APPENDIX E

USGS Water Quality Data

Station #	Station Name	Date(YMD)	Time	Flow (cfs)	Temp (C)	N(NH3 +Org)	TP (mg/l)	SS (mg/l)	SS (t/day)	As (ug/l)	Cd (ug/l)	Cr (ug/l)	Cu (ug/l)	Fe (ug/l)	Pb (ug/l)	Se (ug/l)	Zn (ug/l)	Hg (ug/l)	Ag (ug/l)	Ba (ug/l)
13292200	SALMON RIVER AT HEAD NR OBSIDIAN ID	19720620	1330	NA	7	NA	NA	27	6.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13293200	CHAMPION CREEK NR OBSIDIAN ID	19720620	1200	NA	6	NA	NA	1260	194	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13293400	FOURTH OF JULY CREEK NR OBSIDIAN ID	19720627	1045	NA	5	NA	NA	369	87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13293800	SALMON RIVER @ HWY 93 ABV REDFISH CR NR STANLEY	I 19780717	1300	1110	14	0.19	NA	NA	NA	2	2.<	20	3	40	13.<	1.<	20.<	0.1	NA	NA
13293800	SALMON RIVER @ HWY 93 ABV REDFISH CR NR STANLEY	I 19780911	1140	400	8.5	0.3	NA	NA	NA	5	2.U	0	3	100	6.<	1.U	.0<	0.1	NA	NA
13293800	SALMON RIVER @ HWY 93 ABV REDFISH CR NR STANLEY	I 19790608	1100	777	7.5	0.14	NA	NA	NA	2.U	.0<	20	2	80	12.<	1.<	20.<	0.1	NA	NA
13293800	SALMON RIVER @ HWY 93 ABV REDFISH CR NR STANLEY	I 19800116	1030	195	5E-06	0.37	NA	NA	NA	2	0	NA	3	NA	2	NA	20	0	NA	NA
13293800	SALMON RIVER @ HWY 93 ABV REDFISH CR NR STANLEY	I 19800512	1700	982	9	0.35	NA	NA	NA	3	0	4	3	NA	1	NA	10	0	NA	NA
13293800	SALMON RIVER @ HWY 93 ABV REDFISH CR NR STANLEY	I 19810202	1200	153	5E-06	1.1	0.02	NA	NA	2	0	7	4	160	9	NA	30	0.1	NA	NA
13293800	SALMON RIVER @ HWY 93 ABV REDFISH CR NR STANLEY	I 19810617	1215	737	8	0.55	0.02	NA	NA	3	0	5	5	110	14	NA	40	0	NA	NA
13293800	SALMON RIVER @ HWY 93 ABV REDFISH CR NR STANLEY	I 19820112	1830	195	2.2	0.72	0.01	NA	NA	3	1	9	11	400	17	NA	120	0.8	NA	NA
13293800	SALMON RIVER @ HWY 93 ABV REDFISH CR NR STANLEY	I 19820726	1100	1020	11.5	.2<	0.01	NA	NA	3.<	1	11	3	120	1	NA	30.<	0.1	NA	NA
13293800	SALMON RIVER @ HWY 93 ABV REDFISH CR NR STANLEY	I 19830117	1330	245	2.0001	0.5	0.03	NA	NA	3	2.<	1	6	90	4	NA	20	0.2	NA	NA
13293800	SALMON RIVER @ HWY 93 ABV REDFISH CR NR STANLEY	I 19830711	1300	1270	11.5	0.7	0.02	NA	NA	2	2.<	1	4	80	4	NA	130	0.1	NA	NA
13293800	SALMON RIVER @ HWY 93 ABV REDFISH CR NR STANLEY	I 19840120	1100	229	0	.2<	0.01	NA	NA	3.<	1	6	5	50.<	1	NA	20.<	0.1	NA	NA
13293800	SALMON RIVER @ HWY 93 ABV REDFISH CR NR STANLEY	I 19840728	1215	805	12.5	0.2	0.01	NA	NA	2.<	1	5	11	230	9	NA	30	0.4	NA	NA
13293900	REDFISH LAKE CREEK BL LAKE NR STANLEY ID	19790129	1700	34	0	0.05	NA	NA	NA	1.<	2.<	20.<	2.<	10	9.<	1.U	.0<	0.1	NA	NA
13293900	REDFISH LAKE CREEK BL	19790608	1400	275	9.5<	0.1	NA	NA	NA<	1.U	.0U	0	3	20	8.<	1	30.U	0	NA	NA

	LAKE NR STANLEY ID																			
13293900	REDFISH LAKE CREEK BL LAKE NR STANLEY ID	19800115	1345	56	1	0.16	NA	NA	NA	0	0	NA	3	NA	5	NA	30	0	NA	NA
13293900	REDFISH LAKE CREEK BL LAKE NR STANLEY ID	19800713	1915	285	16	0.59	NA	NA	NA	0	1	4	5	NA	14	NA	40	0.1	NA	NA
13294500	SALMON RIVER AT STANLEY ID	19721003	1000	NA	2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13295000	VALLEY CREEK AT STANLEY ID	19710524	1700	NA	9	NA	0.05	4	6.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13295000	VALLEY CREEK AT STANLEY ID	19710621	1625	NA	13.5	NA	0.02	3	9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13295000	VALLEY CREEK AT STANLEY ID	19710719	1335	NA	13.5	NA	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13295000	VALLEY CREEK AT STANLEY ID	19710830	1045	NA	12	NA	0.04	8	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13295000	VALLEY CREEK AT STANLEY ID	19711004	1600	NA	11	NA	0.04	3	1.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13295000	VALLEY CREEK AT STANLEY ID	19720616	1400	NA	10.5	NA	0.04	10	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13295000	VALLEY CREEK AT STANLEY ID	19720724	1100	NA	12	NA	0.02	4	2.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13295650	BASIN CREEK NR STANLEY ID	19720626	1445	NA	7.5	NA	NA	6	3.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13296000	YANKEE FORK SALMON RIVER NR CLAYTON ID	19780717	1515	383	13	0.5	NA	NA	NA	2.<	2.<	20	6	70	3.<	1.<	20.<	0.1	NA	NA

Station #	Station Name	Date(YMD)	Time	Flow (cfs)	Temp(C)	N(NH3+Org)	TP(mg/l)	SS(mg/l)	SS(t/day)	As(ug/l)	Cd(ug/l)	Cr(ug/l)	Cu(ug/l)	Fe(ug/l)	Pb(ug/l)	Se(ug/l)	Zn(ug/l)	Hg(ug/l)	Ag(ug/l)	Ba(ug/l)
13296000	YANKEE FORK SALMON RIVER NR CLAYTON ID	19780911	1355	108	10	0.2	NA	NA	NA	2.U	.0<	20	3	50	4.<	1.U	.0<	0.1	NA	NA
13296000	YANKEE FORK SALMON RIVER NR CLAYTON ID	19790206	1530	52.5	0	0.03	NA	NA	NA	1.U	.0<	20.U	0	40	6.<	1.U	.0<	0.1	NA	NA
13296000	YANKEE FORK SALMON RIVER NR CLAYTON ID	19790607	1615	555	7.5	0.09	NA	NA	NA	1.U	.0<	20	7	140	21.<	1.<	20	0.2	NA	NA
13296000	YANKEE FORK SALMON RIVER NR CLAYTON ID	19800115	1030	39	5E-06	0.31	NA	NA	NA	1	0	NA	5	NA	1	NA	20	0	NA	NA
13296000	YANKEE FORK SALMON RIVER NR CLAYTON ID	19800713	1445	245	13	0.44	NA	NA	NA	1	0	2	6	NA	9	NA	20	0	NA	NA
13296500	SALMON RIVER BL YANKEE FORK NR CLAYTON ID	19710525	1135	NA	4	NA	0.06	17	134	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13296500	SALMON RIVER BL YANKEE FORK NR CLAYTON ID	19710622	1215	NA	6.5	NA	0.05	32	556	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13296500	SALMON RIVER BL YANKEE FORK NR CLAYTON ID	19710723	1335	NA	12.5	NA	0.05	7	46	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13296500	SALMON RIVER BL YANKEE FORK NR CLAYTON ID	19710903	1030	NA	10	NA	0.04	3	5.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13296500	SALMON RIVER BL YANKEE FORK NR CLAYTON ID	19711008	1115	NA	6	NA	0.04	1	1.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13296500	SALMON RIVER BL YANKEE FORK NR CLAYTON ID	19720616	1110	NA	6.5	NA	0.03	41	644	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13296500	SALMON RIVER BL YANKEE FORK NR CLAYTON ID	19720724	1130	NA	11	NA	0.02	3	11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

13296500	SALMON RIVER BL YANKEE FORK NR CLAYTON ID	19721005	1230	668	8	NA	NA	7	13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13296500	SALMON RIVER BL YANKEE FORK NR CLAYTON ID	19730430	1400	828	5	NA	0.02	6	13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13296500	SALMON RIVER BL YANKEE FORK NR CLAYTON ID	19730604	1350	1740	7.5	NA	0.02	6	28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13296500	SALMON RIVER BL YANKEE FORK NR CLAYTON ID	19740610	1530	4650	7	NA<	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297250	SLATE CREEK NR CLAYTON ID	19720615	1600	NA	11	NA	NA	987	272	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297300	HOLMAN CREEK NR CLAYTON ID	19730604	1620	NA	13.3	NA	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297310	THOMPSON CREEK AB PAT HUGHES CREEK NR CLAYTON I	19720618	1500	NA	8.5	NA	NA	35	9.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297312	PAT HUGHES CREEK AB MINE ADT NR CLAYTON ID	19720629	1150	1	7.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297314	MINE ADT DISC TO PAT HUGHES CR NR CLAYTON ID	19720629	1200	0.5	13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297316	STILLING PONDS TO PAT HUGHES CR NR CLAYTON ID	19720629	1210	0.5	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297320	PAT HUGHES CREEK NR CLAYTON ID	19720618	1700	NA	9	NA	NA	10	0.06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297320	PAT HUGHES CREEK NR CLAYTON ID	19720629	1225	NA	13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297320	PAT HUGHES CREEK NR CLAYTON ID	19730504	1005	7	4	NA	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297330	THOMPSON CREEK NR CLAYTON ID	19730503	1340	17	5.5	NA	0.02	7	0.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297330	THOMPSON CREEK NR CLAYTON ID	19730604	1455	31	10.5	NA	0.03	2	0.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297330	THOMPSON CREEK NR CLAYTON ID	19740614	1530	229	10.5	NA<	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297340	SQUAW CREEK AB BRUNO CREEK NR CLAYTON ID	19720619	1408	NA	6.5	NA	NA	42	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297350	BRUNO CREEK NR CLAYTON ID	19710526	910	NA	3.5	NA	0.1	30	0.89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297350	BRUNO CREEK NR CLAYTON ID	19710622	1625	NA	11	NA	0.07	17	0.87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297350	BRUNO CREEK NR CLAYTON ID	19710723	1135	NA	8	NA	0.06	1	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297350	BRUNO CREEK NR CLAYTON ID	19710902	735	NA	2.5	NA	0.07	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297350	BRUNO CREEK NR CLAYTON ID	19711007	1415	NA	7	NA	0.08	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297350	BRUNO CREEK NR CLAYTON ID	19720614	1620	NA	9	NA	0.07	30	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297350	BRUNO CREEK NR CLAYTON ID	19720724	1440	NA	10	NA	0.05	5	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297350	BRUNO CREEK NR CLAYTON ID	19730503	1530	0.88	6.5	NA	0.03	8	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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13297350	BRUNO CREEK NR CLAYTON ID	19730607	1600	1.6	8.5	NA	0.03	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297350	BRUNO CREEK NR CLAYTON ID	19740614	955	25.8	5	NA	0.11	415	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297355	SQUAW CREEK BL BRUNO CREEK NR CLAYTON ID	19730503	1605	36	6.5	NA	0.06	9	0.87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297355	SQUAW CREEK BL BRUNO CREEK NR CLAYTON ID	19730607	1700	53	13.5	NA	0.04	4	0.57	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297355	SQUAW CREEK BL BRUNO CREEK NR CLAYTON ID	19740614	1300	490	7.5	NA	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297380	SALMON RIVER AB EAST FORK NR CLAYTON ID	19710601	1310	NA	6	NA	0.15	49	1000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297380	SALMON RIVER AB EAST FORK NR CLAYTON ID	19710623	1015	NA	9	NA	0.14	109	2240	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297380	SALMON RIVER AB EAST FORK NR CLAYTON ID	19710722	1645	NA	12	NA	0.04	3	25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297380	SALMON RIVER AB EAST FORK NR CLAYTON ID	19710901	1140	NA	12	NA	0.04	5	16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297380	SALMON RIVER AB EAST FORK NR CLAYTON ID	19711008	915	NA	6.5	NA	0.05	2	5.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297380	SALMON RIVER AB EAST FORK NR CLAYTON ID	19720619	1230	NA	8.5	NA	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297380	SALMON RIVER AB EAST FORK NR CLAYTON ID	19720725	1510	NA	10	NA	0.01	8	42	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297380	SALMON RIVER AB EAST FORK NR CLAYTON ID	19721004	1600	983	7	NA	NA	6	16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297380	SALMON RIVER AB EAST FORK NR CLAYTON ID	19730501	1540	1030	8.5	NA	0.01	10	28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297380	SALMON RIVER AB EAST FORK NR CLAYTON ID	19730607	1445	2150	13	NA	0.01	7	41	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297396	WEST PASS CREEK NR CLAYTON ID	19720629	1615	NA	10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297396	WEST PASS CREEK NR CLAYTON ID	19721004	1000	8.1	7	NA	NA	6	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297400	EF SALMON RIVER BL BOWERYRS NR CLAYTON ID	19720629	1600	NA	11.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297400	EF SALMON RIVER BL BOWERYRS NR CLAYTON ID	19720725	1000	NA	8.5	NA	.01<	1	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297400	EF SALMON RIVER BL BOWERYRS NR CLAYTON ID	19721004	1030	39	7	NA	NA	4	0.42	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297404	GERMANIA CREEK NR CLAYTON ID	19720629	1640	NA	10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297404	GERMANIA CREEK NR CLAYTON ID	19721004	1115	36	4.5	NA	NA	6	0.58	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297425	EF SALMON RIVER BL WICKIUP CREEK NR CLAYTON ID	19710527	1430	NA	7.5	NA	0.04	21	29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297425	EF SALMON RIVER BL WICKIUP CREEK NR CLAYTON ID	19710627	1215	NA	5.5	NA	0.04	90	316	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297425	EF SALMON RIVER BL WICKIUP	19710722	1040	NA	6	NA	0.04	4	5.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

