DRY YEAR

June 4, 2009
Spokane, Washington

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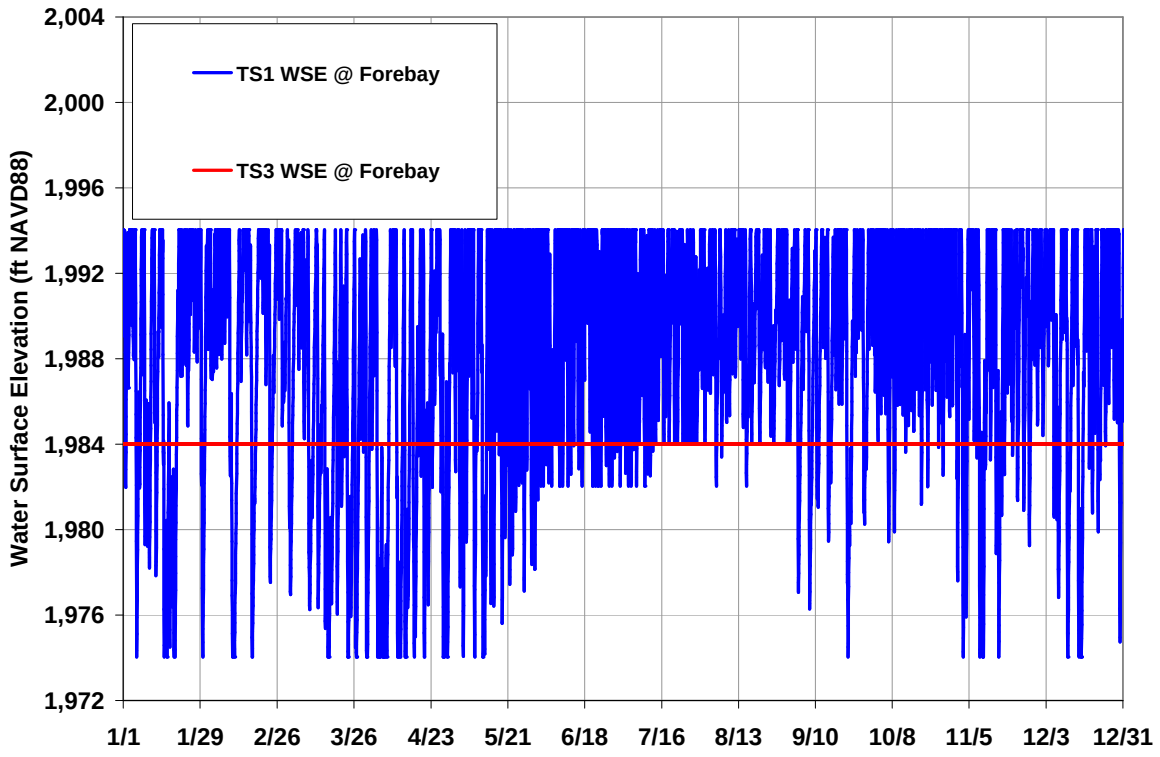

