

# **STATUS REPORT**

**COLUMBIA RIVER FISH RUNS AND FISHERIES  
1938-2000**

**TEXT ONLY**

**Washington Department of Fish and Wildlife**

**Oregon Department of Fish and Wildlife**

**August 2002**

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The Joint Staff is comprised of biologists and technicians from Oregon and Washington cooperating to provide scientific information for the management of Columbia River fisheries that harvest salmon (four species), steelhead trout, shad, smelt, walleye, and sturgeon (two species). Fisheries are monitored to obtain complete fishery statistics used to determine their influence on the various runs. Run size predictions are developed pre-season to establish seasons. Run size updates, through the use of dam counts, test fishing, environmental indices, and early season catches, are used to assist in adjusting seasons to allow maximum harvest while permitting the desired escapement. Escapement and subsequent production are studied to determine the success and contribution to the fishery by brood year. Fish taken in fisheries are sampled for biological data. Many of these duties are carried out in cooperation with the Columbia River treaty Indian tribes, the United States, and the Idaho Department of Fish and Game.

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# **STATUS REPORT**

## **COLUMBIA RIVER FISH RUNS AND FISHERIES 1938-2000**

### **INTRODUCTION**

This annual report produced since 1952 by the Joint Columbia River Management Staff and predecessors, contains data concerning the status of the runs of primarily anadromous fish in the Columbia River. General descriptions of major fisheries and fish runs are presented, followed by detailed information for each run. The detailed information includes the status of each run, description of the fisheries that harvest them, landing statistics from 1938-2000, and catch and escapement highlights for 2000. The focus of this report is on fish runs and fisheries occurring since 1938. The completion of Bonneville Dam and beginning of fish counting in early May 1938 allows for accurate estimates of escapement from the lower Columbia fisheries. Also, since 1938, commercial fishery catch statistics are available by species, by day, by zone, by gear type, and by state in pounds and numbers of fish. Since 1938, total run accounting has been accomplished. Sport catch statistics are available since the 1960s. Tribal ceremonial and subsistence (C&S) catch statistics are available since the 1970s. Statistics relating to the various fish runs and actual 2000 season dates are included in appendix tables at the end of this report.

# **HISTORICAL BACKGROUND**

## **Hydro Development**

Historical records show that salmon and steelhead once extensively utilized the Columbia River and its tributaries. Chinook salmon migrated nearly 1,200 miles up the Columbia River to Lake Windermere, Canada, and 600 miles up the Snake River to Shoshone Falls near Twin Falls, Idaho. Pre-development average annual adult salmon and steelhead run estimates range from 10-16 million fish. The construction of dams has gradually reduced the areas accessible to anadromous fish, especially in the valuable salmon producing tributaries of the upper watershed (Figure 1). Early in the 20th century, irrigation and hydroelectric dams were built on the upriver tributaries, but hydroelectric development of the mainstem Columbia and Snake rivers did not get underway until construction of Rock Island Dam in 1933. Access to over 500 miles of the upper Columbia River, excluding tributaries, was blocked by the construction of Grand Coulee Dam in 1941. Another 52 miles of the mainstem habitat were lost with the building of Chief Joseph Dam, the present upstream limit of salmon and steelhead migration in the Columbia River. In the Columbia River only 50 miles of free flowing stream remain, near Richland, Washington. Over 50% of the originally inhabited main-stem of the Snake River is no longer accessible. Only the lower 247 miles, below Hells Canyon Dam, are presently accessible to salmon and steelhead. The main-stem Snake River has also been impounded, and presently, only 100 miles of natural stream remain between Lower Granite and Hells Canyon dams. Location, completion dates, and description of major, main-stem Columbia and Snake River dams appear in Figure 2. Counts of salmonids at these dams are listed in a supplemental report near the end of this report.

Main-stem dams have further reduced production of salmon and steelhead by creating impoundments that inundated natural streams and causing mortality of downstream migrating juveniles and upstream migrating adults. Impoundments have increased water temperatures to levels that at times are detrimental to salmonids. Impoundments have also increased populations of piscine predators, especially the northern pikeminnow (squawfish). Dam-related causes of mortality during migration periods include delay of migrating adults and juveniles; turbine injury and death to juveniles; and in periods of high water and spill, nitrogen supersaturation.

The Willamette River is a major tributary of the lower Columbia River in western Oregon. The Willamette, in terms of discharge, is the 12th largest river in the United States. The Willamette Basin is roughly rectangular and approximately 11,250 square miles. Harnessing of most major Willamette tributaries, by damming, was complete by the 1960s (Figure 3). Over 400 stream miles that were originally the most important spawning and rearing areas for wild spring chinook were blocked. Some residual spawning areas remain intact and accessible including about two-thirds of the McKenzie River and about one-quarter of the North Santiam River. Even these areas are affected by upstream dams through alteration of flows and temperature.

# Columbia River Basin

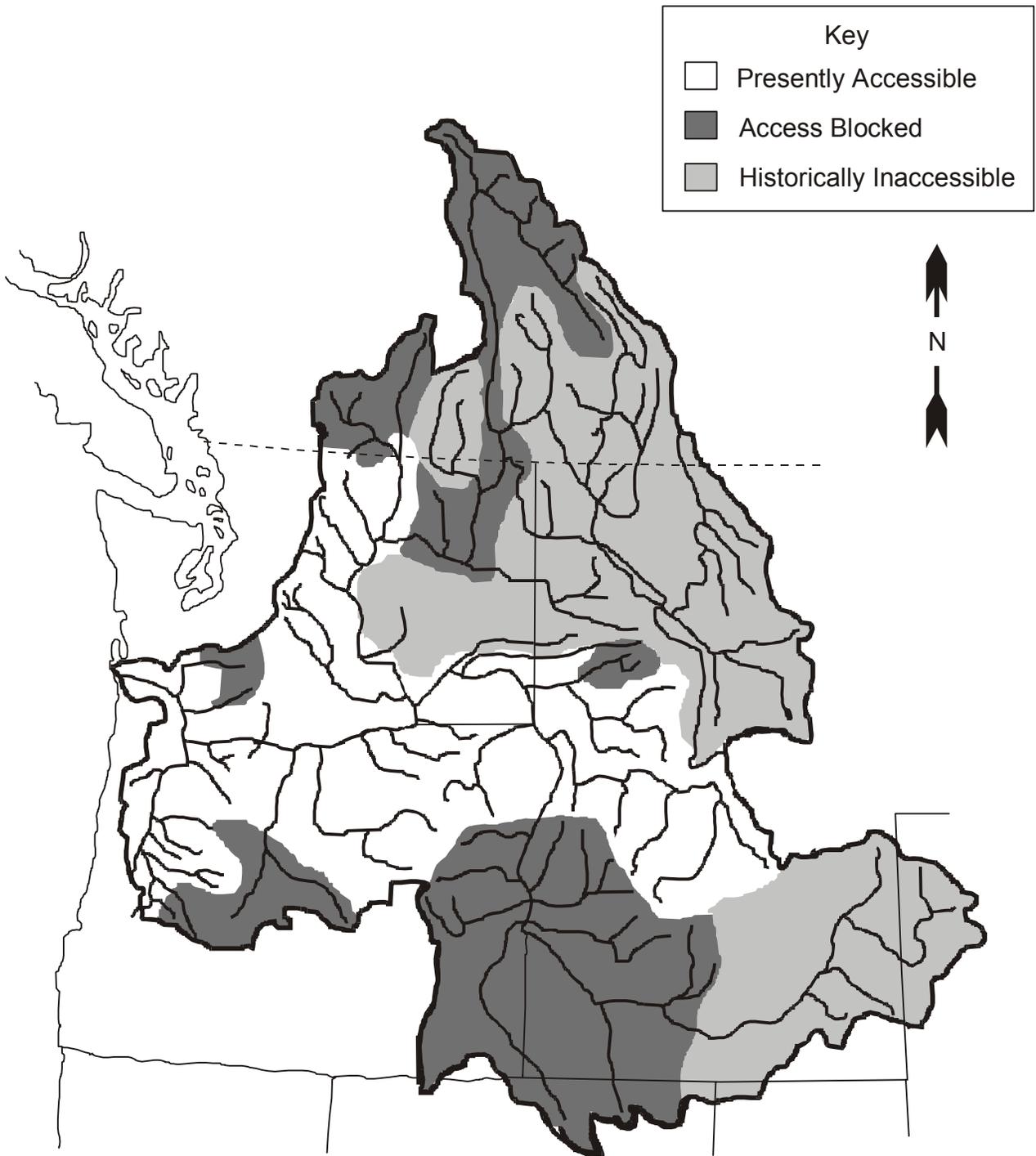


Figure 1. Map of the Columbia River System Showing the Area Accessible to Salmon and Steelhead.

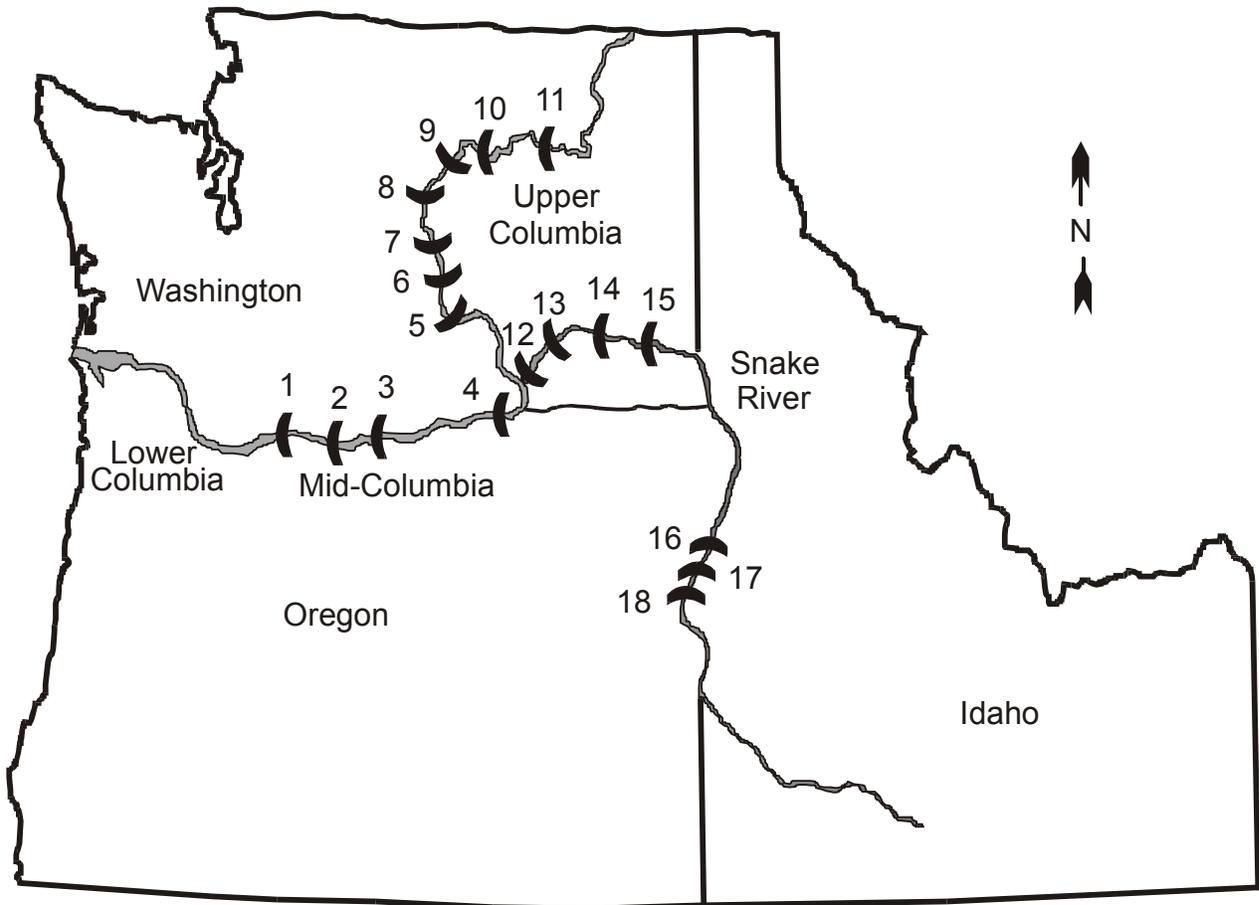
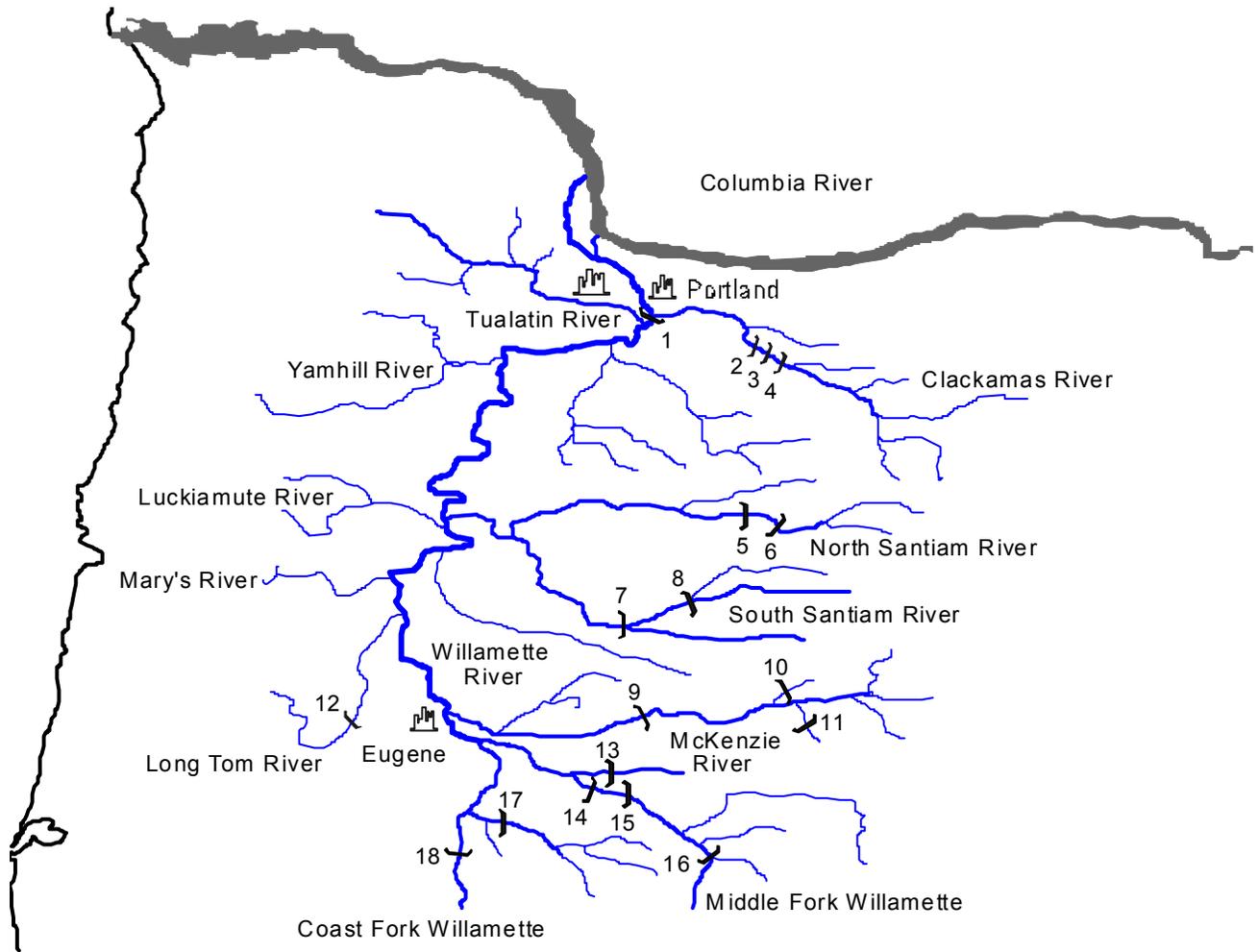


Figure 2: Major Dams on the Columbia and Snake Rivers

Dam	Year in Service	Miles to Mouth	Gross Head (Feet)	Miles of Reservoir	Operator	Adult Fish Passage
1. Bonneville	1938	146	65	45	Corps of Engineers	Yes
2. The Dalles	1957	192	85	24	Corps of Engineers	Yes
3. John Day	1968	216	105	76	Corps of Engineers	Yes
4. McNary	1953	292	75	61	Corps of Engineers	Yes
5. Priest Rapids	1959	397	82	18	Grant County PUD	Yes
6. Wanapum	1963	416	84	38	Grant County PUD	Yes
7. Rock Island	1933	453	54	21	Chelan County PUD	Yes
8. Rocky Reach	1961	474	93	42	Chelan County PUD	Yes
9. Wells	1967	515	72	30	Douglas County PUD	Yes
10. Chief Joseph	1955	545	177	51	Corps of Engineers	No
11. Grand Coulee	1941	597	343	151	Bureau of Reclamation	No
12. Ice Harbor	1961	334	100	32	Corps of Engineers	Yes
13. Lower Monumental	1969	366	100	29	Corps of Engineers	Yes
14. Little Goose	1970	395	100	37	Corps of Engineers	Yes
15. Lower Granite	1975	432	98	39	Corps of Engineers	Yes
16. Hells Canyon	1967	571	210	22	Idaho Power Company	No
17. Oxbow	1961	597	120	12	Idaho Power Company	No
18. Brownlee	1958	609	272	57	Idaho Power Company	No



**Figure 3. Location and Completion Dates of Willamette Basin Dams**

Dam	Stream	Year in Service	Miles to Mouth	Operator
1. Willamette Falls	Main Willamette	1904	26.6	Portland General Electric
2. River Mill	Clackamas	1911	48.1	Portland General Electric
3. Faraday	Clackamas	1906	51.0	Portland General Electric
4. North Fork	Clackamas	1958	55.9	Portland General Electric
5. Big Cliff	N. Santiam	1953	166.1	Corps of Engineers
6. Detroit	N. Santiam	1953	168.9	Corps of Engineers
7. Foster	S. Santiam	1967	145.7	Corps of Engineers
8. Green Peter	S. Santiam	1967	153.7	Corps of Engineers
9. Leaburg	McKenzie	1930	210.6	Eugene Water & Electric Bd.
10. Blue River	Blue River	1968	230.5	Corps of Engineers
11. Cougar	S. Fork McKenzie	1964	236.0	Corps of Engineers
12. Fern Ridge	Long Tom River	1941	171.6	Corps of Engineers
13. Fall Creek	Fall Creek	1965	206.0	Corps of Engineers
14. Dexter	Mid. Fork Willamette	1953	203.8	Corps of Engineers
15. Lookout Point	Mid. Fork Willamette	1953	206.9	Corps of Engineers
16. Hills Creek	Mid. Fork Willamette	1961	232.5	Corps of Engineers
17. Dorena	Row River	1949	215.3	Corps of Engineers
18. Cottage Grove	Coast Fork Willamette	1942	216.7	Corps of Engineers

Since 1938, the minimum number of salmon and steelhead, including jacks, entering the Columbia has ranged from a high of 3.2 million fish in 1986 to a low of 748,900 fish in 1995 (Figure 4 and Table 1). The minimum number of adult salmon and steelhead entering the Columbia River since 1970 has ranged from a high of 2.9 million adults in 1986 to a low of 672,100 adults in 1995 (Figure 4 and Table 2). During the 1990s, the minimum Columbia River returns averaged 1,022,000 adults and 1,090,300 adults and jacks combined. In 2000 returns to the Columbia River totaled 1,518,600 adults and 1,698,200 adults and jacks combined.

## **Hatchery Development**

Historically, all salmon and steelhead were wild fish produced in the natural stream environment. As compensation for the loss of wild salmonid production, many artificial propagation facilities were built throughout the basin. Artificial production now accounts for about three-quarters of all fish returning to the Columbia River system. Chinook and coho salmon returns to Columbia River hatcheries during 1969-2000 are listed in a supplemental report at the end of this report.

## **Fishery Development**

Columbia River salmon were central to Native American Indian life. Columbia River Indians made use of the salmon for thousands of years prior to the arrival of Europeans. Lower Columbia Indians were decimated in the early 1800s by introduced European diseases. Europeans began using salmon about 1830, and by 1861 commercial fishing became important. In 1866, salmon canning began and the non-Indian commercial fishery grew very rapidly. The early commercial fishery used gill nets, seines hauled from beaches, traps, and fishwheels. Later, purse seines and trolling boats using hook and lines entered the fishery. Sturgeon set lines (mostly unbaited snagging lines) were used when sturgeon became commercially valuable in the early 1880s. Mid-Columbia Indians continued to use their traditional dip and hoop nets, with a primary fishing location at Celilo Falls. Recreational or sport fishing began in the late 19th century and occurred primarily in tributaries. The main-stem Columbia sport fishery did not become important until after World War II.

Development of the Columbia River commercial fishery was rapid since its beginnings in the 1860s. The number of canneries increased to a peak of 39 in 1886. The amounts and types of gear employed also increased. Known peak amounts of gear licensed were 2,856 gillnet boats in 1915, 104 haul seines in 1928, 506 traps in 1926, and 76 fish wheels in 1899. Indian and a few non-Indian dipnetters were also licensed. Dipnet licenses peaked at 477 in 1935.

The commercial industry initially fished on the vast runs of spring and summer chinook salmon. Other species and races entered the catch later when these chinook runs declined. Early fishery regulations closed the commercial season during March, April, and late August to early September. Additional escapement was provided by a closed weekly fishing period, usually 6 PM or noon Saturday to 6 PM Sunday. Commercial landings were usually canned and estimates of landings are available from cannery records. Landings exceeded 40 million pounds, annually, in 1883, 1884, 1895, 1911, 1915-1919, and for the last time in 1925. The peak year of landings was 1911, with 49.5 million pounds (Figure 5 and Table 3).

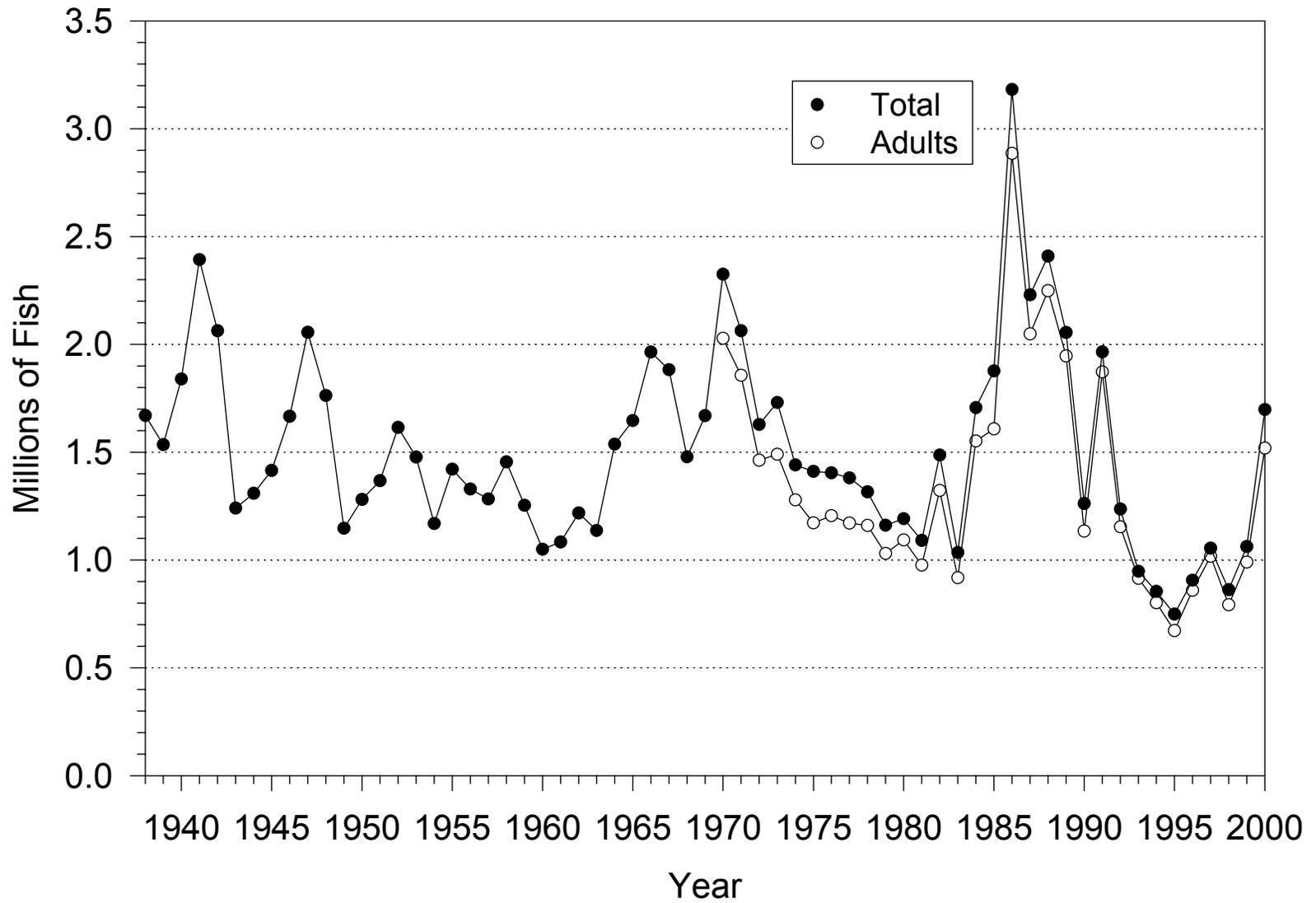
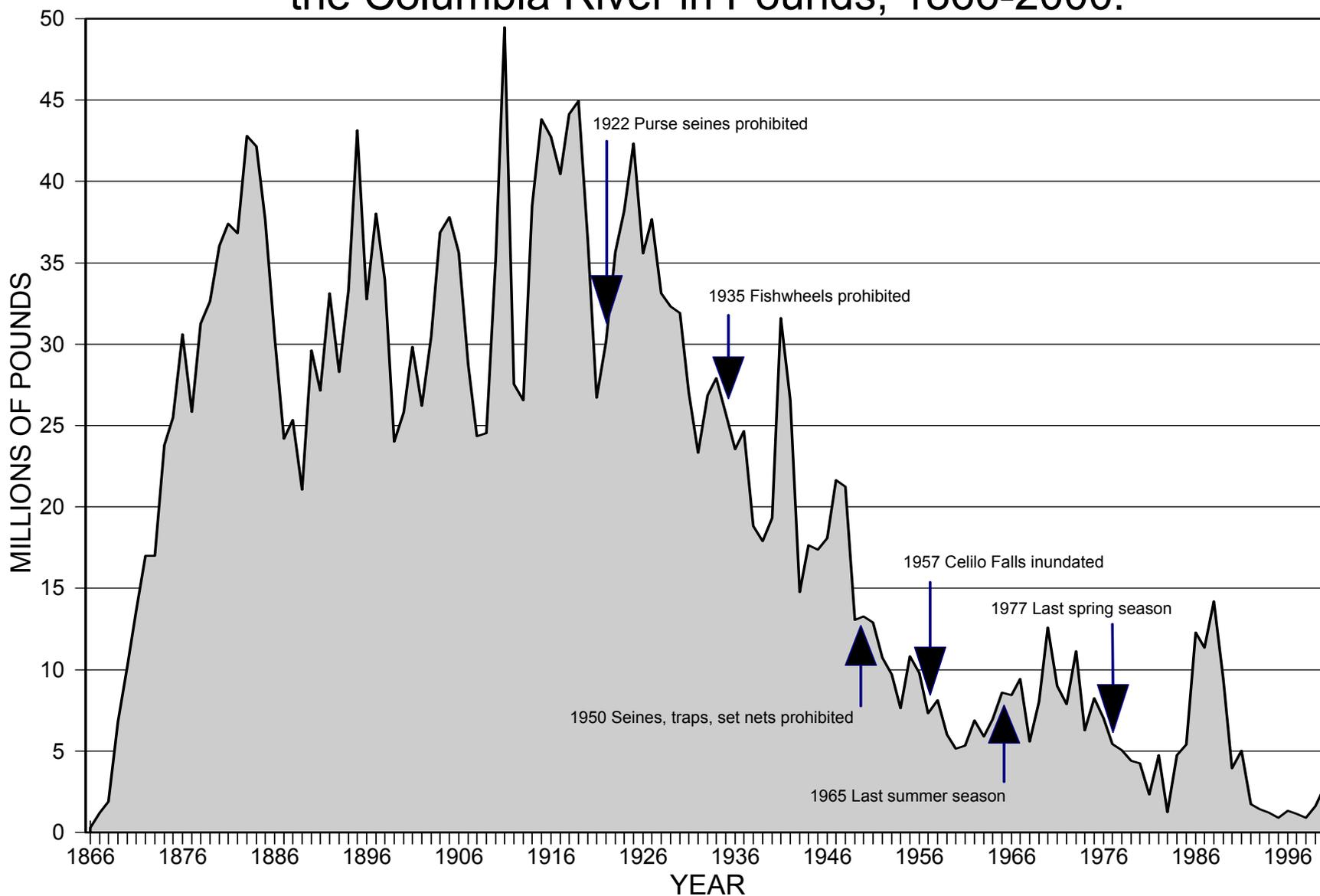


Figure 4. Minimum Numbers of Salmon and Steelhead Entering the Columbia River, 1938-2000.

Figure 5. Commercial Landings of Salmon and Steelhead from the Columbia River in Pounds, 1866-2000.



In a fishery where the amount of fishing gear is excessive and the stock is declining, conflicts within the industry, or "fish fights," may develop. This was true of the Columbia River salmon fishery. Many attempts to eliminate one or more gear types occurred using the political system, with the proponents of the elimination usually claiming biological benefits as the justification. Escapement needs to rebuild runs was also a common justification. Lower river fishing interests often demanded reduction in upper river fishing based on escapement needs. The gillnet sector was the most numerous and organized and made the highest percentage of the catch. By 1949, the only allowable commercial gear types remaining were gill, dip, and hoop nets plus baited set lines for sturgeon. Ocean trolling for salmon off the mouth of the Columbia, and beyond, continued at a high level until the early 1980s. The result of eliminating certain gear types, and allowing others to continue, has not increased escapement as claimed. The result was increased catch by the remaining gear types. Table 4 lists important Columbia River fishery management events, including dates of elimination of various gear types.

Since 1938, total salmon and steelhead commercial landings have ranged from a high of 31.6 million pounds (2,112,500 fish) in 1941 to a low of 0.9 million pounds in 1995 and 1998 (68,000 and 67,200 fish, respectively). During the 1990s, total salmon and steelhead landings averaged 1.9 million pounds (166,300 fish). In 2000, salmon and steelhead landings totalled 2.8 million pounds (246,700 fish). Since 1995 an increasing proportion of treaty Indian commercial landings have been sold to the general public and not licensed fish dealers because of low prices paid by dealers. These public sales are generally included in the C&S catch estimates (Figures 6 and 7 and Tables 3 and 5).

