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b) equitable distribution of the conservation measures across all users, and

c) extending restrictive management measures outside of terminal areas would ensure rebuilding and eventual resource health as well as a fair distribution of the conservation-management burden.

Table 2. Annual benefits to be derived from achieving current chinook salmon escapement goals from the Columbia River to Southeast Alaska (number of fish x 1,000).

Production Unit[1]	Base Period	3:1 C/S[2] Catch at: Base Period	Goal	Change from base	4:1 C/S[2] Catch at: Base Period	Goal	Change from base
Southeast Alaska[3]	77-80	90	219	129	120	292	172
British Columbia							
Northern	1981	340	584	244	453	778	325
Southern	1981	68	165	97	90	220	130
Georgia St.	1981	186	417	231	248	556	308
Fraser	1981	210	465	255	280	620	340
B.C. Subtotal		804	1,631	827	1,071	2,174	1,103
Washington Coastal[4]	1981	97	131	35	129	175	46
Columbia River[5]	1981	371	653	282	495	871	376
Oregon Coastal[6]		-	-	-	-	-	-
Washington/Oregon Subtotals		468	784	317	624	1,046	422
Total		1,362	2,634	1,273	1,815	3,512	1,697

[1] Production unit (spawner base) not harvest area.

[2] C/S = catch/spawner = R/S - 1

[3] Source: Proposed Management Plan for Southeast Alaska Chinook Salmon Runs in 1981. ADF&G. January, 1981. An average counting rate for aerial peak escapement surveys of 62.5% is assumed.

[4] 1981 data preliminary; calculations for natural stocks omitted for areas managed for hatchery stocks; calculations omitted for areas with unidentified escapement goals; WDF goals used where differences of opinion between the state and tribes exist; Quinault River data omitted because data were not available; 1981 Grays Harbor spring chinook escapement estimate not available, therefore, used 1980.

[5] 1981 data preliminary; calculations for natural stocks omitted for areas managed for hatchery stocks; calculations omitted for areas with unidentified escapement goals; for upriver stocks optimum production benefits assume resolution of both overfishing and environmental problems.

[6] Escapement goals not presently available, therefore, Oregon coastal stocks omitted.

APPENDIX I

List of Participants

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APPENDIX II

Detailed Technical Material Presented

Oregon Coastal Chinook Stocks

Oregon coastal chinook stocks primarily contribute to the ocean fisheries off Oregon, Washington, British Columbia and Southeastern Alaska. Portions of some runs are also harvested off northern California.

Oregon Coastal Fall Chinook

These stocks remain in a generally favorable status showing recent upward trends in spawning escapement. Preliminary spawning survey counts for 1981 indicate a continuing stable trend in these stocks even though hatchery returns at this time are less than adequate for fall chinook at many coastal stations.

Elk River fall chinook contribute to Alaskan fisheries in small numbers (2-22% of mark recoveries have occurred in Alaskan fisheries).

Trask River fall chinook contribute substantial numbers to the Alaskan catch (28 to 44% of marks recovered were from Alaskan fisheries).

Observed 1980 catches of 1976-brood Salmon River fall chinook also suggest a substantial catch in Alaskan and British Columbian waters.

Groups of 1977 or 78 brood Nestucca, Salmon, Yaquina, Alsea, Siuslaw, Coos, Rogue, Elk and Chetco fall chinook stocks are tagged and were recovered in the ocean fisheries during 1981.

Oregon Coastal Spring Chinook

Oregon coastal spring chinook contribute low numbers to the Alaskan catch. Generally less than 3% of the Umpqua and 1% of the Rogue spring chinook marks reported have been from Alaska.

Columbia River Chinook Stocks

Columbia River chinook are the predominate chinook stocks found north of Cape Falcon.

Upriver Spring - Summer Chinook

Upriver stocks of spring and summer chinook remain in a depressed state. Runs of both stocks were at record low levels in 1979, 1980, and 1981.

Lower River Spring Chinook

The major lower river Oregon run of spring chinook originates in the Willamette river system. From 6 to 35% of the total Willamette spring chinook marks reported caught in the ocean fisheries from various marked groups were recovered in Alaska.

Brood Year	Species	Stock	Release Location	Mark or CWT #	Release Date	Release Size #/lb	Release Number	Est. % Recovered Through 1978 Catc AK	BC	Wash.	Ore. Col.	Calif
	Oregon Coast											
70	CHF	Trask	Trask	PK-YW	11-15-71	9.0	51,389	42	46	12	0	0
70	CHF	Trask	Big. Cr.	PK-Rd	11-15-71	7.3	51,800	43	44	13	0	0
71	CHF	Trask	Big Cr.	PK-Bu	11-20-72	6.1	42,325	30	50	10	0	0
73	CHF	Trask	Trask	7-10-10	11-1-74	8.4	36,513	24	59	17	0	0
73	CHF	Trask	Alsea	7-10-11	10-31-74	11.6	33,893	23	61	12	4	0
74	CHF	Trask	Trask	7-11-13	10-22-75	10.1	38,232	44	48	8	0	0
74	CHF	Trask	Alsea	7-11-14	10-21-75	9.8	25,578	38	41	13	8	0
71	CHF	Elk	Elk	D-LP	11-3-72	6.6	105,397	2	26	24	43	5
73	CHF	Elk	Elk	7-10-13	11-1-74	10.0	39,660	3	38	16	41	1
73	CHF	Elk	Alsea	7-10-12	10-31-74	9.9	38,030	9	59	15	17	0
73	CHF	Elk	Wright Cr.	7-10-14	4-23-75	7.1	13,000	14	33	28	25	0
74	CHF	Elk	Elk	7-10-15	10-20-75	10.9	24,541	7	28	13	52	0
74	CHF	Elk	Elk	7-12-9	10-20-75	11.5	35,325	12	35	5	48	0
74	CHF	Elk	Alsea	7-11-15	10-21-75	10.1	32,538	22	49	22	7	0
74	CHF	Elk	Coos	7-11-9	10-21-75	11.2	26,30[illegible]	8	65	8	19	C
71	CHS	Umpqua	Umpqua	Ad-LV-RV	3-1-73	5.0	69,022	3	5	29	41	22
	Willamette System											
70	CHS	Eagle Cr.	Eagle Cr.	PK-GN	5-10-72	7.0	25,303	49	12	39	0	0
71	CHS	Clackamas	Clackamas	D-LV-RV	5- -73	10"	99,303	7	19	33	41	0
70	CHS	Santiam	Santiam	D-LP	11-17-71	7.2	20,731	6	12	32	0	C
70	CHS	Willamette	Willamette	D-RP	4- -72	9.0	120,317	9	50	18	23	C
70	CHS	Willamette	Willamette	D-LV	4- -72	----	286,258	35	32	30	3	0
71	CHS	Willamette	Willamette	D-LV	3- -73	----	101,358	12	51	25	9	3
71	CHS	Willamette	Willamette	D-RV	3- -73	5.9	290,045	13	63	15	9	0

WASHINGTON COASTAL STOCKS MAKING FAR NORTHERLY MIGRATIONS

Prepared by:

Salmon Harvest Management Division
Washington State Department of Fisheries

INTRODUCTION

Commercial net and river sport fisheries historically occur in Willapa Bay, Grays Harbor and several north Washington coastal rivers. No treaty Indian fishig rights have been established in Willapa Bay, where only non-Indian sport and commercial net fisheries exist, but stocks originating from the region are subject to equal opportunity criteria when present in tribal, usual and accustomed fishing areas. The Willapa Bay salmon harvest is managed exclusively by the Washington Department of Fisheries (WDF).

A treaty Indian net fishery occurs in Grays Harbor along with non-Indian commercial net and recreational fisheries based upon conservation and U.S. District Court sharing principles. In addition an on-reservation Indian net fishery operates on the Chehalis River (Grays Harbor tributary).

The north Washington coastal net fisheries are currently treaty Indian fisheries. Non-Indian recreational fisheries occur on most river systems. Management of salmon harvest in Grays Harbor and north Washington coastal rivers is shared by WDF and tribal governments, depending upon the specific fishery, participating fishermen, and location. Proposals on fishery schedules, allowable harvest, and escapement needs are presented to the U.S. District Courts Fishery Advisory Board (FAB) and agreed to by all parties, wherever possible, prior to commencement of each fishery.

The catch statistics presented here are necessarily preliminary. In some cases, the fisheries were ongoing at the time of compilation of the statistics and may change significantly by seasons end. Historical catch figures reflect WDF catch records for these fisheries. Where possible, these statistics have been reconciled with tribal records.

Stock Status

Willapa Bay - The summer season for sturgeon and non-local chinook started July 6 and continued through August 20. A total of 4,600 chinook were taken during this period.

Fishing for local salmon stocks began August 24 and continued through November 30. Preliminary catches for this local season are 12,250 chinook. Catches for 1971-1981 are shown in Table 1. Catch of local chinook was 32% above the 1971-1975 average and similar to 1979 and 1980.

Grays Harbor - The early season gillnet fishery for sturgeon and non-local chinook began July 6 and continued through August 14 for non-Indian fishermen and until August 26 for treaty Indian fishermen. A total catch of 1,450 chinook by non-Indian fishermen and 150 chinook by treaty Indian fishermen was made during this time period.

Preseason predictions indicated no harvestable local chinook would be available in 1981 so no directed fisheries on local chinook stocks were allowed. A total of 4,100 chinook (Table 2) were taken incidental to coho and chum fisheries. Total tribal catches were 3,500 chinook, non-Indian catches totalled 600 chinook.

Sport fishing in Grays Harbor and its tributaries was severely restricted in 1981. With the exception of later season openings in the Humptulips and Satsop Rivers designed to harvest extra hatchery fish, all other sport fishing was limited to fish less than 24" total length to meet allocation and conservation concerns.

Chehalis River (Grays Harbor Tributary) - An Indian gillnet fishery is conducted by the Chehalis Tribe on their reservation near Oakville on the Chehalis River. Spring/summer chinook fishing was severely restricted in 1981 to improve declining escapements, although catch of this run was similar to 1980. Catches of fall chinook will likely be below average (Table 3).

Quinault

Spring/summer stocks - Quinault spring summer/chinook are managed to achieve natural escapement goals. The Quinault tribe has established an escapement goal of 850 for spring/summer chinook.

The tribe has identified July as the primary spring/summer chinook management period. The fishery operated five days per week during this period. Season catch was 148 chinook. Escapement for this stock in 1981 is unknown.

Fall stocks - Quinault fall chinook are managed on the basis of hatchery production, while providing adequate natural escapement to utilize the natural rearing environment. The fall fishery yielded a season catch of 5,462 chinook.

Queets River

Spring/summer stocks - The spring/summer chinook stocks are managed for natural production. A three day per week evaluation fishery commenced June 1, continuing for three days per week for four weeks. The in-season estimator showed a run size of 1,343. A dispute between the State and the tribe about the appropriate escapement goal for this stock resulted in a ruling by the FAB chairman for an escapement goal of 1,050 for 1981. The tribe harvested the balance of the catch in brief fisheries during July and August. Final season catch was 299.

Fall stocks - Queets fall chinook are managed for natural production. The tribe operated a fall stock fishery for five days per week beginning September 1. The five days per week evaluation fishery commenced on September 28 and continued for two weeks. The in-season estimators showed a strong chinook run and a poorer than expected coho run. The tribe conducted brief fisheries in October with large mesh gear, targeting on chinook. Small numbers of coho and chum were also taken. The season catch was 4,398 chinook, 3,951 coho, and 151 chum.

Hoh

Spring/summer stocks - Hoh spring/summer chinook are managed for natural production. The tribe initiated a three day per week evaluation

fishery on June 1 continuing through June. This fishery yielded an estimated run size of 1,919. The disputed escapement goal was resolved by a ruling from the FAR chairman, who set the 1981 goal at 1,500. The additional chinook [illegible] available for harvest by this decision were taken in three weeks of fishing time during July. Final season catch was 428.

Fall stocks - The fall chinook and coho fishing season commenced on September 1, ranging from three to five days per week through September 25. The major objective of this fishery was to harvest hatchery coho, which have a somewhat earlier run timing than natural coho.

The evaluation fishery commenced September 28 for two weeks. The in-season estimator showed run sizes of 2,200 chinook.

Quillayute

Spring/summer stocks - Spring/summer chinook are managed for natural production in this river. The spring chinook fishery commenced May 3 and continued through June at 5 days per week. Because of an expected poor run size of summer chinook the fishery was reduced from five to 2-4 days per week during July and early August. The tribe commenced a fishery targeted on coho on August 9. For the season 962 spring/summer chinook were taken. Soleduck hatchery achieved 76% of its broodstock requirements for spring/summer chinook.

Fall stocks - The management season for fall chinook began September 1. The fall coho management period began September 20. Chinook were taken along with summer coho in a five day per week fishery through Septembe 18. A three day fishery was conducted during the week of September 20.

The evaluation fishery began on September 28. In-season run size estimates were 16,000 coho and nearly 5,000 chinook. The fishery closed on October 12 because of the need to protect fall chinook. A subsequent fishery scheduled for September 18-21 was terminated due to excessive chinook catches. Season catch was 1,282 fall chinook.

Evaluation of 1981 Management

Willapa Bay - Willapa chinook are managed based on hatchery run strength. Escapements, even with additional restrictions in 1981, will not meet the needs of the hatchery program. Terminal run size information for 1973-1980 is presented in Table 4.

Grays Harbor - Grays Harbor chinook are managed based on natural run strength. It does not appear that the escapement goal will be met, nor will hatchery requirements for eggs take needs. Terminal run size information for 1973-1980 is presented in Table 5.

North Washington Coast - Natural spring/summer chinook and fall chinook have shown encouraging upward trends in terminal run size in recent years. This trend is primarily a response to increased escapements, commencing with the 1977 brood. Reductions in marine fisheries have also contributed. The escapement goal of

1,500 for spring chinook in the Hoh was achieved, while escapement in the Queets was at the 1981 goal of 1,050. However, it should be stated that these were interim goals set by FAB ruling. Preliminary in-season estimates of fall chinook escapement indicated that the goals would not be achieved in the three systems managed for natural fall chinook production. However, it is expected that post-season escapement estimates will be above the preliminary figures. The Quinault is managed for hatchery production and estimates of natural escapement are not available. Historical terminal run size information is presented in Tables 6-8.