Figure D-1. Boundary forebay water surface elevations for TS-1 and TS-3

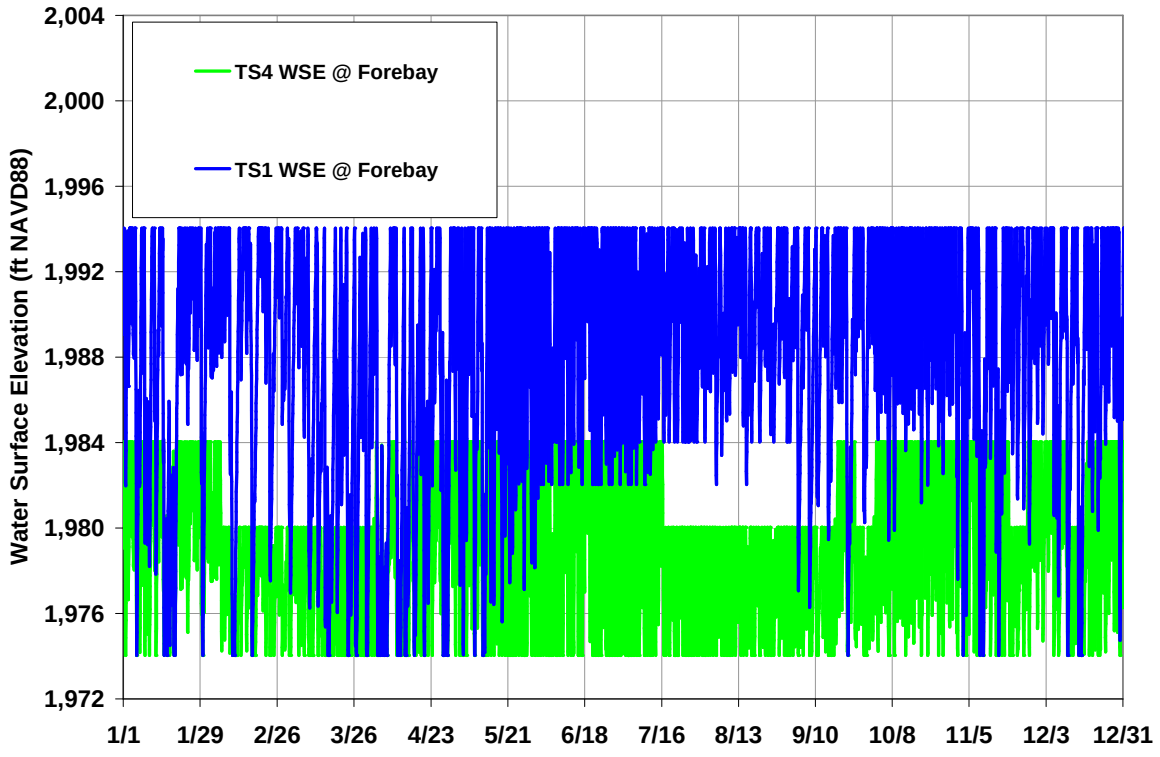

Figure D-2. Boundary forebay water surface elevations for TS-1 and TS-4

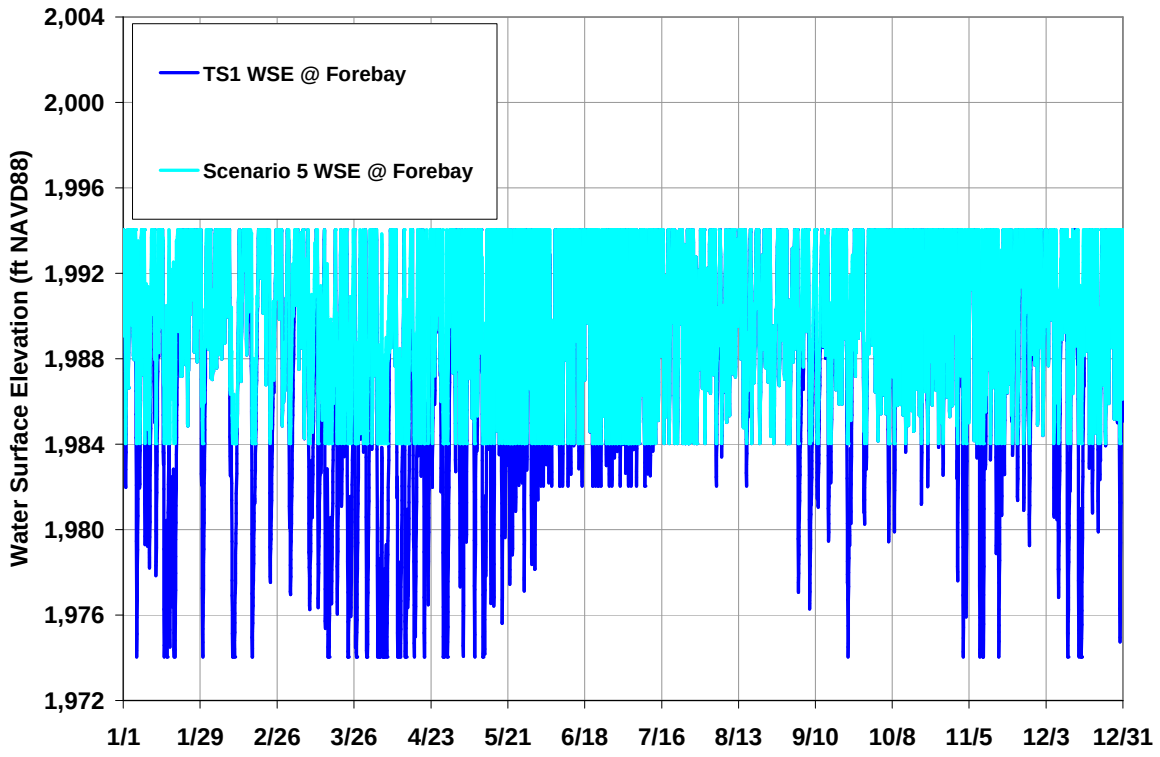

Figure D-3. Boundary forebay water surface elevations for TS-1 and S-5

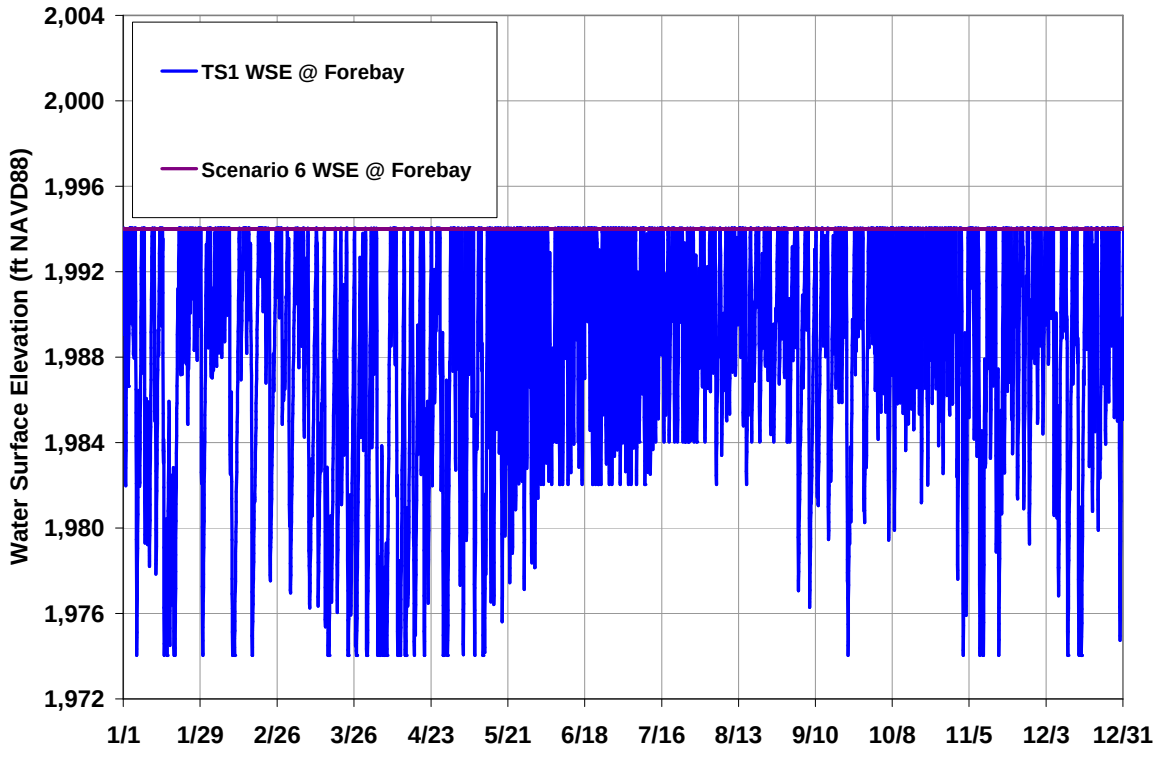

Figure D-4. Boundary forebay water surface elevations for TS-1 and S-6

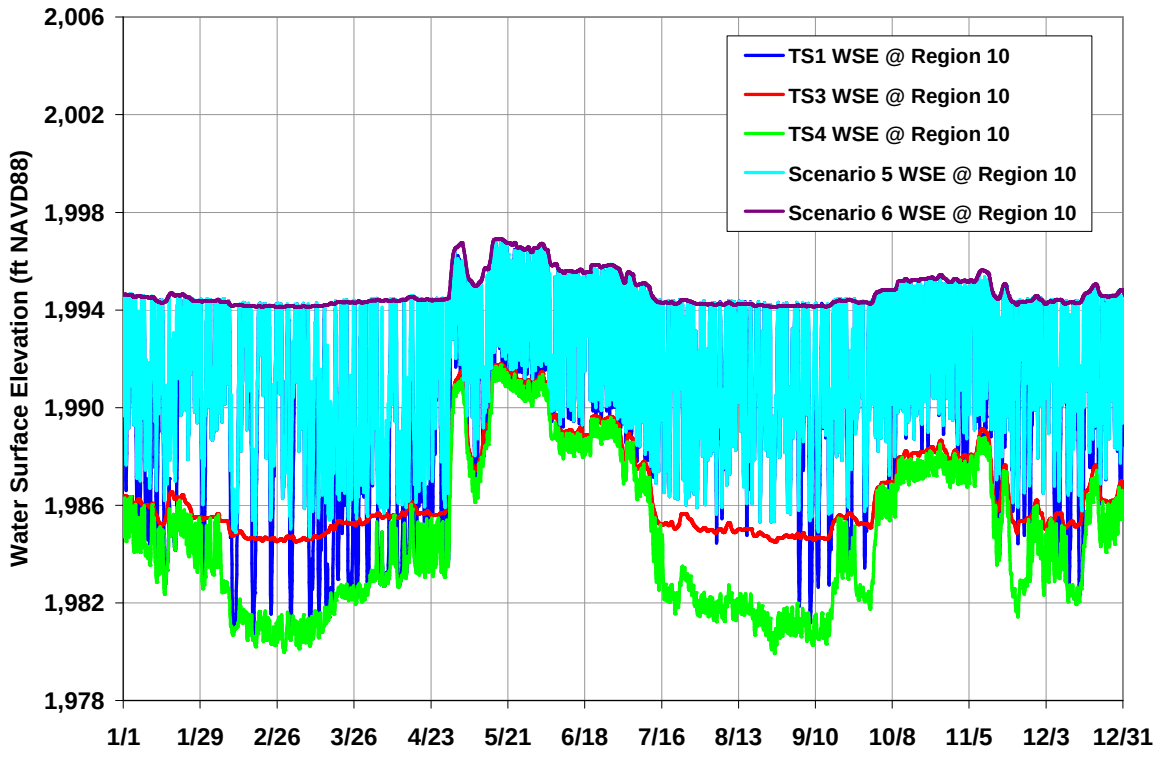

Figure D-5. Region 10 water surface elevations for all five Scenarios

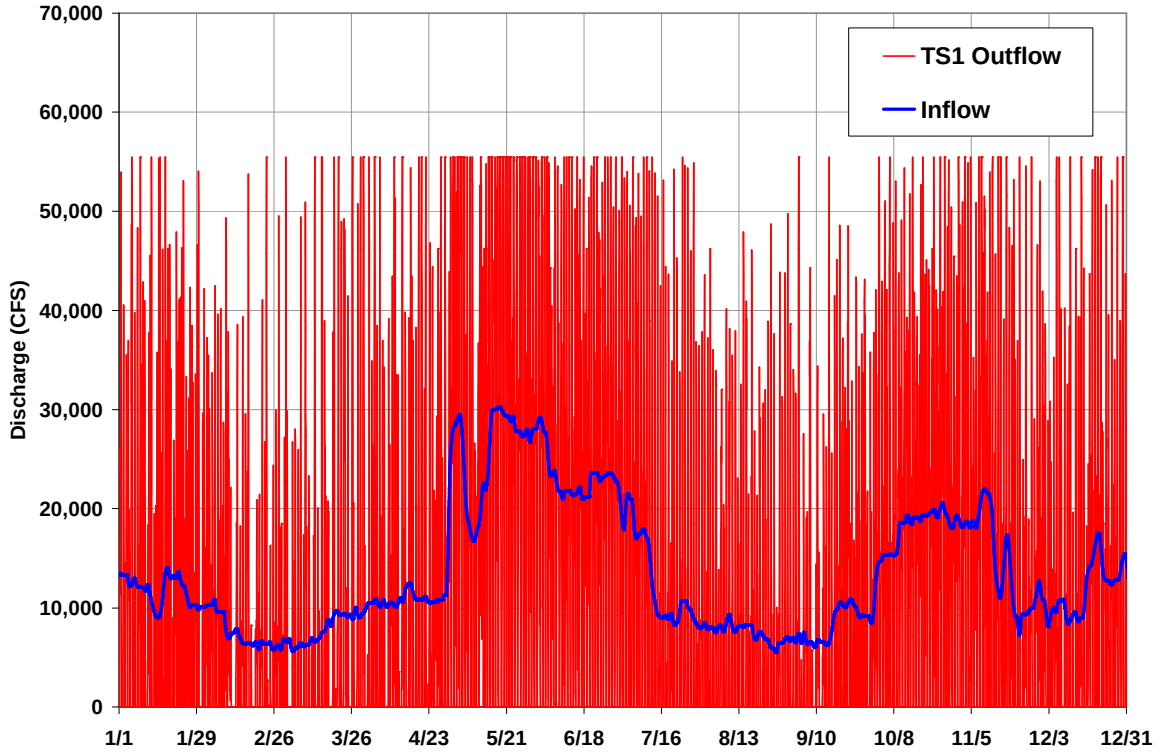

Figure D-6. Boundary project inflow and outflow for TS-1

Figure D-7. Boundary project inflow and outflow for TS-3

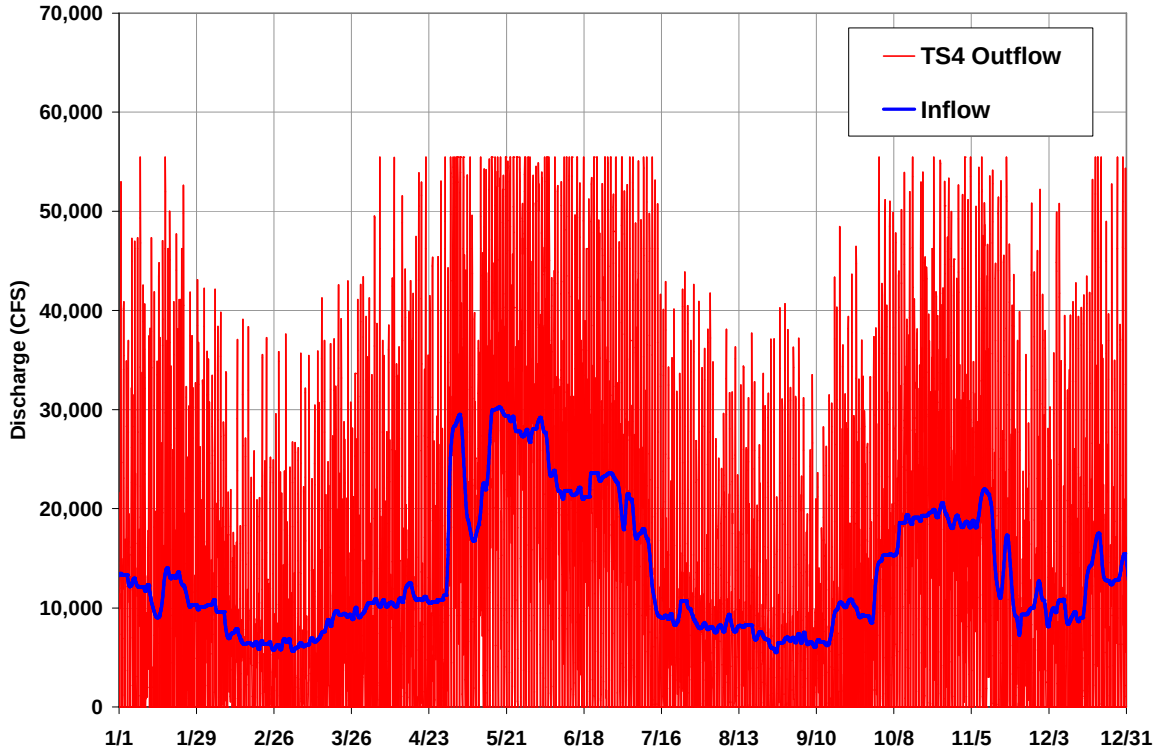

