

Le Flaur

State of Washington
DEPARTMENT OF FISHERIES
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10029

M E M O R A N D U M

TO: Don McIsaac

DATE: June 10, 1981

FROM: Gayle Kreitman *GK*

SUBJECT: Addendum to 8/13/80 naturally spawning population estimates' memo.

This provides the 1980 escapement and age composition estimates as well as changes made to certain pre-1980 estimates. The 1964-1979 adult age compositions (except North Fork of the Lewis River) were based on the relationships between the lower river hatcheries and the different gill net seasons. After reevaluation, adult age compositions using hatchery sampling data were deemed more appropriate. The following delineates the methodology changes:

1964-1969

No changes from the 8/13/80 memo were considered necessary for the Coweeman or the East and North Forks of the Lewis. Escapement estimates on the Cowlitz were previously not expanded for fish per redd, therefore all estimates from 1964-1979 were corrected to include a 2.5 fish per redd expansion factor. For the years 1964-1969 no change was made to age class proportions on the Cowlitz.

For the Elokomín, Grays, Kalama, Toutle and Washougal, the adult age composition was based on hatchery sampling data. Kalama age compositions were an average of sampling data at Lower Kalama and Kalama Falls hatcheries. No fall chinook were collected at Grays in 1967 or the Washougal in 1967, 1968 and 1969, therefore estimates based on the gill net fisheries were considered best. Averaged Grays and Elokomín hatchery sampling data was used for Skamokawa Creek. Toutle Hatchery sample proportions were applied to the Green and the North and South Forks of the Toutle.

Jack percentages based on the late fall gill net season were changed to reflect the jack proportion of the total return as reported by the hatchery.

1970-1977

No hatchery samples were collected in these years so no changes were made to the age compositions. Cowlitz escapement estimates were corrected.

1978-1979

The same methods used for 1964-1969 were applied except the age compositions of the Cowlitz were based on hatchery sampling data.

1980

Due to the terminal gill net fishery in September and the eruption of Mt. St. Helens in May, several adult age composition method changes from 1979 were necessitated. Again, for the Elokom, Grays, Cowlitz, Kalama (an average of Lower Kalama and Kalama Falls hatcheries) and the Washougal, age composition data collected in hatchery samples was used and Skamokawa Creek was an average of Grays and Elokom hatchery sampling data. Age proportions (all ages) based on scale analysis were used on the North Fork of the Lewis. The same adult proportions were applied to the East Fork of the Lewis. Since Toutle Hatchery was obliterated by the eruption, age composition data from Cowlitz samples was applied to the Toutle. The North and South Forks of the Toutle were unsurveyable and although the Green was surveyed the peak spawning count was zero. Cowlitz sampling data was also used for the Coweeman.

Jack proportions were based on length-frequencies of spawning ground survey bio-samples if available. If not, the basis was the jack proportion of the total return as reported by the hatchery.

A corrected Table 1 and an updated Table 3 from the 8/13/80 memo are included in this update. A revised and updated Table 14 is attached.

Literature

Kreitman, Gayle

1980. Population and age composition estimate updates of naturally spawning fall chinook in lower Columbia River tributaries of Washington, 1964-1979. Memorandum dated 8/13/80, Wash. Dept. of Fish., 24 pp.

Kreitman, Gayle

1981. Tag shed and mark rate estimates for the North Fork of the Lewis River wild fall chinook tag codes (by brood year). Memorandum dated 6/9/81, Wash. Dept. Fish., 8 pp.

Roler, Ron

1981. Naturally spawning salmon fork length data for southwest Washington streams, 1980. Memorandum dated 1/26/81. Wash. Dept. of Fish., 12 pp.

Attach:

GK/mp

copies: Austin
Stockley
Dammers
Rasch
Lincoln
Gerke
Pattillo

Table 1. Fall chinook peak count expansion factors for each lower Columbia River tributary index area.

Stream	Peak count expansion	
Coweeman River	2.00	
Cowlitz River	4.00 ^{1/}	2.5 ^{1/}
Elokomin River	2.00	
Grays River ^{6/}	2.03 ^{2/}	3.58 ^{3/}
Green River	2.00	
Kalama River ^{6/}	2.75	
East Fork Lewis River	3.84	
North Fork Lewis River ^{6/}	5.27	
Skamokawa Creek ^{6/}	1.6695	
Toutle River	5.00	
North Fork Toutle River	4.00	
South Fork Toutle River	2.21	
Washougal River	2.50 ^{4/}	3.33 ^{5/}

^{1/} Expansion is for peak redd count. 2.5 fish/redd = total fish expansion factor.

