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(all Info gathered from Table 1 inside.)

WASHINGTON COLUMBIA RIVER AND TRIBUTARY STREAM SURVEY SAMPLING RESULTS, 1989

Columbia River Laboratory Progress Report 90-20

Washington Department of Fisheries
Planning, Research, and Harvest Management
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Introduction

Information collected from spawning surveys in the Columbia River and tributaries for spring and fall chinook, coho, sockeye, and chum salmon has been emphasized in recent years (DeVore, Fiscus, LeFleur, Norman, Roler, Hymer). The natural spawning population sizes, age and stock composition, and coded wire tag recovery information of fall chinook is used in the Pacific Salmon Treaty pass through analysis, the Pacific Fisheries Management Council ocean regulatory process, and Columbia River harvest management.

The emphasis of this report focuses on fall chinook for the 1989 spawning year. Mark recovery information is presented for the other salmon species, along with spring chinook population estimates and mark sample data.

Methods

Stream surveys were conducted in 1989 on all major Washington Columbia River tributaries and the Upper Columbia mainstem area. Tributary biological data collected included live and dead fish counts, enumeration of redds, fork length measurements, scale samples, and sex determination. All fish recovered were mark sampled, with fin clips noted and snouts collected from adipose clipped (CWT) fish. Stream survey assistance was provided by Pacific Power and Light on the North Fork Lewis and Big White Salmon River, the Yakima Indian Nation on the Klickitat and Yakima rivers, and Grant County PUD from Priest Rapids Dam upstream. Scales were read by John Sneva, WDF-Olympia and the WDF Tag Recovery Lab dug and read the coded-wire tags.

Fish were mark sampled for adipose and ventral fin clips. When there was a question as to whether or not a fish had an adipose fin, the sampler made a note of it. Questionable adipose clips that were "No Tags" were not considered true marked fish for fall chinook run prediction CWT analysis. Marked fish with no actual coded-wire tag were aged by scale or fork length data. Population estimates were obtained by expanding fish or redd counts.

The number of Hanford Reach natural spawners was calculated by subtracting the Priest Rapids Dam count, the voluntary return to Priest Rapids Hatchery, the Hanford Reach sport catch, the Yakima River escapement and the Ice Harbor Dam count from the McNary Dam count. Total fall chinook escapement that passed over Ice Harbor not used for hatchery propagation was considered natural spawners. Fall chinook that escaped over Priest Rapids Dam and were not captured in the Priest Rapids Pool treaty net fishery were also considered natural spawners. The fall chinook return to the Yakima River was estimated by using the Prosser Dam count for the upper river and using the ratio of redds counted above and below Prosser Dam to estimate the lower river return.

Age and stock composition were estimated from CWT and scale analysis of fish sampled on the tributary spawning grounds. Hanford Reach sampling was done from jet sleds in the spawning areas of Vernita Bar, Locke Island and Ringold between November 3 and December 3. For natural spawning escapement over Ice Harbor Dam, Lyons Ferry Hatchery age and stock composition were used. Data collected on nine different days from Priest Rapids Dam left ladder, combined with data collected at Sand Hollow and from the treaty net fishery in Priest Rapids pool, were used to estimate the age and stock composition of fall chinook that passed over Priest Rapids Dam. The Yakima River fall chinook age composition was calculated by distributing the marks observed at Prosser Dam by the upriver bright tag rates observed on the fall chinook spawning in the Hanford Reach and the juvenile tag rates of the Yakima River releases of fall chinook.

Results

Table 1 lists the tributary index area description and miles surveyed for each stream sampled for fall chinook and Table 2 lists peak count expansion factors. Table 3 shows the visibility expansions when visibility is less than clear. Visibility expansions are for two of the Bonneville Pool tributaries only.

The total natural spawn escapement into Washington Columbia River tributaries in 1989 was 67,540 (Table 4). The North Fork Lewis and Kalama rivers contained the largest escapement of tributary spawners below McNary Dam in 1989 with 22,977 and 20,493 respectively.

Table 5 lists total escapement of natural spawning fall chinook in the Washington Columbia River system upstream from McNary Dam in 1989. The Hanford Reach area again had the largest natural spawning fall chinook population in the Columbia River basin (79,364).

Table 6 lists the age composition of natural spawning fall chinook in Washington Columbia River tributaries in 1989. Overall, five-year-olds comprised nearly half (49.0%) of the Washington tributary natural spawners.

Table 7 lists the age composition of natural spawning fall chinook in the Washington Columbia River system upstream from McNary Dam in 1989. Coincidentally, almost half (49.2%) of the natural spawners upstream from McNary Dam in 1989 were five-year-olds.

Table 8 lists escapement by age of natural spawning Lower River Hatchery (LRH) stock in Washington Columbia River tributaries. The Kalama River represented 57.2% of the Washington LRH natural spawning escapement. Overall, LRH stock comprised 51.6% of the total escapement of fall chinook spawning naturally in Washington Columbia River tributaries in 1989. Almost 50% of the LRH stock natural spawners in Washington

tributaries were five-year-olds.

The total natural spawning Lower River Wild (LRW) stock component in Washington Columbia River tributaries is listed in Table 9. The stock is primarily produced in the Lewis River. Five-year-olds (51.9%) again were the dominant age class.

Table 10 is a summary of the total escapement and age composition of natural spawning Rogue River Bright (RRB) stock straying into Washington Columbia River tributaries. The RRB stock was recently introduced into Big Creek Hatchery and the South Fork Klaskanine River in Oregon during the mid-80's.

Table 11 is a summary of the total escapement and age composition of natural spawning Bonneville Pool Hatchery (BPH) stock in Washington Columbia River tributaries. Natural spawning BPH stock are found in the Wind, Big White Salmon, and Klickitat River systems. The majority of BPH natural spawners were found in the Klickitat River and overall, four-year-olds (69.6%) were the primary age class.

Table 12 is a summary of total escapement and age composition of natural spawning Mid-Columbia Bright (MCB) stock in the Washington Columbia River system. The MCB stock includes Bonneville Upriver Brights (BUB) released at Bonneville Hatchery and Pool Upriver Brights (PUB) released at various hatcheries and streams between McNary and Bonneville Dams. Most Washington natural spawning MCBs were strays found in the Bonneville Pool tributaries and upstream from McNary Dam. Five-year-olds comprised 48.7% of the Washington natural spawners.