Figure D-8. Boundary project inflow and outflow for TS-4

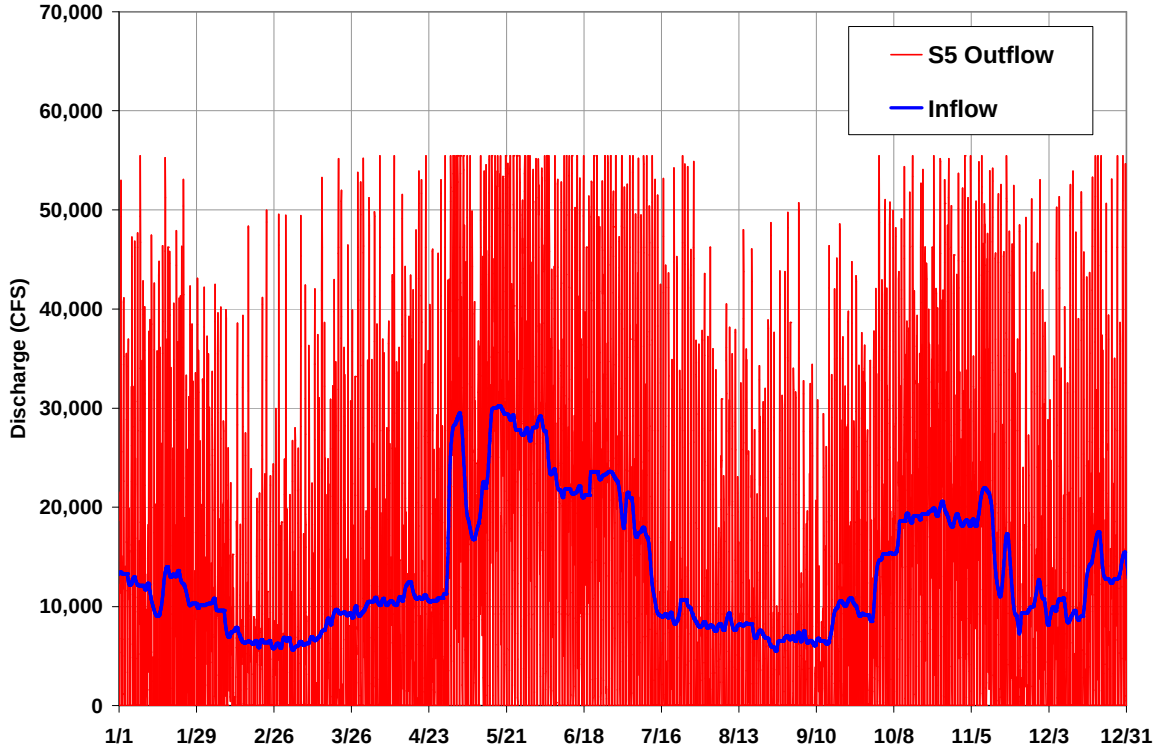

Figure D-9. Boundary project inflow and outflow for S-5

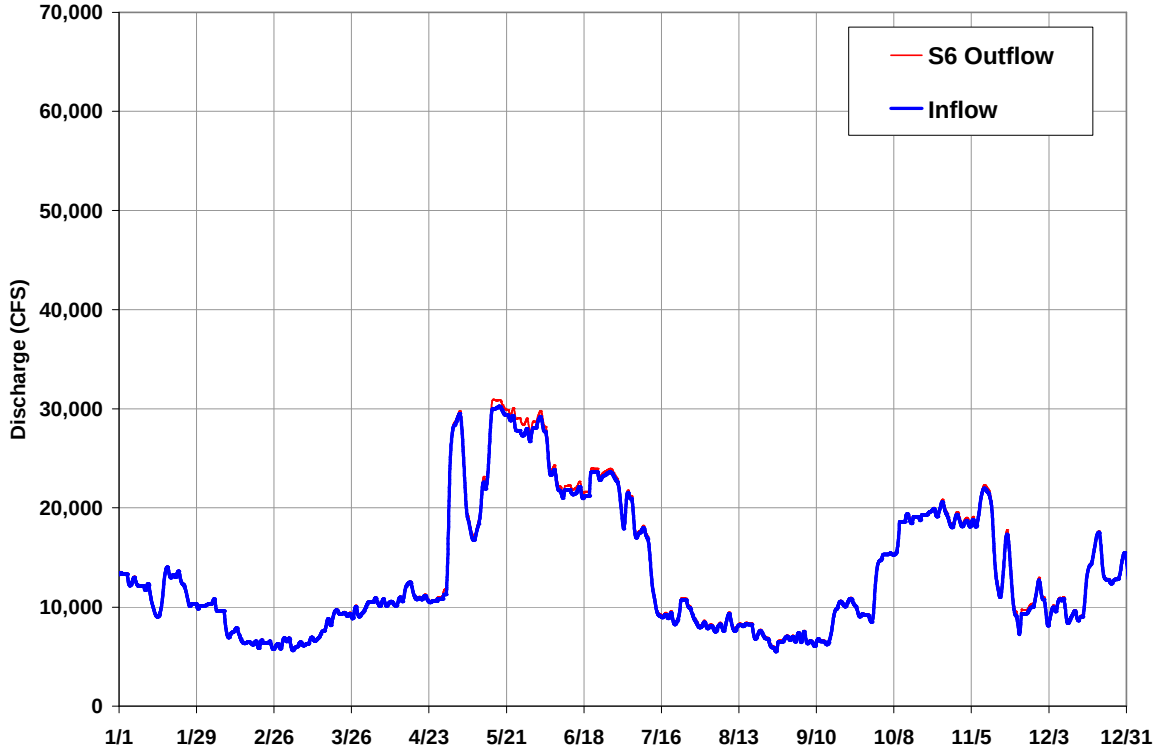

Figure D-10. Boundary project inflow and outflow for S-6

Table D-1. Monthly stranding index as daily weighted channel width (ft^2/ft) and average daily fluctuation in the Upper Reservoir Reach (ft^2/ft)

Month	TS1		TS3		TS4		S5		S6	
	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)
January	66	46	1.6	2.8	16	6.7	78	28	0	0
February	57	43	<1	1.0	6.7	3.0	58	34	0	0
March	62	81	<1	0.7	4.8	2.9	74	50	0	0
April	71	69	<1	0.3	19	12	88	45	0	0
May	42	30	4.0	5.9	16	7.7	38	20	<1	0.1
June	59	21	3.3	3.8	15	4.4	57	18	<1	0.1
