

TABLE 21

**VARIATION 4:
STAFF ESTIMATE OF HYDROPOWER RESPONSIBILITY
USING ALTERNATIVE 2**

Total Loss	7-14 million
	X
Percent Hydropower Purpose of Dam	81% ¹
	=
Hydropower Responsibility	6-11 million

¹ Average of repayment allocations of 92 percent for the area above Grand Coulee Dam and 50 percent for the area above Hells Canyon Dam, and assuming 100 percent hydropower purpose for the area currently available to salmon and steelhead.

TABLE 22

VARIATION 5:
STAFF ESTIMATE OF HYDROPOWER-RELATED LOSSES
USING PRE-1850 RUN SIZE AS A BASIS¹

Fish Distribution (Percentage)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	0.151	0.000	0.248	0.437	0.171	0.000
Between 1 & 2 Dams	0.009	0.000	0.010	0.049	0.022	0.000
Between 2 & 3 Dams	0.033	0.000	0.004	0.000	0.041	0.001
Between 3 & 4 Dams	0.045	0.000	0.004	0.000	0.052	0.000
Between 4 & 5 Dams	0.061	0.018	0.029	0.135	0.061	0.021
Between 5 & 6 Dams	0.000	0.000	0.022	0.000	0.000	0.000
Between 6 & 7 Dams	0.007	0.000	0.064	0.021	0.011	0.000
Between 7 & 8 Dams	0.026	0.012	0.022	0.027	0.011	0.008
Between 8 & 9 Dams	0.325	0.420	0.174	0.139	0.359	0.016
Between 9 & 10 Dams	0.042	0.041	0.000	0.020	0.020	0.303
Above Chief Joseph Dam	0.147	0.166	0.140	0.173	0.105	0.647
Above Hells Canyon Dam	0.153	0.342	0.284	0.000	0.146	0.005

¹ This variation assumes a natural downstream and upstream mortality without dams. Mortality is assumed to be two percent for downstream migrants and one percent for upstream migrants per each section of the river where dams now stand.

TABLE 22 (cont.)

Calculation Parameters

	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Total Adult Production (thousands)	1,449	3,569	1,971	1,342	959	2,722
Ocean Survival	0.02	0.04	0.04	0.08	0.10	0.10
Juvenile Down- stream Survival (per dam passed)	0.80	0.80	0.80	0.80	0.80	0.80
Adult Down- stream Survival (per dam passed)	0.95	0.95	0.95	0.95	0.95	0.95

CALCULATIONS

Number of Adults Without Dams (Thousands)

<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
1,449	3,569	1,971	1,342	959	2,722

Number of Smolts Without Dams (Thousands)

<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
72,450	89,225	49,275	16,775	9,590	27,220

TABLE 22 (cont.)

Numerical Distribution of Smolts (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Conc</u>	<u>Steelhead</u>	<u>Socketve</u>
Below Bonneville	10.940	0	12.220	7.331	1.640	0
Between 1 & 2 Dams	652	0	493	822	211	0
Between 2 & 3 Dams	2.391	0	197	0	393	27
Between 3 & 4 Dams	3.260	0	197	0	499	0
Between 4 & 5 Dams	4.419	1.606	1.429	2.265	585	572
Between 5 & 6 Dams	0	0	1,084	0	0	0
Between 6 & 7 Dams	507	0	3,154	352	105	0
Between 7 & 8 Dams	1,884	1,071	1,084	453	105	218
Between 8 & 9 Dams	23,546	37,475	8,574	2,332	3,443	436
Between 9 & 10 Dams	3,043	3,658	0	336	192	8,248
Above Chief Joseph Dam	10,650	14,811	6,899	2,902	1,007	17,611
Above Hells Canyon Dam	11,085	30,515	13,994	0	1,400	136
Totals:	72,378	89,136	49,324	16,792	9,580	27,247

TABLE 22 (cont.)

Number of Smolts at River Mouth With Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	10,940	0	12,220	7,331	1,640	0
Between 1 & 2 Dams	522	0	394	658	169	0
Between 2 & 3 Dams	1,530	0	126	0	252	17
Between 3 & 4 Dams	1,669	0	101	0	255	0
Between 4 & 5 Dams	1,810	658	585	928	240	234
Between 5 & 6 Dams	0	0	355	0	0	0
Between 6 & 7 Dams	133	0	827	92	28	0
Between 7 & 8 Dams	395	225	227	95	22	46
Between 8 & 9 Dams	3,950	6,287	1,438	391	578	73
Between 9 & 10 Dams	408	491	0	45	26	1,107
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	21,358	7,661	16,274	9,539	3,208	1,477

TABLE 22 (cont.)