Table 13 is a summary of total escapement and age composition of Upriver Bright (URB) stock spawning naturally in the Washington Columbia River system in 1989. Overall, URBs comprised 58.2% of the natural spawners in the entire Washington Columbia River system, including tributaries. Almost 78,000 URBs spawned in the Hanford Reach area in 1989, down 32.2% from 1988. Five-year-olds (48.9%) was the URB primary age class.

Table 14 lists the mark sample size and number of marks recovered by species for each stream/area sampled in 1989. The natural spawn mark sample total includes 23,482 fall chinook, 1,385 spring chinook, 713 coho, 65 chum, and 2 sockeye. Within the sample, 1,010 fall chinook, 15 spring chinook, 44 coho, 2 chum, and 2 sockeye marks were found. Questionable adipose clips and ventral marks are included under total marks recovered.

Table 15 lists the mark recoveries for each stream/area. Questionable adipose clips are noted. Washington Resource Index Area (WRIA) codes are also listed for each stream.

The fall and spring chinook sample size summary is presented in Table 16. The biological sample size represents scale samples taken for a representative age composition of the return.

Table 17 lists the total escapement of natural spawning fall chinook in Washington Columbia River tributaries from 1980-89. Adult and jack fall chinook natural spawning escapement in the Columbia River upstream from McNary Dam from 1983-89 is given in Table 18.

Summary

In 1989, there was an estimated 166,173 fall chinook natural spawners to the Washington Columbia River system. An overall sample rate of 14.1% provided enough data to adequately profile the fall chinook run. A total of 27 streams/mainstem areas were surveyed for spring chinook, coho, chum and sockeye. A total of 25,647 fish were mark sampled and 1,073 marks were recovered.

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Table 1. Fall chinook index area descriptions for Washington Columbia River tributaries.

Stream	Index Area Description	Miles
Gravs River	Hatchery to covered bridge	3.6
Skamokawa Creek	Standard and McDonald Creeks to Wilson Creek	4.5
Elokomin River	Salmon Hatchery to Foster Road Bridge	6.0
Abernathy Creek	Salmon Hatchery to mouth	3.0
Mill Creek	Mill Creek Road Bridge to mouth	2.0
Germany Creek	3.5 miles upstream to mouth	3.5
Cowlitz River	Barrier Dam to Kelso Bridge	45.0
Coweeman River	Mulholland Creek to Jeep Club Bridge	6.0
Kalama River	Italian Creek to I-5 Bridge	3.7
North Fork Lewis River	Merwin Dam to Salmon Hatchery	4.0
East Fork Lewis River	Lewisville Park to Daybreak Park	4.2
Washougal River	Salmon Falls to Wildlife Access	4.0
Wind River	Shipperd Falls to mouth	1.3
Big White Salmon River	Condit Dam to mouth	2.0
Klickitat River	Salmon Hatchery to Twin Bridges	25.9

Table 2. Fall chinook peak count expansion factors for Washington Columbia River tributary index areas.

Stream	Peak Count Expansion 1/
Grays River	3.58
Skamokawa Creek	1.67
Elokomin River	2.00
Abernathy Creek	1.67
Mill Creek	1.67
Germany Creek	1.67
Cowlitz River 2/	6.65
Coweeman River	2.00
Kalama River	2.70
North Fork Lewis River	5.27
East Fork Lewis River	3.84
Washougal River	7.16
Wind River	3.61
Big White Salmon River	
(tule)	2.69
(bright)	1.96
Klickitat River	5.53

1 Rounded to nearest hundredth.
2/ Redd count expansion.

Table 3. Fall chinook expansions factors when visibility is less than clear

Stream	Visibility	Visbility Expansion
Big White Salmon River	Slight Color	1.14
	Some Turbidity	1.33
	3 Feet	1.33
	2.5 Feet	1.60
	2 Feet	2.00
	Turbid	2.00
Klickitat River	Fairly Clear	1.25
	3.5 Feet	1.43
	3 Feet	1.67
	2.5 Feet	2.00
	1.5 Feet	3.33

Table 4. Total escapement of natural spawning fall chinook in Washington Columbia River tributaries, 1989.

Stream	Date	Peak Count	Expansion Factor 1/	Total Escapement
Gravs River	9/25	227	3.58	81
Skamokawa Creek	9/25	587	1.67	980
Elokomin River	10/4	61	2.00	122
Abernathy Creek	9/22	525	1.67	881
Mill Creek	9/25	919	1.67	1,534
Germany Creek	9/22	226	1.67	377
Cowlitz River	10/22	866 a/	6.65 b/	7,357
Coweeman River	10/11	397 c/	2.00	794
Kalama River	9/29	7,605	2.70	20,499
North Fork Lewis River (includes Cedar Creek)	11/9	4,360	5.27	22,977
East Fork Lewis River	10/13	162	3.84	622
Washougal River	10/13	638 d/	7.16	4,571
Wind River (tules)	9/29	31	3.61	112
(brights)	11/15	226	e/	816
Big White Salmon River (tules)	10/3	90 f/	2.69	243
(brights)	11/15	604	1.96 g/	1,182
Klickitat River (tules)	10/14	423	5.53	2,339
(brights)				253 h/
Yakima				1,047 i/
TOTAL				67,540

1/ Rounded to nearest hundredth.

a/ Redd count.

b/ Redd count expansion was not used for 1989 estimate because fish observed suggested a greater population than peak redd counts indicated. Escapement was estimated by expanding the mark sample (2,950) by an assumed 40 percent sample rate.

c/ Peak count includes unusually large numbers of fish (20.9%) spawning outside of index area.

d/ 10/6 survey was actually pre-peak; survey made on 10/30 was post-peak. Population estimate determined by historical relationship between years with pre-peak, post-peak and actual (Oct 13) counts.

e/ No expansion factor has been developed for the "bright" fall chinook in the Wind River. The tule expansion factor was applied to the peak "bright" count.

f/ 68 tule fall chinook counted were multiplied by 1.33 visibility expansion factor.

g/ Peak count expansion factor determined by tagging "bright" fall chinook carcasses in October and November 1989.

h/ YIN surveyed in October and November 1989. Bright counts and estimates were determined by actual counts, water visibility, bright stock timing, and expected bright returns of two and three year-olds.

i/ Escapement estimated by using the Prosser Dam count for the upper river and using the ratio of redds counted above and below Prosser Dam to estimate the lower river return.