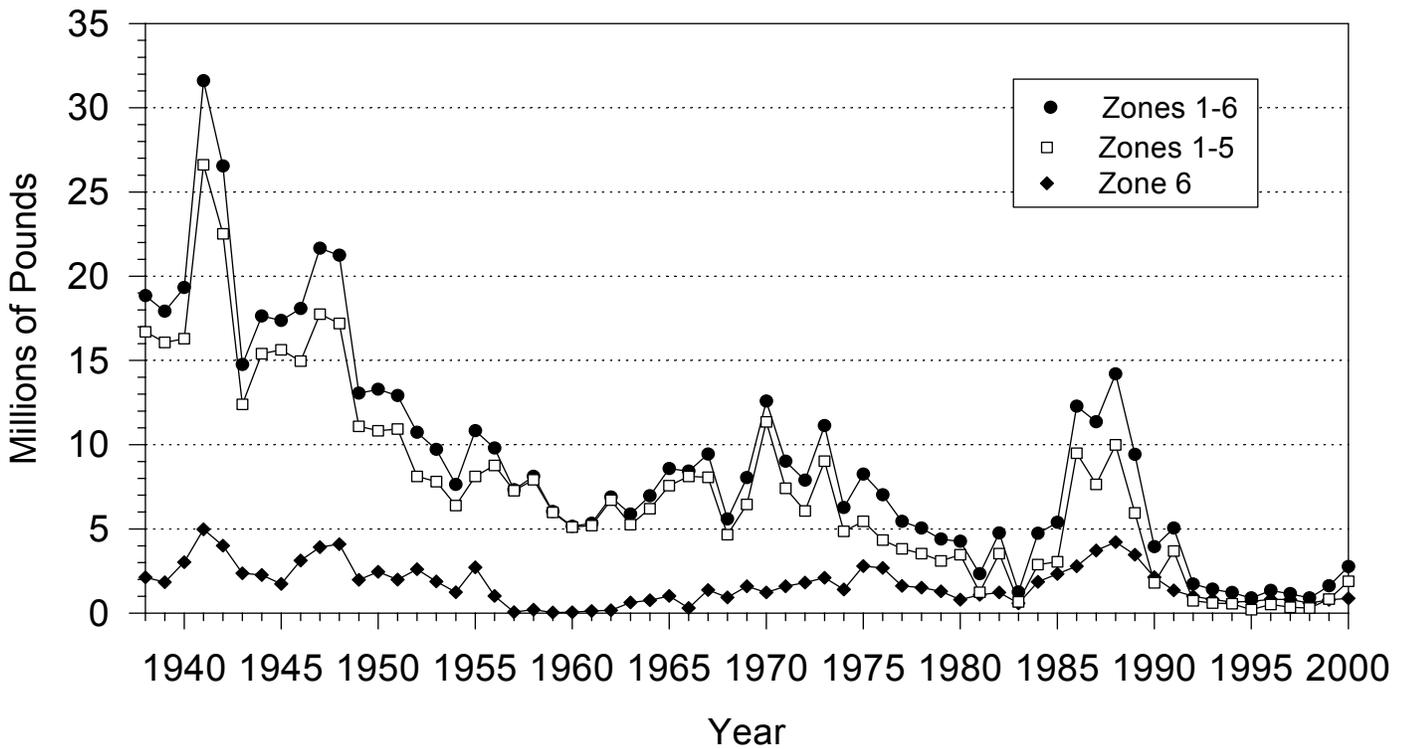


Figure 6. Commercial Landings of Salmon and Steelhead from the Columbia River in Pounds, 1938-2000.

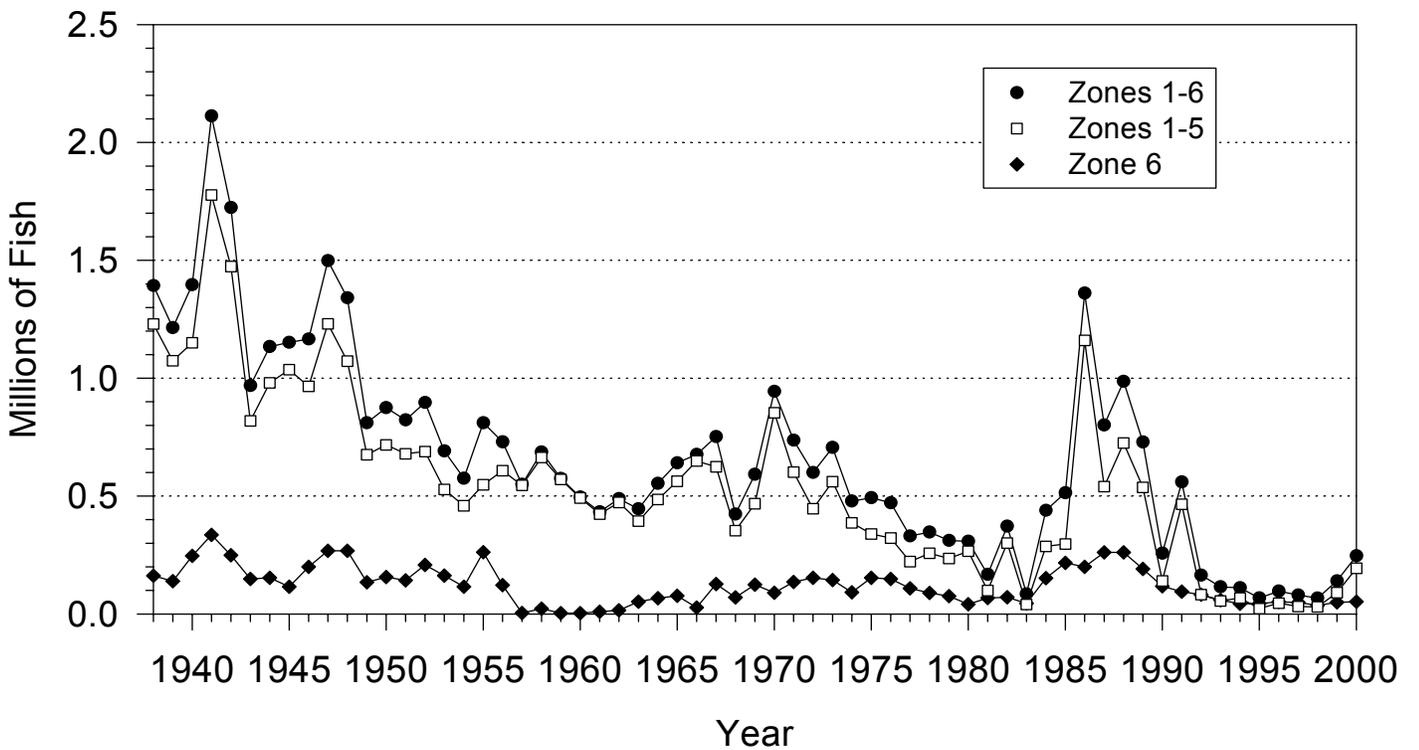


Figure 7. Commercial Landings of Salmon and Steelhead from the Columbia River in Numbers of Fish, 1938-2000.

# **FISHERIES**

## **Introduction**

Salmon, steelhead, sturgeon, smelt, and shad are the principal species harvested from the Columbia River. Commercial fishing occurs in the Columbia River upstream to McNary Dam, except for special closed areas at dams, at the mouths of certain tributaries, and adjacent to hatcheries. There are two distinct commercial fisheries separated geographically by Bonneville Dam (Figure 8 and Table 6). The non-Indian fishery below Bonneville Dam, is an all citizen's fishery that occurs in the mainstem Columbia River (statistical Zones 1-5) and selected off channel fishing areas (statistical Zones 7, 71, 74, 80, and 81). The treaty Indian commercial fishery above Bonneville Dam, in statistical Zone 6, involves only members of the four Columbia River treaty Indian tribes. The tribal C&S fisheries are of the highest priority and generally occur prior to tribal commercial fishing. Recreational fishing occurs throughout the Columbia River Basin.

A listing of non-Indian and treaty Indian season dates in 2000, along with gear and special regulations, is presented in Tables 7 and 8.

## **Regulations**

Commercial fishing seasons in the mainstem Columbia River (concurrent jurisdictional waters) are established by the Columbia River Compact while Select Area commercial fishing seasons occurring in state waters are established by the regulating state. The Columbia treaty tribes regulate treaty Indian C&S fisheries in the mainstem Columbia and tributaries. Recreational fishing regulations for the Columbia River are established separately by the management agencies of Washington and Oregon. Recreational regulations set by each state in the concurrent Columbia River waters are usually identical. All fisheries of the Columbia River are established within the guidelines and constraints of the Columbia River Fish Management Plan (CRFMP), the Endangered Species Act (ESA), and management agreements negotiated between the Parties to U.S. v. Oregon.

### **Columbia River Compact**

The U.S. Congress ratified a compact and agreement between Oregon and Washington in 1918 covering concurrent jurisdiction of Columbia River fisheries. The Columbia River Compact is comprised of the Washington Department of Fish and Wildlife Commission (WFWC) of the Washington Department of Fish and Wildlife (WDFW), and the Oregon Fish and Wildlife Commission (OFWC) of the Oregon Department of Fish and Wildlife (ODFW). In recent years, the WDFW and ODFW commissions have delegated Compact decision-making authority to the agency's director or the director's designee. Compact hearings are held periodically to adopt or review seasonal commercial regulations. Hearings occur just prior to all major seasons to consider current information and establish season dates and gear restrictions. Additional hearings are often necessary when updated information concerning run size, or attainment of escapement goals or catch guidelines, indicates a need to adjust the season.

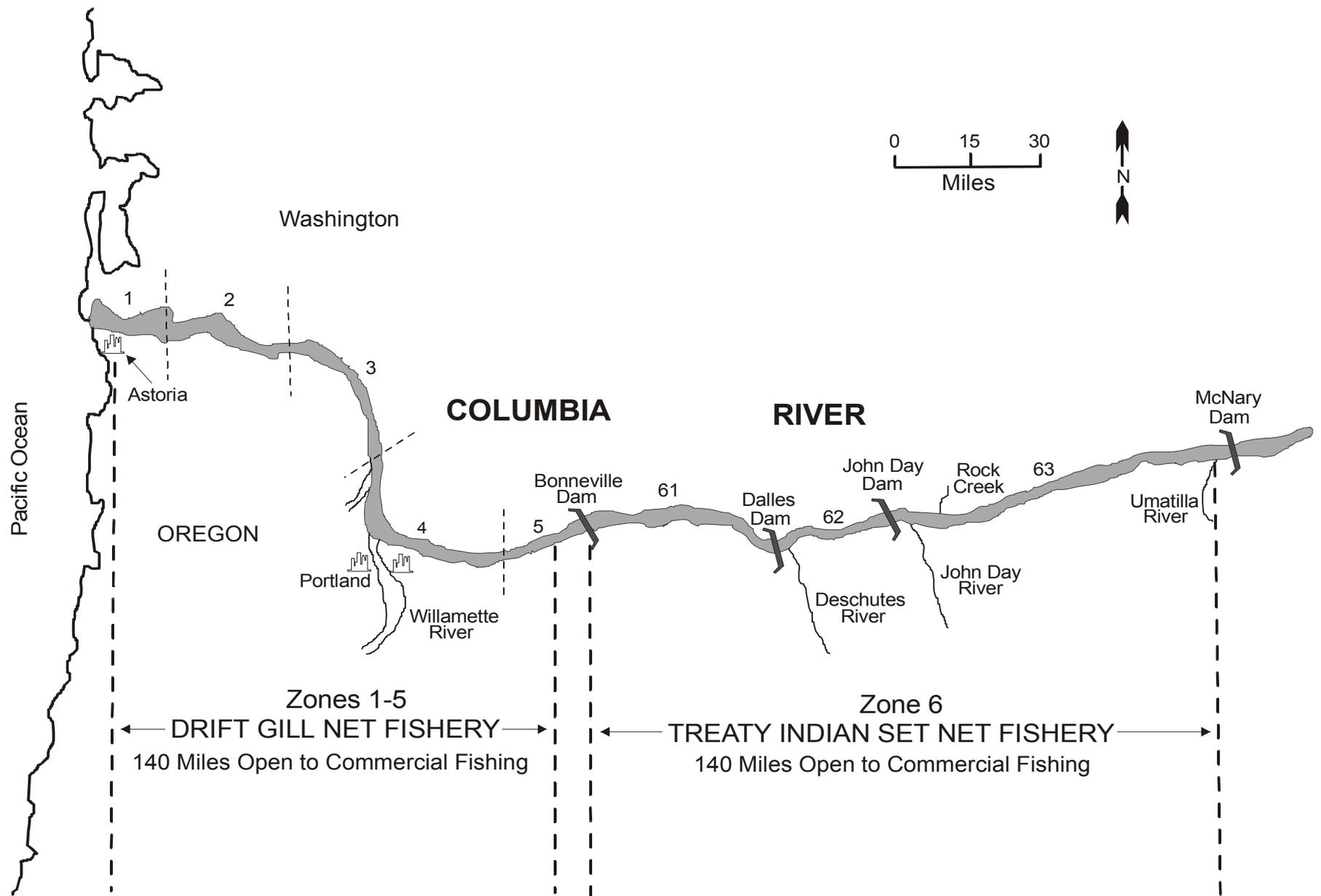


Figure 8. Commercial Fishing Zones on the Columbia River Below McNary Dam.

## **Columbia River Fish Management Plan**

The CRFMP to restore runs and allocate harvest of fish in the Columbia River was agreed to by the Parties: United States, Oregon, Washington, and four treaty Indian tribes (Yakama, Warm Springs, Umatilla, and Nez Perce). The agreement was the culmination of 20 years of legal tests and negotiations stemming from U.S. v. Oregon, a lawsuit filed in U.S. District Court in 1968. The CRFMP was adopted by U.S. District Court order in October of 1988 with the stated purpose to "...provide a framework within which the Parties may exercise their sovereign powers in a coordinated and systematic manner in order to protect, rebuild, and enhance upper Columbia River fish runs while providing harvests for both treaty Indian and non-Indian fisheries". The primary goals of the Parties are to rebuild weak runs to full productivity and fairly share the harvest of upper river runs between treaty Indian and non-Indian fisheries in the ocean and Columbia River Basin. As a means to accomplish this purpose, the Parties intend to use habitat protection authorities, enhancement efforts, and artificial production techniques as well as harvest management to ensure that Columbia River fish runs continue to provide a broad range of benefits in perpetuity." The CRFMP expired on July 31, 1999 and negotiations concerning a revised plan continued through 2000.

## **Endangered Species Act**

The ESA initially impacted the Columbia River with the listing of the Snake River portion of the Columbia River sockeye run as endangered under the ESA in December 1991. Subsequently, in April 1992 the Snake River wild portion of the spring chinook run was combined with the Snake River wild portion of the summer chinook run and listed as threatened, and the Snake River wild portion of the Columbia River fall chinook run was listed as threatened. Lower Columbia River coho were reviewed for possible listing in 1995 and the National Marine Fisheries Service (NMFS) decided that listing was not warranted at that time; however, this "evolutionarily significant unit" (ESU) was designated as a candidate species. During the time period of August 1997 through March 1999 a total of three chinook, one chum, and five steelhead ESU's were defined and listed under the ESA. Additionally, two chinook and one steelhead ESU's were defined but the NMFS determined that listing under the ESA was not warranted at that time (Table 9). Coho destined for Oregon tributaries of the lower Columbia River were listed as an endangered species under Oregon State Law in July 1999. Lower Columbia coho are currently undergoing another review to determine if listing this species as threatened or endangered under the Federal ESA is warranted at this time. This review is expected to be completed in 2001.

## **Management Agreements**

In 1996, the Parties to U.S. v. Oregon negotiated two 3-year (1996-1998) management agreements; one for upper Columbia spring chinook, summer chinook, and sockeye, and one for upper Columbia fall chinook. The agreements were in partial fulfillment of the August 1995 settlement agreement adopted by the court in which the Parties agreed to enter into discussions regarding the possibility of amending the CRFMP. The agreements describe harvest and escapement requirements for each of the aforementioned runs along with production actions.

The 1996-1998 Management Agreement covering the time period of January 1-July 31 was extended through July 31, 1999. For the fall time period, August 1-December 31, a new Management Agreement was negotiated for 1999. In 2000 separate Management

Agreements were completed for the time periods of January 1 through July 31 and August 1 through December 31. Separate Biological Assessments were produced for non-Indian and treaty Indian fisheries during January 1 through July 31, 2000 and August 1 through December 31, 2000. The NMFS subsequently issued biological opinions and incidental take statements.

Since 1997, Joint State Management Agreements that outline sturgeon management objectives and set catch guidelines for white sturgeon inhabiting the Columbia River have been in effect. The initial agreement covered 1997-1999 and was subsequently readopted for the 2000-2002 management period. The management objective for the lower Columbia River is to maintain a 3-year average combined sport and commercial harvest rate at optimal sustained yield (OSY) for the legal-sized white sturgeon population. Both agreements have set forth an annual white sturgeon harvestable number that is allocated 80% for sport fisheries and 20% for commercial fisheries. Green sturgeon is managed separately from white sturgeon. The Joint State Management Agreements limit green sturgeon harvest to at or below historical levels.

### **In-season Management**

The Joint Staff and TAC develop preseason forecasts for all major returns of salmon and steelhead. Within the guidelines and constraints of existing regulations, and based on preseason forecasts, the Joint Staff, TAC, and tribal biological staffs recommend fishing options to the appropriate decision-making body. In-season, the technical staffs monitor returns and fisheries' catches and may make further recommendations for season refinements. Table 10 displays run size forecasts and actual adult returns of salmon to the Columbia River in 2000.

## **Water Conditions**

Water conditions, including temperature, turbidity, and flow, affect salmon and steelhead migration and fishing success. Very cold water temperatures or very warm water temperatures or turbid water delay migration. Very clear water reduces gill net success during the day and high, muddy water, with debris, reduces gill net success in general. Sport fishing success is highest with moderate flow, low turbidity, and moderate water temperatures.

Spring flows and late summer water temperatures are critical factors for juvenile and adult salmonid migrants in the Columbia River. Low flows delay downstream migrants, making them more susceptible to predation and dam-related mortality, while warm water temperatures in late summer are generally associated with disease and prespawning mortality for adult salmonids. Since the construction of the many water storage facilities in the Columbia River Basin, the traditional spring freshet has been reduced by about 40% and late summer water temperatures have increased by about 3°F. Figure 9 displays average daily flow at Bonneville Dam for May and June 1938-2000 and Figure 10 displays average daily water temperature for August and September 1938-2000.

Columbia River flows during the early part of 2000 were more moderate than 1999 and averaged 200 kcfs at Bonneville Dam during February and March versus 250 kcfs during the same period of 1999. Wintertime water temperatures were above average with temperature exceeding 40°F throughout January and February except for a two-week period from January 30 to February 11. Water temperatures reached their lowest temperature of 39°F at Bonneville Dam for two days on February 1 and 2. Turbidity was

low in late winter and early spring with clarity at Bonneville Dam measuring between three and seven feet during January-April. Peak flow, 300-380 kcfs at Bonneville Dam, was in late April and early May in response to snow melt and spilling at dams to aid juvenile salmon migration.

Snowpack was lower in 2000 than 1999 resulting in lower flows during the summer and early fall with flows at Bonneville Dam exceeding 125 kcfs just ten times in September and only four times in October. Flows at Bonneville Dam dropped during August with flows ranging between 145-190 kcfs during August 1-19 and ranging between 101-148 kcfs during August 20-31; fluctuated during September (1-22) with flows ranging between 91-167 kcfs; and stabilized during the remainder of September and all of October with flows ranging between 95-133 kcfs. The lowest flows of the year at Bonneville Dam were during September 27-October 10 and averaged 110 kcfs. Water temperatures at Bonneville Dam during 2000 equaled or exceeded 70°F for 21 days on July 22 and during July 29-August 17, with a peak temperature of 72°F recorded on seven days during that time period. Turbidity was low in late summer and early fall, and water visibility measured between four and seven feet, with the exception that a freak storm in the Cascades reduced visibility at Bonneville to near zero during the first week of October. Figure 11 and Table 11 illustrate Columbia River water conditions as measured at Bonneville Dam in 2000.

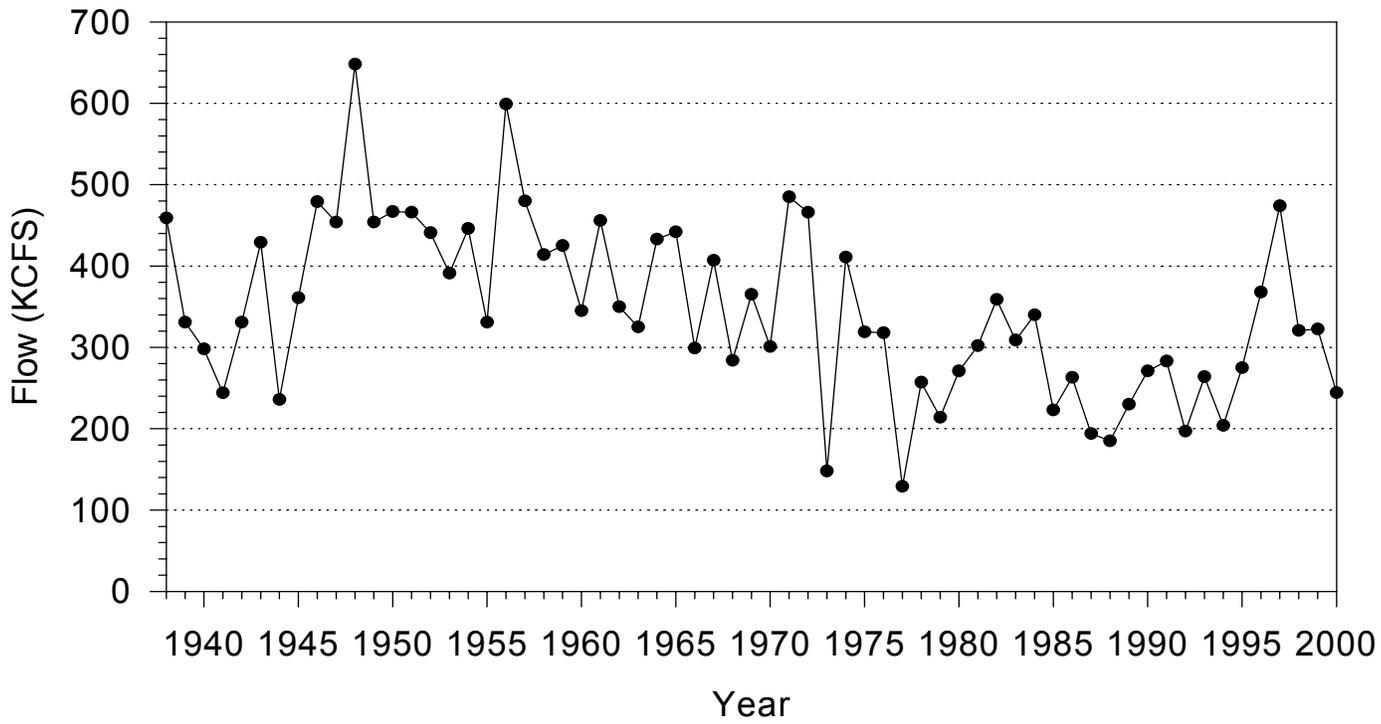


Figure 9. Average Daily Flow at Bonneville Dam, May-June 1938-2000.

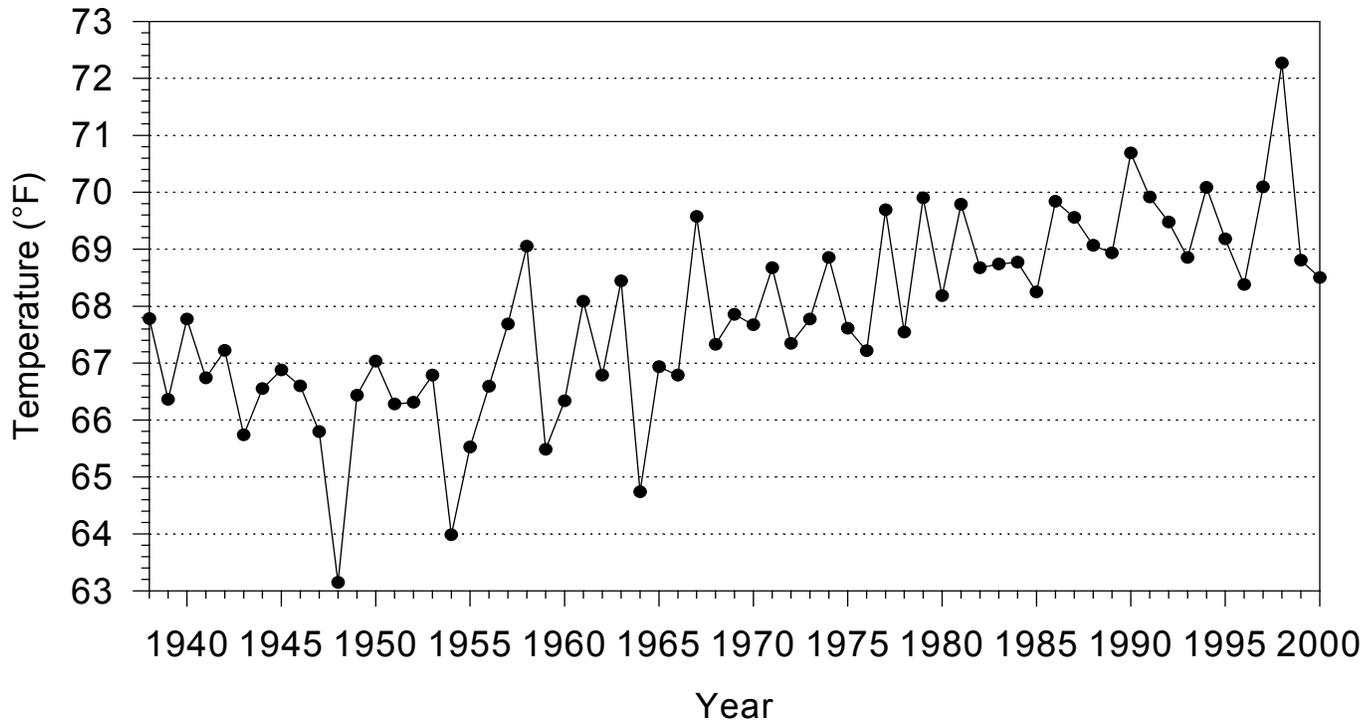


Figure 10. Average Daily Water Temperature at Bonneville Dam, August-September 1938-2000.

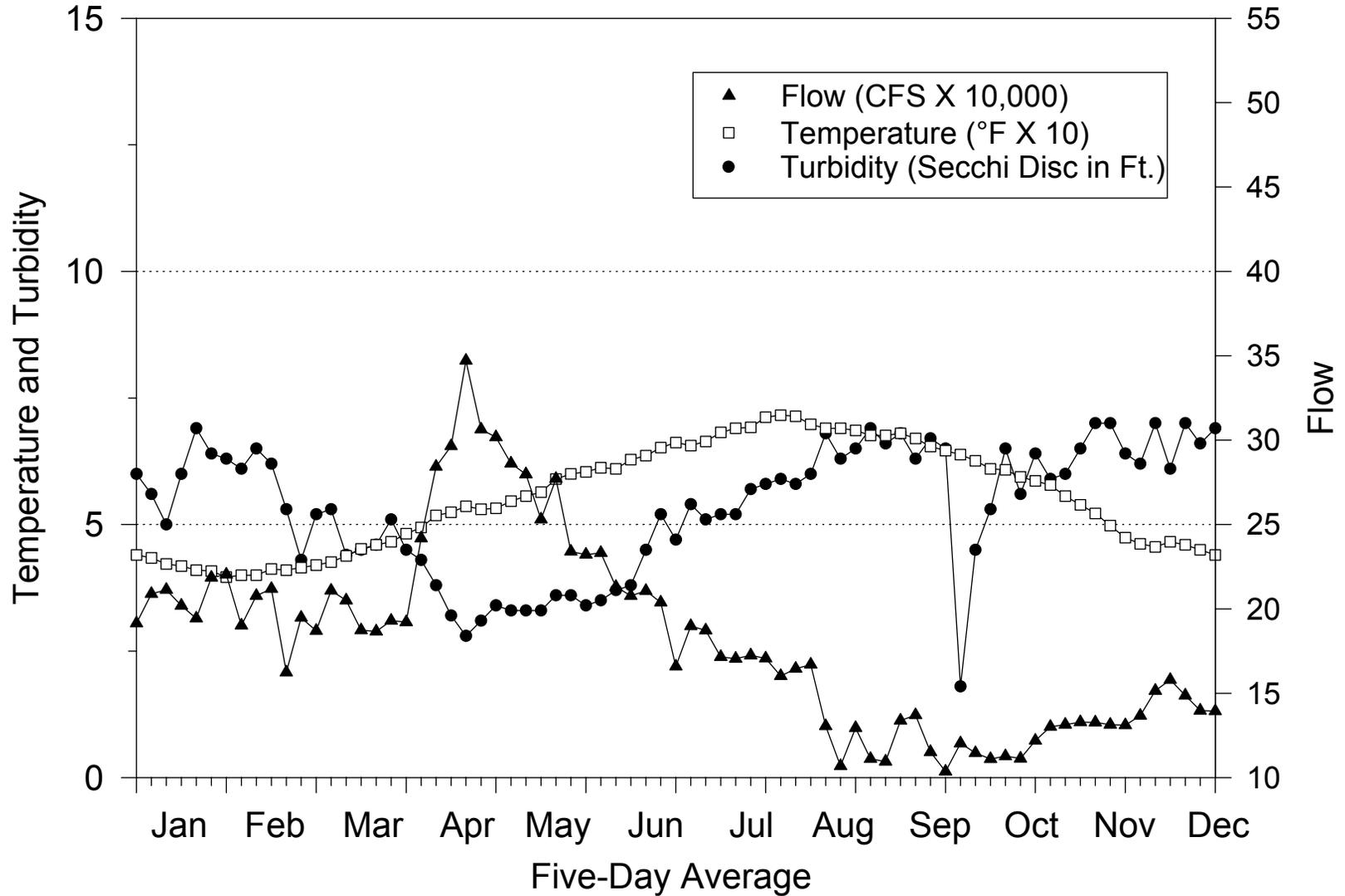


Figure 11. Five-Day Average Columbia River Temperature, Turbidity, and Flow at Bonneville Dam, 2000.

## Non-Indian Commercial Fishery

The number of gillnet licenses issued in the non-Indian commercial fishery below Bonneville Dam since 1938 has ranged from a low of 597 in 1969 to a high of 1,524 in 1979, and since 1979, has declined to 588 in 2000 (Table 12). A limited entry vessel permit moratorium went into effect in 1980. The decline in licenses is partly attributable to gillnet license buyback programs. In the mid-1980's a total of 288 licenses (133 from Oregon and 155 from Washington) were purchased and permanently retired. During 1995-98 a total of 187 Washington licenses were bought back by the state using Northwest Emergency Assistance Program (NEAP) disaster relief funds.

The number of seasons and fishing days allowed for the commercial mainstem fishery below Bonneville Dam has declined dramatically over the last 50 years (Figure 12). Prior to 1943, seasons were closed only in March and April and August 25-September 10. Since the completion of the Columbia Basin hydropower system in the 1960s and 1970s, and ensuing decline in upriver salmon and steelhead runs, several seasons have been completely closed. There has been no summer season since 1964 and no spring season since 1977. No sockeye season occurred 1973-1983 and 1989-1999 and no August season occurred 1980-1986 and 1992-1995. August seasons in 1987-1991 and 1996-2000 were limited in time and areas and operated under strict quotas. There were no September seasons in 1994 and 1995. The September 1996 fishery was limited to only the upper two zones and operated under a quota. In 1997, the September fishery started late in the month and was limited to below the Longview Bridge and above the I-5 Bridge. Stock declines have reduced the number of fishing days allowed per year from over 270, prior to 1943, to an average of 38 since 1977 (Figure 13 and Table 13). A total of 46 fishing days occurred in the mainstem Columbia River in 2000 which is more than the 1990's average of 29. Additional seasons, all salmon target fisheries, occurred during 2000 at five off channel Select Area fishing sites.