Number of Smolts at River Mouth Without Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	10.940	0	12.220	7 331	1,640	0
Between 1 & 2 Dams	639	0	483	806	207	0
Between 2 & 3 Dams	2.296	0	189	0	378	26
Between 3 & 4 Dams	3.069	0	186	0	469	0
Between 4 & 5 Dams	4.076	1,481	1,318	2,089	540	527
Between 5 & 6 Dams	0	0	980	0	0	0
Between 6 & 7 Dams	449	0	2,794	312	93	0
Between 7 & 8 Dams	1,635	930	941	393	92	189
Between 8 & 9 Dams	20.032	31,882	7,294	1,984	2,929	371
Between 9 & 10 Dams	2,537	3,050	0	280	160	6,876
Above Chief Joseph Dam	8,702	12,102	5,637	2,371	823	14,390
Above Hells Canyon Dam	9,242	25,442	11,668	0	1,167	113
Totals:	63,618	74,887	43,709	15,565	8,497	22,493

TABLE 22 (cont.)

Number of Adults at River Mouth With Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	219	0	489	586	164	0
Between 1 & 2 Dams	10	0	16	53	17	0
Between 2 & 3 Dams	31	0	5	0	25	2
Between 3 & 4 Dams	33	0	4	0	26	0
Between 4 & 5 Dams	36	26	23	74	24	23
Between 5 & 6 Dams	0	0	14	0	0	0
Between 6 & 7 Dams	3	0	33	7	3	0
Between 7 & 8 Dams	8	9	9	8	2	5
Between 8 & 9 Dams	79	251	58	31	58	7
Between 9 & 10 Dams	8	20	0	4	3	111
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	427	306	651	763	321	148

TABLE 22 (cont.)

Number of Adults at River Mouth Without Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	219	0	489	586	164	0
Between 1 & 2 Dams	13	0	19	64	21	0
Between 2 & 3 Dams	46	0	8	0	38	3
Between 3 & 4 Dams	61	0	7	0	47	0
Between 4 & 5 Dams	82	59	53	167	54	53
Between 5 & 6 Dams	0	0	39	0	0	0
Between 6 & 7 Dams	9	0	112	25	9	0
Between 7 & 8 Dams	33	37	38	31	9	19
Between 8 & 9 Dams	401	1,275	292	159	293	37
Between 9 & 10 Dams	51	122	0	22	16	688
Above Chief Joseph Dam	174	484	225	190	82	1,439
Above Hells Canyon Dam	185	1,018	467	0	117	11
Totals:	1,272	2,995	1,748	1,245	850	2,249

TABLE 22 (cont.)

Number of Adults at Spawning Grounds With Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	219	0	489	586	164	0
Between 1 & 2 Dams	10	0	15	50	16	0
Between 2 & 3 Dams	28	0	5	0	23	2
Between 3 & 4 Dams	29	0	3	0	22	0
Between 4 & 5 Dams	29	21	19	60	20	19
Between 5 & 6 Dams	0	0	11	0	0	0
Between 6 & 7 Dams	2	0	24	5	2	0
Between 7 & 8 Dams	6	6	6	5	2	3
Between 8 & 9 Dams	52	167	38	21	38	5
Between 9 & 10 Dams	5	12	0	2	2	70
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	379	207	611	731	288	98

All Species Total: 2,314,000

TABLE 22 (cont.)

Number of Adults at Spawning Grounds Without Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Cono</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	219	0	489	586	164	0
Between 1 & 2 Dams	13	0	19	64	20	0
Between 2 & 3 Dams	45	0	7	0	37	3
Between 3 & 4 Dams	60	0	7	0	46	0
Between 4 & 5 Dams	78	57	51	161	52	51
Between 5 & 6 Dams	0	0	37	0	0	0
Between 6 & 7 Dams	8	0	105	24	9	0
Between 7 & 8 Dams	30	35	35	29	9	18
Between 8 & 9 Dams	370	1,177	269	146	270	34
Between 9 & 10 Dams	46	111	0	20	15	628
Above Chief Joseph Dam	157	438	204	172	74	1,301
Above Hells Canyon Dam	169	930	426	0	107	10
Totals:	1,196	2,747	1,650	1,202	802	2,045

All Species Total: 9,642,000

TABLE 22 (cont.)