	CREEK NR CLAYTON ID																			
13297425	EF SALMON RIVER BL WICKIUP CREEK NR CLAYTON ID	19710902	1355	NA	9	NA	0.04	1	0.34	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297425	EF SALMON RIVER BL WICKIUP CREEK NR CLAYTON ID	19711007	1100	NA	5	NA	0.06	1	0.29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297425	EF SALMON RIVER BL WICKIUP CREEK NR CLAYTON ID	19720621	950	NA	5	NA	0.03	36	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297425	EF SALMON RIVER BL WICKIUP CREEK NR CLAYTON ID	19720725	1100	NA	8.5	NA	0.04	3	1.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297425	EF SALMON RIVER BL WICKIUP CREEK NR CLAYTON ID	19721004	1200	97	6.5	NA	NA	5	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297425	EF SALMON RIVER BL WICKIUP CREEK NR CLAYTON ID	19730501	1045	74	3	NA	0.01	6	1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297425	EF SALMON RIVER BL WICKIUP CREEK NR CLAYTON ID	19730605	1515	287	10.5	NA	0.01	2	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19700623	830	NA	1.5	NA	NA	4	0.79	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19700827	840	NA	11	NA	NA	5	0.04	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19701013	845	NA	0	NA	0.13	0	0	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19710629	845	NA	1	NA	0.01	1	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19710831	915	NA	11	NA	0.05	1	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19711005	1150	NA	5.5	NA	0.04	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19720620	830	NA	1.5	NA	0.01	3	0.22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19720718	800	NA	9.5	NA	0.01	1	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19720829	900	0.37	10	NA	0.03	4	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19721003	840	1.5	2	NA	NA	8	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19730502	1000	0.5	0	NA	0.01	15	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19730605	1015	8	3.5	NA<	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19730710	1100	7	13.5	NA<	0.01	3	0.06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19730905	1030	1.61	8.5	NA	0.06	3	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19740611	930	17	1	NA	0.07	4	0.18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19740710	930	31.4	6.5	NA<	0.01	4	0.34	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19740802	900	17.3	11.5	NA<	0.01	1	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19740926	1030	1.37	7	NA	0.01	2	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19750715	900	57	4.5	NA	0.04	1	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19750813	920	7.17	10	NA<	0.01	0.5	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19750904	930	2.38	6.5	NA<	0.01	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19751001	900	0.91	3.5	NA<	0.01	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19760622	1025	31.2	5	NA	0.04	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19760722	1110	17.2	11.5	NA<	0.01	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19760811	845	4.7	10	NA<	0.01	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19760915	1230	6.3	10.5	NA<	0.01	1	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19770615	930	17	3.5	NA<	.01<	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19770712	1420	4.2	15	NA<	.01<	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19770818	915	1.81	12	NA	.01<	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19770927	1110	1.53	6.5	NA	.01<	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297440	LTL BOULDER CREEK AB BAKER LAKE NR CLAYTON ID	19780913	950	5.92	7	NA	.01<	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19700623	935	NA	3.5	NA	NA	32	15	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19700827	945	NA	9.5	NA	NA	4	0.15	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19701013	1015	NA	0	NA	0.04	1	0.02	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19710629	950	NA	2.5	NA	0.04	4	0.89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Station #	Station Name	Date(YMD)	Time	Flow (cfs)	Temp(C)	N(NH3+Org)	TP(mg/l)	SS(mg/l)	SS(t/day)	As(ug/l)	Cd(ug/l)	Cr(ug/l)	Cu(ug/l)	Fe(ug/l)	Pb(ug/l)	Se(ug/l)	Zn(ug/l)	Hg(ug/l)	Ag(ug/l)	Ba(ug/l)
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19710831	1025	NA	9.5	NA	0.06	1	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19711005	1225	NA	5.5	NA	0.04	1	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19720620	915	NA	2.5	NA	0.03	5	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19720718	900	NA	9.5	NA	0.03	2	0.33	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19720829	1010	NA	10	NA	0.03	3	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19721003	1000	6.5	5	NA	NA	4	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19730502	1050	4.4	2	NA	0.02	7	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN	[19730605	1105	28	5.5	NA	0.01	10	0.76	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

	LK OUTLET NR CLAYTON I																			
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19730710	1200	25	13	NA<	0.01	4	0.27	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19730905	1145	4.74	9.5	NA	0.02	1	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19740611	1030	59	3.5	NA	0.1	4	0.64	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19740710	1030	94	7	NA<	0.01	4	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19740802	930	48.1	10	NA	0.01	16	2.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19740926	945	7.64	5	NA	0.01	3	0.06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19750715	1020	142	6.5	NA	0.01	4	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19750813	1000	21.4	8	NA<	0.01	0.6	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19750904	1030	12.7	5	NA<	0.01	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19751001	1000	7.6	4	NA	0.01	1	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19760622	1220	98.1	7	NA	0.03	3	0.79	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19760722	1200	45	11	NA<	0.01	5	0.61	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19760811	930	20	9	NA	0.01	1	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19760915	1345	16.2	9	NA<	0.01	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19770615	1045	35	5	NA<	0.01	2	0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19770712	1515	13.3	15	NA	.01<	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19770818	1000	7.12	12.5	NA	0.02	1	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19770927	1145	5.1	5.5	NA	0.01	1	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297445	L BOULDER C BL BO. CHAIN LK OUTLET NR CLAYTON I	[19780913	915	18.1	4.5	NA	.01<	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19700624	1110	NA	7	NA	NA	137	73	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19700828	825	NA	10.5	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19701012	1800	NA	5	NA	NA	1	0.03	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19710527	1625	NA	7	NA	0.08	13	1.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19710628	1530	NA	7	NA	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19710722	1215	NA	11	NA	0.03	8	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19710830	1545	NA	11	NA	0.05	2	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19711006	1405	NA	5.5	NA	0.06	3	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19720620	1325	107	6.5	NA	0.07	20	5.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19720717	1350	NA	11	NA	0.03	4	0.71	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19720830	1010	NA	10	NA	0.02	5	0.22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19721002	1440	9	5	NA	NA	5	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19730503	950	6.8	3.5	NA	0.01	6	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19730606	917	29	7	NA	0.02	1	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19730710	1515	23	15.4	NA	0.01	2	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19730906	1300	6.7	10	NA	0.08	3	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19740613	1130	144	5.5	NA<	0.01	93	36	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19740710	1430	103	8.6	NA<	0.01	12	3.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19740805	1400	52.3	13.5	NA	0.01	5	0.71	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19740925	1130	8.65	7	NA	0.01	1	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19750618	930	138	4.5	NA	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19750716	1030	300	7	NA	0.05	21	17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19750812	1340	23.7	10.5	NA<	0.01	0.8	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19750903	1550	17.1	7	NA	0.01	1	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19751001	1415	10	6.5	NA	0.01	1.3	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19760621	1645	114	9.5	NA	0.03	20	6.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19760721	1500	46.3	13	NA<	0.01	4	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19760810	1630	21	11.5	NA	0.01	10	0.57	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19760914	1530	21.3	9	NA<	0.01	3	0.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19770614	1330	35.2	9	NA	0.01	6	0.57	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19770712	1845	13	13.5	NA	.01<	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR	19770817	1300	7.82	12.5	NA	0.03	1	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

	CLAYTON ID																			
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19770926	1345	6.83	6.5	NA	.01<	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19780711	1245	136	9	NA	0.02	21	7.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19780912	1515	22.3	6.5	NA	0.01	1	0.06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297450	LITTLE BOULDER CREEK NR CLAYTON ID	19800521	1620	50	10.5	1.3	0.03	34	4.6	3	0	.0<	10	730.<	5	.0<	50.<	1	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19700622	1820	NA	7	NA	NA	325	144	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19700826	1815	NA	11.5	NA	NA	3	0.11	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19701012	1500	NA	3.5	NA	NA	1	0.03	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19710628	935	NA	3.5	NA	NA	13	2.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Station #	Station Name	Date(YMD)	Time	Flow (cfs)	Temp(C)	N(NH3+Org)	TP(mg/l)	SS(mg/l)	SS(t/day)	As(ug/l)	Cd(ug/l)	Cr(ug/l)	Cu(ug/l)	Fe(ug/l)	Pb(ug/l)	Se(ug/l)	Zn(ug/l)	Hg(ug/l)	Ag(ug/l)	Ba(ug/l)
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19710831	1500	NA	11	NA	0.05	3	0.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19711006	1015	NA	2	NA	0.05	2	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19720619	1525	NA	5.5	NA	0.04	16	3.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19720718	1400	NA	11.5	NA	0.02	3	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19720829	1530	NA	11	NA	0.03	2	0.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19721003	1430	11	5	NA	NA	5	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19730502	1635	6.4	3.5	NA	0.02	2	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19730606	1330	35	8.5	NA<	0.01	3	0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19730711	1115	25	12	NA<	0.01	1	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT	19730906	1100	7.52	8	NA	0.06	2	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

	LIVINGSTON MILL NR CLAYTON ID																			
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19740612	1300	90.2	6.5	NA	0.09	30	7.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19740711	1300	79	6	NA<	0.01	4	0.85	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19740801	1030	60	9.5	NA	0.01	1	0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19740924	1130	10.6	4.2	NA	0.01	2	0.06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19750715	1520	109	10	NA<	0.01	8	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19750813	1400	18.4	10	NA<	0.01	0.4	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19750904	1440	13.4	7.5	NA<	0.01	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19751002	1100	9.51	3	NA	0.01	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19760622	940	78	4.5	NA	0.03	14	2.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19760722	945	46.3	7.5	NA<	0.01	1	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19760811	1530	23	13	NA	0.01	10	0.62	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19760915	1000	18.4	5.5	NA<	0.01	1	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19770614	1100	33	5.5	NA<	0.01	2	0.18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19770712	1130	15	10	NA<	.01<	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19770818	1500	9.2	14	NA	0.02	2	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19770927	1445	7.11	6.5	NA<	.01<	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297480	BIG BOULDER CR AT	19780712	1045	80.3	6	NA	0.01	12	2.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

