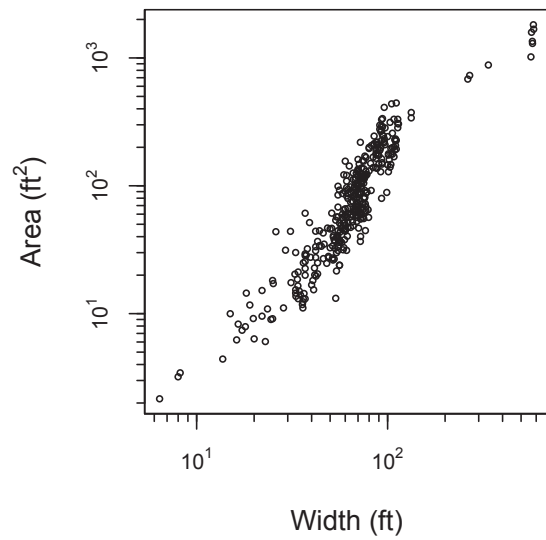
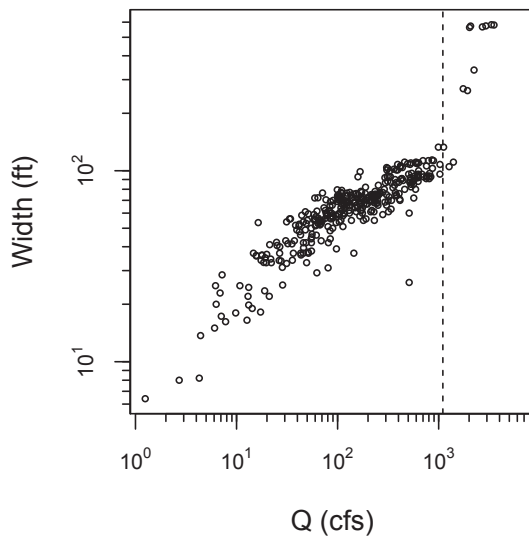
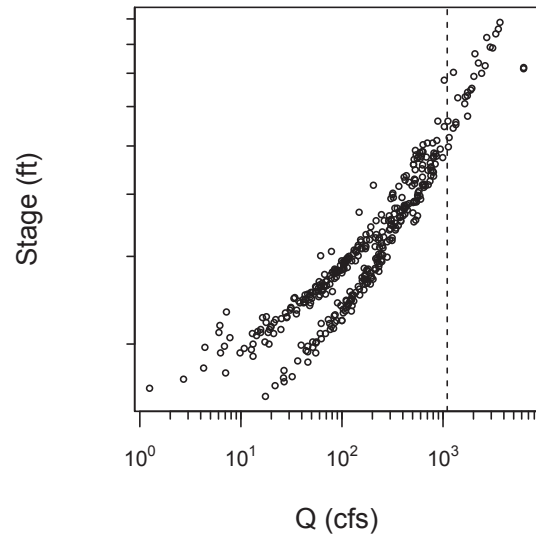
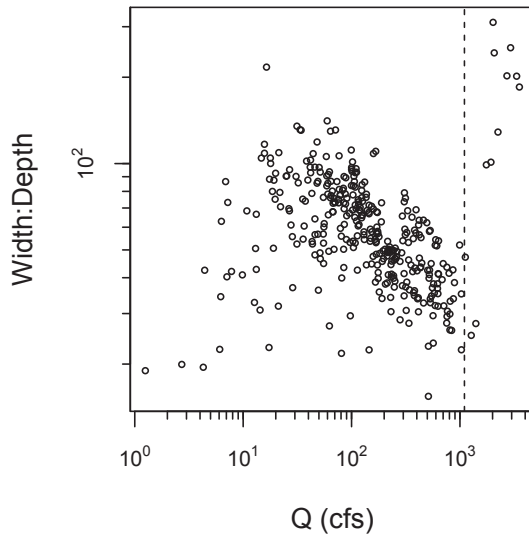
BIG SIOUX R AT AKRON,IA
06485500



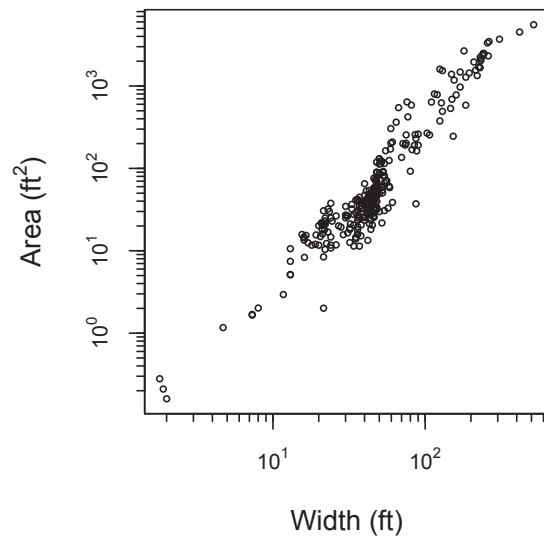
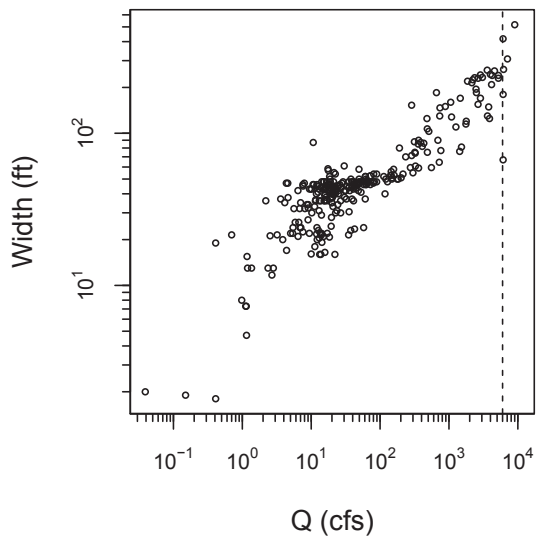
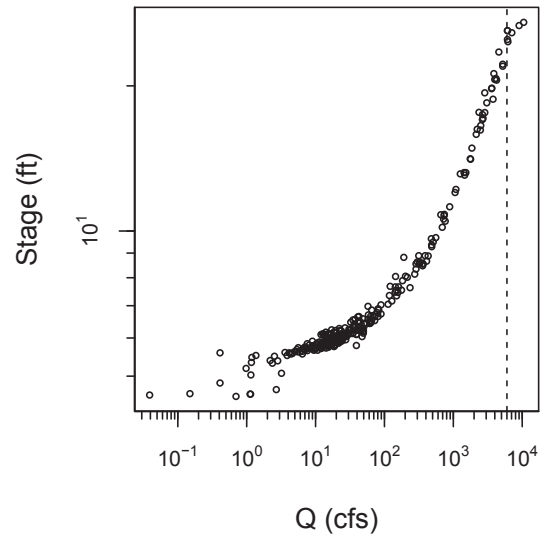
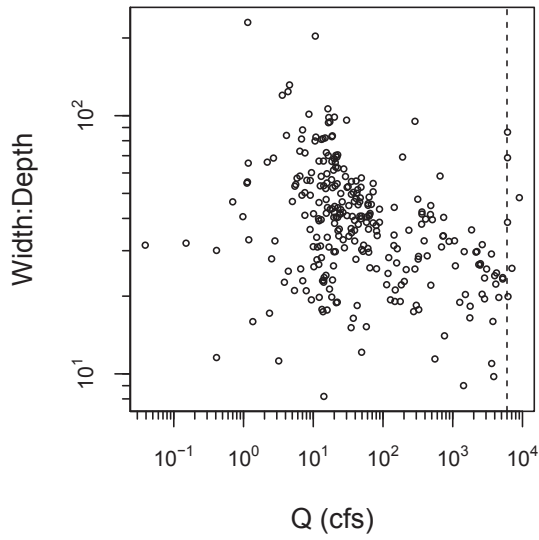
Mississippi River at Thebes, IL
07022000



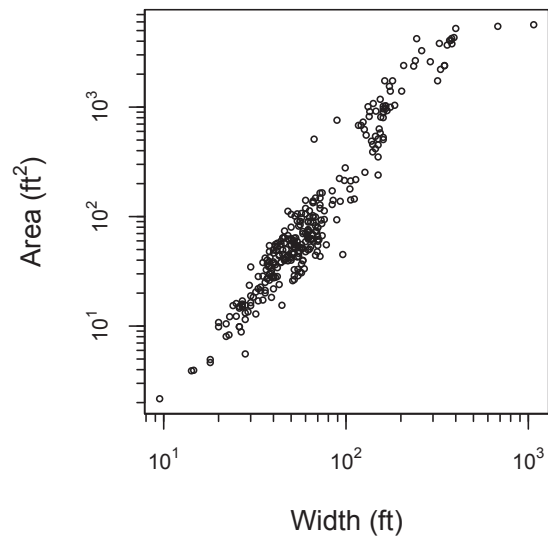
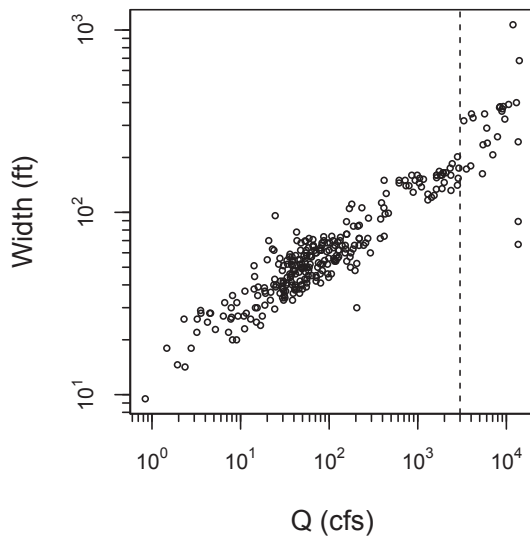
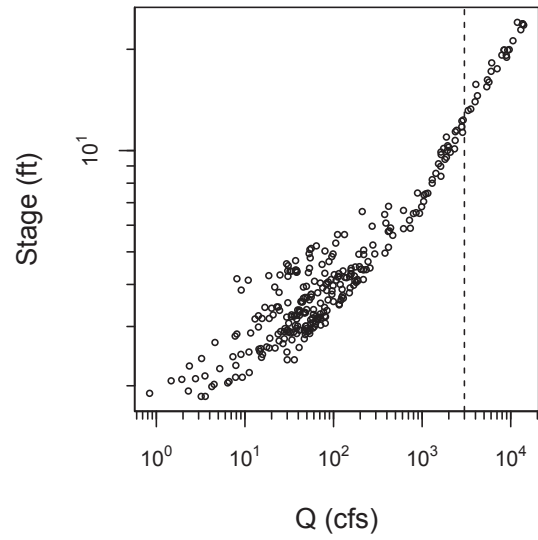
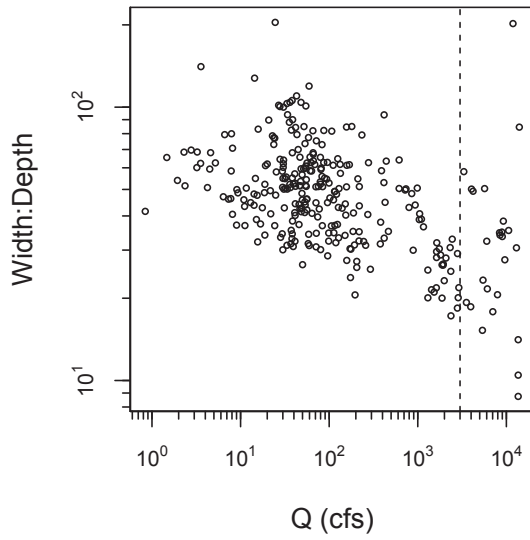
ARKANSAS R NR COOLIDGE, KS
07137500



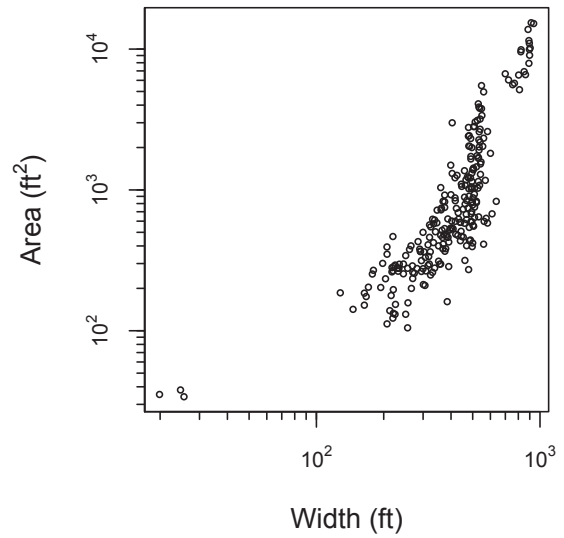
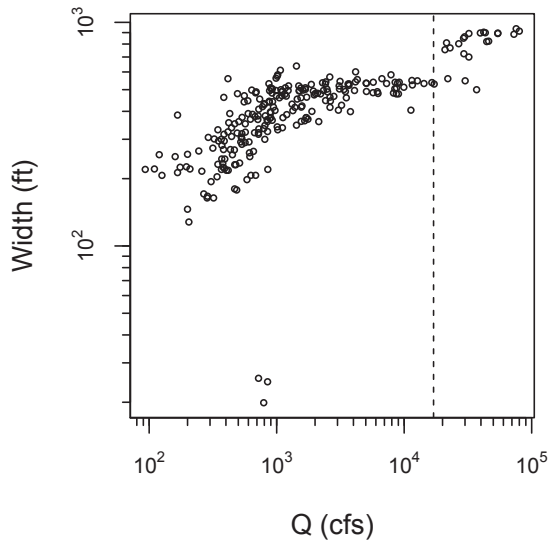
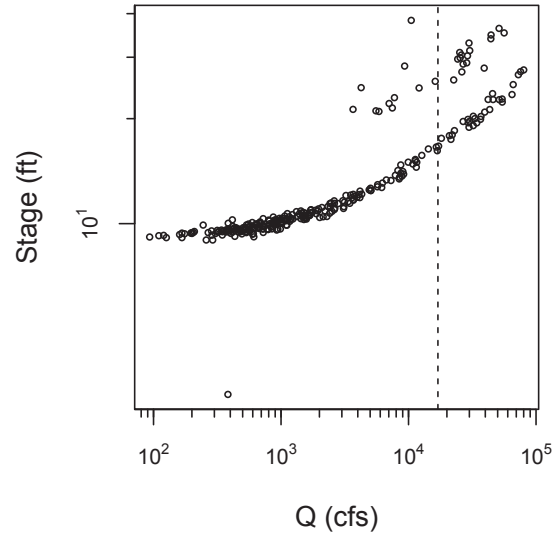
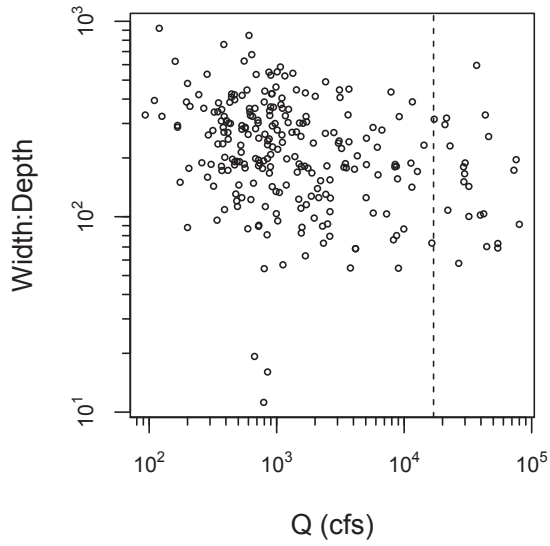
L ARKANSAS R AT HWY 50 NR HALSTEAD, KS
07143672



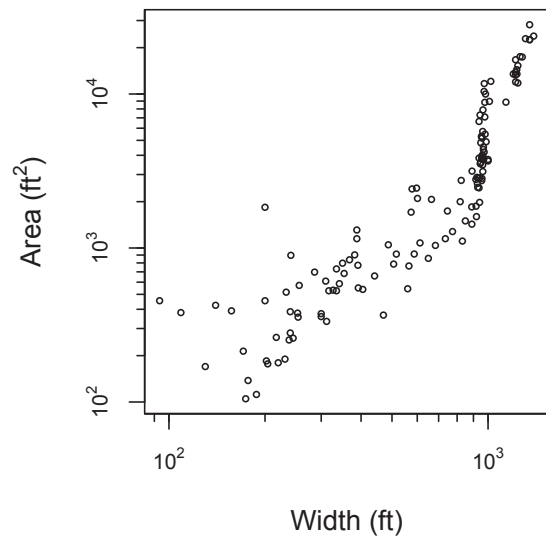
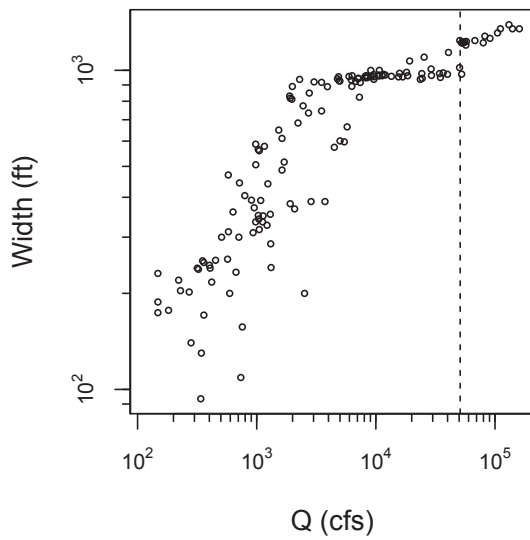
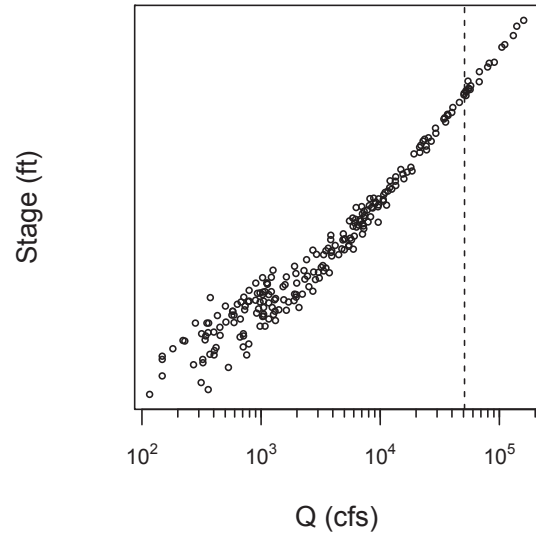
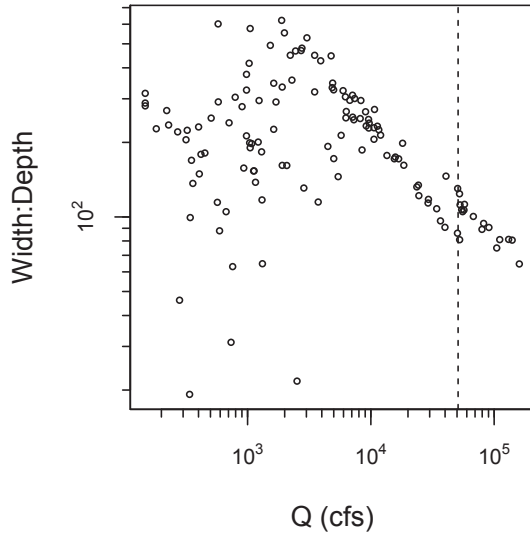
L ARKANSAS R NR SEDGWICK, KS
07144100



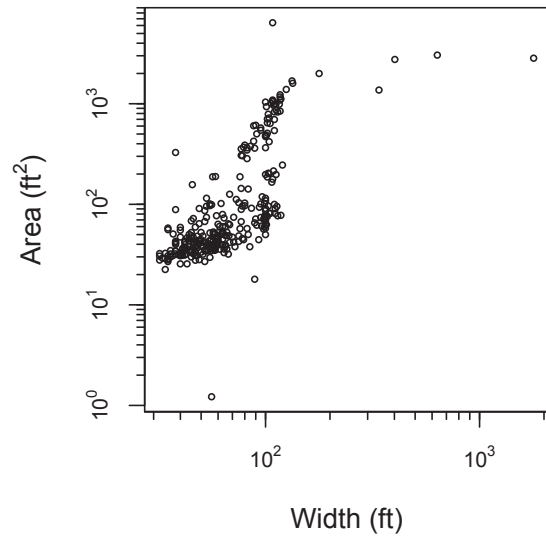
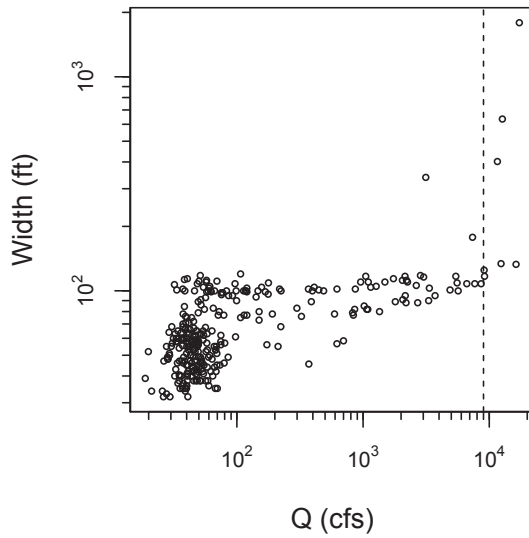
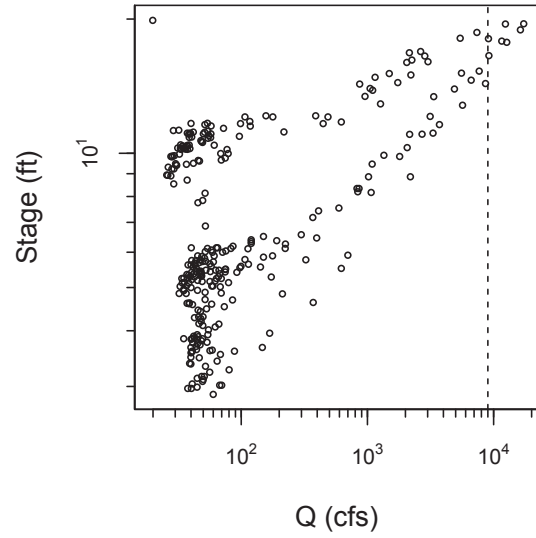
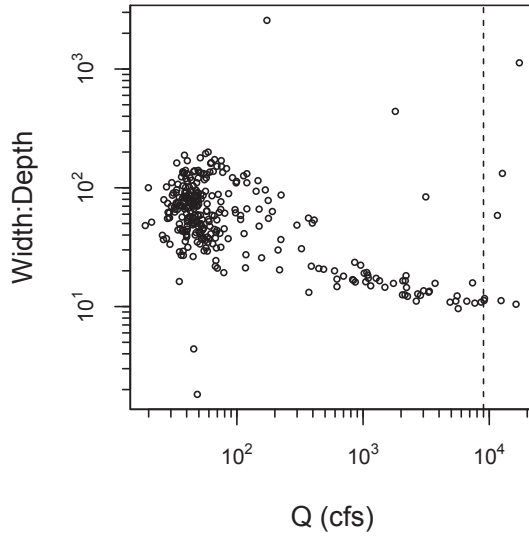
ARKANSAS R AT ARKANSAS CITY, KS
07146500