The 2000 non-Indian commercial catch, including Select Area fisheries, was the largest since 1991. The catch of 1,884,900 pounds (194,400 fish), represents 68% of the total Columbia River commercial salmon catch in 2000 (Tables 3 and 14). During 2000, the Select Area fisheries accounted for 35% of the commercial salmon landings (661,100 pounds or 70,300 fish) below Bonneville Dam and 6% of the commercial white sturgeon landings (19,100 pounds or 700 fish) below Bonneville Dam (Tables 14, 15, and 80). With severe constraints placed on the mainstem fishery because of depressed and ESA-listed stocks, select area fishing on known stock abundance has become an important alternative and this trend will likely continue in the future. The ex-vessel value to non-Indian fishers for sale of their catch of all species in 2000 was \$1,944,300 which is the highest value since 1991 (Table 16).



Figure 12. Commercial Salmon Seasons Below Bonneville Dam, 1909-2000. 2/

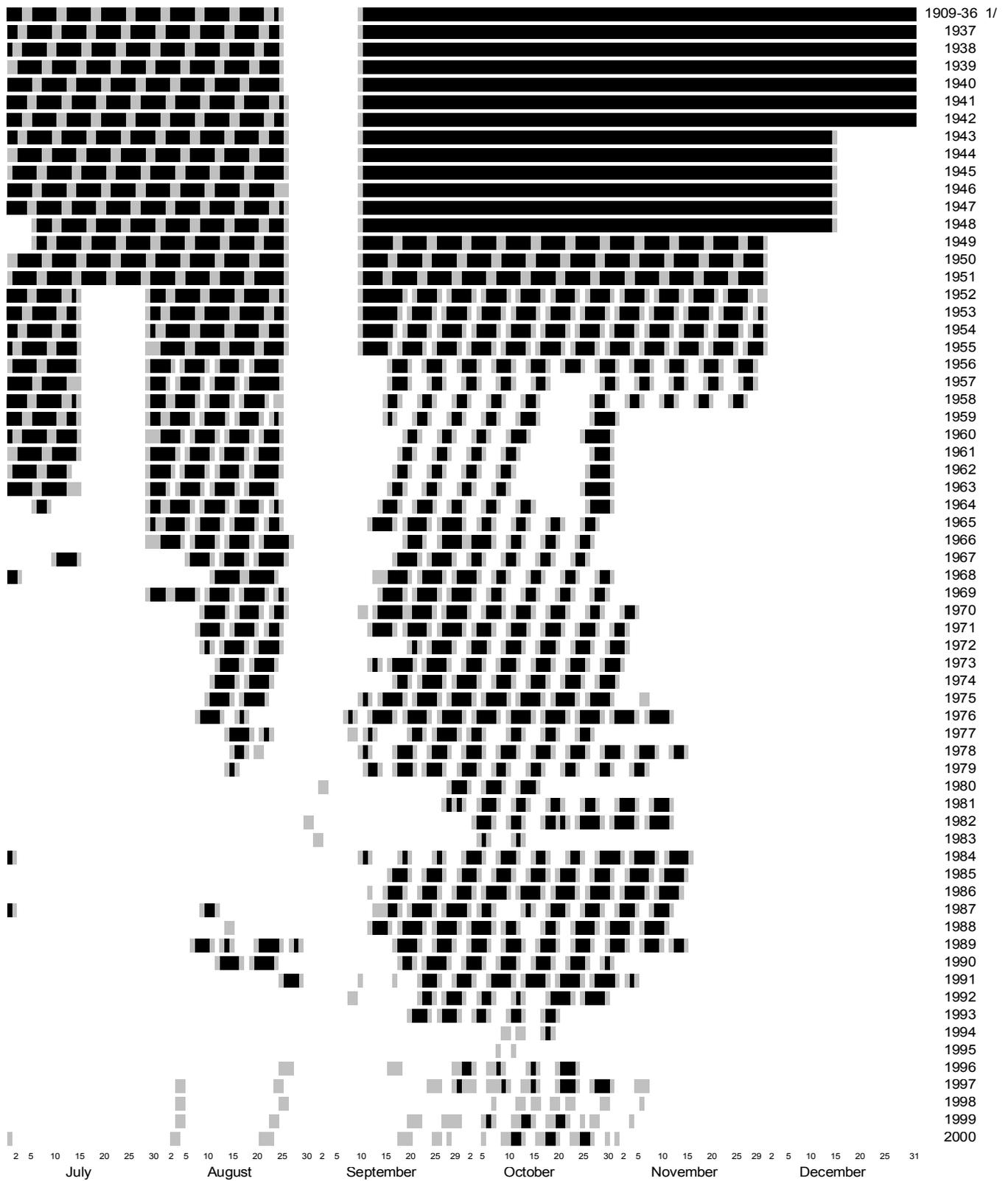


Figure 12. Continued

- 1/ During 1909-36, the weekly closures were 6 PM Saturday to 6 PM Sunday from May 1 to August 25. The 1936 weekly closures are shown in the figure for this time period.
- 2/ The original spring season (approximately May 1-August 25) was split into winter, spring, and summer seasons in 1943. In 1952 the summer season was split into summer and early fall (August) seasons and the remaining fall season was referred to as the late fall season.
- indicates partial fishing day.

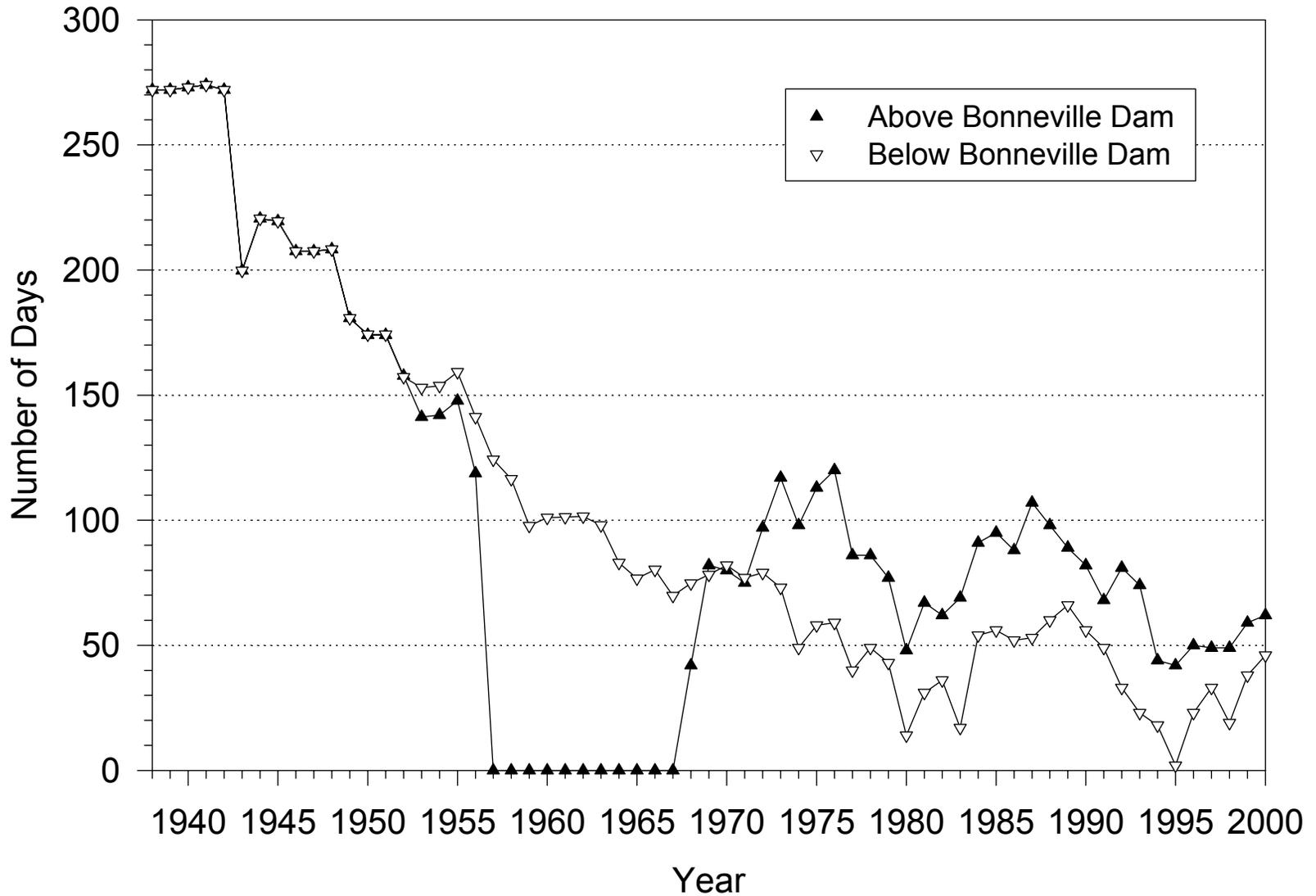


Figure 13. Number of Days Open to Commercial Fishing, 1938-2000.

## Treaty Indian Fishery

The commercial fishery above Bonneville Dam (Zone 6) was open to fishing by both Indian and non-Indians up to 1956. The upper commercial fishing deadline was at the mouth of the Deschutes River with the major fishery in Zone 6 being located at Celilo Falls where a large scale Indian dipnet fishery occurred. Celilo Falls was permanently inundated in 1957 by The Dalles Dam, ending the tribal fishery that had occurred for millennia. Commercial treaty Indian landings at Celilo Falls during 1938-1956 ranged from 0.8 to 3.5 million pounds annually (Table 17). The few non-Indians fishing in Zone 6 after Bonneville Dam was completed, and up to 1956, used gill nets, set lines, and seines. Seines were prohibited in Oregon in September 1950. In 1957, joint action by the states of Oregon and Washington closed Zone 6 to commercial fishing. Treaty Indian fisheries that occurred during 1957-1968 were by tribal ordinances. Similar to the commercial fishery below Bonneville Dam, the number of seasons and fishing days allowed for the commercial fishery in Zone 6 has declined dramatically, especially considering that the current tribal February and March winter season is a sturgeon target fishery (Figure 14).

In June 1968, with the Supreme Court opinion on the appeal of the Puyallup v. Washington case, the states reestablished commercial fishing exclusively for treaty Indian fishers in the mainstem Columbia River above Bonneville Dam. In 1969, the Zone 6 fishery was shaped in regard to area, river mouth closures, dam sanctuaries, and gear regulations. The upper commercial fishing deadline was raised to the mouth of the Umatilla River near McNary Dam. The fishery is now conducted mainly with set gill nets (set nets). Dipnetting occurs from scaffolds erected primarily at Cascade Locks (above Bonneville Dam), the Lone Pine site (below The Dalles Dam), and below John Day Dam. Set lines are used for sturgeon during open commercial set lining periods. Increased fishing days and effort by Indian fishers, legislation banning sale of steelhead by non-Indians, federal court decisions entitling the treaty tribes to specific harvest shares, the Pacific Salmon Treaty, and ocean fishery manipulations have all combined to increase the treaty Indian portion of the total Columbia River catch (Figure 15).

A total of 62 commercial fishing days were allowed for the treaty Indian fishery in 2000 which produced salmon and steelhead landings totaling 875,700 pounds (52,200 fish) (Tables 18 and 19). These figures are for sales to licensed fish dealers. Because of low prices paid by fish dealers again in 2000, about 25% of fall chinook (12,700 fish) and 36% of steelhead (3,240 fish) landings in the fall commercial fishery went home with the tribal fishers or were sold to the general public. The ex-vessel value to treaty Indian commercial fishers for sale of their catch of all species to fish dealers in 2000 was \$698,900 (Table 16). Value for sales to the general public in 2000 was approximately \$452,000 which represents the 6<sup>th</sup> consecutive year in which significant (sales > \$100,000) numbers of salmon, steelhead, and sturgeon have been sold to the general public.

Treaty Indians also catch anadromous fish during noncommercial C&S fisheries. Ceremonial fishing is conducted by tribal permit primarily with gill nets. Subsistence fishing is usually open year round and is conducted by individuals primarily with dip nets, hook and line, or commercial gill nets. Some tribal permits allow subsistence fishing with gill nets when commercial fisheries are closed. Monitoring and catch reporting of C&S fisheries are tribal responsibilities. Attempts to quantify C&S catches have improved in recent years.



Figure 14. Commercial Salmon Seasons Above Bonneville Dam, 1948-2000. 1/

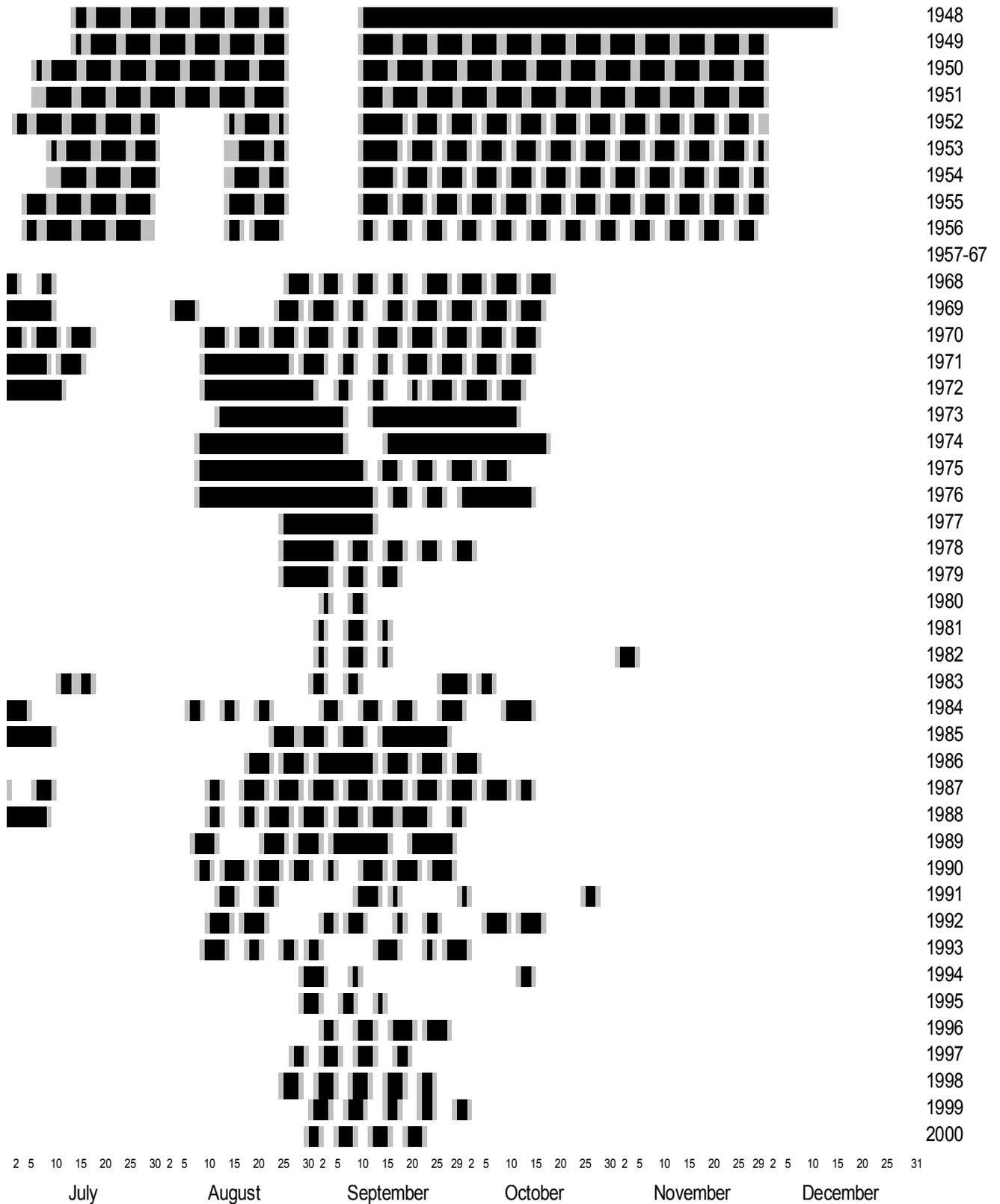


Figure 14. Continued

1/ Prior to 1948 days open were same as below Bonneville Dam (see Figure 12). During 1948-56 spring and summer season days open were staggered from days open below Bonneville Dam. Seasons opened and closed later to account for migration delay at Bonneville Dam. Fall season dates include terminal fisheries occurring in the Spring Creek Hatchery sanctuary, 1975-83 and 1992. No tribal or state seasons were established for above Bonneville Dam during 1957-61. Tribal regulations were in effect from 1962 through the spring seasons of 1968 as follows: Yakama Tribe, 1962-68; Umatilla Tribe, 1966-68; and Nez Perce Tribe, 1966-68. State regulations have been in effect since the 1968 spring season, except for April 14-30, 1969, which was a tribal regulation only.

■ indicates partial fishing day.

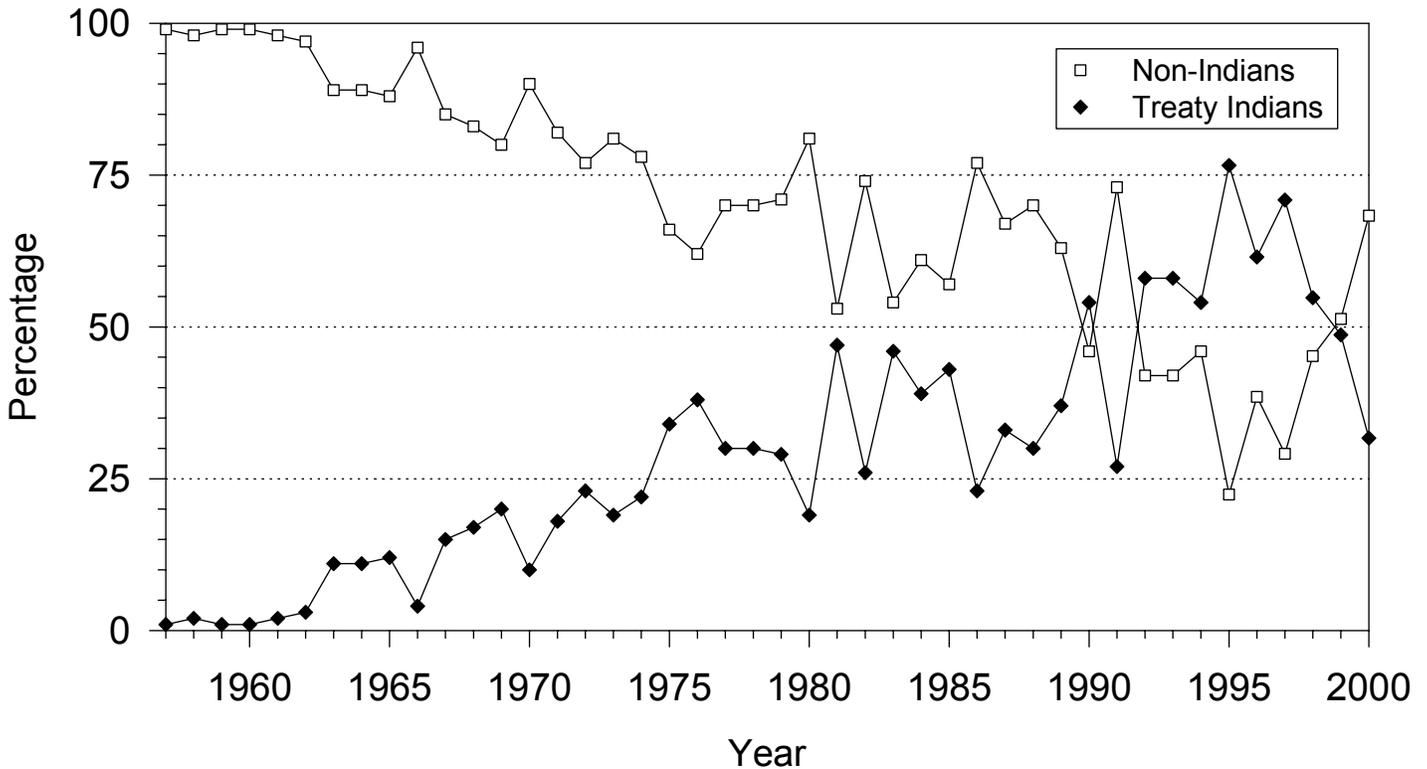


Figure 15. Percentage of Columbia River Commercial Landings of Salmon and Steelhead in Pounds Made by Non-Indians and Treaty Indians, 1957-2000.

## Non-Indian Recreational Fishery

The recreational fisheries referred to in this report include two areas below Bonneville Dam. The mainstem fishery from Bonneville Dam downstream to the Astoria-Megler Bridge for all salmonid species, shad, and sturgeon will be noted as the "lower Columbia fishery." The lower Columbia fishery also includes sturgeon catch taken below the Astoria-Megler Bridge. The estuary fishery for fall chinook and coho from the Astoria-Megler Bridge to Buoy 10 (Buoy 10 is the ocean/inriver boundary) is noted as the "Buoy 10 fishery." There is a recreational fishery for many species above Bonneville Dam in Zone 6. The fishery is much smaller than the recreational fisheries of the lower Columbia River and salmonid catch in Zone 6 is very low.

### Lower Columbia Fishery

In the lower Columbia fishery, estimates of salmonid and shad angler catch and effort by state, month, and boat and bank fisheries are determined using a statistical sampling program during the period of February to October each year. Sturgeon fisheries during November, December, and January are also sampled and estimates of sturgeon catch and effort are made 12 months of the year.

Before 1975, lower Columbia recreational fisheries were primarily salmon and steelhead fisheries. Closures for spring chinook and summer steelhead severely reduced salmon angling opportunities from 1975 to 1983. Improved upriver summer steelhead, upriver fall chinook, and lower river spring chinook runs during 1984-1993 allowed for greater salmonid angling opportunities. Since 1994, generally poor spring chinook, fall chinook, and coho returns have again limited recreational salmon angling opportunities in the fall and spring time periods. Sturgeon angler effort has steadily increased over the years as this fishery gained popularity. New record highs for sturgeon angler trips were set in 1992, 1993, 1995, 1997, and 1998 and in 1995 sturgeon retention was disallowed downstream of Bonneville Dam when the total catch exceeded 45,000 white sturgeon. Angler interest in shad has also increased and record high numbers of trips occurred in the 1990s. In 2000, a total of 335,700 angler trips were made on the lower Columbia, with catches of 23,300 salmon and steelhead, 40,500 legal size white sturgeon kept, and 58,000 shad kept (Table 20).

## **Buoy 10 Fishery**

The Buoy 10 fishery is extremely popular, especially with small boat anglers. Since 1982, fall salmon fisheries occurring between Buoy 10 and the Astoria-Megler Bridge have been considered inriver. Catch made in the Buoy 10 fishery prior to 1982 is included in ocean catch totals. During 1982-1988, this fishery experienced in-season closures or bag limit adjustments for coho, chinook, or both species each year. The regulation changes were needed to keep catches within preseason-established catch quotas or guidelines. Since 1989, managers have attempted to stabilize the fishery and no bag limit changes or closures were enacted in-season during 1989-1993.

Catch and effort in the Buoy 10 boat fishery are estimated via trailer counts at all major boat ramps and interviewing returning boats for information regarding catch, anglers per boat, and hours fished. Catch and effort in the Buoy 10 bank fisheries (Clatsop Spit in Oregon and the North Jetty in Washington) are also estimated. The catch is sampled for biological data, including coded-wire tags (CWT).

Poor salmon runs since 1994 have resulted in closures for chinook and/or coho to achieve hatchery escapement goals or reduce impacts on ESA listed stocks in most years. In 1994, the fishery was opened for coho effective September 18 and did not open for chinook until October 8. In 1995, the fishery opened for coho on August 1 but was not open for chinook until September 5. Similarly, in 1996, a fishery opened to coho August 1 but did not open for chinook until August 30. In 1997 the fishery was opened on August 1 for both chinook and coho. In 1998 the fishery was opened for only 16 days from August 8 through August 23; however, a significant fishery did occur just above the Astoria-Megler Bridge (Astoria bridge fishery) after Buoy 10 closed. In 1999, the fishery was initially scheduled to be open for chinook and adipose fin-clipped coho from August 1 through December 31; however, larger than expected chinook catch and associated impacts on listed stocks resulted in an in-season closure. The fishery was closed to chinook retention during August 30 through September 28. Based on results from 1998, the closure was extended upstream to a line running between Tongue Point on the Oregon shore and Grays Point on the Washington shore.

With an improved outlook for the hatchery coho return to the Columbia River in 2000, managers opened the ocean salmon fishery north of Cape Falcon on July 10 and the Buoy 10 fishery on August 1. Both Buoy 10 and the ocean fisheries were restricted to adipose fin-clipped coho salmon (since 1998) to protect listed Oregon coast natural (OCN) coho

and depressed runs of wild Columbia River coho. Anglers in both fisheries were also limited to not more than one chinook in the daily salmon limit. The ocean fishery was open Sunday-Thursday with catch guidelines of 37,500 adipose fin-clipped coho and 4,300 chinook, or a September 30 closure date. Recreational coho catches in the ocean were excellent, and it was apparent that the coho guideline would be reached in early August. Managers increased the recreational coho catch guideline for the ocean in-season, however, by "swapping" some of the commercial troll coho allocation with surplus chinook from the ocean sport fishery catch guideline. The final Leadbetter-Cape Falcon recreational ocean catch was 39,600 coho and 2,300 chinook from 28,100 angler trips during July 10-August 13, 2000.

The expectation in 2000 was for an average upriver bright fall chinook return to the Columbia River, and non-Indian impacts were limited to 8.25% of the aggregate URB run. Managers established a catch expectation of 9,000 fall chinook for the Buoy 10 fishery to ensure enough impacts remained for planned commercial coho fisheries and fairness of angling opportunity for upriver areas. Beginning in 2000 the area upstream from the Astoria-Megler Bridge to the Tongue Point/Rocky Point line (4 miles) was permanently included in the Buoy 10 management area. As in 1997-1999, chinook catch rates in the 2000 Buoy 10 fishery were excellent. Managers closed the 2000 Buoy 10 fishery to chinook retention on August 28 to avoid exceeding impact guidelines to URB fall chinook. The chinook closure lasted four days. Chinook retention was re-allowed beginning September 1 because impacts were lower than anticipated.

The 2000 fishery from Buoy 10 to the Tongue Point/Rocky Point line resulted in 72,500 angler trips with catches of 6,100 chinook and 21,500 coho with a catch rate of 0.38 salmon/trip (Table 21).

# **FISH RUNS**

The following sections describe the biology and historical status of Columbia River fish.

## **Spring Chinook Salmon**

### **Biology**

- Age at time of return to freshwater includes 2-, 3-, 4-, 5-, and 6-year olds.
- Fish return to freshwater primarily in March-May and spawn in the early fall.
- Juveniles typically rear about 1 year in freshwater then migrate to saltwater in spring.
- Run includes hatchery origin and naturally-spawned fish from tributaries throughout the Columbia River Basin.

### **Historic Status**

- The majority of the pre-development spring chinook run spawned in the Salmon River, a tributary of the Snake River located in Idaho.
- "Spring run" (comprised primarily of what is now known as the summer chinook run) catches inside the Columbia peaked in the early 1880s at about 2 million fish annually. "Spring run" catches fluctuated during 1890-1920, gradually declined during 1921-1973, and then fell to near zero after 1974.
- Upriver spring chinook have not been harvested as a target commercial species in the Columbia River since 1977 except during a limited treaty Indian dipnet commercial fishery in 2000. Almost no harvest of upriver spring chinook occurs in the ocean.
- The decline in runs results from development. Dam construction has blocked access to historic spawning areas and increased mortality of juveniles and adults during migration between the ocean and headwater spawning areas. Irrigation, logging, mining, and other activities have reduced the size and capacity of spawning and rearing areas.
- In May 1992, the wild Snake River spring chinook salmon run was combined with the Snake River wild portion of the summer chinook run into a single ESU and was listed as threatened under the ESA.
- In May 1999, the following ESU's were defined and listed under the ESA: (1) upper Columbia River spring chinook defined as a single ESU (upper Columbia spring) and listed as endangered, (2) the wild portion of the Willamette River spring chinook salmon run was defined as a single ESU (upper Willamette spring) and listed as threatened, and (3) lower Columbia spring chinook were combined with lower Columbia fall chinook to form a single ESU (lower Columbia River spring/fall) that was listed as threatened.

# Summer Chinook Salmon

## **Biology**

- Mature fish return to spawn in freshwater at 2, 3, 4, 5, and 6 years of age.
- Mature fish typically migrate upriver during June and July, with the bulk of the run passing Bonneville Dam by early July.
- An earlier migrating race is destined primarily for the Salmon River drainage in Idaho and a later migrating race is destined for the upper Columbia and its tributaries above Priest Rapids Dam.
- Spawning time for both groups is from late September through November.
- Emergence timing of juveniles for both groups is from January through April.
- Juveniles from the upper Columbia River migrate to saltwater after rearing in freshwater for several months; while juveniles from the Snake River system rear in freshwater for a full year before migrating to saltwater.
- The run is comprised of fish of both hatchery and wild origins.

## **Historic Status**

- Summer chinook, historically referred to as "June hogs" because of their large size and migration timing, were considered the prime fish produced by the Columbia River. Catches inside the Columbia River during the "spring run" peaked in the early 1880s, with 2 million chinook landed annually. It is believed that the majority of these fish were summer chinook.
- Historically, the bulk of the spawning occurred in the upper Columbia River above Grand Coulee Dam and access to that area was blocked by the construction of the dam, which was completed in 1941.
- Summer chinook have not been harvested as a target species since 1965.
- Since the 1980s, the summer chinook runs have generally remained at record low levels.
- In May 1992, the Snake River wild portion of the summer chinook salmon run was combined with the Snake River wild portion of the spring chinook run into a single ESU and was listed as threatened under the ESA.

# Fall Chinook Salmon

## **Biology**

- Age at time of return to freshwater includes 2-, 3-, 4-, 5-, 6-, and occasionally 7-year olds.
- Time of return to freshwater is primarily August and September, with lesser returns throughout the remainder of the fall.
- Spawning occurs in the fall. However, fall chinook have been observed actively spawning as late as April.
- Juveniles typically migrate to saltwater several months after emerging from the gravel in early spring.
- Many of the fish originate from hatcheries while others were spawned naturally throughout the Columbia River Basin and in the mainstem of the Columbia River between McNary and Priest Rapids dams and below Bonneville Dam.
- Upriver fall chinook stocks migrate over Bonneville Dam with peak numbers counted in early September. The Bonneville Pool Hatchery (BPH) migration period is narrow, with 75% of these fish passing Bonneville Dam during the first half of September. The Upriver Bright (URB) migration extends over a broad time period from early August to mid-November.
- Most lower Columbia River tributary fall chinook natural spawners are a mixed stock of composite production. The overall result of straying adult spawners and egg transfers between hatcheries is the development of a widely mixed stock. However, the North Fork Lewis and Sandy rivers have a large enough wild fall chinook escapements to sustain unique, naturally produced populations.

## **Historic Status**

- The largest segment of the fall chinook run historically spawned in the mainstem Columbia River near areas where Bonneville, The Dalles, John Day, and McNary dams were constructed.
- Catches inside the Columbia were generally stable from the beginning of commercial exploitation until the late 1940s, when landings declined by about two-thirds to a level that remained stable from the 1950s through the mid-1980s. This decline was coincident with development of the hydropower system in the Columbia River Basin and an ocean fishery on chinook salmon.
- The run sizes in the late 1980s were the highest since the late 1940s.
- Increased lower river hatchery production led to a significant increase in Columbia River fall chinook returns beginning in the late 1960s. However, due to reduced funding, several hatcheries ceased tulle fall chinook production in the mid to late 1990s.