Dam Produced Salmon and Steelhead Loss (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	0	0	0	0	0	0
Between 1 & 2 Dams	3	0	4	14	4	0
Between 2 & 3 Dams	17	0	3	0	14	1
Between 3 & 4 Dams	31	0	4	0	24	0
Between 4 & 5 Dams	49	35	32	100	32	32
Between 5 & 6 Dams	0	0	26	0	0	0
Between 6 & 7 Dams	7	0	81	18	7	0
Between 7 & 8 Dams	25	28	29	24	7	14
Between 8 & 9 Dams	317	1,010	231	126	232	29
Between 9 & 10 Dams	41	99	0	18	13	558
Above Chief Joseph Dam	157	438	204	172	74	1,301
Above Hells Canyon Dam	169	930	426	0	107	10
Totals:	816	2,540	1,040	471	514	1,946

All Species Total: 7,328,000

TABLE 22 (cont.)

Hydropower-Related Salmon and Steelhead Loss (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	0	0	0	0	0	0
Between 1 & 2 Dams	2	0	4	12	4	0
Between 2 & 3 Dams	15	0	3	0	13	1
Between 3 & 4 Dams	28	0	3	0	21	0
Between 4 & 5 Dams	43	32	28	89	29	28
Between 5 & 6 Dams	0	0	23	0	0	0
Between 6 & 7 Dams	6	0	72	16	6	0
Between 7 & 8 Dams	22	25	26	21	6	13
Between 8 & 9 Dams	282	899	206	112	206	26
Between 9 & 10 Dams	37	88	0	16	12	497
Above Chief Joseph Dam	145	403	188	158	68	1,197
Above Hells Canyon Dam	84	465	213	0	53	5
Totals:	665	1,911	765	425	418	1,767

All Species Total: 5,952,000

TABLE 23

**VARIATION 5:
STAFF ESTIMATE OF HYDROPOWER-RELATED LOSSES
USING CURRENT RUN SIZE AS A BASIS¹**

Fish Distribution (Percentage)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>		<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
			<u>Hatchery</u>	<u>Natural</u>			
Between 1 & 2 Dams	0.027	0.000	0.260	0.175	0.176	0.047	0.000
Between 2 & 3 Dams	0.128	0.000	0.000	0.234	0.109	0.054	0.000
Between 3 & 4 Dams	0.000	0.000	0.150	0.000	0.031	0.107	0.000
Between 4 & 5 Dams	0.084	0.047	0.510	0.508	0.244	0.095	0.000
Between 5 & 6 Dams	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Between 6 & 7 Dams	0.021	0.000	0.050	0.000	0.000	0.023	0.000
Between 7 & 8 Dams	0.033	0.019	0.000	0.020	0.040	0.022	0.210
Between 8 & 9 Dams	0.654	0.870	0.020	0.063	0.359	0.614	0.296
Between 9 & 10 Dams	0.053	0.064	0.000	0.000	0.046	0.038	0.493
Above Chief Joseph Dam	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Above Hells Canyon Dam	0.000	0.000	0.000	0.000	0.000	0.000	0.000

¹ This variation assumes a natural downstream and upstream mortality without dams. Mortality is assumed to be two percent for downstream migrants and one percent for upstream migrants per each section of the river where dams now stand.

TABLE 23 (cont.)

Calculation Parameters

	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>		<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
			<u>Hatchery</u>	<u>Natural</u>			
Total Adult Production (thousands)	92	77	334	360	179	143	58
Ocean Survival	0.02	0.04	0.04	0.04	0.08	0.10	0.10
Juvenile Down- stream Survival (per dam passed)	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adult Down- stream Survival (per dam passed)	0.95	0.95	0.95	0.95	0.95	0.95	0.95

CALCULATIONS

Number of Adults at River Mouth with Dams (Thousands)

	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>		<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
			<u>Hatchery</u>	<u>Natural</u>			
	92	77	334	360	179	143	58

Number of Smolts at River Mouth with Dams (Thousands)

	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>		<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
			<u>Hatchery</u>	<u>Natural</u>			
	4.600	1.925	8.350	9.000	2.238	1.430	580

TABLE 23 (cont.)