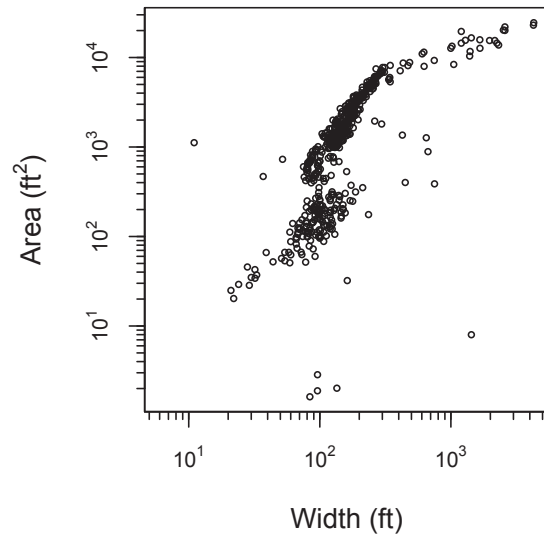
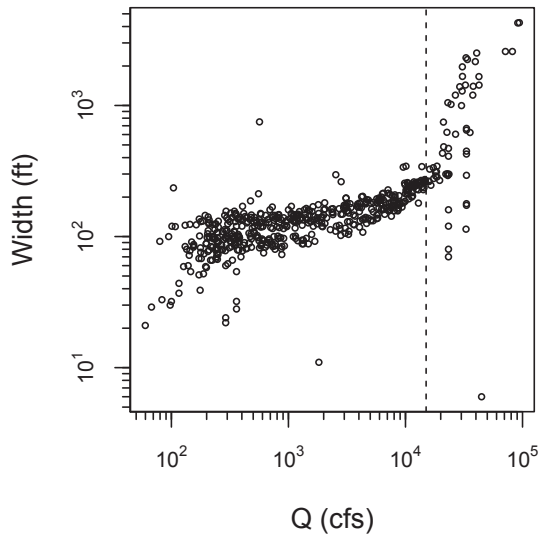
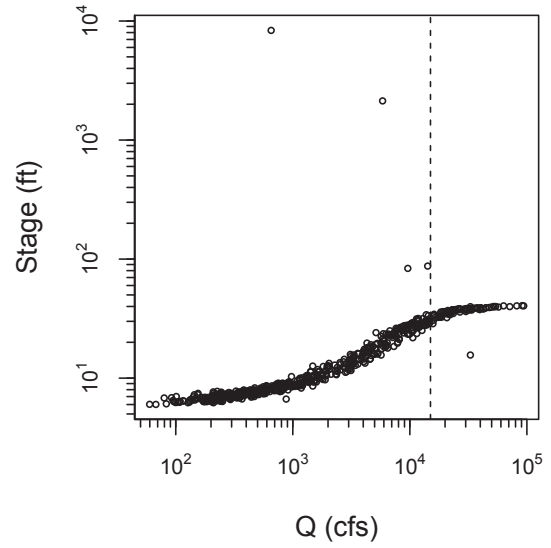
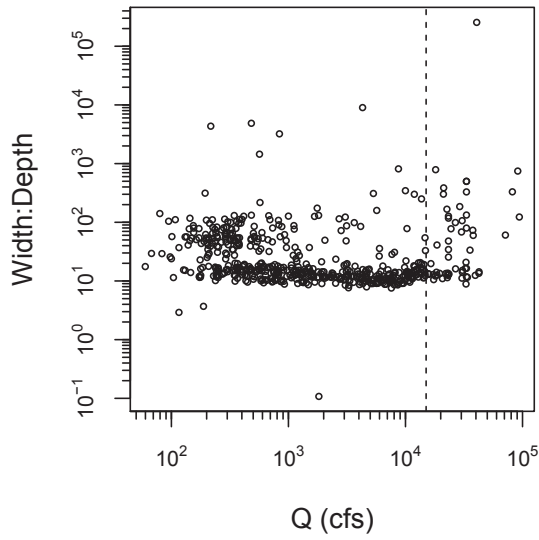
Arkansas River at Ralston, OK
07152500



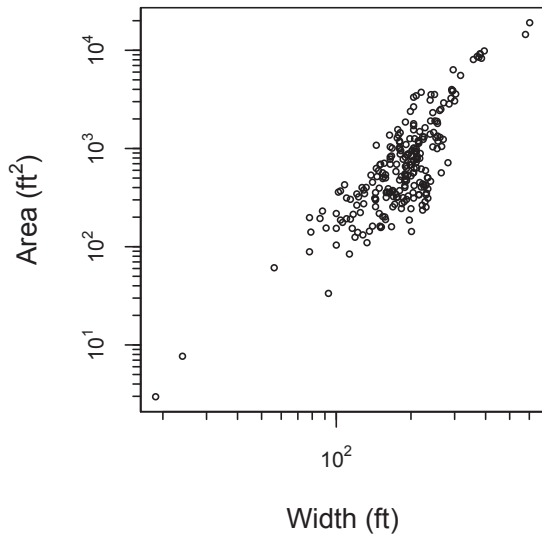
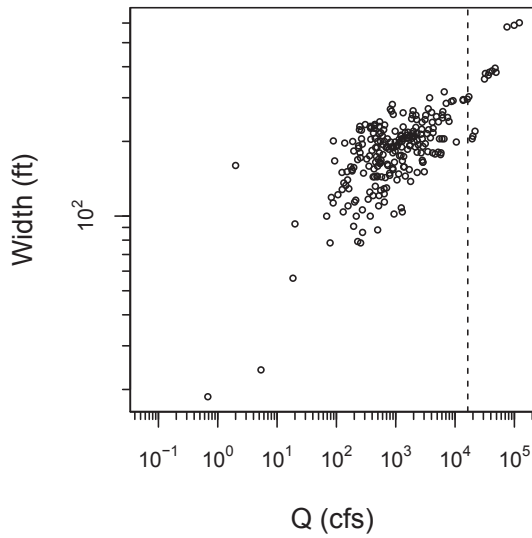
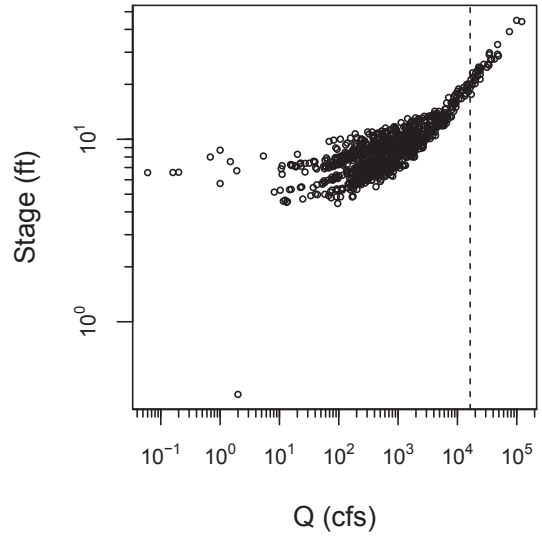
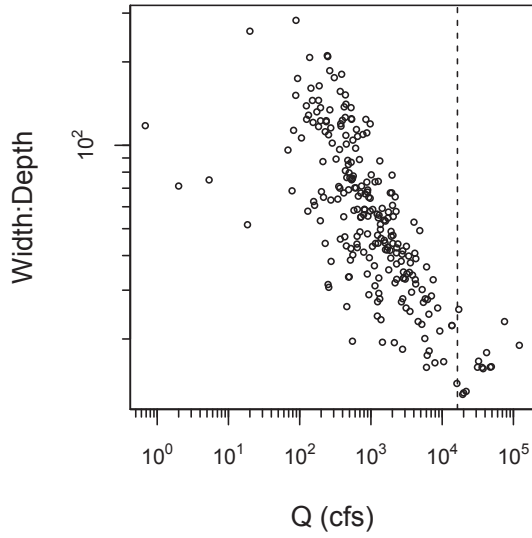
HICKAHALA CREEK NR SENATOBIA, MS
07277700



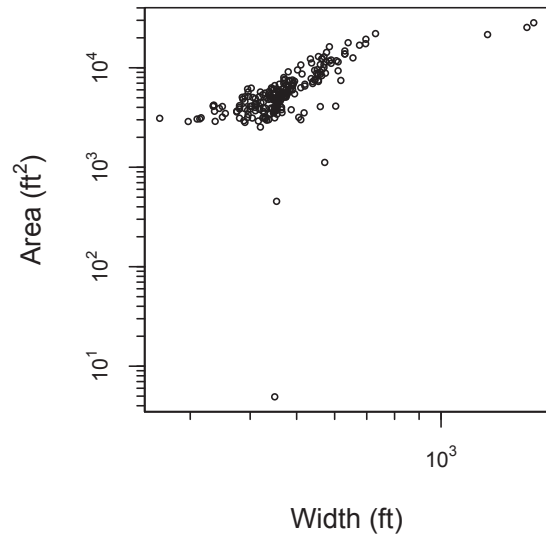
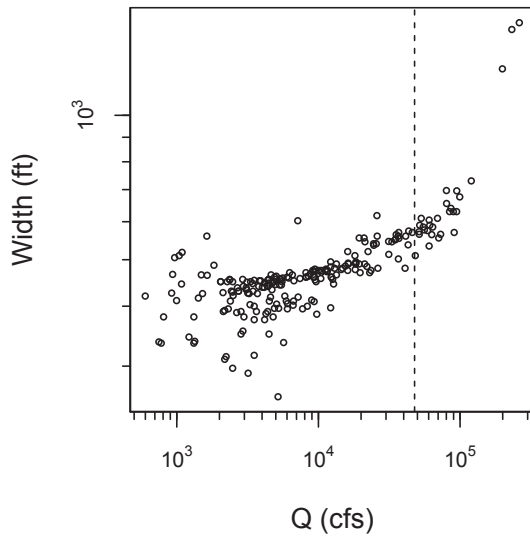
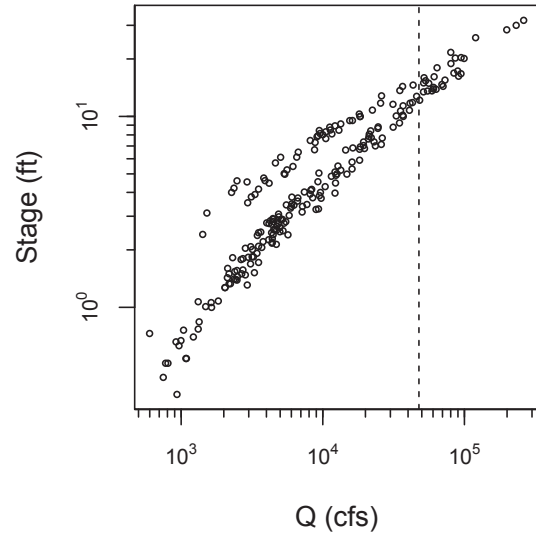
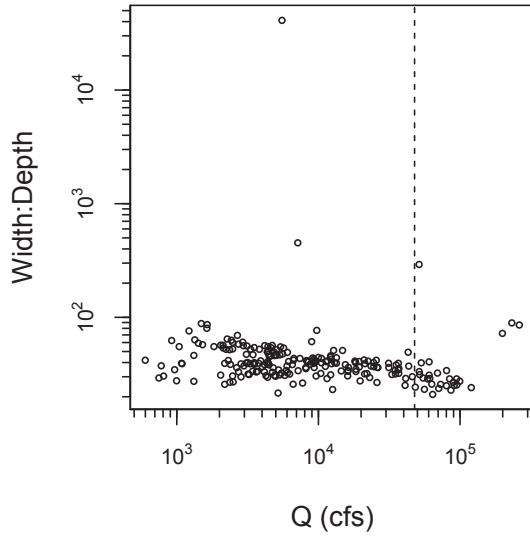
BIG BLACK RIVER NR BOVINA, MS
07290000



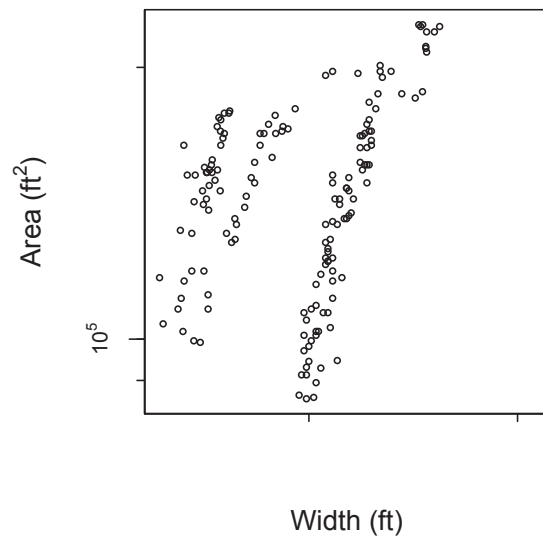
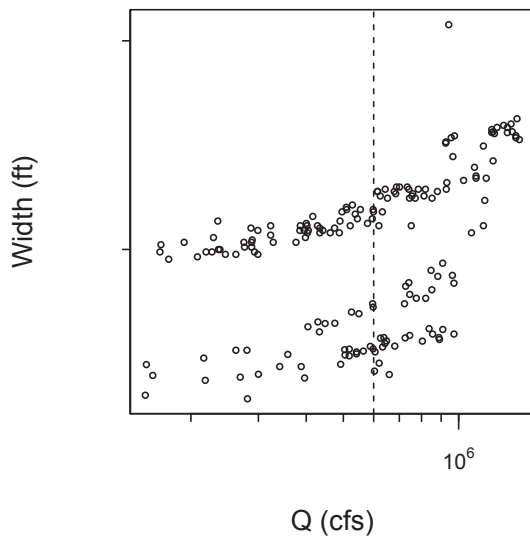
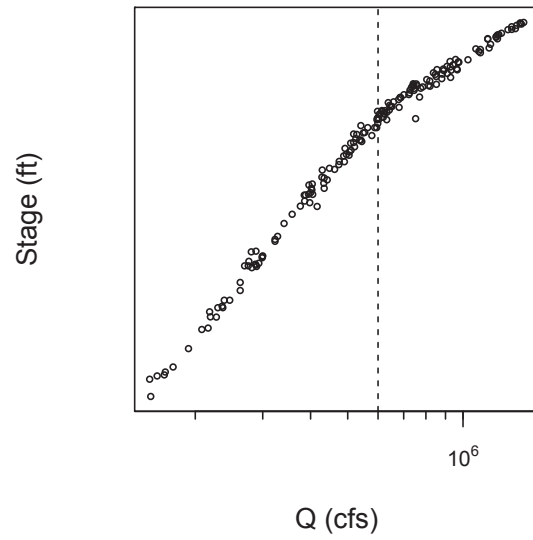
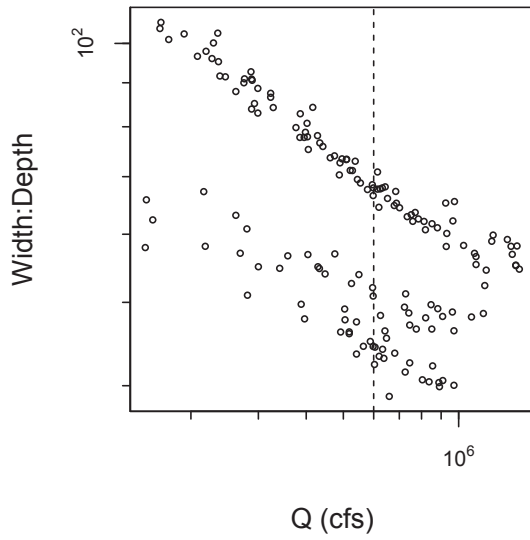
Washita River near Dickson, OK
07331000



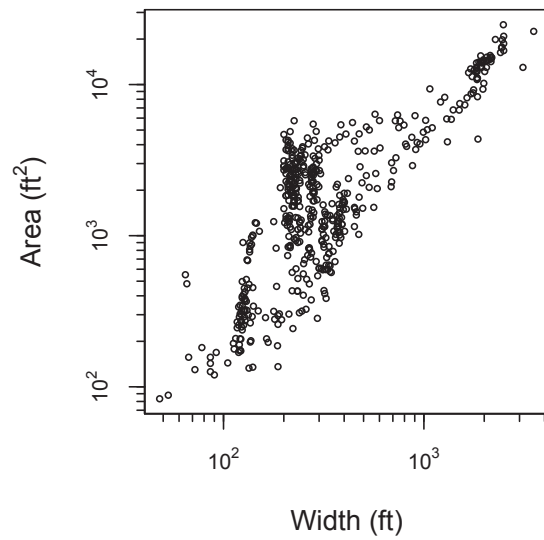
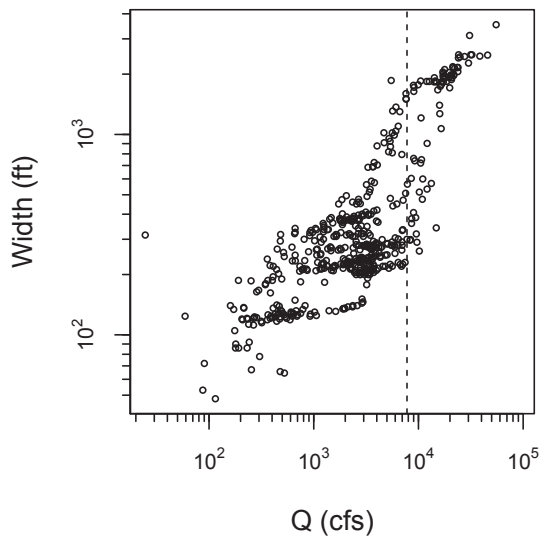
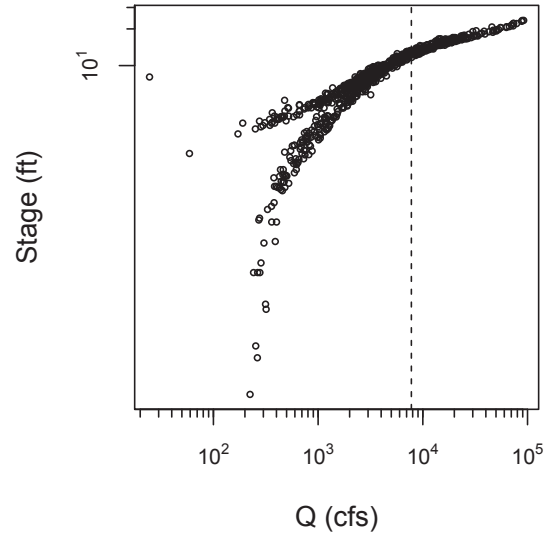
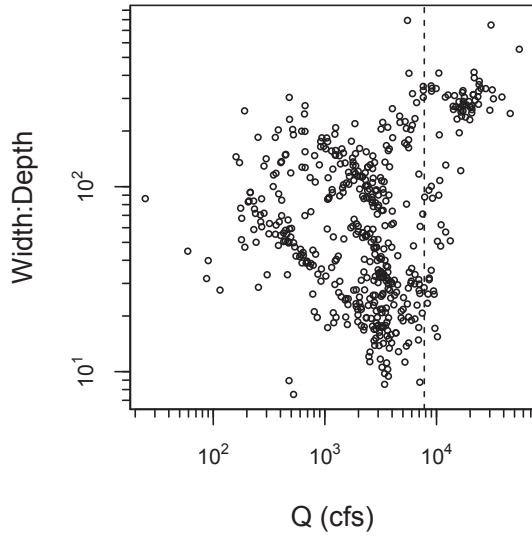
Red River at Index, AR
07337000



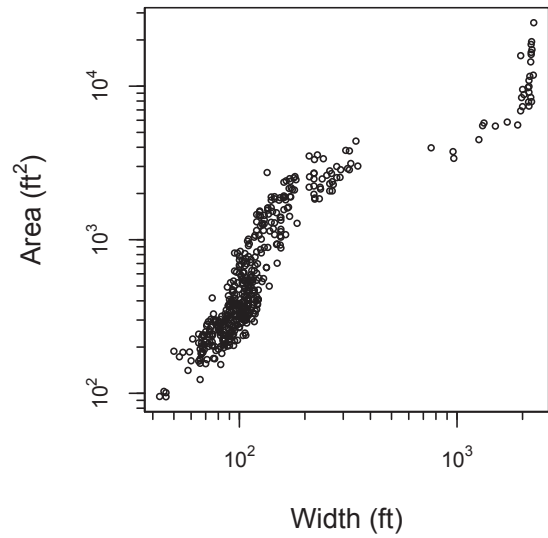
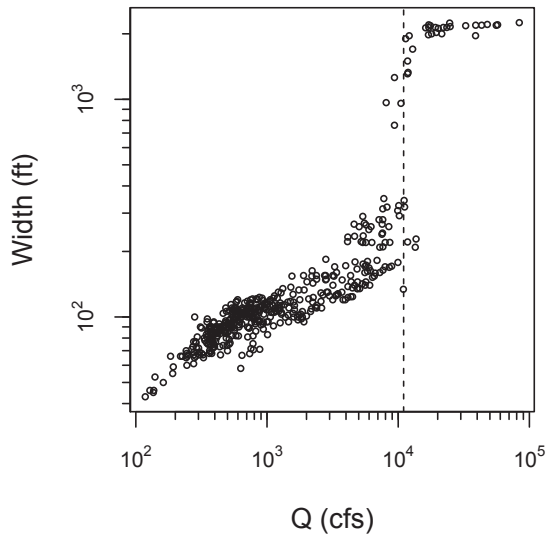
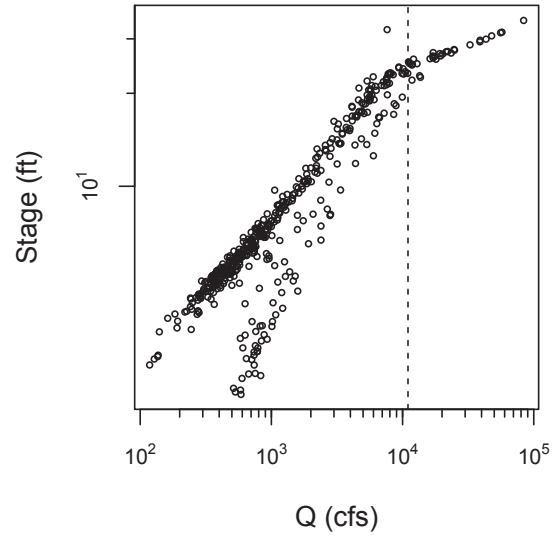
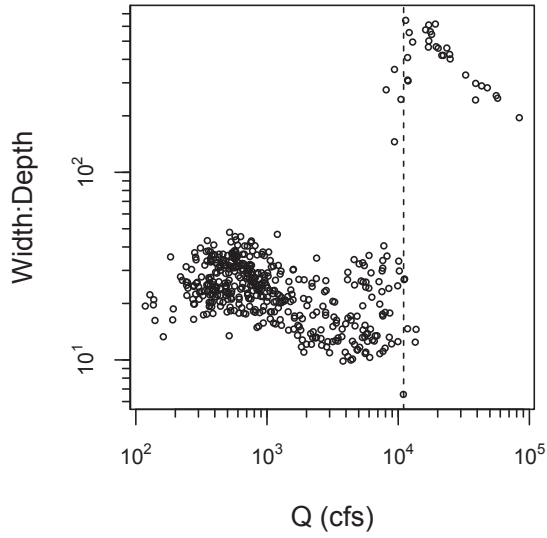
Mississippi River at Baton Rouge, LA
07374000



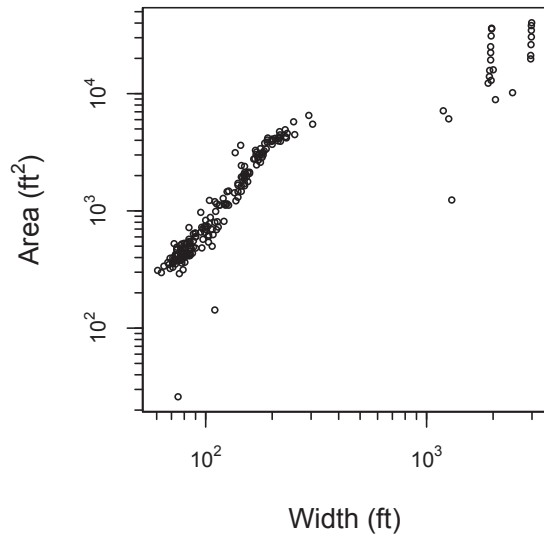
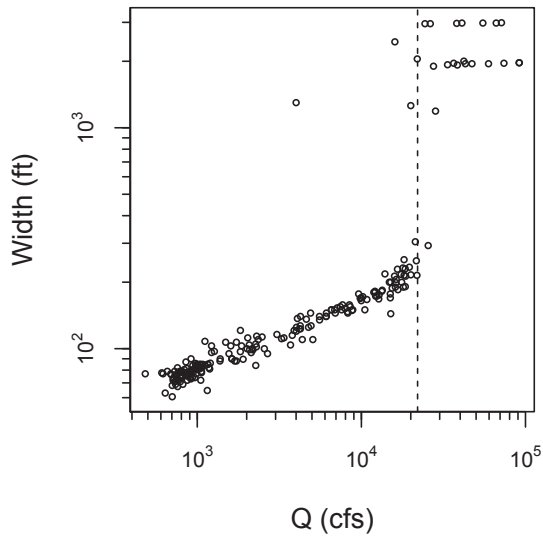
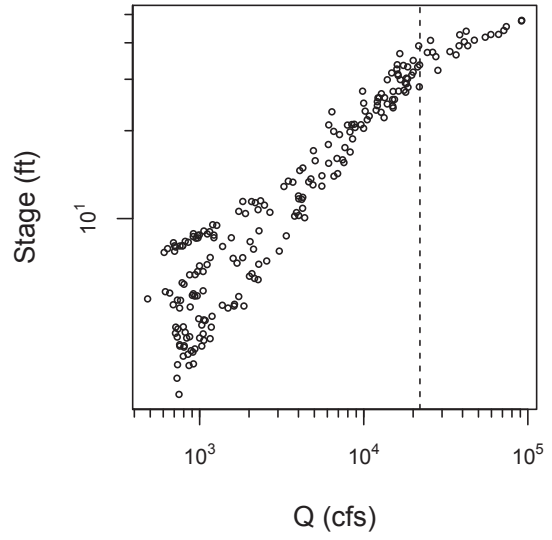
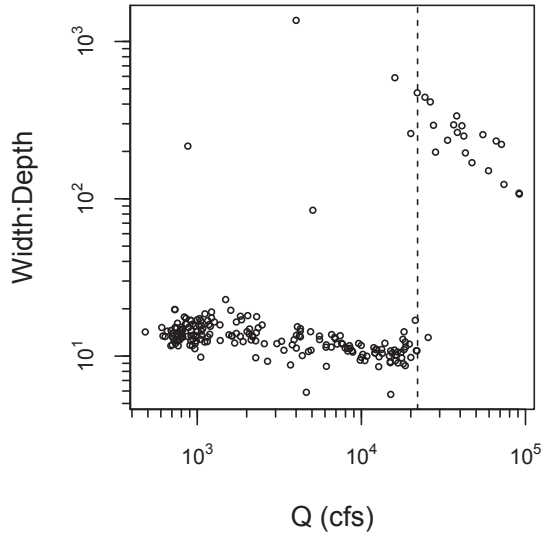
Neches Rv at Evadale, TX
08041000