July	351	160	14	21	84	58	349	159	<1	0.3
August	503	369	12	17	74	40	491	339	0	0
September	469	562	6.9	10	137	66	443	376	0	0
October	289	186	6.2	11	186	84	258	129	<1	0.1
November	81	77	4.8	5.4	22	19	84	52	<1	0.2
December	78	49	2.7	4.1	20	7.9	82	29	<1	0.1

Table D-2. Monthly stranding index as daily weighted channel width (ft^2/ft) and average daily fluctuation (ft^2/ft) for smallmouth bass fry peak periodicity in the Upper Reservoir Reach (July 1 – October 31)

Month	TS1		TS3		TS4		S5		S6	
	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)
July	351	160	14	21	84	58	349	159	<1	0.3
August	503	369	12	17	74	40	491	339	0	0
September	469	562	6.9	10	137	66	443	376	0	0
October	289	186	6.2	11	186	84	258	129	<1	0.1
Period	403	320	9.7	15	120	62	385	252	<1	0.1

Table D-3. Monthly stranding index as daily weighted channel width (ft^2/ft) and average daily fluctuation (ft^2/ft) for the entire mountain whitefish fry periodicity in the Upper Reservoir Reach (February 16 – August 15)

Month	TS1		TS3		TS4		S5		S6	
	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Mean Daily Wt. Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)
February[1]	56	58	<1	0.1	4.3	2.0	58	42	0	0
March	62	81	<1	0.7	4.8	2.9	74	50	0	0
April	71	69	<1	0.3	19	12	88	45	0	0
May	42	30	4.0	5.9	16	7.7	38	20	<1	0.1
June	59	21	3.3	3.8	15	4.4	57	18	<1	0.1
July	351	160	14	21	84	58	349	159	<1	0.3
August[2]	515	341	18	29	72	55	484	302	0	0
Period	146	94	5.2	7.8	30	19	147	78	<1	0.1

[1] Includes model results from February 16th through February 28th only
[2] Includes model results from August 1st through August 15th only

Table D-4. Monthly total trapping index (10,000 ft^2) in the Upper Reservoir Reach

Month	TS1	TS3	TS4	S5	S6
	Total Area (10,000 ft^2)	Total Area (10,000 ft^2)	Total Area (10,000 ft^2)	Total Area (10,000 ft^2)	Total Area (10,000 ft^2)
January	329	30	168	217	2.5
February	261	17	153	186	1.0
March	524	12	82	340	0.6
April	471	16	143	292	0.9
May	119	60	90	88	5.3
June	108	26	93	101	3.4
July	567	148	623	557	5.6
August	903	72	459	857	0.6
September	1,423	30	754	820	0.3
October	400	86	394	364	0.9
November	275	77	190	172	6.7
December	296	45	153	205	2.9