	LIVINGSTON MILL NR CLAYTON ID																			
13297480	BIG BOULDER CR AT LIVINGSTON MILL NR CLAYTON ID	19780913	1515	16	7	NA	.01<	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19700622	1600	NA	8.5	NA	NA	1050	74	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19700826	1550	NA	10	NA	NA	7	0.06	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19701012	1430	NA	3	NA	NA	3	0.02	NA	NA	0	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19710628	850	NA	3	NA	0.08	60	2.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19710831	1425	NA	8.5	NA	0.11	7	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19711006	900	NA	2	NA	0.09	5	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19720619	1430	NA	5	NA	0.09	103	4.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19720718	1330	NA	9.5	NA	0.08	14	0.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19720829	1430	NA	10	NA	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19721003	1320	3.5	3.5	NA	NA	8	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19730502	1515	1.8	2.5	NA	0.04	9	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19730606	1220	4.6	7.5	NA	0.05	4	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19730711	940	2.9	9	NA	0.03	12	0.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19730906	950	2.6	6	NA	0.12	9	0.06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19740612	1030	11.2	5.5	NA	0.22	79	2.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19740711	1130	12.1	4	NA	0.04	13	0.42	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19740801	1000	8.86	6.5	NA	0.03	4	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19740924	940	2.6	3.5	NA	0.03	2	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19750715	1400	14.8	7.5	NA	0.05	36	1.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19750813	1300	6.71	8	NA<	0.01	5	0.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19750904	1330	4.35	6	NA	0.04	1	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19751002	920	2.8	2.5	NA	0.04	1.6	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19760622	850	16.1	5	NA	0.06	12	0.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19760722	915	9	6	NA	0.03	7	0.17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19760811	1445	4.4	10	NA	0.04	11	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19760915	930	3	4.5	NA	0.03	2	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19770614	940	3.72	5.5	NA	0.05	20	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19770712	1100	2.2	8.5	NA	0.02	6	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19770818	1345	1.71	10.5	NA	0.06	9	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19770927	1410	1.5	6.5	NA	0.02	2	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19780712	1000	12	5.5	NA	0.05	69	2.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297485	JIM CREEK AT LIVINGSTON MILL NR CLAYTON ID	19780913	1445	3.3	6	NA	.03<	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297500	BIG BOULDER CREEK NR CLAYTON ID	19720725	1200	NA	8.5	NA	0.02	8	0.95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297500	BIG BOULDER CREEK NR CLAYTON ID	19721002	1200	16	3.5	NA	NA	6	0.26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297500	BIG BOULDER CREEK NR CLAYTON ID	19730501	1140	9.6	2	NA	0.02	6	0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297500	BIG BOULDER CREEK NR CLAYTON ID	19730606	1505	41	11.5	NA	0.03	6	0.66	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297500	BIG BOULDER CREEK NR CLAYTON ID	19740611	1520	98	9.5	NA	0.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13297600	HERD CREEK NR CLAYTON ID	19721004	1300	26	6.5	NA	NA	7	0.49	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298000	EF SALMON RIVER NR CLAYTON ID	19710601	1115	NA	5	NA	0.1	52	150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Station #	Station Name	Date(YMD)	Time	Flow (cfs)	Temp(C)	N(NH3+Org)	TP(mg/l)	SS(mg/l)	SS(t/day)	As(ug/l)	Cd(ug/l)	Cr(ug/l)	Cu(ug/l)	Fe(ug/l)	Pb(ug/l)	Se(ug/l)	Zn(ug/l)	Hg(ug/l)	Ag(ug/l)	Ba(ug/l)
13298000	EF SALMON RIVER NR CLAYTON ID	19710623	1150	NA	7	NA	0.35	555	4000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298000	EF SALMON RIVER NR CLAYTON ID	19710722	1440	NA	7	NA	0.07	51	130	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298000	EF SALMON RIVER NR CLAYTON ID	19710901	1030	NA	11	NA	0.04	4	2.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298000	EF SALMON RIVER NR CLAYTON ID	19711007	1250	NA	5.5	NA	0.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298000	EF SALMON RIVER NR CLAYTON ID	19720615	1310	NA	8	NA	0.07	178	836	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298000	EF SALMON RIVER NR CLAYTON ID	19720725	1330	NA	9	NA	0.02	12	13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298000	EF SALMON RIVER NR CLAYTON ID	19721004	1430	183	7	NA	NA	6	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298000	EF SALMON RIVER NR CLAYTON ID	19730501	1340	142	8	NA	0.02	11	4.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298000	EF SALMON RIVER NR CLAYTON ID	19730607	915	700	9	NA	0.01	21	40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

13298000	EF SALMON RIVER NR CLAYTON ID	19740613	1700	2120	11.5	NA	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298000	EF SALMON RIVER NR CLAYTON ID	19800521	1450	795	14	0.58	0.05	114	245	3	2	0	18	1500	10	.0<	50.<	1	NA	NA
13298400	BAYHORSE CREEK NR CHALLIS ID	19730709	1505	0.91	17	NA	0.01	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298500	SALMON RIVER NR CHALLIS ID	19710526	1615	NA	8.5	NA	0.06	56	708	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298500	SALMON RIVER NR CHALLIS ID	19710626	1335	NA	8	NA	0.2	172	4690	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298500	SALMON RIVER NR CHALLIS ID	19710723	1000	NA	12.5	NA	0.04	7	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298500	SALMON RIVER NR CHALLIS ID	19710901	1330	NA	13	NA	0.04	2	6.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298500	SALMON RIVER NR CHALLIS ID	19711007	1600	NA	11.5	NA	0.05	2	5.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298500	SALMON RIVER NR CHALLIS ID	19720614	1130	NA	8	NA	0.07	130	3070	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298500	SALMON RIVER NR CHALLIS ID	19720724	1530	NA	14.5	NA	0.02	9	49	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298500	SALMON RIVER NR CHALLIS ID	19721005	930	1090	7	NA	NA	7	21	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298500	SALMON RIVER NR CHALLIS ID	19730430	1605	1100	9	NA	0.02	10	30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298500	SALMON RIVER NR CHALLIS ID	19730608	1000	3170	11.5	NA	0.03	22	188	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13298500	SALMON RIVER NR CHALLIS ID	19740615	1500	14400	8.7	NA<	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX F

Macroinvertebrate Biotic Integrity Report

Upper Salmon (HUC 17060201)

Custer County, Idaho

Subbasin Assessment Biotic Integrity (Macroinvertebrates)

Idaho Department of Environmental Quality

State Technical Services Office

2000

Printed on recycled paper

Upper Salmon (HUC 17060201)
Custer County, Idaho

Subbasin Assessment

Biotic Integrity (Macroinvertebrates)

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October 15, 2000

Abstract

The macroinvertebrates of four streams in the Upper Salmon area, Custer County, Idaho, were sampled as part of the Beneficial Use Reconnaissance Project by the Idaho Division of Environmental Quality between 1994 and 1997. Three stream segments (segments on Road Creek, Lost Creek, and Kinnikinic Creek) were listed in the Division of Environmental Quality 1998 303(d) list as water quality limited for Hydrologic Unit Code #17060201 for Apollutant unknown.@ In addition, the Environmental Protection Agency listed Squaw Creek for having, temperatures that exceeded recommended levels. The objective of this study is to determine the pollutant(s) responsible for degrading these four streams. Analysis of the macroinvertebrate data indicate that the upper and lower parts of Road Creek, Lost Creek, and the lower portion of Kinnikinic Creek are all impacted by fine sediment. Additional sampling for fine sediment on Lost Creek is suggested. DEQ analyses did not show impacts from high temperatures in Squaw Creek. The majority of this creek is not impacted by fine sediment.

Introduction

Macroinvertebrates of several 303(d) listed streams (Idaho Division of Environmental Quality 1999) in the Upper Salmon area were sampled as part of the Beneficial Use Reconnaissance Project (BURP) by the Idaho Division of Environmental Quality (DEQ), Idaho Falls Regional Office from 1994-1997. The State Office of DEQ are using these data, in part, to prepare a subbasin assessment of the Upper Salmon area.

Ten stream segments in Hydrologic Unit Code (HUC) #17040104 were listed on the 1998 303(d) list as having poor water quality (Idaho Division of Environmental Quality 1999). Seven of these listed stream segments were reported as Apollutant unknown@ (unknown pollutants at the time of listing). This report provides findings from an analysis of macroinvertebrate data on 14 sample sites on the seven streams in an attempt to identify the pollutant(s) responsible for low macroinvertebrate biotic index scores and the subsequent 303(d) listing. Surface fines (percent fine sediment) taken at the sample sites is also used to help define limiting factors.

Materials and Methods

Study Area

The study area is in HUC 17060201 in the Upper Salmon area, Custer County, Idaho. A portion of the area lies within the Salmon-Challis National Forest (upper parts of Kinnikinic and Squaw Creeks) and the Sawtooth National Forest (upper part of Lost Creek). Road Creek flows through lands administered by the Bureau of Land Management (BLM). The lower portions of Kinnikinic and Squaw Creeks are also on BLM lands. Substantial portions of each stream (mainly lower reaches) pass through private land. Four streams (12 stream sites) are included in this report for macroinvertebrates for this project (Table 1). The BURP site identification number is included for reference.

Field Methods

Macroinvertebrate sample methods follow Clark and Maret (1993) McIntyre (1994), Idaho Division of Environmental Quality (1995), Idaho Division of Environmental Quality Beneficial Use reconnaissance Project Technical Advisory Committee (1996a), and Idaho Division of Environmental Quality Beneficial Use Reconnaissance Project Technical Advisory Committee (1997). Three Hess samples were taken and combined for each of three separate riffles. Macroinvertebrates were processed by EcoAnalysts, Inc. of Moscow, Idaho. Voucher specimens of the macroinvertebrates have been deposited in the Orma J. Smith Museum of Natural History, Albertson College of Idaho, Caldwell. Fine sediment values were determined by using a modified Wolman pebble count at each of the three riffles sampled for macroinvertebrates (McIntyre 1994, Idaho Division of Environmental Quality Beneficial Use Reconnaissance Project Technical Advisory Committee 1995, 1996a, 1997) and these data are presented in Table 2.

Methods of Analysis

The macroinvertebrate sample metrics were interpreted consistent with current literature. Clark (1997) provides a draft list of cold water macroinvertebrate indicators for Idaho. Hafele and Hinton (1996), Oregon Watershed Enhancement Board (1999), Relyea (1999), PEERS (1998), and Wisseman (1996) were especially helpful in determining the tolerance of the invertebrates collected to fine sediment. Tables 3, 4, and 5 list the metrics examined for this study. For a

regional comparison of macroinvertebrates found in this area, Platts and Rountree (1974) may be consulted.

The Macroinvertebrate Biotic Index (MBI) scores were calculated using Idaho Division of Environmental Quality (1996b) water body assessment guidance process and are listed in Table 2. The MBI uses the seven metrics discussed in detail below (taxa richness, Ephemeroptera Plecoptera Trichoptera [EPT] index, percent EPT, percent scrapers, percent dominant taxa, the Hilsenhoff Biotic Index, and Shannon=s H= diversity index). In summary, the MBI process was developed by DEQ as a non-arbitrary, objective water body assessment tool. An MBI score of 2.5 or less renders an impaired rating for aquatic life (cold water biota in most cases). An MBI score of 3.5 or greater is determined to be not impaired. If a score falls between 2.5 and 3.5 the site was considered too close to determine and given a rating of Aneeds verification@ (Idaho Division of Environmental Quality 1999). The MBI and other metrics were used from the water body assessment guidance (Idaho Division of Environmental Quality 1996b) for the 1994, 1995, and 1996 BURP sites. The two sites sampled during 1997 were assessed using the Biological Assessment Tool (Idaho Department of Environmental Quality 2000).

Cold water indicators (Table 3) are compared with a draft list prepared for Idaho (Clark 1997) and for the Pacific Northwest (Hafele and Hinton 1996). Essig (1998) is a good reference for examination of the dilemma associated with temperature criteria in Idaho. Clark (1999) provides background information on identifying and determining the distribution of the aquatic macroinvertebrates in Idaho.

The macroinvertebrate metrics currently used by DEQ to calculate the MBI include: percent EPT; modified Hilsenhoff Biotic Index (HBI); percent scrapers, percent dominance; EPT index; taxa richness; and Shannon=s H= diversity index. In addition the number of Plecoptera taxa was examined. The macroinvertebrate information examined can be separated into four general categories: richness, composition, tolerance, and trophic/habitat.

Richness

Taxa richness reflects the health of the assemblage through a measure of the variety of taxa (total number of distinct genera or species) present. Taxa richness can be equated to biodiversity. Taxa Richness generally increases with increasing water quality, habitat diversity, or habitat suitability. Barbour *et al*. (1992) and Karr and Chu (1999) report that taxa richness is a reliable indicator of human influence in the Pacific Northwest and will generally decrease with an increase in such influence. The EPT Index is a metric which summarizes the taxa richness of these three orders of insects that are generally considered to be sensitive to pollution (including temperature and fine sediment). Barbour *et al*. (1992) reports that the EPT Index is a reliable indicator of human influence in the Pacific Northwest and will generally decrease with an increase in such influence. It follows then that the number of Ephemeroptera taxa and the number of Plecoptera taxa will likewise be good indicators of temperature and fine sediment pollution. It is sometimes helpful to look at these taxa separately even though they are considered in the two previously-mentioned metrics. Karr and Chu (1999) show that these three metrics are reliable indicators of human influence across the Pacific Northwest, including central Idaho. Another way to measure diversity is with Shannon=s H= Diversity Index. This metric is based on the observation that relatively undisturbed environments support communities having great taxa richness with no individual species present in overwhelming abundance. It has been one of the most popular diversity indices used for water quality assessment.

Composition

Percent EPT increases as water quality increases, since these groups generally contain taxa that are considered more sensitive to temperature and fine sediment pollution. Karr and Chu (1999) show that these taxa decreased with increased human influence in the Pacific Northwest. They show the same relationship with other intolerant taxa as well. Therefore, each of the EPT groups examined separately (percent Ephemeroptera, percent Plecoptera, and percent Trichoptera) will also show the same trend in relation to temperature and fine sediment pollution. It may be useful to examine these metrics separately at times. Total abundance of macroinvertebrate organisms in a sample can also serve as an indicator of stream health. Generally greater total abundance will indicate a stream of decreased impact and increased water quality. There comes a point (this is dependent on the particular stream, impacts, and taxa present) where greater total abundance indicates a decrease in water quality. This condition is evident when pollution (which includes temperature and fine sediment) has reduced or eliminated the sensitive species and the remaining tolerant species thrive with the resulting reduced competition.

Tolerance

The Hilsenhoff Biotic Index (HBI) was originally a measure of organic pollution. It has been modified several times. For each index each macroinvertebrate taxon is assigned a tolerance value relating to the response to organic and toxic pollutants. A value of 0-10 may be assigned to each taxon, with 0 being the least tolerant to pollution (inverse relationship). A score of 11 indicates the tolerance value is unknown. This index has also been shown to be useful for evaluating the effects of both point and nonpoint source pollution. U.S. Environmental Protection Agency (1997) and Barbour *et al*. (1999) indicate that the HBI is useful in determining the impacts of nonpoint source pollution. APercent dominance@ represents the percent contribution of the numerically dominant taxon to the total number of individuals in the community. It provides an indication of community balance at the lowest positive taxonomic level (usually genus or species). A community (assemblage) dominated by relatively few species would suggest environmental stress. Percent dominance will increase with the impacts of human influence on streams in the Pacific Northwest (Karr and Chu 1999).