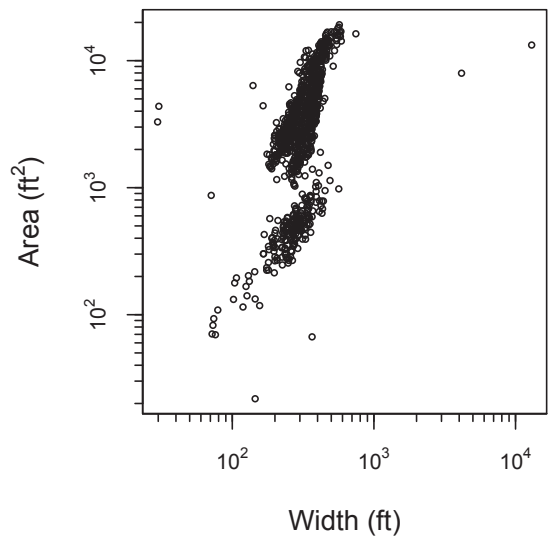
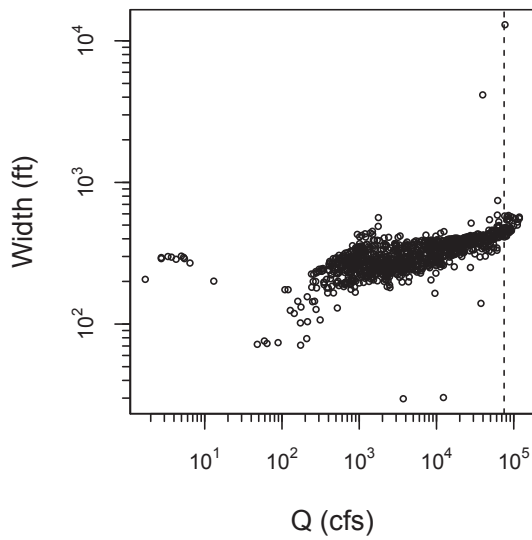
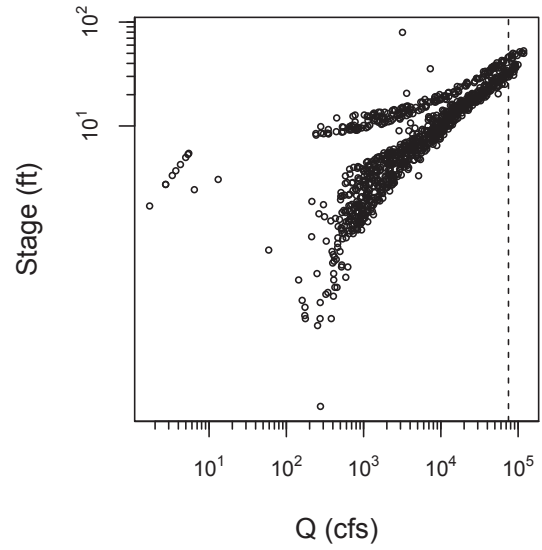
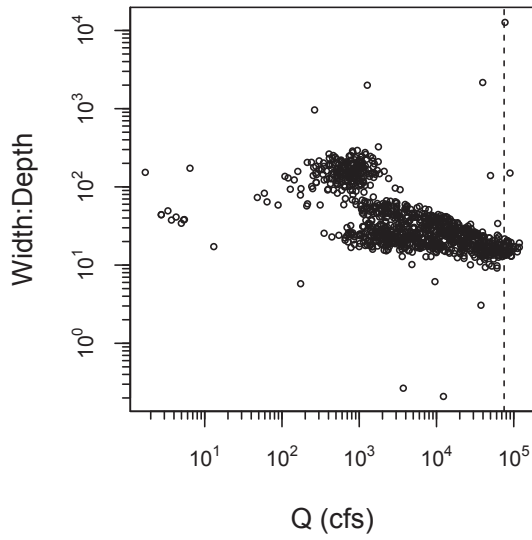
Trinity Rv bl Dallas, TX
08057410



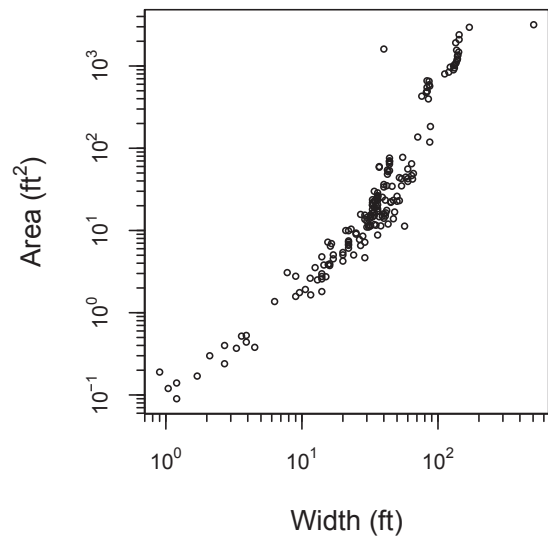
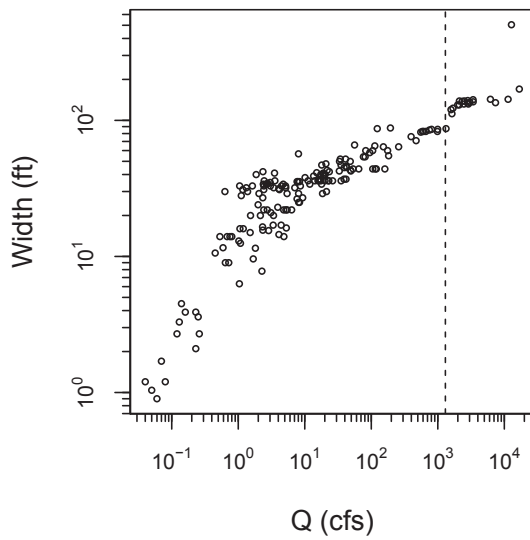
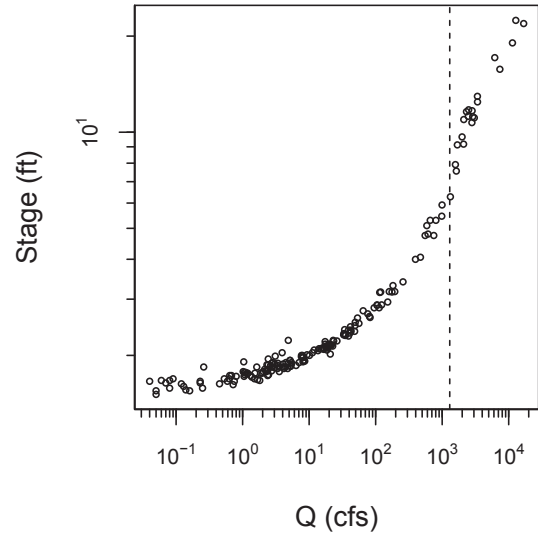
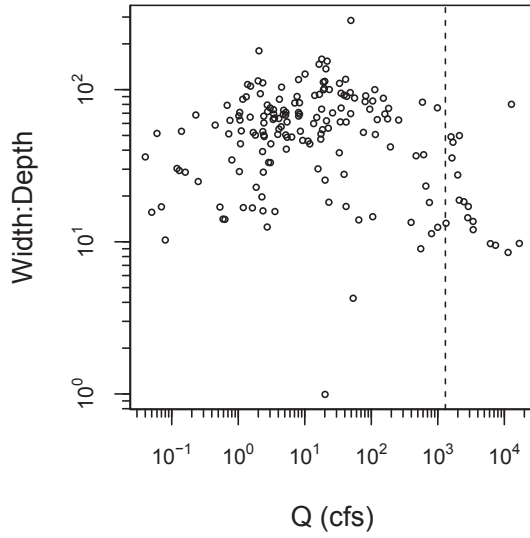
Trinity Rv at Trinidad, TX
08062700



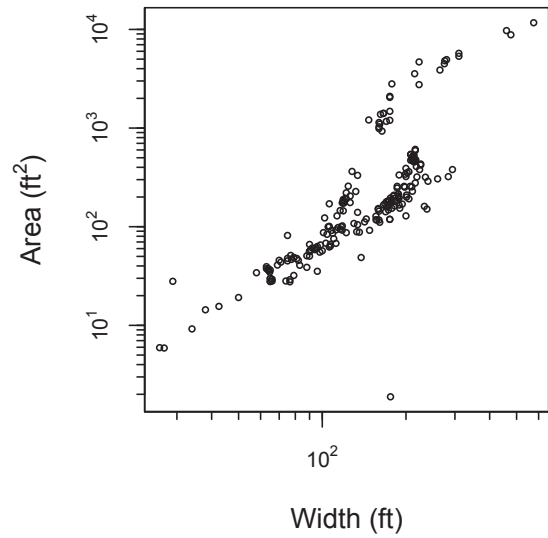
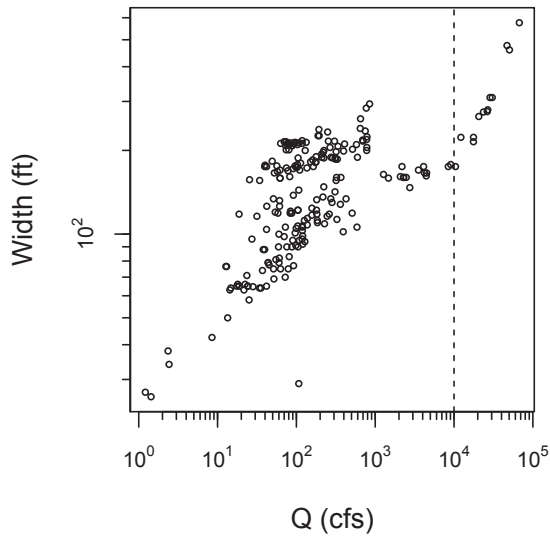
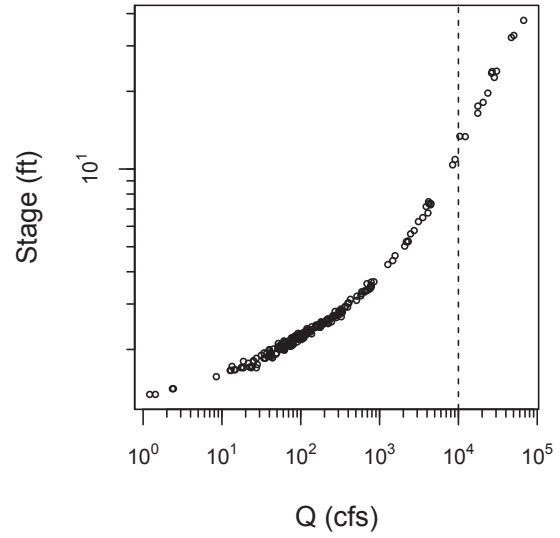
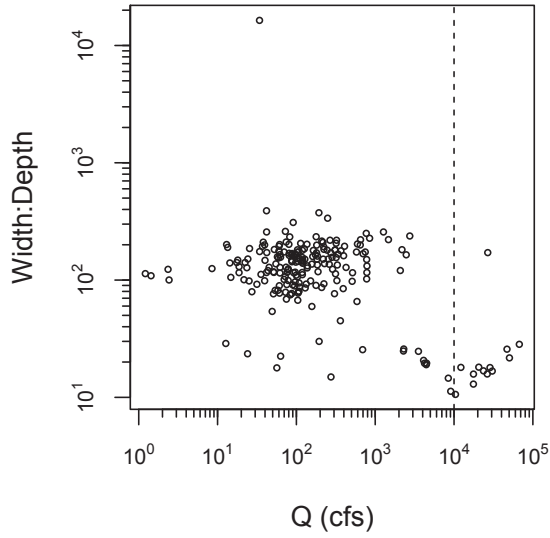
Brazos Rv at Richmond, TX
08114000



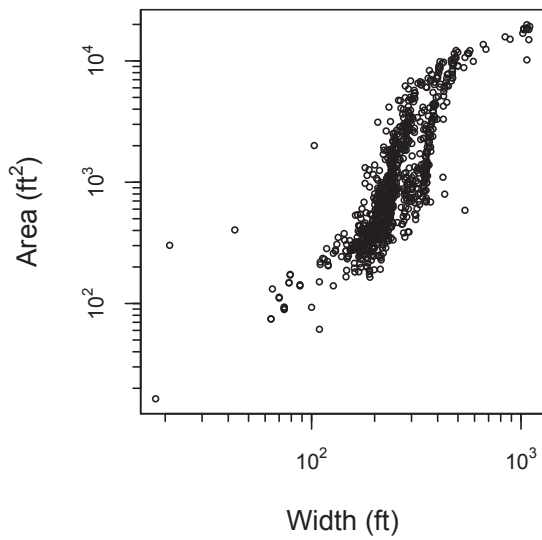
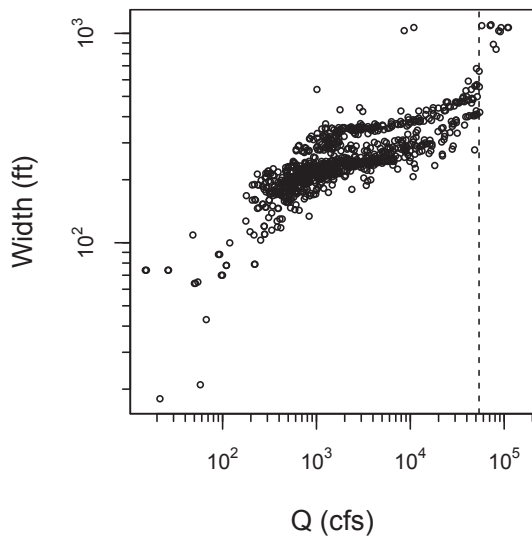
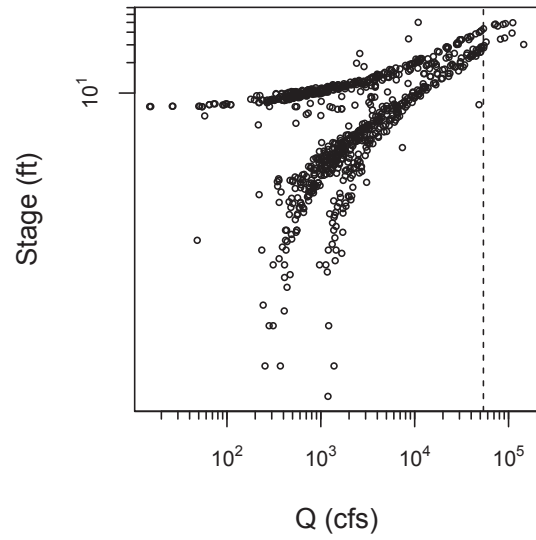
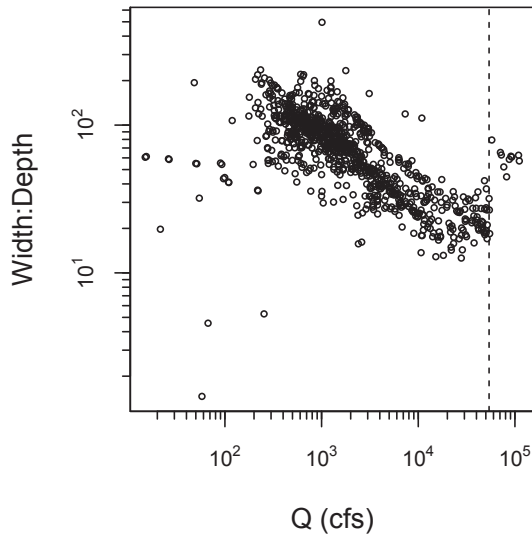
Colorado Rv abv Silver, TX
08123850



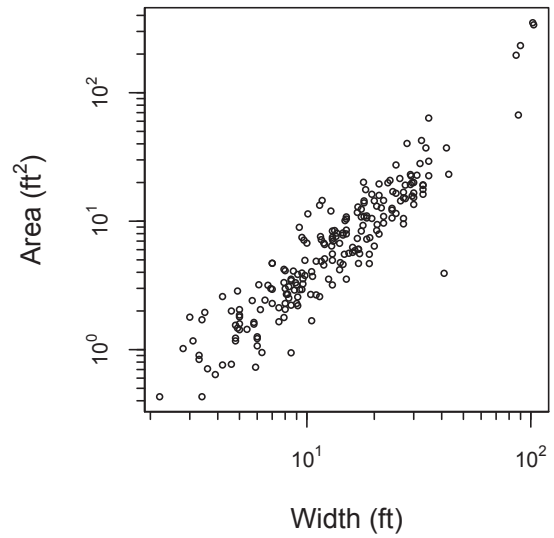
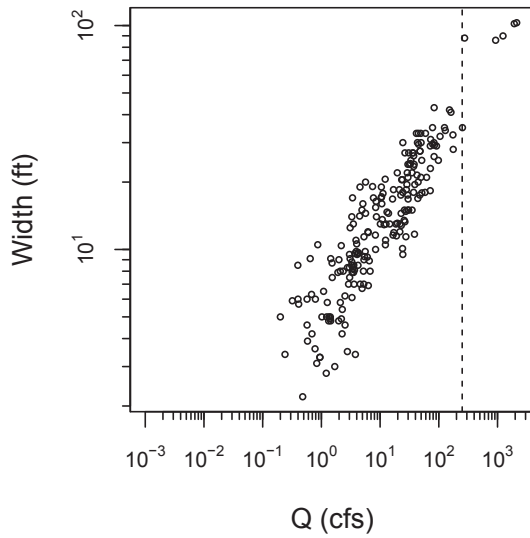
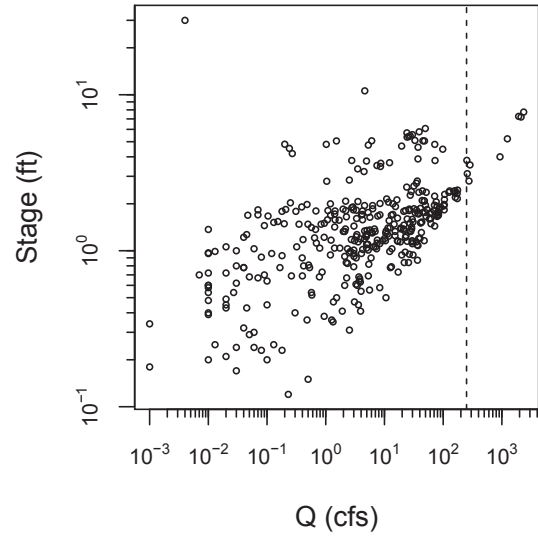
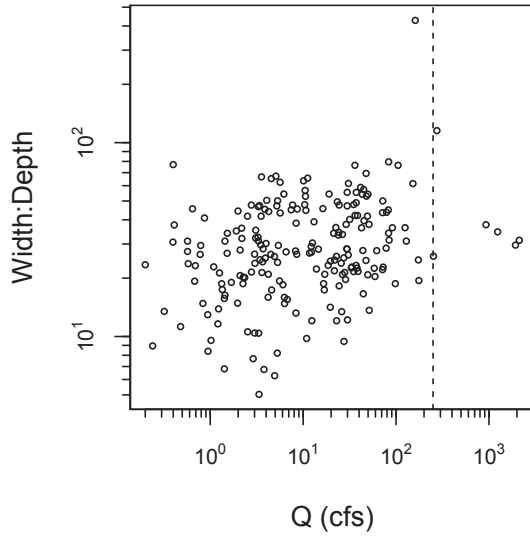
Colorado Rv nr San Saba, TX
08147000



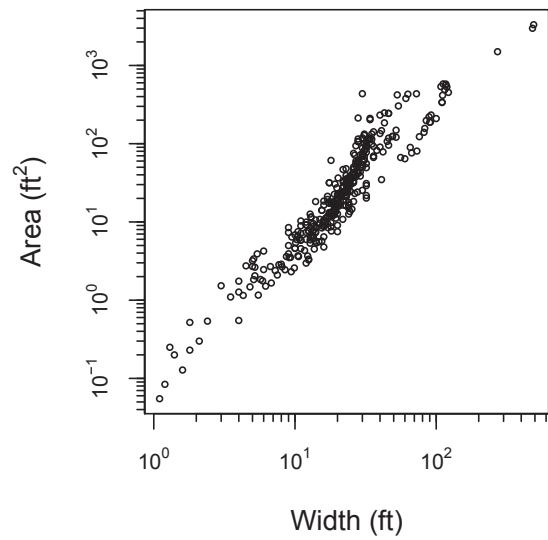
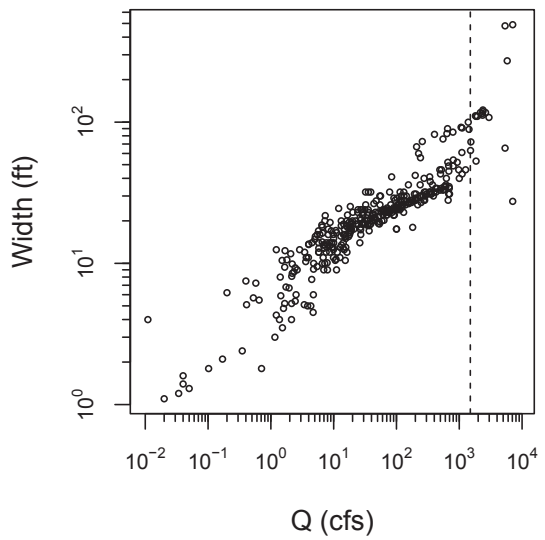
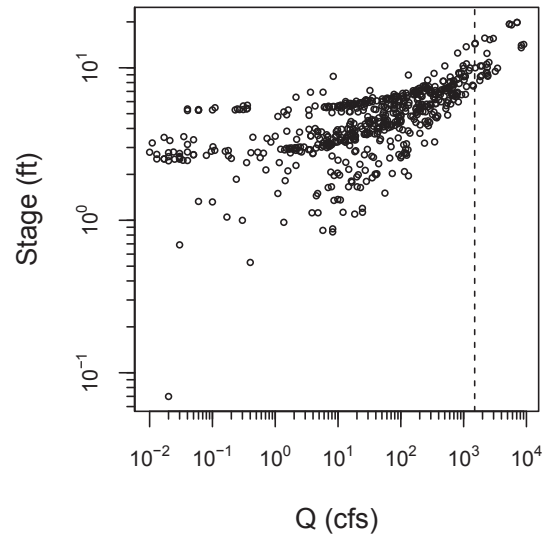
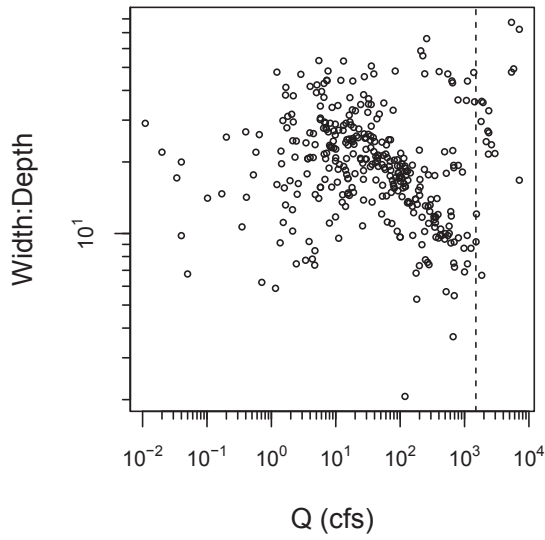
Colorado Rv at Wharton, TX
08162000