Table D-5. Monthly total trapping index (10,000 ft^2) for smallmouth bass fry peak periodicity in the Upper Reservoir Reach (July 1 – October 31)

Month	TS1	TS3	TS4	S5	S6
	Total Area (10,000 ft^2)	Total Area (10,000 ft^2)	Total Area (10,000 ft^2)	Total Area (10,000 ft^2)	Total Area (10,000 ft^2)
July	567	148	623	557	5.6
August	903	72	459	857	0.6
September	1,423	30	754	820	0.3
October	400	86	394	364	0.9
Period	3,293	337	2,230	2,598	7.4

Table D-6. Monthly total trapping index (10,000 ft^2) for the entire mountain whitefish fry periodicity in the Upper Reservoir Reach (February 16 – August 15)

Month	TS1	TS3	TS4	S5	S6
	Total Area (10,000 ft^2)	Total Area (10,000 ft^2)	Total Area (10,000 ft^2)	Total Area (10,000 ft^2)	Total Area (10,000 ft^2)
February[3]	134	4.6	42	90	0.7
March	524	12	82	340	0.6
April	471	16	143	292	0.9
May	119	60	90	88	5.3
June	108	26	93	101	3.4
July	567	148	623	557	5.6
August[4]	412	52	190	387	0.1
Period	2,336	318	1,262	1,855	17

[3] Includes model results from February 16th through February 28th only
[4] Includes model results from August 1st through August 15th only

Table D-7. Monthly transect weighted, reach averaged effective spawning width (ft^2/ft) and ratio of effective/potential spawning index (ESI/PSI) for smallmouth bass spawn periodicity in the Upper Reservoir Reach (May 15 – July 31)

Month	TS1		TS3		TS4		S5		S6	
	Transect Wt. Reach Ave. ESI Width (ft)	ESI / PSI Ratio	Transect Wt. Reach Ave. ESI Width (ft)	ESI / PSI Ratio	Transect Wt. Reach Ave. ESI Width (ft)	ESI / PSI Ratio	Transect Wt. Reach Ave. ESI Width (ft)	ESI / PSI Ratio	Transect Wt. Reach Ave. ESI Width (ft)	ESI / PSI Ratio
May	38	0.69	54	0.86	48	0.80	41	0.74	46	0.99
June	26	0.48	39	0.85	33	0.78	29	0.54	52	0.99
July	16	0.34	16	0.74	0.7	0.06	18	0.39	58	0.99
Period	24	0.47	33	0.83	23	0.66	26	0.51	53	0.99

Table D-8. Monthly effective spawning (ft^2/ft) and ratio of ESI/PSI for mountain whitefish spawn periodicity in the Upper Reservoir Reach (October 15 – January 15)

	TS1		TS3		TS4		S5		S6	
	Transect Wt. Reach Ave. ESI Width (ft)	ESI / PSI Ratio	Transect Wt. Reach Ave. ESI Width (ft)	ESI / PSI Ratio	Transect Wt. Reach Ave. ESI Width (ft)	ESI / PSI Ratio	Transect Wt. Reach Ave. ESI Width (ft)	ESI / PSI Ratio	Transect Wt. Reach Ave. ESI Width (ft)	ESI / PSI Ratio
October	261	0.52	406	0.87	335	0.72	326	0.65	535	0.99
November	262	0.54	419	0.92	349	0.79	321	0.64	544	0.99
December	255	0.53	425	0.95	355	0.83	320	0.64	551	0.99
January	264	0.56	427	0.96	354	0.82	323	0.65	552	0.99
Period	259	0.53	421	0.93	350	0.80	321	0.64	547	0.99

Table D-9. Monthly average BMI weighted usable area (WUA) (ft^2/ft) and monthly average fluctuation in BMI WUA (ft^2/ft) in the Upper Reservoir Reach

Month	TS1		TS3		TS4		S5		S6	
	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)
January	493	58	491	3.6	445	30	572	73	658	4.1
February	430	50	453	4.8	383	15	514	59	623	3.2
March	414	49	455	4.1	377	10	499	69	627	3.3
April	443	42	483	2.3	419	22	527	60	653	3.8
May	510	56	524	3.0	472	12	579	60	702	1.6
June	594	72	554	1.5	525	22	616	74	705	0.8
July	568	92	497	6.0	446	25	572	91	659	4.8
August	518	73	454	4.3	378	13	525	76	623	3.4
September[5]	452	56	458	4.4	382	14	518	64	629	4.2
October	529	45	507	2.1	450	16	580	53	691	2.2
November	524	61	505	6.2	457	24	582	71	672	7.0
December	482	48	485	4.5	430	22	562	67	657	6.3

[5] September values are provided in IRA Table

Table D-10. Monthly average thermal refugia area (10,000 ft^2) and average daily minimum refugia area (10,000 ft^2) for Flume, Sullivan, Linton, and Sweet Creek (June 30 – September 20)