Table 5. Total escapement of natural spawning fall chinook in the Washington Columbia River system upstream from McNary Dam, 1989.

Area	Total Escapement	
	Adult	Jack
Ice Harbor Dam 1/	2,427	1,075
Hanford Reach 2/	64,345	15,019
Priest Rapids Dam 3/	13,655	2,112
TOTAL	80,427	18,206

1/ The escapement past Ice Harbor Dam was calculated by subtracting the total Lyons Ferry Hatchery escapement from the Ice Harbor Dam count. Total adult escapement does not include 6 Trinity River spring chinook counted as fall chinook.

2/ The number of Hanford Reach natural spawners was calculated by subtracting the the Priest Rapids Dam count, the return to Priest Rapids Hatchery, the Hanford Reach sport catch, the Yakima River River return, and the Ice Harbor Dam count from the McNary Dam count.
Total adult escapement does not include 46 Wells summer chinook counted as fall chinook.

3/ Priest Rapids Dam escapement was calculated by subtracting the fall chinook harvested from the Yakima Indian Nation setnet fishery in Priest Rapids Pool.
Total adult escapement does not include 349 Wells summer chinook counted as fall chinook.
Total jack escapement does not include 141 Wells summer chinook counted as fall chinook.

Table 6. Age composition of natural spawning fall chinook in Washington Columbia River tributaries, 1989.

Stream	Total Escapement	Age Composition				
		2's	3's	4's	5's	6's
Grays River	813	8	103	421	281	0
Skamokawa Creek	980	7	149	590	234	0
Elokomin River	122	2	58	50	12	0
Abernathy Creek	881	20	521	290	50	0
Mill Creek	1,534	44	767	642	181	0
Germany Creek	377	20	119	198	40	0
Cowlitz River	7,375	155	715	2,980	3,451	74
Coweeman River	794	24	67	262	441	0
Kalama River	20,495	32	779	8,362	11,272	0
North Fork Lewis River (includes Cedar Creek)	22,977	1,778	2,568	6,261	12,210	160
East Fork Lewis River	922	21	49	240	302	0
Washougal River	4,578	170	311	1,355	2,742	0
Wind River (tules)	112	0	9	26	77	0
(brights)	516	10	17	268	221	0
Big White Salmon River (tules)	243	38	165	29	1	0
(brights)	1,182	55	125	173	823	6
Klickitat River (tules)	2,339	6	114	1,811	408	0
(brights) 1/	253	0	253	0	0	0
Yakima 2/	1,047	28	923	64	32	0
TOTAL	67,540	2,478	7,812	23,932	33,078	240

1/ The bright stock age composition was determined by YIN carcass sampling during November and separating stocks by timing, size, and the expected returns of two and three year old brights.

2/ The age composition was calculated by distributing the marks observed at Prosser Dam by the Upriver Bright tag rates found on the fall chinook spawning on the Hanford Reach and the juvenile tag rates of the Yakima River releases of fall chinook.

Table 7. Age composition of natural spawning fall chinook in the Washington Columbia River system upstream from McNary Dam, 1989.

Area	Total Escapement	Age Composition				
		2's	3's	4's	5's	6's
Ice Harbor Dam 1/	3,502	1,075	1,083	1,050	274	20
Hanford Reach 2/	79,364	15,019	5,904	13,637	44,266	538
Priest Rapids Dam 3/	15,767	2,112	5,021	4,621	3,961	52
TOTAL	98,633	18,206	12,008	19,308	48,501	610

1/ Fish passed over Ice Harbor Dam and not accounted for at Lyons Ferry Hatchery were not sampled. Lyons Ferry Hatchery age and stock composition used to estimate the escapement.
Total escapement does not include 6 four-year old Trinity River spring chinook.

2/ Total escapement does not include 46 five-year old Wells summer chinook.

3/ All chinook passing over the left ladder were mark and scale sampled on nine different days between September 12 and October 10. This data was combined with the data collected at Sand Hollow and from the treaty net fishery in Priest Rapids Pool to estimate age and stock composition of chinook passing over Priest Rapids Dam.
Total escapement does not include 141 two-year old, 296 four-year old and 53 five-year old Wells summer chinook.
Total escapement does not include 60 three-year old, 178 four-year old, and 579 five year-old chinook caught during the Yakima Indian Nation setnet fishery in Priest Rapids Pool.

Table 8. Total escapement and age composition of natural spawning Lower River Hatchery (LRH) stock in Washington Columbia River tributaries, 1989.

Stream	Total Escapement	Age Composition 2's	3's	4's	5's	6's
Grays River	811	8	103	419	281	0
Skamokawa Creek	971	7	145	585	234	0
Elokomin River	122	2	58	50	12	0
Abernathy Creek	877	20	521	286	50	0
Mill Creek	1,532	44	767	542	179	0
Germany Creek	377	20	119	198	40	0
Cowlitz River	3,350	0	255	1,786	1,309	0
Coweeman River	794	24	67	262	441	0
Kalama River	19,952	82	779	7,819	11,272	0
North Fork Lewis River (includes Cedar Cr.)	1,141	0	285	191	665	0
East Fork Lewis River	349	15	49	134	151	0
Washougal River	4,578	170	311	1,355	2,742	0
TOTAL	34,854	392	3,459	13,627	17,376	0

Table 9. Total escapement and age composition of natural spawning Lower River Wild (LRW) stock in Washington Columbia River tributaries, 1989.

Stream	Total Escapement	Age Composition 2's	3's	4's	5's	6's
Cowlitz River	4,022	155	460	1,191	2,142	74
Kalama River	543	0	0	543	0	0
North Fork Lewis River (includes Cedar Cr.)	21,832	1,774	2,283	6,070	11,545	160
East Fork Lewis River	273	16	0	106	151	0
TOTAL	26,670	1,945	2,743	7,910	13,838	234

Table 10. Total escapement and age composition of natural spawning Rogue River Bright (RRB) stock in Washington Columbia River tributaries, 1989.