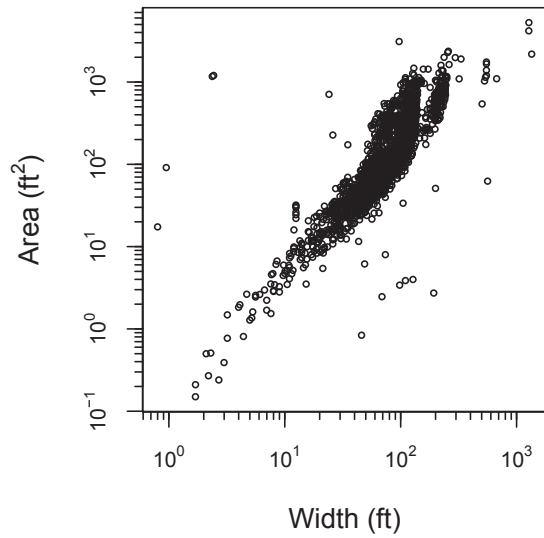
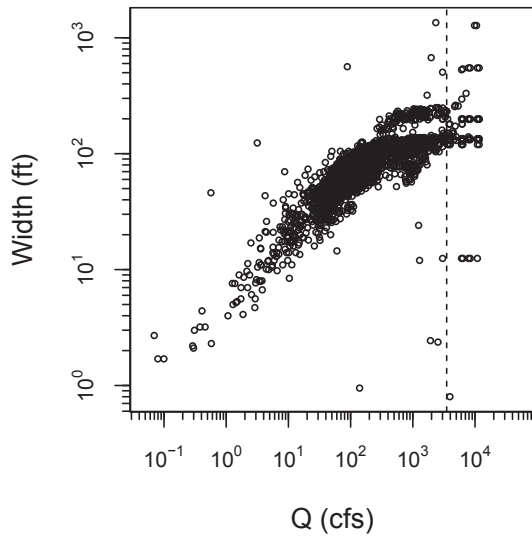
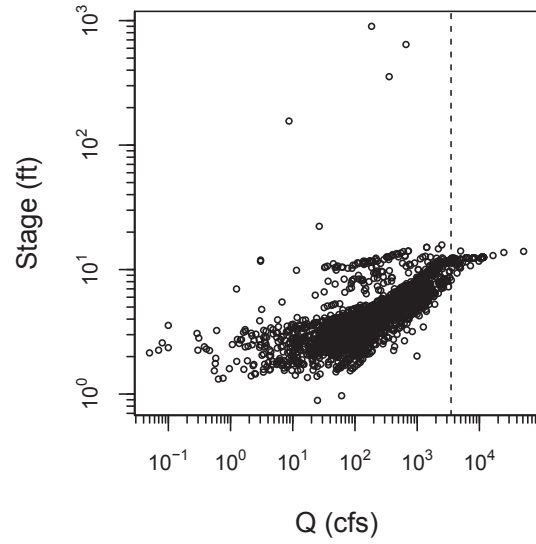
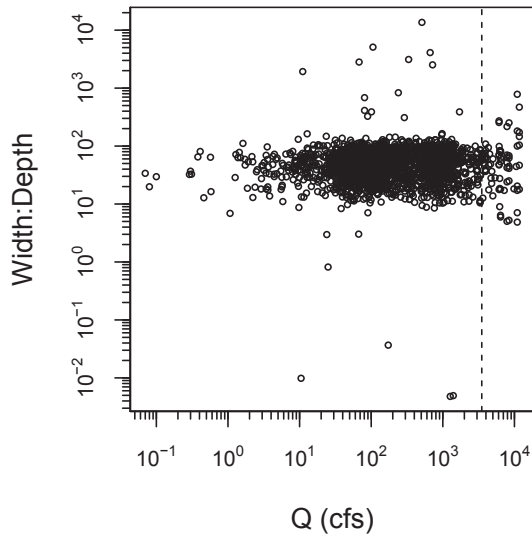
RIO PUERCO ABV ARROYO CHICO NR GUADALUPE, NM
08334000



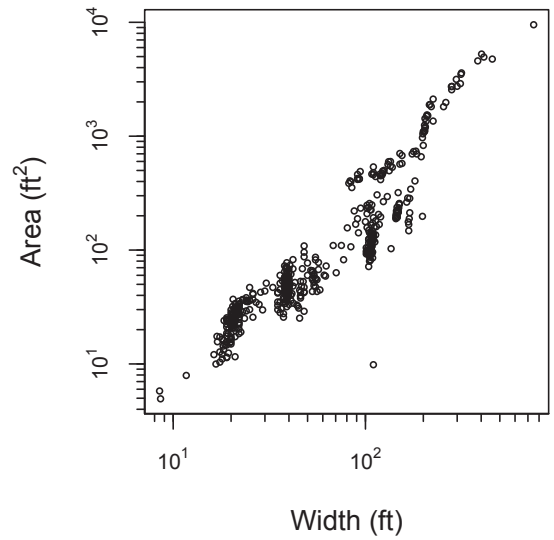
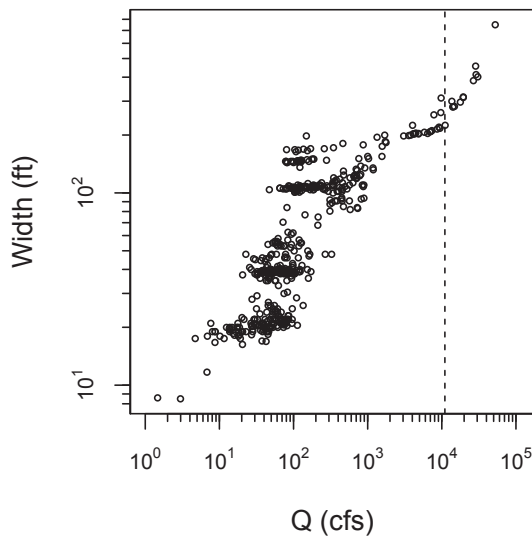
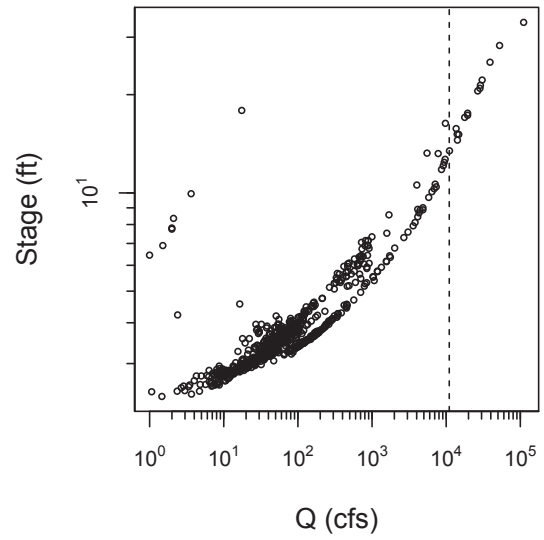
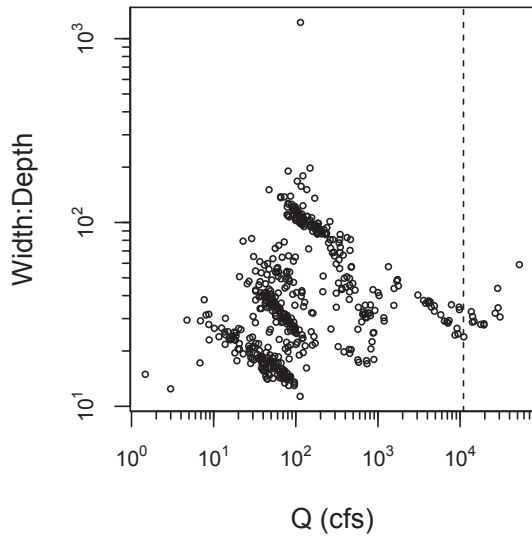
RIO PUERCO NEAR BERNARDO, NM
08353000



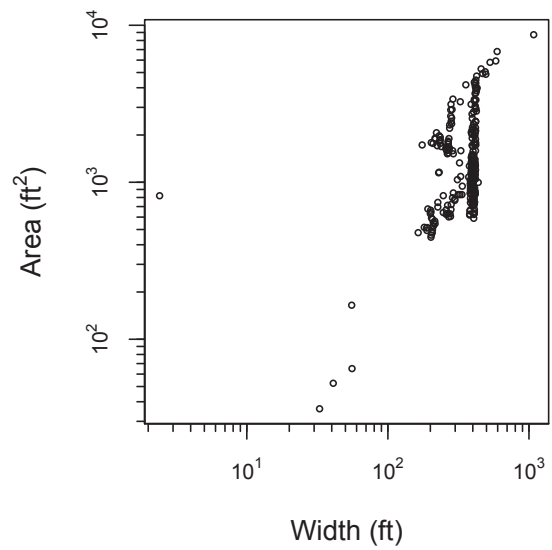
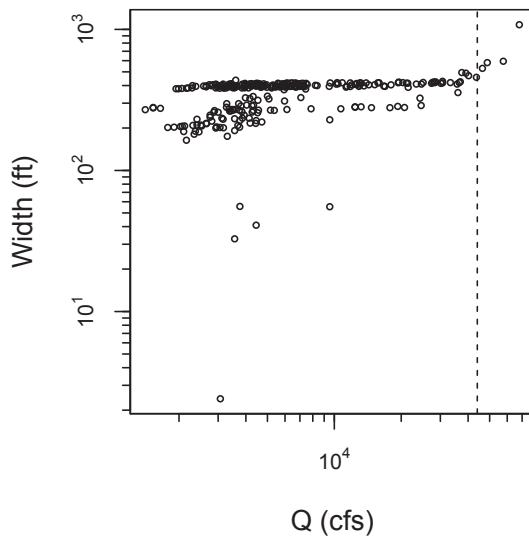
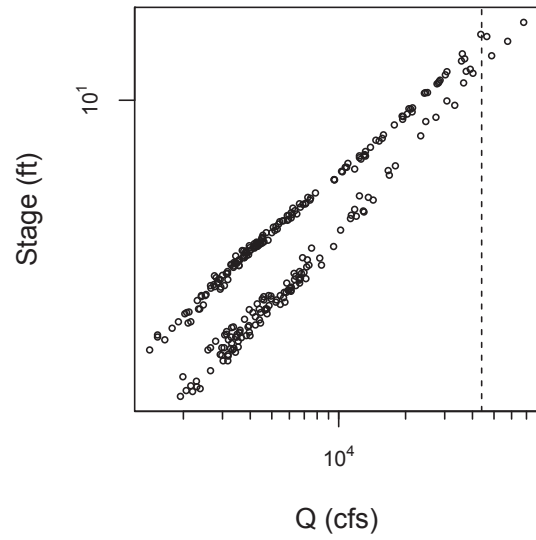
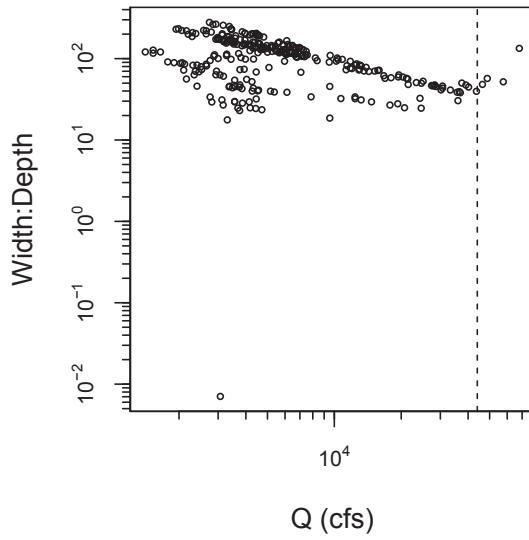
PECOS RIVER NEAR ARTESIA, NM
08396500



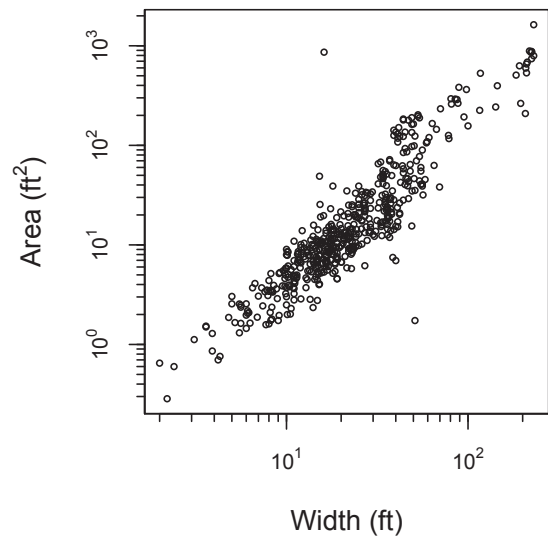
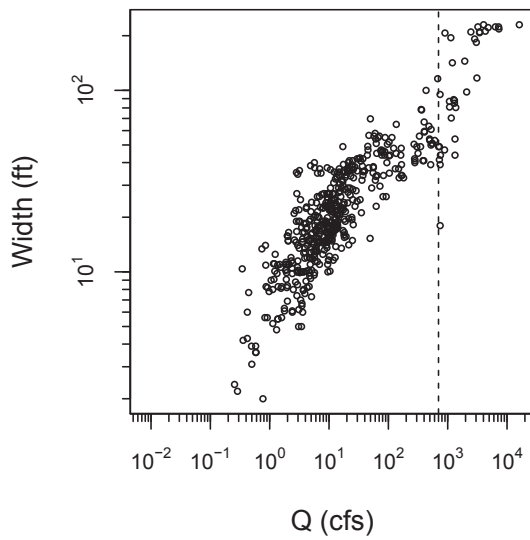
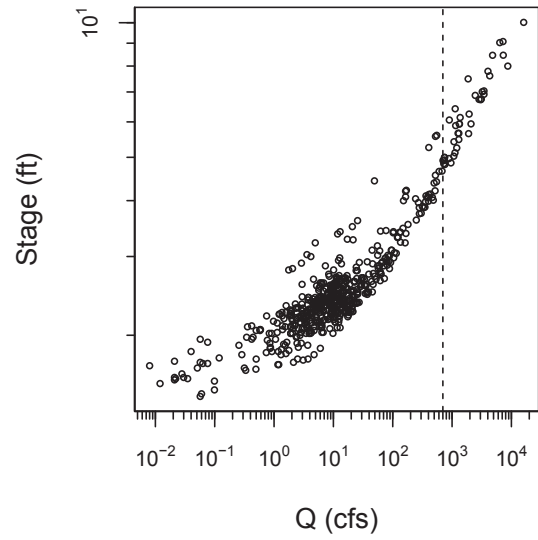
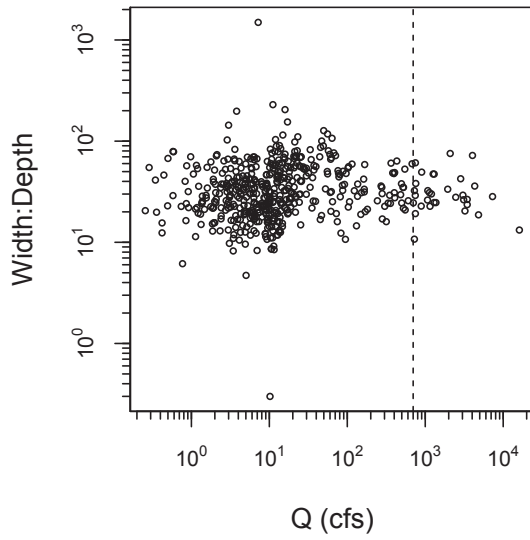
PECOS RIVER AT RED BLUFF, NM
08407500



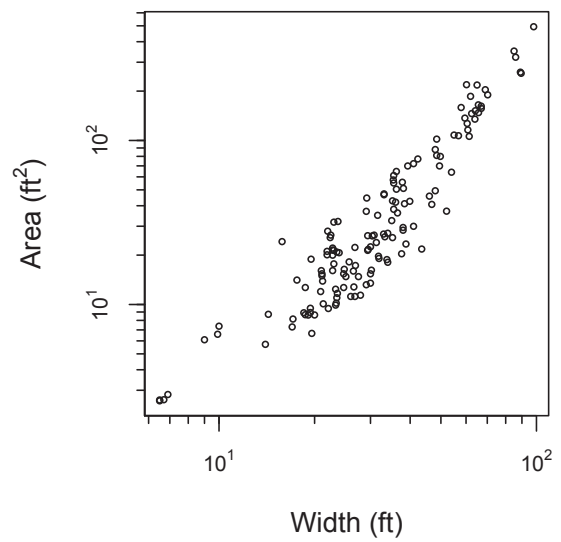
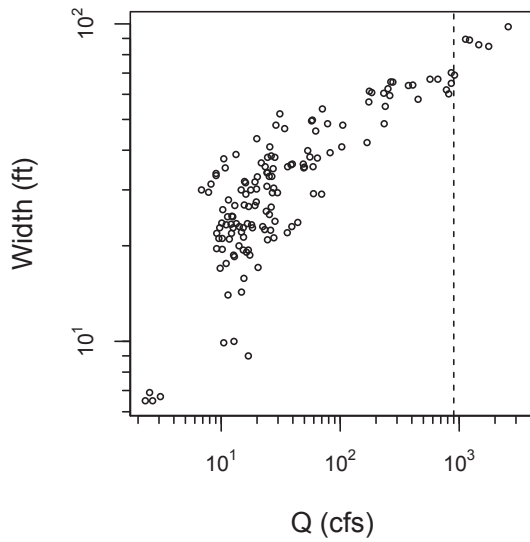
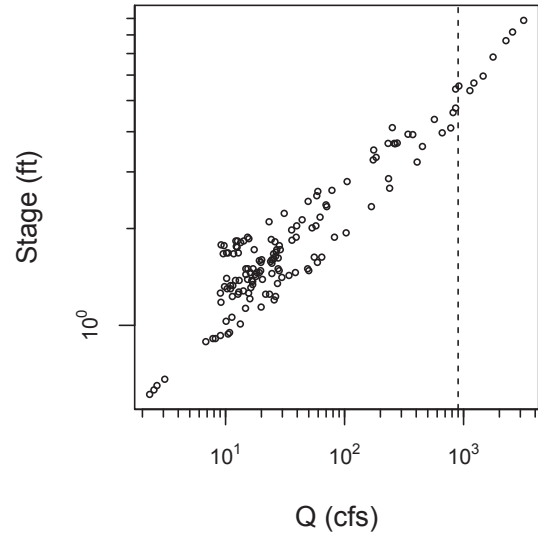
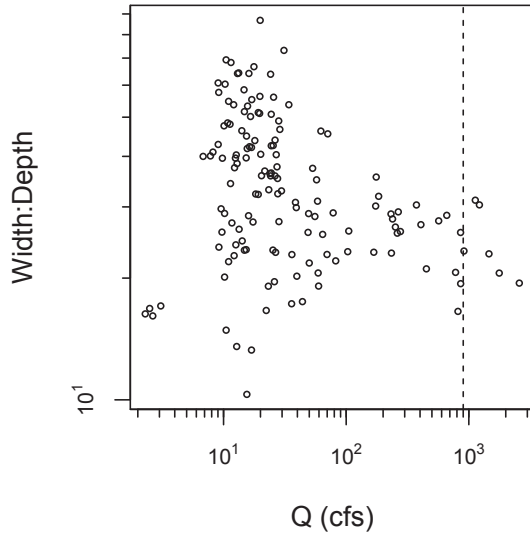
COLORADO RIVER NEAR COLORADO-UTAH STATE LINE
09163500



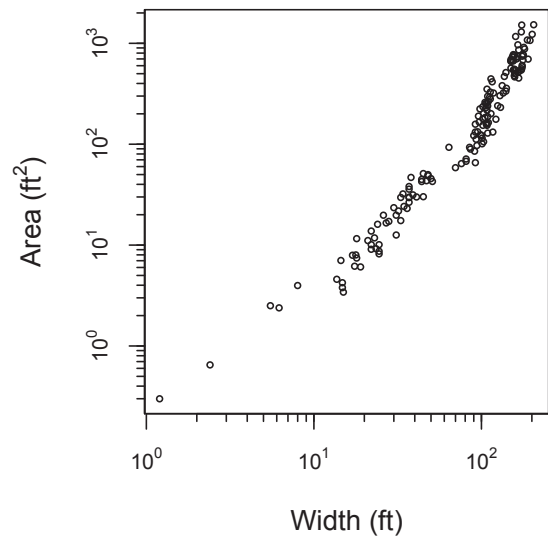
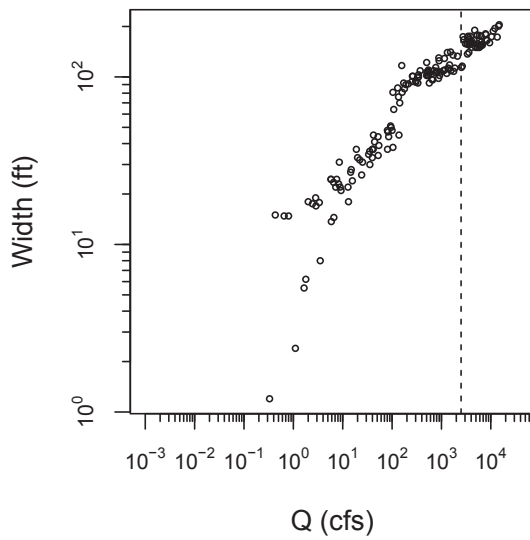
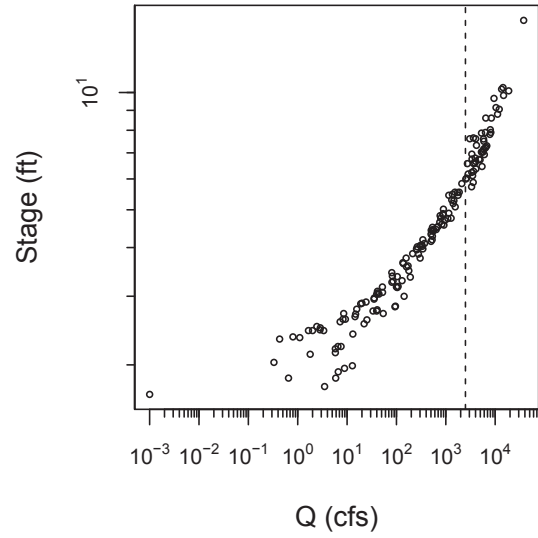
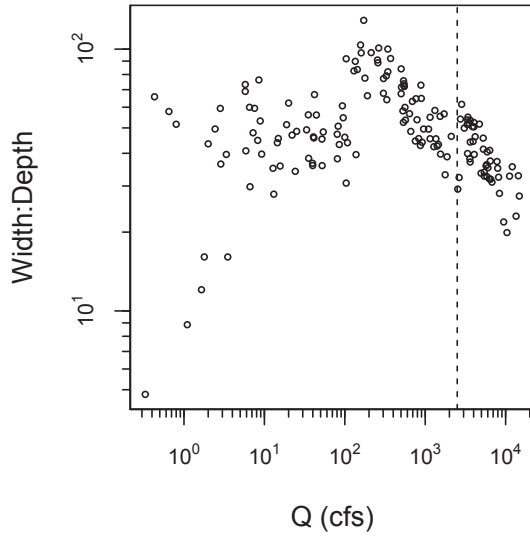
SAN PEDRO RIVER AT CHARLESTON, AZ.
09471000



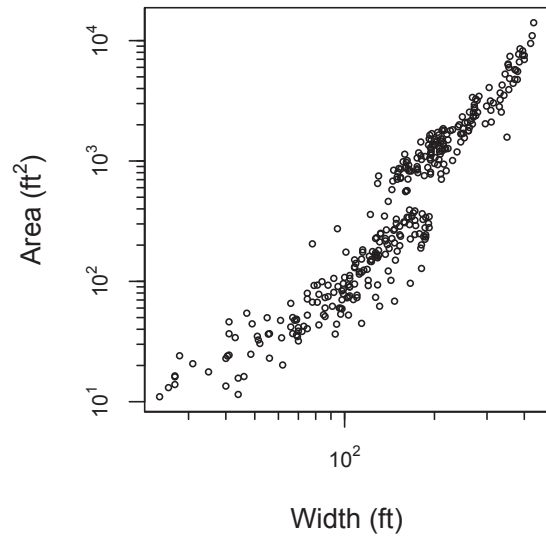
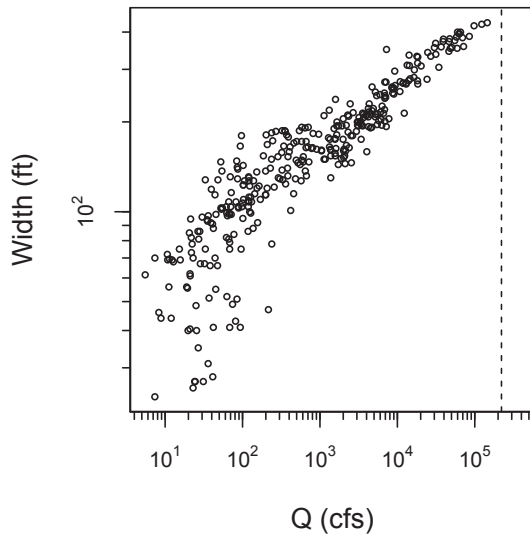
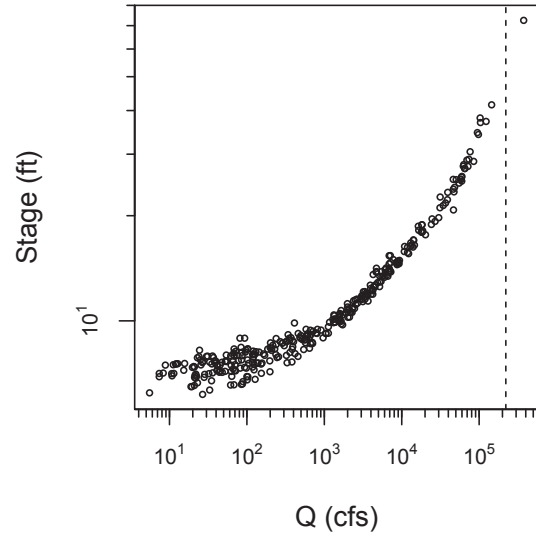
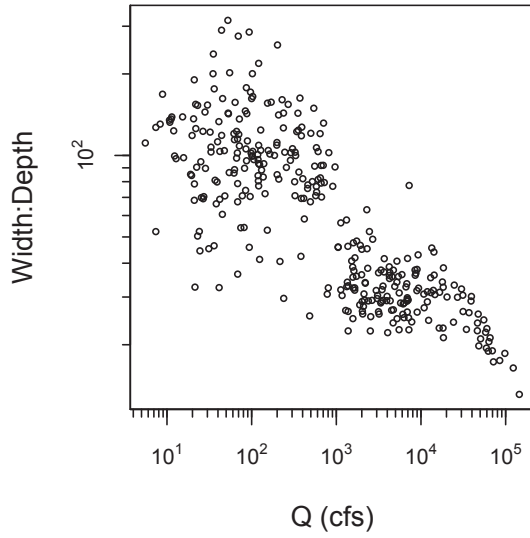
ARROYO DE LA LAGUNA A VERONA CA
11176900