Trophic/Habitat

APercent scrapers@ is an index that uses the functional feeding group of each taxon to assess water quality. The relative abundance of scrapers provides an indication of the riffle community food base (periphyton or primary production composition). Scrapers increase with increased abundance of diatoms and decrease as filamentous algae and aquatic mosses increase. Scrapers decrease in relative abundance following increases in fine particle sedimentation in coarse particle substrate stream beds. Percent scrapers has been shown to be sensitive to human influence in central Idaho (Karr and Chu 1999).

Results and Discussion

For comparison, the MBI scores for the DEQ 1996 method (Idaho Division of Environmental Quality 1996b) and the DEQ 2000 method (Idaho Division of Environmental Quality 2000), were compared (Table 2) where the data were available. While expected differences are evident, primarily because the Biological Assessment Tool (Idaho Division of Environmental Quality 2000) uses a revised and expanded taxa and taxa attribute list, the results (assessment call), were

the same except for a single case. That site was on Kinnikinic Creek where the 1996 method indicated an Aimpaired@ stream and the 2000 method resulted in a Aneeds verification@ classification.

Road Creek

Road Creek was listed on the 1998 303(d) list as having unknown pollutants (Apollutant unknown@) (Idaho Division of Environmental Quality 1999). Road Creek was represented by four BURP sites sampled between 1995 and 1997 (Table 1).

The MBI scores for the 1995 and 1996 sites (uppermost and lowermost sites) were in the Aimpaired@ and Aneeds verification@categories, while the 1997 sites indicated that the stream was Anot impaired@ (Table 2). Two cold water indicators were present at the two middle sites (Table 3).

The biological metrics listed in Tables 4 and 5 indicate that the upper and lower sites indicate impairment at these two sites. Macroinvertebrates intolerant of fine sediment impacts, such as *Drunella doddsi* (one specimen was found at a mid elevational site), and most Plecoptera were absent. Considering the composition of the macroinvertebrate assemblages at these sites and the extremely low proportion of scrapers (0 and 0.02% respectively), these two sites are likely impacted by fine sediment.

Lost Creek

Lost Creek was listed on the 1998 303(d) list as having unknown pollutants (Apollutant unknown@) (Idaho Division of Environmental Quality 1999). Lost Creek was represented by a single BURP site sampled in 1996 (Table 1). Lost Creek had a low MBI (1.17), indicating impairment. It did have two cold water indicators (Table 3) indicating that temperature was not a problem. The other macroinvertebrate metrics; however, indicate serious problems. A taxa richness of eight is very poor, no scrapers were present (Table 4), and only three EPT taxa and no Plecoptera (Table 5) were present. These factors indicate fine sediment impacts on the biological assemblage at this site.

Kinnikinic Creek

Kinnikinic Creek was listed on the 1998 303(d) list as having unknown pollutants (Apollutant unknown@) (Idaho Division of Environmental Quality 1999). There were three BURP sites located on Kinnikinic Creek (Table 1). The MBIs on the upper two sites indicate that the stream in this area is Anot impaired@ (Table 2). The lower site had a much lower MBI, which indicates that it is Aimpaired.@

The stream had four to eight cold water indicators present (Table 3) which implies that temperature is not a problem. The metrics shown in Tables 4 and 5 indicate that the upper two sites are in much better condition than the lower site. The lower site appears to be impacted by fine sediment.

Squaw Creek

Squaw Creek was originally not listed on the 1998 303(d) list (Idaho Division of Environmental Quality 1999). Subsequently the U.S. Environmental Protection Agency listed Squaw Creek as being impaired due to high temperatures.

Squaw Creek was represented by four BURP sites sampled during the 1994 and 1995 field seasons (Table 1). Three of the sites rank as Anot impaired@ or Afull support@ and have MBIs of

over 3.5 (Table 2). One site, (A041) had an MBI of 3.13, which means Aneeds verification@ (Table 2). However, the stream, especially near this site, may have impacts from other pollutants such as fine sediment.

The stream had cold water taxa at each site (ranging from two to six)(Table 3). These data would indicate that temperature is not a problem on Squaw Creek. The taxa richness for Squaw Creek was the highest of the four streams in this study (range 35-49) (Table 4). Table 5 shows that Squaw Creek had the highest number of EPT taxa (range 20-33) including Plecoptera taxa (range 6-9), again indicating that temperature does not appear to be a problem in this stream.

Conclusions and Recommendations

1. According to the macroinvertebrate data collected, Road Creek appears to be impacted by fine sediment, but not by increased temperature.

2. According to the macroinvertebrate data examined, Squaw Creek does not appear to be impacted by increased temperatures. This creek had good numbers of cold water indicators, high taxa richness, and high EPT values. Based on these data, DEQ recommends that Squaw Creek be removed from the 303(d) list.

3. The macroinvertebrate assemblage data presented showed that the upper two sites on Kinnikinic Creek are not impacted by increased temperature or fine sediment, but that the lower site appears to be impacted by fine sediment.

4. Lost Creek was represented by macroinvertebrate data from only one site, but that site showed the impacts of fine sediment. DEQ recommends establishing and sampling additional sites on Lost Creek.

Acknowledgments

The macroinvertebrate identifications were done by several laboratories: Northwest Management, Inc. (Jody White) provided the 1994 sample results, the Idaho State Bureau of Laboratories (Kate Parkin and Luana McCauley) provided some of the 1995 results, EcoAnalysts, Inc. (Gary Lester, Scott Lindstrom) provided some of the 1995 and 1996 results, and Weese Bollman, and Kate some of the 1996 and the 1997 results presented here. The Idaho Falls DEQ Regional Office BURP crew took the field samples. Thanks to Steve Robinson for coordinating the field work. Amy Luft reviewed an earlier draft of this report and offered valuable editorial comments.

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Table 1. Macroinvertebrate collection sites for the Upper Salmon area, Idaho, 1994-1997 (HUC 17060201) are given along with their 303(d) listed pollutant. The BURP site ID number is given for reference. Streams that have more than one site have the upper most site (highest elevation) listed first and continue down the list so that the last site listed is lowest in the watershed.

303(d) LISTED STREAM	SITE	BURP SITE ID	POLLUTANT
Road Creek	0.5 mi. bl. N. Fk. (Sage Cr.)	1995SIDFA027	unknown[1]
	7.5 mi. Up Road Cr. Rd.	1997SIDFL106	unknown
	Ab. road crossing	1997SIDFL046	unknown
	20 m. ab. E. Fk. Salmon	1996SIDFA028	unknown
Squaw Creek	120 m. bl. Martin Creek	1995SIDFA069	temperature [2]
	300 m. bl. Cinnibar Cr. Tr.	1994SIDFA041	temperature
	Below USFS boundary	1995SIDFA070	temperature
	100 m. bl. bridge @ state land boundary	1994SIDFA042	temperature
Kinnikinic Creek	0.2 mi. ab. Rd. crossing	1996SIDFY114	unknown
	50 m. bl. Broken Ridge Cr.	1996SIDFY112	unknown
	0.5 mi. above mouth	1996SIDFY118	unknown
Lost Creek	50 m. bl. Valley Road	1996SIDFY097	unknown

[1]unknown = Idaho Division of Environmental Quality (1999)
[2]Temperature - EPA

Table 2. 1999 Macroinvertebrate Biotic Index scores for the Upper Salmon area, Idaho, 1994-1996 and for 1997 (HUC 17060201) using both the 1996 Macroinvertebrate Biotic Index (Idaho Division of Environmental Quality 1996b) and the Biological Assessment Tool (Idaho Division of Environmental Quality 2000).

STREAM	BURP SITE ID	1996 MBI	2000 MBI
Road Creek	1995SIDFA027	0.75	1.64
	1997SIDFL106	n/a	3.84
	1997SIDFL046	n/a	4.2
	1996SIDFA028	2.52	2.54
Squaw Creek	1995SIDFA069	4.69	4.35
	1994SIDFA041	3.13	3.12
	1995SIDFA070	4.07	3.9
	1994SIDFA042	4.55	---
Kinnikinic Creek	1996SIDFY114	4.73	4.57
	1996SIDFY112	4.32	4.13
	1996SIDFY118	2.17	2.49
Lost Creek	1996SIDFY097	1.17	1.17

Table 3. 1999 Macroinvertebrate cold water indicators for the Upper Salmon area, Idaho, 1994-1997 (HUC 17060201).

STREAM	BURP SITE ID	# COLD WATER TAXA	% COLD WATER TAXA
Road Creek	1995SIDFA027	0	0
	1997SIDFL106	2	0.8
	1997SIDFL046	2	0.4
	1996SIDFA028	0	0
Squaw Creek	1995SIDFA069	5	3
	1994SIDFA041	6	2
	1995SIDFA070	2	2
	1994SIDFA042	3	1
Kinnikinic Creek	1996SIDFY114	8	52.1
	1996SIDFY112	6	40.1
	1996SIDFY118	4	1
Lost Creek	1996SIDFY097	2	<0.1

Table 4. Macroinvertebrate data (taxa richness, modified Hilsenhoff Biotic Index, Shannon=s H= Diversity Index, percent scrapers) for the Upper Salmon area, Idaho, 1994-1997 (HUC 17060201).

STREAM	BURP SITE ID	TAXA RICHNESS	HBI	H=	% SCRAPERS
Road Creek	1995SIDFA027	4	5.90	0.18	0
	1997SIDFL106	32	3.84	1.1	13.9
	1997SIDFL046	31	3.47	1.04	6.6
	1996SIDFA028	11	4.8	0.89	0.02
Squaw Creek	1995SIDFA069	37	3.9	1.09	0.24
	1994SIDFA041	35	5.2	0.74	0.05
	1995SIDFA070	42	4.5	0.98	0.15
	1994SIDFA042	49	4.5	1.04	0.24
Kinnikinic Creek	1996SIDFY114	27	2.3	1.03	0.35
	1996SIDFY112	23	2.7	1.06	0.32
	1996SIDFY118	20	5.4	0.57	0.02
Lost Creek	1996SIDFY097	8	5.9	0.29	0

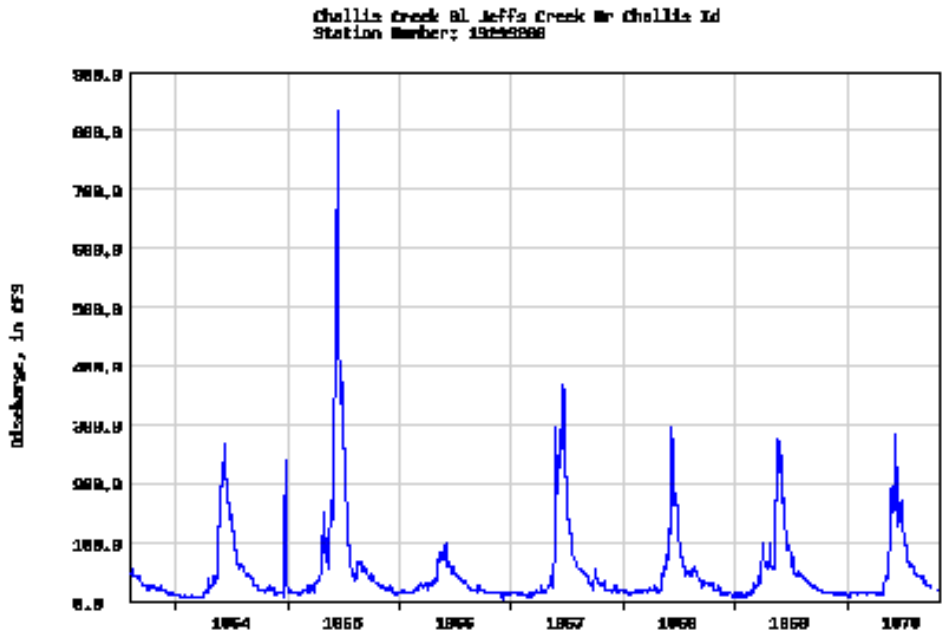
Table 5. Macroinvertebrate data (sum Ephemeroptera Plecoptera Trichoptera taxa, percent EPT, and sum Plecoptera taxa) for the Upper Salmon area, Idaho, 1994-1997 (HUC 17060201).