1982 Washington Coastal Chinook Outlook

Willapa Bay - Hatchery releases of 1978 brood chinook, which will make up the bulk of the 1982 return to Willapa Bay, were 3.23 million, down from the 4.32 million 1977 brood releases though still above the recent 5-year average. The 1979 brood releases, which will contribute as 3-year-olds in 1982, were 3.4 million. Based on these releases, the 1982 run is not expected to be as good as 1981.

Grays Harbor - The 1982 chinook returns to Grays Harbor will result primarily from the wild escapements in 1978 and 1979. Both these years were well below the desired escapement level, though the 1979 escapement was the best since 1979 which may provide some optimism. Based on this, an improved natural run of chinook is expected in 1982, but it will still not be sufficient to provide a directed chinook fishery. Hatchery returns will likely continue to provide no substantial harevst, as they will be needed to develop hatchery brood stock programs.

North Coast

Chinook - Natural chinook stocks on the north coast are expected to return to the terminal areas in above-average strength for 1982, as indicated by juvenile abundance indices. Returns of hatchery chinook should be comparable to 1981 returns.

Table 1. Willapa Bay chinook catches in numbers of fish by gill net gear, 1971-1980.

Year	Early season[a/]	Regular fall season
1971	2,059	7,830
1972	2,376	8,562
1973	27,857	12,586
1974	4,997	8,727
1975[b/]	6,791	8,620
1971-75 average	8,816	9,265
1976[b/]	15,678	13,340
1977[b/]	21,934	9,420
1978	3,781	7,599
1979[c/]	5,482	12,696
1980[c/]	11,850	12,900
1981[c/]	4,600	12,250

[a/] Prior to August 26.

[b/] Includes Indican catches although no treaty rights have been adjudicated in this area.

[c/] Preliminary (subject to change).

Table 2. Grays Harbor treaty Indian and non-Indian commercial chinook catches in number of fish by gill net gear, 1971-1981.

Year	Early season[a/]	Fall Season		
		Non-Indian	Indian	Total
1971	449	8,880	-	8,880
1972	440	10,113	-	10,113
1973	6,054	10,476	-	10,476
1974	1,735	7,941	70	8,011
1975	401	7,013	1,294	8,307
1971-75 average	1,816	8,885	-	9,157
1976	5,280	2,874	3,086	5,960
1977	13,536	1,840	4,006	5,846
1978	901	703	2,674	3,377
1979[b/]	881	0	95	95
1980[b/]	1,550	3,508	5,652	9,160
1981[b/]	1,600[c/]	600	3,500	4,100

[a/] Prior to August 16.

[b/] Preliminary (subject to change).

[c/] Includes 1,450 non-treaty and 150 treaty chinook.

Table 3. Chehalis Indian Reservation catch, 1971-1981.

Year	Spring chinook	Fall chinook
1971	609	487
1972	855	1,652
1973	799	2,236
1974	275	511
1975	149	578
1971-75 average	537	1,093
1976	388	386
1977	864	1,317
1978	616	1,069
1979[a/]	764	1,413
1980[a/]	301	1,229
1981[b/]	250	650

a/ Preliminary.

b/ Through November 22, 1981.

Table 4. Estimated terminal run size, catch, and escapement for Willapa Bay chinook, 1973-1980.

	Catch		Escapement		
Year	Gill net	River sport[a/]	Natural	Hatchery	Total
1973	12,600	N.A.[b/]	2,500	5,500	20,600
1974	8,700	300	2,700	5,400	17,100
1975	8,600	200	800	4,000	13,600
1976	13,300	300	3,400	2,900	19,900
1977	9,400	500	3,000	5,800	18,700
1978	7,600	600	6,700	3,700	18,600
1979	12,700	N.A.[b/]	5,000	3,900	21,600
1980	12,900	300	4,900	4,100	22,200

[a/] Adult fish only; no jacks included.

[b/] Sport catch data in 1973 and 1979 cannot be separated by sepcies and area. Total run size estimates for these 2 years are minimum values.

Table 5. Estimated terminal run size, catch, and escapement for Grays Harbor chinook, 1973-1980.

		Catch		Escapement		
Stock	Year	Gill net	River sport[a/]	Natural	Hatchery	Total
Fall	1973	12,700	N.A.[b/]	7,200	0	19,900
	1974	8,500	1,100	4,200	0	13,800
	1975	8,900	700	4,300	0	13,900
	1976	6,300	800	1,800	0	8,900
	1977	7,200	1,000	5,200	200	13,600
	1978	4,400	2,000	4,600	200	11,200
	1979	1,500	N.A.[b/]	9,400	100	11,000
	1980	10,300	800	11,700	1,100	23,900
Spring	1973	800	0[c/]	250		1,050
	1974	300	0	350		650
	1975	150	0	450		600
	1976	400	0	650		1,050
	1977	850	0	850		1,700
	1978	600	0	1,050		1,650
	1979	750	0	350		1,100
	1980	300	0	250		550

[a/] Adults only; jacks not included.

[b/] Sport catch data in 1973 and 1979 cannot be separated by species and area. Total run size estiamts for these 2 years are minimum values.

[c/] Less than 50 fish per year.

Table 6. Estimated in-river run size, catch, and escapement of Queets River chinook stocks, 1973-1981.

Stock	Year	Catch[a/]			Escapement		Terminal run size		
		Gill net	Ceremonial and subsistence	River sport[b/]	Natural	Hatchery	Natural	Hatchery	Total
Spring/summer	1973	459	NA	80	NA	-	NA	-	NA
	1974	381	NA	82	NA	-	NA	-	NA
	1975	345	NA	122	NA	-	NA	-	NA
	1976	148	NA	144	NA	-	NA	-	NA
	1977	364	NA	151	732	-	1,247	-	1,247
	1978	229	NA	85	1,110	-	1,424	-	1,424
	1979	479	31	150	989	-	1,649	-	1,649
	1980	108	?	149	1,138	-	1,404	-	1,404
	1981[c/]	299	NA	75	969	-	1,343	-	1,343
Fall	1973	3,629	NA	88	3,541	-	7,258	-	7,258
	1974	3,063	NA	109	1,540	-	4,712	-	4,712
	1975	2,052	NA	115	2,393	-	4,560	-	4,560
	1976	1,274	NA	107	1,167	-	2,548	-	2,548
	1977	1,935	NA	128	3,422	-	5,485	-	5,485
	1978	901	NA	135	2,063	-	3,099	-	3,099
	1979	860	13	160	5,653	-	6,786	-	6,786
	1980	2,621	NA	100	3,841	-	6,562	-	6,562
	1981[c/]	3,797	NA	300	4,179	-	8,276	-	8,276

a/ Gill net and ceremonial/subsistence catch from tribal records.

b/ Predominantly jacks.

c/ Preliminary.

Table 7. Estimated in-river run size, catch, and escapement of Hoh River chinook stocks, 1973-1981.

Stock	Year	Catch[a]			Escapement		Terminal run size		
		Gill net	Ceremonial and subsistence	River sport[b]	Natural	Hatchery	Natural	Hatchery	Total
Spring/summer	1973	717	50	371	NA	-	NA	-	NA
	1974	623	50	261	NA	-	NA	-	NA
	1975	495	75	522	546	-	1,638	-	1,638
	1976	484	50	229	621	-	1,384	-	1,384
	1977	871	30	118	1,015	-	2,034	-	2,034
	1978	937	90	111	1,351	-	2,489	-	2,489
	1979	653	115	264	1,442	-	2,474	-	2,474
	1980	115	44	154	842	-	1,155	-	1,155
	1981[c]	386	42	200	1,520	-	2,086	62	2,148
Fall	1973	2,187	75	226	1,966	-	4,454	-	4,454
	1974	820	75	208	563	-	1,666	-	1,666
	1975	677	150	267	400	-	1,494	-	1,494
	1976	483	25	215	469	-	1,192	-	1,192
	1977	1,619	30	193	1,191	-	3,033	-	3,033
	1978	788	55	111	797	-	1,751	-	1,751
	1979	445	35	313	1,750	-	2,543	-	2,543
	1980	481	35	382	2,127	-	3,025	-	3,025
	1981[c]	801	40	150	2,000	-	2,991	-	2,991

[a] Gill net catches and ceremonial/subsistence catch from tribal records.

[b] Predominantly jacks.

[c] Preliminary.

Table 8. Estimated in-river run size, catch, and escapement of Quillayute River stocks, 1973-1981.

Stock	Year	Catch		Escapement			Terminal run size		
		Gill net	Ceremonial and subsistence	River sport[a/]	Natural[b/]	Hatchery	Natural	Hatchery[c/]	Total
Spring/summe	1973	292	NA	1,465	NA	20	NA	NA	NA
	1974	117	NA	375	NA	-	NA	NA	NA
	1975	2,256	35	900	1,064	1,420	1,013	4,662	5,675
	1976	2,513	40	1,523	1,120	1,767	2,491	4,472	6,963
	1977	2,595	40	590	2,492	926	1,213	5,430	6,643
	1978	3,201	50	340	2,195	666	3,244	3,208	6,452
	1979	2,473	40	238	1,958	228	3,908	1,029	4,937
	1980	1,000	15	154	948	448	1,742	823	2,565
	1981[d/]	965	10	100	830	305	1,668	542	2,210
Fall	1973	5,035	NA	346	4,690	-	10,071	-	10,071
	1974	3,849	NA	259	2,307	-	6,415	-	6,415
	1975	2,290	25	707	2,072	20	4,565	549	5,114
	1976	2,246	20	643	2,083	19	4,598	413	5,011
	1977	5,297	50	316	2,973	242	7,260	1,618	8,878
	1978	1,357	15	506	4,607	251	6,385	351	6,736
	1979	2,610	25	353	4,610	81	7,459	245	7,704
	1980	1,415	22	[illegible]	6,631	41	7,842	739	8,581
	1981[d/]	1,295	20	227	5,200	118	6,46[illegible]	393	6,860

a/ Predominantly jacks.

b/ Includes hatchery strays.

c/ Excludes hatchery strays.

d/ Preliminary.

COLUMBIA RIVER STOCKS

prepared by:

Columbia River Technical Advisory Committee

Decmeber 14, 1981

INSIDE FISHERIES

Columbia River

(Oregon and Wash)

Restrictive regulations placed upon the in-river recreational and commercial fisheries in 1981 essentially eliminated any non-treaty targeted harvest of chinook salmon originating above Bonneville Dam due to need to protect spawning escapement and provide for allocation as set forth in the "Management Plan" adopted by the U.S. District Court in February, 1977.

The most restrictive commercial season ever adopted for the treaty-Indian fishery also occurred in 1981. Although all in-river runs originating below Bonneville Dam were of sufficient size to allow harvest, the only upriver origin in-river run with harvestable numbers was the Bonneville Pool Hatchery origin fall chinook "Tule" stock.

For management purposes, the various Columbia River salmon runs are separated by seasons which reflect run timing through the standard treaty and non-treaty fishing zones, both above and below Bonneville Dam.

Table II-37 shows the current status of each of the major salmonid runs.

Table II-37. Estimate of runs into Columbia River of adult salmon and steelhead destined to migrate above Bonneville Dam (in thousands of fish), 1971-81.

Year	Spring Chinook	Summer Chinook	Sockeye[a/]	Fall Chinook	Coho[b/]	Steelhead
1971	146.5	66.3	150.5	244.8	76.0	224.6
1972	269.5	63.6	123.3	188.6	65.9	225.6
1973	223.8	35.3	61.3	249.3	54.6	187.8
1974	99.8	39.0	43.9	176.9	61.0	144.8

(cont.)

Table (cont.)

1975	97.9	33.0	58.2	311.6	58.3	84.1
1971-75 Average	167.5	47.4	87.4	234.2	63.2	173.4
1976	63.9	43.8	43.7	260.4	51.9	122.4
1977	138.4	34.1	90.8	199.0	19.4	196.1
1978	127.0	39.7	18.4	193.8	52.6	105.0
1979[c/]	48.6	27.7	52.6	172.4	45.3	114.2
1980[c/]	61.0	27.0	59.4	174.9[d/]	21.7	129.8
1981[c/]	69.0	27.0	56.0	158.0[d/]	29.5	159.0

a/ Includes adult and jack salmon.
b/ Bonneville Dam count only.
c/ Preliminary.
d/ Includes Bonneville Dam count and estimated catches of upriver fish in September fisheries below Bonneville based on mark recoveries for 1980 and 1981 only.

Winter Season (Jan-March). The "Management Plan" does not set forth that catch sharing will occur during the "winter season". This is essentially due to the fact that the lower river fishery is designed to primarily harvest the early arriving segments of spring chinook salmon destined for several lower river tributaries, with Willamette River fish predominating. The 1981 lower river commercial "winter" season was not as short as the record 1980 1-day season but was significantly below the more than 12-day average season allowed through the early 1970's. In 1981, 6 days were allowed downstream of the mouth of the Willamette River during which 7,300 spring chinook were caught. The 1981 Treaty Indian "winter" season was from Feb. 1 to April 1. Unlike 1980, a treaty Indian commercial fishery above Bonneville Dam was allowed during the last two weeks of March, catching 1,500 spring chinook. The lower river sport harvest through March was an estimated 3,700 fish, essentially of lower river stock origin. Table II-38 denotes 1971-1981 "winter" season catches of spring chinook during Feb-March below Bonneville Dam.

Table II-38. Columbia River winter season chinook landings (in thousands), 1971-81. Zone 1-5 only.[b/]

Year	Commercial		Sport
	Numbers	Pounds	Numbers
1971	13.4	278.0	6.5
1972	15.8	3[illegible].0	0.2
1973	17.2	337.5	7.4
1974	13.3	277.0	2.2
1975	9.1	184.8	2.3
1971-75 Average	13.8	281.7	3.7
1976	4.7	96.1	3.2
1977	6.8	132.5	3.1
1978[a/]	13.5	264.7	5.0
1979[a/]	5.5	111.8	1.7
1980[a/]	0.4	7.6	0.8
1981[a/]	7.3	141.4	3.7

[a/] Preliminary.
[b/] A portion of catches shown for Non-Treaty fishery are of upriver origin.