Stream	Total Escapement	Age Composition 2's	3's	4's	5's	6's
Grays River	2	0	0	2	0	0
Skamokawa Creek	9	0	4	5	0	0
Abernathy Creek	4	0	0	4	0	0
Mill Creek	2	0	0	0	2	0
Cowlitz River	3	0	0	3	0	0
North Fork Lewis River	4	4	0	0	0	0
TOTAL	24	4	4	14	2	0

Table 11. Total escapement and age composition of natural spawning Bonneville Pool Hatchery (BPH) stock in Washington Columbia River tributaries, 1989.

Stream	Total Escapement	Age Composition 2's	3's	4's	5's	6's
Wind River	112	0	9	26	77	0
Big White Salmon River	243	38	165	39	1	0
Klickitat River	2,339	6	114	1,811	408	
TOTAL	2,694	44	288	1,876	486	0

Table 12. Total escapement and age composition of natural spawning Mid-Columbia Bright (MCB) stock in Washington Columbia River system, 1989.

Stream	Total Escapement	Age Composition 2's	3's	4's	5's	6's
Wind River	816	10	17	269	521	0
Big White Salmon River 1	1,182	55	125	171	823	6
Klickitat River	253	0	253	0	0	0
Ice Harbor Dam 2	1,040	155	422	313	144	6
Hanford Reach 3	1,454	0	0	471	983	0
Priest Rapids Dam 4	436	0	49	334	53	0
TOTAL	5,181	220	866	1,559	2,524	12

1 Total escapement includes 11 three-year old and 6 six-year old Bonneville Hatchery brights and 3 three-year old Bonneville Dam passage study brights.

2 Total escapement includes 147 two-year old, 403 three-year old, 298 four-year old, 133 five-year old, and 6 six-year old Umatilla River brights, 2 four-year old and 4 five-year old Spring Creek Hatchery brights released in Social Security Lake and 7 five-year old Little White Salmon Hatchery brights, 8 two-year old and 19 three-year old Bonneville Dam passage study brights and 13 four-year old Bonneville Hatchery brights.

3 Total escapement includes 412 four-year old and 968 five-year old Umatilla River brights, 59 four-year old and 15 five-year old Spring Creek Hatchery brights released in Social Security Lake and Rock Creek.

4 Total escapement includes 334 four-year old Umatilla River brights and 53 five-year old Spring Creek Hatchery brights released in Social Security Lake and Rock Creek and 49 three-year old Bonneville Dam passage study brights.

Table 13. Total escapement and age composition of natural spawning Upriver Bright (URB) stock in Washington Columbia River system, 1989.

Stream	Total Escapement	Age Composition				
		2's	3's	4's	5's	6's
Ice Harbor Dam 1/	2,462	920	961	737	130	14
Yakima River 2/	1,047	28	923	64	32	0
Hanford Reach 3/	77,910	15,019	5,304	13,166	43,283	538
Priest Rapids Dam 4/	15,331	2,112	4,872	4,287	3,903	52
TOTAL	96,750	18,079	12,460	18,254	47,353	604

1/ Total escapement includes 9 three-year old Yakima River URBs and 74 three-year old, 140 four-year old, and 33 five-year old URBs of non-Snake River origin. Lyons Ferry Hatchery age and stock composition used to estimate the escapement.

2/ Total escapement includes 180 three-year old and 2 five-year old Yakima River URBs.

3/ Total escapement includes 34 three-year old and 15 five-year old Yakima River URBs, 30 four-year old and 44 five-year old Spring Creek Hatchery brights released at Hanford, 46 four-year old Lyons Ferry Hatchery URBs and 48 four-year old Rocky Reach Hatchery URBs.

4/ Total escapement includes 153 two-year old, 134 three-year old, 547 four-year old and 56 five-year old Rocky Reach Hatchery URBs, 334 three-year old Yakima River URBs, 33 five-year old Spring Creek Hatchery brights released at Hanford. Total does not include Yakima Indian Nation setnet fishery catch in Priest Rapids Pool.

Table 14. Mark sampling data for natural spawning fall chinook in the Washington Columbia River system, 1989.

Stream	Sample Size	Total Marks Recovered	Adjusted 1/ Adipose Marks Recovered
Grays River	388	48	47
West Fork Grays River	37	23	23
Skamokawa Creek	351	133	132
Elokomin River	31	2	2
Abernathy Creek	445	7	6
Mill Creek	363	15	15
Germany Creek	99	0	0
Cowlitz River	2,950	105	103
Coweeman River	403	0	0
S.Fk.Toutle River	7	0	0
Kalama River	3,957	67	67
North Fork Lewis River	5,605	303	294
Cedar Creek	203	12	12
East Fork Lewis River	103	3	2
Washougal River	859	72	70
Hamiliton Creek	6	0	0
Wind River			
(tules)	13	0	0
(brights)	163	5	5
Big White Salmon River			
(tules)	14	4	4
(brights)	990	113	105
Klickitat River			
(tules)	195 2/	0	0
(brights)	13 3/	0	0
Hanford Reach	4,813	49	48
Priest Rapids Dam	382	44	44
Sand Hallow Creek	61	5	5
Priest Rapids Pool	11	0	0
Total Fall Chinook	23,482	1,010	974

1/ Adjusted adipose marks recovered does not include ventral marks and questionable adipose clips that had no coded-wire tags.

2/ Includes 115 mark sampled by YIN.

Table 14. Mark sampling data for natural spawning spring chinook in the Washington Columbia River system, 1989.

Stream	Sample Size	Total Marks Recovered	Adjusted 1/ Adipose Marks Recovered
Cowlitz River	159	10	10
Kalama River	119	0	0
North Fork Lewis River	1,085	2	1
Cedar Creek	2	0	0
Wind River	14	1	1
Klickitat River	3	2	0
TOTAL Spring Chinook	1,385	15	12

1/ Adjusted adipose marks recovered does not include ventral fin marks and questionable adipose clips that had no coded-wire tags.

Table 14. Mark sampling data for natural spawning coho in the Washington Columbia River system, 1989.

Stream	Sample Size	Total Marks Recovered	Adjusted 1 Adipose Marks Recovered
Grays River	21	0	0
West Fork Grays River	13	1	0
Skamokawa Creek	3	2	2
Elokomin River	1	0	0
Cowlitz River	6	0	0
Coweeman River	1	0	0
Kalama River	57	1	1
North Fork Lewis River	358	21	21
Cedar Creek	200	14	14
Johnson Creek	4	1	1
Washougal River	3	0	0
Hardy Creek	12	2	2
Hamilton Creek	1	0	0
Wind River	6	0	0
Big White Salmon River	15	2	2
TOTAL Coho	713	44	43

1/ Adjusted adipose marks recovered does not include ventral marks and questionable adipose clips that had no coded-wire tags.