## Fall Chinook Salmon continued

- Increased hatchery production of URB fall chinook in the mid-Columbia River region in the late 1980s has resulted in significant increases in fall chinook returning to historically (pre-dam) productive regions of the mainstem Columbia River between Bonneville and McNary dams.
- Implementation of the Pacific Salmon Treaty occurred in 1985 with amendments adopted in 1999.
- In May 1992, the Snake River wild portion of the fall chinook salmon run was listed as threatened under the ESA.
- In May 1999, lower Columbia (downstream from the Klickitat River) spring chinook were combined with lower Columbia River fall chinook to form a single ESU (lower Columbia spring/fall) that was listed as threatened under the ESA.

# Sockeye Salmon

## **Biology**

- Age at time of return to freshwater includes 3-, 4-, and 5-year olds. The majority of Columbia River sockeye spend 2 years in the ocean before returning as adults to spawn as 4-year olds.
- Run timing is for an average peak at Bonneville Dam on July 1. Spawning occurs in September-October.
- Juveniles normally rear in a freshwater nursery lake for at least 1 full year before migrating to the ocean.
- Columbia River sockeye are the southernmost sockeye run in North America. Production is almost entirely from two extant wild stocks in the Wenatchee and Okanogan River systems.
- Returns to the Wenatchee River are comprised primarily of 5-year olds while returns to the Okanogan River are comprised primarily of 4-year olds.
- An average adult weighs about 4 pounds, the smallest sized adults of any of the North American sockeye stocks.

## **Historic Status**

- Historic run sizes were as large as 3 million fish.
- Commercial landings in late 1890s twice exceeded 4.5 million pounds.
- Sockeye were not harvested commercially during 1988-99.
- Eight tributary lake systems historically produced sockeye in the Columbia Basin. Blockage by Columbia and Snake River dams reduced original surface acreage of Columbia Basin sockeye nursery lakes by 96%.
- Returns of Snake River sockeye to the Columbia River mouth have been less than 100 fish since 1985.
- In December 1991, the Snake River portion of the sockeye salmon run was listed as endangered under the ESA.

# Coho Salmon

## **Biology**

- Age at time of return to freshwater is 2 years for jacks and 3 years for adults.
- Time of return to freshwater is primarily from August through November. Spawning occurs primarily from October through December with some fish spawning as late as mid-February.
- Juveniles migrate to saltwater after rearing in freshwater for about one full year.
- The Columbia River run consists of two components, an early segment that returns primarily in September and a late segment that returns primarily in October.
- Production in the Columbia River is almost entirely from hatcheries. Natural production is minor, averaging less than 10% of the run.

## **Historic Status**

- Commercial catches rose to a peak of 8 million pounds in 1925, then gradually declined until the 1960s, when hatchery production of coho became very successful.
- Abundance increased dramatically in the late 1960s and early 1970s, but declined in conjunction with increased ocean fishing until the mid-1980s.
- The Columbia River commercial catch in 1986 of nearly 1 million fish was a record high number, but was about 1 million pounds less than the record high poundage in 1925.
- In 1990 the wild portion of the coho salmon run from the lower Columbia River (Columbia River and its tributaries below Bonneville Dam, exclusive of the Willamette River) was petitioned for listing as threatened or endangered under the ESA. In 1991, the NMFS decided not to list wild coho of the lower Columbia River because the remaining small remnant runs are predominately hatchery-maintained and are not a species as defined in the ESA. In 1995, the NMFS combined Columbia River coho (including the Willamette River and tributaries below Willamette Falls) with Willapa Bay and Grays Harbor coho into the single Lower Columbia River/Southwest Washington Coast ESU and identified it as a candidate species, worthy of further study. In July 2000, the NMFS accepted a petition to list lower Columbia River coho and has undertaken another status review.
- In July 1999, the State of Oregon listed wild coho salmon destined for lower Columbia River tributaries as endangered under the state ESA.

# Chum Salmon

## **Biology**

- Chum returns are almost entirely from natural/wild production.
- Age at time of return to freshwater includes 3-, 4-,5- and a few 6-year olds; typically most return as 4-year olds.
- Time of return to freshwater is mainly in late October and November, with spawning in November and December.
- Chum salmon are produced primarily in the Grays River and in smaller tributaries downstream from Bonneville Dam, with some production occurring in the mainstem Columbia River just below Bonneville Dam and in the I-205 Bridge area.
- Based on allozyme sampling, the Grays River and Bonneville populations are genetically distinct from other populations and the Grays River and Bonneville populations are genetically distinct from each other.
- The Columbia River is near the southern end of the distribution range.
- Chum salmon spawn in the lower reaches of streams which increases their susceptibility to environmental degradation.
- Juveniles migrate to saltwater soon after emerging from the gravel in the spring.
- Habitat improvements in key areas have been beneficial.

## **Historic Status**

- Chum salmon were once very abundant in the Columbia River Basin with commercial landings ranging from 1 to 8 million pounds in most years prior to the early 1940s.
- Commercial landings have been less than 50,000 pounds since 1959.
- In May 1999, natural-origin chum returning to the Columbia River were defined as a single ESU (Columbia River) and listed as threatened under the ESA.

# Winter Steelhead

## **Biology**

- Maturing winter steelhead return to the Columbia River during November through April and spawn in tributaries during December through June.
- Most returning winter steelhead have spent 2 years in the ocean and less than 5% of returning adults are repeat spawners.
- Female winter steelhead produce 3,000-5,000 eggs.
- Most winter steelhead return to tributaries below Bonneville Dam and none return to tributaries above The Dalles Dam.
- Most wild juvenile winter steelhead smolt and migrate to the ocean in May and June after spending 2 or 3 years rearing in freshwater.
- Hatchery winter steelhead smolts migrate to the ocean in May and June after only 1 year rearing in freshwater.

## **Historic Status**

- Lower Columbia River winter gillnet seasons during 1938-1974 resulted in winter steelhead catches ranging from 2,100-18,900 annually.
- Non-Indian commercial steelhead landings have been prohibited since 1975.
- Mainstem and tributary (Oregon and Washington) winter steelhead sport catch, ranged from 29,000-124,100 annually during 1953-1995 but have declined to 6,400-13,100 during 1996-99.
- Runs increased substantially in the mid-1960s when successful hatchery production began. Recent declines are primarily attributed to poor ocean conditions.
- Run size index indicates that large runs are in the magnitude of 300,000 fish and small runs are probably less than 100,000.
- Treaty Indian catch of winter steelhead in Bonneville Pool since 1979 has ranged from fewer than 100 to 1,500 annually.
- In May 1998, wild steelhead destined for lower Columbia River tributaries, excluding the upper Willamette River, were defined as a single ESU (lower Columbia River) and listed as threatened under the ESA.
- In May 1999, wild steelhead destined for the Willamette River above Willamette Falls were defined as a single ESU (upper Willamette) and listed as threatened under the ESA.

# Summer Steelhead

## **Biology**

- Summer steelhead adults return to the Columbia River from March through October.
- Columbia River summer steelhead spawn from January to June in the calendar year following their entry to freshwater.
- Returning summer steelhead have spent 1, 2, or 3 years in the ocean.
- Less than 1% of returns are repeat spawners.
- Summer steelhead return to tributaries throughout the Columbia and Snake basins.
- Females produce 2,500-6,000 eggs, depending on stock and age.
- Juvenile summer steelhead smolt and migrate to the ocean in May and June.
- Most wild summer steelhead will migrate to the ocean at age 2 while most hatchery smolts migrate at age 1.

## **Historic Status**

- The commercial steelhead record high landing occurred in 1892 and totaled over 4.9 million pounds (estimated 545,000 fish).
- Lower Columbia River gillnet summer steelhead catches ranged from 4,000-240,000 fish annually during 1938-1974.
- Tribal catches at Celilo Falls by dip net ranged from 25,000-66,000 fish annually during 1938-1956.
- Inundation of Celilo Falls in 1957 created a large increase in upriver summer steelhead escapement for about 10 years.
- Passage problems at mainstem dams in the 1970s brought upriver summer steelhead stocks to historic low levels.
- Hatcheries have increased summer steelhead runs and during 1984-2000 have comprised 90% of lower river returns and 75% of upriver returns.
- In October 1997, steelhead destined for the Snake River and the upper Columbia River basins were classified into two separate ESU's (Snake River and upper Columbia River) and listed as threatened and endangered, respectively, under the ESA.
- In May 1999, wild steelhead destined for middle Columbia River tributaries were classified as a single ESU (middle Columbia River) and listed as threatened under the ESA.

# Smelt

## **Biology**

- Smelt return to freshwater most often at 3, 4, and 5 years of age.
- Smelt first enter the Columbia River in late-December/early-January, when water temperature is favorable, near 40 °F.
- Soon after freshwater entry, spawning occurs in the mainstem Columbia River and tributaries downstream from Bonneville Dam. Most tributary spawning is in the Cowlitz River but, in some years, also occurs in the Grays, Elochoman, Lewis, Kalama, and Sandy rivers.
- Smelt are broadcast spawners in areas of coarse sandy bottom. Females produce 20,000-60,000 eggs. Adults die following spawning.
- Eggs are sticky, settle to the bottom, and incubate for about 30-40 days dependent on water temperature.
- Young smelt larvae are about 4 mm in length and drift with the current to sea.

## **Historic Status**

- The smelt fishery can be traced to the late 1800s.
- Run sizes, using commercial landings as an index, have remained relatively stable for many years, with the exceptions of 1984 and 1993-2000.
- Eruption of Mt. St. Helens severely impacted Cowlitz River spawning in 1980 and consequent return of adults in 1984.
- In 1993, smelt strayed to many Washington coastal streams and bays due to cold Columbia River water temperature.
- In July 1999, smelt returning to the Columbia River basin were petitioned for listing as threatened or endangered under the ESA and subsequently in November 1999 NMFS chose not to propose a listing.

# Shad

## **Biology**

- Shad mature at 3 to 5 years, with males usually returning 1 year earlier than females.
- Shad pass Bonneville Dam during mid-April through August with peak migration occurring in June.
- Spawning occurs in the Columbia River mainstem (especially in areas above Bonneville Dam) and in tributaries such as the Willamette River below Willamette Falls.
- Both sexes return to the ocean soon after spawning.
- Shad may survive to spawn in several successive years.
- A female will produce 100,000-600,000 eggs annually, dependent on her size and age.
- Eggs are spawned in open water and hatch in 3 to 8 days.
- Juveniles grow rapidly and leave freshwater in their first fall at about 3-5 inches.

## **Historic Status**

- Shad were introduced on the West Coast in the late 19th century from Atlantic Coast stocks.
- Columbia River runs steadily increased after mainstem dams were completed, reaching a record high run size of 4.0 million in 1990.
- Harvestable numbers far exceed commercial and recreational demand.
- Poor market limits commercial opportunity and economic benefits.
- Popularity as a sport fish peaked in the early 90's with over 20,000 angler trips on the lower Columbia River.

# White Sturgeon

## **Biology**

- Populations downstream of Bonneville Dam can move freely between the ocean and freshwater. Sturgeon upstream of Bonneville Dam have restricted migration and tend to remain within a single reservoir their entire life.
- Initial sexual maturity occurs at about 4 feet in length for males and about 6 feet in length for females.
- Mature females commonly have 100,000-300,000 eggs and spawn at 3-4 year intervals. As females become older and larger, they produce more eggs but may spawn less often.
- Spawning occurs at water temperatures of 48-62 °F, primarily in May and June in rocky, fast flowing areas.
- In the lower Columbia, growth is about 4 inches per year up to 3 feet, about 3 inches per year until mature, and slower after attaining sexual maturity.
- Average length at age are; 7-9 inches (1 year); 3 feet (8 years); 4 feet (12 years); 5 feet (17 years); and 6 feet (23 years).
- At current size limits of 3-1/2 to 5 feet in length, sturgeon in the lower Columbia River are susceptible to harvest for an average of 7 years, from age 10 to age 17.
- Small numbers of hatchery-produced white sturgeon have recently been released into the upper Willamette and Snake rivers.

## **Historic Status**

- The commercial white sturgeon fishery in the Columbia began in the early 1880s, reached a peak of 5.5 million pounds in 1892, and the population was decimated by 1899.
- Most of the harvest during the late 1800s was broodstock size fish averaging 7 feet and 150 pounds each.
- Recovery of the population did not begin until the broodstock was protected with a 6-foot maximum size limit enacted in 1950.
- Sturgeon stocks in the lower Columbia rebounded in the 1970s, about 20 years after the maximum size limit was enacted.

## White Sturgeon continued

- Current fisheries in the Columbia River land about the same number of fish as the commercial fishery of the 1890s; however, the current yield totals only about 1 million pounds.
- Reservoir populations in the Columbia River are limited by lack of access to highly productive marine and estuarine environments as well as spring and early summer flow regimes which influence spawning success and recruitment of juvenile sturgeon.
- Sturgeon populations in The Dalles and John Day reservoirs have declined in recent years but are showing signs of recovery since conservative harvest guidelines have been in place.
- Populations in the upper Columbia and Snake rivers have been depressed since construction of mainstem dams.

# Green Sturgeon

## **Biology**

- Green sturgeon inhabit marine and brackish water.
- In the Columbia River green sturgeon are found almost exclusively in the lower 40 miles and do not occur upstream of Bonneville Dam.
- Green sturgeon are primarily found in the Columbia River during the summer and early fall months. They are believed to inhabit Washington and Oregon coastal estuaries during this time as part of a general feeding migration.
- Green sturgeon, which are smaller than white sturgeon, reach a maximum length of about 8 feet.
- Green sturgeon are known to spawn in the Sacramento, Klamath, and Rogue rivers but spawning has not been documented in the Columbia River.
- Females mature sexually near 5-6 feet in length.
- No hatchery production has occurred to date.

## **Historic Status**

- Less abundant than white sturgeon, annual harvest has been relatively minor; usually 1,000-3,000 in the commercial fishery and less than 500 in the recreational fishery.
- Commercial harvest in 1986 was a modern record high of 6,000 fish.
- Green sturgeon are economically less important than white sturgeon. Ex-vessel price for green sturgeon has commonly been \$.30-\$.50/lb compared to \$1.00-\$2.00/lb for white sturgeon.

# Walleye

## **Biology**

- Walleye spawn in March and April at water temperatures between 40 and 50 °F.
- Most spawning occurs at night in water 2 to 3 feet deep over gravel or rocky bottom.
- Number of eggs per female increases with size varying from 20,000 to 50,000 eggs per pound of fish.
- Columbia River walleye spawning success is highest in years of low spring flows and minimal fluctuations in pool levels.
- Conditions that enhance salmonid smolt survival (i.e. high flows, spilling at dams, and pool drawdowns) may minimize or eliminate walleye spawning success.
- Columbia River walleye grow very rapidly compared to other North American walleye populations.
- Salmonid juveniles are a major food item for small (20 to 30 cm) Columbia River walleye and are less important, but still consumed by larger walleye.

## **Historic Status**

- Walleye, not native to the Columbia Basin, were introduced above Grand Coulee Dam in the 1940s or 1950s.
- First established population was in Lake Roosevelt (Grand Coulee Reservoir). Occasional, individual fish were reported in downstream reservoirs, and eventually established below Bonneville with first documented catch in 1966 at Oneonta.
- First large reproduction year below the Snake River confluence was 1979; this year class generated widespread sport fishing interest especially in The Dalles and John Day reservoirs from 1981 through 1984.
- Walleye populations in the Columbia River have fluctuated with their variable reproductive success since 1984, and sport catches reflect trends in walleye abundance.
- Popular sport fisheries have developed in all mainstem reservoirs (except Snake River), in the lower Columbia River between Portland and Bonneville Dam, and in the lower Willamette River below Willamette Falls.

# **RUN STATUS AND HARVEST**

The following sections of this report review the status and inriver harvest of the major Columbia River fish runs. Landings for the non-Indian commercial fishery downstream of Bonneville Dam (Zones 1-5, 7, 71, 74, 80, and 81) are found under the sections entitled Non-Indian Commercial Harvest. Landings for treaty Indian commercial, ceremonial, and subsistence fisheries between Bonneville and McNary Dams (Zone 6) are in Treaty Indian Harvest sections. Sport catches are described in Non-Indian Recreational Harvest sections. Commercial landings from all fisheries in the Columbia River for 2000, based on fish receiving tickets completed by fish buyers, are summarized in Table 22.

## **Spring Chinook**

### **Lower River Run**

#### **Status**

The lower river spring chinook run is comprised of the Willamette and Sandy River stocks in Oregon and the Cowlitz, Kalama, and Lewis River stocks in Washington. Lower river fish enter the Columbia from January through May, with peak abundance in late March and early April.

The minimum lower river spring chinook run entering the Columbia River is calculated by combining the commercial and sport catches of lower river fish made during February-May in the lower Columbia with runs entering the Cowlitz, Kalama, Lewis, Sandy, and Willamette rivers (Figure 16 and Tables 23 and 24). The lower river run has been significantly increased by hatchery production. During the 1980s, the run averaged 113,200 fish (107,100 adults). Since peaking in 1990, the lower river run has declined to lows of 44,100 (42,400 adults) in 1996, in part because of an extended period of poor ocean productivity. With the recent reversal in ocean conditions and as a result of an increasing Willamette River run, the lower river run has increased each year since 1996. The Cowlitz, Kalama, and Lewis River runs have remained at or near record low levels since 1996 with only slight improvements in 2000.

In May 1999, wild spring chinook destined for the Willamette River Basin were defined as the upper Willamette spring ESU and were listed as threatened under the ESA. Also in May 1999, native spring chinook destined for other Columbia River tributaries downstream of the Cascade Range were combined with naturally produced fall chinook destined for the same geographic region to form the lower Columbia spring/fall ESU that was listed as threatened under the ESA (Table 9).

#### **Non-Indian Commercial Harvest**

A commercial fishery in late February and early March (winter season) historically targeted lower river spring chinook and was dominated by the Willamette River stock. Some lower river fish were also taken in the late April to May spring season in years when the upriver run was large enough to support a commercial fishery. Since 1978, poor upriver runs have precluded directed fishing for the spring chinook run destined for areas above Bonneville Dam. No spring commercial season has occurred since 1977 while winter commercial salmon target seasons have occurred in all years except 1995 and 1997-1999 (Tables 25 and 30). No commercial season occurred during the winter of 1995 and winter commercial

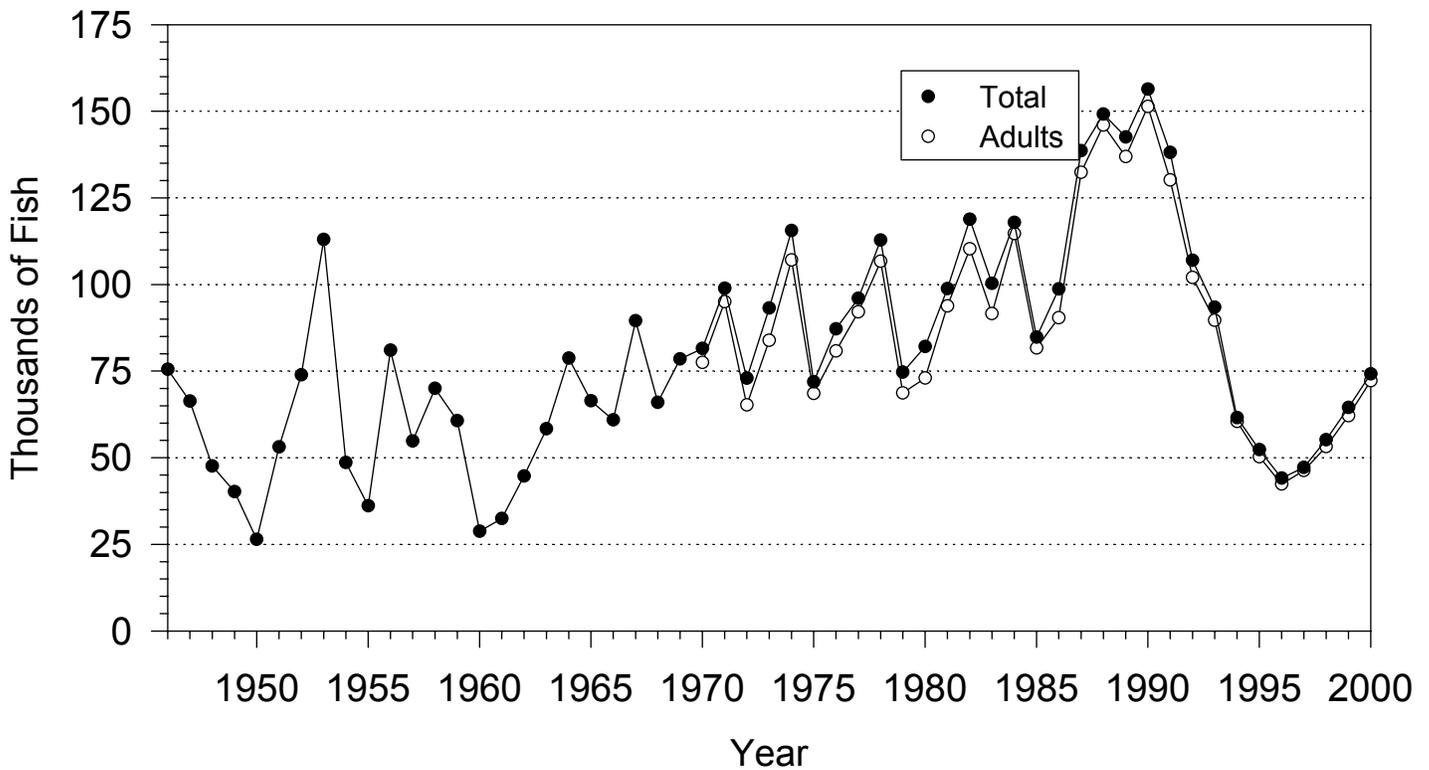


Figure 16. Estimated Numbers of Lower River Spring Chinook Entering the Columbia River, 1946-2000.

seasons in 1997-1999 were sturgeon target seasons, although sales of incidentally caught chinook were also allowed. Winter gillnet season dates for spring chinook have been established since 1878. Seasons through 1967 closed March 1. Seasons from 1968-2000 have varied from 1-20 days, starting as early as February 10 and ending as late as March 11. Seasons from 1968-1996 were shaped towards preseason forecasts of each year's Willamette River spring chinook return. Winter gillnet season catches from 1968-1996 ranged from 12,000-18,300 salmon and averaged 8,800 salmon, excluding 1995 during which a winter gillnet salmon season did not occur (Figure 17 and Table 25). Winter commercial seasons in 2000 were 2-days per week between January 10 and February 11 under a sturgeon management agreement which allowed sturgeon harvest outside traditional salmon harvest time frames and 8 days during February 13-29 targeting spring chinook. Spring chinook catch in the 2000 winter seasons was estimated to be 496 fish.

Since 1970, winter gillnet fisheries have operated with minimum mesh restrictions of: 7-1/4" during 1970-1974; 8" during 1975-1996; 8-3/4" in 1997; 9" during 1998-2000 target sturgeon seasons; and 8" in 2000 target salmon seasons. Initial mesh size restrictions were adopted to reduce steelhead handle. Sale of steelhead by non-Indian commercial fishers has been prohibited since 1975. During 1997-2000 target sturgeon seasons, the minimum mesh size was increased to reduce the handle of chinook and sublegal sturgeon. From 1975-1996, the fishery was restricted to the area from Kelley Point (Willamette River mouth) downstream to the Columbia River mouth to focus harvest on surplus Willamette spring chinook. Since 1997, the target sturgeon fishery has included the entire mainstem commercial fishing area downstream from Beacon Rock.

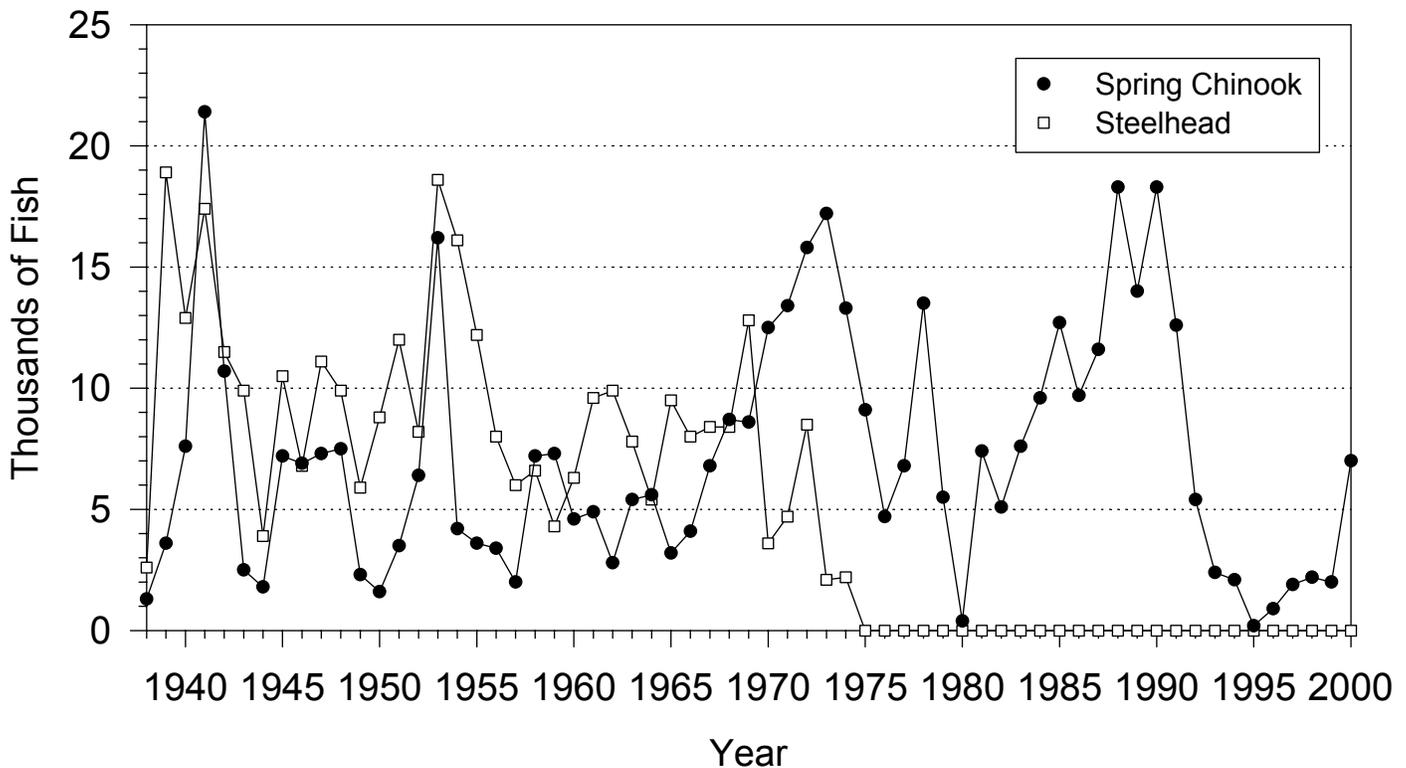


Figure 17. Columbia River Winter Season Spring Chinook and Steelhead Commercial Landings in Zones 1-5, 1938-2000.

From 1988-1997, Willamette spring chinook harvest was regulated according to guidelines in ODFW's Willamette Sub-basin Fish Management Plan (WFMP). The WFMP provided for changing escapement guidelines and allocation (sport/commercial) percentages based on predicted run sizes. For runs under 50,000, the Compact determined allocation at a public meeting. Harvest above escapement needs was allocated 24% commercial and 76% sport for runs of 50,000 to 90,000, and 30% commercial and 70% sport for runs above 90,000. The Willamette Falls escapement goal was 30,000 when runs were predicted to be less than 70,000 and the goal was stepped up to 45,000 when runs were predicted to be greater than 100,000. The Clackamas River mouth escapement guideline was 6,000 fish, regardless of run size.

The Oregon Fish and Wildlife Commission (OFWC) adopted revisions to spring chinook chapters of the Willamette Basin Fish Management plan on February 27, 1998 to address the ODFW wild fish policy while continuing to provide fishing opportunities for hatchery fish. At preseason forecasts of less than 30,000 Willamette spring chinook returning to the Columbia River, no sport fishing was allowed and incidental commercial impacts during sturgeon fisheries were to be minimized so as not to exceed 1% of the forecasted run. At run sizes of 30,000 to 60,000, sport impacts increased incrementally from 5 to 20% and commercial impacts during sturgeon seasons were to be limited to 1% of the forecasted run. At run sizes of 60,000 to 90,000, sport impacts increased from 20 to 30% and commercial impacts of 11.5% were allowed. The OFWC also directed staff to identify alternatives, to be considered at a later date, for smoothing the abrupt transition of allowable commercial impacts from 1% to 11.5% at runs of 60,000.

The OFWC adopted a slightly smoother transition for allowable commercial allocation on February 19, 1999. The commercial allocation allowed impacts of less than 1% for runs less the 55,000, 2% for runs 55,000-<60,000, 9.5% for runs 60,000-<65,000, and 11.5%

for runs greater than or equal to 65,000. Coincidentally, sport fishery impacts were modified to ensure that the total harvest rate did not change from the previously adopted impacts matrix.

Provisions in the CRFMP protected upriver spring chinook during spring fishing periods in 1988-1994 and thereby limited lower river commercial access to Willamette spring chinook to about one-half or less of the harvest allowed under the WFMP. During 1988-1992 Willamette spring chinook runs were predicted to exceed 90,000 and the 30% commercial: 70% sport allocation was not achieved with shares averaging 26% commercial and 74% sport. During 1993-1994 Willamette spring chinook runs were predicted to be between 50,000 and 90,000 and the 24% commercial: 76% sport allocation was not achieved with shares averaging 5.5% commercial and 94.5% sport. In 1995 the Compact did not set a commercial fishing season in the mainstem Columbia River during winter, spring, or summer and fewer than 10 Willamette spring chinook were landed in the Youngs Bay spring gillnet fishery. In 1996 the commercial allocation was 400 and the sport allocation was 6,000 which corresponds to a commercial allocation of (6.3%). During 1997-1999 the commercial allocation of Willamette spring chinook was limited to include impacts associated with target sturgeon fisheries (less than 100 chinook). In 2000, the winter commercial salmon fishery was reinitiated with a 1,200 Willamette spring chinook allocation.

The proportion of upriver fish in the 2000 winter catch was determined using visual stock identification (VSI) characteristics. In past sampling, both VSI and genetic stock identification (GSI) provided similar estimates of the proportion of upriver fish; however, VSI cannot distinguish Snake River fish from other upriver stocks or among lower river stocks. Based on VSI performed on 330 chinook (67% of the catch), it was estimated that the 2000 winter season catch included 410 lower river fish and 86 upriver fish. A total of 341 chinook (69% of the catch) were examined for fin marks and coded-wire tags (CWT), and 35 snouts were collected. Based on lower river spring chinook run size proportions, it was estimated that 86% (354 fish) of the 410 lower river chinook were destined for the Willamette River and 56 fish (14%) were destined for either the Kalama, Cowlitz, or Lewis River. Impact to Snake River wild fish in the 2000 winter gillnet fishery was estimated to be six fish (7% of the catch).

### **Non-Indian Recreational Harvest**

The February-March sport catch of spring chinook on the lower Columbia River below the I-5 Bridge is primarily Willamette River fish. In order to protect upriver spring chinook and meet federal ESA requirements, this sport fishery was closed for salmon, steelhead, and shad angling effective March 16, by emergency action at a Joint State hearing held on March 14, 2000. Spring chinook forecasts were generally improved but high, cold water conditions in February and early March, combined with low salmon numbers resulted in 322 sport-caught chinook from 9,900 salmonid angler trips in the mainstem sport fishery through the March 15 ending date.