Spring Season (April-May). The 1981 upriver spring chinook run to the Columbia River showed some improvement over the near record low return experienced in 1980 although it was still significantly below the escapement objective as defined in the "Management Plan". The run was not of sufficient size to allow a targeted harvest by treaty Indian or non-treaty fishermen.

Both commercial and recreational seasons were eliminated during April & May. In addition, significant steelhead sport fisheries in the mainstem Columbia River were also curtailed due to the impact from the incidental catch and handling of spring chinook which would unavoidably occur.

Although no Spring Season harvests as such occurred in 1981, Table II-39 denotes historical harvests since 1971 for reference purposes. Included within this table are the Feb.- May above Bonneville Dam treaty Indian commercial catches and April-May below Bonneville Dam commercial

catches. As set forth in the "Management Plan" the ceremonial & subsistance catches by Treaty Indians was limited to a maximum of 2000 fish due to low run size. Table II-39 does not include ceremonial & subsistence catches.

Table II-39. Columbia River upriver spring chinook landings (in thousands), 1971-81.[b/]

	Non-Treaty			Treaty	
	Commercial		Sport	Commercial	
Year	Numbers	Pounds	Numbers	Numbers	Pounds
1971	22.6	363.3	19.9	12.7	162.5
1972	69.9	1,076.5	24.4	42.8	637.9
1973	60.5	928.5	30.3	34.2	533.9
1974	8.4	135.1	14.0	17.5	270.8
1975	0	0	0	0	0
1971-75 Average	32.?	500.7	17.7	21.4	321.0
1976	0	0	0	0.4	7.2
1977	9.3	123.8	14.8	17.2	234.6
1978	0	0	0.1	2.6	55.4
1979[a/]	0	0	0	0.5	10.8
1980[a/]	0	0	0	0	0
1981[a/]	0	0	0	1.5	22.3

a/ Preliminary.
b/ A portion of catches shown for Non-Treaty fishery are of lower river origin. Table also does not include portion of upriver origin spring chinook caught during lower river Winter Season.

Summer Season (June-July). No recreational fisheries or treaty and non-treaty commercial net fisheries were allowed to target on summer miging salmon runs, either chinook or sockeye in 1981. In accordance with the "Management Plan" the treaty Indian ceremonial & subsistence catches were limited to 2000 chinook & 2000 sockeye salmon. The 1981 summer chinook run was 27,000 adults (Table II-37). The 1981 sockeye run was 56,000 fish (Table (II-37).

Fall Chinook Seasons Above and Below Bonneville. The upriver adult fall chinook run totaled approximately 158,000 adult fish (205,500 including jacks) in 1981. This was near the preseason forecast of 163,500 adult fish entering the river and one of the smallest runs ever recorded. With only lower river incidental catches and passage losses at Bonneville Dam, it was projected that the run entering the upriver fishery would be 150,000 adult fish. The upriver bright component of this upriver fall chinook run was a new record low 63,900 adult fish (1980 previous record) and only slightly above the preseason forecast of 63,500 adult fish at the river mouth.

The new data base established for in-river fall chinook management in 1980 was again used successfully in 1981. This new data base reflected revised stock timing data made available from recent micro-tagging experiments, ability to differentiate the Bonneville passage count into the two major run components and the ability to estimate harvest by stock of origin, again through use of micro-tag data obtained from the fishery. As occurred in 1980 the objectives of the 1981 fall chinook management was to achieve the 40,000 adult escapement goal over McNary Dam by maximizing harvest opportunity for Bonneville Pool Hatchery origin fall chinook "Tule" stocks while minimizing harvest of upriver origin fall chinook "bright" stocks. It was also the objective of in-river management to reduce as much as possible the share deficit owed the treaty tribes while minimizing impact on the depressed upriver "bright" run component.

Table II-40. Columbia River commercial catch of upriver origin fall chinook (in thousands, including jacks), 1971-81.

	Non-Treaty		Treaty	
Year	Numbers	Pounds	Numbers	Pounds
1971	93.8	2,044.7	56.5	953.6
1972	96.3	2,177.5	42.9	634.5
1973	105.4	2,350.9	67.9	1,148.3
1974	52.2	1,225.6	54.9	980.1
1975	95.9	2,257.8	140.6	2,665.6
1971-75 Average	88.7	2,011.3	72.6	1,276.4
1976	33.4	746.3	135.0	2,555.0
1977	69.2	1,509.6	55.2	941.8
1978 a/	39.7	939.4	61.6	1,173.7
1979 a/	28.4	636.3	62.4	1,183.5
1980 a/ b/	38.5	N/A	35.2	N/A
1981 a/ b/	4.1	69.7	53.0	915.3

a/ Preliminary.
b/ Includes Bonneville Dam count and estimated catches of upriver fish in Sept.-Nov. fisheries below Bonneville Dam based upon mark recoveries for 1980 & 1981 only.

Controversey surrounded the establishment of the actual harvest deficit owed the treaty tribes going into the 1981 season as set forth by the "Management Plan". This controversey occurred due to questions of foregone harvest opportunity, straying of upriver origin salmon into lower river hatcheries and thus not destined to return to upriver harvest areas, and harvest estimates for subsistence catches. Regardless of this controversey, the upriver origin run was not of sufficient size to eliminate the deficit, however calculated, using traditional harvest methods or fishing areas due to the depressed status

of upriver bright run component. The harvest deficit owed the treaty tribes for fall chinook was ultimately declared by the U.S. District Court to be 25,300 adult fish prior to 1981 harvests. The long-term status of the share deficit is yet to be adjudicated.

Due to the anticipated and ultimate status of upriver "bright" fall chinook as well as the question of allocation deficit between treaty and non-treaty fisheries, no lower river mainstem Columbia River commercial fishery was allowed to target on fall chinook.

Like the question of harvest deficit, the treaty Indian season for the area above Bonneville Dam was set by U.S. District Court action due to inaction by the Columbia River Compact. A decision could not be reached by the Columbia River Compact since conservation could not be defined and applied to fisheries management. The joint Oregon/Washington technical staffs had indicated that the upriver "bright" run size was not of sufficient size to achieve the 40,000 escapement goal, due to anticipated large inter-dam losses, and also sustain a targeted harvest by the treaty Indian fishery. Thus, a fishery only in the Bonneville Pool area was recommended where harvest would target on hatchery origin fall chinook while reducing upriver "bright" harvest to an incidental level. If an incidental harvest was allowable, it was argued that a targeted harvest of similar magnitude could also occur and therefore, the closure of 2/3's of the treaty fishery area was not justified since a showing of "reasonable and necessary for conservation purposes" had not been

made. Such reasoning, obviously, would not allow for maximum harvest opportunity for hatchery origin fall chinook "Tule" run component. This conflict in management strategy was left unanswered by the Columbia River Compact, making U.S. District Court action necessary.

Although indicating the season was adopted without precedence for future season considerations, the season established by the U.S. District Court did allow a targeted harvest of upriver "bright" fall chinook despite the fact that the escapement goal was not to be achieved and seemed to place a higher priority on the treaty fishing location than the future status of the resource. With a mesh restriction imposed to minimize harvest of steelhead, the Court adopted season was noon September 1 to noon September 3 (2 days) in all 3 dam pools, noon September 7 to noon September 11 (4 days) in Bonneville Pool only and noon September 14 to noon September 16 (2 days), again in all three pools. The latter could be curtailed by tribal technical staff's option, if necessary (first 6 hours of this fishing period was eliminated by tribal action after first closing totally then reopening at 6 pm on September 14). Since it had been previously announced that the second fishing period in all three pool areas was being curtailed by tribal action and it was determined that excess returns of "Tule" stock fall chinook would occur at the Spring Creek Federal Hatchery in Bonneville Pool, the Columbia River Compact acted to allow 2 additional days of fishing time in a restricted area adjacent to the hatchery. Subsequent action to re-open the total treaty fishery by the treaty tribes meant that the Columbia River Compact action resulted in only 1 additional day being provided

Table II-41. Columbia River in-river harvest of individual fall chinook stocks (adults) in 1981[a/].

Fishery	Upriver Bright	Bonneville Pool Hatchery	Upriver Total	Lower River Natural & Hatchery	Total
Lower River (non-treaty)					
Tributary Terminal Gillnet Fisheries	300	500	800	23,200	26,000
Mainstem Fall Coho Season	700	100	800	4,400	5,200
Mainstem Sport	350	0	350	650	1,000
Total Lower River Catch	1,350	2,600	3,950	28,250	32,200
Upper River					
Treaty Indian Above Bonneville	NA	NA	45,100	-0-	45,100
Total River Catch	--	--	49,000	28,300	77,300

[a/] Preliminary (as of December 14, 1981).

adjacent to Spring Creek Federal Hatchery. In summary, 3.75 days of fishing occurred in all three dam pools (5 days in 1980) with 4 additional days in Bonneville Pool only and 1 day in the restricted area adjacent to Spring Creek Federal Hatchery.

The Columbia River catch of upriver fall chinook is summarized in Table II-40. The fishery was managed based upon the strength of the two components of the upriver fall chinook run as well as the need to reduce, in as much as was possible, the sharing deficit owed the treaty tribes under the Columbia River Management Plan. This plan requires that a zero deficit be achieved after 5-years. This year was the fifth year of management under the Columbia River Management Plan. In summary, the only commercial harvest of fall chinook below Bonneville Dam occurred in select stock restricted terminal fishing areas and incidental to targeted coho harvests. Despite the almost total lower river harvest curtailment, the treaty-Indian fishing season was one of the most restrictive ever adopted and the catch was considerably below recent years average although above the catch made in 1980.

Escapement at McNary Dam was the smallest in recent two decades and a allocation deficit is still owed the treaty tribes. Table II-41 shows the in-river harvest by fall chinook stocks which occurred in 1981.

Fall Coho Season

The Fall Coho Season is established in the region below Bonneville Dam to harvest hatchery origin stocks.

The total coho catch in 1981 was second only to the record low 1977 catch as being an all-time record low since the early 1960's. A total of 46,600 coho were caught during the fall coho season with an additional 9,700 coho caught in the lower river terminal fishing areas. Since a mainstem fall chinook fishery did not occur below Bonneville, no coho were caught during that traditional fishing period (Aug-early Sept.).

The lower river non-treaty commercial fall coho season opened on September 27, one day earlier than the record late opening date in 1980, and occurred as scheduled for a total of 25 fishing days, running through November 12 (2-four-day fishing periods followed by 3 3 day fishing periods and then 2 - 4 day fishing periods). The initial open area was restricted to below Longview/Rainier highway bridge to further minimize upriver fall chinook incidental harvest. After initial 2 days open fishing time, area was expanded upstream to Lady Island due to low level chinook harvests and potential to increase coho harvests. The fishing area was not expanded further during the duration of the season. A targeted coho harvest is not allowed in the treaty fishing area due to need to minimize incidental catches of upriver origin steelhead under terms of the "Management Plan". A maximum 7 inches mesh restriction was imposed throughout lower river fall coho season to provide further protection for chinook salmon (9 inches and greater mesh size was allowed for targeted sturgeon fishery). The only mainstem lower river commercial harvest of fall chinook occurred

incidental to a mainstem coho fishery as well as in the Youngs Bay and 5 Washington Terminal river fishery areas. Lower river fall chinook and coho catches are shown in Table II-42.

Table II-42. Columbia River commercial landings of lower river fall chinook and coho (in thousands), 1971-81.

Year	Chinook		Coho[a/]	
	Numbers	Pounds	Numbers	Pounds
1971	122.1	2,027.3	264.3	2,191.5
1972	43.4	715.4	131.3	1,177.5
1973	165.3	3,201.4	183.7	1,823.2
1974	44.7	748.5	261.0	2,391.0
1975	77.4	1,478.1	156.6	1,530.8
1971-75 Average	90.6	1,634.1	199.4	1,822.8
1976	114.9	2,174.2	168.4	1,298.4
1977	97.9	1,721.7	39.0	308.9
1978[b/]	70.3	1,213.9	132.7	1,074.1
1979[b/]	74.2[c/]	1,283.7	127.6	1,065.7
1980[b/]	78.4[c/]	NA	149.5	NA
1981	27.6[c/]	NA	59.0	NA

[a/] Includes small number of August season landings, except in 1980 which includes terminal fishery catches.

[b/] Preliminary.

[c/] The chinook catch for 1980 & 1981 is an estimate of lower river stocks caught in all fisheries below Bonneville Dam, September-October.

III Evaluation of 1981 Management

Introduction

Escapement

Columbia River Chinook

Upriver Spring Chinook

The upriver run of spring chinook destined for areas above Bonneville Dam was 62,800 adults, a slight improvement over the record low runs of 1979 & 1980 (Table III-9). The escapement of adults into the Snake River at Lower Granite Dam showed considerable improvement over the disaster 1979 and 1980 escapements but still less than 50% of the minimum 30,000 adult escapement goal as set forth in "Management Plan". The Priest Rapids Dam count of 14,500 adults, which measures upper Columbia River escapement above the confluence of the Yakima & Snake rivers also showed considerable improvement (11,000 1971-80 ave.). Although these stocks are known to contribute to the ocean fisheries and only minor inriver harvests has occurred in recent years, the major cause for failure to meet in-river escapement goals was due to in-river environmental problems directly related to Snake River and Columbia River hydroelectric dam projects. Historically, the Snake River component of the upriver Spring chinook run represented the major segment. Based upon comparison of Priest Rapids and Ice Harbor Dam counts, the Snake River component represented a maximum of 48% of the run originating above McNary Dam (maximum percentage since comparison does not include run destined for Yakima River and WDF Hatchery complex below Priest Rapids Dam). The same comparison indicates the 1971-75 average was maximum 81% Snake River origin for run destined to return above McNary Dam.

Table III-9. Estimates of in-river run size and escapement of upriver adult spring chinook, 1971-81.