Table 14. Mark sampling data for natural spawning chum in the Washington Columbia River system, 1989.

Stream	Sample Size	Total Marks Recovered	Adjusted 1/ Adipose Marks Recovered
Grays River	17	2	2
Gorley's Creek	11	0	0
Crazy Johnson's Creek	27	0	0
Hardy Creek	2	0	0
Hamilton Creek	5	0	0
TOTAL Chum	65	2	2

1/ Adjusted adipose marks recovered does not include ventral marks and questionable adipose clips that had no coded-wire tags.

Table 14. Mark sampling data for natural spawning sockeye in the Washington Columbia River system downstream from McNary Dam, 1989.

Stream	Sample Size	Total Marks Recovered	Adjusted 1/ Adipose Marks Recovered
North Fork Lewis River	1	1	1
Big White Salmon River	1	1	1
TOTAL Sockeye	2	2	2

1/ Adjusted adipose marks recovered does not include ventral marks and questionable adipose clips that had no coded-wire tags.

Table 15. Fall chinook mark recoveries from the Washington Columbia River system, 1989. (Cont.)

Stream	Number of Recoveries	Fall Chinook Tag Code	Fall Chinook Brood Year	Fall Chinook Origin
Grays River (25-0093)	1	07-33/45	84	Klaskanine
	1	63-32/42	84	Grays
	3	63-32/43	84	Grays
	5	63-33/26	84	Grays
	10	63-33/27	84	Grays
	1	Lost	84	———
	1	NT	84	———
	1	07-34/37	85	Big Creek (Rogue River Stock)
	3	63-33/21	85	Grays
	1	63-34/59	85	Elokomin
	2	63-36/31	85	Grays
	4	63-36/32	85	Grays
	1	63-37/60	85	Grays
	1	63-37/61	85	Grays
	4	63-37/62	85	Grays
	3	Lost	85	———
	1	NT	85	———
	1	NT	85	?Ad
	2	No snout	85	———
	1	07-44/55	86	Klaskanine
	1	No snout	86	———
	48			
West Fork Grays River (25-0131)	3	63-32/42	84	Grays
	4	63-32/43	84	Grays
	4	63-33/26	84	Grays
	2	63-33/27	84	Grays
	1	63-36/31	85	Grays
	1	63-37/60	85	Grays
	3	63-37/61	85	Grays
	2	63-37/62	85	Grays
	1	NT	85	———
	2	No snout	85	———
	23			

Table 15. Fall chinook mark recoveries from the Washington Columbia River system, 1989. (Cont.)

Stream	Number of Recoveries	Tag Code	Brood Year	Origin
Skamokawa Creek (25-0194)	9	63-32/42	84	Grays
	7	63-32/43	84	Grays
	11	63-33/26	84	Grays
	8	63-33/27	84	Grays
	1	Lost	84	———
	4	NT	84	———
	2	No snout	84	———
	1	07-34/41	85	Big Creek (Rogue River Stock)
	2	07-34/42	85	Big Creek (Rogue River Stock)
	1	07-34/43	85	Big Creek (Rogue River Stock)
	4	63-33/21	85	Grays
	5	63-34/58	85	Elokomin
	2	63-34/59	85	Elokomin
	4	63-36/31	85	Grays
	6	63-36/32	85	Grays
	3	63-37/59	85	Grays
	2	63-37/60	85	Grays
	18	63-37/61	85	Grays
	23	63-37/62	85	Grays
	2	63-38/19	85	Elokomin
	1	63-38/20	85	Elokomin
	3	Lost	85	———
	3	NT	85	———
	1	NT	85	?Ad
	2	No snout	85	———
	2	07-34/60	86	Big Creek (Rogue River Stock)
	1	07-35/04	86	Big Creek (Rogue River Stock)
	133			
Elokomin River (25-0236)	1	63-32/42	84	Grays
	1	63-33/21	85	Grays
	2			
Abernathy Creek (25-0297)	1	07-33/50	85	Big Creek (Rogue River Stock)
	1	07-34/39	85	Big Creek (Rogue River Stock)
	3	63-34/59	85	Elokomin
	1	63-36/31	85	Grays
	1	NT	85	?Ad
	7			

Table 15. Fall chinook mark recoveries from the Washington Columbia River system, 1989. (Cont.)

Stream	Number of Recoveries	Tag Code	Brood Year	Origin
Mill Creek (25-0284)	1	07-32/32	84	Big Creek (Rogue River Stock)
	1	NT	84	———
	3	63-34/58	85	Elokomin
	5	63-34/59	85	Elokomin
	1	63-38/19	85	Elokomin
	2	63-38/20	85	Elokomin
	1	NT	85	———
	1	NT	86	———
	15			
Cowlitz River (26-0002)	1	63-31/27	83	Lewis wild
	5	63-32/35	84	Cowlitz
	2	63-32/36	84	Cowlitz
	5	63-32/37	84	Cowlitz
	4	63-32/38	84	Cowlitz
	3	63-34/09	84	Lewis
	1	63-34/10	84	Lewis
	1	63-34/11	84	Lewis wild
	2	63-34/12	84	Lewis wild
	9	63-34/48	84	Cowlitz
	3	63-34/50	84	Cowlitz
	16	63-34/51	84	Cowlitz
	7	NT	84	———
	1	07-34/38	85	Big Creek (Rogue River Stock)
	2	63-38/21	85	Lewis wild
	2	63-38/22	85	Lewis wild
	5	63-41/08	85	Cowlitz
	1	Lost	85	———
	9	NT	85	———
	1	NT	85	?Ad
	1	No snout	85	———
	2	63-41/26	86	Cowlitz
	1	63-41/51	86	Lewis wild
	2	63-41/53	86	Lewis wild
	1	NT	86	———
	3	63-50/61	87	Lewis wild
	2	63-50/62	87	Lewis wild
	2	NT	87	?Ad
	1	code 8	87	———
	105			

Table 15. Fall chinook mark recoveries from the Washington Columbia River system, 1989. (Cont.)