Number of Smolts Produced (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	155	0	4.683	492	84	0
Between 2 & 3 Dams	920	0	3.291	381	121	0
Between 3 & 4 Dams	0	0	2.446	135	299	0
Between 4 & 5 Dams	943	221	21.559	1,333	332	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	368	0	1.593	0	125	0
Between 7 & 8 Dams	724	174	858	427	150	581
Between 8 & 9 Dams	17.931	9.982	4.375	4.788	5.233	1.023
Between 9 & 10 Dams	1.816	918	0	767	405	2,130
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	22.859	11.295	38.804	8.323	6.749	3.734

TABLE 23 (cont.)

Number of Smolts at River Mouth Without Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	152	0	4.589	482	82	0
Between 2 & 3 Dams	884	0	3.160	366	116	0
Between 3 & 4 Dams	0	0	2.302	128	281	0
Between 4 & 5 Dams	870	204	19.885	1.229	306	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	326	0	1,411	0	111	0
Between 7 & 8 Dams	628	151	745	370	130	504
Between 8 & 9 Dams	15,255	8,493	3,722	4,073	4,452	871
Between 9 & 10 Dams	1,514	765	0	639	338	1,776
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	19,631	9,613	35.815	7,288	5,817	3,151

TABLE 23 (cont.)

Number of Adults at River Mouth Without Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	3	0	184	39	8	0
Between 2 & 3 Dams	18	0	126	29	12	0
Between 3 & 4 Dams	0	0	92	10	28	0
Between 4 & 5 Dams	17	8	795	98	31	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	7	0	56	0	11	0
Between 7 & 8 Dams	13	6	30	30	13	50
Between 8 & 9 Dams	305	340	149	326	445	87
Between 9 & 10 Dams	30	31	0	51	34	178
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	393	385	1,433	583	582	315

TABLE 23 (cont.)

Number of Adults at Spawning Grounds Without Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	3	0	182	38	8	0
Between 2 & 3 Dams	17	0	124	29	11	0
Between 3 & 4 Dams	0	0	89	10	27	0
Between 4 & 5 Dams	17	8	764	94	29	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	6	0	53	0	10	0
Between 7 & 8 Dams	12	6	28	28	12	47
Between 8 & 9 Dams	282	313	137	301	411	80
Between 9 & 10 Dams	28	28	0	47	31	162
Above Chief Joseph Dam	213	592	276	232	101	1,761
Above Hells Canyon Dam	222	1,221	560	0	140	14
Totals:	799	2,168	2,213	778	781	2,065

All Species Total: 8,805,000

TABLE 23 (cont.)

Number of Adults at Spawning Grounds With Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Cono</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	2	0	142	30	6	0
Between 2 & 3 Dams	11	0	76	18	7	0
Between 3 & 4 Dams	0	0	43	5	13	0
Between 4 & 5 Dams	6	3	288	36	11	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	1	0	12	0	2	0
Between 7 & 8 Dams	2	1	5	5	2	9
Between 8 & 9 Dams	40	44	19	43	58	11
Between 9 & 10 Dams	3	3	0	5	3	18
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	66	52	586	141	104	38

All Species Total: 986.000

TABLE 23 (cont.)

Dam Produced Salmon and Steelhead Loss (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	1	0	39	8	2	0
Between 2 & 3 Dams	7	0	48	11	4	0
Between 3 & 4 Dams	0	0	46	5	14	0
Between 4 & 5 Dams	10	5	476	59	18	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	5	0	41	0	8	0
Between 7 & 8 Dams	10	5	23	23	10	38
Between 8 & 9 Dams	242	269	118	258	353	69
Between 9 & 10 Dams	25	25	0	42	27	144
Above Chief Joseph Dam	213	592	276	232	101	1,761
Above Hells Canyon Dam	222	1,221	560	0	140	14
Totals:	733	2,116	1,628	638	678	2,027

All Species Total: 7,819,000

TABLE 23 (cont.)