Since 1975, the river below the I-5 Bridge traditionally closed on March 31. In-season sport catch estimates in some years allowed fishery managers to extend the sport fishery beyond March 31 and remain within CRFMP harvest guidelines. In 3 of 5 years during 1986-1990, the fishery was extended into April. In 1991 and 1992, managers closed the March sport fishery prior to the traditional closing date because the combined non-Indian commercial and sport catch of upriver chinook reached the harvest impact guideline. The mainstem sport fishery was extended for boat and bank anglers below the I-5 Bridge for 7 days (April 1-7) in 1993 and 3 days (April 1-3) in 1994. In 1999, for the fifth consecutive

year, predicted low returns of spring chinook precipitated early sport fishery closures. The sport fishery was closed effective February 16 in 1995, March 11 in 1996-1999, and March 16 in 2000.

The Columbia River upstream from the I-5 Bridge has been closed to salmon angling from March 16 through July 31 since 1980. In late 1992, both states amended the permanent salmon angling closure above the I-5 Bridge to include the January 1 through March 15 time period to further protect upriver spring chinook. The I-5 Bridge is located at river mile 106, 5 miles above the mouth of the Willamette River. Chinook catches in the area above the I-5 Bridge during January 1 through March 15, although minor, were comprised of 100% upriver stock.

## **Upriver Run**

### **Status**

Upriver spring chinook destined for above Bonneville Dam include hatchery and natural fish originating from the upper Columbia River system above McNary Dam, the Snake River system, and middle Columbia River tributaries between Bonneville and McNary dams (Table 26). Upriver fish begin entering the Columbia River in March and reach peak abundance in April and early May. Current runs are predominantly hatchery fish. The number of upriver fish entering the Columbia River is estimated by combining commercial and sport catches of upriver fish from the lower Columbia River during February-May and the Bonneville Dam count (Figures 18 and 19 and Tables 27 and 28).

Indian tribes harvested upriver spring chinook for many centuries before Europeans arrived in the Columbia Basin. Fishing occurred at several locations, with the fishery at Celilo Falls being the largest. Each year's arrival of the first upriver spring chinook was an event of great spiritual and ceremonial significance. Commercial fishing by non-Indians began in about 1866, after salmon canning techniques were advanced. The commercial industry favored the spring or royal chinook as the finest salmon product. Recreational fishing for spring chinook began during the early 20th century and gained popularity after World War II.

Seasonal regulation of the commercial salmon fishery began in 1877. During 1909-1963, fairly standard commercial fishing seasons were established to harvest upriver spring chinook. Spring seasons opened on or about May 1, and closed on or about August 25 through 1942 and on or about May 27 during 1943-1963. Until 1957, commercial fishing was allowed from the mouth of the Columbia to the mouth of the Deschutes River approximately 200 miles upstream. During 1948-1956, the spring fishery above Bonneville Dam (Zone 6) was staggered from that of the lower Columbia (Zones 1-5) fishery. Zone 6 would open and close later than Zones 1-5, in recognition of the fish migration delay effect at Bonneville Dam.

In 1957, commercial fishing was prohibited in Zone 6 coincident with the completion of The Dalles Dam. Tribal regulations reopened Zone 6 during 1962-1968 upstream to the mouth of the Umatilla River. Since the spring season of 1968, state and tribal regulation of Zone 6 fishing has occurred. Since 1957, only Columbia River treaty tribes have fished in Zone 6. Spring chinook commercial fishing seasons in Zones 1-5 during 1964-1973 ranged from 8 to 21 open fishing days and averaged 15 days. Average opening date was May 2 and average closing date was May 23. Spring chinook commercial fishing seasons for tribal fishers in Zone 6 during 1962-1973 ranged from 10 to 40 open fishing days and averaged 25 days. Average opening date was April 23 and average closing date was May 26.

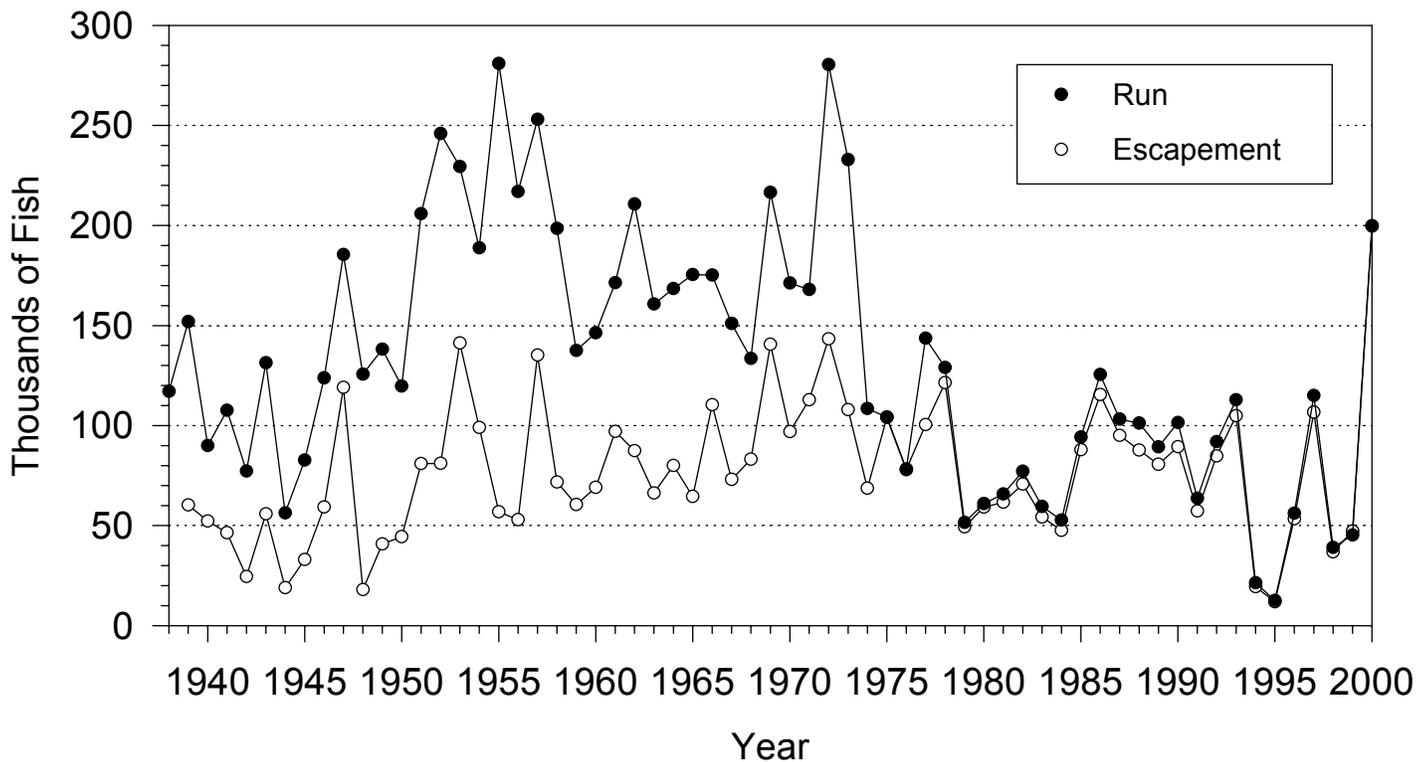


Figure 18. Estimated Numbers of Upriver Spring Chinook, Including Jacks, Entering the Columbia River and Escapement, 1938-2000.

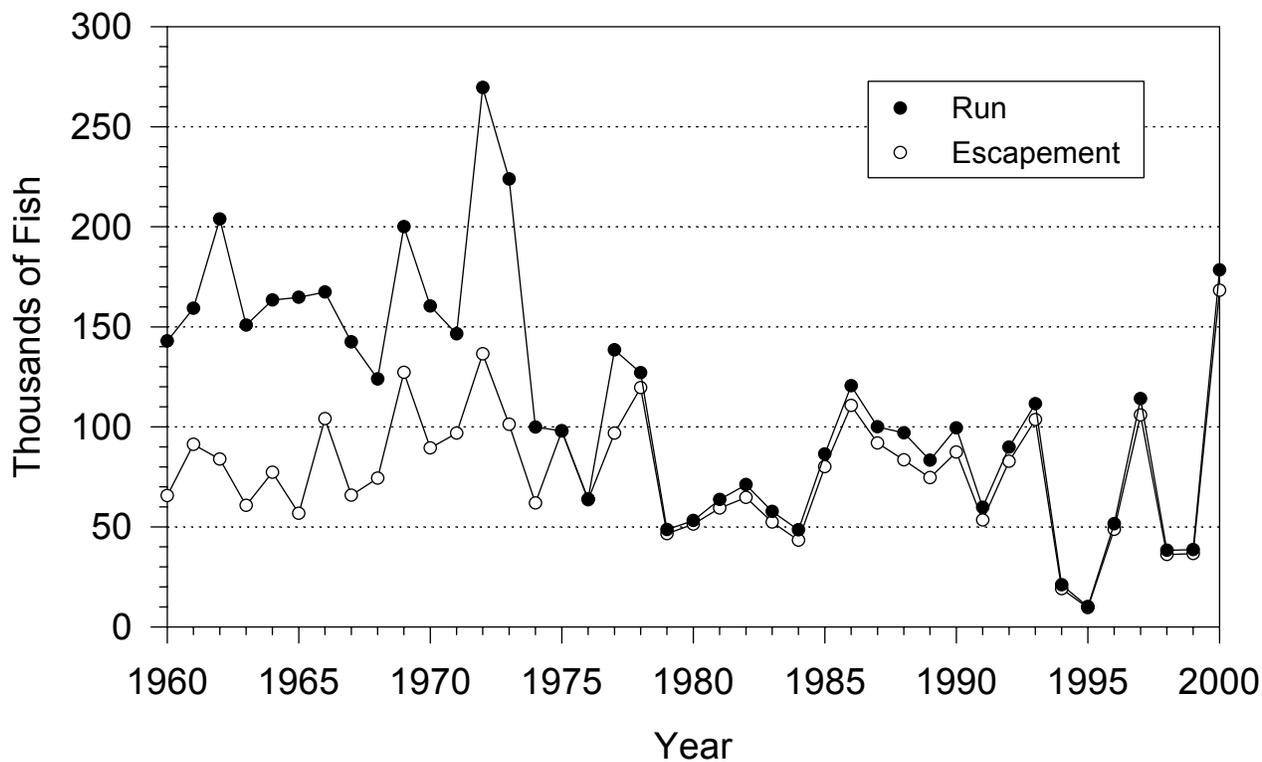


Figure 19. Estimated Numbers of Upriver Spring Chinook Adults Entering the Columbia River and Escapement, 1960-2000.

In 1974 the upriver adult run fell below 100,000 for the first time since the mid-1940s. Commercial seasons were limited to 1-day (May 10-11) in Zones 1-5 and 2-days (May 10-12) in Zone 6. Commercial fishing was completely closed for the first time in history to protect low runs in 1975 and 1976. The upriver run improved in 1977 and commercial fishing occurred for 5 days (May 8-13) in Zones 1-5 and 8 days (April 19-23 and May 2-6) in Zone 6. The 1977 commercial season was the last allowed. Even with no commercial fishing since 1977, the upriver run has met the escapement goal (115,000 adults passing Bonneville Dam) only twice, in 1978 and 1986, and has exceeded 100,000 fish only eight times since 1976.

Sport angling for upriver spring chinook began after World War II. The majority of the catch and effort occurred below Bonneville Dam in the mainstem Columbia. Lower Columbia seasons were uninterrupted until 1967-1969 and 1971 when in-season closures of varying lengths occurred. The sport season closed again in mid-May 1974 and has remained closed to the present except for an April 12-May 31 opening in 1977. Sport fishing in the tributary streams of the Snake River was subject to in-season closures during the mid-1970s and has been permanently closed since 1979.

Treaty Indian C&S fishing occurs each year by permit (issued by each tribe) using gill and dip nets, and hook and line. Most fishing occurs in Zone 6, although some subsistence fishing occurs in tributary streams (especially those with hatchery surpluses). C&S fishing is strictly regulated and catches are reported by the tribes.

Over 20 years of fishery closures have failed to restore upriver spring chinook runs. No directed commercial or sport harvest of the upriver run has occurred since 1977. Upriver spring chinook harvest rates have been reduced from the 1938-1973 average of 55% to an average of <10% in 1974-2000. Harvest restrictions have returned escapement to pre-1974 levels, but stocks no longer provide a harvestable surplus because factors other than harvest and escapement have reduced recruitment rates since the 1970s.

In May 1992, wild portions of the Snake River spring and summer chinook runs were combined by the NMFS into a single ESU (Snake River spring/summer) which was listed as threatened under the ESA. In May 1999, spring chinook destined for the upper Columbia River Basin were defined as a single ESU (upper Columbia spring) and listed as endangered under the ESA (Table 9).

Interim management goals for upriver adult spring chinook are 115,000 at Bonneville Dam and 35,000 (25,000 wild/natural) at Lower Granite Dam. The Bonneville Dam goal was achieved, with 178,300 adults passing the dam in 2000. The Lower Granite Dam goal was not achieved for the 22nd consecutive year, with 8,049 wild adults passing in 2000 (Table 29).

### **Non-Indian Commercial Harvest**

No commercial fisheries have targeted on upriver spring chinook since the run declined in the mid-1970s. There has been no spring (May) season since 1977 (Figure 20 and Table 30). Some incidental harvest of upriver spring chinook does occur in the February-March (winter season) fishery (Tables 27 and 28).

From 1996-1999, spring chinook fisheries were managed in accordance with the 1996-1998 Management Agreement that called for non-Indian commercial and recreational fisheries (combined) impacts on upriver spring chinook of no more than 1% of the upriver run when the aggregate upriver spring chinook return was predicted to be less than 50,000 or the Snake River natural return is predicted to be less than 5,000. This management agreement was not extended for 2000 and non-Indian fisheries were limited to 0.5% impact on the upriver run in 2000. Of the 496 spring chinook caught during the 2000 winter season, 86 were of upriver origin (Table 29).

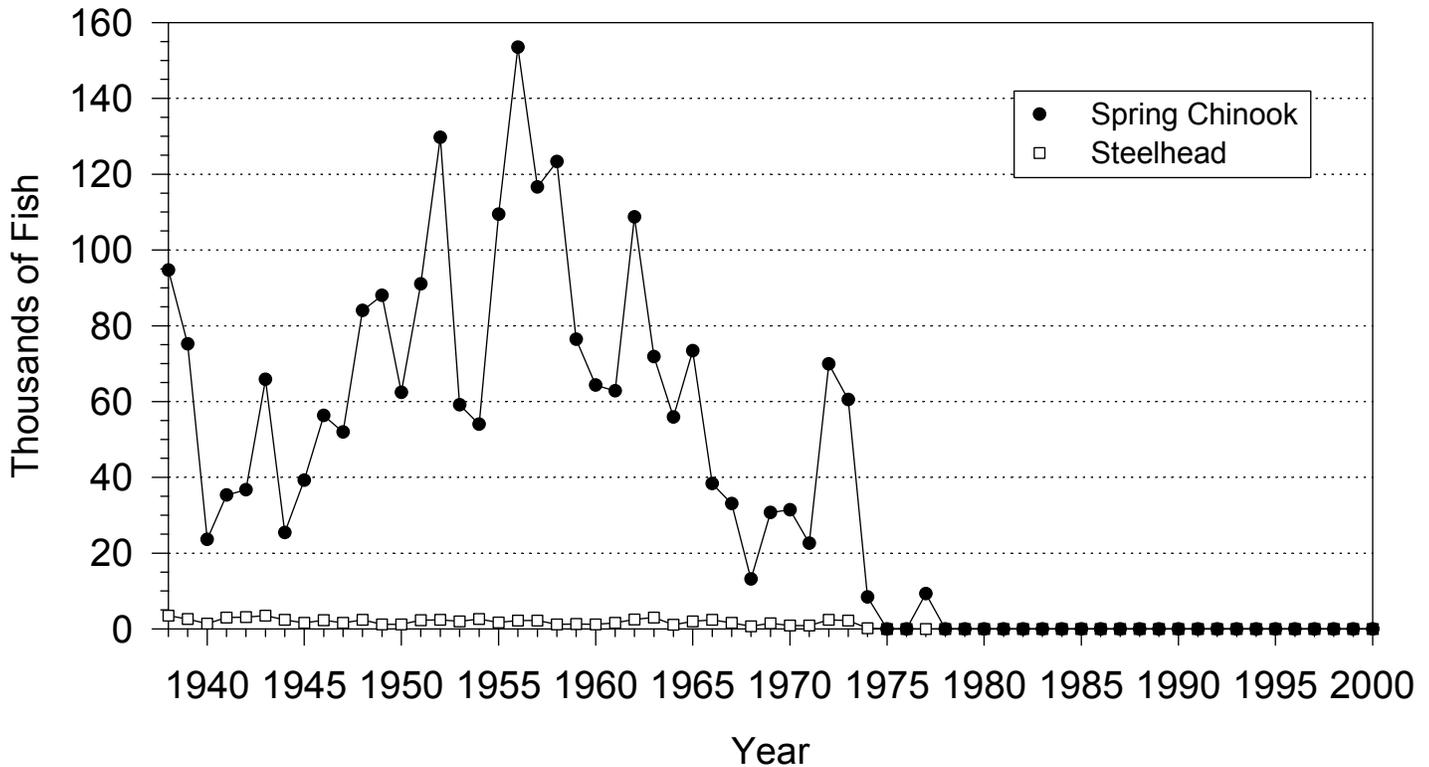


Figure 20. Columbia River Spring Season Upriver Spring Chinook and Steelhead Commercial Landings in Zones 1-5, 1938-2000.

**Treaty Indian Commercial Harvest**

In the past, Treaty Indians have harvested upriver spring chinook during the February and March winter commercial seasons, late April and May spring commercial seasons, and C&S fisheries (Figures 21 and 22 and Tables 27, 28, and 31). The 1996-1998 Management Agreement was extended through 1999 and called for treaty Indian fishery impacts of no more than 5% of the upriver run when the aggregate upriver spring chinook return was predicted to be less than 50,000 or the Snake River natural return is predicted to be less than 5,000. The 1996-1998 Management Agreement was not extended for 2000 and treaty Indian fishery impacts were limited to 8.5% of the upriver run in 2000. Due to the large upriver run size, a limited commercial dipnet fishery occurred in 2000, representing the first treaty Indian commercial spring chinook opportunity since 1977.

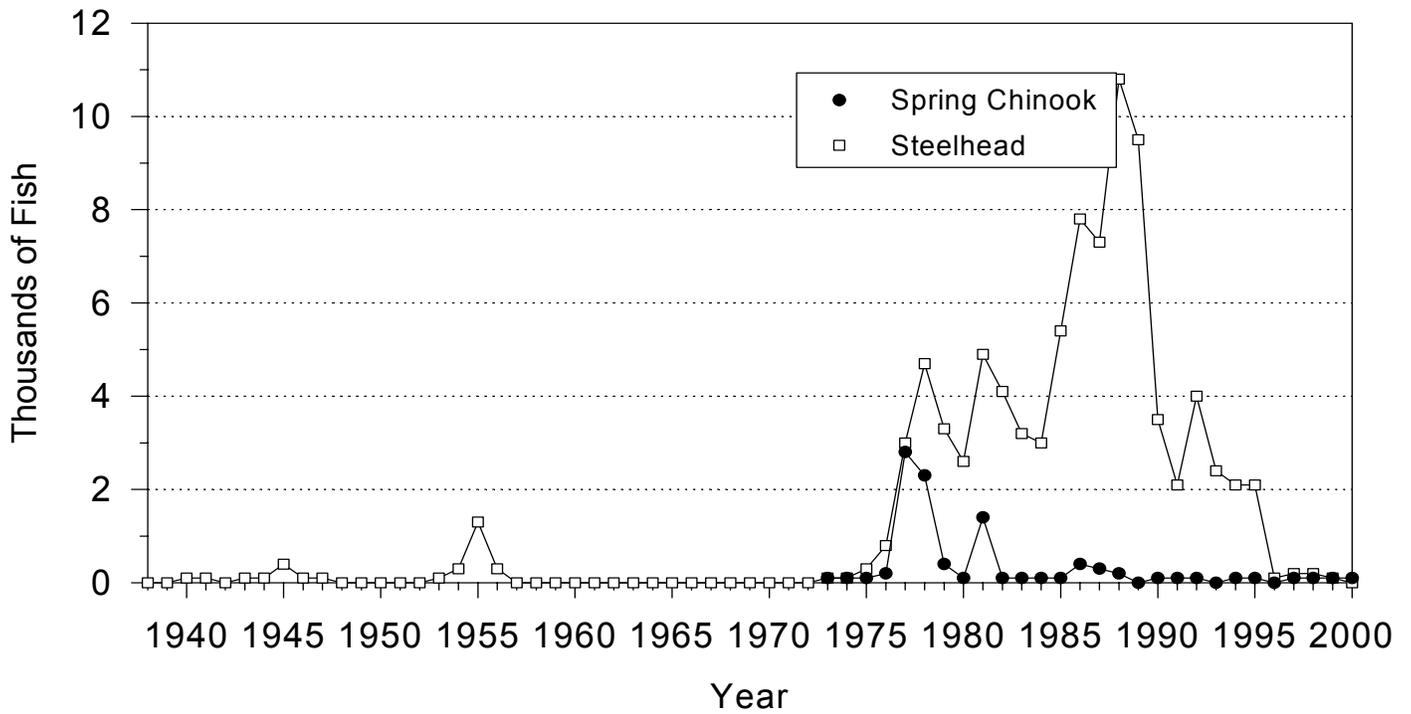


Figure 21. Columbia River Winter Season Spring Chinook and Steelhead Commercial Landings in Zone 6, 1938-2000.

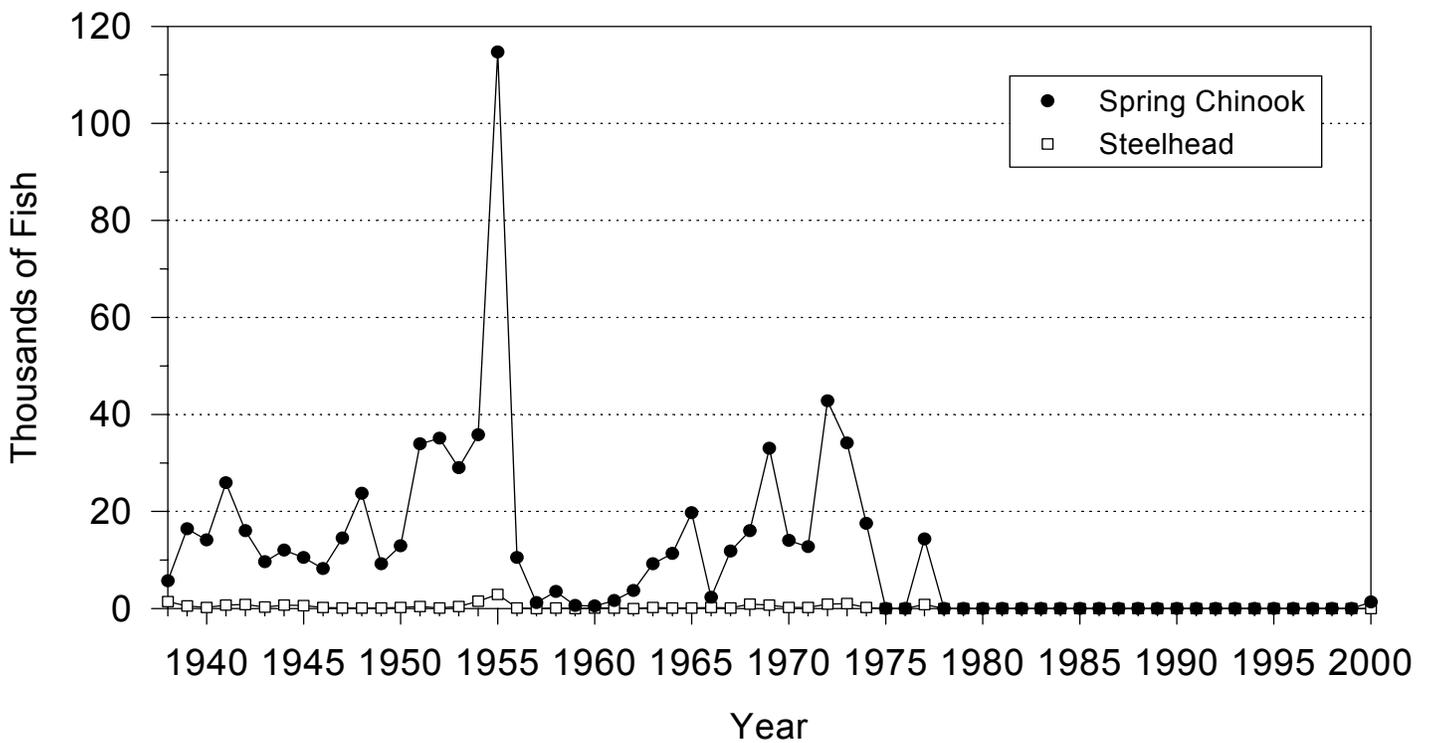


Figure 22. Columbia River Spring Season Upriver Spring Chinook and Steelhead Commercial Landings in Zone 6, 1938-2000.

Recent treaty Indian winter seasons have been sturgeon target fisheries. The winter fishery typically closes before significant numbers of spring chinook have crossed Bonneville Dam. The 2000 winter season was adopted at the January 27, 2000 Compact hearing and subsequently modified at a March 14 Compact hearing. The season began on February 1 and continued through March 18. A total of 31 spring chinook were caught and sold during this fishery.

Treaty Indian spring season commercial fisheries have been closed since 1977. The large upriver run size combined with the 8.5% allowable impact rate for treaty spring chinook fisheries in 2000 permitted a limited commercial harvest. A total of 1,281 spring chinook were sold during a May 6-May 27 treaty Indian dipnet fishery.

### **Treaty Indian Ceremonial and Subsistence Harvest**

The C&S catch in Zone 6 has included 600-10,100 upriver spring chinook and averaged 5,387 fish per year since 1986 (6.5% of the upriver runs). The preseason catch guideline for the 2000 C&S mainstem fisheries was 10,000 spring chinook, based on the expired CRFMP and the forecasted run of 134,000. The four tribes issued permits for gillnet C&S fisheries for spring chinook during late March through May. The subsistence fishery was open throughout the spring migration period. The C&S catch of spring chinook totaled 10,100 or 5.7% of the upriver run of 178,600. The TAC estimates 6.9% of the treaty commercial and C&S catch, or 782 fish were Snake River wild spring chinook. A catch of 782 Snake River wild spring chinook represents 6.3% of the estimated 2000 Snake River wild spring chinook return of 12,400 (Table 29).

The CRFMP provides for a 10,000 minimum spring and summer chinook entitlement for treaty Indian C&S purposes. A portion of this entitlement is taken in mainstem C&S fisheries up to limits specified in the 1996-1998 Management Agreement (extended through July 31, 1999). The majority of the harvest is to be taken from the spring chinook run and not the summer chinook run. If the minimum C&S entitlement of 10,000 fish is not reached in each calendar year, then the balance shall be provided by the states from the Cowlitz Salmon Hatchery, Willamette River system hatcheries below Willamette Falls, or other hatchery facilities having spring and summer chinook or fish of equal quality. For the first time since the inception of the CRFMP this entitlement was met entirely with treaty C&S fisheries. No hatchery surplus was needed to fulfill the 10,000 fish entitlement in 2000.

### **Non-Indian Recreational Harvest**

Upriver spring chinook are harvested incidentally by the lower Columbia sport fishery in March-May (Tables 27 and 28). The upriver run reaches peak abundance in the lower river from mid-April to mid-May. Since 1977, no mainstem recreational fisheries have targeted on upriver spring chinook. The recreational fishery is scheduled to close each year on January 1 above the I-5 Bridge (RM 106) and April 1 for that portion of the river below the I-5 Bridge. At a Joint State hearing on March 14, 2000, by emergency action the Columbia sport fishery for salmon, steelhead, and shad was closed below the I-5 bridge effective March 16. This closure was enacted to protect upriver spring chinook and meet federal ESA requirements.

The annual lower Columbia River sport catch ranged from 9,900-33,100 during 1960-1974 and averaged 19,600 which represents 5-23% and an average of 11% of the upriver spring chinook run. The sport fishery caught 14,200 (10% of the upriver run) during an April 12-May 31 emergency reopening in 1977. During 1978-1997, incidental catches of upriver

spring chinook in the lower Columbia sport fishery ranged between 0-3,100 fish and averaged 700 fish (0.8% of upriver runs). High and cold turbid water conditions in February and early March of 2000 and low salmon numbers resulted in a catch of 121 upriver chinook from the 9,900 salmonid angler trips in the mainstem sport fishery through the March 15 ending date.

## **Summer Chinook**

### **Status**

Summer chinook enter the Columbia River in June and July on their migration to the upper Columbia River Basin. The run is comprised of an earlier migrating race destined primarily for the Salmon River drainage in Idaho and a later migrating race destined for the upper Columbia River and its tributaries above Priest Rapids Dam with the vast majority of the run returning to the upper Columbia Basin (Table 35).

Historic summer commercial seasons harvested summer chinook, sockeye salmon, summer steelhead, and shad. Commercial seasons during 1909-1942, were open May 1 to August 25. Two principal reductions in fishing time occurred before the season below Bonneville was closed entirely in 1965: (1) effective 1943, an extended closure in June was enacted to protect chinook salmon and (2) a closure in the last half of July became effective in 1952. No summer chinook season has occurred below Bonneville Dam since the 2-day season allowed in 1964 and the last summer chinook season above Bonneville Dam occurred in 1965.

The minimum run size entering the Columbia River is calculated by combining the commercial and sport catches from the lower Columbia River during June and July with the Bonneville Dam count (Figures 23 and 24 and Tables 33 and 34). The summer chinook run is the most severely depressed of all chinook runs to the Columbia River. Even with closures of sport and commercial fisheries, the minimum spawning escapement goal of 80,000-90,000 over Bonneville Dam has not been achieved since 1969. The run of 30,600 adults in 2000 was higher than the recent ten-year average of 20,600.

In May 1992, the Snake River wild portion of the summer chinook run was combined with the Snake River wild portion of the spring chinook run to form the Snake River spring/summer ESU which was listed as threatened under the ESA (Table 9).

The 2000 run of Snake River wild summer chinook was 886 adults, as compared to the recent 21-year (1979-1999) average run of 3,300. Lower Granite Dam is used as the measurement of escapement for this stock. In 2000, the escapement over Lower Granite Dam was 846 adults, or about 34% of the 1979-1999 average escapement of 2,500 (Table 36).

### **Non-Indian Commercial Harvest**

Summer chinook have not been harvested as a target species since 1964. Incidental harvest was allowed in 1967-1973 during shad and sockeye seasons and no harvest has occurred since 1974, except jacks (chinook  $\leq 24$ " ) during the 1984-1988, and 2000 sockeye seasons (Figure 25 and Tables 33, 34, and 37). Summer chinook fisheries in 2000 were managed to limit impacts on upriver summer chinook to no more than 1% of the upriver run in non-Indian commercial and recreational fisheries combined.