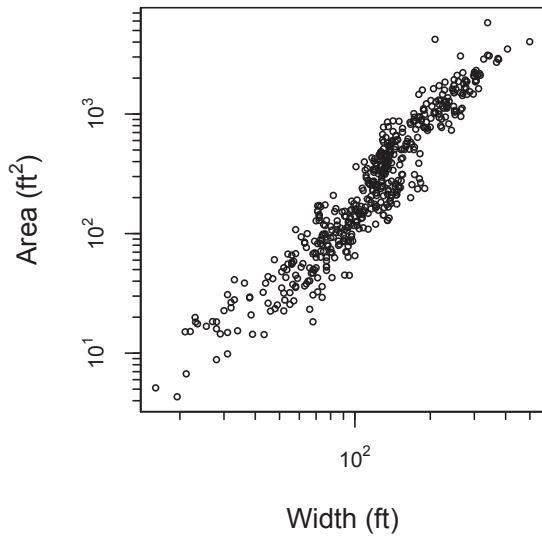
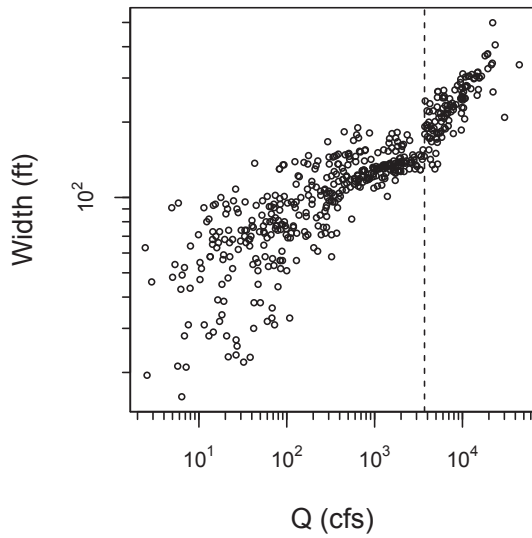
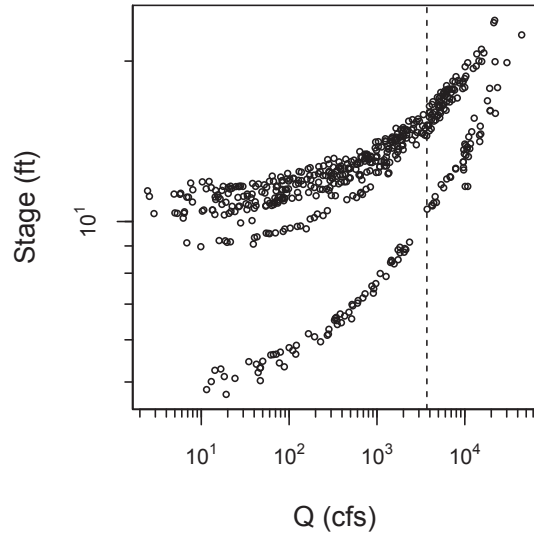
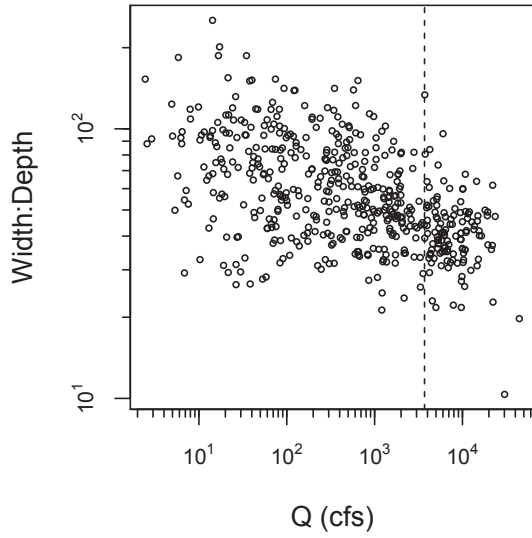
THOMES C A PASKENTA CA
11382000



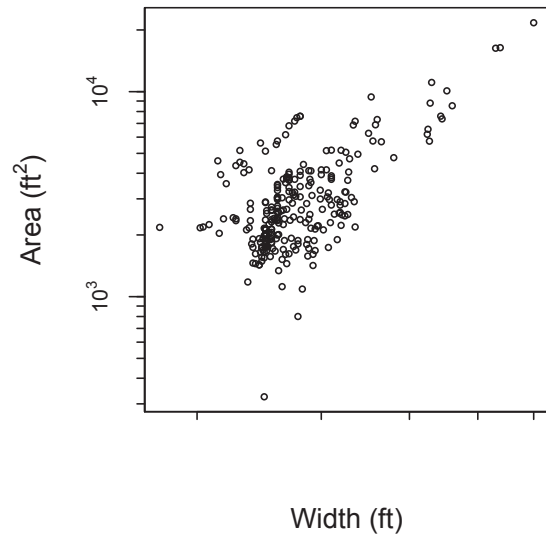
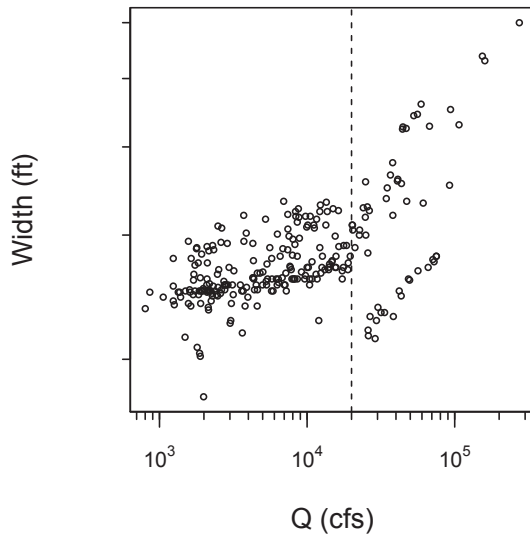
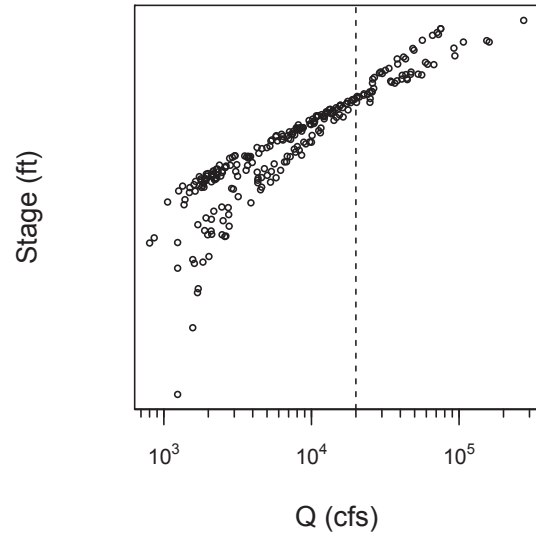
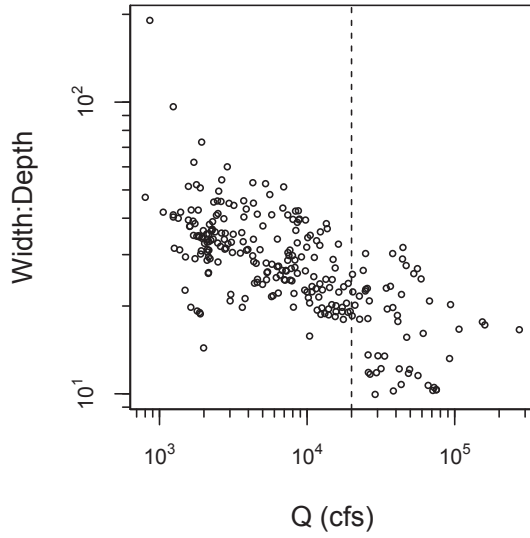
EEL R A FORT SEWARD CA
11475000



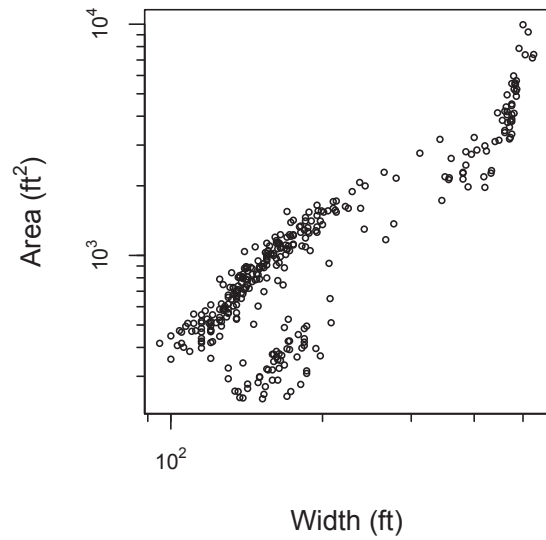
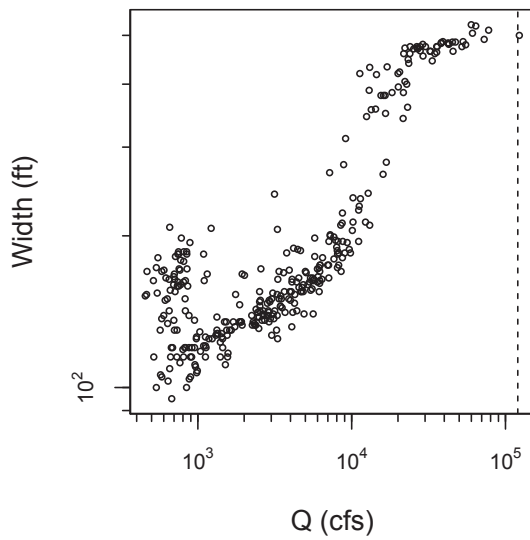
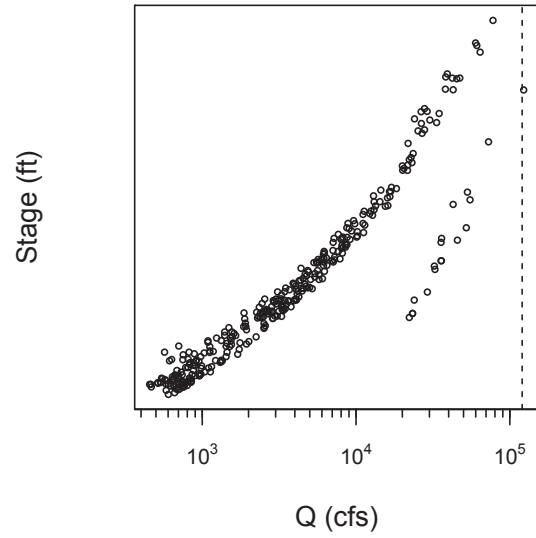
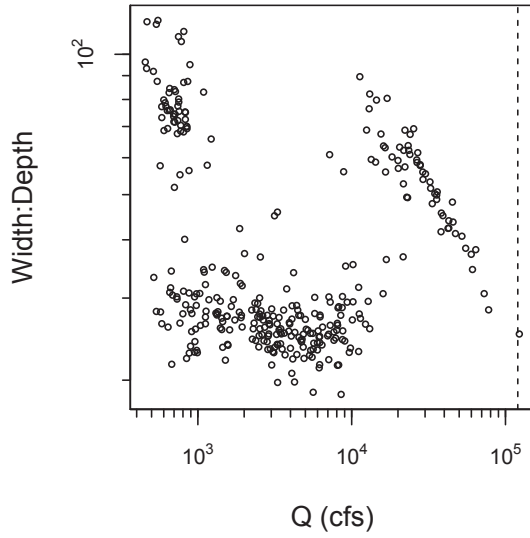
REDWOOD C A ORICK CA
11482500



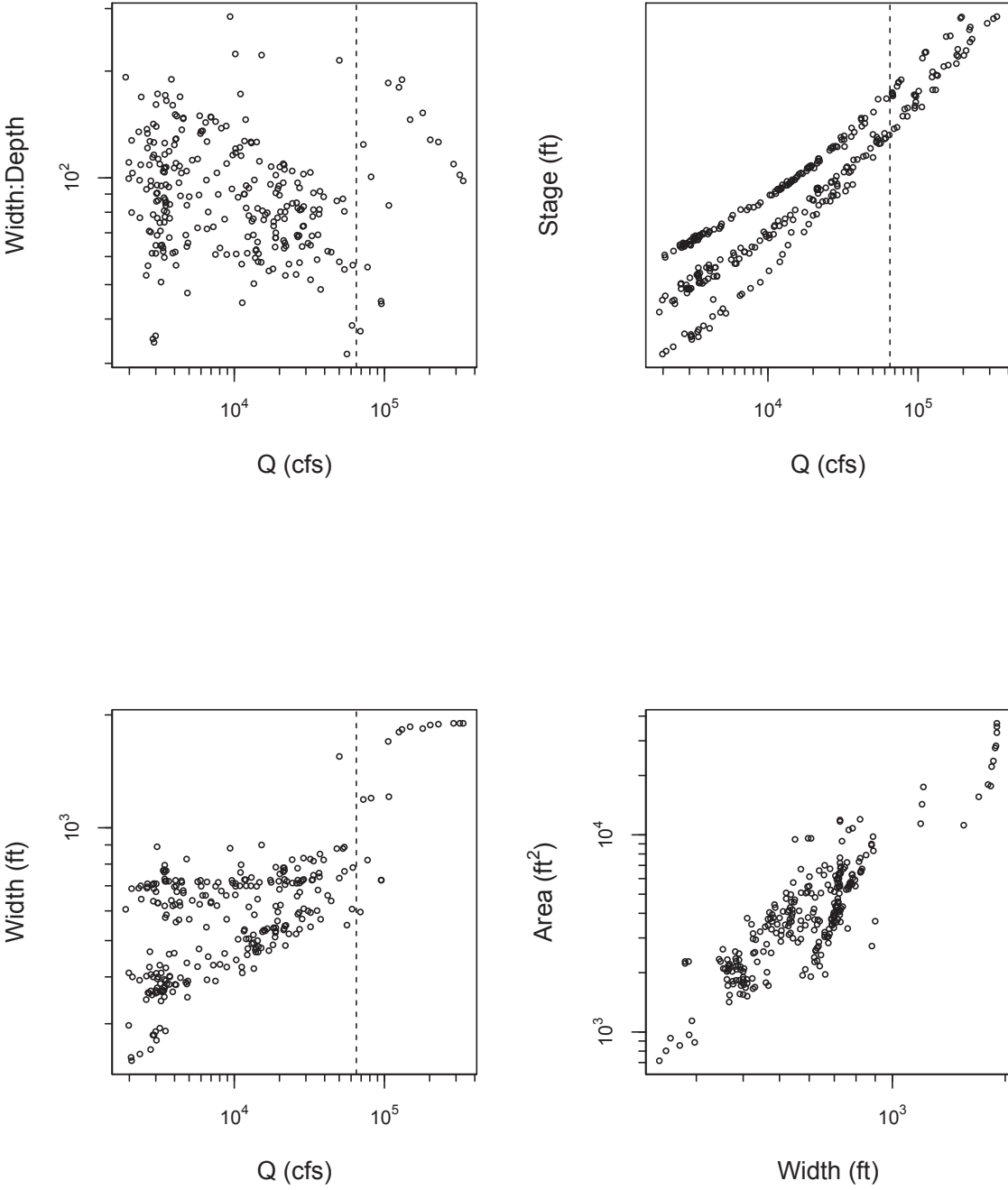
KLAMATH R A ORLEANS
11523000



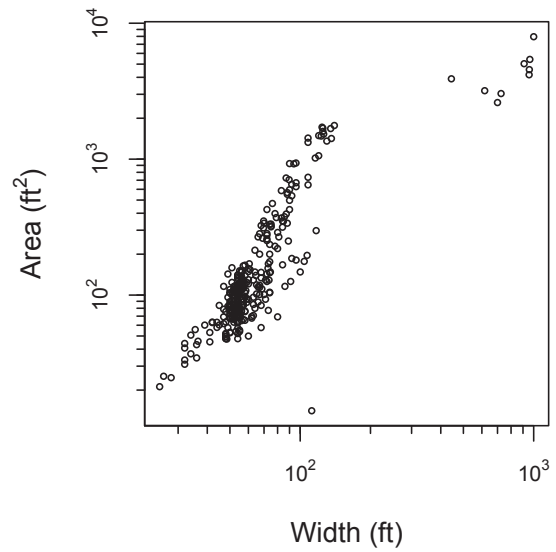
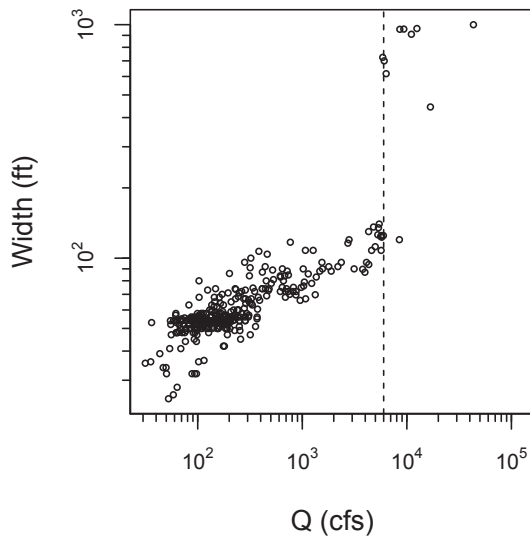
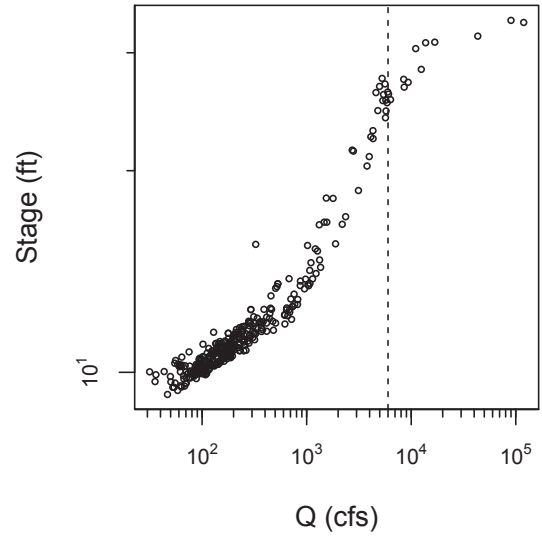
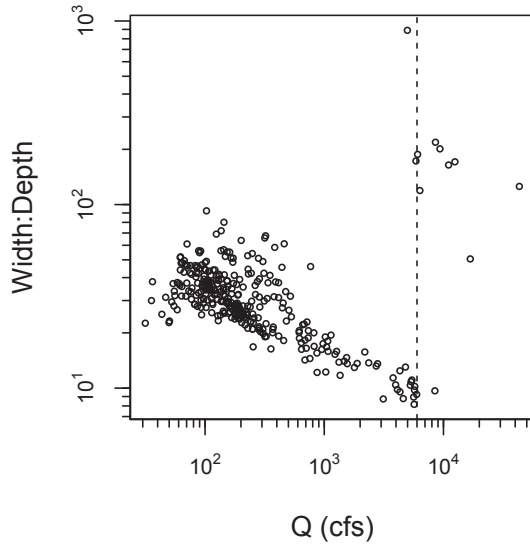
TRINITY R A HOOPA CA
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KLAMATH R NR KLAMATH CA
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RIO GRANDE DE MANATI AT HWY 2 NR MANATI, PR
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APPENDIX G – Log-Linear Regression Uncertainty Analysis

Methods and Results

Detailed methods for generating confidence and prediction bands for log-linear regression models is given for ordinary least squares, robust, and Bayesian linear models are provided. Plots of additional examples of confidence and prediction bands for selected sites are provided. Finally, results from site-specific sediment yield metric uncertainty analysis are also included.

G.1 Ordinary Least Squares Log-Linear Regression

While ordinary least squares regression (OLS) is perhaps the most used and easiest to implement, it also comes with the most assumptions and restrictions on the data. Specifically, it assumes that the residuals about the mean response are normally-distributed with constant variance over the range of predictor variable values (covariates) [*Ott and Longnecker, 2001*]. Note that from the Central Limit Theorem if the number of data pairs, n , is sufficiently large then the normality assumption is approximately valid. Residual normality can be checked with a QQ-plot of the residuals, r , versus quantiles of the standard normal distribution using the `qqnorm(r)` and `qqline()` functions in R.

For log-linear data, normally-distributed residuals translates to the log-transformed residuals having a normal distribution and their variance increasing exponentially in arithmetic space. Closed form solutions exist for the parameters of OLS models; however, they are sensitive to outliers as the method involves minimizing the square of the residuals, giving extra weight to outliers. Pointwise confidence intervals for

the mean response (regression line) and prediction intervals, heretofore referred to as confidence and prediction bands, also have closed form solutions as they are based on an assumed normal distribution of the residuals. The confidence band for the mean response is calculated as follows:

$$\begin{aligned} \hat{y}|_{x=\xi} &\in \left[\hat{y}(\xi) \pm t_{n-2} s_y \sqrt{\frac{1}{n} + \frac{(\xi - \bar{x})^2}{(n-1)s_x^2}} \right], \\ s_y &= \sqrt{\frac{\sum (y_i - \hat{y}_i)^2}{n-2}}, \quad s_x = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}} \end{aligned} \quad (\text{G.1})$$

where \hat{y} is the mean response at ξ , a new value of predictor variable x , and t_{n-2} is the Student's t distribution with $n - 2$ degrees of freedom. The prediction interval for \tilde{y} , a newly-predicted value, is very similar:

$$\tilde{y}|_{x=\xi} \in \left[\hat{y}(\xi) \pm t_{n-2} s_y \sqrt{1 + \frac{1}{n} + \frac{(\xi - \bar{x})^2}{(n-1)s_x^2}} \right]. \quad (\text{G.2})$$

As can be seen by the form of these equations, they become wider as one moves away from the mean value of the covariate x , hence their hyperbolic shape. Confidence and prediction bands are implemented in R using the `predict()` function with a linear, OLS model as the input, `lm(log(Qs) ~ log(Q))`, and specified confidence and prediction probability values.

G.2 Robust Log-Linear Regression

Robust linear regression performs well when residuals are not normally distributed, especially when they are heavy-tailed [*Marona et al.*, 2006]. Given the large scatter in sediment transport data, especially with bed load data, this is a desirable property. Robust regression comprises a family of methods that include least-trimmed squares, several weighted least squares methods, and least absolute deviation regression, which fits to the median response (as opposed to the mean response with OLS). All robust methods require iterative solutions and can therefore generate non-unique fits. This non-uniqueness can become more apparent for small sample sizes. The appeal of robust methods is that they relax assumptions on the distribution of residuals and are less sensitive to outliers; however, they still assume constant residual variance. I use a weighted least-squares method called the ‘MM’ estimator within the `rlm()` function in the MASS package in R [*Venables and Ripley*, 2002].

Closed-form solutions to confidence and prediction bands do not exist and bootstrap methods are often used to create these [*Davison and Hinkley*, 1997, Ch. 5 and 6]. Bootstrapping treats the existing data as the best estimate of the population without making any assumptions about the form of the underlying population, and re-samples (with replacement) from the original data to create estimates of uncertainty. Two general bootstrap re-sampling methods exist for estimating the uncertainty of linear regression models. 1) Model re-sampling, which involves fitting new regression lines to data comprising the original x values, and the originally-fitted y values plus a resampled

residual value. This method assumes constant variance of the residuals. 2) Case re-sampling, which involves fitting new regression lines to data comprising re-sampled original (x,y) data pairs. Case re-sampling relaxes the assumption of constant residual variance.

Davison and Hinkley [1997] outline several methods for calculating confidence intervals from bootstrapped samples. While quantile methods can be used to calculate confidence and prediction intervals (e.g., the 2.5th and 97.5th quantiles for a 95% interval) they assume a symmetric distribution about the median. The accelerated bootstrap confidence interval (BCa) accounts for skewness and kurtosis in the residual distribution through second-order approximation of these values [Davison and Hinkley, 1997]. I use the BCa method along with case re-sampling to estimate the point-wise confidence band for the mean response. The algorithm for this method is as follow as per Algorithm 6.2 in Davison and Hinkley [1997, p. 264-266]:

1. Data pairs are selected randomly with replacement from (\mathbf{x}, \mathbf{y}) , the original vectors of log-transformed data pairs to produce $(\mathbf{x}^*, \mathbf{y}^*)$, vectors of bootstrapped sampled data pairs.
2. A new regression model is fitted to $(\mathbf{x}^*, \mathbf{y}^*)$ producing $\hat{\mathbf{y}}^* = \beta_0^* + \beta_1^* \mathbf{x}$, where \mathbf{x} is a gridded vector of new x -values at which to evaluate the confidence band using the BCa method.

$R = 1,000$ bootstrap samples tends to suffice in creating stable confidence bands.

Prediction bands pose a slightly more complex problem using bootstrap methods because they require sampling the residuals twice. The algorithm for this procedure is as follows Algorithm 6.4 in Davison and Hinkley [1997, p. 284-286]:

1. Conduct model re-sampling to create a bootstrapped model fitted to $(\mathbf{x}, \mathbf{y} + \mathbf{r}^*)$ using a modified form of residual standardization as described in Davison and Hinkley [1997].
2. Create a gridded vector of bootstrapped mean response as before:

$$\hat{\mathbf{y}}^* = \beta_0^* + \beta_1^* \mathbf{x}$$

3. Bootstrap prediction error by taking the difference between the bootstrapped mean response and the original mean response added with a bootstrapped residual value (from the original residuals) for each gridded value of \mathbf{x} :

$$\mathbf{e}^* = \hat{\mathbf{y}}^* - (\beta_0 + \beta_1 \mathbf{x} + \mathbf{r}^*).$$

4. This prediction residual error is then added back to the original mean response and prediction intervals are calculated using the quantile method.