Hydropower-Related Salmon and Steelhead Loss (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	1	0	35	7	2	0
Between 2 & 3 Dams	6	0	43	10	4	0
Between 3 & 4 Dams	0	0	41	5	13	0
Between 4 & 5 Dams	9	4	424	52	16	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	4	0	36	0	7	0
Between 7 & 8 Dams	9	4	20	20	9	34
Between 8 & 9 Dams	215	239	105	230	314	61
Between 9 & 10 Dams	22	22	0	37	24	128
Above Chief Joseph Dam	196	545	254	213	93	1,620
Above Hells Canyon Dam	111	611	280	0	70	7
Totals:	572	1,425	1,238	574	552	1,851

All Species Total: 6,213,000

**VARIATION 5:
STAFF ESTIMATE OF HYDROPOWER-RELATED LOSSES
USING CURRENT POTENTIAL RUN SIZE AS A BASIS¹**

(Numbers of Smolts Produced by Area)

Areas of Production	Spring Chinook		Summer Chinook		Fall Chinook		Coho		Steelhead		Sockeye	
	Hatchery	Natural	Hatchery	Natural	Hatchery	Natural	Hatchery	Natural	Hatchery	Natural	Hatchery	Natural
Between 1 & 2 Dams	4,917,000	864,000	---	---	4,431,000	---	1,750,000	269,000	160,000	197,000	---	---
Between 2 & 3 Dams	765,000	1,407,000	---	---	---	2,057,000	---	331,000	130,000	105,000	---	---
Between 3 & 4 Dams	---	4,273,000	---	---	2,580,000	2,025,000	---	---	48,000	456,000	---	---
Between 4 & 5 Dams	514,000	3,112,000	---	---	8,520,000	21,938,000	---	---	359,000	355,000	---	---
Between 5 & 6 Dams	---	---	---	---	---	---	---	---	---	---	---	---
Between 6 & 7 Dams	---	---	---	---	840,000	---	---	---	220,000	1,000	---	---
Between 7 & 8 Dams	1,640,000	887,000	---	556,000	---	---	---	---	---	94,000	---	316,000
Between 8 & 9 Dams	6,251,000	16,905,000	1,364,000	14,159,000	360,000	24,000	320,000	232,000	4,472,000	1,885,000	---	460,000
Above Wells and Below Chief Joseph dams	800,000	1,266,000	1,344,000	1,295,000	---	---	---	---	368,000	78,000	---	748,000

¹ This variation assumes a natural downstream and upstream mortality without dams. Mortality is assumed to be two percent for downstream migrants and one percent for upstream migrants per each section of the river where dams now stand.

TABLE 24 (cont.)

Number of Smolts Produced (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	5,781	0	4,431	2,019	357	0
Between 2 & 3 Dams	2,172	0	2,057	331	235	0
Between 3 & 4 Dams	4,273	0	4,605	0	506	0
Between 4 & 5 Dams	3,626	0	30,458	0	714	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	0	0	840	0	221	0
Between 7 & 8 Dams	2,527	556	0	0	94	316
Between 8 & 9 Dams	23,156	15,523	384	552	6,357	460
Above Wells and Below Chief Joseph	2,066	2,639	0	0	446	748
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	43,601	18,718	42,775	2,902	8,930	1,524

All Species Total: 118,450,000

TABLE 24 (cont.)

Smolts to River Mouth With Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	4,625	0	3,545	1,615	286	0
Between 2 & 3 Dams	1,390	0	1,316	212	150	0
Between 3 & 4 Dams	2,188	0	2,358	0	259	0
Between 4 & 5 Dams	1,485	0	12,476	0	292	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	0	0	220	0	58	0
Between 7 & 8 Dams	530	117	0	0	20	66
Between 8 & 9 Dams	3,885	2,604	64	93	1,067	77
Above Wells and Below Chief Joseph	277	354	0	0	60	100
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	14,380	3,075	19,979	1,920	2,192	244

All Species Total: 41,789,000

TABLE 24 (cont.)

Smolts to River Mouth Without Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	5.665	0	4.342	1.979	350	0
Between 2 & 3 Dams	2.086	0	1.976	318	226	0
Between 3 & 4 Dams	4.022	0	4.334	0	476	0
Between 4 & 5 Dams	3.345	0	28.093	0	659	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	0	0	744	0	196	0
Between 7 & 8 Dams	2.194	483	0	0	82	274
Between 8 & 9 Dams	19.700	13.206	327	470	5.408	391
Above Wells and Below Chief Josephn	1.723	2.200	0	0	372	624
Above Chief Josephn Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	38.734	15.889	39.816	2.766	7.768	1.289

All Species Total: 106.263.000

TABLE 24 (cont.)