Stream	Number of Recoveries	Tag Code	Brood Year	Origin
Kalama River (27-0002)	1	63-32/38	84	Cowlitz
	1	63-32/42	84	Grays
	1	63-33/34	84	Washougal
	4	63-33/35	84	Washougal
	1	63-34/07	84	Washougal
	1	63-34/14	84	Washougal
	4	63-34/28	84	Washougal
	3	63-34/31	84	Washougal
	2	63-34/32	84	Washougal
	1	63-34/34	84	Washougal
	2	NT	84	———
	5	NT	84	?Ad
	1	63-33/21	85	Grays
	1	63-34/58	85	Elokomin
	2	63-34/59	85	Elokomin
	2	63-38/21	85	Lewis wild
	1	63-38/22	85	Lewis wild
	2	63-38/27	85	Washougal
	1	63-38/28	85	Washougal
	5	63-38/29	85	Washougal
	4	63-38/30	85	Washougal
	2	63-38/32	85	Washougal
	8	63-41/13	85	Washougal
	2	Lost	85	———
	4	NT	85	———
	5	NT	85	?Ad
	1	NT	86	———
	67			

Table 15. Fall chinook mark recoveries from the Washington Columbia River system, 1989. (Cont.)

Stream	Number of Recoveries	Tag Code	Brood Year	Origin
North Fork Lewis River (27-0168)	1	63-31/27	83	Lewis wild
	1	63-32/37	84	Cowlitz
	5	63-33/34	84	Washougal
	2	63-33/35	84	Washougal
	2	63-34/07	84	Washougal
	1	63-34/08	84	Washougal
	18	63-34/09	84	Lewis
	25	63-34/10	84	Lewis
	28	63-34/11	84	Lewis wild
	33	63-34/12	84	Lewis wild
	1	63-34/15	84	Washougal
	1	63-34/33	84	Washougal
	1	63-34/49	84	Cowlitz
	1	63-34/50	84	Cowlitz
	1	63-34/51	84	Cowlitz
	3	Lost	84	———
	13	NT	84	———
	1	NT	84	? AD
	1	63-37/61	85	Grays
	19	63-38/21	85	Lewis wild
	24	63-38/22	85	Lewis wild
	2	63-38/27	85	Washougal
	1	63-38/31	85	Washougal
	3	63-38/32	85	Washougal
	4	63-41/13	85	Washougal
	1	Lost	85	———
	21	NT	85	———
	5	NT	85	? AD
	22	63-41/51	86	Lewis wild
	22	63-41/53	86	Lewis wild
	7	NT	86	———
	2	NT	86	? AD
	1	07-41/36	87	Big Creek (Rogue River Stock)
	19	63-50/61	87	Lewis wild
	7	63-50/62	87	Lewis wild
	2	NT	87	———
	1	NT	87	? AD
	1	No snout	87	———
	303			
Cedar Creek (27-0339)	3	63-34/09	84	Lewis
	5	63-34/10	84	Lewis
	2	63-34/12	84	Lewis wild
	1	63-34/34	84	Washougal
	1	63-41/50	86	Washougal
	12			

Table 15. Fall chinook mark recoveries from the Washington Columbia River system, 1989. (Cont.)

Stream	Number of Recoveries	Tag Code	Brood Year	Origin
East Fork Lewis River	1	63-41/13	85	Washougal
(27-0173)	1	NT	85	? AD
	1	63-41/50	86	Washougal
	3			
Washougal River	5	63-33/34	84	Washougal
(28-0159)	5	63-33/35	84	Washougal
	4	63-34/07	84	Washougal
	2	63-34/08	84	Washougal
	1	63-34/14	84	Washougal
	2	63-34/15	84	Washougal
	7	63-34/16	84	Washougal
	1	63-34/28	84	Washougal
	2	63-34/31	84	Washougal
	6	63-34/34	84	Washougal
	2	NT	84	———
	1	63-38/28	85	Washougal
	5	63-38/29	85	Washougal
	5	63-38/30	85	Washougal
	5	63-38/31	85	Washougal
	3	63-38/32	85	Washougal
	8	63-41/13	85	Washougal
	1	NT	85	———
	2	NT	85	?Ad
	1	No snout	85	———
	2	63-41/50	86	Washougal
	1	NT	86	———
	1	63-52/28	87	Washougal
	72			

Table 15. Fall chinook mark recoveries from the Washington Columbia River system, 1989. (Cont.)

Stream	Number of Recoveries	Tag Code	Brood Year	Origin
Wind River (brights) (29-0023)	1	05-12/51	84	Little White Salmon Bright
	1	05-12/53	84	Little White Salmon Bright
	1	05-18/07	85	Little White Salmon Bright
	1	NT	85	
	1	B5-01/01	86	Drano Lake Pens Bright
	5			
Big White Salmon River (tules) (29-0160)	1	05-18/55	86	Spring Creek
	1	05-18/60	86	Spring Creek
	1	05-18/63	86	Spring Creek
	1	05-19/05	86	Spring Creek
	4			
Big White Salmon River (brights) (29-0160)	1	07-31/26	83	Bonneville Upriver Bright
	4	05-12/50	84	Little White Salmon Bright
	12	05-12/51	84	Little White Salmon Bright
	5	05-12/52	84	Little White Salmon Bright
	6	05-12/53	84	Little White Salmon Bright
	5	05-12/54	84	Little White Salmon Bright
	9	05-12/55	84	Little White Salmon Bright
	5	05-12/56	84	Little White Salmon Bright
	12	05-12/57	84	Little White Salmon Bright
	7	NT	84	
	5	NT	84	?Ad
	4	05-18/07	85	Little White Salmon Bright
	5	05-18/08	85	Little White Salmon Bright
	4	05-18/09	85	Little White Salmon Bright
	2	05-18/10	85	Little White Salmon Bright
	1	Lost	85	
	4	NT	85	
	3	NT	85	?Ad
	1	07-47/21	86	Bonneville Upriver Bright
	1	07-47/32	86	Bonneville Upriver Bright
	1	23-21/44	86	NMFS rel. Bonneville Upriver Bright
	1	23-21/46	86	NMFS rel. Bonneville Upriver Bright
	1	B5-01/01	86	Drano Lake Pens Bright
	2	B5-01/03	86	Drano Lake Pens Bright
	1	B5-01/04	86	Drano Lake Pens Bright
	3	B5-01/06	86	Drano Lake Pens Bright
	4	B5-02/02	86	Drano Lake Pens Bright
	1	B5-07/13	86	Drano Lake Pens Bright
	1	B5-07/14	86	Drano Lake Pens Bright
	2	NT	86	
	113			

Table 15. Fall chinook mark recoveries from the Washington Columbia River system, 1989. (Cont.)