I use the quantile method here to calculate the 95% prediction band because $R = 50,000+$ bootstrap samples are required to create stable and relatively smooth prediction bands. The BCa method requires an iterative, numerical solution and is therefore computationally intensive for large sample sizes. The quantile method produces very similar results with this large bootstrap sample size for large samples.

G.3 Robust Bayesian Log-Linear Regression

Bayesian linear regression combines aspects of the parametric assumptions of OLS and the sampling procedures of bootstrapping. In special, limited cases, Bayesian linear regression can equate to the OLS methodology. However, my implementation of it does not. The strength of Bayesian analysis is manifold. For linear regression problems it allows one to select any probability distribution for the residuals, and, using the likelihood function for the data along with assumed (and uninformative) prior distributions for the model parameters, generate a posterior distribution for the mean and predicted responses generally through Markov Chain Monte Carlo (MCMC) sampling. Posterior distributions are also generated for each parameter. With the MCMC samples of mean and predicted response at gridded values of x , one can then generate confidence and prediction bands using a quantile method if the posterior distribution is symmetric or a highest posterior density interval (HPD) method if the posterior distribution is not. The Bayesian log-linear regression model is as follows:

$$\begin{aligned}
 \hat{y}_i &\sim t(\mu_i, 1/\tau, df) \\
 \mu_i &\sim \beta_0 + \beta_1 x_i \quad \beta_i \sim N(0, 1000) \\
 \tau &\sim \text{Gamma}(0.001, 0.001) \\
 df &\sim \text{Uniform}[1, \infty)
 \end{aligned} \tag{G.3}$$

The $\mu \sim N(0, 1000)$ notation implies that the variable of interest follows a specified distribution with given parameters (in this case the normal distribution). The first

relationship in 4.3 indicates that a mean response, \hat{y}_i (a function of x_i), follows a Student's t distribution with mean μ_i (also a function of x_i), variance $1/\tau$, and degrees of freedom df , all of which are treated as random variables. The data pairs are first standardized before analysis, which reduces correlation between the β values and aids in MCMC sampler convergence on the posterior distribution [Christensen *et al.*, 2010, p. 187]. This Bayesian model is sampled using a Gibbs sampler implemented in JAGS [Plummer, 2003] using the R-JAGS interface package rjags [Plummer, 2014].

As described above, confidence bands are calculated by from the HPD interval of the mean response over gridded x values:

$$\hat{y}_i^* = \beta_0^* + \beta_1^* x_i \quad (\text{G.4})$$

where, as before, the asterisk indicates a sampled value of the parameter or mean response from one MCMC sample. The prediction band is calculated similarly as the bootstrap prediction band with randomly sampled residuals from the posterior distribution added to the mean response over all MCMC samples:

$$\tilde{y}_i^* = \hat{y}_i^* + t(df^*)s_y \quad (\text{G.5})$$

where \hat{y}_i^* comes from 4.4 and df^* is the MCMC sample of the degrees of freedom from the Student's t distribution.

Appropriate Bayesian model specification (G.3) and sampler convergence can be evaluated by considering the autocorrelation plots of the MCMC sample for each parameter (Figure G.2). Autocorrelation should trail off to small values for lags greater

than 2-5 steps. High correlation at larger lag values indicates that the MCMC sampler is not “stuck” on certain values or areas of the posterior distribution and is therefore creating a representative sample. Trace plots of the sample over iterations are also helpful as they show this same phenomenon: whether or not the samples are favoring a particular range of values or are spread about randomly (Figure G.3). The latter behavior is needed for a proper and representative posterior sample.

Model sensitivity to prior specification may be evaluated by exchanging prior distributions and/or changing the prior parameter value (e.g., the mean and variance of a normal distribution or the bounds of a uniform distribution). I chose a diffuse, uninformative prior distribution of $N(0,1000)$. The mean values of the model coefficients are not sensitive to prior specification. Because sediment transport is nearly always positively correlated with flow and realistic values for β_0 and β_1 are bounded, more-informed priors might be used in this case. Note that the data were first log-transformed and then standardized, therefore a prior distribution that can accommodate these transformed values is necessary.

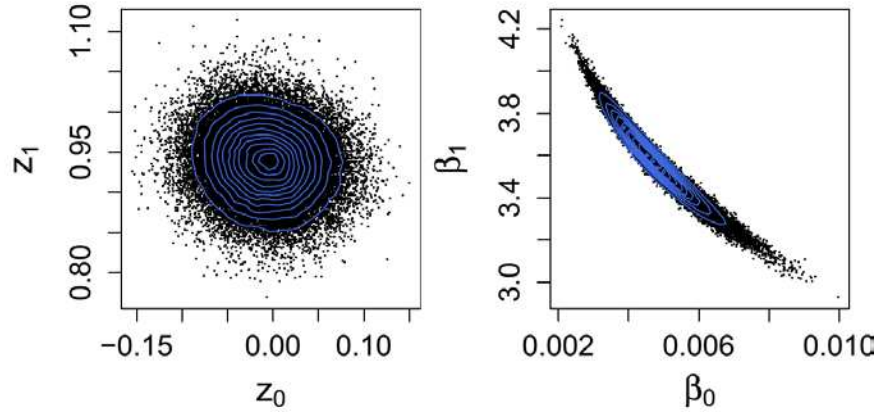


Figure G.1 An example of the MCMC sampling of standardized linear regression parameters (z_0 and z_1), which are highly uncorrelated, as well as un-standardized and un-transformed parameters (β_0 and β_1), which are correlated by nature for Eggers Creek, ID. Note that an empirical PDF can be constructed for each parameter directly from this MCMC sample for parameter uncertainty analysis.

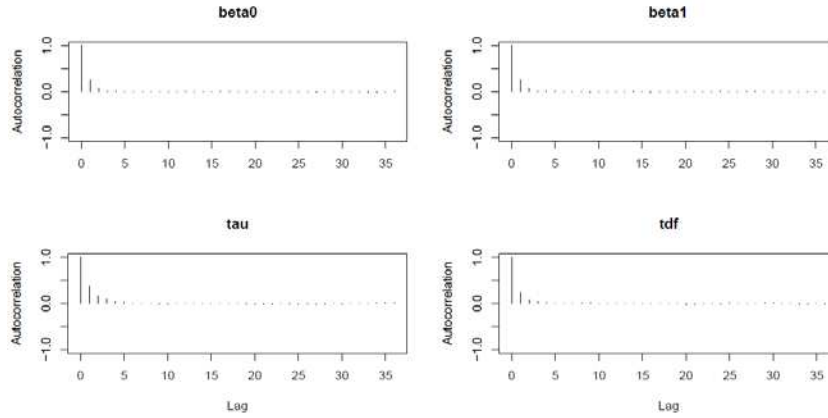


Figure G.2 Autocorrelation plots for MCMC samples for each model parameter.

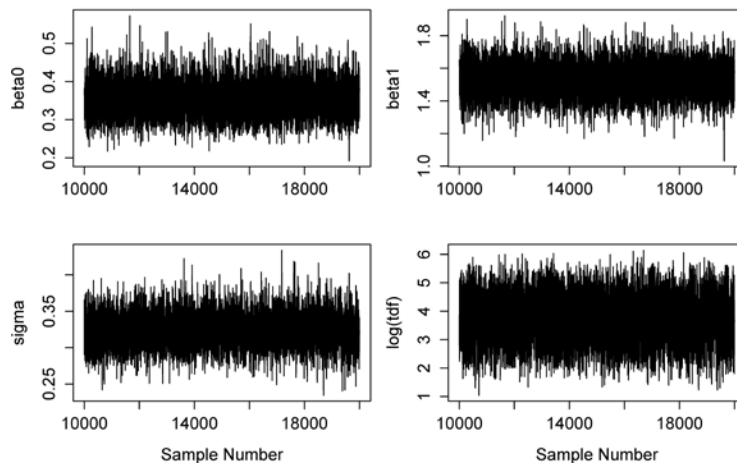


Figure G.3 Traceplots of model parameter values from posterior distribution samples.

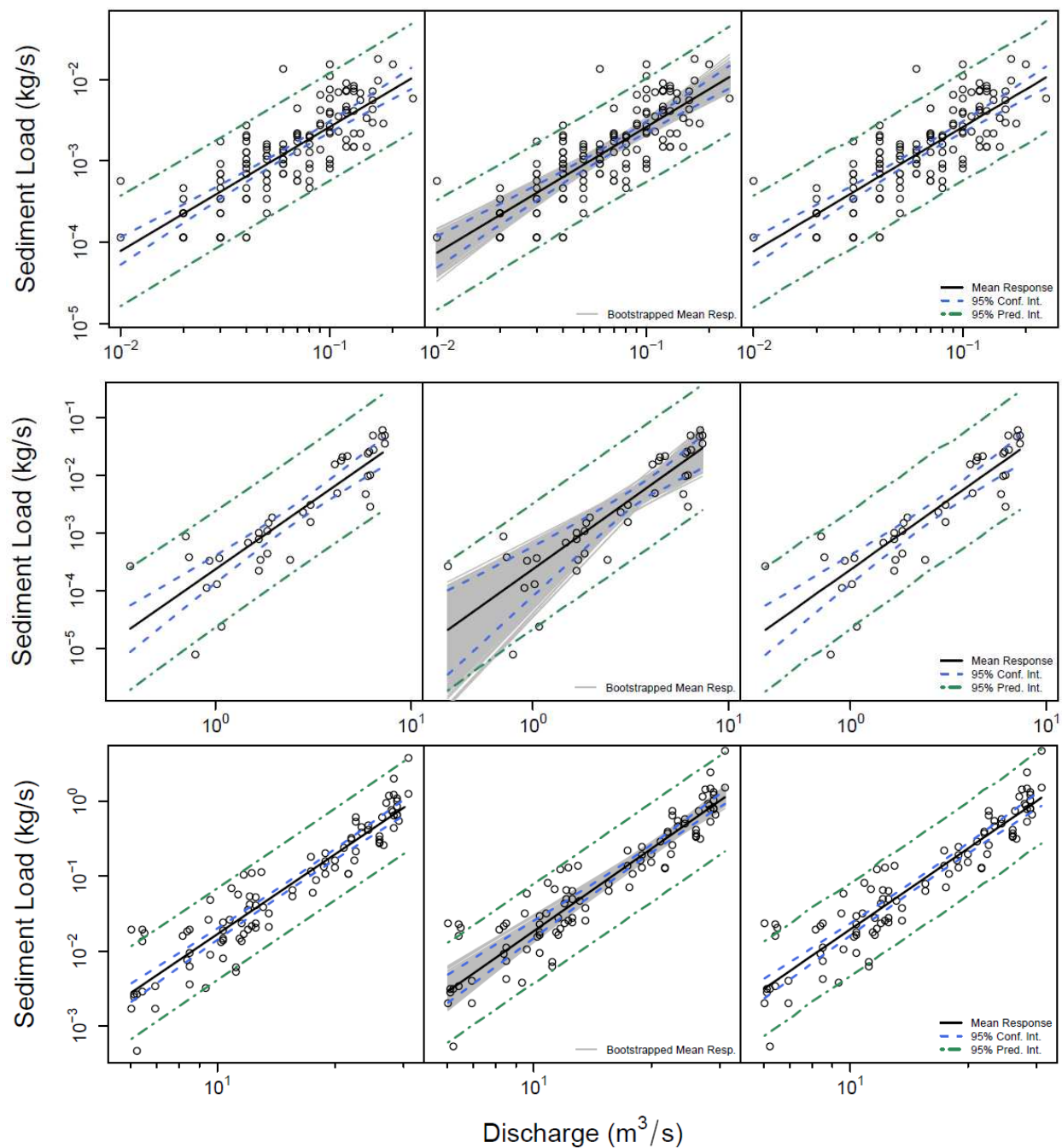


Figure G.4 Side-by-side comparisons of OLS, RLM, and Bayesian regression models (left to right) for bed sediment load at Eggers Creek, ID; Big Sandstone Creek near Savary, WY; and the Big Wood River near Ketchum, ID, respectively (top to bottom). Gray lines in middle column are bootstrapped mean response lines.

Table G.1 Results from sediment yield metric uncertainty analysis for coarse bed sites.

Site No.	Site Name	n sed	α	β	R^2	σ_e	RL	C_V	Q_{s50}	Spread Q_{s50}	Q_{eff}	Spread Q_{eff}
06228000	WIND RIVER AT RIVERTON, WY	25	0.915	0.915	0.22	0.61	98	1.51	45.72	2.76	9.83	12.6
07083000	HALFMOON CREEK NEAR MALTA, CO	49	-4.102	3.282	0.66	1	67	1.56	5.63	0.82	5.28	1.5
0914650A	East Fk Dallas Creek nr Ridgeway, CO	57	-0.827	2.902	0.76	1	21	1.21	3.4	0.94	4.02	1.58
09253400	Battle Creek near Encampment, WY	55	-5.015	3.146	0.69	1.4	10	2.12	9.73	1.09	12.47	1.12
09255400	East Fork Savery Creek near Encampment, WY	47	-0.266	2.833	0.75	0.97	4	2.11	1.72	1.05	2.15	0.99
09255900	Big Sandstone Creek near Savery, WY	39	-3.904	2.366	0.76	1.1	5	2.35	5.02	1.08	6.5	0.99
09339900	East Fork San Juan River, CO	77	-7.963	5.124	0.92	0.59	45	1.58	21.6	0.67	23.54	0.88
09347200	Middle Fork Piedra River, CO	86	-7.309	4.567	0.91	0.79	51	1.58	14.79	1.07	24.12	0.81
09361400	Junction Ck nr Durango, CO	34	-10.225	4.779	0.79	0.93	48	1.85	7.5	0.91	11.55	0.76
09362900	Florida River near Lemon Reservoir, CO	37	-11.217	4.516	0.97	0.5	79	1.68	23.14	0.67	25.52	1.26
09404900	East Fork Virgin River nr Springdale, UT	37	-1.608	0.984	0.46	0.65	22	0.87	1.59	1.64	1.58	0.33
10343500	Sagehen Creek nr Truckee, CA	55	-0.929	1.783	0.29	1.1	60	1.84	2.19	9.43	21.24	1
11143250	CARMEL RIVER NR CARMEL, CA	47	-2.979	1.629	0.7	1.2	51	3.22	37.13	2.36	12.51	18
11148900	NACIMIENTO R BL SAPAQUE C NR BRYSON, CA	30	-9.259	2.527	0.78	0.82	42	4.42	272.12	1.01	492.32	0.98
11149900	SAN ANTONIO R NR LOCKWOOD, CA	205	-1.145	0.886	0.7	0.86	48	3.9	15.66	3.31	0.25	0.16
11173575	ALAMEDA Ck BL WELCH C NR SUNOL, CA	35	-4.644	1.461	0.54	1.2	14	3.48	11.34	1.66	10.9	3.42
11179000	ALAMEDA Ck NR NILES, CA	60	-6.416	1.98	0.71	0.96	113	4.31	137.17	1.46	155.69	2.98
11180960	CULL CK ABV CULL Ck RES NR CASTRO VALLEY, CA	30	0.317	1.593	0.75	0.88	35	4.76	3.43	2.26	9.06	1
11481500	REDWOOD C NR BLUE LAKE, CA	66	-7.247	2.474	0.75	0.87	42	1.8	68.78	1.61	223.86	1.01
11482500	REDWOOD C A ORICK, CA	93	-4.276	1.344	0.77	0.63	62	1.91	113.29	2.22	57.77	0.9
11525530	RUSH C NR LEWISTON, CA	41	-8.067	3.077	0.74	1.1	37	1.44	6.99	2.69	25.84	0.89
11525600	GRASS VALLEY C A FAWN LODGE NR LEWISTON, CA	98	-1.598	0.587	0.09	1.2	29	1.69	1.56	3.38	0.4	0.16
11525670	INDIAN C NR DOUGLAS CITY, CA	42	-7.651	2.859	0.87	0.88	37	2.14	33.11	1.42	55.9	0.96
11525854	TRINITY R A DOUGLAS CITY, CA	116	-14.964	3.047	0.71	0.68	11	1.2	185.17	1.07	350.81	0.82
12044900	ELWHA RIVER ABV LAKE MILLS NR PT ANGELES, WA	76	-2.036	2.15	0.7	0.93	95	0.81	81.24	2.17	48.11	7.49
1241490A	Cat Spur Creek, ID	35	-1.33	2.001	0.42	1.2	48	1.21	1.44	1.97	1.23	5.86

Site No.	Site Name	n sed	α	β	R^2	σ_e	RL	C_V	Q_{s50}	Spread Q_{s50}	Q_{eff}	Spread Q_{eff}
13011500	Pacific Creek at Moran, WY	41	-4.288	2.421	0.52	1.5	63	1.87	54.73	1.11	58.31	1.63
13018300	Cache Creek, nr Jackson, WY	60	-2.925	2.66	0.75	0.63	51	1.28	2	1.12	2.84	1.36
13019438	LITTLE GRANITE CK AT MOUTH NR BONDURANT, WY	322	-3.787	2.872	0.69	1.3	10	1.75	8.57	1.37	13.05	1.3
13135500	BIG WOOD RIVER NR KETCHUM, ID	100	-7.788	3.544	0.87	0.71	25	1.31	27.9	0.75	36.99	0.79
13162225	JARBIDGE RV BLW JARBIDGE, NV	56	-4.308	3.164	0.59	1.3	14	1.94	9.99	1.14	10.05	1.66
13185000	BOISE RIVER NR TWIN SPRINGS, ID	82	-7.519	2.553	0.85	0.64	102	1.22	148	0.51	161.34	0.44
13235000	SOUTH FORK PAYETTE RIVER AT LOWMAN, ID	72	-4.178	2.02	0.7	0.77	72	1.13	87.48	0.78	87.98	0.88
13292500	SALMON RIVER NR OBSIDIAN, ID	50	-6.284	3.388	0.61	0.71	79	1.49	14.48	0.92	15.25	1.17
13295000	VALLEY CREEK AT STANLEY, ID	192	-5.296	2.804	0.59	1.2	73	1.12	23.68	0.55	22.74	0.36
1329500B	Herd Creek, ID	72	-1.388	2.376	0.83	1	71	0.87	3.12	0.21	3.6	0.01
1329500C	Marsh Creek, ID	98	-4.204	2.427	0.68	1.1	71	1.64	29.98	1.36	33.83	3.12
13296500	SALMON RIVER BL YANKEE FORK NR CLAYTON, ID	60	-14.866	3.851	0.72	0.97	79	1.15	159.61	0.71	168.09	1.11
13297330	Thompson Creek, ID	81	-1.277	2.9	0.87	0.75	41	1.74	4.74	1.14	5.41	1.79
13297355	SQUAW CREEK BL BRUNO CREEK NR CLAYTON, ID	92	-2.332	2.516	0.79	1.2	41	1.67	7.54	1.13	7.94	1.58
1329735A	Squaw Ck nr North Fork, ID (USFS)	42	0.047	2.274	0.49	1.1	41	1.17	0.51	1	0.69	0.91
13307000	SALMON RIVER NR SHOUP, ID	61	-17.541	3.884	0.71	0.81	48	0.97	408.27	0.87	471.45	0.96
13309220	MIDDLE FORK SALMON RIVER NR YELLOW PINE, ID	64	-27.028	5.747	0.82	1	22	1.37	490.03	0.95	585.76	0.84
13310520	DOLLAR CREEK NR WARM LAKE NR CASCADE, ID	85	-2.376	2.121	0.69	0.92	41	1.7	7.33	1.45	7.72	2.53
13310565	BLACKMARE CK NR POVERTY FLAT NR CASCADE, ID	88	-2.326	1.962	0.61	0.99	41	1.33	4.68	0.84	3.69	1.54
13310660	LITTLE BUCKHORN CK NR KRASSEL RGR STA, ID	77	0.562	2.01	0.49	1	41	1.08	0.68	0.76	0.78	1.13
13310670	WF BUCKHORN CK NR KRASSEL RGR STA, ID	85	-1.995	1.763	0.39	1.3	41	1.51	5.14	1	6.14	1.09
13310700	South Fk Salmon River, ID	130	-8.531	3.007	0.74	1.3	41	1.41	89.42	0.9	90.98	1.3
1331070A	Rapid River, ID	189	-4.629	2.19	0.58	1.5	87	1.2	20.6	0.87	19.12	1.27
13313000	JOHNSON CREEK AT YELLOW PINE, ID	72	-9.806	2.805	0.87	0.73	85	1.67	67.86	0.74	56.77	1.05
1331650A	Little Slate Creek, ID	156	-3.463	1.391	0.44	1.1	46	1.02	7.27	0.79	1.31	7.45
13337000	LOCHSA RIVER NR LOWELL, ID	72	-19.757	3.891	0.78	0.87	86	1.36	485.96	0.62	500.14	0.77
1333850A	Johns Creek, ID	69	-8.046	2.464	0.5	1.2	49	1.2	19.13	0.98	22.61	3.31
1333850B	Lolo Creek, ID	112	-3.072	1.489	0.37	1.2	35	1.21	7.82	0.97	4.48	1.95
1333850C	Main Fork Red River, ID	74	-1.932	1.825	0.62	1.2	35	1.39	8.91	1.22	9.6	1.46

Site No.	Site Name	n sed	α	β	R^2	σ_e	RL	C_V	Q_{s50}	Spread Q_{s50}	Q_{eff}	Spread Q_{eff}
1333850D	South Fk Red River, ID	201	-2.138	1.454	0.41	1.4	35	1.51	5.3	1.49	0.41	12
1333850F	Trapper Creek, ID	166	-0.723	1.327	0.44	1.3	49	1.28	0.95	1.12	0.11	13.7
13340600	NF CLEARWATER R NR CANYON RGR STA, ID	72	-19.308	3.853	0.88	0.73	46	1.15	503.21	0.83	430.77	1.55
13342500	Clearwater River at Spalding, ID	78	-12.637	2.474	0.72	0.84	91	1.09	1525.53	0.8	1247.13	0.47
M332AEC	Eggers Creek, ID	137	2.025	1.525	0.63	0.76	32	1.53	5.61	1.56	0.41	12

Table G.2 Results from sediment yield metric uncertainty analysis for fine bed sites.