Year	Run Size	Escapement	Snake River Escapement[c/]
1971	146,500	96,800	21,800
1972	296,500	136,400	38,500
1973	223,800	101,200	52,800
1974	99,800	61,900	15,500
1975	97,900	97,900	16,100
1971-75 Average	167,500	98,800	28,900
1976	63,900	63,700	15,900
1977	138,400	98,600	36,200
1978	127,000	124,700	40,700
1979	48,600	48,100	6,800
1980	53,100	53,100	5,500
1981[a/]	62,800	61,300	13,100
Goal[b/]	250,000	100,000-120,000	30,000 (minimum)

a/ Preliminary.
b/ Set forth in "Management Plan".
c/ Upper most Snake River Dam.

Upriver Summer Chinook

Despite the continued almost total lack of in-river harvest, the Columbia River summer chinook run continues in a depressed state. The 1981 run as measured by the Bonneville Dam count was 27,000 fish, the smallest run ever recorded (Table III-10). Previous record low run size was 1980. The major components of summer chinook originate from the Snake River and the Columbia River above Priest Rapids Dam. The principle reason for not achieving the escapement goal is in-river environmental problems which, like spring chinook, is manifesting itself more in the Snake River than other production areas. However, the problem is further aggrevated by harvests in the ocean fisheries. The 1981 Snake

River escapement was only 25% of the 1971-75 average while the upper Columbia River escapement was 75% of the 1971-75 average.

Table III-10. Estimates of in-river run size and escapement of upriver summer chinook, 1971-81.

Year	Run Size	Escapement	Snake River Escapement	Upper Columbia Escapement
1971	89,500	72,100	26,800	17,700
1972	77,500	66,400	20,500	14,800
1973	48,900	43,400	12,000	14,300
1974	34,000	34,000	8,800	13,700
1975	44,400	44,400	8,600	22,200
1971-75 Average	59,600	52,100	15,300	16,500
1976	42,100	42,100	9,900	19,300
1977	41,200	41,000	8,400	19,600
1978	43,400	43,000	11,800	21,200
1979	34,400	34,200	3,600	22,700
1980	31,200	31,100	3,400	18,700
1981[a/]	27,000	27,000	3,800	12,300
Goal	-	80,000-90,000[b/]	-	-

[a/] Preliminary
[b/] Goal was set in 1963, subsequently incorporated into "Management Plan".

Upriver Fall Chinook

The upriver fall chinook run was only 158,00 adult fish, the smallest run ever observed since the construction of Bonneville Dam in 1938 (Table III-11). The 1981 run consisted of 63,900 adult upriver "brights" and 94,100 adults of Bonneville Pool Hatchery complex (Tule stock) origin. The escapement of 21,000 adults over McNary Dam was the smallest count

recorded in the recent decade. In 1980, an abnormally large inter-dam loss occurred, reducing the possibility of achieving the escapement goal at McNary Dam. This to-date unexplained loss occurred again in 1981 such that the in-river fall chinook run was not of sufficient size to achieve the escapement goal. Inter-dam loss of over 50% has now occurred in two successive years. The Columbia River Technical Advisory Committee and others are reviewing this problem and will seek funding for research to identify the source (s) of this extreme in-river mortality. Since this factor alone has such a large impact upon achievement of escapement goals, ability to harvest more abundant stocks, and to allocate in-river harvest, it is imparative that another year not be lost before research is begun to address this problem. The Snake River component of the upriver "bright" fall chinook run was a record low 700 fish (Ice Harbor count of adults). Like spring and summer chinook runs, a weak Snake River component is typical of this run in recent years.

Table III-11. Estimates of in-river run size and escapement of upriver origin adult fall chinook, 1971-81.

Year	Run Size	Bonneville Escapement[a/]	McNary Count
1971	244,800	102,000	49,000
1972	188,600	55,200	37,600
1973	249,300	91,100	46,600
1974	176,900	74,100	34,600
1975	311,600	97,200	29,600
1971-75 Average	234,200	83,900	39,500
1976	250,400	107,200	28,800
1977	199,000	85,700	37,600

(cont.)

River escapement was only 25% of the 1971-75 average while the upper Columbia River escapement was 75% of the 1971-75 average.

Table III-10. Estimates of in-river run size and escapement of upriver summer chinook, 1971-81.

Year	Run Size	Escapement	Snake River Escapement	Upper Columbia Escapement
1971	89,500	72,100	26,800	17,700
1972	77,500	66,400	20,500	14,800
1973	48,900	43,400	12,000	14,300
1974	34,000	34,000	8,800	13,700
1975	44,400	44,400	8,600	22,200
1971-75 Average	59,600	52,100	15,300	16,500
1976	42,100	42,100	9,900	19,300
1977	41,200	41,000	8,400	19,600
1978	43,400	43,000	11,800	21,200
1979	34,400	34,200	3,600	22,700
1980	31,200	31,100	3,400	18,700
1981[a/]	27,000	27,000	3,800	12,300
Goal	-	80,000-90,000[b/]	-	-

a/ Preliminary
b/ Goal was set in 1963, subsequently incorporated into "Management Plan".

Upriver Fall Chinook

The upriver fall chinook run was only 158,00 adult fish, the smallest run ever observed since the construction of Bonneville Dam in 1938 (Table III-11). The 1981 run consisted of 63,900 adult upriver "brights" and 94,100 adults of Bonneville Pool Hatchery complex (Tule stock) origin. The escapement of 21,000 adults over McNary Dam was the smallest count

Table (cont.)

1978	183,800	89,500	27,300
1979[b/]	172,100	84,000	31,200
1980[b/]	174,900[c/]	98,100	29,700
1981[b/]	158,000	101,500	21,000
Goal[d/]	300,000	100,000	40,000

a/ Bonneville Dam count minus Indian harvest.

b/ Preliminary.

c/ Derived from new methodology for stock separation by origin of stock.

d/ As set forth in "Management Plan".

Lower River Spring Chinook

One of the major components of the lower river spring chinook run originates from the Willamette River. The other major component is the Cowlitz River run. The Willamette run was 48,600 fish in 1981 and the escapement of 30,100 adults was at the low range of the desired level of 30-35,000 escapement over Willamette Falls (Table III-12). Escapement to the Cowlitz River was 38,100 fish, including a preliminary estimate of 13,000 recreational catch.

Table III-12. Estimates of in-river run size and escapement of lower Columbia River spring chinook, including jacks, 1971-81.

Year	Run Size	Willamette River (Willamette Falls Count)	Cowlitz
1971	67,400	44,600	11,000
1972	47,100	26,200	9,200
1973	54,500	42,000	13,700
1974	71,800	44,500	27,800
1975	32,600	19,100	45,200
1971-75 Average	54,700	35,300	21,400
1976	40,700	22,200	53,000
1977	58,000	40,000	35,800

(cont.)

Table (cont.)

1978	71,400	47,500	35,700
1979[a/]	44,600	26,600	17,200
1980[a/]	42,500	27,000	30,000
1981[a/]	48,600	30,100	38,100
Goal	-	30,000-35,000	-

a/ Preliminary.

Lower River Fall Chinook

The returns of lower river fall chinook was below average in 1981. The only targeted harvest occurred by recreational fishery (minor) and commercial fishery in select stock tributary river/bay fisheries (restricted area terminal fisheries). Washington terminal area commercial fisheries caught 21,000 chinook while Youngs Bay (Oregon) caught 5,000 chinook (Table II-42).

Hatchery Chinook

Returns of adult chinook to Columbia River stations since 1971 are shown in Table III-13. In general, egg take needs were met for all stocks of salmon except upriver fall chinook "brights". Spring chinook eggs were again obtained from federal hatcheries located in Washington to meet Snake River hatcheries production goals. To meet system wide program goals, exchange of eggs occurred between hatchery stations wherever common desired stocks were available.

Table III-13. Adult chinook and coho returns to Columbia River hatcheries (thousands), 1971-80. Includes hatcheries operated by all agencies.

	Chinook				Coho	
	Spring		Fall			
Year	Below Bonneville	Above Bonneville	Below Bonneville	Above Bonneville	Below Bonneville	Above Bonneville
1971	16.9	8.2	55.7	17.1	187.6	20.4
1972	9.3	20.5	41.2	9.6	91.3	6.2
1973	15.1	19.8	50.1	20.4	68.2	4.6
1974	33.2	6.4	34.2	14.2	152.8	10.0
1975	25.9	12.0	34.8	36.8	85.4	16.7
1976	29.9	14.8	51.6	25.8	117.3	14.4
1977	30.2	20.1	41.6	22.2	37.1	2.0
1978	25.2	14.1	59.4	20.1	131.4	7.8
1979[a/]	19.2	9.3	46.8	21.2	101.4	7.7
1980[a/]	28.4	11.2	36.3	30.2	120.4	3.4
1981[a/]	33.1	11.8	53.0	24.6	65.3	11.0

Columbia River and Oregon Coastal Coho

Measured escapements of coho salmon for the Oregon Production Index (OPI) area totaled 186,000 in 1981. The 1981 OPI escapement of coho was _____ the preseason objective of _____. This escapement is below the 1978-80 average of 305,700. The 1981 OPI escapement figure included a run size of 151,200 to the Columbia River and an escapement of _____ resulting from Oregon coastal hatchery production. The 1981 run of 151,200 to the Columbia River was the smallest in-river run size since the 1977 run when problems with OPI production were first identified. This year's in-river run was considerably below the 1978-80 runs and far below the 1971-75 average of 360,100 (Table III-14). Despite little in-river harvest of early coho, hatchery escapement of 65,300 Columbia River coho in 1981 was second only to the 1977 escapement in being the smallest in the recent decade. Early stock coho (Aug-Sept.) salmon are largely unfishable in the mainstem Columbia river due to the mixed species conflicts with chinook management needs during this period. This problem will exist as long

as lower river harvest constraints exist for fall chinook of upriver origin, subject to treaty Indian allocation. Required egg takes have been

Table III-14. Estimated in-river run size, catch and escapement of Columbia River adult coho, 1971-80 (in thousands).

	Catch	Escapement			
	Gill Net	Hatcheries			
Year	Below Bonneville	Below Bonneville	Bonneville Count	Willamette Count	Minimum Run Size
1971	264.3	187.6	53.8	17.4	523.1
1972	131.3	91.3	34.2	10.0	266.8
1973	183.7	68.2	25.8	5.2	282.9
1974	261.0	152.8	31.6	1.5	446.9
1975	156.6	85.4	32.8	5.9	280.7
1971-75 Average	199.4	117.1	35.6	8.0	360.1
1976	168.4	117.3	35.5	2.3	323.5
1977	39.0	37.1	9.3	1.0	86.4
1978	132.7	131.4	30.2	1.7	296.0
1979[a/]	127.6	101.4	29.6	1.8	260.4
1980[a/]	143.3	120.4	12.7	1.3	277.7
1981[a/]	59.0	68.2	23.0	1.0	151.2

[a/] Preliminary.

Required egg takes have been achieved for this stock and surpluses were available although not of the same magnitude as observed in past years especially when the fact is considered that an Aug-Sept. lower river fishery was not allowed in 1981. The dominant stock produced by Washington hatcheries is the late coho (Oct.-Jan.) salmon of Cowlitz River origin. Program goals for these fish is directed at achieving a run timing such that the majority of these fish contribute to the October to mid-November in-river management window, a time after most necessary chinook harvest constraints and before winter steelhead begin entering the river in significant numbers. The proper egg-taking pattern was achieved for the 1978-81 brood cycle and therefore, it is not anticipated that a large late returning (Dec.- Jan.) surplus of adults will occur in 1981 as occurred in 1980.

Declines have been noted in the abundance of natural spawning stocks of coho in the Columbia River. However, the decline is not unexpected since coho management in the Columbia River is based upon hatchery production which would tend to overharvest the natural stocks.

IV OCEAN MANAGEMENT OF SALMON IN 1982

STATUS OF CHINOOK AND COHO RESOURCE FOR 1982

Columbia River Chinook Stocks

Columbia River chinook salmon are the predominant chinook stocks found north of Cape Falcon off Oregon and along the Washington coast. Of these stocks originating from the Columbia River, the fall chinook "Tule" stock is the largest single contributor to the Oregon-Washington coastal fisheries with spring and summer & upriver "bright" fall chinook stocks contributing lesser amounts.

Status of specific stocks of Columbia River chinook is presented by current in-river management components as follows:

Lower River Spring Chinook

The major lower river spring chinook runs originate in the Willamette and Cowlitz Rivers with minor runs also originating in the Lewis, Kalama Rivers and Sandy rivers. The Willamette run is expected to be above average, about 65,000 fish in 1982 compared to the 1971-75 average of 46,100 fish.

The Cowlitz run is also expected to be as large as the 1981 run of 38,100 fish, and likely will be below the 1971-75 average of 21,400 fish.

Upriver Spring-Summer Chinook

Despite the achievement of desired spawning escapement goal for Snake River spring chinook run component in 1977 & 1978, the 1982 run is projected to be 49,000 fish, a run of the magnitude observed in 1979 (record low). This projection is based upon relationship between returning numbers of jacks and adult brood year production. There are no indications that the summer chinook will improve above record low runs seen since 1979.

Upriver Fall Chinook

Based on a relationship between a jack index at The Dalles, and John Day dams and the returning adult run of the same brood, the preliminary forecast for the Upriver Bright fall chinook return to the river is 63,000 adults, a record low. This follows record low adult returns of 77,800 in 1980 and 63,900 in 1981.

A relatively large return of two-year-old males of the Bonneville Pool Hatchery stock occurred in 1981. However, no strong relationship exists between jacks and adult production within the same brood for this stock. Therefore, the Bonneville Pool Hatchery stock run to the river in 1982 is not expected to be significantly greater than that experienced in recent years (the 1979-1981 average is 92,600 adult fish).

Lower River Fall Chinook

The status of the Lower River Hatchery stock is similar to the Bonneville Pool Hatchery stock - while the return of jacks in 1981 may be above average, the run in 1982 is not expected to be significantly greater than the poor returns of recent years. The 1979-80 average run to the river was 106,000 adult fish; the 1981 return is not available at this time.