^{2/} Expansion factor for 1964-1976 excludes schooled fish.

^{3/} Post-1976 expansion factor (WECO pond production adjustment) (includes schooled fish).

^{4/} Expansion factor for 1964-1974.

^{5/} Expansion factor for post-1974. Increase based on high 1978 count of fall chinook from Washougal River Salmon Hatchery to Salmon Falls.

^{6/} Based on sampling data (base points for other expansion factors). The Kalama River factor of 2.75 was used instead of 2.695 quoted in a Don McIsaac - H. Fiscus memo, "Total naturally spawning escapement estimates for fall chinook in the Kalama and Grays rivers based on carcass tagging, 1978" to compensate for that portion of the Kalama not surveyed.

Table 3. Fall chinook peak index counts for lower Columbia River tributaries, 1980.

Stream	Date	Peak count	Visibility	Miles surveyed	Comments
Coweeman	10/08/80	28	low, clear	6	
Cowlitz	Oct. 1980	269 ^{1/}		45	
Elokomin	10/03/80	32	low, clear (5 ft.)	6	
Grays	10/01/80	55	low, clear	3.6	
Green	10/10/80	0	-	.6	
Kalama	10/09/80	1,934	low, 6 ft.	8.7	
East Fork Lewis	10/08/80	137	low, clear	4.2	
North Fork Lewis	10/30/80	3,363	clear	4	
Skamokawa	09/26/80	110	low, clear	4.5	
Toutle	10/29/80	2	low, 2 in.	8	
North Fork Toutle	-	0	-	-	Unsurveyable due to Mt. St. Helens eruption 5/18/80. Estimate peak spawning count of zero
South Fork Toutle	-	0	-	-	
Washougal	10/29/80	1,032	very low, clear	4.0	

^{1/} Peak redd count

Table 14. Estimates of naturally spawning fall chinook populations and age compositions in lower Columbia River tributaries 1964-1980.

Year	River	Escapement	AGE COMPOSITION			
			II	III	IV	V
1964	Coweeman	371 $\frac{1}{10}$	7	208	124	32
	Cowlitz	3,380 $\frac{4}{4}$	68 $\frac{2}{2}$	1,892	1,132	288
	Elokomin	96 $\frac{4}{4}$	1 $\frac{2}{2}$	54	40	1
	Grays	100 $\frac{5}{5}$	8 $\frac{2}{2}$	90	2	0
	Green	2,375 $\frac{6}{6}$	88	1,591	684	12
	Kalama	4,942 $\frac{1}{1}$	247	1,470	3,197	28
	East Fork Lewis	680 $\frac{1}{1}$	48	361	216	55
	North Fork Lewis	20,557 $\frac{7}{7}$	3,700	3,289	9,868	3,700
	Skamokawa	2,969 $\frac{5}{5}$	44	1,710	1,194	21
	Toutle	353 $\frac{5}{5}$	13	236	102	2
	North Fork Toutle	2,201 $\frac{5}{5}$	81	1,475	634	11
	South Fork Toutle	215 $\frac{4}{4}$	8 $\frac{2}{2}$	144	62	1
	Washougal	230 $\frac{1}{1}$	78 $\frac{2}{2}$	135	17	0
	Total	38,469	4,391	12,655	17,272	4,151
1965	Coweeman	86 $\frac{1}{10}$	11	14	58	3
	Cowlitz	6,560 $\frac{4}{4}$	853 $\frac{3}{3}$	1,059	4,385	263
	Elokomin	225 $\frac{4}{4}$	34 $\frac{3}{3}$	68	123	0
	Grays	171 $\frac{5}{5}$	35 $\frac{2}{2}$	49	87	0
	Green	1,482 $\frac{6}{6}$	192 $\frac{2}{2}$	101	1,167	22
	Kalama	5,559 $\frac{1}{1}$	50 $\frac{2}{2}$	650	4,642	217
	East Fork Lewis	1,048 $\frac{1}{1}$	157	165	685	41
	North Fork Lewis	9,667 $\frac{7}{7}$	1,740	1,547	4,640	1,740
	Skamokawa	2,969 $\frac{5}{5}$	621	849	1,499	0
	Toutle	330 $\frac{5}{5}$	43	22	260	5
	North Fork Toutle	2,057 $\frac{5}{5}$	267	140	1,619	31
	South Fork Toutle	201 $\frac{4}{4}$	26 $\frac{3}{3}$	14	158	3
	Washougal	206 $\frac{1}{1}$	8 $\frac{2}{2}$	124	74	0
	Total	30,561	4,037	4,802	19,397	2,325
1966	Coweeman	110 $\frac{1}{10}$	2	58	41	9
	Cowlitz	4,880 $\frac{4}{4}$	98 $\frac{3}{3}$	2,547	1,840	395
	Elokomin	178 $\frac{4}{4}$	23 $\frac{2}{2}$	150	5	0
	Grays	144 $\frac{5}{5}$	17 $\frac{2}{2}$	126	1	0
	Green	1,350 $\frac{6}{6}$	202 $\frac{3}{3}$	533	521	94
	Kalama	2,739 $\frac{1}{1}$	55 $\frac{2}{2}$	1,280	942	462
	East Fork Lewis	595 $\frac{1}{1}$	12	310	225	48
	North Fork Lewis	13,176 $\frac{7}{7}$	1,549	3,229	5,685	2,713
	Skamokawa	2,969 $\frac{5}{5}$	140	2,740	89	0
	Toutle	386 $\frac{5}{5}$	58	152	149	27
	North Fork Toutle	2,406 $\frac{5}{5}$	360	950	928	168
	South Fork Toutle	235 $\frac{4}{4}$	35 $\frac{2}{2}$	93	91	16
	Washougal	290 $\frac{1}{1}$	41 $\frac{2}{2}$	172	59	18
	Total	29,458	2,592	12,340	10,576	3,950