Site No.	Site Name	n sed	α	β	R^2	σ_e	RL	C_V	Q_{s50}	Spread Q_{s50}	Q_{eff}	Spread Q_{eff}
01095220	STILLWATER RIVER NEAR STERLING, MA	40	0.277	1.36	0.87	0.74	20	1.46	4.46	2.07	2.5	0.32
01401000	Stony Brook at Princeton NJ	58	-1.847	2.092	0.67	1	60	2.54	33.18	1.45	105.53	0.98
01463500	Delaware River at Trenton NJ	261	-6.351	2.276	0.77	1.3	101	1.02	1170.65	1.67	717.66	10.3
01466500	McDonalds Branch in Byrne State Forest NJ	127	0.72	1.272	0.22	1	61	0.59	0.07	1	0.04	0.67
01570500	Susquehanna River at Harrisburg, PA	152	-4	1.734	0.82	1.1	124	1.2	3032.16	1.19	1510.93	0.85
01618000	POTOMAC RIVER AT SHEPHERDSTOWN, WV	102	-3.181	1.681	0.65	1.3	70	1.49	691.52	1.98	264.42	18
01653600	PISCATAWAY CREEK AT PISCATAWAY, MD	43	1.41	1.865	0.76	1.5	48	2.62	16.02	5.05	134.04	0.99
01658500	S F QUANTICO CK NR INDEPENDENT HILL, VA	22	2.271	1.609	0.96	0.89	63	2.86	2.92	2.02	0.17	76.7
01668000	RAPPAHANNOCK R NR FREDERICKSBURG, VA	252	-3.699	2.17	0.84	1.3	107	1.74	722.14	2	3598.46	0.99
02047000	NOTTOWAY RIVER NEAR SEBRELL, VA	108	-0.21	1.046	0.62	1.3	73	1.35	80.4	1.21	38.7	1.46
02075500	DAN RIVER AT PACES, VA	88	-2.755	2.051	0.62	1.2	63	1.19	394.29	1.76	78.22	22.1
02089500	NEUSE RIVER AT KINSTON, NC	372	-0.131	1.231	0.54	1.2	83	1.04	162.06	0.6	45.41	2.66
02131000	PEE DEE RIVER AT PEEDEE, SC	127	0.365	1.008	0.36	1.1	74	0.89	373.91	0.9	175.9	0.23
02143040	JACOB FORK AT RAMSEY, NC	27	-0.317	1.735	0.73	0.76	53	1.57	7.55	3.82	1.15	59.3
02217274	WHEELER CK AT BILL CHEEK RD, AUBURN, GA	32	4.605	1.845	0.87	1.3	13	2.16	1.1	1.57	2.83	0.98
02248000	SPRUCE CREEK NEAR SAMSULA, FL	48	1.727	1.282	0.79	1.1	62	2.33	5.69	1.66	0.64	13
02300700	BULLFROG CREEK NEAR WIMAUMA FL	29	0.615	0.959	0.58	0.99	36	2.78	2.82	9.07	0.45	196
03261950	Loramie Creek near Newport OH	16	-0.826	1.785	0.89	0.52	50	2.49	45.16	1.49	31.42	5.35
03353600	LITTLE EAGLE CREEK AT SPEEDWAY, IN	28	2.297	1.036	0.74	1.1	54	2.62	2.6	2.95	0.25	0.5
03365500	EAST FORK WHITE RIVER AT SEYMOUR, IN	52	2.494	0.992	0.69	0.9	87	1.67	153.25	2.23	47.63	0.75
03382170	BRUSHY CREEK NEAR HARCO, IL	34	3.417	1.699	0.95	1.4	47	3.74	8.41	1.5	25.25	1.09
04024430	NEMADJI RIVER NEAR SOUTH SUPERIOR, WI	92	-0.856	2.027	0.89	1	40	1.89	98.98	1.28	101.87	3.23
04230380	OATKA CREEK AT WARSAW NY	36	-1.348	3.05	0.92	0.68	49	1.65	24.82	1.41	50.96	0.89
05054000	RED RIVER OF THE NORTH AT FARGO, ND	63	-0.548	1.283	0.63	0.89	112	1.99	86.05	4.04	12.95	28.2
05064500	RED RIVER OF THE NORTH AT HALSTAD, MN	111	0.845	0.959	0.5	1.1	52	1.89	177.73	2.71	26.75	0.08
05099400	LITTLE SOUTH PEMBINA RIVER NR WALHALLA, ND	22	3.231	1.735	0.81	1.2	39	5.22	38	1.54	73.66	1.53
05099600	PEMBINA RIVER AT WALHALLA, ND	61	1.586	1.714	0.78	1.6	66	2.85	110.86	1.72	126.55	3.05
05102500	RED RIVER OF THE NORTH AT EMERSON, MANITOBA	74	-0.173	1.186	0.58	1.3	101	1.93	536.32	1.87	56.48	13.7

Site No.	Site Name	n sed	α	β	R^2	σ_e	RL	C_V	Q_{s50}	Spread Q_{s50}	Q_{eff}	Spread Q_{eff}
05437632	SPRING CR AT ROCK VALLEY COLLEGE, ROCKFORD IL	21	2.817	2.422	0.68	1.6	63	2.58	1.2	1.77	2.28	2.03
05451500	Iowa River at Marshalltown, IA	45	0.311	1.763	0.82	1.2	96	1.61	136.16	2	68.64	15.8
05520500	KANKAKEE RIVER AT MOMENCE, IL	97	-1.238	1.731	0.63	1.1	99	0.73	112.04	0.45	130.87	0.59
05526000	IROQUOIS RIVER NEAR CHEBANSE, IL	104	0.468	1.153	0.76	1.1	91	1.52	147.83	0.96	34.06	1.93
05548105	NIPPERSINK CREEK ABOVE WONDER LAKE, IL	28	2.808	0.914	0.61	0.97	10	1.63	2.57	4.19	0.82	1.29
05568800	INDIAN CREEK NEAR WYOMING, IL	37	3.007	1.359	0.64	1.2	54	2.36	6.47	4.85	1.73	49.6
05570000	SPOON RIVER AT SEVILLE, IL	72	1.918	1.299	0.86	0.95	99	1.8	127.56	1.85	25.31	0.7
05572000	SANGAMON RIVER AT MONTICELLO, IL	86	1.936	1.033	0.6	1.3	104	1.85	34.65	1.66	7.63	0.67
05584500	LA MOINE RIVER AT COLMAR, IL	70	1.08	1.394	0.83	1	69	2.64	118.78	2.06	9.94	46.9
05591200	KASKASKIA RIVER AT COOKS MILLS, IL	43	1.543	1.005	0.67	1.3	44	1.77	35.04	1.76	6.64	1.44
05594100	KASKASKIA RIVER NEAR VENEDY STATION, IL	146	1.179	1.088	0.61	1.4	45	1.24	247.01	0.9	121.68	0.02
06088300	Muddy Creek near Vaughn MT	122	1.085	2.455	0.85	1.1	27	1.03	9.4	2.46	8.14	7.06
06485500	BIG SIOUX R AT AKRON,IA	90	1.413	1.341	0.75	0.97	86	2.12	191.44	2.49	53.64	33.9
06753990	LONETREE CREEK NEAR GREELEY, CO.	84	3.605	1.516	0.72	1.6	5	2.3	1.6	1.46	1.57	2.73
06817000	Nodaway River at Clarinda, IA	154	-0.204	2.175	0.92	1.2	81	2.9	402.49	1.12	1016.83	0.96
07022000	Mississippi River at Thebes, IL	308	-2.868	1.741	0.49	1	79	0.67	10298.52	0.45	6765	1.06
07137500	ARKANSAS R NR COOLIDGE, KS	64	2.619	1.795	0.77	1.1	64	4.6	63.06	12.6	6.34	128
07143672	L ARKANSAS R AT HWY 50 NR HALSTEAD, KS	120	1.374	1.411	0.89	1.2	18	3.71	103.46	1.15	135.6	1.54
07144100	L ARKANSAS R NR SEDGWICK, KS	159	0.317	1.552	0.92	1.1	20	3.59	196.23	1.14	288.57	0.99
07146500	ARKANSAS R AT ARKANSAS CITY, KS	41	-0.65	2.031	0.78	1.3	96	1.9	571.51	1.65	478.1	4.04
07152500	Arkansas River at Ralston, OK	109	0.015	1.609	0.7	1.5	89	1.81	804.45	1.98	236.04	20.1
07196900	Baron Fork at Dutch Mills, AR	98	0.59	0.951	0.72	1	56	3.55	4.02	5.71	0.94	0.81
07277700	HICKAHALA CREEK NR SENATOBIA, MS	104	-1.494	2.272	0.85	1.1	24	3.38	204.84	1.03	322.79	1
07288955	YAZOO RIVER BL STEELE BAYOU NR LONG LAKE, MS	114	0.803	1.14	0.35	1.2	14	0.78	868.47	0.58	351.76	2.16
07290000	BIG BLACK RIVER NR BOVINA, MS	111	1	1.196	0.75	1.1	78	1.57	333.28	0.83	248.49	0.93
07331000	Washita River near Dickson, OK	178	1.379	1.894	0.77	1.4	85	2.25	630.6	1.74	2674.54	0.98
07337000	Red River at Index, AR	188	-4.237	2.33	0.76	1.4	78	1.39	1779.29	1.38	1728.78	3.72
07355500	RED R @ ALEXANDRIA, LA	129	-3.52	2.177	0.76	1.1	55	1.08	2789.66	0.52	3656.32	0.41
07374000	Mississippi River at Baton Rouge, LA	70	-20.806	3.454	0.87	0.69	9	0.49	25330.56	0.37	25771.38	0.7

Site No.	Site Name	n sed	α	β	R^2	σ_e	RL	C_V	Q_{s50}	Spread Q_{s50}	Q_{eff}	Spread Q_{eff}
08041000	Neches Rv at Evadale, TX	157	1.555	0.998	0.33	1.5	95	1.23	366.23	0.92	89.38	4.98
08057410	Trinity Rv bl Dallas, TX	66	-3.095	2.042	0.71	1.3	54	1.65	372.74	2.25	183.61	8.8
08062700	Trinity Rv at Trinidad, TX	111	-1.178	1.707	0.67	1.4	50	1.62	567.66	1.54	448.31	5.75
08114000	Brazos Rv at Richmond, TX	190	-5.124	2.604	0.86	1.3	94	1.61	1633.92	0.9	1760.86	1.56
08123850	Colorado Rv abv Silver, TX	122	0.876	1.454	0.79	1.5	47	6.12	46.75	1.66	43.88	5.94
08147000	Colorado Rv nr San Saba, TX	114	0.632	1.117	0.53	1.3	95	4.33	269.71	3.36	6.97	358
08162000	Colorado Rv at Wharton, TX	161	-2.585	2.245	0.71	1.4	75	1.89	913.06	1.29	1327.36	1.72
08313000	RIO GRANDE AT OTOWI BRIDGE, NM	390	2.657	1.749	0.44	1.5	111	1.25	158.37	1.34	23.56	7.77
08330000	RIO GRANDE AT ALBUQUERQUE, NM	638	1.201	2.102	0.68	1.3	72	1.2	131.75	0.88	153.9	0.86
08334000	RIO PUERCO ABV ARROYO CHICO NR GUADALUPE, NM	192	8.155	1.863	0.9	1.1	62	3.79	11.88	1.73	30.01	0.95
08340500	ARROYO CHICO NR GUADALUPE, NM	289	7.381	1.711	0.93	1.2	51	6.04	27.21	1.18	56.53	1.66
08353000	RIO PUERCO NEAR BERNARDO, NM	531	6.844	1.716	0.85	1.4	74	5.37	46.75	1.39	141.99	0.75
08383500	PECOS RIVER NEAR PUERTO DE LUNA, NM	163	1.726	2.35	0.61	1.6	76	2.25	141.05	1.69	286.34	1.1
08396500	PECOS RIVER NEAR ARTESIA, NM	345	2.619	1.766	0.85	1	108	3.1	99.94	3.52	20.76	23.6
08407500	PECOS RIVER AT RED BLUFF, NM	151	1.417	1.355	0.48	1.5	77	5.83	162.71	3.07	2.11	623
09163500	COLORADO RIVER NEAR CO-UT STATE LINE	175	-3.136	2.29	0.7	1.1	63	1.07	730.12	1.15	1002.04	1.81
09260000	LITTLE SNAKE RIVER NEAR LILY, CO	284	4.244	1.452	0.62	1.6	92	1.82	83.13	0.84	85.56	1.06
09364500	ANIMAS RIVER AT FARMINGTON, NM	267	0.569	2.176	0.62	1.7	91	1.37	120.36	0.86	103.04	1.46
09382000	PARIA RIVER AT LEES FERRY, AZ	341	6.828	2.457	0.9	1.1	91	3.96	153.02	0.98	155.69	1
09431500	GILA RIVER NEAR REDROCK, NM	202	0.869	2.087	0.65	1.6	77	2.75	216.07	1.59	433.59	1.27
09466500	GILA RIVER AT CALVA, AZ.	109	3.33	1.872	0.87	1.2	85	4.42	384.38	2.2	885.62	0.99
09471000	SAN PEDRO RIVER AT CHARLESTON, AZ.	47	2.183	2.086	0.85	1.2	99	6.19	154.79	1.6	521.49	1
09473500	SAN PEDRO R AT WINKELMAN, ARIZ.	18	5.975	1.614	0.93	1.4	12	6.51	89.54	1.4	137.88	1
11042000	SAN LUIS REY R A OCEANSIDE CA	164	3.025	1.68	0.77	1.6	80	6.33	40.02	1.77	152.14	0.99
11176900	ARROYO DE LA LAGUNA A VERONA CA	261	1.072	1.978	0.77	1.4	58	4.16	66.8	1.22	157.49	1
11382000	THOMES C A PASKENTA CA	40	0.059	2.406	0.91	0.82	76	2.37	147.83	1.42	217.39	1.4
11475000	EEL R A FORT SEWARD CA	110	-4.478	2.486	0.88	1.1	59	2.65	9372.51	0.97	12284.25	0.97
11482500	REDWOOD C A ORICK CA	298	-0.979	2.224	0.86	1	62	1.91	291.2	1.8	1027.28	1.1
11523000	KLAMATH R A ORLEANS	73	-5.811	2.499	0.83	1	87	1.23	1733.73	2.23	6783.84	0.94

Site No.	Site Name	n sed	α	β	R^2	σ_e	RL	C_v	Q_{s50}	Spread Q_{s50}	Q_{eff}	Spread Q_{eff}
11530000	TRINITY R A HOOPA CA	106	0.16	1.874	0.9	0.57	87	1.48	688.51	1.98	282.1	14.8
11530500	KLAMATH R NR KLAMATH CA	114	-7.008	2.586	0.88	1	77	1.28	3235.13	1.92	994	10.5
50024950	RIO GRANDE DE ARECIBO BLW UTUADO, PR	79	3.609	1.996	0.73	1.7	15	1.95	39.03	3.62	125.58	3.99
50028000	RIO TANAMA NR UTUADO, PR	114	2.731	2.246	0.84	1.4	53	1.29	13.98	3.6	56.61	0.97
50038100	RIO GRANDE DE MANATI AT HWY 2 NR MANATI, PR	56	1.119	1.59	0.94	1.1	42	3.77	240.02	2.39	1728.81	1
50051800	RIO GRANDE DE LOIZA AT HWY 183 SAN LORENZO, PR	58	2.035	1.887	0.83	1.4	23	2.04	46.67	2.94	282.83	0.99
50144000	RIO GRANDE DE ANASCO NR SAN SEBASTIAN, PR	25	-0.323	2.216	0.82	1.1	51	2.13	135.03	2.99	424.54	1.25

APPENDIX H – Non-stationary Flow Examples

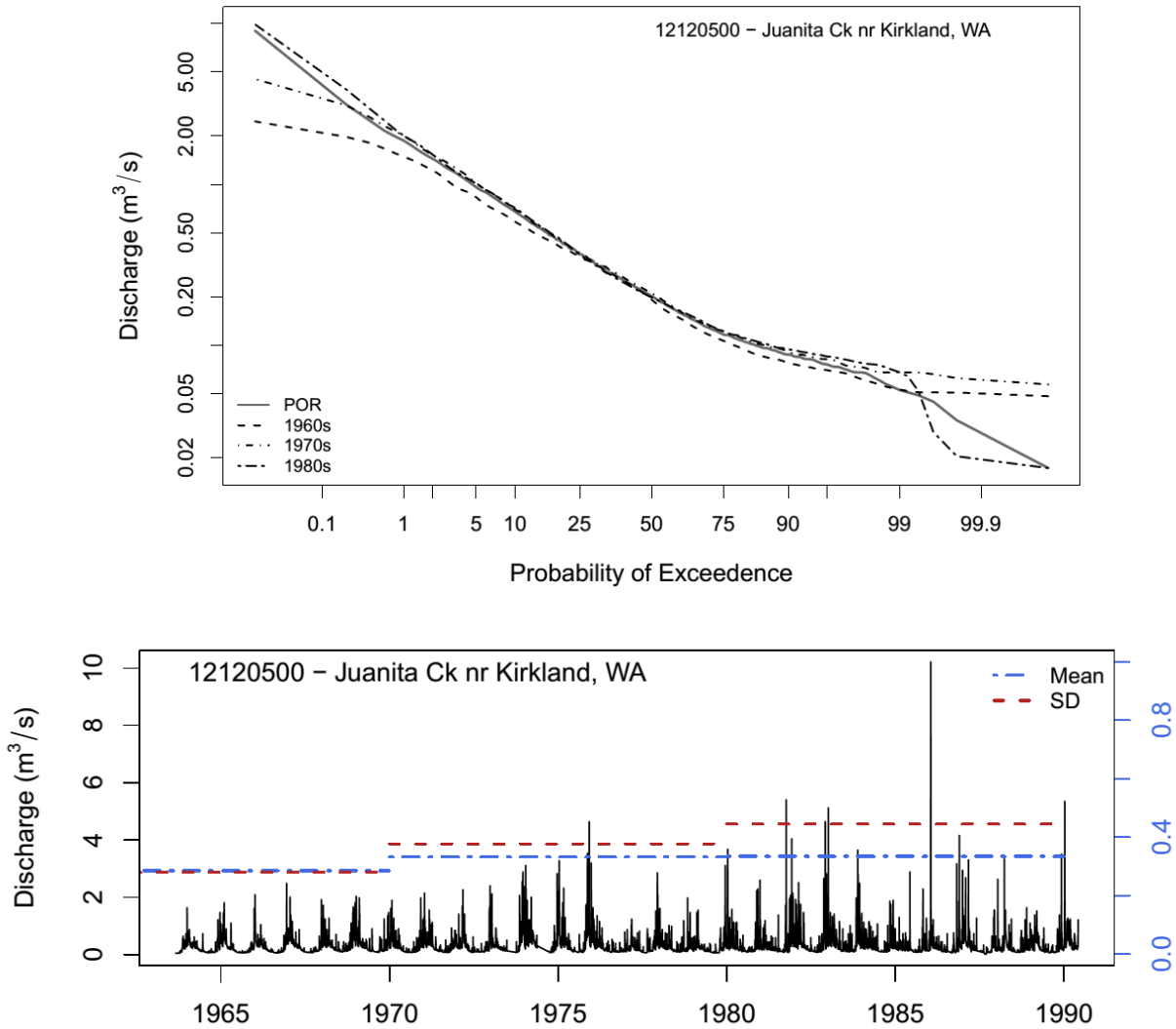


Figure H.1 Flow duration curves by period of record and by decade for Juanita Creek near Kirkland, WA an urban watershed (top), and daily flow record (left axis) plotted with decadal mean and standard deviation values (right axis) (bottom). Note that the mean and standard deviation are referenced to the right, vertical axis.

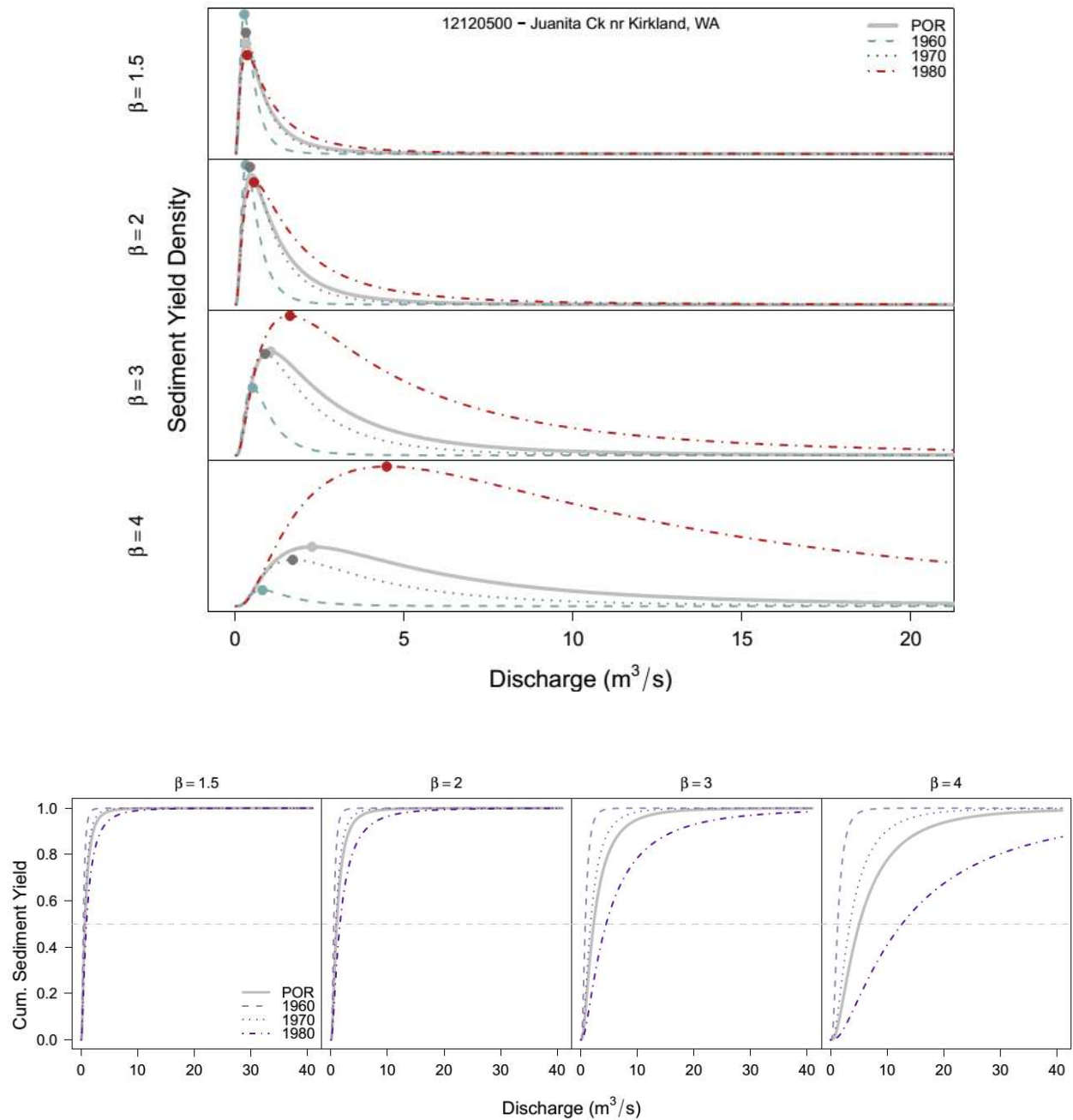


Figure H.2 Sediment yield (effectiveness) curves for period of record as well as decade for a range of hypothetical β values (top) for Juanita Creek near Kirkland, WA, an urban watershed. Cumulative sediment yield curves for period of record and by decade for various hypothetical values of β (bottom).

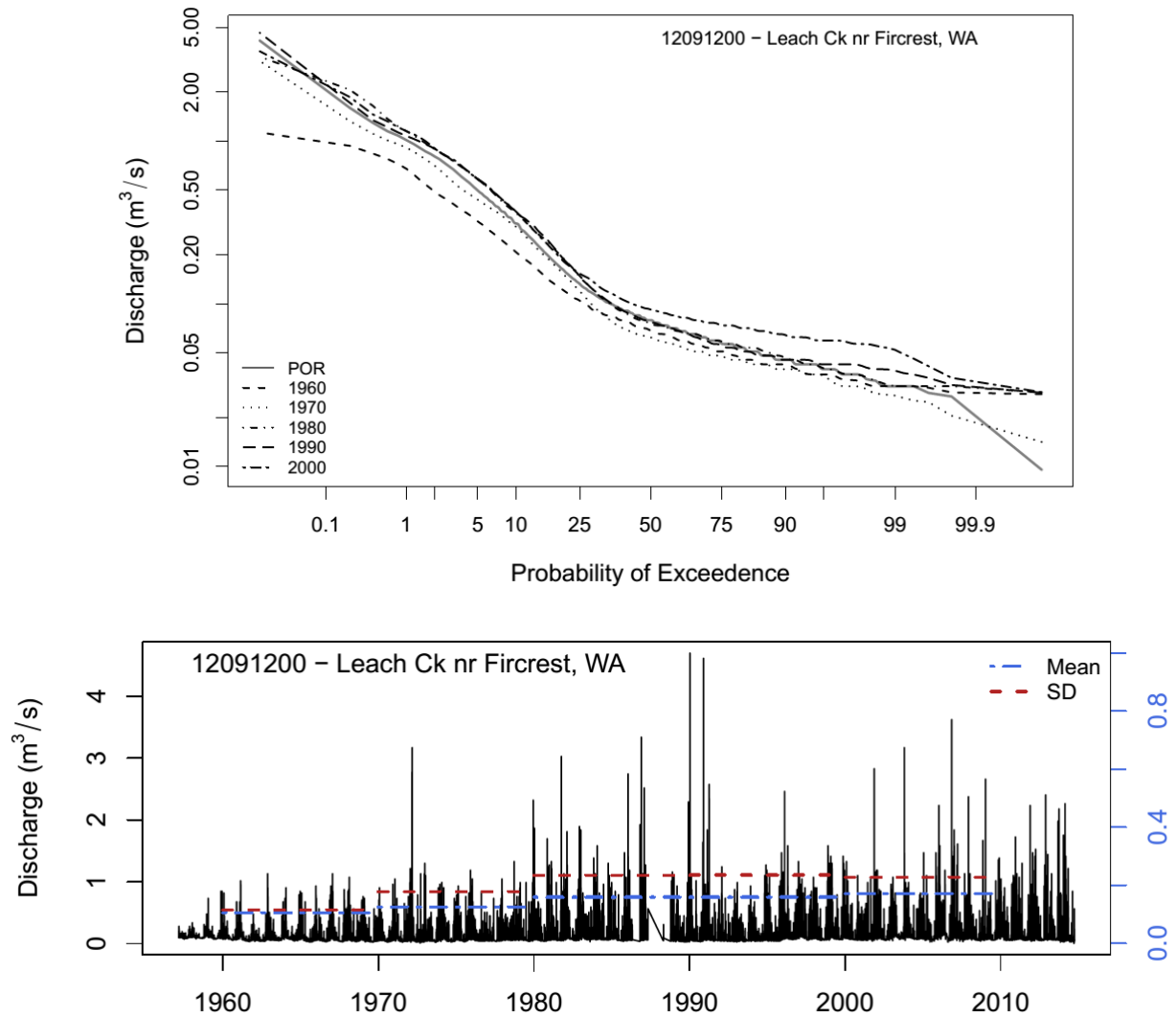


Figure H.3 Flow duration curves by period of record and by decade for Leach Creek near Fircrest, WA, an urban watershed (top), and daily flow record (left axis) plotted with decadal mean and standard deviation values (right axis) (bottom). Note that the mean and standard deviation are referenced to the right, vertical axis.