The status of the Lower River Tule stock is not expected to be significantly different than recent year runs. The 1979-80 average run to the river was 28,600 adult fish, the 1981 return is not available at this time.

Columbia River Coho (Oregon staff)

The return of jacks to Columbia River counting areas in 1981 is about 35,000. The Columbia & Oregon Coastal jack index is about 45,000 and indicates a record low production in the OPI area for 1982, exclusive of private hatchery contribution.

EVALUATION OF 1981 MANAGEMENT FOR UPPER COLUMBIA RIVER "BRIGHT" FALL CHINOOK

Prepared by:

Salmon Harvest Management Division
Washington State Department of Fisheries

Presently, the one major chinook stock with conservation problems where sufficient information is available to evaluate the effect of 1981 ocean regulations with the National Bureau of Standards/Washington Department of Fisheries catch regulation analysis model ("the model") is the Upper Columbia "bright" fall chinook stock. Preliminary evaluation of 1975 brood bright stock coded-wire tag results permitted inclusion of this stock in the regualtory analysis presented to the North Pacific Fishery Management Council in March 1981. Post-season update of that analysis is presented here to evaluate the regulatory actions of 1981. More detailed analysis of 1982 options must await further anlaysis of upriver bright tagging data plus analysis of tagging data from other stocks.

Essentially, two types of information are required to develop a picture of the 1981 ocean catch distrubtion of the upriver brights: (1) estimates of fishing rate changes for each fishery of concern plus regulatory measures enacted (e.g. size limits), and (2) an estimate of stock abundance.

The principal fisheries that harvest brights are (not necessarily in order of importance) the Southeast Alaska troll fishery, the British Columbia troll, net and sport fisheries, the Washington/Oregon troll and sport fisheries and the Columbia River net fisheries.

Since direct measures of fishing rates are difficult to obtain, fishing rate changes are usually inferred through examination of changes in fishing effort (e.g. days fished, angler trips, etc.). Comparison of present effort levels with those during the base period (1974-76) when the stock tag data were collected form the basis for estimatng fishing rates changes.

Preliminary 1981 Washington ocean troll and sport effort statistics are available and were compared with 1974-76 averages. Effort data for 1981 Oregon coastal catch areas are not available at this time; therefore, observed changes in Washington Statistical Area 1 (Columbia River mouth) were assumed to apply to the Oregon fisheries in that area. Other southerly, marine fishing rates (Oregon south of Cape Falcon; California; Puget Sound; Washington coastal net) were left unchanged from 1981 pre-season expectations.

The 1981 effort statistics for the British Columbia troll fishery are not yet available. To project a picture of 1981 fishing rate changes, a mean of 1979 and 1980 troll-days-fished statistics was employed for each major management area on a monthly basis. Since an odd-year pink salmon run was expected in 1981, the 1979 statistics were felt to be representative of effort distribution and levels under this condition, while 1980 effort statistics represented the most recent overall level of effort in the fishery. The mean of 1979-80 days fished was then compared with the mean of 1974-76 days fished and adjusted for an October closure. No additional adjustments were made for localized short-term closures in Statistical Areas 1, 21, and 23. Angler effort data for the British Columbia sport fishery are not available at this time. However, the new 45-cm sport-caught chinook size limit imposed in 1981 was used in the fishery model simulation runs.

The Southeast Alaska troll fishery presents a difficult challenge in this regard due to a lack of effort statistics. To obtain some idea of the magnitude of fishing rate changes in the Southeast Alaska troll fishery, the average troll

chinook catch during the period 1974-76 was compared to the catch during the period 1977-80. This was done separately for both the total Southeast Alaska region and the outside catch areas and then averaged. The key assumption here is that the overall abundance of stocks contributing to the Southeast Alaska troll fishery had remained relatively stable. If stock abundance had increased during the latter period, fishing rates would be over-estimated and, conversely, if stock abundance had decreased, fishing rates would be under-estimated. The fact that fishery managers coastwide have observed depressed if not declining abundance levels is the rule for chinook stocks contributing to Southeast Alaska plus the fact that statistics show intercepting fisheries (e.g. British Columbia troll) have probably increased their harvest share of these stocks make it more likely fishing rates have been under-estimated rather than the reverse. One additional occurrence pertaining to this problem is the effect of a size limit increase in the Southeast Alaska troll fishery from 26" to 28" beginning in 1977. Simulation studies with the model were used to adjust for this effect.

To describe the effect of 1981 regulations on fishing rates in Southeast Alaska, the 1981 troll chinook catches were compared to the average 1977-80 troll catches on a monthly basis. Again, the key assumption is that overall chinook stock abundance in Southeast Alaska has not changed.

After fishery model simulations with estimated 1981 fishing rate changes, the next task was to relate actual 1981 stock abundance to model results. The mechanism for accomplishing this is to compare the 1981 terminal run size in the Columbia River (Bonneville Dam plus estimated lower river catch) with the model terminal run size (ages 3-5 escapement and in-river net catch). The terminal run size serves as a benchmark for annual comaprison of stock abundance changes. The ratio of actual terminal run size to model terminal run size enables the user to scale model recruit population up or down accordingly. Using this recruit scale factor in addition to the above fishing rate changes, model simulations were generated to describe the 1981 ocean catch distribution of brights.

The objective with respect to the bright stock is to increase terminal run size to achieve the spawning escapement objective (i.e. 40,000 adult fall chinook at McNary Dam). In 1981 only 21,000 fish were passed over McNary out of a total run size of 63,900. Under 1981 management conditions in the Columbia River and assuming no harvest of upriver brights above Bonneville Dam by treaty Indian fishermen, a run size of approximately 102,100 would have been needed to achieve the escapement goal. If the harvest rate by treaty fishermen observed in 1981 is assumed, the goal in 1981 would have been 120,500. Both objectives assume:

1. approximately 40% survival of unharvested fish between Bonneville and McNary Dams;

2. approximately 1% lower river interception rate in fisheries directed at stocks other than upriver brights; and

3. a 16% overall harvest rate by treaty Indian fishermen above Bonneville Dam (second objective only).

Table 1 presents the results of model simulation runs. Of the regulatory options considered, only a complete closure of the Southeast Alaska/northern British Columbia troll fisheries or coho-only fisheries in Southeast Alaska to central British Columbia, plus an additional coastwide June closure in all other areas, yielded terminal run sizes within the range of objectives.

Table 1. Results of model simulations of 1981 ocean fishery regulatory impacts on upper Columbia River "bright" fall chinook.

Area	Number of fish (X 1,000) Run 1	Run 2	Run 3
Southeast Alaska	37.9	0	0
Northern British Columbia	27.1	1.3	1.3
Central British Columbia	8.0	0.8	9.5
Northwest Vancouver Island	4.0	4.0	4.9
Southwest Vancouver Island	10.3	10.3	12.5
Other British Columbia[1/]	2.5	2.6	2.9
Washington/Oregon	4.6	4.8	4.8
Columbia River[2/]	63.9	106.0	106.0

Run 1: 1981 fishing regulations and intensities scaled to 1981 terminal run size

Run 2: Alaska to central British Columbia - no chinook retention - all other troll closed additionally in June (assuming no effort shifts)

Run 3: Alaska and northern British Columbia completely closed (assuming no effort shifts)

1/ Other British Columbia includes Georgia Strait, Johnston Strait, Strait of Juan de Fuca, and Washington coast.

2/ Columbia River ages 3-5 only.

1982 UPPER COLUMBIA RIVER "BRIGHT" FALL CHINOOK RUN SIZE EXPECTATIONS

Salmon Harvest Management Division
Washington Department of Fisheries

Prepared with information available through December 8, 1981, and, therefore, subject to change. This run size expectation constitutes the best available estimate at this time; while it will be superseded by a more accurate run prediction by July 1982 it does reflect the continuing decline of this resource.

December 9, 1981
Olympia, Washington

The Washington Department of Fisheries' (WDF) technical staff has developed a technique for making accurate per-season adult in-river run size predictions for the upper Columbia River chinook known as upriver brights by utilizing relationships oetween age group abundance within a brood year. At this time complete information about the most recently returned year class (1981) is unavailable, nevertheless, an expectation for 1982 in-river abundance is needed for guiding management in both North Pacific and Pacific council management areas.

An early pre-season projection was made of the 1981 in-river run size by quantifying the trend in adult abundance for the years 1975 to 1980 (WDF report, March 1981). The 1981 expectation of 69,400 adults compares with the preliminary estimated 1981 return of 63,900 adults (Figure 1). Though the difference between actual and projected is no greater than the error expected of such a trend line, continued reliance upon such a method should be avoided if additional or more appropriate information is available.

A similarly declining trend to that seen in adult run size is observed of the in-river return of age-two upper Columbia River brights. Upriver bright jacks are enumerated at The Dalles, John Day, and McNary dams, however, a consistent measure of relative age-two population size is found by combining the annual jack counts at John Day and The Dalles dams. To reflect the abundance of a single adult year class, jack counts from brood years of the major three contributing adult age groups (3-5) are combined and averaged. A relationship between jack and adult returns assumes that most of the variability in brood year production occurs prior to the return of two-year-olds and that the maturity schedule of different broods is relatively constant. Though the 1981 jack count increased from the 1980 count, the three-year index corresponding to the 1982 adult run is less than the index of 1981 previously the lowest index within the data base (Table 1).

Upriver bright adult run size is regressed against the jack index for the years 1975 to 1981 to produce a predictive relationship for the 1982 run size. A predicted adult run size of 62,900 is slightly less than the record low run size of 1982 (Figure 2).

LITERATURE CITED

Review of 1981 NPFMC Preferred Options and Refinements to the Analysis of Upper Columbia River "Bright" Fall Chinook Management Needs and Opportunities for 1981. Washington Department of Fisheries March 12, 1981.

Figure 1. Upriver bright adult run size, 1975-1981.

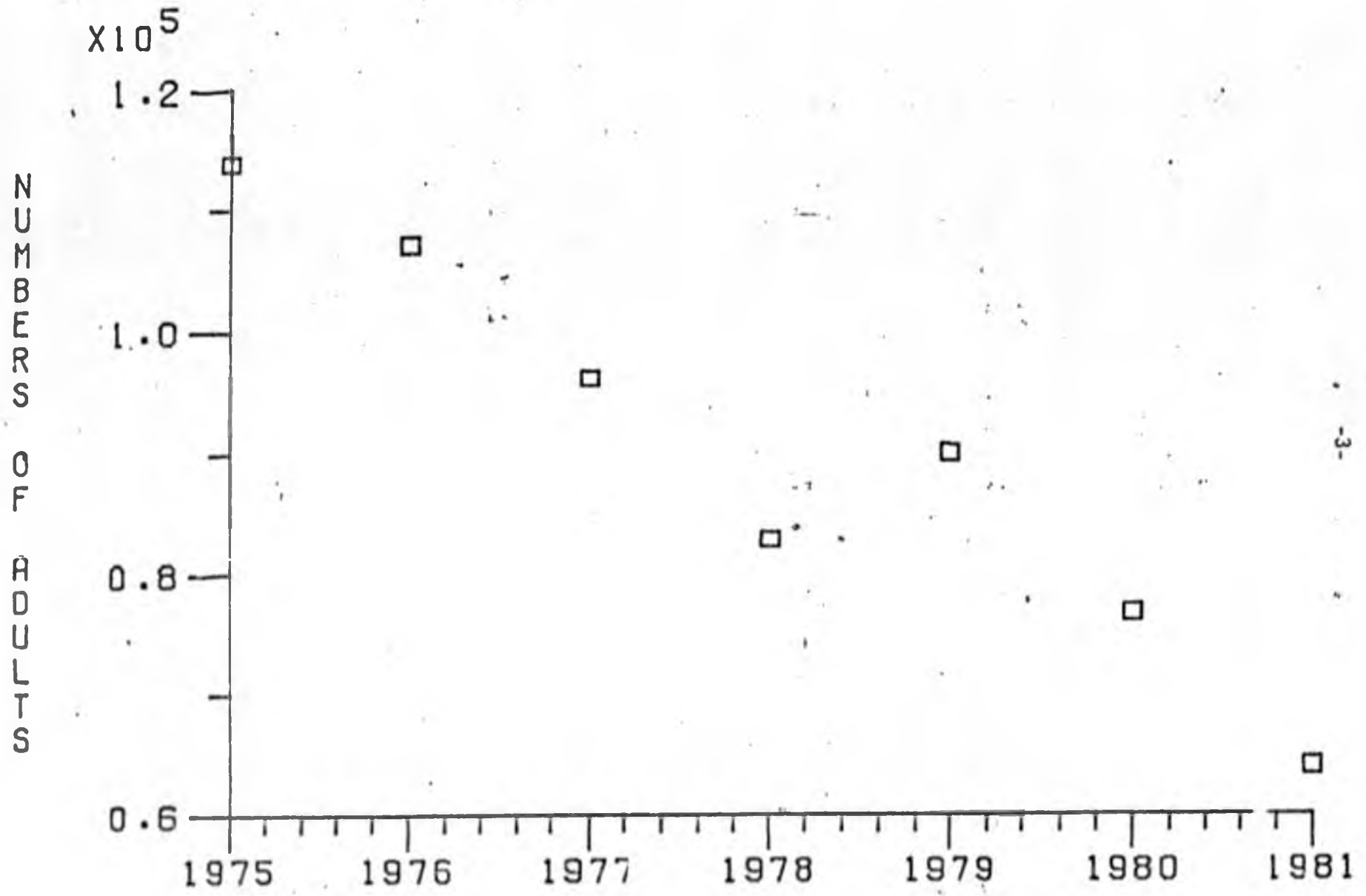
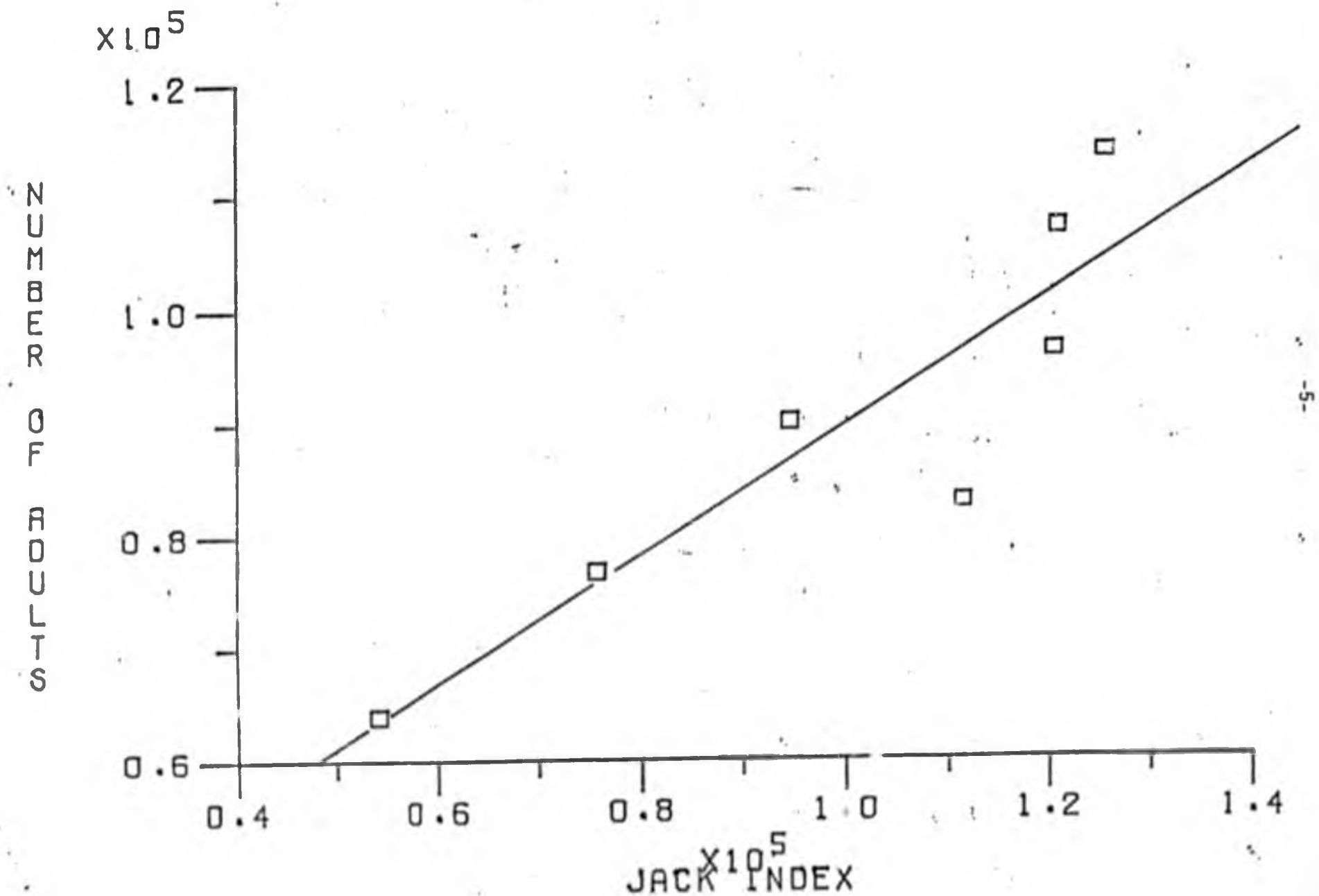