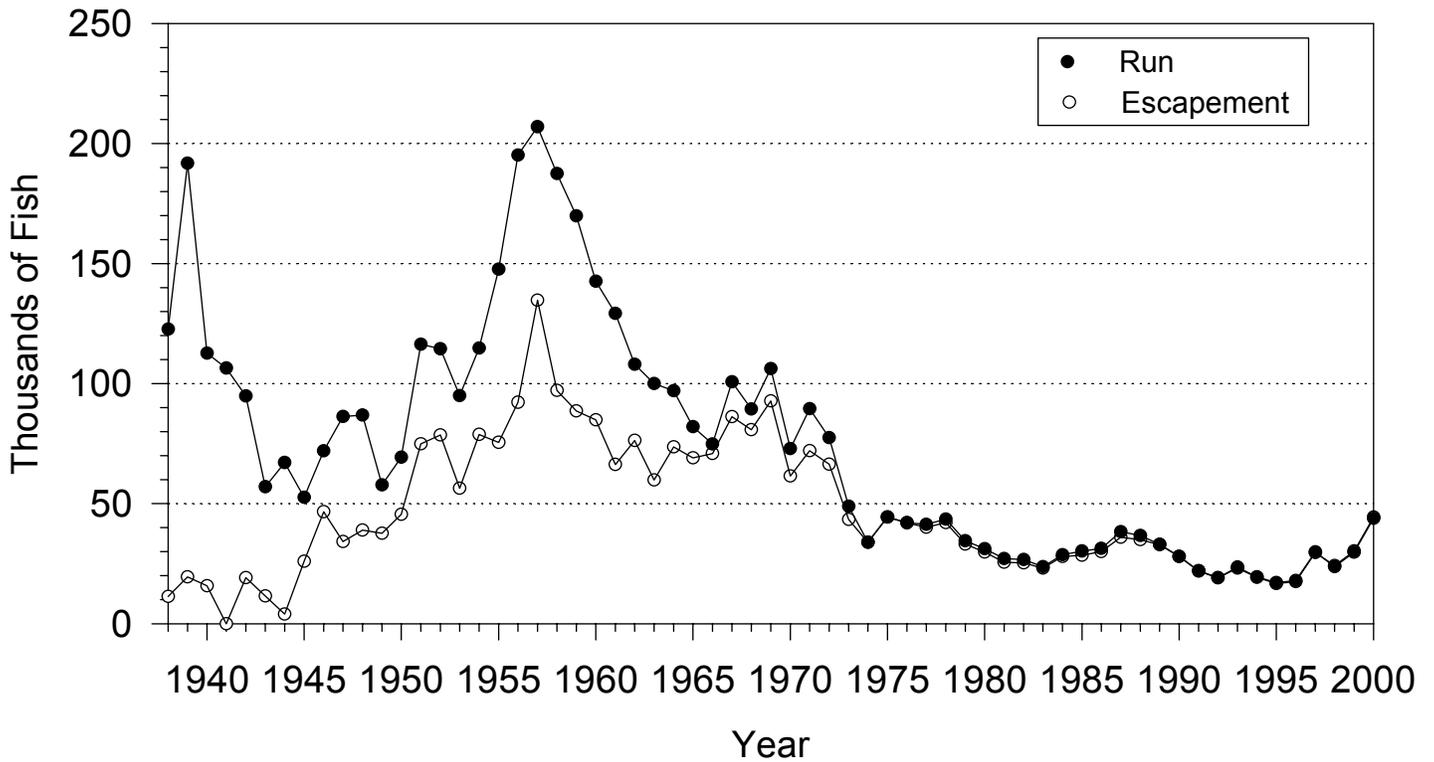


Figure 23. Estimated Numbers of Upriver Summer Chinook, Including Jacks, Entering the Columbia River and Escapement, 1938-2000.

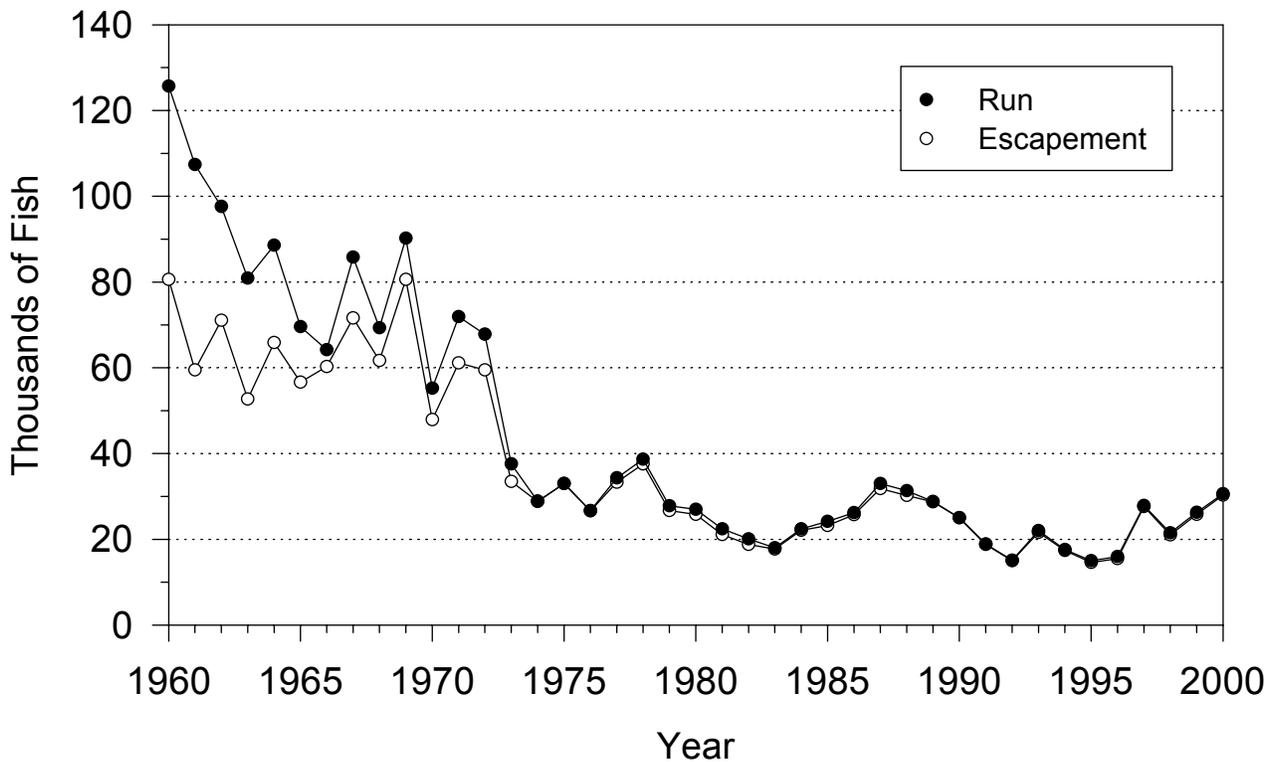


Figure 24. Estimated Numbers of Upriver Summer Chinook Adults Entering the Columbia River and Escapement, 1960-2000.

## Treaty Indian Harvest

Summer chinook have not been harvested as a target species since 1965. Incidental harvest occurred in 1966-1973 during shad and sockeye seasons and no harvest occurred from 1974-1984. Summer chinook were allowed for sale as an incidental species during the 1985-1988 sockeye seasons; however, a 4-1/2" maximum mesh size restriction was adopted to minimize chinook catch. No sockeye fisheries occurred during 1989-2000 and therefore no summer chinook were landed commercially during 1989-2000 (Figure 25 and Tables 33, 34, and 37).

The treaty Indian fishery impacts on upriver summer chinook were limited to no more than 5% of the upriver run. There was no C&S gillnet fishery for summer chinook in 2000; however, platform and hook and line C&S fisheries were open. The harvest of summer chinook from platform and hook and line fisheries in 2000 was 280, of which an estimated 8 were Snake River wild summer chinook (Table 36).

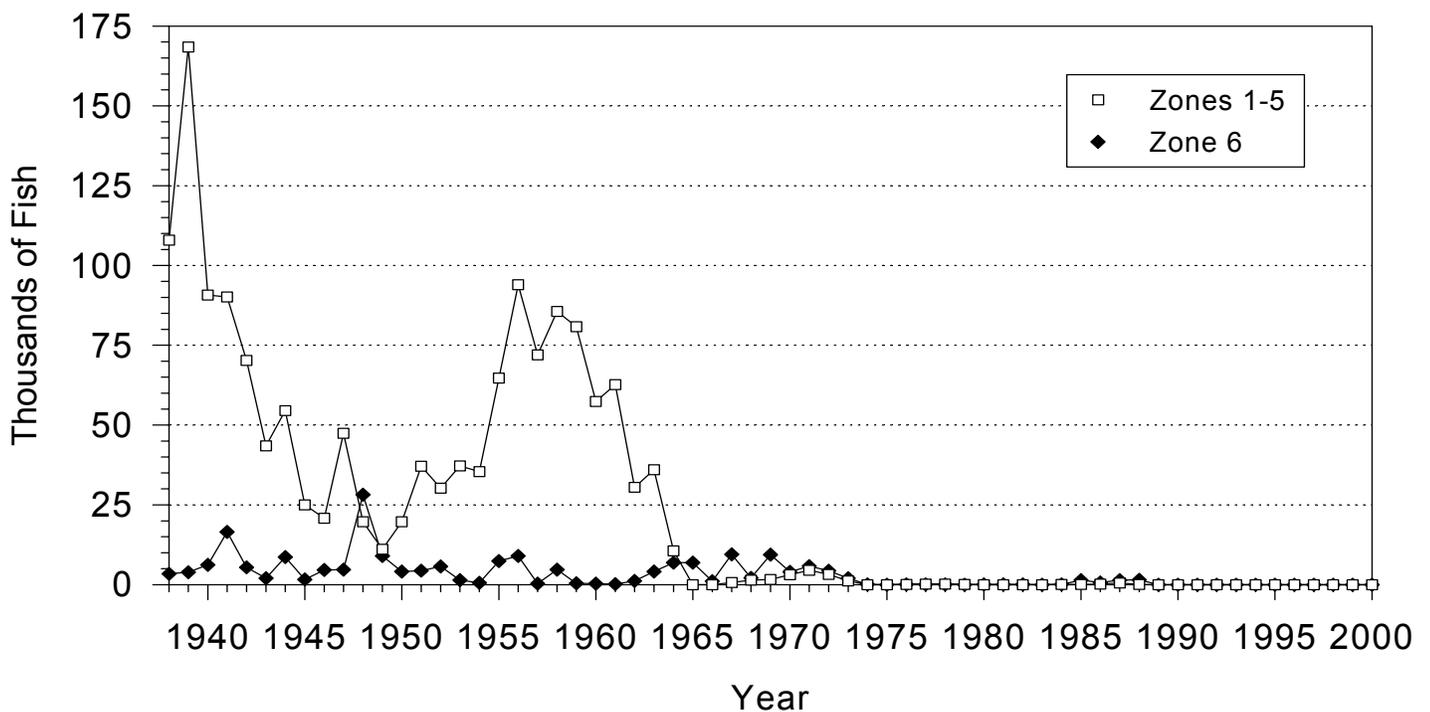


Figure 25. Columbia River Summer Chinook Commercial Landings, 1938-2000.

## Non-Indian Recreational Harvest

No recreational harvest of summer chinook in the Columbia River has been allowed since 1973, except that jacks were permitted to be taken in summer steelhead fisheries during 1977-1991 and 2000. A total of 198 summer chinook jacks were taken during the June 28-July 31 retention season in 2000. The summer chinook jack catch included some 2-year-old (mini-jack) spring chinook (Tables 33 and 34).

# Fall Chinook

## Upriver Run

Columbia River upriver fall chinook originate from hatchery and natural production areas upstream of Bonneville Dam. The run includes "tule" and "bright" fall chinook stocks. The upriver fall chinook run is managed under the terms of the CRFMP and consists of three stocks; Bonneville pool hatchery (BPH), upriver bright (URB), and mid-Columbia River bright (MCB).

The BPH is a tule fall chinook stock destined for the Spring Creek National Fish Hatchery (NFH) and tributaries in Bonneville Pool. URB's are a bright fall chinook stock destined for the mainstem Columbia River, tributaries upstream of McNary Dam, and the Deschutes River. The hatchery and wild URB fall chinook originating from the Snake River are referred to as Snake River brights (SRB) and are considered to be a sub-component of the URB stock. The wild portion of the SRB sub-component is known as Snake River wild (SRW) and were defined as a single ESU (Snake River fall) and listed as threatened under the ESA in April 1992.

URB hatchery stock fall chinook reared and released below McNary Dam are referred to as MCBs. The MCBs include Bonneville upriver brights (BUB) and pool upriver brights (PUB). The BUB stock is released below Bonneville Dam and the PUB stock above Bonneville Dam.

The estimated total return (including jacks) of all upriver fall chinook stocks entering the Columbia River and the escapements from 1938-2000 are listed in Table 38 (Figure 26). The total run has ranged from 153,100 (1993) to 760,700 (1947) fish. The 1938-1999 average was 338,000 fish. A total of 265,500 fish returned in 2000. Since 1951, with exception of the 1986-1988 period, the total run size has been less than 400,000 fish.

During 1938-2000 upriver fall chinook total adult and jack escapement has ranged from 55,100 in 1953 to 310,200 in 1986 and averaged 154,100 fish. Since 1938, on average approximately 50% of the total upriver fall chinook run entering the Columbia River has reached escapement areas. Most recently, since 1992, escapement has exceeded 70% of the upriver fall chinook returns to the Columbia River. In 2000, the escapement was 206,300 fish and the escapement/return ratio exceeded 75%.

The estimated number of upriver fall chinook adults entering the Columbia River and escapements from 1970-2000 are listed in Table 39 (Figure 27). The adult return has ranged from 125,200 (1983) to 469,200 (1987). The 1970-1999 average adult return was 224,500 fish. An estimated 204,500 adults entered the Columbia River in 2000.

During 1970-1999 upriver fall chinook adult escapement has ranged from 55,200 in 1972 to 198,400 in 1987 and averaged 115,500 fish. On average, approximately 54% of the returning upriver adults reached escapement areas during this period. Since 1993, adult escapement has been at or above 70% of the adult run entering the Columbia River and 2000 continued that trend with an escapement of 149,700 adults and an escapement/return ratio exceeding 73%.

Upriver run size and management decisions are based on Bonneville Dam counts and sport and commercial harvest estimates. Before 1980, harvest timing was used to estimate the impacts to upriver races. Since 1980, harvest impacts have been determined using CWT analysis. Specific fishery proposals change annually based on relative return forecasts and escapement needs for the upriver stocks.

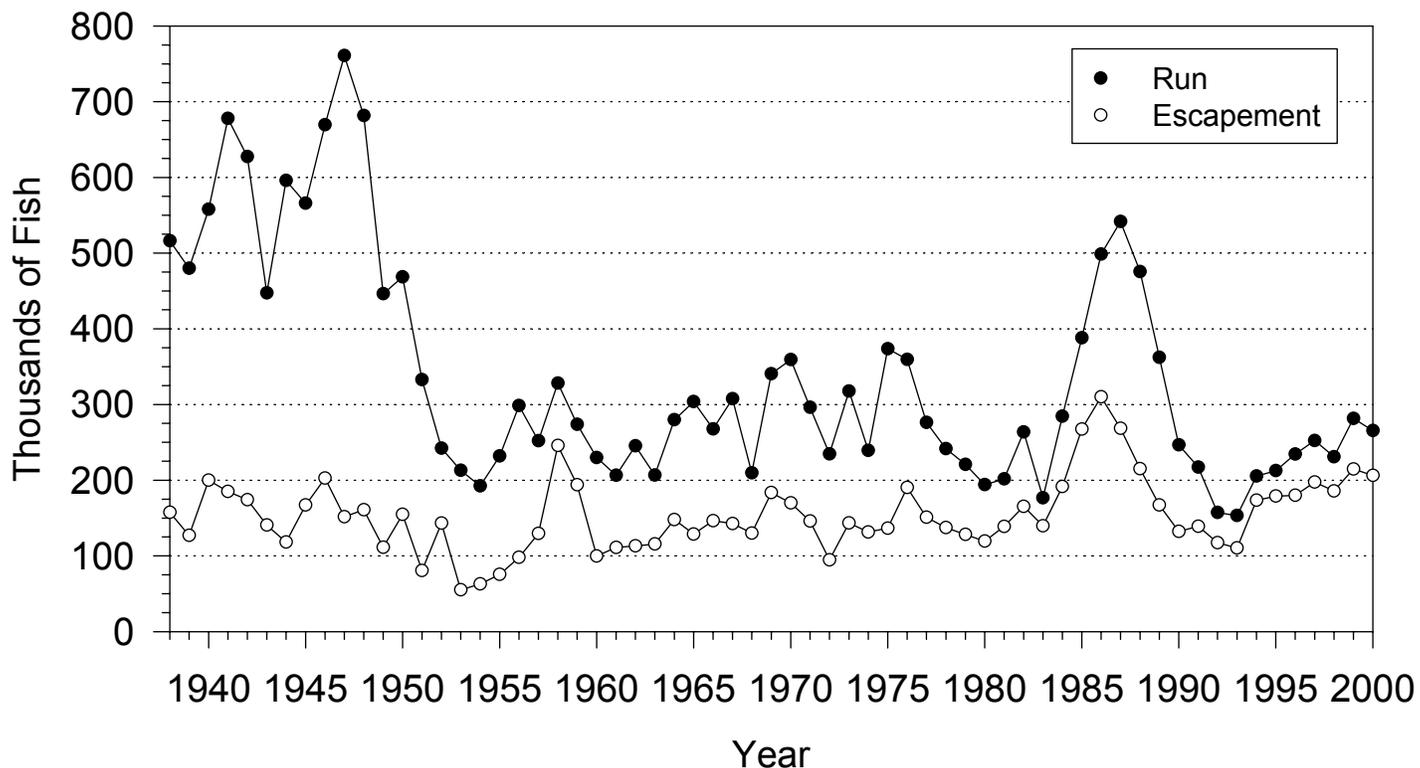


Figure 26. Estimated Numbers of Upriver Fall Chinook, Including Jacks, Entering the Columbia River and Escapement, 1938-2000.

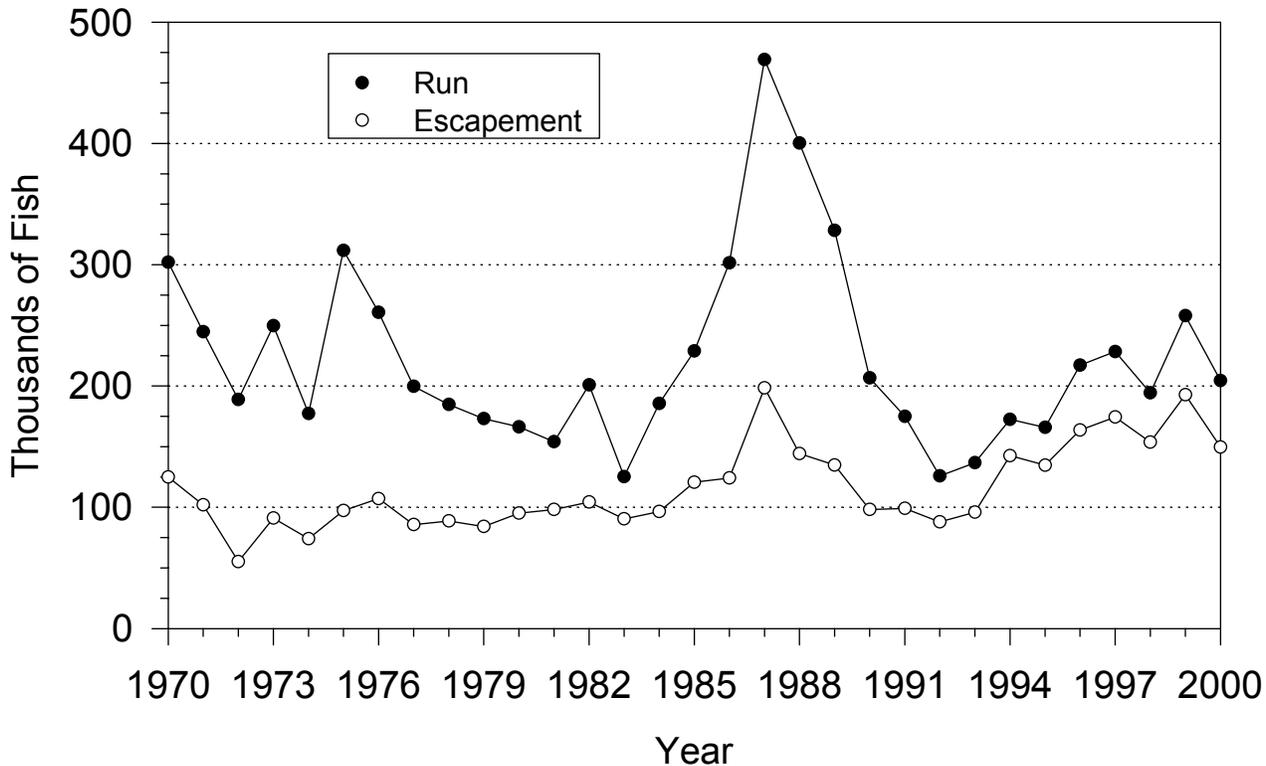


Figure 27. Estimated Numbers of Upriver Fall Chinook Adults Entering the Columbia River and Escapement, 1970-2000.

### **BPH Stock Status**

Historically, tule fall chinook were native to the Wind and White Salmon rivers in Washington. The State of Washington operated a salmon hatchery near the mouth of the Wind River from 1899 until 1938 to propagate Wind River stock fall chinook. In 1937, Carson NFH was constructed on the Wind River and began fall chinook production. Over time, Carson NFH switched to spring chinook production. The last hatchery release of fall chinook in the Wind River was in 1976. Currently, natural tule production in the Wind River is depressed, averaging less than 100 spawners annually.

In 1901, tule fall chinook broodstock was taken from the White Salmon River for production in Spring Creek NFH. Eventually, rearing ponds on the White Salmon River were used to raise fall chinook. The last release of fall chinook in the White Salmon River was in 1984. Today, natural tule production in the White Salmon is also depressed, averaging about 200 spawners annually.

Historically, BPH fall chinook hatchery production occurred at Little White Salmon and Klickitat hatcheries in Washington. The last tule fall chinook release from Klickitat Hatchery occurred in the late 1980s and the last small release of Spring Creek stock from Little White Salmon Hatchery occurred in 1993. Currently, BPH fall chinook are produced only at Spring Creek NFH. The current escapement goal for BPH fall chinook is 7,000 adult (4,000 females) fall chinook returning to Spring Creek NFH. This escapement would achieve the 15-16 million smolt production requirement of the hatchery. In 2000, only 2,760 adult females returned out of the 4,000 females needed.

The adult escapement goal was achieved annually from 1970-1984, 1991-1992, 1994-1997, and in 1999. During 1986-1991, 1993, and 1998, low returns to Spring Creek NFH required supplementation with broodstock trapped at Bonneville Dam. Bonneville trap contribution ranged from 5-58% of the total broodstock collected. No trapping of BPH fall chinook occurred in 2000.

In 1987, the BPH returns to the mouth of the Columbia River were only 9,100 fish, which converted to 3,900 fish for Spring Creek NFH (less than half the goal). Lower river tule fall chinook (the closest relative of Spring Creek stock) were transferred from Bonneville and Abernathy hatcheries to cover the deficit. About 60% of the 1988 releases were hybrid Spring Creek and Abernathy/Bonneville stock. Since Spring Creek genes were present in all releases, the U.S. Fish and Wildlife Service (USFWS) concluded that stock integrity could be maintained by selective spawning.

The upriver tule fall chinook adult hatchery returns (including fish trapped from Bonneville Dam) are listed in Table 40. The number of adult BPH fall chinook entering the Columbia River from 1980-2000 is listed in Table 41 (Figure 28). The total number of adults has ranged from 9,100 (1987) to 120,700 (1982) and averaged 39,000 during 1980-1999. An estimated 20,500 adults entered the Columbia River in 2000.

### **URB Stock Status**

The URB fall chinook are what remains of the original upriver run. Historically, they spawned in the mainstem Columbia River near the present locations of Bonneville, The Dalles, John Day, and McNary dams and the mainstem Snake River. Currently, the URB stock production includes natural production in the Columbia, Snake, Deschutes, and Yakima rivers. The Hanford Reach of the Columbia River is the primary natural production area. Hatchery propagation of URB stock occurs at several upriver hatcheries, chiefly Priest Rapids and Lyons Ferry. Ringold Hatchery production, which had ended in 1986, resumed in 1993. No broodstock was taken at Ringold Hatchery in 2000.

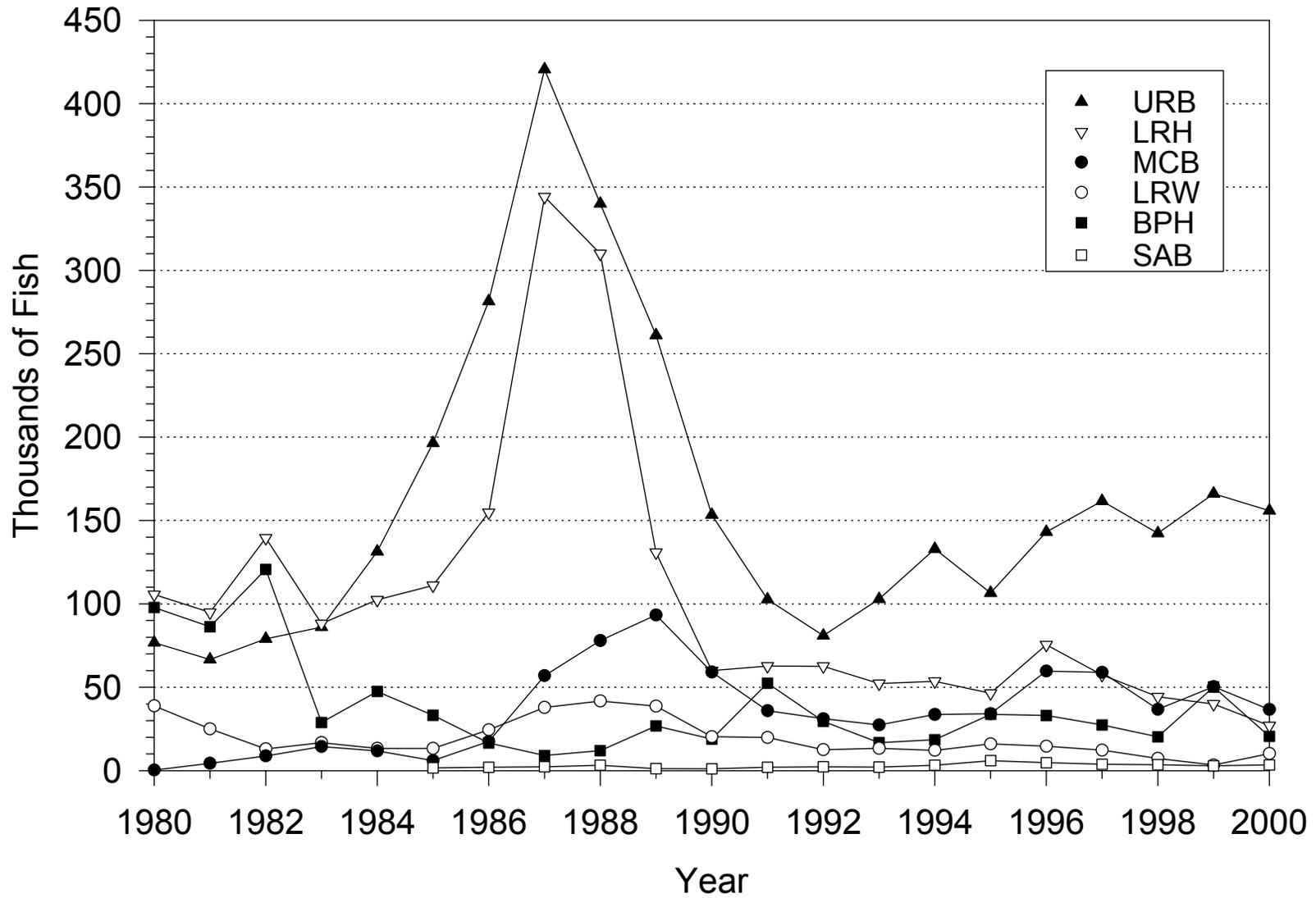


Figure 28. Estimated Stock Accountability for Six Components of Columbia River Fall Chinook, 1980-2000.

An interim spawning escapement goal of 40,000 natural spawning Columbia River upriver bright fall chinook adults above McNary Dam is stated in the CRFMP. This goal, derived by the TAC in 1982, included 38,700 Hanford Reach and 1,100 Snake River natural spawners. The McNary Dam escapement goal of 40,000 adults was not achieved from 1974-1982, but has been achieved annually since then.

From 1990-1993, the escapement goal was increased to 45,000 in recognition of increased hatchery programs above McNary Dam and concern for the wild SRB stock. In 1994, tribal and state managers agreed to increase the management goal above McNary Dam to 46,000 adult fall chinook to include the full opportunity for the Vernita-Hanford Reach area recreational fishery, as well as escapement needs.

In 2000, tribal and state managers agreed to maintain the management goal of 46,000 adults above McNary Dam which would include the aforementioned recreational fishery plus achieve the hatchery and natural escapement goal of 43,500 adults past McNary Dam. The 2000 McNary Dam count was 67,600 adults. Table 40 lists upriver fall chinook adult counts at McNary Dam from 1960-2000.

The number of URB fall chinook adults entering the Columbia River and escaping to spawning locations during 1980-2000 is listed in Table 42 (Figure 28). The total number of adults has ranged from 66,600 (1981) to 420,600 (1987) and averaged 161,600 during 1980-1999. An estimated 155,900 adults entered the Columbia River in 2000.

### **MCB Stock Status**

The MCB stock resulted from an egg bank program initiated in 1977 at Bonneville Hatchery, via trapping at Bonneville Dam, with the first adult returns occurring in 1980. Since then, MCB rearing programs have been expanded to Little White Salmon, Klickitat, and Ringold hatcheries in Washington plus Irrigon Hatchery (through 1991), Umatilla Hatchery (beginning in 1992), and 3-Mile Dam broodstock pond in Oregon. Although, the MCB stock is not genetically distinct from the URB stock, it may have different maturation and survival rates due to a larger hatchery component.

In 1978, the states of Oregon and Washington, federal agencies, and the U.S. Army Corps of Engineers (USACE) agreed to fall chinook mitigation for completion of John Day Dam. The agreement called for replacement of an annual spawning escapement of 30,000 adults, plus all offspring contributing to ocean and in-river fisheries.

The mitigation program was originally housed at Bonneville and Spring Creek hatcheries. The USACE funded expansion of rearing facilities at these hatcheries. The John Day Mitigation Production Program (JDMP) originally released tule fall chinook, then switched to URB stock. In 1986, the State of Washington's responsibility for JDMP at Spring Creek NFH was transferred to Little White Salmon NFH.

Progeny from these hatchery programs are raised on station and released below Bonneville Dam and in tributaries between Bonneville and McNary dams. Significant natural spawning populations have developed in the Klickitat, White Salmon, and Wind rivers from these releases.

Recently, a bright fall chinook population has been found spawning in the mainstem Columbia River downstream from Bonneville Dam. The joint staffs of WDFW/ODFW have recently classified these fish as Lower River Bright (LRB) stock for the purpose of fisheries modeling. Because this population is comprised of natural spawning fish with little to no CWTs, these fish were included with the BUB component of MCBs until 1998. Beginning in the fall of 1998 the LRB stock was considered a separate stock.

Planting in the Umatilla River, John Day Reservoir, Yakima River, and the Hanford Reach area has also occurred. Since 1992, MCB releases into the Yakima River have been scaled back or eliminated due to concerns about the potential genetic influence on the native URB population that spawns in Marion Drain.

The number of adult MCB fall chinook entering the Columbia River from 1980-2000 is listed in Table 43 (Figure 28). The adult return has ranged from 300 (1980) to 93,300 (1989) fish and averaged 35,900 during 1980-1999. An estimated 36,700 adults entered the Columbia River in 2000.