Number of Adults at River Mouth With Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	92	0	142	129	29	0
Between 2 & 3 Dams	28	0	53	17	15	0
Between 3 & 4 Dams	44	0	94	0	26	0
Between 4 & 5 Dams	30	0	499	0	29	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	0	0	9	0	6	0
Between 7 & 8 Dams	11	5	0	0	2	7
Between 8 & 9 Dams	78	104	3	7	107	8
Above Wells and Below Chief Joseph	6	14	0	0	6	10
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	288	123	799	154	219	24

All Species Total: 1,607,000

TABLE 24 (cont.)

Number of Adults at River Mouth Without Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	113	0	174	158	35	0
Between 2 & 3 Dams	42	0	79	25	23	0
Between 3 & 4 Dams	80	0	173	0	48	0
Between 4 & 5 Dams	67	0	1,124	0	66	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	0	0	30	0	20	0
Between 7 & 8 Dams	44	19	0	0	8	27
Between 8 & 9 Dams	394	528	13	38	541	39
Above Wells and Below Chief Joseph	34	88	0	0	37	62
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	775	636	1,593	221	777	129

All Species Total: 4,130,000

TABLE 24 (cont.)

Number of Adults at Spawning Grounds With Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Cono</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	88	0	135	123	27	0
Between 2 & 3 Dams	25	0	48	15	14	0
Between 3 & 4 Dams	38	0	81	0	22	0
Between 4 & 5 Dams	24	0	406	0	24	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	0	0	6	0	4	0
Between 7 & 8 Dams	7	3	0	0	1	5
Between 8 & 9 Dams	52	69	2	5	71	5
Above Wells and Below Chief Joseph	3	9	0	0	4	6
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	237	81	678	143	167	16

All Species Total: 1,322,000

TABLE 24 (cont.)

Number of Adults at Spawning Grounds Without Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	112	0	172	157	35	0
Between 2 & 3 Dams	41	0	77	25	22	0
Between 3 & 4 Dams	78	0	168	0	46	0
Between 4 & 5 Dams	64	0	1,079	0	63	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	0	0	28	0	18	0
Between 7 & 8 Dams	41	18	0	0	8	26
Between 8 & 9 Dams	364	487	12	35	499	36
Above Wells and Below Chief Joseph	31	80	0	0	34	57
Above Chief Joseph Dam	213	592	276	232	101	1,761
Above Hells Canyon Dam	222	1,221	560	0	140	14
Totals:	1,166	2,399	2,373	448	966	1,894

All Species Total: 9,247,000

TABLE 24 (cont.)

Dam Produced Salmon and Steelhead Loss (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	24	0	37	34	8	0
Between 2 & 3 Dams	16	0	30	10	9	0
Between 3 & 4 Dams	41	0	87	0	24	0
Between 4 & 5 Dams	40	0	673	0	39	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	0	0	22	0	14	0
Between 7 & 8 Dams	33	15	0	0	6	21
Between 8 & 9 Dams	312	418	10	30	428	31
Above Wells and Below Chief Joseph	28	71	0	0	30	51
Above Chief Joseph Dam	213	592	276	232	101	1,761
Above Hells Canyon Dam	222	1,221	560	0	140	14
Totals:	929	2,318	1,695	305	799	1,878

All Species Total: 7,924,000

TABLE 24 (cont.)

Hydropower-Related Salmon and Steelhead Loss (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Between 1 & 2 Dams	22	0	33	30	7	0
Between 2 & 3 Dams	14	0	27	9	8	0
Between 3 & 4 Dams	36	0	78	0	21	0
Between 4 & 5 Dams	36	0	599	0	35	0
Between 5 & 6 Dams	0	0	0	0	0	0
Between 6 & 7 Dams	0	0	19	0	13	0
Between 7 & 8 Dams	30	13	0	0	6	19
Between 8 & 9 Dams	278	372	9	26	381	28
Above Wells and Below Chief Joseph	25	64	0	0	27	45
Above Chief Joseph Dam	196	545	254	213	93	1,620
Above Hells Canyon Dam	111	611	280	0	70	7
Totals:	747	1,604	1,299	279	660	1,718