Month	TS1		TS3		TS4		S5		S6	
	Average Refugia Area (10,000 ft²)	Average Daily Min. Refugia Area (10,000 ft²)	Average refugia area (10,000 ft²)	Average Daily Min. Refugia Area (10,000 ft²)	Average refugia area (10,000 ft²)	Average Daily Min. Refugia Area (10,000 ft²)	Average refugia area (10,000 ft²)	Average Daily Min. Refugia Area (10,000 ft²)	Average refugia area (10,000 ft²)	Average Daily Min. Refugia Area (10,000 ft²)
July	6.2	3.5	2.5	2.4	1.7	1.2	5.9	3.2	7.6	7.6
August	5.7	3.1	1.5	1.5	0.4	0.2	5.4	2.9	7.3	7.3
September	9.1	4.8	2.9	2.8	0.9	0.5	10	5.8	13	13
Period	6.7	3.7	2.2	2.2	1.0	0.7	6.7	3.7	8.9	8.9

Table D-11. Average thermal refugia area[6] (10,000 ft^2) and average daily minimum refugia area (10,000 ft^2) by creek (June 30 – September 20)

Month	TS1		TS3		TS4		S5		S6	
	Average refugia area (10,000 ft²)	Average Daily Min. Refugia Area (10,000 ft²)	Average refugia area (10,000 ft²)	Average Daily Min. Refugia Area (10,000 ft²)	Average refugia area (10,000 ft²)	Average Daily Min. Refugia Area (10,000 ft²)	Average refugia area (10,000 ft²)	Average Daily Min. Refugia Area (10,000 ft²)	Average refugia area (10,000 ft²)	Average Daily Min. Refugia Area (10,000 ft²)
Flume	0.88	0.73	0.35	0.35	0.47	0.29	0.61	0.44	0.71	0.71
Sullivan	5.1	2.5	1.6	1.6	0.45	0.32	5.5	2.9	7.4	7.4
Linton	0.36	0.27	0.12	0.12	0.05	0.04	0.29	0.18	0.40	0.40
Sweet	0.33	0.19	0.12	0.12	0.04	0.03	0.35	0.21	0.38	0.37
Total	6.7	3.7	2.2	2.2	1.0	0.7	6.7	3.7	8.9	8.9

[6] Thermal refugia area is defined as the area of thermal plume area with water temperature less than 18°C when mainstem temperatures area greater than 20°C, or plume area with water temperatures 2°C cooler than mainstem when mainstem temperatures are less than 20°C

Table D-12. Average daily minimum adult bull trout WUA as channel width (ft²/ft) and average daily fluctuation (ft²/ft) in the Upper Reservoir Reach

Month	TS1		TS3		TS4		S5		S6	
	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)
January	192	127	179	4.1	144	32	220	136	355	7.1
February	261	105	221	4.0	159	17	282	97	394	1.5
March	196	148	216	4.3	156	13	240	140	393	2.0
April	359	118	372	7.6	316	43	411	114	531	6.7
May	386	116	390	2.4	368	18	406	102	510	4.4
June	403	118	396	1.6	369	24	410	113	525	2.4
July	407	127	381	2.5	324	28	412	123	536	1.2
August	416	106	370	1.4	291	13	419	103	532	0.6
September	397	111	372	1.7	300	21	430	96	533	0.7
October	423	115	390	2.0	348	34	434	104	538	0.7
November	175	142	170	14	142	29	195	144	315	23
December	195	138	181	6.5	144	29	215	144	351	11
Summer[7]	394	115	386	1.8	348	28	417	106	527	2.1
Winter[8]	203	132	193	5.1	149	23	229	132	361	7.1

[7] Includes model results from April 1 through June 29 and September 21 through October 31 only
[8] Includes model results from November 1 through March 31 only

Table D-13. Average daily minimum adult cutthroat trout WUA as channel width (ft²/ft) and average daily fluctuation (ft²/ft) in the Upper Reservoir Reach

Month	TS1		TS3		TS4		S5		S6	
	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)	Average Channel Width (ft^2/ft)	Ave. Daily Fluct. (ft^2/ft)
January	145	147	137	1.7	113	23	164	167	277	9.7
February	195	186	167	5.8	123	17	205	192	384	11
March	150	197	161	5.3	121	14	177	215	370	12
April	359	176	386	12	299	65	436	170	607	14
May	389	123	395	2.6	369	23	411	110	511	9.3
June	402	138	396	1.0	361	32	409	132	534	5.5
July	429	179	395	4.4	317	37	436	173	603	5.5
August	468	143	410	2.4	306	18	474	138	611	2.0
September	433	157	406	3.1	306	31	480	134	613	2.0
October	420	168	379	2.7	331	41	431	156	584	4.3
November	135	155	133	12	114	25	149	167	249	29
December	147	164	138	3.1	113	23	160	179	279	16
Summer[9]	395	150	390	2.5	338	38	427	139	564	5.4
Winter[10]	154	169	147	3.9	117	19	170	183	311	13

[9] Includes model results from April 1 through June 29 and September 21 through October 31 only
[10] Includes model results from November 1 through March 31 only