### **SRB Stock Status**

The naturally spawning fall chinook run in the Snake River is a remnant of a formerly large run that returned an average of 41,000 fall chinook annually during 1957-1960. Returns declined coincidentally with construction of Brownlee (1958), Oxbow (1961), and Hells Canyon (1967) dams which flooded spawning reaches and blocked passage. Snake River wild (SRW) fall chinook were listed as threatened under the ESA in April 1992.

Fall chinook from the Snake River (SRB) are a component of the URB stock. Both wild and hatchery-produced runs return to the Snake River Basin. The Snake River component has accounted for 1.7% (1994) to 9.2% (1991) of the total URB return during 1986-1999. An estimated 8.2% of the URB return in 2000 were SRBs.

The number of SRB fall chinook adults entering the Columbia River during 1986-1999 has ranged from 2,200 (1994) to 16,100 (1987) and averaged 6,900 (Table 44). An estimated 12,800 adults entered the Columbia River in 2000.

The number of SRW fall chinook adults entering the Columbia River during 1986-1999 has ranged from 665 (1990) to 4,811 (1988) and averaged 2,076 (Table 45). An estimated 1,977 wild adults entered the Columbia River in 2000.

Wild escapement is measured at Lower Granite Dam, although some natural spawning (<100 fish) occurs in the Tucannon and Palouse rivers. The estimated number of SRW fall chinook adults escaping over Lower Granite Dam during 1986-1999 has ranged from 78 (1990) to 905 (1999) and averaged 461 (Table 45). Overall, approximately 25% of the SRW adult fall chinook entering the Columbia River have escaped over Lower Granite Dam during 1986-1999. In 2000, 43% passed Lower Granite Dam which is similar to the recent 5-year (1995-1999) average of 34%.

The number of SRW fall chinook adults that enter the Columbia River and reach spawning grounds above Lower Granite Dam is dependent on two main factors; fishery harvest impacts and Columbia and Snake River system passage losses. During 1986-1999, the number of SRW fall chinook adults harvested during non-Indian and treaty Indian fisheries have ranged from 192 (1994) to 3,065 (1988), representing 18.2% (1994) to 63.7% (1988) of the total number of SRW fall chinook entering the Columbia River. Since 1992, harvest rates have averaged less than 30%. The 2000 harvest of 566 fish represented 28.6% of the run entering the Columbia River.

Dam passage losses are fish counted at a particular dam that are unaccounted for at the next dam upstream after estimating all fishery catches and tributary turn-offs between the two dams. During 1986-1999, the number of SRW fall chinook adults that were counted at Bonneville Dam, but were missing at Lower Granite Dam have ranged from 162 (1990) to 1,036 (1991). After subtracting harvest from the total run size, Bonneville to Lower

Granite dam passage losses ranged from 36.6% (1993) to 76.5% (1991) of the remaining fish. An estimated 555 adults (39.3%) were lost during dam passage in 2000. Table 45 lists fishery catches and dam passage losses of Snake River wild fall chinook adults 1986-2000.

The CRFMP short-term production goal at Lyons Ferry Hatchery is an annual release of 4.9 million fall chinook and the long term goal is 9.0 million. Since the early 1980s, Lyons Ferry Hatchery has released juvenile fall chinook into the Snake River and trapped returning adults at Ice Harbor and Lower Granite dams to supplement the broodstock. Due to the ESA status of SRW fall chinook, only marked fish have been trapped since 1991. A total of 1,470 marked adults were trapped at Lower Granite Dam in 2000. No fish have been trapped at Ice Harbor Dam since 1993.

### **Treaty Indian Harvest**

Prior to the completion of The Dalles Dam in 1957, treaty Indians and non-Indians both had commercial fisheries in the mainstem Columbia River from 15 miles above Bonneville Dam to the mouth of the Deschutes River. The treaty Indian dipnet fishery at Celilo Falls and nearby fishing sites accounted for most of the catch. Before the completion of The Dalles Dam, the 1938-1956 estimated number of upriver fall chinook landed each year from above Bonneville Dam ranged from 29,700 (1955) to 187,800 (1941) (Table 38).

After the completion of The Dalles Dam, treaty Indian fishing sites were inundated, virtually eliminating the dipnet fishery. The Zone 6 area was closed to commercial fishing by the states, and the non-Indian commercial fishery was restricted to the area below Bonneville Dam. The current treaty Indian fishing area (Zone 6) was established in 1969 and lies between Bonneville to McNary dams, with sanctuaries at tributary mouths and above and below the dams. Zone 6 covers approximately 140 river miles. Fish caught in the Klickitat River dipnet fishery may also be sold during open Zone 6 seasons.

Upriver fall chinook landings above Bonneville Dam dropped to 1,200 fish in 1959. For several years, treaty Indian fishers experimented with different fishing methods and soon became efficient with gill nets. By 1963, the number of upriver fall chinook landed rose to 23,500 fish. From 1964-1999 (except 1966), landings have exceeded the 1963 total.

Prior to 1957, and since 1969, commercial fisheries above Bonneville Dam were regulated by the states of Oregon and Washington. From 1957-1968, fisheries were set by tribal ordinances. Prior to 1948, days open to commercial salmon fishing were the same as those below Bonneville Dam. In 1948, an experiment that regulated the fishery as the runs passed upstream was devised. From 1948-1956, the summer fishery closed no later than August 26, and the fall fishery began on September 10 and ended no later than December 15. Since 1969, the treaty Indian mainstem commercial fisheries have opened in early to late August and ended by October. Figure 14 displays commercial salmon seasons above Bonneville Dam during 1948-2000.

Since 1988, the management of Columbia River fish runs and fisheries has been principally based on the CRFMP. In 2000 the fall mainstem Columbia River commercial fisheries were managed based on the 2000 Management Agreement which was principally based on the 1996-1998 and 1999 Management Agreements. The states of Oregon and Washington, Federal parties, and Columbia River treaty Tribes reached an agreement on the management of upper Columbia River fall chinook for the time period of August 1 through December 31, 2000. This Management Agreement required that all Columbia River fisheries below the confluence of the Snake River be managed to ensure a 30% reduction in the harvest rate of SRW fall chinook relative to the 1988-1993 base period,

as represented by a 31.29% harvest rate index of the aggregate URB run. Intent is to provide for a tribal harvest of 50% of the harvestable surplus, and a reasonable non- Indian fishery which corresponded to an URB impact of 8.25% in 2000.

Table 46 lists Columbia River fall season chinook commercial landings in numbers and pounds from Zone 6 during August-December 1938-2000 (Figure 29). The landings have ranged from 19,200 pounds in 1959 to 3.8 million pounds in 1941. An estimated 737,800 pounds (37,500 fish) of salmon were sold to commercial buyers in 2000. The 1938-1999 average was 62,600 fish. The treaty Indian commercial catches for each race/stock of Columbia River fall chinook are found in Tables 41-45 and Tables 49-51.

Low prices paid by licensed commercial buyers during the fall seasons of 1996-2000, resulted in large numbers of fish being sold directly to the general public or be used for ceremonial and subsistence purposes. In 2000 an estimated 12,700 chinook were sold directly to the general public or taken home for personal use.

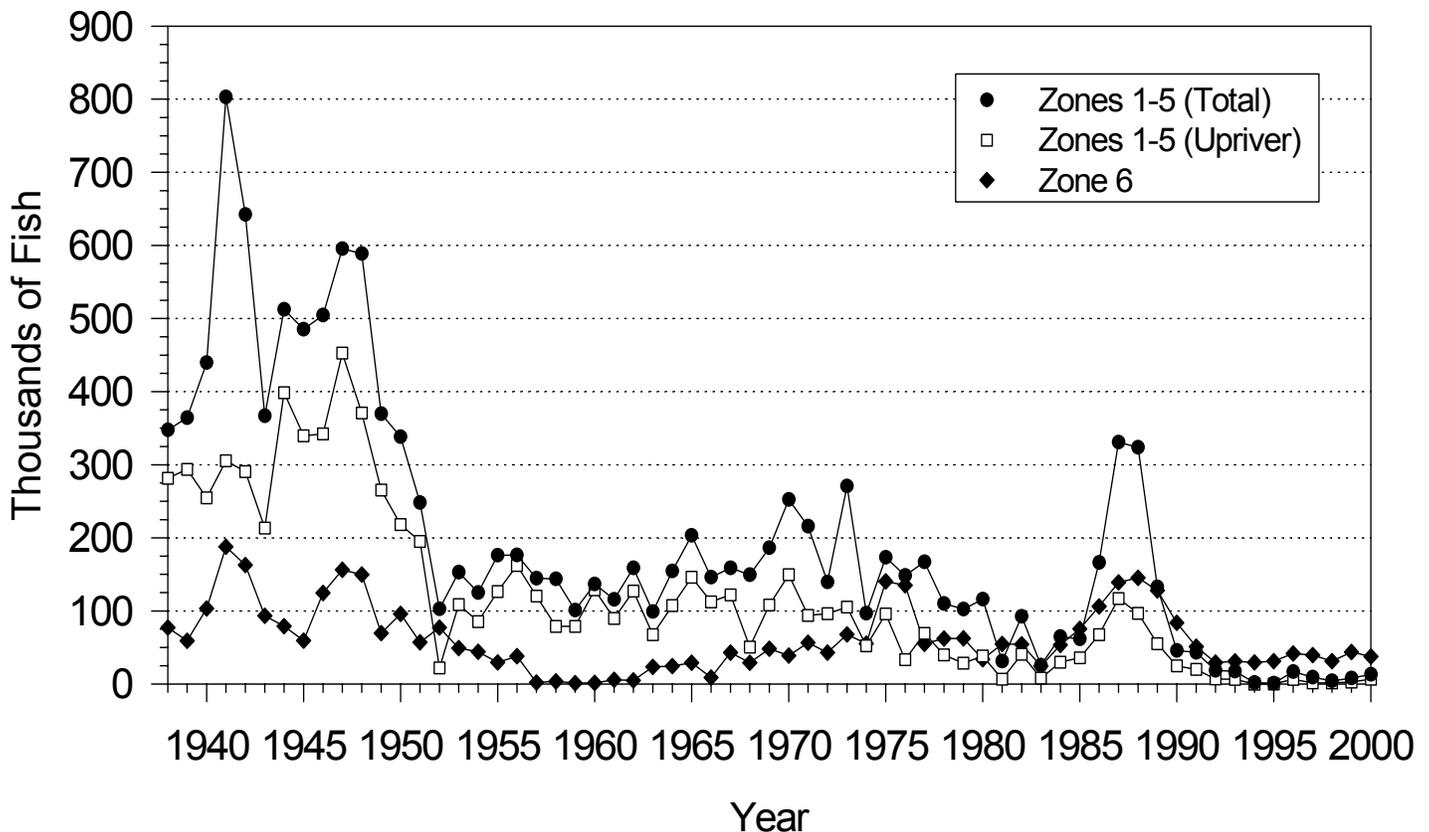


Figure 29. Columbia River Fall Chinook Commercial Landings, 1938-2000.

### **Non-Indian Recreational Harvest**

Recreational fisheries on the mid-Columbia River (Bonneville to McNary dams) have changed significantly since the construction of hydroelectric dams. Studies show that anglers spend more time fishing for resident fish and less time fishing for salmonids. In The Dalles Pool, a major sport fishery for salmon and steelhead has occurred at the mouth of the Deschutes River in Oregon. Minor fall chinook sport catch occurs in Bonneville Pool tributaries, including Drano Lake and the Wind, White Salmon, and Klickitat rivers in Washington. The mainstem mid-Columbia recreational fishery caught an estimated 7,600 fall chinook in 2000. An estimated 2,100 adult fall chinook were caught in the tributaries. The upper Columbia River (McNary to Chief Joseph dams) recreational fishery occurs primarily upstream from the Snake River; hence, the fishery was not constrained by SRW impacts. An estimated 4,400 adults and 700 jacks were caught in 2000. Most of the catch occurred in the Hanford Reach area.

### **Lower River Run**

The lower river run of fall chinook is destined for production areas downstream of Bonneville Dam and the naturally produced portion of this run was included in the lower Columbia River spring/fall ESU and listed as threatened under the ESA. The run consists of lower river hatchery (LRH) and lower river wild (LRW) stocks. Production of LRH stock now occurs in only one Oregon and five Washington hatcheries with limited natural production occurring in some lower river tributaries.

Lower river hatcheries in Oregon also produce limited numbers of MCB and select area bright (SAB) stock fall chinook. The SAB stock is a local hatchery stock that originated from the Rogue River fall chinook stock and is currently being reared at Klaskanine Hatchery for release into Youngs Bay (formerly called Rogue River bright stock or RRB). The BUB stock is released from Bonneville Hatchery.

The estimated total (including jacks) lower river fall chinook run entering the Columbia River from 1938-2000 is listed in Table 47 (Figure 30). The total lower river run has ranged from 14,200 (1956) to 497,800 (1941) fish and averaged 133,300 fish during 1938-1999. An estimated 58,500 fish returned in 2000.

The minimum numbers of lower river fall chinook, combined with the upriver run, form the total fall chinook run (including jacks) entering the Columbia River (Table 47). During 1938-1999, the minimum run has ranged from 231,900 (1954) to 1,175,700 (1941) fish and averaged 471,300 fish. An estimated 323,900 fish returned in 2000.

The estimated number of lower river fall chinook adults entering the Columbia River from 1970-2000 is listed in Table 48 (Figure 30). During 1970-1999, the total adult run size has ranged from 55,100 (1999) to 402,500 (1987) and averaged 144,500. An estimated 49,800 adults returned in 2000, a new record low return.

The minimum numbers of lower river adult fall chinook, combined with the upriver adult run, form the total adult fall chinook run entering the Columbia River (Table 48). During 1970-1998, the minimum run has ranged from 213,900 (1993) to 871,700 (1987) adults and averaged 374,100 adults. An estimated 254,300 adults returned in 2000.

Lower river run size updates and management decisions were based on Bonneville Dam counts and sport and commercial catch during the September-November time-frame. Before 1980, harvest timing was used to estimate the impacts to lower river stocks. Since 1980, harvest impacts have been determined using CWT analysis. Specific fishery proposals change annually, based on relative return forecasts and escapement needs of the lower river stocks.

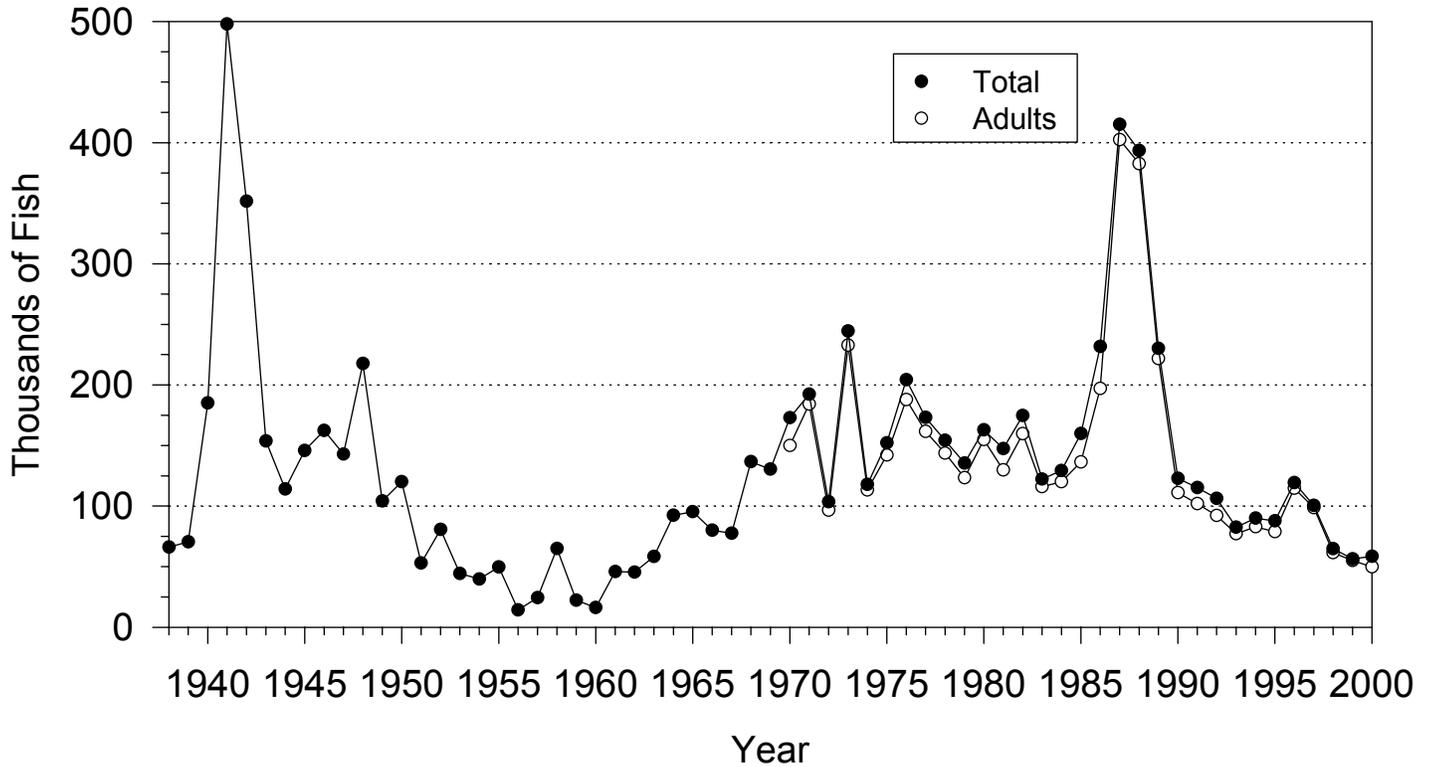


Figure 30. Estimated Numbers of Lower River Fall Chinook Entering the Columbia River, 1938-2000.

**LRH Stock Status**

The escapement goal for LRH stock fall chinook is stated in the CRFMP as broodstock necessary to meet hatchery program production requirements. This requirement had been defined as 33,600 adult fall chinook returning to Washington and Oregon Columbia River hatcheries. Due to federal funding reductions, Grays River, Abernathy, Lower Kalama, and Bonneville hatcheries no longer collect their own broodstock for production. The 2000 escapement goal was 14,500 fish.

The number of adult LRH fall chinook entering the Columbia River from 1980-2000 is listed in Table 49 (Figure 28). During 1980-1999, the total number of adults has ranged from 40,000 (1999) to 344,100 (1987) and averaged 106,900 adults. An estimated 27,000 adults returned in 2000 which was a new record low return.

**LRW Stock Status**

LRW production occurs primarily in the Lewis River in Washington, with smaller populations in the Cowlitz, Coweeman, and East Lewis rivers in Washington and the Sandy River in Oregon. A maximum sustainable yield (MSY) spawning escapement of 5,700 adult spawners has been recommended for the Lewis River.

The number of adult LRW fall chinook entering the Columbia River from 1980-2000 is listed in Table 50 (Figure 28). During 1980-1999, the total number of adults has ranged from 3,300 (1999) to 41,700 (1988) and averaged 19,700 adults. An estimated 10,200 adults returned in 2000.

### **SAB Stock Status**

The SAB stock was introduced into Big Creek Hatchery and the South Fork Klaskanine River in 1982 and 1983, respectively. The Youngs Bay net pen program began releasing SAB stock starting in 1983. The SAB fall chinook program now exists exclusively in Youngs Bay to increase harvest in the select area and eliminate excessive straying to outside escapement areas. Since 1997, all releases were from Youngs Bay net pens or Klaskanine Hatchery.

The number of adult SAB fall chinook entering the Columbia River from 1985-2000 is listed in Table 51 (Figure 28). During 1985-1999, the total number of adults has ranged from 1,100 (1990) to 6,000 (1995) and averaged 2,800 adults. An estimated 3,400 adults returned in 2000.

### **Non-Indian Commercial Harvest**

Non-Indian commercial fisheries have occurred in the Columbia River since the 1860s. Prior to the completion of The Dalles Dam in 1957, non-Indian and treaty Indians both had commercial fisheries in the mainstem Columbia River above Bonneville Dam. After the completion of The Dalles Dam, non-Indian commercial fishers were restricted to the Columbia River below Bonneville Dam. The fishing area is now limited to Beacon Rock (5 miles below the dam) downstream to Buoy 10 (near the mouth), a distance of approximately 140 river miles. In addition, Select Area/terminal fisheries have occurred in Youngs Bay since 1963. Other Select Area/terminal fisheries have occurred near the mouth of Big Creek (1983, 1987-1988, and 1996-1997), Tongue Point (1996-2000), Blind Slough (1996-2000), Deep River (1996-1997, and 2000), Steamboat Slough (2000), and several Washington tributaries (1980-1982).

Beginning in 1918, and extending to the present day, the Columbia River Compact has set non-Indian commercial fisheries. Since 1988, the management of Columbia River fish runs and fisheries has been principally based on the CRFMP. The 2000 fall mainstem commercial fisheries were managed per the 2000 Management Agreement, the subsequent ESA Section 10 Biological Opinion of the NMFS, and other considerations. The Management Agreement required that all Columbia River fisheries below the confluence of the Snake River will be managed to ensure a 30% reduction from the 1988-1993 average inriver harvest rate. The 30% reduction corresponds to 31.29% harvest rate index of the aggregate URB run with non-Indian fisheries allocated 8.25% and treaty Indian fisheries allocated 23.04%.

The early fall non-Indian commercial fishery is typically August to early September and targets on chinook. Prior to 1956, fall seasons were closed only between August 25 (or August 26) and September 10. No early fall fisheries occurred during 1980-1986 and 1992-1995. Early fall fisheries during 1987-1991 were limited in time and area and operated under strict quotas. An Area 2S fishery occurred in late August 1996 through 2000. Due to LRH and LRW concerns, no early fall fishery has occurred in all of Zones 1-5 since the 1989 season.

URB/BPH ratios in the dam count, test fishing, and hatchery escapement information are in-season management tools used to refine and shape the start of late fall commercial gillnet fisheries below Bonneville Dam. The late fall fishery period is typically mid-September to mid-November and targets on surplus Columbia River hatchery coho stocks, although significant catches of chinook can occur, especially during the first two weeks of the season. Chinook catches decline to very low levels by early October. Surpluses of URB and MCB fall chinook have resulted in significant catches of these stocks in the late

fall fishery. No fall fisheries have occurred in December since 1949 and salmon fisheries have not occurred in November since 1991. Figure 12 displays the commercial salmon seasons below Bonneville Dam, 1909-2000.

A total of 13,200 chinook were caught in the non-Indian fall commercial fisheries in 2000, the sixth lowest total on record (Table 46). Total chinook catches were 10,900 fish from the 24 day non-Indian mainstem season from late August through early November 2000. The 2000 Youngs Bay Select Area fishery was open 61 days from early August through October and produced a harvest of 1,750 fall chinook. During the 32-night seasons occurring in Select Areas from early September to late October, 250 chinook were caught in Tongue Point, 130 in Blind Slough, 110 in Deep River, and 80 in Steamboat Slough. Table 15 lists Oregon and Washington Select Area fishery seasons and landings during 1979-2000.

Table 46 (Figure 29) lists Columbia River fall season chinook commercial landings from Zones 1-5 (including select areas) in numbers and pounds of fish during August-December 1938-2000. During 1938-1999 the landings have ranged from 900 (1995) to 803,000 (1941) fish and averaged 200,400 fish. Landings in 2000 totalled 13,200 fish. The non-Indian commercial catches, by zone, for each race/stock of Columbia River fall chinook are found in Tables 41-45 and 49-51.

### **Non-Indian Recreational Harvest**

The recreational fishery in the Columbia River and its tributaries has existed since the late 19th century. During the late 1930s, the importance of the fishery at the mouth of the Columbia River expanded. Through the early 1950s, the fishery generally occurred in the estuary between Chinook and Megler, Washington. With the availability of larger, safer boats (around 1953), the fishery shifted from the estuary to the ocean. By 1982 ocean seasons were shortened when federal court decisions mandated increased escapement from ocean fisheries to areas with treaty Indian fisheries. As a result, a major portion of the recreational fishery shifted back to the estuary (Buoy 10 to Tongue Point/Rocky Point line).

A long standing fall salmonid recreational fishery occurs in the lower Columbia (above the Tongue Point/Rocky Point line) at or near major river mouths, such as the Cowlitz, Kalama, Lewis, and Sandy rivers. The lower Columbia River recreational catch of fall chinook is very small relative to run size, and the bright stocks represent a large portion of the catch.

The principal streams where sport harvest of fall chinook occurs among lower Columbia River tributaries are the Cowlitz, Kalama, Lewis, and Washougal rivers in Washington. The majority of catch in these streams occurs upstream of the river mouths. Oregon lower Columbia River tributaries produce very minor or no fall chinook catch.

The Columbia River Washington tributaries were not open in 2000 with the exception of the Elochoman and Kalama rivers.

The Buoy 10 and mainstem Columbia River fisheries were scheduled to be open August 1 through December 31 under permanent regulations. Under emergency regulations the Columbia River from the Buoy 10 line upstream to a line running from Tongue Point, OR to Rocky Point, WA was closed to chinook angling on August 28-31 with the expectation of the 9,000 chinook quota being met. Projected catches did not materialize, thus the Buoy 10 line upstream to the Tongue Point/Rocky Point line re-opened on September 1 for the remainder of the season.

Table 21 lists the chinook catch at Buoy 10 from 1982-2000. During 1982-1999 the chinook catch has ranged from zero in 1994 (closed to chinook retention until October 8) to 42,100 in 1987 and averaged 10,500. An estimated 6,100 chinook were caught in the Buoy 10 area, including the Astoria bridge fishery, in 2000.

The 2000 lower mainstem Columbia River recreational catch of fall chinook was 7,600 adults and 1,300 jacks (Table 20). The preliminary Washington tributary catch was 2,100 adults and 300 jacks. Final 2000 catch record estimates for tributary catches are unavailable at this time.

Lower Columbia River (including Buoy 10, mainstem, and tributaries) recreational fishery catch for each fall chinook race/stock is found in Tables 41-45 and 49-51.

## **Sockeye**

### **Status**

Sockeye salmon in the Columbia Basin have declined substantially from historic levels. Most of the original production of sockeye occurred in nursery lakes located in the uppermost reaches of the Columbia and Snake River basins. Upstream passage was blocked by the construction of several key dams including: Grand Coulee Dam (completed 1941) in the upper Columbia system; and by Swan Falls (1901), Sunbeam (1913-1934), Black Canyon (1914), and Brownlee (1958) dams in the Snake River system. Landlocked sockeye salmon, commonly called kokanee, are still produced in many of the areas that formerly contained anadromous runs. Currently, anadromous populations of sockeye originate almost exclusively from natural production in the Wenatchee and Okanogan basins. The anadromous run of sockeye in the Snake River has been reduced to a remnant run in Redfish Lake. Fewer than 50 of these sockeye have been counted annually at Lower Granite Dam since 1984, until 2000 when an estimated 400 fish migrated upstream of the dam. In December 1991, NMFS listed Snake River sockeye as endangered under the ESA (Table 9).

The 2000 Columbia River run of 93,700 sockeye was the largest return since 1988. (Figure 31 and Table 52). The escapement goal of 65,000 sockeye passing Priest Rapids Dam was achieved for the first time since 1993. The Okanogan stock escapement of 59,900 was the largest return since 1984 and was over four times greater than the 1995-1999 average. An estimated 19,100 sockeye returned to the Wenatchee River in 2000, which was a significant improvement from the low of 3,400 in 1998. An estimated 447 Snake River sockeye returned to the Columbia River in 2000, which was the largest return since the captive brood program was implemented. A total of 400 sockeye were estimated to have passed Lower Granite Dam in 2000, as compared to the 1990-1999 average of six (Table 53).

### **Non-Indian Commercial Harvest**

The 2000 sockeye return of 93,700 greatly exceeded preseason expectations and reached a harvestable level for the first time since 1988 (Figure 32 and Tables 52 and 54). A three night fishery in Area 2S was adopted with a total catch of 342 sockeye. Because of the late notice and the area of the fishery there was very low participation. Sockeye fisheries in 2000 were managed to not exceed a 1% impact on listed Snake River sockeye. The commercial fishery was not allowed to retain adipose fin-clipped sockeye, some of which were destined for the Snake River.

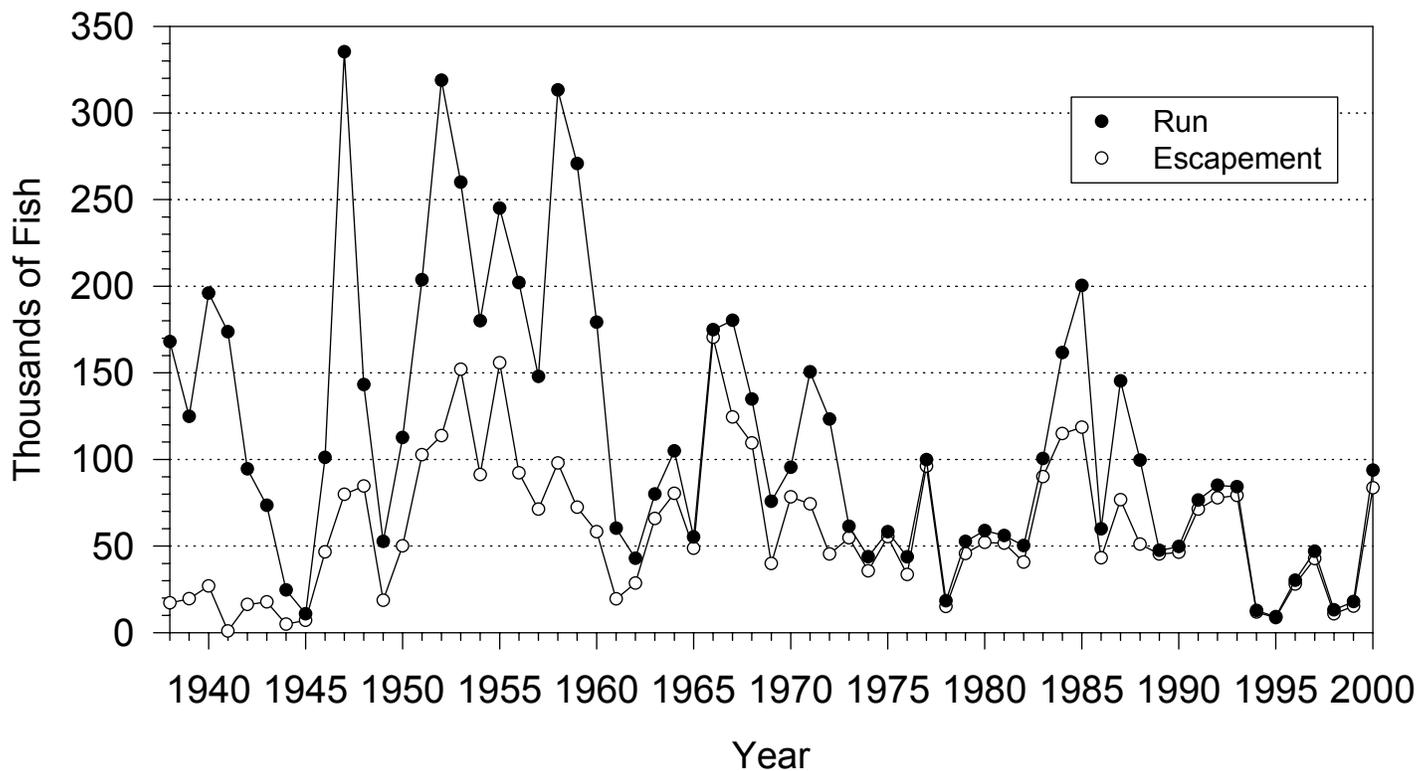


Figure 31. Estimated Numbers of Sockeye Entering the Columbia River and Escapement, 1938-2000.