All Species Total: 6,307,000

TABLE 25

VARIATION 6:
 STAFF ESTIMATE OF HYDROPOWER-RELATED LOSSES¹
 USING PRE-1850 RUN SIZE AS A BASIS

Fish Distribution (Percentage)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	0.151	0.000	0.248	0.437	0.171	0.000
Between 1 & 2 Dams	0.009	0.000	0.010	0.049	0.022	0.000
Between 2 & 3 Dams	0.033	0.000	0.004	0.000	0.041	0.001
Between 3 & 4 Dams	0.045	0.000	0.004	0.000	0.052	0.000
Between 4 & 5 Dams	0.061	0.018	0.029	0.135	0.061	0.021
Between 5 & 6 Dams	0.000	0.000	0.022	0.000	0.000	0.000
Between 6 & 7 Dams	0.007	0.000	0.064	0.021	0.011	0.000
Between 7 & 8 Dams	0.026	0.012	0.022	0.027	0.011	0.008
Between 8 & 9 Dams	0.325	0.420	0.174	0.139	0.359	0.016
Between 9 & 10 Dams	0.042	0.041	0.000	0.020	0.020	0.303
Above Chief Joseph Dam	0.147	0.508	0.140	0.173	0.105	0.647
Above Hells Canyon Dam	0.153	0.000	0.284	0.000	0.146	0.005

¹ Assumes all summer chinook production occurred above the site of Grand Coulee Dam.

TABLE 25 (cont.)

Calculation Parameters

	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Total Adult Production (thousands)	1,449	3,569	1,971	1,342	959	2,722
Ocean Survival	0.02	0.04	0.04	0.08	0.10	0.10
Juvenile Down- stream Survival (per dam passed)	0.80	0.80	0.80	0.80	0.80	0.80
Adult Down- stream Survival (per dam passed)	0.95	0.95	0.95	0.95	0.95	0.95

CALCULATIONS

Number of Adults Without Dams (Thousands)

<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
1,449	3,569	1,971	1,342	959	2,722

Number of Smolts Without Dams (Thousands)

<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
72,450	89,225	49,275	16,775	9,590	27,220

TABLE 25 (cont.)

Numerical Distribution of Smolts Produced Without Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	10,940	0	12,220	7,331	1,640	0
Between 1 & 2 Dams	652	0	493	822	211	0
Between 2 & 3 Dams	2,391	0	197	0	393	27
Between 3 & 4 Dams	3,260	0	197	0	499	0
Between 4 & 5 Dams	4,419	1,606	1,429	2,265	585	572
Between 5 & 6 Dams	0	0	1,084	0	0	0
Between 6 & 7 Dams	507	0	3,154	352	105	0
Between 7 & 8 Dams	1,884	1,071	1,084	453	105	218
Between 8 & 9 Dams	23,546	37,475	8,574	2,332	3,443	436
Between 9 & 10 Dams	3,043	3,658	0	336	192	8,248
Above Chief Joseph Dam	10,650	45,326	6,899	2,902	1,007	17,611
Above Hells Canyon Dam	11,085	0	13,994	0	1,400	136
Totals:	72,378	89,136	49,324	16,792	9,580	27,247

TABLE 25 (cont.)

Number of Smolts at River Mouth With Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	10,940	0	12,220	7,331	1,640	0
Between 1 & 2 Dams	522	0	394	658	169	0
Between 2 & 3 Dams	1,530	0	126	0	252	17
Between 3 & 4 Dams	1,669	0	101	0	255	0
Between 4 & 5 Dams	1,810	658	585	928	240	234
Between 5 & 6 Dams	0	0	355	0	0	0
Between 6 & 7 Dams	133	0	827	92	28	0
Between 7 & 8 Dams	395	225	227	95	22	46
Between 8 & 9 Dams	3,950	6,287	1,438	391	578	73
Between 9 & 10 Dams	408	491	0	45	26	1,107
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	21,358	7,661	16,274	9,539	3,208	1,477

TABLE 25 (cont.)