(Continued)

Table 14. Estimates of naturally spawning fall chinook populations and age compositions in lower Columbia River tributaries 1964-1980. (Continued).

Year	River	Escapement	AGE COMPOSITION			
			II	III	IV	V
1967	Coweeman	108 ¹ / ₁	8	27	68	5
	Cowlitz	5,900 ¹⁰ / ₄₇	413	1,485	3,719	283
	Elokomin	363 ² / ₁	16 ² / ₁	198	149	0
	Grays	147 ¹ / ₁	10	37	93	7
	Green	1,701 ⁵ / ₁	255	671	656	119
	Kalama	3,308 ⁶ / ₁	3 ² / ₁	185	2,885	235
	East Fork Lewis	442 ¹ / ₁	31	111	279	21
	North Fork Lewis	10,084 ¹ / ₁	373	1,807	6,352	1,552
	Skamokawa	2,969 ⁷ / ₁	134	1,618	1,217	0
	Toutle	224 ⁵ / ₁	34	88	86	16
	North Fork Toutle	1,397 ⁵ / ₁	210	551	538	98
	South Fork Toutle	136 ⁵ / ₁	20	54	52	10
	Washougal	170 ¹ / ₁	12	43	107	8
	Total	26,949	1,519	6,875	16,201	2,354
1968	Coweeman	140 ¹ / ₁	8	52	61	19
	Cowlitz	2,450 ¹⁰ / ₁	147	904	1,069	330
	Elokomin	1,096 ⁴ / ₁	340 ³ / ₁	524	214	18
	Grays	347 ⁴ / ₁	9 ² / ₁	287	51	0
	Green	2,640 ⁵ / ₁	161	1,151	1,125	203
	Kalama	2,893 ⁶ / ₁	87 ³ / ₁	609	1,832	365
	East Fork Lewis	265 ¹ / ₁	16	98	116	35
	North Fork Lewis	7,344 ¹ / ₁	184	590	4,922	1,648
	Skamokawa	2,969 ⁷ / ₁	131	2,129	665	44
	Toutle	180 ⁵ / ₁	11	78	77	14
	North Fork Toutle	374 ⁵ / ₁	23	163	159	29
	South Fork Toutle	42 ⁵ / ₁	3	18	18	3
	Washougal	153 ¹ / ₁	9	57	67	20
	Total	20,893	1,129	6,660	10,376	2,728
1969	Coweeman	118 ¹ / ₁	32	26	53	7
	Cowlitz	5,680 ¹⁰ / ₁	1,420	1,307	2,619	334
	Elokomin	324 ⁴ / ₁	23 ² / ₁	157	142	2
	Grays	156 ⁴ / ₁	27 ² / ₁	11	116	2
	Green	2,650 ⁵ / ₁	429	1,031	1,007	183
	Kalama	2,381 ⁶ / ₁	190 ³ / ₁	432	1,470	289
	East Fork Lewis	599 ¹ / ₁	270	101	202	26
	North Fork Lewis	5,774 ¹ / ₁	788	868	2,099	2,019
	Skamokawa	2,969 ⁷ / ₁	297	1,092	1,559	21
	Toutle	790 ⁵ / ₁	128	307	300	55
	North Fork Toutle	838 ⁵ / ₁	136	326	318	58
	South Fork Toutle	390 ⁵ / ₁	63	152	148	27
	Washougal	70 ¹ / ₁	8	19	38	5
	Total	22,739	3,811	5,829	10,071	3,028