STREAM	BURP SITE ID	# EPT TAXA	% EPT	# PLECOPTERA TAXA
Road Creek	1995SIDFA027	0	0	0
	1997SIDFL106	18	30.9	4
	1997SIDFL046	17	38.2	2
	1996SIDFA028	4	0.3	1
Squaw Creek	1995SIDFA069	24	0.8	7
	1994SIDFA041	20	0.3	6
	1995SIDFA070	30	0.7	6
	1994SIDFA042	33	0.3	9
Kinnikinic Creek	1996SIDFY114	23	0.7	9
	1996SIDFY112	18	0.6	7
	1996SIDFY118	15	32	4
Lost Creek	1996SIDFY097	3	0.1	0

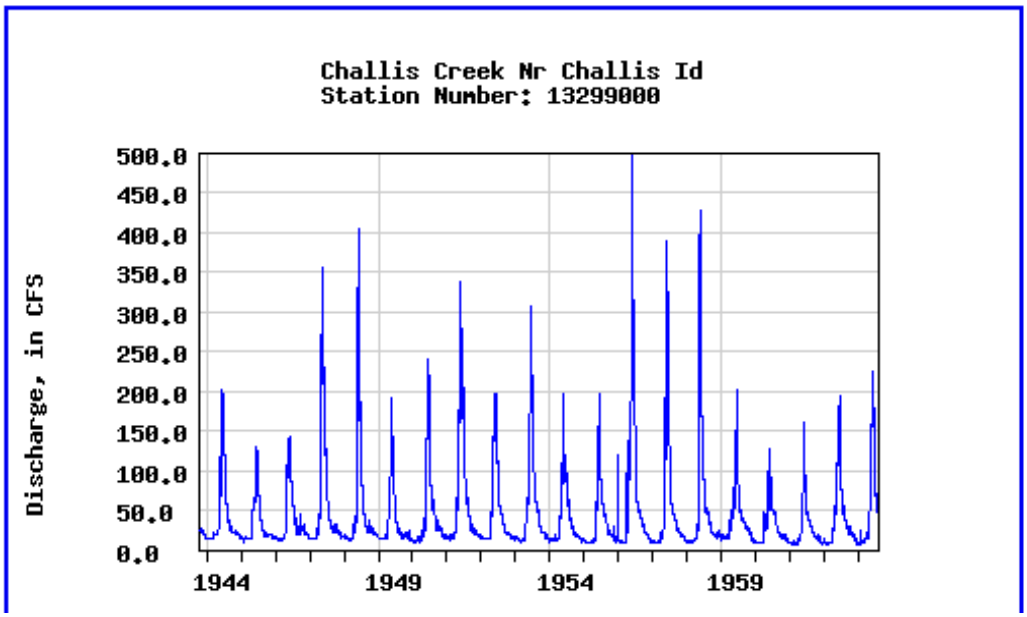
APPENDIX G

USGS Historic Streamflow Graphs

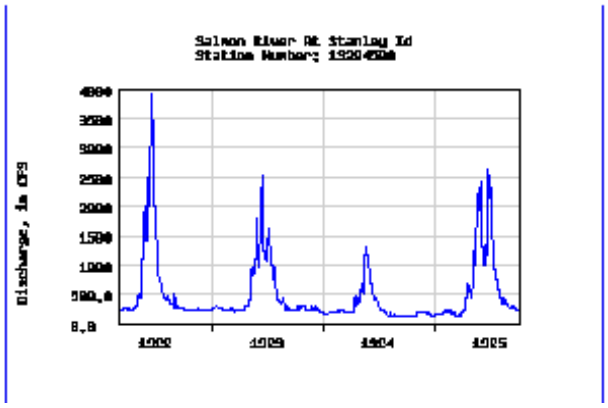
Historical Streamflow Daily Values Graph for Challis Creek Bl Jeffs Creek Nr Challis Id (13299200)



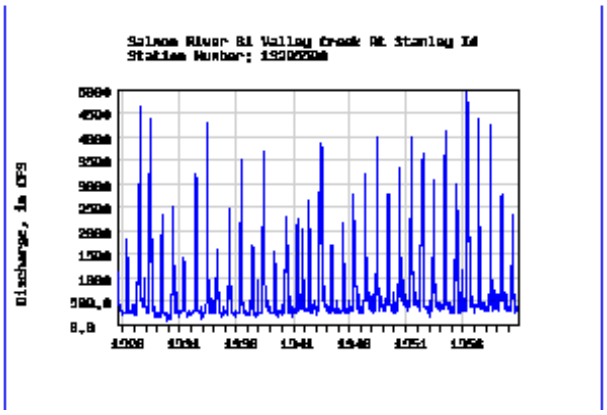
Historical Streamflow Daily Values Graph for Challis Creek Nr Challis Id (13299000)



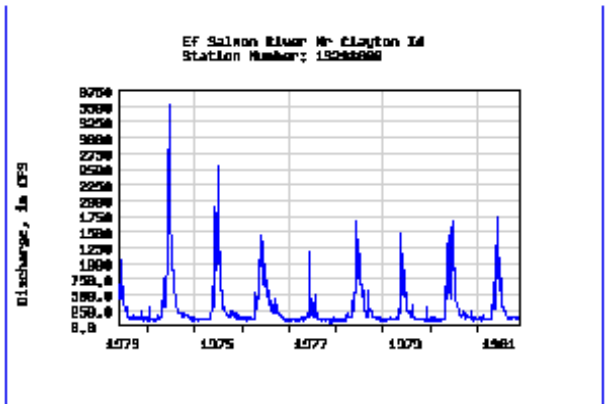
Historical Streamflow Daily Values Graph for Salmon River At Stanley Id (13294500)



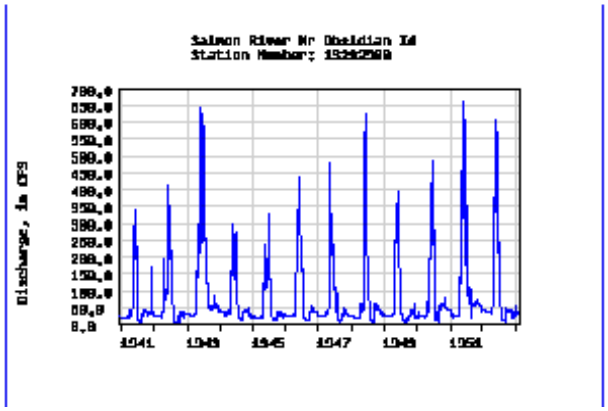
Historical Streamflow Daily Values Graph for Salmon River Bl Valley Creek At Stanley Id (13295500)



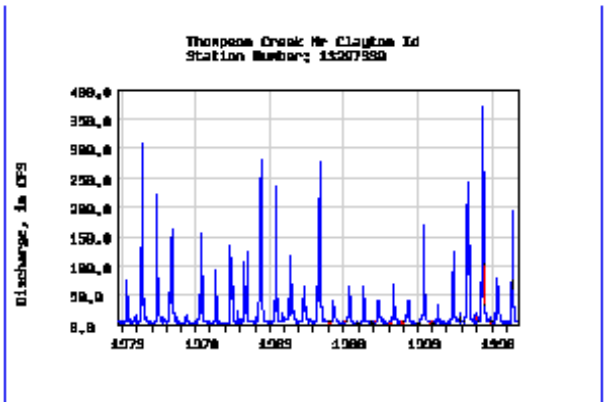
Historical Streamflow Daily Values Graph for Ef Salmon River Nr Clayton Id (13298000)



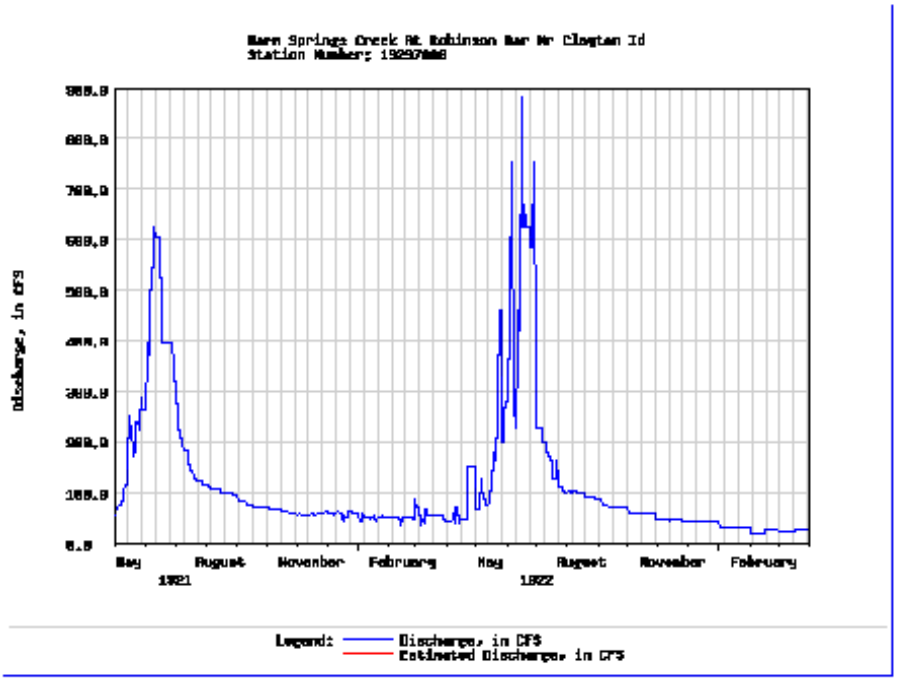
Historical Streamflow Daily Values Graph for Salmon River Nr Obsidian Id (13292500)



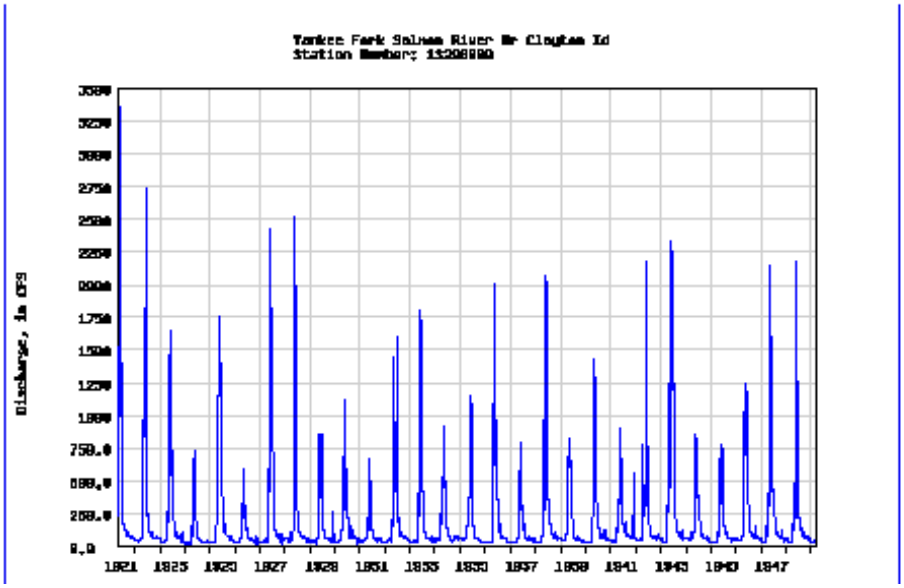
Historical Streamflow Daily Values Graph for Thompson Creek Nr Clayton Id (13297330)



Historical Streamflow Daily Values Graph for Warm Springs Creek At Robinson Bar Nr Clayton Id (13297000)



Historical Streamflow Daily Values Graph for Yankee Fork Salmon River Nr Clayton Id (13296000)



UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - IDAHO DISTRICT 05/18/2000

STATION NUMBER 13297330 THOMPSON CREEK NR CLAYTON ID STREAM SOURCE AGENCY USGS
LATITUDE 441601 LONGITUDE 1143048 DRAINAGE AREA 29.1 DATUM 5700. STATE 16 COUNTY 037

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1998 TO SEPTEMBER 1999
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.2	5.8	4.7	4.0	3.7	4.3	18	52	99	40	10	7.1
2	5.1	6.1	4.6	3.9	3.8	3.7	16	58	103	37	10	7.9
3	4.8	6.1	5.0	e4.0	3.6	4.0	15	54	109	35	10	6.6
4	4.5	6.1	4.9	4.0	3.6	3.3	14	47	121	32	10	6.7
5	4.3	6.2	2.5	3.8	e3.5	e3.5	13	42	110	29	11	6.3
6	4.4	6.2	3.1	3.8	e3.5	e3.5	12	41	114	27	12	6.0
7	4.3	6.0	4.2	3.8	e4.0	e3.5	13	50	104	27	10	5.8
8	5.1	6.1	5.1	3.8	3.9	3.7	14	56	86	26	9.5	5.7
9	6.7	5.6	3.8	3.8	3.8	3.6	14	55	70	25	9.7	5.6
10	6.7	5.8	3.5	3.8	3.7	3.4	14	49	65	23	9.4	5.5
11	6.7	6.0	5.1	3.8	e3.5	3.3	14	43	66	22	9.3	5.4
12	6.8	5.9	4.8	3.8	e3.5	3.7	17	41	71	21	9.3	5.3
13	6.7	6.2	4.2	3.7	e3.5	3.6	22	40	83	21	9.5	5.2
14	6.6	6.6	4.3	3.7	3.8	3.9	29	37	101	20	8.3	5.2
15	6.6	6.6	4.2	4.1	3.6	4.6	31	35	125	19	7.8	5.1
16	6.6	6.4	4.3	4.0	3.6	5.5	35	33	157	18	7.7	5.0
17	6.5	6.3	4.3	3.9	3.7	5.4	57	30	168	17	7.4	5.0
18	6.7	6.9	e4.0	4.0	3.6	5.7	67	32	171	16	7.3	4.9
19	6.8	5.2	e4.0	3.8	3.7	6.9	72	45	164	16	7.2	4.9
20	6.7	3.9	e3.5	3.9	e3.5	10	72	63	144	15	7.0	4.8
21	6.7	4.8	e3.5	3.8	e3.5	13	64	e80	129	15	6.8	4.8
22	6.7	5.1	3.2	3.7	3.7	14	55	94	114	14	6.7	4.8
23	7.0	4.7	e3.5	4.0	3.7	17	45	107	98	13	6.7	4.7
24	6.7	5.6	4.0	3.7	3.7	21	43	120	85	12	6.9	4.6
25	6.6	4.8	4.6	e3.5	3.7	29	51	125	76	12	6.5	4.6
26	6.6	4.2	4.9	4.4	3.6	39	66	114	65	12	6.3	4.6
27	6.5	4.7	4.3	3.9	3.5	32	62	132	56	12	6.3	4.7
28	6.5	4.7	4.3	e4.0	3.9	27	59	145	49	11	7.5	4.8
29	6.4	4.6	4.1	3.7		23	49	196	45	11	9.4	4.9
30	5.9	4.5	4.1	e4.0		21	45	172	42	11	7.0	4.9
31	5.6		4.0	e4.0		19		127		11	6.4	
TOTAL	188.0	167.7	128.6	120.1	102.4	333.6	1098	2315	2990	620	258.9	161.4