Table 1. Upriver bright adult run size, annual jack count at The Dalles and John Day dams(combined), and the jack index of adult return, 1975-1982.

Year	adults	jack count	jack index
1975	113900	111900	125700
1976	107200	128500	121000
1977	96300	94200	120400
1978	82800	61000	111500
1979	90000	71900	94600
1980	76700	29400	75700
1981	63900	59200	54100
1982			53500

Figure 2. Relationship between jack index and upriver bright adult run size, 1975-1981.



State of Washington
DEPARTMENT OF FISHERIES

PROGRESS REPORT NO. 129

1981 PUGET SOUND SPRING CHINOOK STATUS AND RECOMMENDATIONS FOR MANAGEMENT

Prepared by
Harvest Management Division

February 1981

INTRODUCTION

The staff of the Washington Department of Fisheries has prepared this report for the purpose of facilitating management of the Puget Sound spring chinook resource. This report includes information on allowable harvest levels, desired escapements, brood year natural escapements, hatchery releases, and predicted returns of natural and hatchery stocks.

Methodology employed in the calculation of predicted returns remains unchanged from the procedures followed last year. Anyone desiring further knowledge of those methods are referred to Progress Report Numbers 41, 81 and 98, where predictive techniques have been presented in detail.

ALLOWABLE HARVEST LEVELS

Numbers of spring chinook expected to reach Puget Sound, excluding treaty Indian troll, ceremonial and subsistence catches, and Puget Sound marine sport catch, are shown in Table 1. A quick scan of the column entitled, "Allowable Harvest" shows that desired escapements are not expected to be met in any of the Puget Sound spring chinook streams in 1981. Sport fishing regulations reflect conservation needs with all river sport salmon seasons being closed throughout the spring chinook management period.

SPAWNING GROUND ESCAPEMENT GOALS

Natural stock escapement goals for Puget Sound streams are the same as given in the 1980 status report, Progress Report Number 98, with the exception of the Duwamish-Green River. The Duwamish-Green River natural spring chinook stock has been removed from the report due to its non-viability.

During the period from July 9-17, 1980, WDF personnel conducted a survey of upper Green River areas where spring chinook would be expected to hold. A total of 16.9 miles of stream between R.M. 44.0 and R.M. 60.9 were surveyed by sections by a team of snorkel-equipped swimmers. Although the surveys were not a complete census of the early-run chinook in the upper river holding area, they are probably indicative of the relative run strength in the Green River. A total of five (5) live and two (2) dead adult chinook were observed over the 16.9 miles of river surveyed. Hatchery plantings may have contributed to the returns to the river in 1980, and if chinook of natural stock origin were present in these upper river holding areas during 1980, they were so few in number that they cannot be viewed as a viable management entity.

PREDICTIONS AND MANAGEMENT RECOMMENDATIONS

Puget Sound natural spring chinook runs in 1981 are expected to have no harvestable numbers of fish and are described as poor. Information from Canadian fisheries personnel states that Fraser River spring chinook returns this year will be very similar to 1980 levels, which were termed poor also. Since both Puget Sound and Fraser River natural spring chinook stocks are in need of protection in 1981, the following harvest recommendations are made:

Areas 4B, 5, 6, 6A, 6C, 7, 7A and 7D

There should be no fisheries directed at spring chinook in these management areas from April 15 through June 15.

Elwha River

Confirmation of remaining natural spring chinook in the Elwha River has yet to be made. In the absence of conclusive evidence confirming their absence, no fishery should take place prior to July 22.

Dungeness River

Area 6D and the Dungeness River should remain closed prior to July 1 to protect both the natural and hatchery origin spring chinook, which are comingled. All adult returns of the hatchery stock will be needed for enhancement efforts. Upstream resting/holding pools and spawning areas should be protected by restricting fishing until spawning is completed around mid-September.

Nooksack River

On- and off-reservation fisheries in Bellingham Bay and the Nooksack River should be curtailed for the duration of the 1981 spring run from April 15 through June 30 for protection of the natural run. In addition, hatchery stocks are anticipated to produce small numbers of fish that will be totally required for further enhancement. Furthermore, based on recent return rates experienced at Nooksack hatchery, the predicted hatchery run size is probably overly optimistic.

Skagit River

Skagit River spring chinook are predicted to return at a level that is only a fraction of the desired escapement level. Therefore, complete protection for the natural stock is required, and there should be no commercial fishing in Skagit Bay, the Skagit River and all tributaries according to the following schedule:

Area 8 (Skagit Bay) - April 15 through June 15, all waters of Skagit Bay and Saratoga Passage north of the Area 8/Area 8A boundary line.

Skagit River No. 1 and below - April 15 through June 15, from the mouth of the North and South Forks to Gilligan Creek.

Skagit River No. 2 - April 15 through June 18, from Gilligan Creek to Hamilton.

Skagit River No. 3 - April 15 through July 7, from Hamilton to "Old Faber Ferry Landing" above C ncrete.

Skagit River No. 4 - April 15 until spawning is finished in all areas above "Old Faber Ferry Landing", including all tributaries.

Return rates for hatchery releases in this river system must be viewed as questionable at this time. It is felt that the values used for Puget Sound as a whole are probably optimistic for this stock; but regardless of the rate, all returns of artificially reared stock will be needed for continued enhancement.

A certain amount of cautious optimism can be expressed at the 1980 spring chinook escapement in the Skagit River system. Last year's estimated escapement and return per spawner were at the highest level that we have seen for the last eight years. Escapements for the last three years show a reversal of the previous downward trend. Optimism must be tempered, however, by pointing out that escapement last year was only slightly more than half the desired goal.

Stillaguamish and Snohomish Systems

There should be no fishery in Area 8A, the Stillaguamish River below the confluence of the North and South Forks, or the Snohomish River below the confluence of the Skykomish and Snoqualmie rivers prior to July 1. Both forks of the Stillaguamish River and all resting pools and spawning areas of the Skykomish and Snoqualmie rivers should remain closed until the conclusion of spawning.

Duwamish-Green River

Surveys of the principal resting areas during 1980 have shown that very few early-run chinook were present last year and support the suspected absence of a viable natural run. The potential for returns to the Green River in 1981 depends on a fry plant of spring chinook stock of the 1977 brood. Lacking definitive data on return rates for such plants of spring chinook in the Puget Sound area, it is impossible to predict the magnitude of the run; but experience drawn from chinook fry plants woulo tend to suggest that a minimal return can be expected.

Puyallup River

The extremely tenuous status of the Puyallup River spring chinook run necessitates closing of the Puyallup River and Area 11A, including reservation waters, through June 30. In addition, the White River, including reservation waters, should also be closed through July 31. WDF has committed its efforts to preserve this stock through development of an egg-bank, which may be used as a source in the future to enhance this run.

Minter Creek

Small numbers of White River stock of the 1977 and 1978 broods may return to Minter Creek this year as part of a program to assure the existence of the stock through development of an egg-bank source. All adult returns are essential for brood stock and require complete protection. Therefore, there should be no commercial fishing in Area 13A prior to July 22, and Minter Creek should be closed to fishing through July 31.

Hood Canal

Whether or not there is a natural run of spring chinook in Skokomish River still remains undetermined. In the case of the hatchery run of spring chinook in Hood Canal, planting records indicate releases of Hood Canal Hatchery stock in the Dosewallips River and on-station at Finch Creek. However, return timing data shows this stock to exhibit migration characteristics of summer/fall chinook. Therefore, no predicted return has been calculated for this stock in the spring chinook status report. Instead, these release and return data for the Hood Canal Hatchery stock will be incorporated in future summer/fall chinook status reports.

PREDICTION METHODS

Comments included in the introductory section of this report addressed the question of methodology employed in predictive calculations and told where method details could be located. The only change from 1980 involves updating "the most recent 10-year" data base for the Skagit River.

Predicted returns to the Skagit River are calculated by multiplying the most recent 10-year average return per spawner times the brood or cycle year natural escapement. For 1981, this calculation, (1.04) x (716), gives an expected return value that is approximately 25% of the desired escapement goal of 3,000 spawners for the river system. If, however, the return per spawner realized in 1981 is more similar to recent values observed in 1978-80, we may realize a natural run which is twice as large as the previously calculated return but still only one-half of the desired goal.

Escapements in the Skagit River system should perhaps be viewed positively. As pointed out earlier in this report, returns for the 1978-80 seasons show a promising upward trend. The 1981 return will be of great interest, because it will result mainly from the 1977 brood, which is the weakest parent brood in recorded data for the Skagit River.

Use of return per spawner data for the Puyallup River continues to be meaningless at current stock level. It is probably safe to say that the return to the Buckley trap in 1981 will number less than 50 fish, as has been the case in recent years. Also, contributions of hatchery-reared native stock remains questionable because of possible downstream passage problems encountered by out-migrating smolts.

Table 1. 1981 Puget Sound spring chinook predictions, desired escapements and allowable harvests.

	Predicted total return	Desired escapement	Allowable harvest	Brood or cycle year natural escapement	Artificial production yearling releases (numbers) 1977 brood	Comments
Strait of Juan de Fuca						
ELWHA - natural	unknown	undetermined	-	unknown		Presence of natural spring chinook has yet to be confirmed.
DUNGENESS - natural	few	undetermined	-	unknown		
- hatchery	200	see comments	0		11,800	All adults are needed for enhancement.
Nooksack-Samish						
NOOKSACK - natural	few	500	0	unknown		
- hatchery	200	see comments	0		118,649[1/]	Complete protection required for natural stock. All hatchery returns needed for enhancement.
Skagit						
SKAGIT - natural	750	3,000	0	716		
- hatchery	200	see comments	0		51,080	Complete protection required for natural stock. All hatchery returns needed for enhancement, but success of this program has yet to be substantiated. Therefore, return rates must be questionable at this point for hatchery releases.
Stillaguamish-Snohomish						
STILLAGUAMISH - natural	few	undetermined	-	unknown		
SNOHOMISH - natural	few	undetermined	-	unknown		
Duwamish-Green						
GREEN - hatchery	few	0	-		[2/]	Returns from fry plant are questionable.
Puyallup						
PUYALLUP - natural	few	undetermined	-	unknown		All adult returns are needed for enhancement efforts to perpetuate the run through development of an egg-bank source.
Minter						
MINTER CREEK - hatchery	few	see comments	0		20,461[3/]	All adult returns to Minter Creek will be required for enhancement. Return rate is uncertain for this program.
Hood Canal						
FINCH CREEK - hatchery	see footnotes indicated under Artificial Production				158,136[1/4/]	

1/ Although listed in hatchery production tables as "spring chinook", the stock planted exhibits characteristic summer/fall chinook timing.
2/ Fry plant only, totaling 116,250.
3/ Another 960 transferred to NMFS Manchester Pens. Total 1977 brood year artificial production 21,421.
4/ An additional 49,840 planted as fry.