(Continued)

Table 14. Estimates of naturally spawning fall chinook populations and age compositions in lower Columbia River tributaries 1964-1980. (Continued).

Year	River	Escapement	AGE COMPOSITION			
			II	III	IV	V
1970 ^{1/}	Coweeman	111	39	41	27	4
	Cowlitz	10,550 ^{10/}	844	5,590	3,599	517
	Elokomin	495	40	262	168	25
	Grays	390	31	207	133	19
	Green	4,244	340	2,249	1,447	208
	Kalama	2,976	238	1,577	1,015	146
	East Fork Lewis	1,217	560	379	244	34
	North Fork Lewis	21,726	17,596	1,469	2,203	458
	Skamokawa	2,969	238	1,573	1,013	145
	Toutle	263	21	139	90	13
	North Fork Toutle	2,515	201	1,333	858	123
	South Fork Toutle	289	23	153	99	14
	Washougal	85	13	41	27	4
	Total	47,830	20,184	15,013	10,923	1,710
1971 ^{1/}	Coweeman	296	6	103	177	10
	Cowlitz	23,345 ^{10/}	587	10,249	17,587	922
	Elokomin	375	8	131	224	12
	Grays	635	13	222	380	20
	Green	5,268	105	1,838	3,154	171
	Kalama	3,165	63	1,105	1,895	102
	East Fork Lewis	2,354	212	763	1,309	70
	North Fork Lewis	20,409	483	4,241	13,019	2,666
	Skamokawa	2,969	59	1,036	1,778	96
	Toutle	180	4	63	108	5
	North Fork Toutle	11,380	288	3,970	6,813	369
	South Fork Toutle	578	12	201	346	19
	Washougal	1,700	34	593	1,017	56
	Total	78,654	1,814 1,874	24,515	47,807	4,518
1972 ^{1/}	Coweeman	212	38	38	123	13
	Cowlitz	22,610 ^{10/}	1,583	4,648	14,852	1,527
	Elokomin	116	8	24	76	8
	Grays	688	14	149	476	49
	Green	6,654	466	1,368	4,371	449
	Kalama	3,465	243	712	2,276	234
	East Fork Lewis	668	134	118	377	39
	North Fork Lewis	19,198	710	1,920	14,364	2,204
	Skamokawa	2,969	208	610	1,950	201
	Toutle	355	25	73	233	24
	North Fork Toutle	9,408	659	1,934	6,180	635
	South Fork Toutle	440	31	90	289	30
	Washougal	1,300	13	284	909	94
	Total	68,083	4,132	11,968	46,476	5,507

(Continued)

Table 14. Estimates of naturally spawning fall chinook populations and age compositions in lower Columbia River tributaries 1964-1980. (Continued).