MEAN	6.06	5.59	4.15	3.87	3.66	11.1	36.6	74.7	99.7	20.0	8.35	5.38
MAX	7.00	6.9	5.1	4.4	4.0	39.0	72	196	171	40	12	7.9
MIN	4.20	3.9	2.5	3.5	3.5	3.3	12	30	42	11	6.3	4.6
AC-FT	373	333	255	238	203	683	2180	4590	5930	1230	514	320
CFSM	0.21	0.19	0.14	0.13	0.13	0.38	1.26	2.57	3.42	0.69	0.29	0.18
IN.	0.24	0.21	0.16	0.15	0.13	0.44	1.40	2.96	3.82	0.79	0.33	0.21

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1973 – 1999, BY WATER YEAR (WY)

MEAN	5.02	5.20	4.68	4.47	4.62	8.07	24.4	64.0	64.4	18.4	7.11	5.17
MAX	8.07	14.0	11.9	10.3	9.9	25.5	60.1	170	1680	43.9	15.3	9.90
(WY)	1985	1984	1984	1984	1984	1986	1986	1997	1974	1982	1984	1984
MIN	2.87	2.47	2.85	2.46	2.24	3.13	5.34	7.88	9.56	3.45	2.14	2.07
(WY)	1980	1980	1980	1980	1980	1977	1975	1977	1994	1994	1977	1994

SUMMARY STATISTICS	FOR 1998 CALENDAR YEAR		FOR 1999 WATER YEAR		WATER YEARS 1973 – 1999	
ANNUAL TOTAL	6211.1		8494.2			
ANNUAL MEAN	17.0		23.3		18.0	
HIGHEST ANNUAL MEAN					37.9	1997
LOWEST ANNUAL MEAN					4.70	1977
HIGHEST DAILY MEAN	78	May 6	196	May 29	373	May 15 1997
LOWEST DAILY MEAN	2.5	Mar 4	2.5	Dec 5	1.4	Nov 21 1979
ANNUAL SEVEN-DAY MINIMUM	2.7	Mar 4	3.5	Mar 4	1.6	Aug 18 1977
ANNUAL RUNOFF (AC-FT)	12320		16850		13030	
ANNUAL RUNOFF (CFSM)	.58		.80		.62	
ANNUAL RUNOFF (INCHES)	7.94		10.86		8.40	
10 PERCENT EXCEEDS	53		68		50	
50 PERCENT EXCEEDS	6.6		6.6		6.2	
90 PERCENT EXCEEDS	3.5		3.7		3.1	

e Estimate

APPENDIX H

Yankee Fork Ranger District Project List

YANKEE FORK R.D. - SALMON-CHALLIS N.F.

BULL TROUT CONSERVATION – RELATED PROJECTS

BEAR VALLEY KEY WATERSHED

DRAINAGE	PROJECT NAME	YEAR	PROJECT DESCRIPTION	RESOURCE BENEFITS
Kelly Beaver Knapp	Capehorn Allot. Management Plan	1994	Livestock management Plan for grazing in a Manner appropriate for Aquatic resources.	Improvement in Riparian condition And bank stability Decreased sediment
Marsh	Bull Trout Allotment Mgt. Plan	1994	Livestock management Plan for grazing in a Manner appropriate for Aquatic resources.	Improvement in Riparian condition And bank stability Decreased sediment
Marsh	Fish snorkeling Survey	1995	Fish presence/absence Survey	Assess distrib of Aquatic population
Knapp Marsh	Fish Habitat Improvement Str	1995	Construct barbs and Streambank revetment Structures	Reduce sediment Impacts from Eroding banks
Knapp Marsh	Stream Temp Monitoring	1995	Placement and analysis of temperature devices at 9 locations	Assess impacts to water quality from resource mgt
Knapp	Knapp Creek Trail Reloc-ation Project	1996	Relocate 3 miles of trail out of riparian habitat cons area	Eliminate recr impacts to aquatic riparian resources
Knapp	R1/R4 Fish Habitat Survey Subset	1996	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat condition and trend
Knapp	R1/R4 Fish Habitat Survey Subset	1997	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat condition and trend
Knapp	Knapp Creek Bridge reconstr	1997	Reconstruct sheep bridge across Knapp Creek	Reduce impacts to streambanks from sheep herding
Knapp Marsh	Fish Habitat Improvement Str	1997	Maintain stream str placed in 1995	Reduce sediment impacts from eroding banks

UPPER SALMON RIVER KEY WATERSHED

DRAINAGE	PROJECT NAME	YEAR	PROJECT DESCRIPTION	RESOURCE BENEFITS
Valley	Capehorn Allot. Management Plan	1994	Livestock management Plan for grazing in a Manner appropriate for Aquatic resources.	Improvement in Riparian condition And bank stability Decreased sediment
Basin	Basin Creek Trail Reloc-ation Project	1996	Relocate 3 miles of trail out of riparian habitat cons area	Reduce sediment impacts to aquatic riparian resources
Valley	Valley Creek Bridge/Trail Project	1995	Construct bridge across Valley Creek for recreational trail	Reduce disturb of stream banks, decreased sediment
Basin	Fish snorkeling survey	1995	Fish presence/absence Survey on 10 miles of stream	Assess distrib of aquatic population
Valley & Basin	Stream Temp Monitoring	1995	Placement and analysis of temperature devices at 13 locations	Assess impacts to water quality from resource mgt
Valley & Basin	Stream Sediment Monitoring	1995	McNeil Core Sampling of depth fines	Data used to analyze management affects on aquatic
Basin	R1/R4 Fish Habitat Survey Subset	1995	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat condition and trend
Valley	R1/R4 Fish Habitat Survey Subset	1996	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat condition and trend
Valley & Basin	R1/R4 Fish Habitat Survey Subset	1997	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat condition and trend
Valley	Stream Temp Monitoring	1997	Placement and analysis of temperature devices at 2 locations	Assess impacts to water quality from resource mgt
Basin	Salmon River Breaks Allot	1997	Livestock management Plan for grazing in a Manner appropriate for Aquatic resources.	Improvement in riparian condition and bank stability decreased sediment

THOMPSON – BAYHORSE KEY WATERSHED

DRAINAGE	PROJECT NAME	YEAR	PROJECT DESCRIPTION	RESOURCE BENEFITS
Cash	Cash Creek Riparian Excl	1994	Construction of 4 miles of fence to exclude livestock from Cash Cr	Improved riparian seral cond and aquatic habitat
Squaw Thompson	Fish snorkeling survey	1995	Fish Presence/absence survey on 20 miles of stream	Assess distrib of aquatic population
Thompson Squaw	Stream Temp Monitoring	1995	Placement and analysis of temperature devices at 9 locations	Assess impacts to water quality from resource mgt
Thompson Squaw Bayhorse	R1/R4 Fish Habitat Survey Subset	1995	Survey of fish habitat to assess impacts from livestock grazing	Analysis of fish habitat condition and trend
Thompson Squaw	Stream Sediment Monitoring	1995	McNeil Core Sampling of depths fines Squaw Thompson, Kinnikinic	Data used to analyze management affects on aquatic
Kinnik – inic Cr	R1/R4 Fish Habitat Survey	1996	Survey fish habitat to assess condition for future analysis	Analysis of fish habitat condition and trend
Thompson	Fish Habitat Improvement Str	1996	Construct barbs and streambank revetment structures	Reduce sediment impacts from eroding banks
Squaw	Squaw Creek Trail relocation Project	1996	Reconstruction trail and maintenance of stream crossings	Reduce soil erosion and silt input into habitat
Thompson Squaw Bayhorse	R1/R4 Fish Habitat Survey Subset	1996	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat condition and trend
Bayhorse Thompson Squaw	R1/R4 Fish Habitat Survey Subset	1997	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat condition and trend
Thompson	R1/R4 Fish Habitat Survey	1997	Survey fish habitat to assess condition for future analysis	Analysis of fish habitat condition and trend
Thompson	Watershed Improvement Project	1997	Construct 8 barbs and riparian planting to portions of Thompson	Reduce sediment impacts to aquatic habitat
	Salmon River		Livestock management	Improvement in

Thompson	Breaks Allot Management Plan	1997	plan for grazing in a manner appropriate for aquatic resources	riparian condition and bank stability decreased sediment

YANKEE FORK KEY WATERSHED

DRAINAGE	PROJECT NAME	YEAR	PROJECT DESCRIPTION	RESOURCE BENEFITS
Yankee Fork	Stream Temp Monitoring	1995	Placement and analysis of temperature devices at 4 locations	Assess impacts to water quality from resource mgt
Yankee Fork	Stream Sediment Monitoring	1995	McNeil Core Sampling of depth fines Jordan, W F, 10 mi, 8 mi, main	Data used to analyze management affects on aquatic
Yankee Fork	Preachers Cove Reclamation (mining)	1996	Phase 1 of mining mill reclamation project	Reduce risks to Yankee Fork Fisheries
Yankee Fork	Stream Sediment Monitoring	1996	McNeil Core Sampling of depth fines Jordan, W F, 10 mi, 8 mi, main	Data used to analyze management affects on aquatic
Yankee Fork	R1/R4 Fish Habitat Survey Subset	1997	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat condition and trend
Yankee Fork	Preachers Cove Reclamation Project	1997	Phase 2-Removal of 100 tons of hazardous material	Reduce risks to Yankee Fork Fisheries
Yankee Fork	Stream Temp Monitoring	1997	Placement and analysis of temperature devices at 4 locations. Aquatic resources	Data used to analyze affects on aquatic resource Decreased sediment
Yankee Fork	Stream Sediment Monitoring	1997	McNeil Core Sampling of depth fines Jordan, W F, 10 mi, 8 mi, main	Data used to analyze management affects on aquatic

EAST FORK SALMON RIVER KEY WATERSHED

DRAINAGE	PROJECT NAME	YEAR	PROJECT DESCRIPTION	RESOURCE BENEFITS
Pine	Pine Creek Allotment Managemen t Plan	1994	Livestock management plan for grazing in a manner appropriate for aquatic resources	Improvement in riparian condition and bank stability Decreased Sediment
Herd E Pass	Stream Temp Monitoring	1995	Placement and analysis of temperature devices at 3 locations	Assess impacts to water quality from resource mgt
Herd Pine Fox	R1/R4 Fish Habitat Survey Subset	1995	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat condition and trend
Herd E Pass	Stream Sediment Monitoring	1995	McNeil Core Sampling of depth fines Herd and E Pass Creeks	Data used to analyze management affects on aquatic
Herd E Pass Fox	R1/R4 Fish Habitat Survey	1995	Survey Fish habitat to assess condition for future analysis	Analysis of fish habitat condition and trend
Lake Cr Herd W Pass	R1/R4 Fish Habitat Survey	1996	Survey Fish habitat to assess condition for future analysis	Analysis of fish habitat condition and trend
Herd	Herd Creek Riparian Excl	1996	Construction of 2 miles of fence to exclude Livestock from Herd Cr	Improve riparian seral cond and aquatic habitat
Herd Pine E Pass Fox	R1/R4 Fish Habitat Survey Subset	1996	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat condition and trend
Herd Pine Fox	R1/R4 Fish Habitat Survey Subset	1997	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat condition and trend
Pine	R1/R4 Fish Habitat Survey	1997	Survey Fish habitat to assess condition for future analysis	Analysis of fish habitat condition and trend

Yankee Fork R D – Salmon-Challis N F
Bull Trout Conservation – Related Projects

DRAINAGE	PROJECT NAME	YEAR	PROJECT DESCRIPTION	RESOURCE BENEFITS
Bayhorse	Bull Trout Population Survey	1998	Determine Fish Population Density, following IDFG Protocol	Analysis of fish Population and Trend
Kinnicknic	Bull Trout Population Survey	1998	Determine Fish Population Density, following IDFG Protocol	Analysis of fish Population and Trend
Squaw	Bull Trout Population Survey	1998	Determine Fish Population Density, following IDFG Protocol	Analysis of fish Population and Trend
Thompson	Bull Trout Population Survey	1998	Determine Fish Population Density, following IDFG Protocol	Analysis of fish Population and Trend
Burnt, Badger, Gardner	Bull Trout Population Survey	1998	Determine Fish Population Density, following IDFG Protocol	Analysis of fish Population and Trend
Peach	Bull Trout Population Survey	1998	Determine Fish Population Density, following IDFG Protocol	Analysis of fish Population and Trend
Basin	Bull Trout Population Survey	1998	Determine Fish Population Density, following IDFG Protocol	Analysis of fish Population and Trend
Pine	Bull Trout Population Survey	1998	Determine Fish Population Density, following IDFG Protocol	Analysis of fish Population and Trend
Knapp, Marsh	Stream Temp Monitoring	1998-2000	Placement and Analysis of Temperature Devices	Assess impacts to water quality from resource management