Stream	Number of Recoveries	Tag Code	Brood Year	Origin
Upper Columbia River (Hanford Reach) (36-0001)	1	05-07/05	84	Spring Creek Bright/released Rock Creek
	1	05-12/43	84	Spring Creek Bright, released Yakima R.
	3	05-15/24	84	Spring Creek Bright/released Hanford
	4	07-33/26	84	Bonneville Upriver Bright, released Umatilla R.
	2	07-33/27	84	Irrigon/released Umatilla R.
	1	63-32/19	84	Wells summer
	1	63-32/22	84	Priest Rapids
	1	No snout	84	———
	5	NT	84	———
	1	NT	84	?Ad
	1	B5-02/12	85	Rock Cr. Pens Bright
	1	B5-03/13	85	Social Security Lake Bright
	1	B5-03/14	85	Social Security Lake Bright
	1	B5-03/15	85	Social Security Lake Bright
	1	05-17/59	85	Spring Creek Bright/released Hanford
	1	07-38/36	85	Irrigon/released Umatilla R.
	1	07-38/37	85	Irrigon/released Umatilla R.
	1	07-38/41	85	Irrigon/released Umatilla R.
	2	23-19/32	85	Wild/released below Bonneville
	2	23-19/40	85	Wild/released below Bonneville
	3	63-31/12	85	Rocky Reach
	1	63-41/02	85	Priest Rapids
	3	63-41/59	85	Lyons Ferry
	1	Lost	85	———
	2	NT	85	———
	1	05-19/18	86	Yakima River Bright
	1	23-20/01	86	Wild/released below Bonneville
	1	23-20/16	86	Wild/released below Bonneville
	1	63-41/52	86	Columbia River wild
	2	NT	86	———
	1	NT	87	———
	49			

Table 15. Fall chinook mark recoveries from the Washington Columbia River system, 1989. (Cont.)

Stream	Number of Recoveries	Tag Code	Brood Year	Origin
Priest Rapids Dam (36-0126)	1	H5-07/03	84	Spring Creek Bright/released Social Security Lk.
	1	05-15/24	84	Spring Creek Bright/released Hanford
	1	63-23/30	84	Priest Rapids
	4	63-28/58	84	Rocky Reach
	1	63-32/19	84	Wells summer chinook
	1	B1-03/08	85	Wells summer chinook
	1	B1-03/10	85	Wells summer chinook
	14	63-31/12	85	Rocky Reach
	1	63-41/02	85	Priest Rapids
	1	NT	85	———
	1	05-19/17	86	Yakima River Bright
	2	05-19/21	86	Yakima River Bright
	1	23-22/07	86	NMFS released Bonneville Upriver Bright
	3	63-28/43	86	Rocky Reach
	1	63-41/28	86	Priest Rapids
	7	63-49/52	87	Rocky Reach
	1	63-50/37	87	Wells summer chinook
	1	63-50/38	87	Wells summer chinook
	1	63-52/32	87	Columbia River wild
	44			
Upper Columbia River (Sand Hollow Creek) (41-2151)	1	63-23/30	84	Priest Rapids
	1	63-41/02	85	Priest Rapids
	2	NT	85	———
	1	05-19/17	86	Yakima River Bright
	5			

Table 15. Spring chinook mark recoveries from the Washington Columbia River system, 1989.

Stream	Number of Recoveries	Tag Code	Brood Year	Origin
		Spring Chinook		
Cowlitz River (26-0002)	1	63-35-08	84	Cowlitz
	1	63-35-09	84	Cowlitz
	2	63-35-11	84	Cowlitz
	2	63-35-12	84	Cowlitz
	2	NT	84	———
	1	63-38-34	85	Cowlitz
	1	NT	85	———
	10			
North Fork Lewis River (27-0168)	1	63-35-10	84	Cowlitz
	1	NT	84	?Ad
	2			
Wind River (29-0023)	1	05-18-26	85	Carson
Klickitat River (30-0002)	2	LV	85	Klickitat (Carson Stock)

Table 15. Coho mark recoveries from the Washington Columbia River system, 1989.

Stream	Number of Recoveries	Tag Code	Brood Year	Origin
		Coho		
West Fork Grays River (25-0131)	1	NT	86	? Ad
Skamokawa Creek (25-0194)	1	63-42-50	85	Grays (S)
	1	No Snout	86	———
	2			
Kalama River (27-0002)	1	NT	86	———
North Fork Lewis River (27-0168)	8	63-44-50	86	Lewis (S)
	9	63-49-19	86	Lewis (N)
	2	63-49-56	86	Lewis (N)
	2	NT	86	———
	21			
Cedar Creek (27-0339)	8	63-44-50	86	Lewis (S)
	3	NT	86	———
	2	Lost	86	———
	1	No Snout	86	———
	14			
Johnson Creek (27-0327)	1	NT	86	———
Big White Salmon River (29-0160)	1	07-43-56	86	Cascade H. rel. Umatilla River
	1	NT	86	———
	2			
Hardy Creek (28-0303)	2	No Snout	86	———

Table 15. Chum mark recoveries from the Washington Columbia River system, 1989.

Stream	Chum			
	Number of Recoveries	Tag Code	Brood Year	Origin
Grays River (25-0093)	1	NT	84	? Ad
	1	NT	85	? Ad

Table 15. Sockeye mark recoveries from the Washington Columbia River system, 1989.

Stream	Sockeye			
	Number of Recoveries	Tag Code	Brood Year	Origin
North Fork Lewis River (27-0168)	1	23-20-37	85	Wild, tagged by NMFS at PR Dam, rel. Corbett Station
Big White Salmon River (29-0160)	1	23-20-34	85	Wild, tagged by NMFS at PR Dam, rel. Corbett Station

Table 16. Sample size summary of natural spawning fall chinook in the Washington Columbia River system, 1989.