Year	River	Escapement	AGE COMPOSITION			
			II	III	IV	V
1973 ^{1/}	Coweeman	54	12	15	21	6
	Cowlitz	8,740 ^{10/}	350	2,903	4,032	1,455
	Elokomin	521	21	173	240	87
	Grays	530	27	174	242	87
	Green	908	36	302	419	151
	Kalama	6,262	63	2,145	2,979	1,075
	East Fork Lewis	538	328	73	101	36
	North Fork Lewis	13,029	3,909	1,643	4,879	2,598
	Skamokawa	2,969	119	986	1,370	494
	Toutle	738	30	245	240	123
	North Fork Toutle	1,250	50	415	577	208
	South Fork Toutle	178	7	59	82	30
	Washougal	203	14	66	91	32
	Total	35,920	4,966	9,199	15,373	6,382
1974 ^{1/}	Coweeman	42	1	12	25	4
	Cowlitz	7,800 ^{10/}	234	2,110	4,687	769
	Elokomin	253	8	69	152	24
	Grays	717	93	174	387	63
	Green	1,292	39	350	776	127
	Kalama	12,834	385	3,472	7,712	1,265
	East Fork Lewis	576	156	117	260	43
	North Fork Lewis	9,320	1,771	1,982	3,737	1,830
	Skamokawa	2,969	89	803	1,784	293
	Toutle	255	8	68	153	26
	North Fork Toutle	4,784	144	1,294	2,874	472
	South Fork Toutle	261	8	71	157	25
	Washougal	2,977	208	772	1,716	281
	Total	44,080	3,144	11,294	24,420	5,222
1975 ^{1/}	Coweeman	94	3	31	48	12
	Cowlitz	5,070 ^{10/}	304	1,623	2,508	635
	Elokomin	234	14	75	116	29
	Grays	751	45	240	371	95
	Green	634	38	203	313	80
	Kalama	18,123	362	6,048	9,347	2,366
	East Fork Lewis	618	37	198	305	78
	North Fork Lewis	14,904	1,045	2,577	8,079	3,203
	Skamokawa	5,446	218	1,781	2,751	696
	Toutle	413	25	132	204	52
	North Fork Toutle	6,909	138	2,306	3,563	902
	South Fork Toutle	114	7	36	56	15
	Washougal	982	59	315	486	122
	Total	54,292	2,295	15,565	28,147	8,285

(Continued)

Table 14. Estimates of naturally spawning fall chinook populations and age compositions in lower Columbia River tributaries 1964-1980. (Continued).

Year	River	Escapement	AGE COMPOSITION			
			II	III	IV	V
1976 ^{1/}	Coweeman	74	6	27	33	8
	Cowlitz	4,050	324	1,457	1,839	430
	Elokomin	1,734	52	658	830	194
	Grays	1,192	48	447	565	132
	Green	1,480	74	550	694	162
	Kalama	8,352	835	2,940	3,708	869
	East Fork Lewis	353	28	127	160	38
	North Fork Lewis	4,199	828	741	1,799	831
	Skamokawa	723	22	275	346	80
	Toutle	155	12	56	71	16
	North Fork Toutle	2,587	207	931	1,174	275
	South Fork Toutle	313	25	113	142	33
	Washougal	3,037	213	1,104	1,393	327
	Total	28,249	2,674	9,426	12,754	3,395
1977 ^{1/}	✓Coweeman	86	5	32	41	8
	✓Cowlitz	6,210	373	2,336	2,941	560
	✓Elokomin	604	36	227	286	55
	✓Grays	1,590	95	598	753	144
	✓Green	948	28	368	464	88
	✓Kalama	6,549	65	2,595	3,267	622
	✓East Fork Lewis	604	36	227	286	55
	✓North Fork Lewis	7,779	849	1,933	3,677	1,320
	✓Skamokawa	2,462	0	985	1,241	236
	✓Toutle	235	14	89	111	21
	✓North Fork Toutle	1,465	88	551	694	132
	✓South Fork Toutle	143	9	54	67	13
	✓Washougal	1,652	99	622	782	149
	<i>Abernathy Total</i>	30,327	1,697	10,617	14,610	3,403
1978	Coweeman	62 ^{1/}	4 ^{2/}	16	36	6
	Cowlitz	5,190 ^{10, 4/}	1,998 ^{2/}	1,645	1,486	61
	Elokomin	1,846 ^{4/}	0 ^{2/}	59	1,732	55
	Grays	2,685 ^{4/}	0 ^{3/}	317	2,314	54
	Green	6,488 ^{5/}	45 ^{3/}	786	5,360	297
	Kalama	3,711 ^{6/}	74 ^{3/}	462	2,924	251
	East Fork Lewis	968 ^{1/}	281	185	433	69
	North Fork Lewis	6,129 ^{1/}	766	1,483	2,912	968
	Skamokawa	3,246 ^{7/}	32	264	2,873	77
	Toutle	115 ^{5/}	1	14	95	5
	North Fork Toutle	1,450 ^{5/}	10	176	1,198	66
	South Fork Toutle	302 ^{5/}	2 ^{2/}	37	249	14
	Washougal	593 ^{4/}	0 ^{2/}	65	509	19
	Total	32,785	3,213	5,509	22,121	1,942

(Continued)

Table 14. Estimates of naturally spawning fall chinook populations and age compositions in lower Columbia River tributaries 1964-1980. (Continued).