DRAINAGE	PROJECT NAME	YEAR	PROJECT DESCRIPTION	RESOURCE BENEFITS
Basin	Stream Temp Monitoring	1998-2000	Placement and Analysis of Temperature Devices	Assess impacts to water quality from resource management
Yankee Fork	Stream Temp Monitoring	1998-2000	Placement and Analysis of Temperature Devices	Assess impacts to water quality from resource management
Peach, Gardner	Stream Temp Monitoring	1998-2000	Placement and Analysis of Temperature Devices	Assess impacts to water quality from resource management
Thompson	Stream Temp Monitoring	1998-2000	Placement and Analysis of Temperature Devices	Assess impacts to water quality from resource management
Squaw	Stream Temp Monitoring	1998-2000	Placement and Analysis of Temperature Devices	Assess impacts to water quality from resource management
Kinnicknic	Stream Temp Monitoring	1998-2000	Placement and Analysis of Temperature Devices	Assess impacts to water quality from resource management
Bayhorse	Stream Temp Monitoring	1998-2000	Placement and Analysis of Temperature Devices	Assess impacts to water quality from resource management
Herd	Stream Temp Monitoring	1998-2000	Placement and Analysis of Temperature Devices	Assess impacts to water quality from resource management
Marsh, Knapp, Valley	R1/R4 Fish Habitat Survey Subset	1998-2000	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat conditions and trend

DRAINAGE	PROJECT NAME	YEAR	PROJECT DESCRIPTION	RESOURCE BENEFITS
Basin	R1/R4 Fish Habitat Survey Subset	1998-2000	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat conditions and trend
Thompson	R1/R4 Fish Habitat Survey Subset	1998-2000	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat conditions and trend
Squaw	R1/R4 Fish Habitat Survey Subset	1998-2000	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat conditions and trend
Kinnicknic	R1/R4 Fish Habitat Survey Subset	1998-2000	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat conditions and trend
Bayhorse	R1/R4 Fish Habitat Survey Subset	1998-2000	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat conditions and trend
Herd	R1/R4 Fish Habitat Survey Subset	1998-2000	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat conditions and trend
Pine	R1/R4 Fish Habitat Survey Subset	1998-2000	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat conditions and trend
Muley	R1/R4 Fish Habitat Survey Subset	1998-2000	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat conditions and trend
Peach	R1/R4 Fish Habitat Survey Subset	1998-2000	Survey fish habitat to assess impacts from livestock grazing	Analysis of fish habitat conditions and trend

DRAINAGE	PROJECT NAME	YEAR	PROJECT DESCRIPTION	RESOURCE BENEFITS
Coal Creek (Basin Watershed)	Culvert Replacement	2000	Replace existing culvert with a baffled culvert	Allow for fish migration passage providing access to 3 mi habitat
Rankin Creek (Yankee Fk Watershed)	Culvert Replacement	2000	Replace existing culvert	Allow for fish migration passage providing access to 2 mi habitat
American Creek	Culvert Replacement	2000	Replace existing culvert	Allow for fish migration passage providing access to 3 mi habitat
Yankee Fork	Dredge Pile Restoration	1999-2000	Ongoing Project to Restore active floodplain - Design and analysis	Restore geomorphology of the Yankee Fork River. Providing improved spawning and rearing for salmonids
Yankee Fork	Fire Rehab	2000	Rehab of Rankin Creek Fire	Reduce impacts if Rankin Creek Fire, stabilizing soils
Pine	Bull Trout Population Survey	1999	Determine Fish Population Density, following IDFG Protocol	Analysis of fish Population and Trend
Greylock Creek	Culvert Bridge Replacement	1999	Replace existing Bridge	Allow for fish migration passage, stabilize streambanks
Thompson Creek	Schelite Jim Mill Site Restoration	1999	Create wetland to reduce heavy metals and ARD from mining	Improve water quality

Appendix I

Streambank and Road Erosion Inventory, Depth Fine Sediment Methods and Results

Sediment TMDL Methods and Results

Introduction

This appendix documents the analytical techniques and data used to develop the gross sediment budget and instream sediment measures used in this TMDL. It describes the methods, data, and results for the 1) stream bank erosion inventory and 2) for surface and subsurface fine sediment data. These data are intended to characterize the natural and existing condition of the landscape, estimate the desired level of erosion and sedimentation, and provide baseline data that can be used in the future to track the effectiveness of TMDL implementation. For example, the stream bank erosion inventories can be repeated and will ultimately provide an adaptive management or feedback mechanism.

Stream bank Erosion Inventory

The stream bank erosion inventory used to estimate background and existing stream bank erosion followed methods outlined in the proceedings from the Natural Resource Conservation Service (NRCS) Channel Evaluation Workshop (1983). Using the direct volume method, sub-sections of 1996 303(d) watersheds were surveyed to determine the extent of chronic bank erosion and estimate the needed reductions.

The NRCS stream bank erosion inventory is a field-based methodology, which measures stream bank/channel stability, length of active eroding banks, and bank geometry. The stream bank/channel stability inventories were used to estimate the long-term lateral recession rate. The recession rate is determined from field evaluation of stream bank characteristics that are assigned a categorical rating ranging from 0 to 3. The categories of rating the factors and rating scores are:

Bank Stability:

Do not appear to be eroding - 0
Erosion evident - 1
Erosion and cracking present - 2
Slumps and clumps sloughing off - 3

Bank Condition:

Some bare banks, few rills, no vegetative overhang - 0
Predominantly bare, some rills, moderate vegetative overhang - 1
Bare, rills, severe vegetative overhang, exposed roots - 2
Bare, rills and gullies, severe vegetative overhang, falling trees - 3

Vegetation / Cover On Banks:

Predominantly perennials or rock-covered - 0
Annuals / perennials mixed or about 40% bare - 1
Annuals or about 70% bare - 2
Predominantly bare - 3

Bank / Channel Shape:

V - shaped channel, sloped banks - 0
Steep V - shaped channel, near vertical banks - 1
Vertical Banks, U - shaped channel - 2
U - shaped channel, undercut banks, meandering channel – 3

Channel Bottom:

Channel in bedrock / non-eroding - 0
Soil bottom, gravels or cobbles, minor erosion - 1
Silt bottom, evidence of active downcutting - 2

Deposition:

No evidence of recent deposition - 1
Evidence of recent deposits, silt bars - 0

Cumulative Rating

Slight (0-4) Moderate (5-8) Severe (9+)

From the cumulative rating, the lateral recession rate is assigned.

0.01 - 0.05 feet per year	**Slight**
0.06 - 0.15 feet per year	**Moderate**
0.16 - 0.3 feet per year	**Severe**
0.5+ feet per year	**Very Severe**

Stream bank stability can also be characterized through the following definition and the corresponding stream bank erosion condition rating. Ratings from Bank Stability or Bank Condition, above, are included in italics.

Stream banks are considered stable if they do not show indications of any of the following features:

Breakdown - Obvious blocks of bank broken away and lying adjacent to the bank. *Bank Stability Rating 3*

Slumping or False Bank - Bank has obviously slipped down, cracks may or may not be obvious, but the slump feature is obvious. *Bank Stability Rating 2*

Fracture - A crack is visibly obvious on the bank indicating that the block of bank is about to slump or move into the stream. *Bank Stability Rating 2*

Vertical and Eroding - The bank is mostly uncovered and the bank angle is steeper than 80 degrees from the horizontal. *Bank Stability Rating 1*

Stream banks are considered covered if they show any of the following features:

Perennial vegetation ground cover is greater than 50%. *Vegetation/Cover Rating 0*

Roots of vegetation cover more than 50% of the bank (deep rooted plants such as willows and sedges provide such root cover). *Vegetation/Cover Rating 1*

At least 50% of the bank surfaces are protected by rocks of cobble size or larger. *Vegetation/Cover Rating 0*

At least 50% of the bank surfaces are protected by logs of 4-inch diameter or larger. *Vegetation/Cover Rating 1*

Stream bank stability is estimated using a simplified modification of Platts, Megahan, and Minshall (1983, p. 13) as stated in *Monitoring Protocols to Evaluate Water Quality Effects of Grazing Management on Western Rangeland Streams* (Bauer and Burton, 1993). The modification allows for measuring stream bank stability in a more objective fashion. The lengths of banks on both sides of the stream throughout the entire linear distance of the representative reach are measured and proportioned into four stability classes as follows:

Mostly covered and stable (non-erosional). Stream banks are over 50% covered as defined above. Stream banks are stable as defined above. Banks associated with gravel bars having perennial vegetation above the scourline are in this category. *Cumulative Rating 0 - 4 (slight erosion) with a corresponding lateral recession rate of 0.01 - 0.05 feet per year.*

Mostly covered and unstable (vulnerable). Stream banks are over 50% covered as defined above. Stream banks are unstable as defined above. Such banks are typical of "false banks" observed in meadows where breakdown, slumping, and/or fracture show instability, yet vegetative cover is abundant. *Cumulative Rating 5 - 8 (moderate erosion) with a corresponding lateral recession rate of 0.06 - 0.2 feet per year.*

Mostly uncovered and stable (vulnerable). Stream banks are less than 50% covered as defined above. Stream banks are stable as defined above. Uncovered, stable banks are typical of stream banks trampled by concentrations of cattle. Such trampling flattens the bank so that slumping and breakdown do not occur even though vegetative cover is significantly reduced or eliminated. *Cumulative Rating 5 - 8 (moderate erosion) with a corresponding lateral recession rate of 0.06 - 0.2 feet per year.*

Mostly uncovered and unstable (erosional). Stream banks are less than 50% covered as defined above. They are also unstable as defined above. These are bare eroding stream banks and include ALL banks mostly uncovered, which are at a steep angle to the water surface. *Cumulative Rating 9+ (severe erosion) with a corresponding lateral recession rate of over 0.5 feet per year.*

Stream banks were inventoried to quantify bank erosion rate and annual average erosion. These data were used to develop a quantitative sediment budget to be used for TMDL development.

Site Selection

The first step in the bank erosion inventory is to identify key problem areas. Stream bank erosion tends to increase as a function of watershed area (NRCS, 1983). As a result, the lower stream segment of larger watersheds tend to be problem areas. These stream segments tend to be alluvial streams commonly classified as response reaches (Rosgen B and C channel types).

Because it is often unrealistic to survey every stream segment, sampled reaches were used and bank erosion rates were extrapolated over a larger stream segment. The length of the sampled reach is a function of stream type variability where streams segments with highly variable channel types need a large sample, whereas segments with uniform gradient and consistent geometry need less. Typically between 10 and 30 percent of stream bank needs to be inventoried. Often, the location of some stream inventory reaches is more dependent on land ownership than watershed characteristics. For example, private land owners are sometimes unwilling to allow access to stream segments within their property.

Stream reaches are subdivided into *sites* with similar channel and bank characteristics. Breaks between sites are made where channel type and/or dominate bank characteristics change substantially. In a stream with uniform channel geometry there may be only one site per stream reach, whereas in an area with variable conditions there may be several sites. The subdivision of stream reaches is at the discretion of the field crew leader.

Field Methods

Stream bank erosion or channel stability inventory field methods were originally developed by the U.S. Forest Service (Pfankuch, 1975). Further development of channel stability inventory methods are outlined in Lohrey (1989) and NRCS (1983). As stated above, the NRCS (1983) document

outlines field methods used in this inventory. However, slight modifications to the field methods were made and are documented.

Field crews typically consist of two to four people and are trained as a group to ensure quality control or consistent data collection. Field crews survey selected stream reaches measuring bank length, slope height, bankfull width and depth, and bank content. In most cases, a Global Positioning System is used to locate the upper and lower boundaries of inventoried stream reaches. Additionally, while surveying field crews photograph key problem areas.

Bank Erosion Calculations

The direct volume method is used to calculate average annual erosion rates for a given stream segment based on bank recession rates determined in the survey (NRCS, 1983). The erosion rate (tons/mile/year) is used to estimate the total bank erosion of the selected stream corridor. The direct volume method is summarized in the following equations:

$$E = [A_E * R_{LR} * \rho_B]/2000 \text{ (lbs/ton)}$$

where:
E = bank erosion over sampled stream reach (tons/yr/sample reach)
A_E = eroding area (ft^2)
R_{LR} = lateral recession rate (ft/yr)
ρ_B = bulk density of bank material (lps/ft^3)

The bank erosion rate (E_R) is calculated by dividing the sampled bank erosion (E) by the total stream length sampled:

$$E_R = E/L_{BB}$$

where:
E_R = bank erosion rate (tons/mile/year)
E = bank erosion over sampled stream reach (tons/yr/sample reach)
L_{BB} = bank to bank stream length over sampled reach

Total bank erosion is expressed as an annual average. However, the frequency and magnitude of bank erosion events are greatly a function of soil moisture and stream discharge (Leopold et al. 1964). Because channel erosion events typically result from above average flow events, the annual average bank erosion value should be considered a long term average. For example, a 50-year flood event might cause five feet of bank erosion in one year and over a ten-year period this events accounts for the majority of bank erosion. These events have less of an influence where bank trampling is the major cause of channel instability.

The *eroding area* (A_E) is the product of linear horizontal bank distance and average bank slope height. Bank length and slope heights are measured while walking along the stream channel. Pacing is used to measure horizontal distance, and bank slope heights are continually measured and averaged over a given reach or site. The horizontal length is the length of the right or left bank, not both. Typically, one bank along the stream channel is actively eroding, such as the bank on the outside of a meander. However, both banks of channels with severe headcuts or gullies will be eroding and are to be measured separately and eventually summed.