State of Washington
DEPARTMENT OF FISHERIES

PROGRESS REPORT

No. 130

1981 Status of Puget Sound Summer/Fall Chinook and Pink Salmon and Recommendations for Management

Harvest Management
Division

April 1981

Progress Reports are printed by the Department of Fisheries to document progress being made in various projects and programs. They are primarily for internal use and often contain preliminary data and conclusions that may be later revised.

These reports of progress are not considered as scientific publications, but they may be cited when referring to the material contained in them unless specifically noted.

STATE OF WASHINGTON
John Spellman, Governor

DEPARTMENT OF FISHERIES
Rolland A. Schmitten, Director

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Peter E. Bergman, Assistant Director

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INTRODUCTION

The Washington Department of Fisheries presents these management considerations for 1981 summer/fall chinook and pink salmon returns to Puget Sound in order to facilitate resource management. Data, methods, and recommendations are similar to those of recent years. Techniques utilized to determine escapement goals and escapement estimates are similar to those used in the past (see Washington Department of Fisheries Technical Report No. 29). Pre-season forecasts for 1981 were developed with some changes from previous years. Any changes instituted in forecast methods for 1981 are presented in a later section of this report entitled "PREDICTION METHODS".

Predicted returns of chinook and pink salmon to Puget Sound (excluding treaty Indian troll, ceremonial, and subsistence catches, and Puget Sound sport catch) are outlined in this report by stock management unit. Desired escapements for hatchery and natural runs, allowable harvests, net fishery management recommendations, test fishing needs, and prediction methods utilized are also included. A detailed breakdown of predicted returns, desired escapements, allowable harvests, brood year escapement levels, and artificial production releases are presented by stream in the Appendix.

Puget Sound pre-season salmon forecasts should be used only as a guide for initial establishment of regulations. Even though the forecasts have been fairly reliable, actual run size may deviate from a pre-season forecast because of statistical variability, unusual survival rates, or unanticipated fishing rates in interception fisheries. Fisheries managers, therefore, depend on in-season catch data for indicators of run strength. Fishing regulations can then be adjusted, if necessary, to accommodate the size of the run that actually reaches the subject fishery. In-season adjustment methods will be presented in a separate report and will be similar to those used in recent years.

Chinook stocks in the Skagit, Stillaguamish-Snohomish, Lake Washington, and Duwamish-Green systems will be managed on the basis of natural run escapement requirements. Other systems will continue to be managed to provide full hatchery fish harvest. With the exception of small pink salmon runs destined for Hoodsport, Port Gamble, Chambers Creek, and Minter Creek, this species will be managed for natural run escapement requirements.

FISHERY MANAGEMENT RECOMMENDATIONS

Summer/fall chinook and pink salmon returns to Puget Sound in 1981 are expected to range from small natural runs that cannot withstand directed fisheries to returns of hatchery and natural fish that can be harvested at high rates (Table 1). Although each of the six major production systems will have some harvestable fish returning to Puget Sound this year, some mixed-stock areas will remain closed to protect weak Canadian and/or Puget Sound stocks. Likewise, some extreme terminal areas will not have directed chinook or pink fisheries.

Management recommendations are presented in two ways. First, basic management considerations for each of the numbered management/catch reporting areas and each of the rivers are given in Table 2. This is followed by a more detailed discussion of management recommendations for each stock management unit.

Harvestable numbers represent fish available for harvest by all U.S. commercial net fisheries in Puget Sound. The harvest should be limited to those management/catch reporting areas as outlined herein.

In several stock management areas, allowable harvest is the difference between predicted return and the biologically determined escapement goal. In an area where a hatchery stock returns simultaneously with natural fish that

Table 1. Summary of predicted Puget Sound net fishery harvests of chinook and pink salmon, 1981.

Region of origin	Expected harvest	
	Chinook	Pink
Strait of Juan de Fuca tributaries	1,100[1/]	102,000
Nooksack-Samish	86,200	58,000
Skagit	12,500	705,300
Stillaguamish-Snohomish	14,800	811,900
South Sound	30,500	82,700
Lake Washington	-2,700	NA
Duwamish-Green	-6,900	NA
Puyallup	-3,900	77,400
Minter Creek-Carr Inlet	-8,800	-4,300[2/]
Nisqually	-1,100	-700[2/]
Deschutes-Capitol Lake	-6,600	NA
Miscellaneous South Sound	-500	-300[2/]
Hood Canal	9,600	26,500[2/]
Total	154,700	1,786,400

[1/] Includes an incidental catch of 200 for stocks without a harvestable surplus.

[2/] Comprised totally or almost totally of incidental catch.

Table 2. 1981 summer/fall chinook and pink salmon management recommendations--Puget Sound.

Area	Management period		Relative harvest rate		Comments
	Chinook	Pink	Chinook	Pink	
4B, 5W	June 16-Aug. 29	IPSFC control	Minimal	--	IPSFC control through 9/12. Weak Canadian and Puget Sound chinook stocks will require net fishery restrictions.
5E, 6C	June 16-Aug. 29	IPSFC control	None	--	IPSFC control through 9/12. Weak Canadian and Puget Sound chinook stocks will require net fishery restrictions.
6	June 16-Sept. 5	IPSFC control	None	--	IPSFC control through 9/19. Weak Canadian and Puget Sound chinook stocks will require net fishery restrictions.
6D	July 1-Sept. 19	July 12-Sept. 12	None	Moderate	No harvestable chinook. Net fishery restrictions required.
Dungeness River	July 1-Sept. 19	July 12-Sept. 26	None	Moderate	No harvestable chinook. Net fishery restrictions required.
Elwha River	July 22-Sept. 19	July 26-Sept. 12	Low	Moderate	Success of overall program has yet to be established.
Other Strait of Juan de Fuca tribs.	July 22-Sept. 26	None present	None	--	No harvestable chinook.
6A	June 16-July 15 (summers) July 16-Sept. 5 (falls)	IPSFC control	None	--	IPSFC control through September 19. Management periods reflect timing of Skagit River chinook stocks. No directed chinook fishery warranted because of weak Canadian and Puget Sound stocks.
7, 7A	June 16-Sept. 5	IPSFC control	None	--	IPSFC control through and extending past entire period. No directed chinook fishery warranted.
6B, 9	June 16-Sept. 5	July 12-Sept. 12	Minimal	None	Nisqually pink need protection. Net fishery restrictions required. Lake Washington, Duwamish, and Hoodsport chinook stocks have low allowable exploitation rates.
7B	July 1-Sept. 5	July 19-Aug. 22	High	Moderate	
7D	July 1-Sept. 5	IPSFC control	See comment	--	IPSFC control through September 19.
7C, Samish River	July 1-mid-October	July 19-Aug. 22	High	Moderate	Area west of Oyster Creek line must close after August 8 to ensure chinook escapement needs at Samish Hatchery. Samish River and Area 7C east of the Oyster Creek line must be closed from July 1 to assure escapement from all segments of the run.
Nooksack River	July 1-Sept. 12	July 19-Aug. 29	Moderate	Moderate	Upriver management periods may need adjustment.
8	June 16-Aug. 4 (summers) Aug. 5-Sept. 5 (falls)	Aug. 2-Sept. 1	Moderate	High	Chinook harvest rate must be established to allow fishery throughout duration of run with majority of harvest taken from summer segment of run. 6-inch maximum gill net mesh required and restriction on purse seines to prevent overharvest of fall chinook segment during pink salmon fishery.
Skagit River	See text	See text	Low	Moderate	See text for management details by river section. Harvest rates dependent upon those in Area 8.

(Continued)

Table 2. (continued)

Area	Management period		Relative harvest rate		Comments
	Chinook	Pink	Chinook	Pink	
8A	July 1-Sept. 5	Aug. 2-Sept. 19	Moderate	High	Chinook harvest rate must be established to allow fishery throughout duration of run. During last 3 weeks of chinook management period, when majority of pink harvest will occur, a 6-inch maximum gill net mesh required and restriction on other net gear to prevent overharvest of this chinook run segment.
Stillaguamish River	July 1-Sept. 12	Aug. 2-Sept. 19	Low	Low	Harvest rates dependent upon rate in marine waters, but no major fishery anticipated.
Snohomish River	July 1-Sept. 12	Aug. 2-Sept. 19	See comment	See comment	No fishery anticipated.
10	July 1-Sept. 5	July 26-Sept. 12	Low	None	Nisqually pink require protection. Net fishery restrictions required.
10A	July 15-Sept. 12	None present	Low	--	
Duwamish River	July 15-Sept. 26	None present	Low	--	Harvest rate dependent upon that in marine waters.
10B	July 1-Sept. 19	None present	Low	--	No chinook fishery prior to August 1. From August 1 through September 19, a 6-1/2-inch minimum mesh restriction on gill nets to protect Lake Washington sockeye.
10C	July 31-Sept. 19	None present	None	--	Total closure to protect chinook and sockeye spawners.
10D (Lake Sammamish)	July 31-Oct. 3	None present	None	--	Harvestable chinook will be caught incidentally during prior net fisheries.
Cedar River	July 31-Jan. 2	None present	None	--	Total closure to protect chinook and sockeye spawners.
10E	July 1-Sept. 19	None present	See comment	--	No fishery anticipated.
11	July 1-Sept. 5	July 26-Sept. 12	Moderate	None	Nisqually pink require protection. Net fishery restrictions required.
11A	July 1-Sept. 5	July 26-Sept. 12	Moderate	High	Rate depends on that in prior net fisheries.
Puyallup River	July 1-Sept. 12	July 26-Sept. 19	Moderate	High	Rate depends on that in marine waters.
White River	Aug. 1-Sept. 12	None present	None	--	Harvestable will be caught in prior net fisheries.
9A	July 1-Sept. 5	July 19-Sept. 5	--	None	Small hatchery pink run. Hatchery will take all available eggs.
12, 12B	July 1-Aug. 29	July 12-Aug. 29	Low	Low	Harvest should be spread to ensure escapement of both chinook and pink salmon.
12A	July 1-Sept. 5	None present	See comment	--	No harvestable stock present. All Quilcene chinook planted at Walcott Slough.

(Continued)

Table 2. (continued)

Area	Management period		Relative harvest rate		Comments
	Chinook	Pink	Chinook	Pink	
12C	July 1-Sept. 5	July 19-Sept. 5	Low	Low	Rate depends on that in prior net fisheries. Closure near Hoodsport Hatchery required in August and September to ensure hatchery escapement.
Skokomish River	July 1-Sept. 26	None present	High	--	Harvest should be concentrated in the river to protect a weak hatchery run to Hoodsport Hatchery.
12D	July 1-Sept. 5	None present	None	--	No harvestable chinook present.
13	July 1-Sept. 12	Aug. 2-Sept. 26	Moderate	None	Nisqually pink require protection. Net fishery restrictions required.
Nisqually River	July 1-Sept. 19	Aug. 16-Oct. 3	Moderate	None	Chinook harvest rate depends on that in prior marine areas. Pink require protection. Net fishery restrictions required.
13A	July 22-Sept. 19	Aug. 2-Sept. 26	High	High	
13B	July 1-Sept. 19	None present	Moderate	--	Rate depends on that in prior net fisheries.

cannot be harvested independently and the area is managed at the hatchery exploitation rate (e.g., Nooksack River chinook), the harvestable number is higher than this amount. In these areas, the harvest rate for the hatchery stocks also determines the harvest rate for the natural stock. The spawning goal for such natural stocks technically will not be achieved in 1981.

In some stock management units there are minor returns to small streams that are not listed separately in Appendix Table 1. Each of these minor areas has been considered and has been included if it has a surplus that can be harvested. Moreover, each known plant, no matter how small, has been considered.

Effort must be spread throughout the management periods to achieve escapement and catch from all segments of the run. In addition, incidental harvest which occurs during coho fisheries must be subtracted from allowable harvest during directed chinook and pink fisheries.

U.S. Convention Waters

Chinook management period: 4B, 5, 6C - June 16 through August 29
6, 6A, 7, 7A - June 16 through September 5

Pink management period: 4B, 5, 6, 6A, 6C, 7, 7A - IPSFC control

From June 16 through June 20, all the above areas should be closed to net fishing to protect depressed Canadian and Puget Sound stocks. The Canadian status report "1981 Commercial Fishing Guide" states that "Total [chinook] return to the Fraser River expected to continue on a downward trend. Conservation measures will be imposed." Fraser River chinook escapement in 1977 was 80,000, or 52% of optimum.

The International Pacific Salmon Fisheries Commission (IPSFC) assumes control on June 21. From that date through the chinook management period, purse seines and reef nets must release chinook and drift nets must use 5-7/8-inch maximum mesh size in Areas 4B, 5, 6, 6A, 6C, 7, and 7A. Set nets must use 5-7/8-inch maximum mesh during this time period in Areas 5 (east of Pillar Point), 6, 6A, 6C, 7, and 7A.

Strait of Juan de Fuca Streams

Chinook management period: 6D and Dungeness River - July 1 through September 19
Elwha River - July 22 through September 19
Other rivers - July 22 through September 26

Pink management period: 6D - July 12 through September 12
Dungeness River - July 12 through September 26
Elwha River - July 26 through September 12

Elwha River is the only Strait of Juan de Fuca stream where chinook and pink fisheries will be warranted in 1981. Some uncertainty exists about the level of chinook harvest because the success of the overall hatchery program has not yet been established. Therefore, estimates of harvestable numbers of hatchery fish may be optimistic. The magnitude of the forecasted pink return may also be optimistic based on catches made during the 1979 fishery and the nature of the escapement estimation methodology.

Local chinook runs to all other streams will be below the desired escapement levels. This necessitates closures in all these streams except the Dungeness River, where harvestable pink are projected. In Area 6D and the Dungeness River, a restriction involving 6-inch maximum gill net mesh and release of chinook by other commercial gear will be required during the pink management period. Limited test fishing should precede any openings for coho to ensure that chinook have cleared the fishing area. Test fishing should not commence prior to the end of the chinook management period.