Stream	Population Estimate	Mark Sample Size	Sample Rate	Biological Sample Size
Grays River	813	425 a/	0.5228 b/	364
Skamokawa Creek	980	851	0.8684 b/	165
Elokomin River	122	31	0.2541	21
Abernathy Creek	881	445	0.5051	88
Mill Creek	1,534	863	0.5626	132
Germany Creek	377	99	0.2626	19
Cowlitz River	7,375	2,950	0.4000 c/	610
Coweeman River	794 d/	403	0.5076	188
Kalama River	20,495	3,957	0.1931	745
North Fork Lewis River	22,977	5,808 e/	0.2528	1,145
East Fork Lewis River	622	103	0.1656	69
Washougal River	4,578	859	0.1876	161
nd River (tule)	112	13	0.1161	13
(bright)	816	163	0.1998	64
Big White Salmon River (tule)	243	14	0.0576	10
(bright)	1,182 f/	990	0.8376	194
Klickitat River (tules)	2,339	195 g/	0.0834	80
(brights)	253	13 h/	0.0514	
Yakima	1,047	0	0.0000	0
Ice Harbor Dam	3,502	0 i/	0.0000	0
Hanford Reach	79,364	4,813	0.0606	945
Priest Rapids Dam	15,767	474 j/	0.0301	463
TOTAL	166,173	23,469	0.1412	5,476

a/ Includes 37 mark sampled in West Fork Grays.
b/ Heavily sampled to increase coded-wire tag recoveries for hatchery studies.
c/ Assumed 40 percent sample rate instead of redd count expansion.
d/ Population estimate expanded to include large numbers of fish spawning outside of index area.
e/ Includes 203 mark sampled in Cedar Creek.
f/ Population estimates were made by expansion factors determined by carcass tagging October and November spawning fall chinook in 1989.
g/ Includes 115 mark sampled by YIN.
h/ Mark sampled by YIN.
i/ No sampling of fish passed over Ice Harbor Dam and not accounted for at Lyons Ferry Hatchery.
j/ Includes chinook sampled at Priest Rapids Dam Left Ladder,

Table 16. Sample size summary of natural spawning spring chinook in the Washington Columbia River system, 1989.

Stream	Population Estimate	Mark Sample Size	Sample Rate	Biological Sample Size
Cowlitz River	684	159	0.2325	39
Kalama River	584	119	0.2038	82
North Fork Lewis River	3,594	1,087 a/	0.3024	224
Wind River	157	14	0.0892	14
Klickitat River				
(Klickitat stock)	363	4	0.0110	4
(Carson stock)	30	2	0.0667	0
TOTAL	5,412	1,385	0.2559	363

a/ Includes 2 mark sampled in Cedar Creek.

Table 17. Total escapement of natural spawning fall chinook in Washington Columbia River tributaries, 1980-89.

✓ entered Mon Dec 3rd 1990

Stream	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980
Grays River ✓	813	1,010	1,113	1,074	838	340	927	422	351	197
Skamokawa Creek ✓	980	1,090	356	756	5,596	1,813	1,611	1,035	286	184
~~Elokoman~~ River ✓ ELOCHOMAN R	122	1,370	2,458	918	464	294	1,016	340	138	64
Abernathy Creek ✓	881	972	3,917	915	1,464	509	3,177	2,446	1,287	468
Mill Creek ✓	1,534	927	1,867	8	2	3	N/E	N/E	N/E	N/E
Germany Creek ✓	377	1,234	384	57	349	102	548	204	80	48
Cowlitz River ✓	7,375	7,990	6,390	3,711	4,800	2,606	3,695	3,150	4,820	2,690
Coweeman River ✓	794	1,108	86	124	168	164	40	76	38	56
North Fork Toutle River ✓	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	10	0
South Fork Toutle River ✓	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	91	0
Kalama River ✓										
(tules)	20,495	24,549	9,651	2,601	1,259	3,043	2,722	4,595	1,917	5,850
(egg bank)	N/E	N/E	N/E	83	57	322	480	703	900	N/E
North Fork Lewis River ✓	22,977	14,653	17,080	14,561	9,475	8,079	14,756	9,207	21,276	14,919
East Fork Lewis River ✓	622	476	157	445	653	200	334	346	438	526
Washougal River ✓	4,578	3,328	3,625	1,589	1,983	1,217	2,677	330	1,841	3,437
Wind River ✓✓										
(tules)	112	1,206	776	422	170	134	495	365	256	401
(brights)	816	664	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E
Big White Salmon River ✓✓										
(tules)	243	382	161	116	153	393	280	1,579	839	1,598
(brights)	1,182	2,997	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E
Klickitat River ✓✓										
(tules)	2,339	N/E	664	415	54	230	348	764	558	770
(brights)	253	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E
Yakima River ✓✓	1,047	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E

✓✓ entered on Dec. 5th 1990

Table 18. Total escapement of natural spawning fall chinook in the Washington Columbia River system upstream from McNary Dam, 1983-89.

Adults

Area	1989	1988	1987	1986	1985	1984	1983
Ice Harbor Dam 1/	2,427	2,172	3,253	1,697	1,438	1,650	870
Hanford Reach 2/	64,345	73,801	86,047	73,900	60,781	45,432	36,982
Priest Rapids Dam 3/	13,655	21,405	34,251	16,896	11,635	7,475	4,982

Jacks

Area	1989	1988	1987	1986	1985	1984	1983
Ice Harbor Dam 1/	1,075	1,254	1,297	2,494	2,972	795	332
Hanford Reach 2/	15,019	42,368	36,680	90,354	67,803	38,945	21,612
Priest Rapids Dam 3/	2,112	4,289	4,134	10,383	2,273	4,149	1,447

1/ The escapement past Ice Harbor Dam was calculated by subtracting the total Tucannon Hatchery escapement in 1983 and Lyons Ferry Hatchery escapement 1984-89 from the Ice Harbor Dam count. Does not count springs/summers counted as falls.

2/ The number of Hanford Reach natural spawners was calculated by subtracting the Priest Rapids Dam count, the voluntary return to Priest Rapids Hatchery, the Hanford Reach sport catch, the Yakima River return in 1989 and the Ice Harbor Dam count from the McNary Dam count. Does not count spring/summers counted as falls.

3/ Priest Rapids Dam escapement was calculated by subtracting the fall chinook harvested from the Yakima Indian Nation setnet fishery in Priest Rapids Pool in 1989 and the trapped fish taken from Priest Rapids Dam left ladder to Priest Rapids Hatchery from 1983-88. Does not include spring/summers counted as falls.