Determining the *lateral recession rate* (R_{LR}) is one of the most critical factors in this methodology (NRCS, 1983). Several techniques are available to quantify bank erosion rates, such as aerial photo interpretation, anecdotal data, bank pins, and channel cross-sections.

To facilitate consistent data collection, the NRCS developed rating factors used to estimate lateral recession rate. Similar to methods developed by Pfankuch (1975), the NRCS method measures bank and channel stability, and then uses the ratings as surrogates for bank erosion rates.

The *bulk density* (ρ_B) of bank material is measured ocularly in the field. Soil bulk density is the weight of material divided by its volume, including the volume of its pore spaces. A table of typical soil bulk densities can be used, or soil samples can be collected and soil bulk density measured in the laboratory.

Subsurface Fine Sediment Sampling

McNeil Sediment Core samples were collected to describe size composition of bottom materials in salmonid spawning beds of streams on the 303(d) list for sediment. Research has shown that subsurface fine sediment composition is important to egg and fry survival (Hall 1986); (Reiser and White 1988). Data gathered as part of this TMDL and other studies relevant to the Challis Creek subwatershed are presented after the narrative section of this appendix.

Site Selection

Sample sites selected displayed characteristics of gravel size, depth, and velocity required by salmonids to spawn and were determined to be adequate spawning substrate by an experienced fisheries biologist. Samples were collected during periods of low discharge, as described in McNeil and Ahnell (1964), to minimize loss of silt in suspension within the core sampling tube. Sample sites were generally in the lower reach of streams where spawning habitat was determined to exist.

Field Methods

A 12-inch stainless steel open cylinder was worked manually as far as possible, at least 4 inches, into spawning substrate without allowing flowing water to top the core sampling tube. Samples of bottom materials were removed by hand, using a stainless steel mixing bowl, to a depth of at least 4 inches and placed into buckets. After solids were removed from the core sampling tube and placed into buckets, the remaining suspended material was discarded. It is felt that this fine material would be removed through the physical action of excavating a redd and would not be a significant factor with regard to egg to fry survival. Additionally, rinsing of sieves to process the sample results in some loss of the fraction below the smallest (0.053 mm) mesh size.

Samples were placed wet into a stack of sieves and were separated into 10 size classes by washing and shaking them through nine standard Tyler sieves having the following square mesh openings (in mm): 63, 25, 12.5, 6.3, 4.75, 2.36, .85, .212, .053. Silt passing the finest screen was discarded.

The volume of solids retained by each sieve was measured after the excess water drained off. The contents of each of the sieves were placed in a bucket filled with water to the level of a spigot for measurement by displacement. The water displaced by solids was collected in a plastic bucket and transferred to a 2,000 ml graduated cylinder and measured directly. Water displaced by solids retained by the smaller diameter sieves was also collected in a plastic bucket and measured in a 250 ml graduated cylinder. Variation in sample volumes was caused by variation in porosity and

core depth. All sample fractions were expressed as a percentage of the sample with and without the 63 mm fraction.

Three sediment core samples were collected at each sample site and grouped together by fractions 6.3 mm and greater and 4.75 mm to 0.53 mm. The results for a particular site are the percentage of 4.75 mm to 0.53 mm as a percent of the total sample. Standard deviation is calculated for estimates including and excluding particles 63 mm and above.

Surface Erosion from Roads

Surface erosion from unimproved/unsurfaced roads and four-wheel drive trails considered to generally be within 50 meters of TMDL waters was estimated using numerical values from an extension of the US Department of Agriculture WEPP model. This model has been widely applied to estimate surface erosion from unsurfaced roads, particularly on USFS lands. The model is based on the gradient of the road, the distance to the stream (buffer distance), the slope angle to the stream (buffer slope), the width of the road, the soil type adjacent to the road and the amount of precipitation on the road. The assumptions used for the estimated tons of sediment produced over a particular reach of road were that the buffer slope was not more than 25%, road width was 15 feet, distance to the stream was not more than 120 meters, the soil or road material was gravelly loam and erosion was primarily snowmelt driven which uses an annual precipitation of 32 inches. It is likely that erosion is consistently over estimated given these assumptions within the Challis Creek watershed, however the purpose is to conservatively estimate erosion load and to prioritize sources that may be having an impact on aquatic beneficial uses. It is felt that erosion estimates are a valid tool for identifying and ranking sources in which to apply reductions based on implementation of BMPs.

Segments to be evaluated were identified using 7.5 minute USGS topographical maps and orthoquad aerial photos. The distance to water was estimated using an optical range finder on site. Gradient was determined using digital rasterized 7.5 minute USGS topographical maps to determine road distance for each 40 foot contour interval along the road being evaluated.

Erosion estimates from the WEPP model were made for gradients of 2%, 4%, 8% and 16%. Linear regression was used to interpolate intermediate values for gradients from 1 to 44 percent. Predicted tons per mile were then applied to the various segment lengths at each of the observed gradients and accumulated to estimate the tons of sediment produced by each segment of Road. Tons of sediment was broken down by the distance to the stream to show the relative amount in each distance interval. The result is a conservative estimate of sediment delivered to the stream in question with an implicit margin of safety.

Stream Bank Erosion Inventory Worksheet

Stream Challis Creek

Section Lower: Approximately 2 miles above confluence with Salmon River

Field Crew Tom Herron DEQ, Sr. Water Quality Analyst **Data reduced by** Tom Herron, DEQ

Land Use Grazing, irrigated pasture and crop

Stream Segment Location

		Degrees	Minutes	Elevation
GPS: Upstream	N	44	33.8298	
	W	114	13.718	
Downstream	N	44	33.726	
	W	114	13.0854	

Stream Bank Erosion Calculations

AVE. Bank Height:	2.3	feet	**Inv. bank to bank length (LBB)**	6168	feet
bank to bank Eroding Seg. Length	2520	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.41				
Bank erosion over sampled reach (E)	95	tons/year/sample reach			
Erosion Rate (ER)	96	tons/mile/year			
Feet of Similar Stream Type	20239	feet			
Eroding bank extrapolation	19057.70	feet			
Total stream bank erosion	**422**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	41	tons/year/sample reach
Erosion Rate (ER)	71	tons/mile/year
Feet of Similar Stream Types	20239.00	feet
Eroding bank extrapolation	9329.20	feet
Total stream bank erosion	**312.8**	tons/year

Comments

Flow a contributing factor?: No

Other contributing factors?: Head cut at N 44 33.7941, W 114 13.62942. Evidence of old log jam that blew-out resulting in short-term, very high flow. This event likely affected stream for some distance below. Horse paddock and cattle pasture accessing stream over lower reach. Extrapolated upstream to middle reach and downstream to confluence.

Stream Bank Erosion Inventory Worksheet

Stream Challis Creek

Section From 1/4 mile above Mill Cr. Road to 1 mile below Mill Cr. Road

Field Crew Tom Herron DEQ, Sr. Water Quality Analyst **Data reduced by** Tom Herron, DEQ

Land Use Transportation, Recreation, Residential, Grazing

Stream Segment Location

		Degrees	Minutes	Elevation
GPS: Upstream	N	44	33.726	
	W	114	17.0172	
Downstream	N	44	33.7092	
	W	114	15.5364	

Stream Bank Erosion Calculations

AVE. Bank Height:	1.0	feet	**Inv. bank to bank length (LBB)**	14466	feet
bank to bank Eroding Seg. Length	2892	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.20				
Bank erosion over sampled reach (E)	6	tons/year/sample reach			
Erosion Rate (ER)	5	tons/mile/year			
Feet of Similar Stream Type	0	feet			
Eroding bank extrapolation	2892.00	feet			
Total stream bank erosion	**6**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	8	tons/year/sample reach
Erosion Rate (ER)	6	tons/mile/year
Feet of Similar Stream Types	0.00	feet
Eroding bank extrapolation	2893.20	feet
Total stream bank erosion	**8.0**	tons/year

Comments

Flow a contributing factor?: No.

Other contributing factors?: Valley Narrows, good riparian shrubery, rock armored banks.

Other Notes: Little grazing over this reach. Significant diversion below this reach.

Stream Bank Erosion Inventory Worksheet

Stream Challis Creek

Section From Upper Extrapolation Point to 1/4 mile above Mill Cr. Road

Field Crew Tom Herron DEQ, Sr. Water Quality Analyst **Data reduced by** Tom Herron, DEQ

Land Use Grazing, Transportation, Residential

Stream Segment Location

		Degrees	Minutes	Elevation
GPS Upstream	N	44	34.3686	
	W	114	21.3096	
Downstream	N	44	33.7254	
	W	114	17.0208	

Stream Bank Erosion Calculations

AVE Bank Height:	1.2	feet	**Inv. bank to bank length (Lbb)**	47520	feet
bank to bank Eroding Seg. Length	19008	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.40				
Bank erosion over sampled reach (E)	46	tons/year/sample reach			
Erosion Rate (Er)	10	tons/mile/year			
Feet of Similar Stream Type	0	feet			
Eroding bank extrapolation	19008.00	feet			
Total stream bank erosion	**46**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	29	tons/year/sample reach
Erosion Rate (Er)	6	tons/mile/year
Feet of Similar Stream Types	0.00	feet
Eroding bank extrapolation	9504.00	feet
Total stream bank erosion	**28.5**	tons/year

Comments

Flow a contributing factor?: No.

Other contributing factors?: Valley Narrows, good riparian shrubery, rock armored banks.

Other Notes: Little grazing over this reach. Significant diversion below this reach.

Stream Bank Erosion Inventory Worksheet

Stream Challis Creek

Section Upper: From Forest Rd crossing below reservoir to just above beaver dams, extrapolated to White Valley Cr (minus beaver dams)

Field Crew Tom Herron DEQ, Sr. Water Quality Analyst **Data reduced by** Tom Herron, DEQ

Land Use Grazing, Transportation, Recreation

Stream Segment Location

		Degrees	Minutes	Elevation
GPS Upstream	N	44	31.859	
	W	114	25.1376	
Downstream	N	44	32.3298	
	W	114	24.613	

Stream Bank Erosion Calculations

AVE. Bank Height:	3.0	feet	**Inv. bank to bank length (Lse)**	7940	feet
bank to bank Eroding Seg. Length	3176	feet	(Inventoried stream length X 2)		
Percent eroding bank	0.40				
Bank erosion over sampled reach (E)	53	tons/year/sample reach			
Erosion Rate (ER)	71	tons/mile/year			
Feet of Similar Stream Type	19681	feet			
Eroding bank extrapolation	18920.80	feet			
Total streambank erosion	**318**	tons/year			

Stream Bank Erosion Reduction Calculations

Bank erosion over sampled reach (E)	27	tons/year/sample reach
Erosion Rate (ER)	36	tons/mile/year
Feet of Similar Stream Types	19681.00	feet
Eroding bank extrapolation	9460.40	feet
Total streambank erosion	**159.1**	tons/year

Comments

Flow a contributing factor?: Yes. Likely high velocities in spring flow.

Other contributing factors?: Steep gradient in alluvial fan and glacial outwash cobble at mouth of canyon. Many old channels at much higher grade. Two large log jams and significant course woody debris. Changes to lower gradient over 2nd reach.

Upper Challis Creek Road Sediment Calculations

Elevation	Road Segment L	Dist.toWater	%Gradient	Tons/Mile	Tons/Seg.	Notes:	
6560	0	5	5	10.3		Start	Segs/Reach
6520	774	60	5	10.3	1.5		1.1
6480	718	15	6	12.4	1.7		1.0
6440	951	90	4	8.3	1.5		1.4
6400	942	60	4	8.3	1.5		1.4
6360	1525	3	3	6.2	1.8		2.2
6320	1076	120	4	8.3	1.7		1.6
6280	944	21	4	8.3	1.5		1.4
6240	640	45	6	12.4	1.5	End	0.9
Relief (ft)	Total Sample(ft)	Transect Interval	Ave. Gradient		Tot. Tons		**11**
320	7570	688	4.2		**12.6**		

Middle Challis Creek Road Sediment Calculations

Elevation	Road Segment L	Average Dist to V	%Gradient	Tons/Mile	Tons/Seg.	Notes:	
5860	0					Start	Segs/Reach
5840	1594	50.4	3	6.2	1.9		4.6
5800	1095	7.3	5	10.3	2.1		3.2
5760	1404	61	6	12.4	3.3		4.1
5720	2181	51.3	4	8.3	3.4		6.3
5680	633	89.5	4	8.3	1.0	End	1.8
Relief (ft)	Total Sample(ft)	Transect Interval	Ave. Gradient		Tot. Tons		**20**
180	6907	345	2.6		**11.7**		

Tons of Sediment

24.3

WEPP OUTPUT	
%Gradi	tons/mile
2	3
4	8
8	19
16	32

Gradient Values	Predicted tons/mile
1	2.1
2	4.2
3	6.2
4	8.3
5	10.3
6	12.4
7	14.5
8	16.5
9	18.6
10	20.7
11	22.7
12	24.8
13	26.8
14	28.9
15	31.0
16	33.0
17	35.1
18	37.1
19	39.2
20	41.3
21	43.3
22	45.4
23	47.4
24	49.5
25	51.6
26	53.6
27	55.7
28	57.7
29	59.8
30	61.9
31	63.9
32	66.0
33	68.1
34	70.1
35	72.2
36	74.2
37	76.3
38	78.4
39	80.4
40	82.5
41	84.5
42	86.6
43	88.7
44	90.7