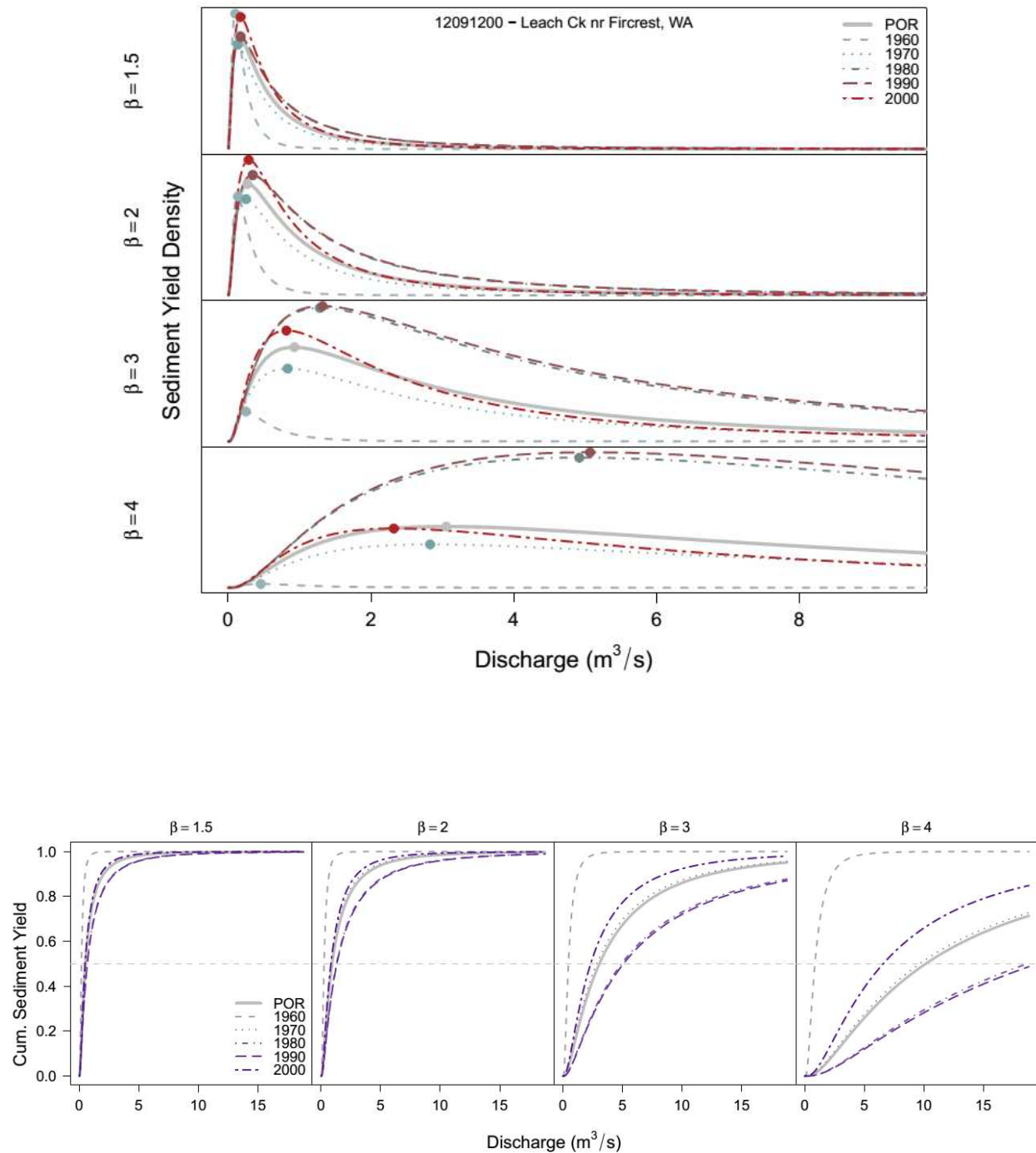


Figure H.4 Sediment yield (effectiveness) curves for period of record as well as decade for a range of hypothetical β values for Leach Creek near Fircrest, WA, an urban watershed (top). Cumulative sediment yield curves for period of record and by decade for various hypothetical values of β (bottom). Note that the mean and standard deviation are referenced to the right, vertical axis.

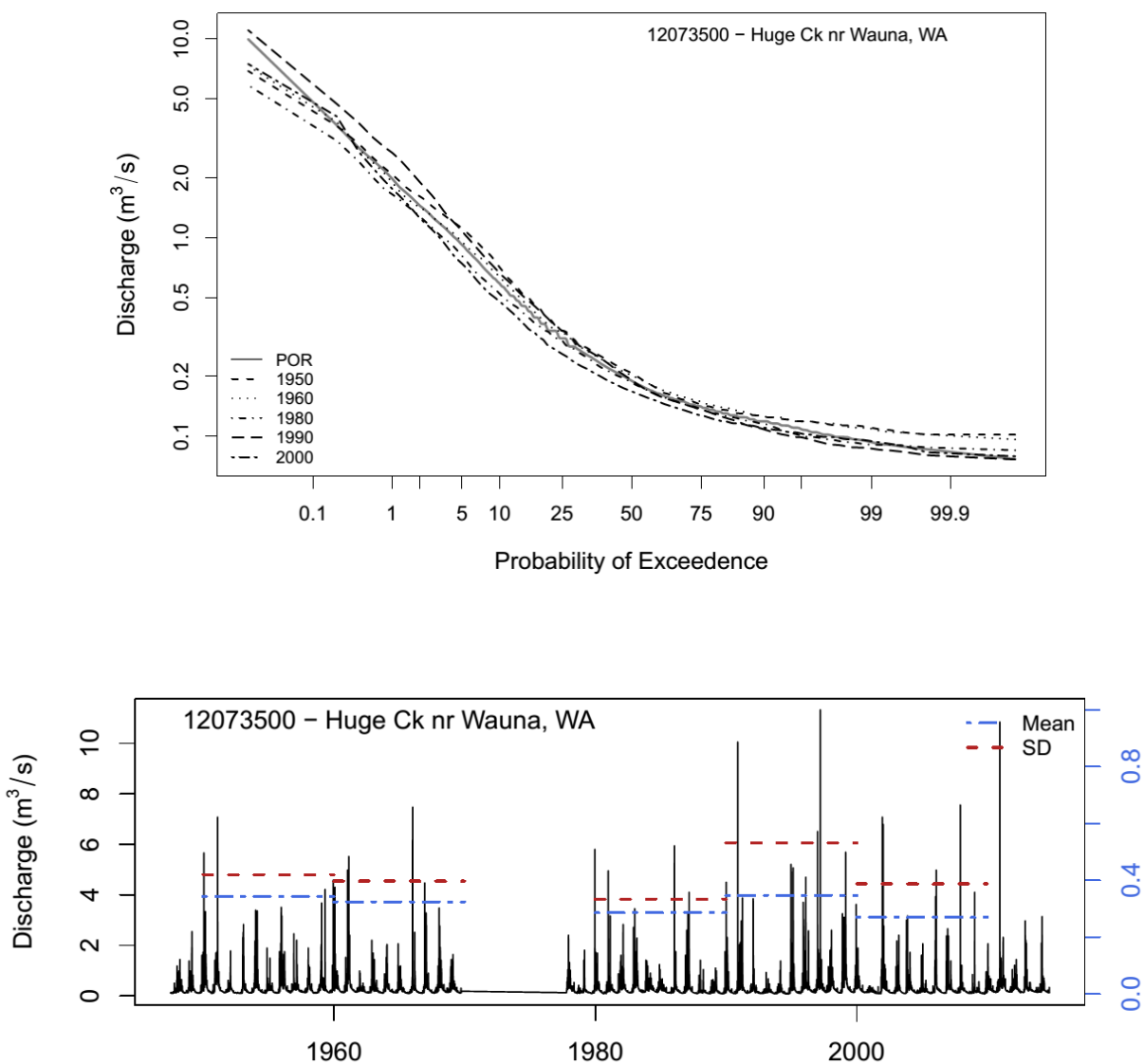


Figure H.5 Flow duration curves by period of record and by decade for Huge Creek near Wauna, WA, a rural watershed (top), and daily flow record (left axis) plotted with decadal mean and standard deviation values (right axis) (bottom). Note that the mean and standard deviation are referenced to the right, vertical axis.

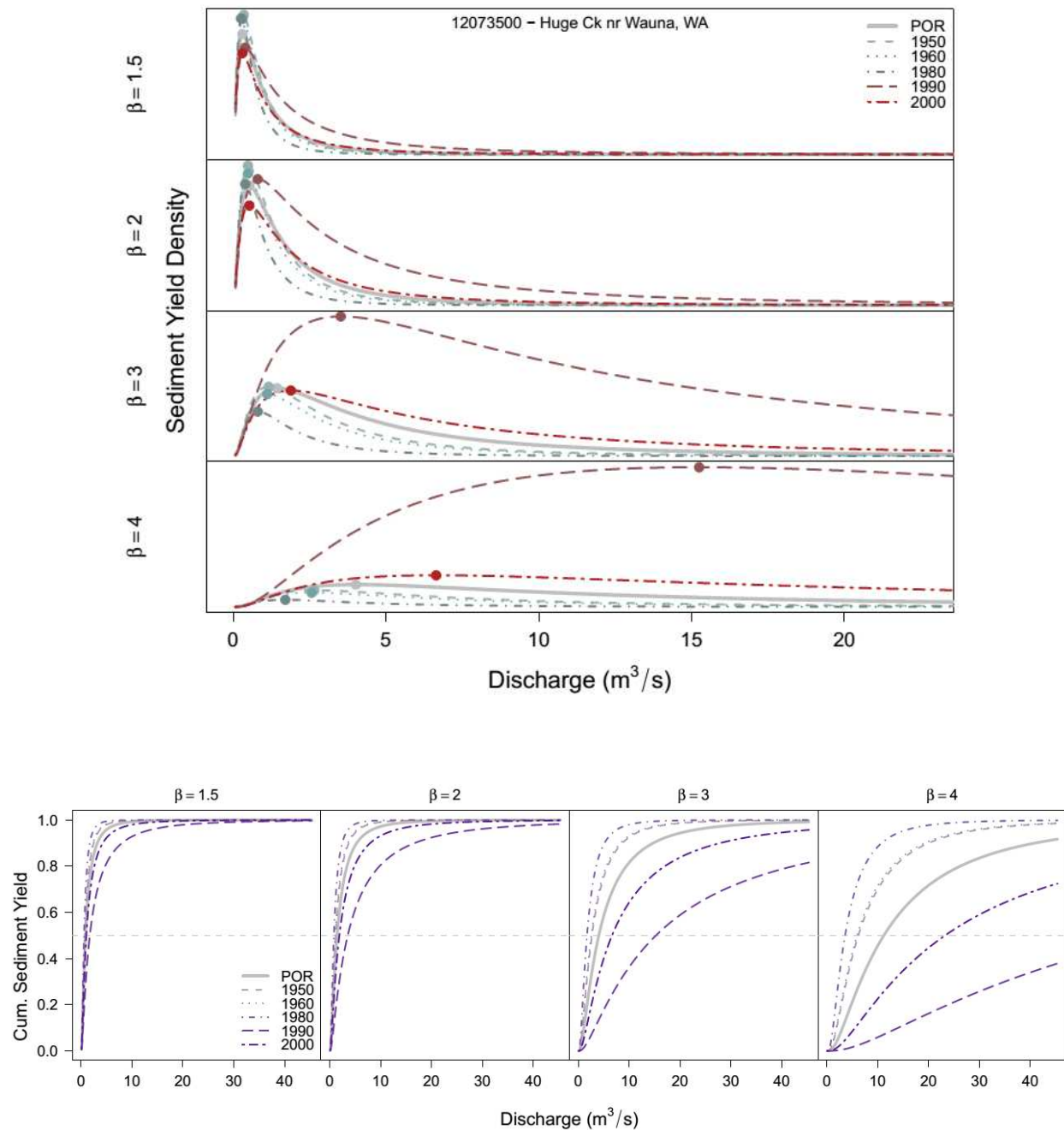


Figure H.6 Sediment yield (effectiveness) curves for period of record as well as decade for a range of hypothetical β values for Huge Creek near Wauna, WA, a rural watershed (top). Cumulative sediment yield curves for period of record and by decade for various hypothetical values of β (bottom).

APPENDIX I – At-A-Station Hydraulic Geometry Relations Used in Sediment Transport Modelling

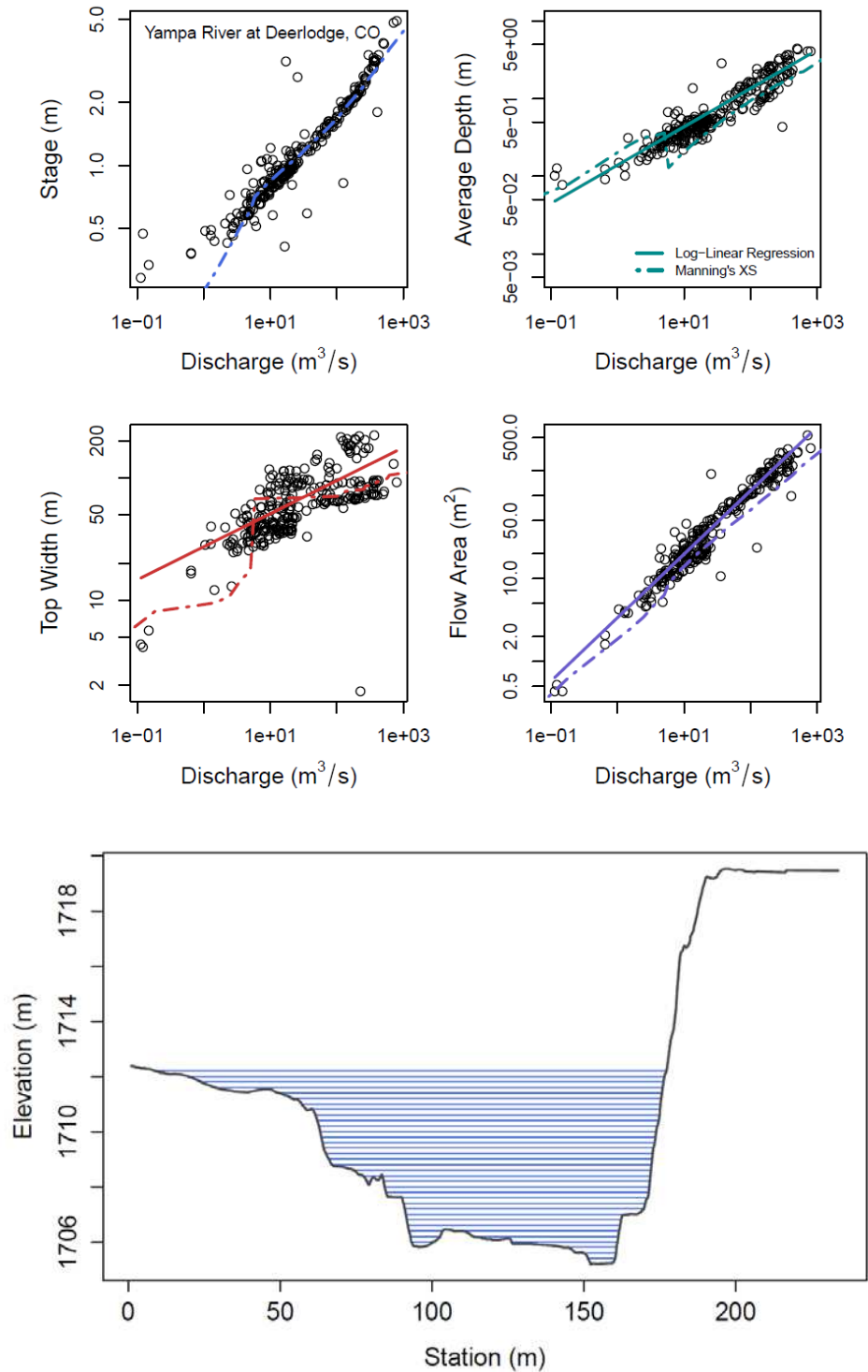


Figure I.1 At-a-station hydraulic geometry relations for stage, average depth, top width, and flow area as a function of discharge for the Yampa River (top), as well as the cross-sectional profile with water surface flow depths used to calculate discharge plotted (bottom).

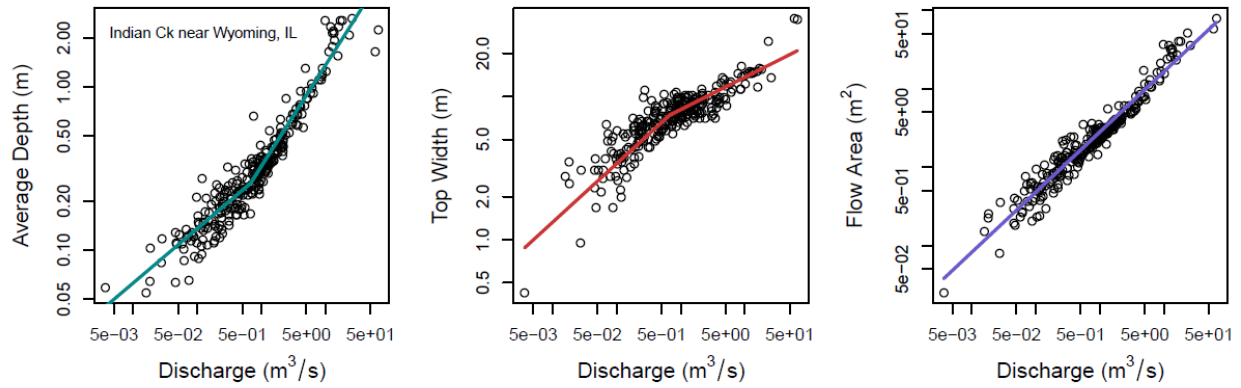


Figure I.2 At-a-station hydraulic geometry relations for average depth, top width, and flow area as a function of discharge for Indian Creek.

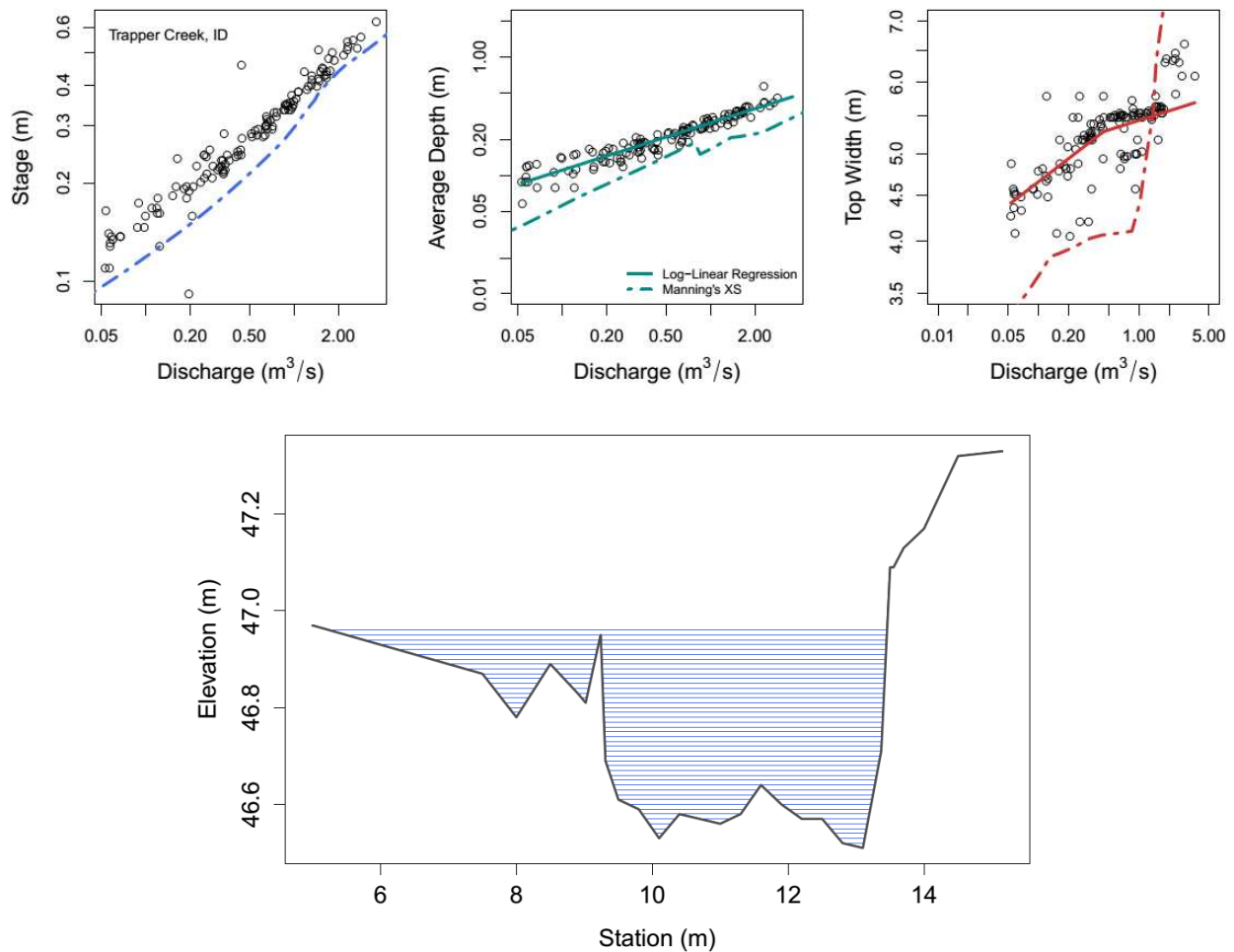


Figure I.3 At-a-station hydraulic geometry relations for stage, average depth, and top width as a function of discharge for Trapper Creek (top), as well as the cross-sectional profile with water surface flow depths used to calculate discharge plotted (bottom).

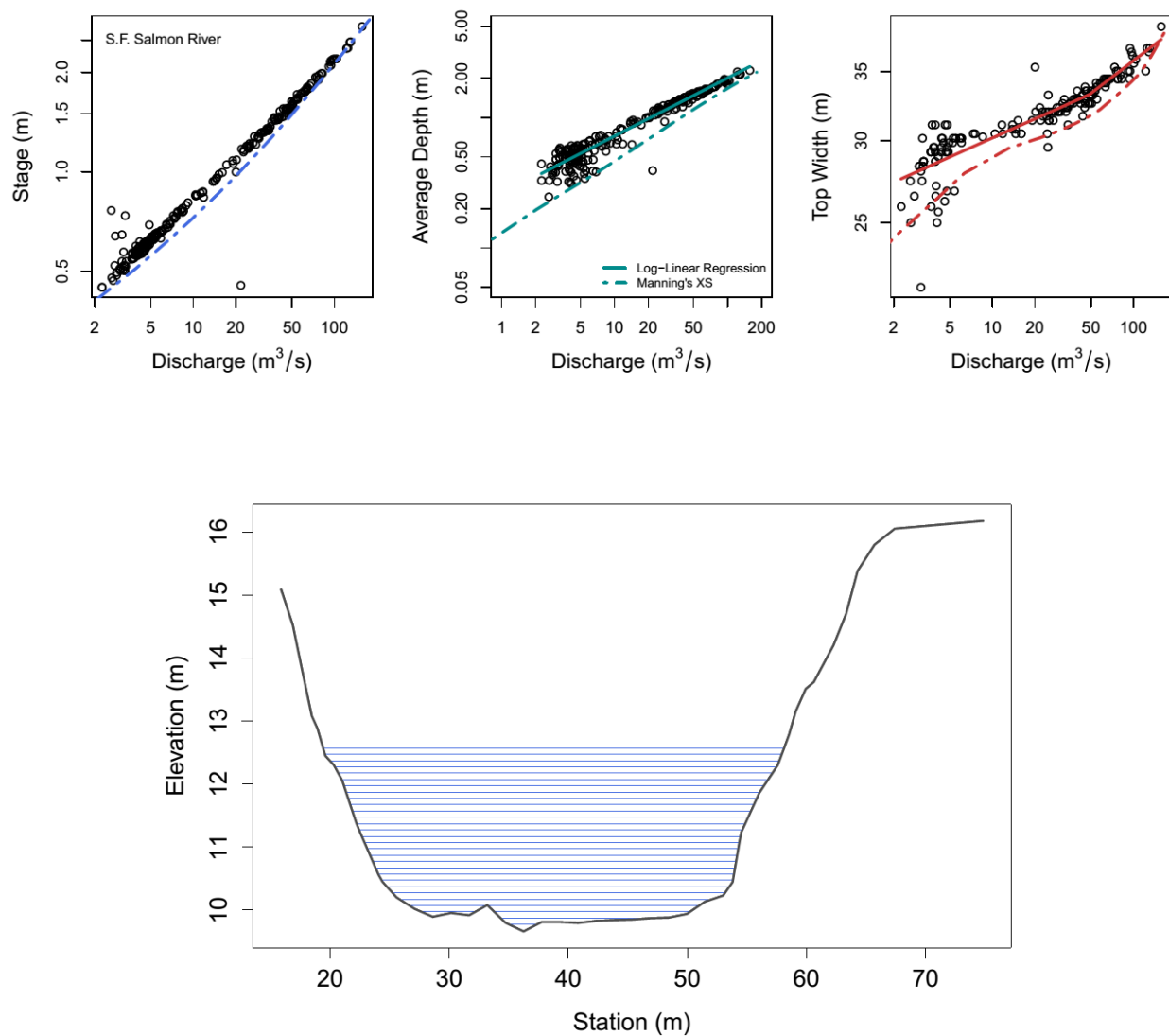


Figure I.4 At-a-station hydraulic geometry relations for stage, average depth, and top width as a function of discharge for the South Forks of the Salmon River, ID (top), as well as the cross-sectional profile with water surface flow depths used to calculate discharge plotted (bottom).