Nooksack-Samish

Chinook management period: 7B, 7D - July 1 through September 5
Nooksack River - July 1 through September 12
7C and Samish River - July 1 through mid-October

Pink management period: 7B, 7C - July 19 through August 22
7D - IPSFC control
Nooksack River - July 19 through August 29

A good run of fall chinook to the Bellingham Bay area in 1981 is expected to provide a harvest of approximately 86,200 fish. Allowance must be made for approximately 10% of the chinook catch occurring during the coho fishery subsequent to the chinook management period. IPSFC will have relinquished control of Area 7B prior to the start of the chinook management period, but Area 7D will be under Commission control throughout the management period. An estimated harvestable number of 58,000 pink is projected, with most of the catch occurring between July 26 and August 15.

In spite of good chinook run with a high allowable harvest rate, care must be taken to ensure sufficient escapement for perpetuation and enhancement of the run, which is predominantly of hatchery origin. Therefore, Samish River and Area 7C inside the Oyster Creek line must be closed throughout the chinook period. Area 7C outside the Oyster Creek line must close from August 9 through the chinook management period. Test fishing by the Department will ascertain chinook status in the area.

Skagit

Chinook management period: 8 - June 16-August 4 (summers)
- August 5-September 5 (falls)

Skagit River (mouth to Gilligan Creek) - June 16 through September 5

Skagit River (Gilligan Creek to Hamilton) - June 19 through September 19

Skagit River (Hamilton to Old Faber Ferry Landing) - July 8 through September 19

Skagit River (upstream of Old Faber Ferry Landing including tributaries) - continuous closure to protect spawning fish

Pink management period: 8 - August 2 through September 19

Skagit River (mouth to Gilligan Creek) - August 9 through September 19

Skagit River (above Gilligan Creek) - August 9 through October 31

Total returns of Skagit River summer/fall chinook and pink salmon this year are predicted to be 28,800 and 1,035,450 fish, respectively. This should provide a harvest of approximately 12,500 chinook and 705,300 pink. Summer and fall chinook runs to the Skagit River are not predicted separately, but the summer run predominates and should provide the bulk of the catch and escapement. About 75% (9,400) of the catch should be taken during the summer run management period. Of the 3,100 fish to be harvested in the fall management period, all should be reserved for harvest during the pink management period. Thus, Skagit Bay should be closed from the period August 5-15, when the pink run is building. Similar 2-week closures should occur in Skagit River at the start of the respective fall chinook management periods.

The large harvest of pink should start on August 16 in Skagit Bay and continue until coho catches become significant (approximately September 6 in the bay).

Admiralty Inlet-Discovery Bay

Chinook management period: 6B, 9 - June 16 through September 5
Pink management peirod: 6B, 9 - July 12 through September 12

Nisqually pink salmon require protection. Therefore, from late July (when Lake Washington sockeye have cleared) through September 5, a 7-1/2-inch minimum gill net mesh size and release of pink by other commercial gear will be required.

Chinook salmon dest ned for Hoodsport, Lake Washington, and Duwamish River have low allowable fishing rates, so chinook fishing (if any) in Areas 6B and 9 should be limited.

Stillaguamish-Snohomish

Chinook management period: 8A - July 1 through September 5
Stillaguamish and Snohomish Rivers - July 1 through September 12

Pink management period: 8A, Stillaguamish and Snohomish Rivers - August 2 through September 19

The chinook run to this area is composed of three parts, a natural segment which predominates, and artificially produced runs from Skykomish Hatchery and Tulalip Bay. This system is managed to provide for natural run escapement requirements, and harvest rates are established on that basis. As a consequence, the harvest rate for hatchery fish is dictated by the appropriate rate for the natural run. Return this year are predicted to be 25,300 of which 13,500 will be harvestable in mixed-stock areas. Any chinook harvest in the Stillaguamish River must reflect prior catches from marine waters. An additional harvest of 1,300 chinook in Tulalip Bay will depend upon success of the Tulalip Bay program.

The pink run to this area is predicted to total 1,089,900 with 811,900 harvestable. Most of this harvest should occur between August 16 and September 12.

Southern Puget Sound

Two chinook stocks within this region, Lake Washington and Duwamish-Green, are managed on the basis of natural run escapement requirements. All other stocks are managed to provide full hatchery fish harvest.

Lake Washington

Chinook management period: 10 - July 1 through September 5
10B - July 1 through September 19
10C - July 31 through September 19
10D - July 31 through October 3
Cedar River - July 31 through January 2

Pink management period: 10 - July 26 through September 12

Chinook returning to the Lake Washington system this fall are expected to number approximately 12,500. Since the Lake Washington system is managed on the basis of the natural stock, the harvest rate for hatchery fish will be determined by the rate which provides the desired natural stock escapement. Total harvest of both hatchery and natural chinook is predicted to be 2,700 fish. This harvest will be taken by chinook fisheries of low intensity in Areas 6B, 9, 10, and/or 10B and caught incidentally during fisheries for other species. Net restrictions similar to those in Areas 6B and 9 will be required in Area 10 to protect Nisqually pink.

Duwamish-Green River

Chinook management period: 10A - July 15-September 12
Duwamish-Green River - July 15-September 26

Fall chinook management in the Duwamish-Green River is keyed to attaining full natural stock escapement. The run of natural and hatchery chinook combined is predicted to number 23,500. The harvest rate for the natural stock will provide for a total harvest of 6,900 fish. Around 10% of this chinook harvest will be taken during the coho management period, so the remainder should be taken during the chinook management period. Harvest should be restricted in a manner that spreads the catch throughout the duration of the run and provides protection of Nisqually pink in Area 10.

Puyallup River

Chinook management period: 11, 11A - July 1 through September 5
Puyallup River - July 1 through September 12
White River - August 1 through September 12

Pink management period: 11, 11A - July 26 through September 12
Puyallup River - July 26 through September 19

Natural and hatchery chinook and pink salmon of Puyallup River origin are expected to total 7,100 and 96,800 fish, respectively, of which 3,900 chinook and 77,400 pink will be harvestable. Fishing rates for chinook in Area 11A and the Puyallup River will depend on harvest in prior areas. Because Puyallup pink have a higher allowable exploitation rate than chinook, care must be taken through appropriate maximum mesh restrictions to prevent overharvest of chinook (particularly during the last 2 weeks of August and first week of September, when most of the pink fishery should occur).

Nisqually River

Chinook management period: 13 - July 1 through September 12
Nisqually River - July 1 through September 19

Pink management period: 13 - August 2 through September 26
Nisqually River - August 16 through October 3

Predictions for the Nisqually River chinook run this year indicate a return of 2,200 fish can be expected. The chinook run in the Nisqually River is composed of natural and hatchery fish. The allowable harvest of the combined stocks is 1,100 fish. The predicted Nisqually River pink run of 4,500 is less than that required for escapement, so appropriate minimum mesh restrictions will be required in Area 13 and the river during any chinook fisheries.

Minter Creek-Carr Inlet

Chinook management period: 13A - July 22 through September 19

Pink management period: 13A - August 2 through September 26

The Carr Inlet fall chinook and pink runs are entirely hatchery fish from Minter Creek. Forecasts show an expected return of 9,200 chinook and 7,200 pink, with allowable harvests of 8,800 and 4,300, respectively.

Deschutes-Capitol Lake

Chinook management period: 13B - July 1 through September 19

The principal chinook stock in Area 13B is the run to the Capitol Lake-Deschutes River hatchery facility located at the lower end of Budd Inlet. Preseason forecasts indicate a return of 13,100 can be expected this fall. Hatchery escapement requirements for this stock in 1981 are 6,500 fish. The remaining 6,600 chinook will be available for harvest.

Miscellaneous South Sound

Chinook and pink management periods: incorporated in previous discussions and areas

In addition to the major chinook runs which have been discussed above, there are two minor hatchery programs not situated on large river systems. Garrison Springs, or Chambers Creek, should contribute approximately 200 chinook to various fisheries in marine waters. From a total return of 400 fish, the hatchery facility should realize an escapement of 200. Another facility on McLane Creek producing hatchery chinook is predicted to contribute 300 fish to marine area fisheries from a total return of 700.

The Chambers Creek pink run of 1,800 fish is not large enough to sustain a directed fishery. The harvest of 300 is expected to occur incidentally.

Hood Canal

Chinook management period: 12, 12B - July 1 through August 29
9A, 12A, 12C, 12D - July 1 through Septembe 5
Skokomish River - July 1 through September 26

Pink management period: 12, 12B - July 12 through August 29
12C - July 19 through September 5

The only chinook run in Hood Canal this year with a significant number of harvestable fish is the Skokomish River run. Other stocks, including the hatchery stock originating from Hoodsport, have low numbers of harvestable fish that will be caught by low-intensity chinook fisheries in Areas 12, 12B, and/or 12C and by fisheries directed at other species. (Note that Quilcene fish were planted at Walcott Slough and return rates are uncertain.) From a total return of 17,000 Hood Canal chinook, there will be 9,600 harvestable. The bulk of

this harvest, 8,300 fish, consists of Skokomish River chinook. Area closures around Hoodsport Hatchery and Dewatto Bay will be required to assure chinook escapement.

The pink salmon run to Hood Canal is predicted to total 156,200, with 26,500 harvestable. The allowable fishing rate for pink destined for Hoodsoort Hatchery is slightly higher than that for pink destined for Area 12B streams.

PREDICTION METHODS

Chinook Salmon

The 1981 prediction of summer/fall chinook runs to Puget Sound is the number expected to enter the Strait of Juan de Fuca. The prediction this year is composed of five major parts: the natural portion, two hatchery segments, and the Nooksack-Samish and Hood Canal runs.

The natural portion of each run, with the exception of Hood Canal, is predicted as the mean annual run size originating from that stream. Escapement estimates, plus estimates of natural run catch, are combined to make the natural run size.

Runs resulting from hatchery plants are predicted similarly as the mean annual hatchery run. Hatchery rack counts are added to harvest estimates of the hatchery stocks to produce the hatchery run size. The hatchery run is then divided into two parts resulting from yearling and fingerling releases. The basic procedures employed in preparation of the 1981 hatchery prediction have been discussed previously in Progress Report No. 107. Hatchery runs to Green River, Minter Creek, and Deschutes River were adjusted again this year to reflect recent success of plants.

Methods used to predict the Nooksack-Samish run were presented in the 1980 status report (Progress Report No. 107). The procedure involves calculating a total brood return to Puget Sound from a hatchery production factor (pounds X numbers). The total brood return is then separated into contribution by age group or fishery year. Total predicted return within a given year is the summation of 5-year-old, 4-year-old, and 3-year-old returns from three consecutive brood year releases.

Prediction for the Hood Canal run was made separately using a multiple regression equation. More than 37 combinations of factors involving natural escapements and hatchery releases were examined by a multiple regression program. This analysis yielded the predictive equation:

$$y = 259.85 - 1{,}091{,}787\ X_1 - 21.03\ X_2$$

where

y = natural log of run to Strait of Juan de Fuca,

X_1 = the reciprocal of hatchery fingerling pounds planted 3 years prior, and

X_2 = natural log of hatchery fingerling pounds planted 3 years prior.

Pink Salmon

The 1981 predictions of pink salmon returns to Puget Sound (Appendix Table 2) are the numbers of fish of each specific stock expected to enter U.S. waters.

The natural stock predictions are based on significant correlations of past total Puget Sound recruit/spawner rates (1965-1977) with one or more of the following variables: same brood chum salmon escapement, total precipitation in January, and/or mean sea-surface salinity at Neah Bay during spring months. The chum salmon escapement variable represents the production of chum juveniles which as competitors have been shown to have a significant effect on the survival of pink salmon. The two environmental variables have correlated significantly with past pink salmon returns. Individual stock forecasts were made by allocating the total Puget Sound prediction to each stock based on its relative proportion of 1979 parent-year escapement.

Artificial production returns were predicted using survival rates for previous broods of pink salmon released from each production site. For those release areas where no previous survival data were available, survival rates from the nearest long-term release site were used, e.g., Hood Canal Hatchery survival rates were used for the Port Gamble forecast.

Run sizes entering U.S. waters predictions for both natural and artificial stocks were based on average interception rates for the 1959-79 return years.

Appendix Table 1. 1981 Puget Sound summer/fall chinook salmon predictions, desired escapements, and expected harvests.

Stock	Predicted total return	Desired escapement	Harvest	Brood year natural escapement (1977)	Artificial production releases (1977 brood)	Comments
Strait of Juan de Fuca						
Sekiu--natural	150	250	0	Unknown		
Hoko--natural	550	850	0	Unknown		
Clallam--natural	100	150	0	Unknown		
Pysht--natural	400	650	0	Unknown		
Lyre--natural	50	100	0	Unknown		
Elwha--natural	350	250	100	Unknown		Escapement reflects same ratio to prediction as for hatchery fish.
--hatchery	2,900	2,100	800		599,992 fingerlings 482,132 yearlings	Estimate of harvestable may be optimistic because success of overall program not yet established.
Dungeness--natural	250	400	0	Unknown		
Salt Creek--natural	100	150	0	Unknown		
Deep Creek--natural	50	100	0	Unknown		
Total	4,900	5,000	900			
Nooksack-Samish						
Nooksack--natural and hatchery	61,200	2,300	58,900	1,500	4,124,573 fingerlings 299,768 yearlings	Includes Lummi and co-op releases. 1,250 expected escapement to Nooksack Hatchery.
Samish--predominantly hatchery	38,300	11,000	27,300	600	4,577,881 fingerlings 479,138 yearlings	
Total	99,500	13,300	86,200			
Skagit						
Skagit--natural	24,400	14,900	11,500	9,500		Harvest rates set on the basis of natural stock.
--hatchery	2,400	1,400	1,000		119,848 fingerlings 926,900 yearlings	Hatchery will take eggs from all available summers and falls.
Total	28,800	16,300	12,500			
Stillaguamish-Snohomish						
Stillaguamish--natural	4,300	2,000	2,300	1,500		
Snohomish--natural	11,400	5,300	6,100	5,600		
--hatchery	6,900	3,200	3,700		3,524,574 fingerlings 416,400 yearlings	Hatchery will take all available eggs. Harvest rate set on the basis of natural stock.
Tulalip--hatchery	2,700	0	2,700		502,206 yearlings	1,400 to be harvested in mixed-stock areas, the remainder in Tulalip Bay.
Total	25,300	10,500	14,800			

(Continued)