Year	River	Escapement	AGE COMPOSITION			
			II	III	IV	V
1979	Coweeman	88 ^{1/10} _{4/}	8	27	41	12
	Cowlitz	9,190 ^{2/4/}	937 ^{2/3/}	4,886	3,342	25
	Elokomin	1,478 ^{4/4/}	0 ^{3/3/}	109	1,205	164
	Grays	1,206 ^{4/5/}	0 ^{3/3/}	398	808	0
	Green	4,418 ^{5/6/}	18 ^{3/3/}	568	3,485	347
	Kalama	2,731 ^{1/1/}	27 ^{3/3/}	1,046	1,366	292
	East Fork Lewis	814 ^{1/1/}	98	242	366	108
	North Fork Lewis	8,954 ^{1/7/}	931 ^{3/3/}	2,364	4,540	119
	Skamokawa	796 ^{5/5/}	72 ^{3/3/}	122	551	51
	Toutle	188 ^{5/5/}	1	24	148	15
	North Fork Toutle	455 ^{5/5/}	3	58	358	36
	South Fork Toutle	158 ^{5/5/}	1 ^{3/3/}	20	124	13
	Washougal	2,388 ^{4/4/}	0 ^{3/3/}	554	1,648	186
	Total	32,864	2,096	10,418	17,982	2,368
	1980	Coweeman	56 ^{8/4/}	6 ^{2/2/}	18	28
Cowlitz		2,690 ^{4/4/}	272 ^{2/2/}	846	1,354	218
Elokomin		64 ^{4/4/}	0 ^{2/2/}	5	56	3
Grays		197 ^{9/9/}	12 ^{2/2/}	24	144	17
Green		0 ^{6/6/}	0 ^{1/1/}	0	0	0
Kalama		5,850 ^{11/11/}	175 ^{1/1/}	454	4,937	284
East Fork Lewis		526 ^{11/11/}	215 ^{1/1/}	68	207	36
North Fork Lewis		14,919 ^{7/7/}	1,080	3,049	9,201	1,589
Skamokawa		184 ^{7/7/}	1	15	159	9
Toutle		37 ^{8/8/}	4	12	18	3
North Fork Toutle		0 ^{9/9/}	0	0	0	0
South Fork Toutle		0 ^{9/9/}	0	0	0	0
Washougal		3,437 ^{4/4/}	285 ^{1/1/}	631	2,143	378
Total	27,960	2,050	5,122	18,247	2,541	

1/ No changes from 8/13/80 memo from Gayle Kreitman to Don McIsaac (unless otherwise noted). See 8/13/80 memo for escapement/age composition deviations.

2/ Jack proportion based on total return to hatchery.

3/ Jack proportion based on length-frequency/bio-sampling on spawning grounds.

4/ Adult proportion based on hatchery sampling data.

5/ Jack proportion based on total return to Toutle Hatchery (unless otherwise indicated), adult proportion based on Toutle Hatchery sampling data.

6/ Adult proportion based on combined results of Kalama Falls and Lower Kalama hatcheries sampling data.

7/ Adult proportion based on combined results of Elokomin and Grays River hatcheries sampling data; includes jacks 1964-1969 and 1980, 1967 - only Elokomin as no chinook collected at Grays that year.

8/ Jack proportion based on total return to Cowlitz Hatchery, adult proportion based on Cowlitz Hatchery sampling data.

9/ Nothing found on Green; North Fork and South Fork Toutle unsurveyable due to Mt. St. Helens eruption of May 18, 1980.

10/ Previous escapement not expanded for fish/redds, change includes 2.5 fish/redd expansion factor; age proportions not changed from 8/13/80 memo (unless otherwise indicated). 1980 escapement includes the 2.5 fish/redd factor.

11/ East Fork Lewis adult proportions based on those for North Fork Lewis adults.

Escapement and age composition based on Gayle Kreitman's memo to Don McIsaac 6/9/81 on North Fork Lewis escapement and mark rate estimates.