Number of Adults at River Mouth With Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	219	0	489	586	164	0
Between 1 & 2 Dams	10	0	16	53	17	0
Between 2 & 3 Dams	31	0	5	0	25	2
Between 3 & 4 Dams	33	0	4	0	26	0
Between 4 & 5 Dams	36	26	23	74	24	23
Between 5 & 6 Dams	0	0	14	0	0	0
Between 6 & 7 Dams	3	0	33	7	3	0
Between 7 & 8 Dams	8	9	9	8	2	5
Between 8 & 9 Dams	79	251	58	31	58	7
Between 9 & 10 Dams	8	20	0	4	3	111
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	427	306	651	763	321	148

TABLE 25 (cont.)

Number of Adults at Spawning Grounds With Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	219	0	489	586	164	0
Between 1 & 2 Dams	10	0	15	50	16	0
Between 2 & 3 Dams	28	0	5	0	23	2
Between 3 & 4 Dams	29	0	3	0	22	0
Between 4 & 5 Dams	29	21	19	60	20	19
Between 5 & 6 Dams	0	0	11	0	0	0
Between 6 & 7 Dams	2	0	24	5	2	0
Between 7 & 8 Dams	6	6	6	5	2	3
Between 8 & 9 Dams	52	167	38	21	38	5
Between 9 & 10 Dams	5	12	0	2	2	70
Above Chief Joseph Dam	0	0	0	0	0	0
Above Hells Canyon Dam	0	0	0	0	0	0
Totals:	379	207	611	731	288	98

All Species Total: 2,314,000

TABLE 25 (cont.)

Number of Adults at Spawning Grounds Without Dams (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	219	0	489	586	164	0
Between 1 & 2 Dams	13	0	20	66	21	0
Between 2 & 3 Dams	48	0	8	0	39	3
Between 3 & 4 Dams	65	0	8	0	50	0
Between 4 & 5 Dams	88	64	57	181	58	57
Between 5 & 6 Dams	0	0	43	0	0	0
Between 6 & 7 Dams	10	0	126	28	11	0
Between 7 & 8 Dams	38	43	43	36	11	22
Between 8 & 9 Dams	471	1,499	343	187	344	44
Between 9 & 10 Dams	61	146	0	27	19	825
Above Chief Joseph Dam	213	1,813	276	232	101	1,761
Above Hells Canyon Dam	222	0	560	0	140	14
Totals:	1,448	3,565	1,973	1,343	958	2,725

All Species Total: 12,012,000

TABLE 25 (cont.)

Dam Produced Salmon and Steelhead Loss (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	0	0	0	0	0	0
Between 1 & 2 Dams	3	0	5	16	5	0
Between 2 & 3 Dams	20	0	3	0	17	1
Between 3 & 4 Dams	37	0	4	0	28	0
Between 4 & 5 Dams	59	43	38	121	39	38
Between 5 & 6 Dams	0	0	32	0	0	0
Between 6 & 7 Dams	8	0	102	23	9	0
Between 7 & 8 Dams	32	37	37	31	9	19
Between 8 & 9 Dams	419	1,332	305	166	306	39
Between 9 & 10 Dams	56	134	0	25	18	755
Above Chief Joseph Dam	213	1,813	276	232	101	1,761
Above Hells Canyon Dam	222	0	560	0	140	14
Totals:	1,068	3,359	1,362	613	670	2,626

All Species Total: 9,698,000

TABLE 25 (cont.)

Hydropower-Related Salmon and Steelhead Loss (Thousands)

<u>Area of Production</u>	<u>Spring Chinook</u>	<u>Summer Chinook</u>	<u>Fall Chinook</u>	<u>Coho</u>	<u>Steelhead</u>	<u>Sockeye</u>
Below Bonneville	0	0	0	0	0	0
Between 1 & 2 Dams	3	0	4	14	5	0
Between 2 & 3 Dams	18	0	3	0	15	1
Between 3 & 4 Dams	33	0	4	0	25	0
Between 4 & 5 Dams	52	38	34	107	35	34
Between 5 & 6 Dams	0	0	29	0	0	0
Between 6 & 7 Dams	7	0	91	20	8	0
Between 7 & 8 Dams	29	33	33	28	8	17
Between 8 & 9 Dams	372	1,186	271	148	272	34
Between 9 & 10 Dams	50	119	0	22	16	672
Above Chief Joseph Dam	196	1,668	254	214	93	1,620
Above Hells Canyon Dam	111	0	280	0	70	7
Totals:	871	3,043	1,002	552	545	2,385

All Species Total: 8,399,000