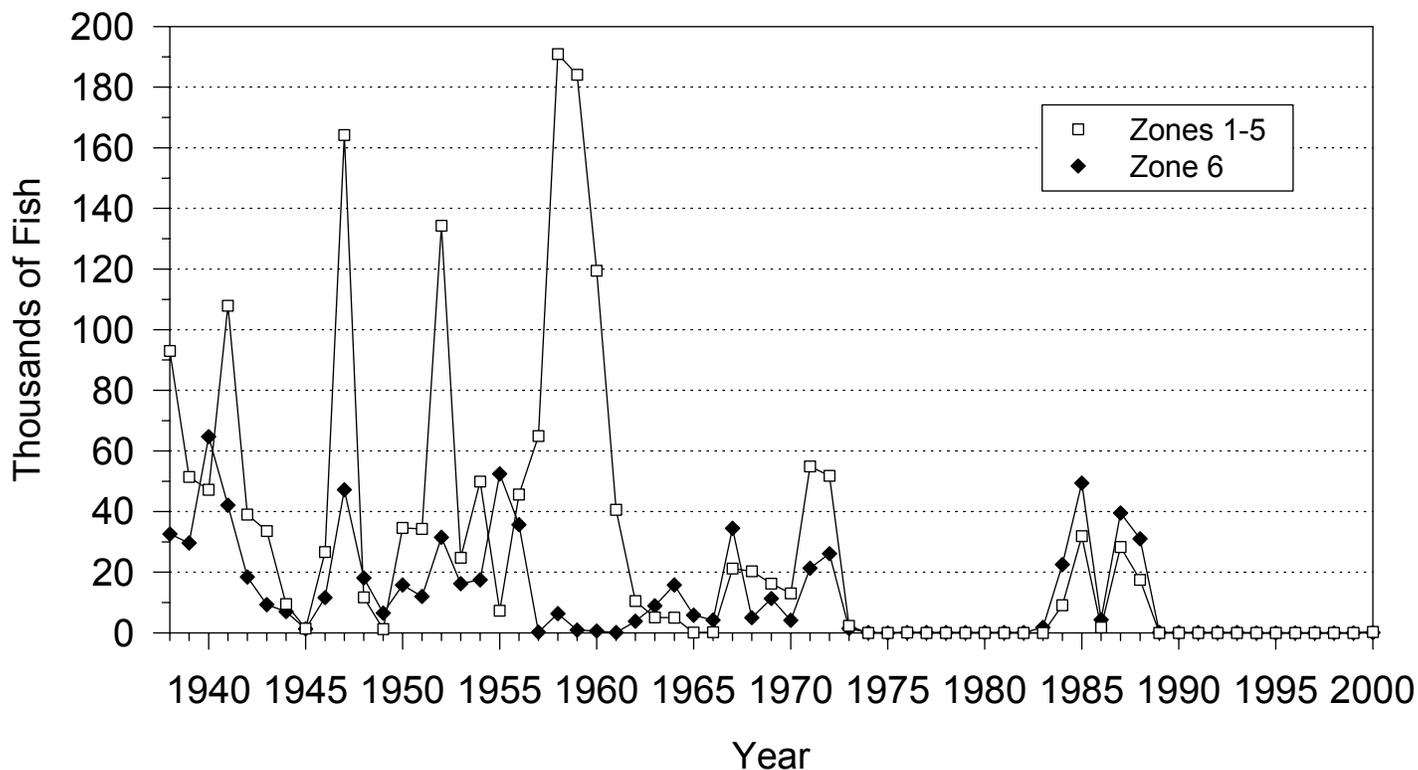


Figure 32. Columbia River Sockeye Commercial Landings, 1938-2000.

## **Treaty Indian Harvest**

The treaty Indian fishery was managed not to exceed 5% on runs less than 50,000 and 7% on runs greater than 50,000, with further discussion on runs greater than 75,000. Treaty Indian harvest in 2000 was limited to C&S fisheries from platforms with commercial sale allowed during these fisheries. A total of 2,765 sockeye were harvested for C&S purposes and 122 were sold commercially. No other commercial season targeting sockeye has occurred in Zone 6 since 1988 (Figure 32 and Tables 52 and 54).

## **Non-Indian Recreational Harvest**

The recreational sockeye fishery on the lower Columbia River has been closed since July 1991 due to the endangered status of Snake River sockeye. Even in years with large sockeye runs, the harvest in the mainstem Columbia River was minor (<300 fish). Most recreational fishing opportunity for sockeye is dependent on having harvestable returns to the rearing lakes. In 2000, with the large return of 93,700 sockeye, the retention of sockeye was allowed during the on-going mainstem steelhead sport fishery. A total of 24 sockeye were harvested. Although the return in 2000 was improved, most of the sockeye returned to the Okanogan system where a recreational season in the rearing lake (Osoyoos) does not occur due to management complications in U.S. and Canada boundary waters. Due to poor returns to the Wenatchee system there has been no fishery in Lake Wenatchee since 1993.

# **Coho**

## **Status**

Columbia River coho are an important species in both freshwater and marine fisheries. Columbia River coho are major contributors to the ocean fisheries off the coasts of Washington and Oregon and an important constituent of commercial and recreational fisheries in the Columbia River.

Columbia River coho enter freshwater primarily from August through November. The Columbia River coho return consists of two components (stocks), an early stock with peak migration through the lower Columbia River in early September, and a late stock that peaks in mid-October. The major contributor of both stocks is hatchery production with wild production probably comprising less than 10% of the total return (Table 55). Oregon facilities dominate hatchery production of early stock coho, while late stock coho production is limited to Washington facilities and dominated by the Cowlitz and Lewis River hatcheries. Hatchery releases of yearling coho during the 1980s averaged 29.5 million, 14.7 million early and 14.8 million late. The 2000 releases of yearling coho included 19.9 million early stock and 10.7 million late stock for a total release of 30.6 million smolts.

The minimum 2000 total coho return to the Columbia River mouth was 624,300, of which 551,400 were adults (Tables 56 and 57). The 2000 total coho return was the largest since 1991 (Figures 33 and 34). The 2000 early stock adult return was 324,000, which accounted for nearly 60% of the total adult return. This was more than double the recent 10-year average of 145,200 (Figure 35 and Table 58). The 2000 late stock adult return was 227,400, which was also more than double the recent 10-year average of 94,800 (Figure 35 and Table 59). The 2000 hatchery escapement of 232,000 adults, including 138,200 early stock and 93,800 late stock accounted for just over 40% of the total adult return (Tables 57, 58, and 59). The late stock hatchery escapement goal of 15,200 was easily met, as was the early stock hatchery escapement goal of 19,600 adults.

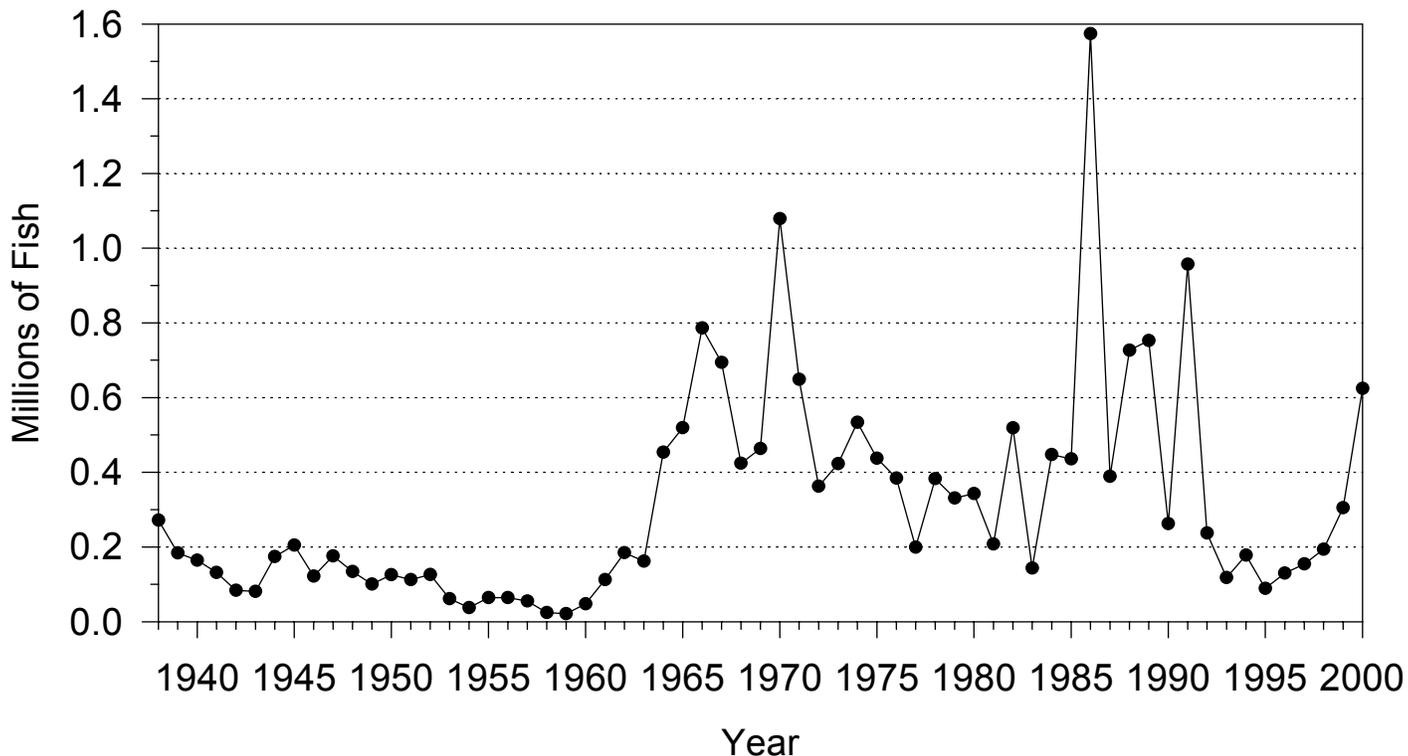


Figure 33. Estimated Numbers of Coho, Including Jacks, Entering the Columbia River, 1938-2000.

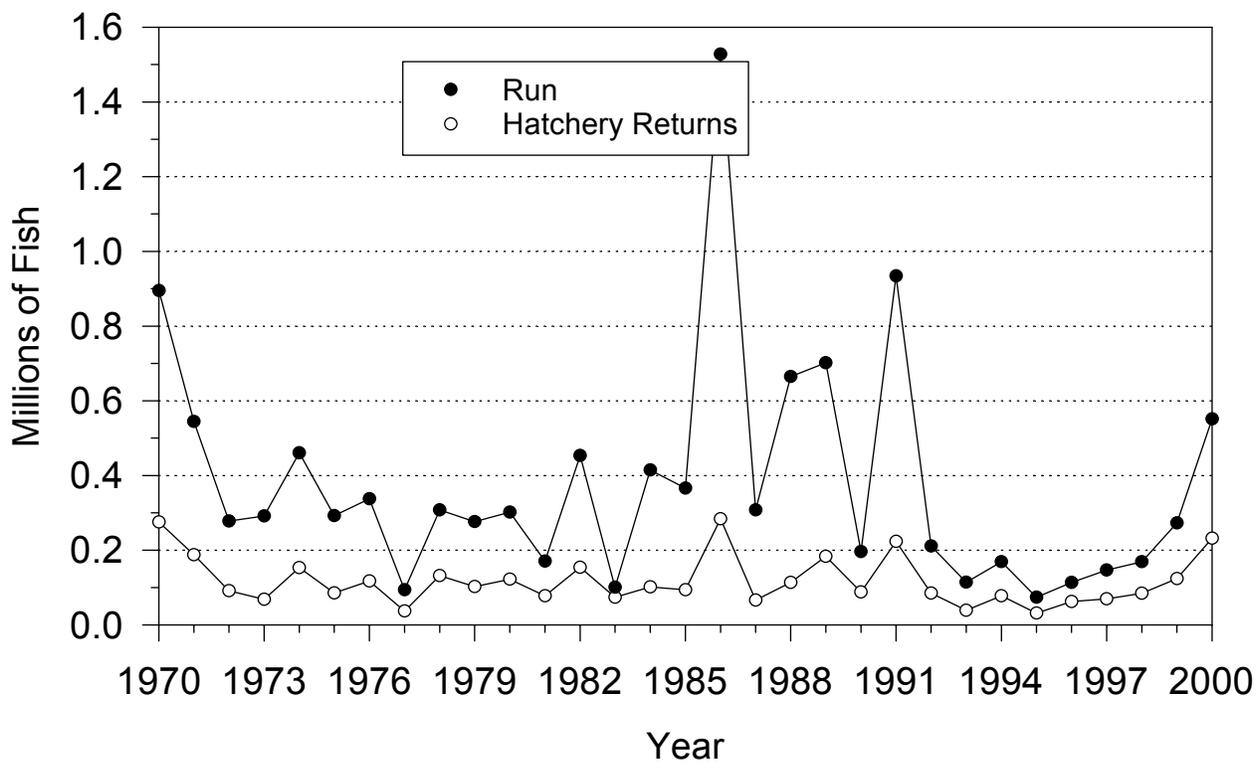


Figure 34. Estimated Numbers of Coho Adults Entering the Columbia River and Returning to Hatcheries, 1970-2000.

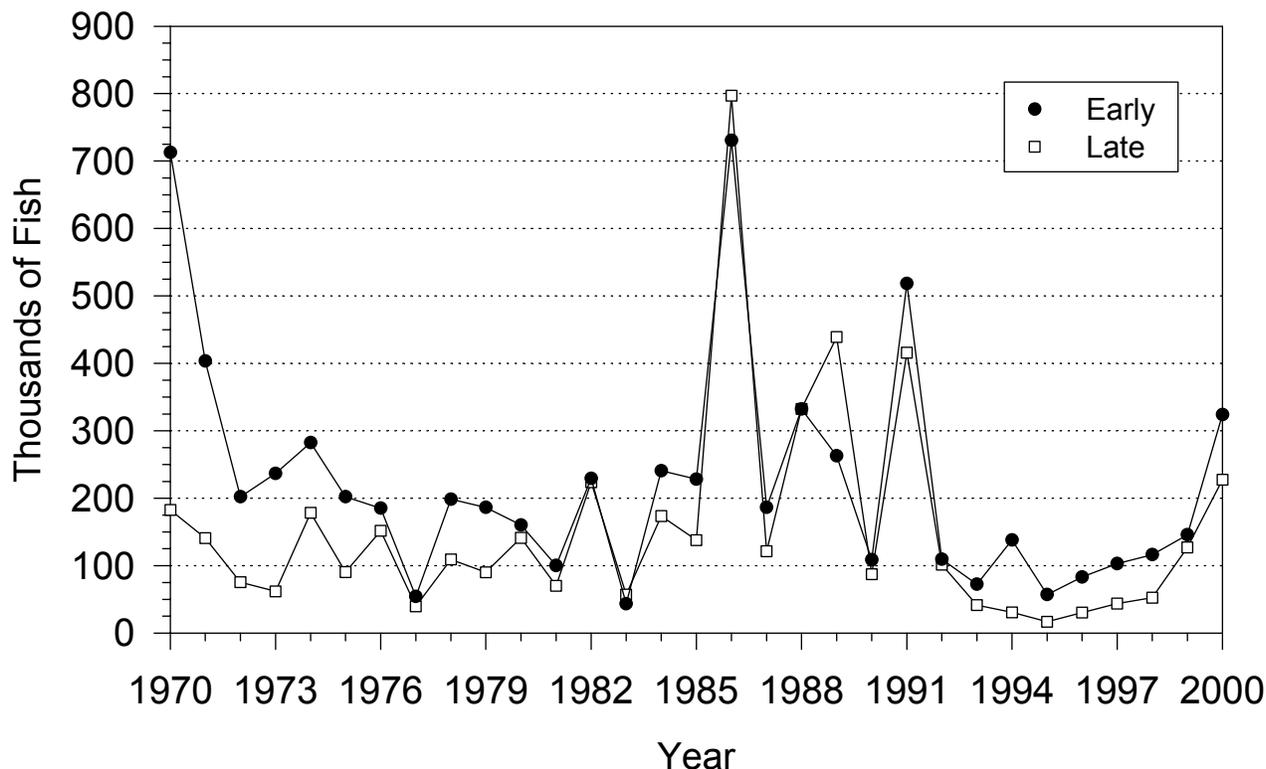


Figure 35. Minimum Numbers of Early and Late Stock Coho Adults Entering the Columbia River, 1970-2000.

In July 1999, the State of Oregon listed wild coho destined for Oregon tributaries of the Columbia River from Hood River downstream as threatened under the state ESA. Populations destined for lower river tributaries below the mouth of the Willamette River are generally considered to be extirpated. The remaining wild coho populations are destined for the Clackamas and Sandy rivers with both early and late stock coho returning to the Clackamas River and only early stock returning to the Sandy River.

### **Non-Indian Commercial Harvest**

Commercial harvest of coho occurs in the lower Columbia River below Bonneville Dam, including Youngs Bay, Tongue Point, and Blind Slough Select Area Fisheries Enhancement (SAFE) sites in Oregon and the Deep River and Steamboat Slough SAFE sites in Washington. Fisheries targeting on coho usually begin in mid to late September and may continue into early November; however, since 1992 the late fall fishery has been terminated at the end of October in consideration of wild late stock coho destined for the Clackamas River. In the lower Columbia River, catch of early stock coho occurs primarily in September and early October, transitioning to primarily late stock catch during the remainder of October. Historically, the commercial catch has been mostly adult coho, jacks are less susceptible to the type of gillnet gear used in mainstem fisheries. However, since Clatsop County Economic Development Council (CEDC), ODFW, and WDFW began releasing coho in their net-pen programs in the Youngs Bay (1989), Tongue Point Basin (1995), Blind Slough (1995), Deep River (1995), and Steamboat Slough (1999) SAFE sites, the use of small mesh gear has become more prevalent in these fisheries and has resulted in significant landings of jacks in some years.

Based on the Pacific Fishery Management Council's (PFMC) modeled ocean fisheries, the preseason forecast for 2000 Columbia River coho stocks was for a combined river mouth return of 450,200 adults which was comprised of 253,600 early stock and 196,600 late stock coho. These large returns provided a considerable harvestable surplus of hatchery fish. However, concerns over lower river wild and Snake River wild fall chinook precluded any early fall target coho fisheries. Late fall target coho fisheries began on September 18 and continued through October 30.

During 2000, late fall fisheries were managed to limit impacts on naturally produced coho destined for the Clackamas and Sandy rivers. In conjunction with the 1999 decision to list lower Columbia River coho, the OFWC decided that 1999 harvest rates on wild coho destined for Oregon tributaries of the lower Columbia River would not exceed 15%, including ocean fisheries. For 2000 fisheries, the OFWC determined that ocean and freshwater impacts on wild Columbia River coho should not exceed 13.3%, the level that was observed during 1999 fisheries. Fall fisheries occurring in 2000 were managed with time, area, and gear restrictions to ensure that harvest rates did not exceed 13.3%. The lack of target coho fisheries prior to September 18 afforded significant protection for early stock coho destined for the Sandy and Clackamas rivers and after October 30 minimized impact on late stock coho destined for the Clackamas River. Closed areas above the Longview Bridge also afforded significant protection for natural coho destined for both the Clackamas and Sandy rivers. Finally, chinook and sturgeon fisheries operated under 8 and 9-inch minimum mesh size restrictions to minimize handle of coho. The 2000 ocean and freshwater fishery impact was 12.8% compared to the 13.3% cap.

The 2000 commercial landings of coho, including jacks, from below Bonneville Dam were 173,900 fish weighing 1,548,600 pounds (Figure 36 and Table 60). The Select Area fisheries (Youngs Bay, Tongue Point, Blind Slough, Deep River, and Steamboat Slough) harvested 58,700 adults and 2,800 jacks and accounted for 35% of the commercial landings of coho from below Bonneville Dam.

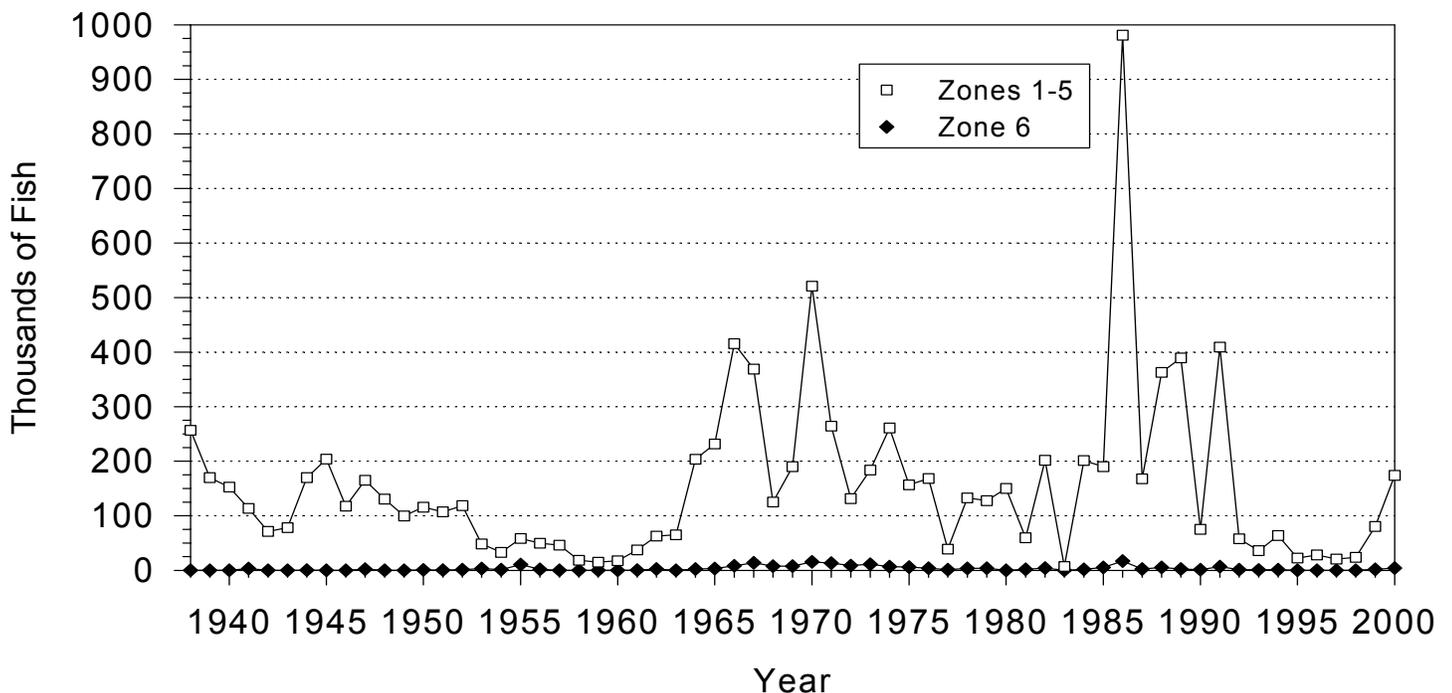


Figure 36. Columbia River Coho Commercial Landings, 1938-2000.

## **Treaty Indian Harvest**

The harvest of coho in treaty Indian commercial fisheries is usually minor because of constraints to protect steelhead. Beginning in 1987, yearling coho releases (both early and late stock) into tributaries above Bonneville Dam have increased from an average of 2.7 million (1982-1986) to an average of 8.7 million during 1996-2000. In recent years, most of the releases have been into the Little White Salmon and Klickitat rivers. In addition, ODFW has released an average of 1.8 million coho into the Umatilla and Yakima rivers during the past five years. In 2000, 85,700 adult coho passed Bonneville Dam which is the largest return since 1986 and well above the recent 10-year average of 25,300 adult coho (Table 57). An estimated 16% of the adult coho entering the Columbia River passed Bonneville Dam in 2000 which is similar to the 1994-1999 average of 17%. During 1970-1993 the Bonneville Dam adult coho passage accounted for only 8% of the total adult coho entering the Columbia River.

Existing, or enhanced, upriver coho were not subject to a formal harvest allocation scheme under the now expired CRFMP. The increased and modified hatchery releases above Bonneville Dam provided for additional tributary harvest opportunities in lieu of a formal allocation. Since 1999 the parties to *U.S. v Oregon* have negotiated annual management agreements that establish a coho harvest sharing principle. Treaty Indian and non-Indian fisheries are provided the opportunity to each harvest 50% of the upriver coho available for harvest in the ocean south of the US-Canada border and in the Columbia River.

An estimated 4,400 coho were landed in treaty Indian commercial fisheries during 2000 which is the largest total since 1991 (Figure 36 and Table 60).

## **Non-Indian Recreational Harvest**

The 2000 total recreational adult coho catch was 23,100, including 1,620 coho from the mainstem lower Columbia River sport fishery (Rocky Point/Tongue Point line upstream to Bonneville Dam). Typically, the majority of the recreational harvest of coho occurs in the Buoy 10 fishery, which includes that area between the Rocky Point/Tongue Point line and the mouth of the Columbia River at Buoy 10. In recent years the Buoy 10 fishery has had a standard opener of August 1, concurrent with the opening of the adjacent mainstem fall salmon fishery, and this was the case in 2000. The lower Columbia River mainstem, Buoy 10, and ocean recreational fisheries were restricted to the retention of adipose fin-clipped coho to protect federally listed Oregon coastal natural coho and state listed lower Columbia River wild coho. The Buoy 10 and ocean fisheries were also limited to not more than one chinook in the daily salmon limit. During August 28 through August 31, the Buoy 10 fishery was closed to the retention of chinook; however, retention of marked coho was allowed during that time period. In spite of the largest coho return since 1991, the Buoy 10 coho catch rate (0.30 coho/trip) was only slightly higher than the recent 5-year average of 0.24 coho/trip and no where near the record high catch rate of 1.22 coho/trip seen in 1991.

# Chum

## Status

Chum salmon returns to the Columbia River have occurred at minor levels since the mid-1950s. Production occurs primarily from Washington tributaries of the lower Columbia River. Natural spawning has maintained chum runs at current low levels prompting the NMFS to list all natural-origin chum in the lower Columbia River as threatened under the ESA in March 1999. Limited hatchery releases are also contributing to the returns. Restoration of spawning areas and rearing habitat are helping to slowly rebuild returns. Stream surveys in 2000 showed peak index counts totaling 2,425 fish in 6.1 miles, or 398 fish per mile. This value was above the 1989-1999 average of 224 fish per mile (Table 61).

Only 18 chum returned to Sea Resources Hatchery on the Chinook River in Washington. Seventeen chum returned to the Cowlitz hatchery and one chum returned to the Elochoman Hatchery. At Bonneville Dam 39 chum were counted using video tape through the December 31 counting period (Table 62). Age composition in 2000 was 25% 3-year olds, 74% 4-year olds, 1% 5-year olds, with no 6-year olds to natural spawning areas and 3% 3-year olds, 97% 4-year olds, with no 5 or 6-year olds to Sea Resources, Cowlitz, and Elochoman hatcheries.

A minimum run size calculation, based on commercial catch plus fish counted in standard escapement areas, including Bonneville Dam counts, totaled 2,500 fish in 2000. This value was of a similar magnitude to many past runs observed since the decline of chum runs occurred in the early 1950s (Figure 37 and Table 62). This decline in chum abundance lead the NMFS to list Columbia River chum salmon as threatened under the ESA in May 1999 (Table 9).

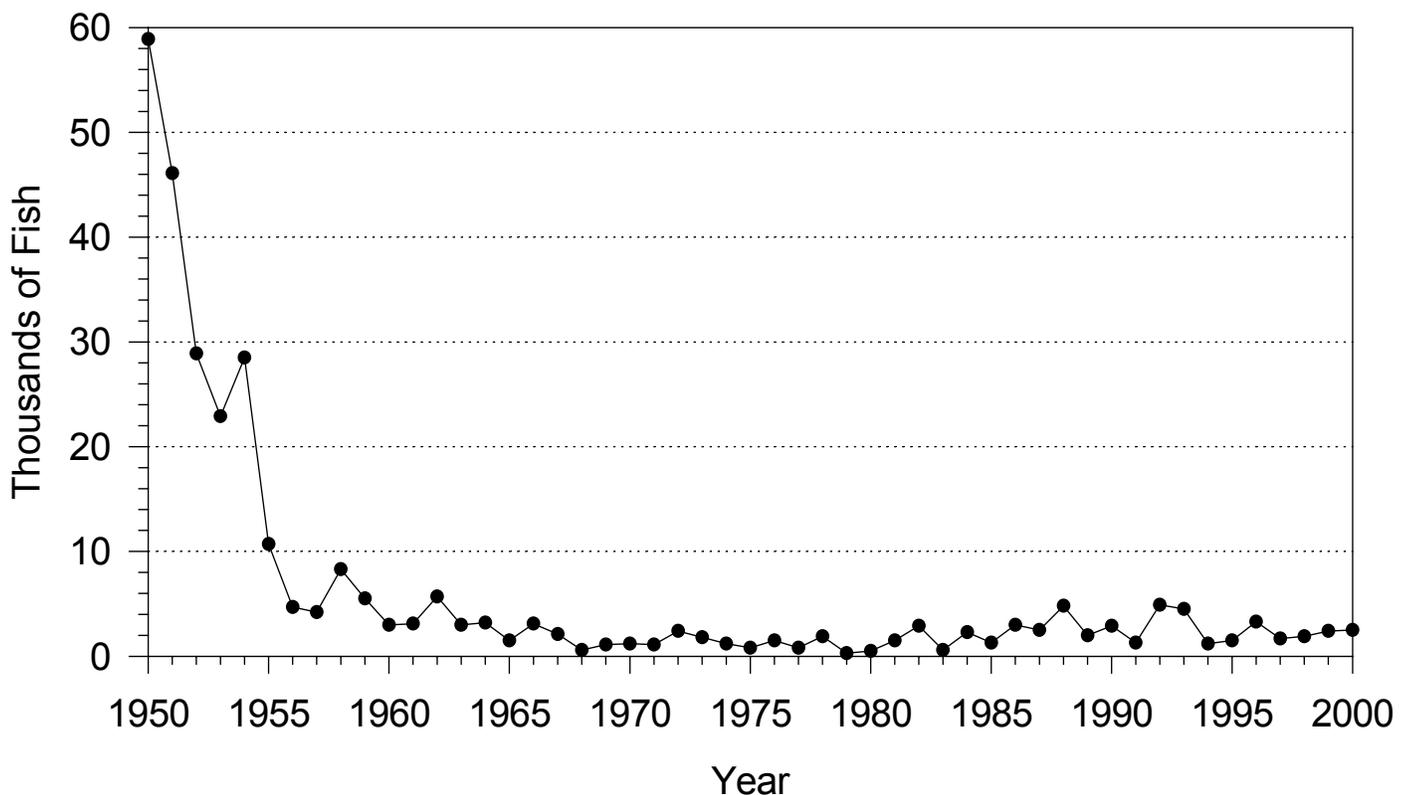


Figure 37. Minimum Numbers of Chum Entering the Columbia River, 1950-2000.

## Non-Indian Commercial Harvest

Limited commercial fishing in 2000 precluded a significant chum harvest. Less than 338 pounds, or 35 fish, were landed. This compared to the recent 10-year annual average catch of about 240 chum (Figure 38 and Table 63). The 2000 late fall mainstem Columbia River fishery closed October 30. Late October fisheries were restricted to above the Harrington/Settler Point line (above Grays Bay) to reduce chum catch. All Select Area fisheries were closed by October 31.

## Non-Indian Recreational Harvest

The Columbia River system is closed to chum angling. Chum angling has been closed on the Oregon side of the Columbia River since 1992 and on the Washington side since 1995. Additionally, a salmon angling closure was adopted for the Grays River in Washington in 1994.

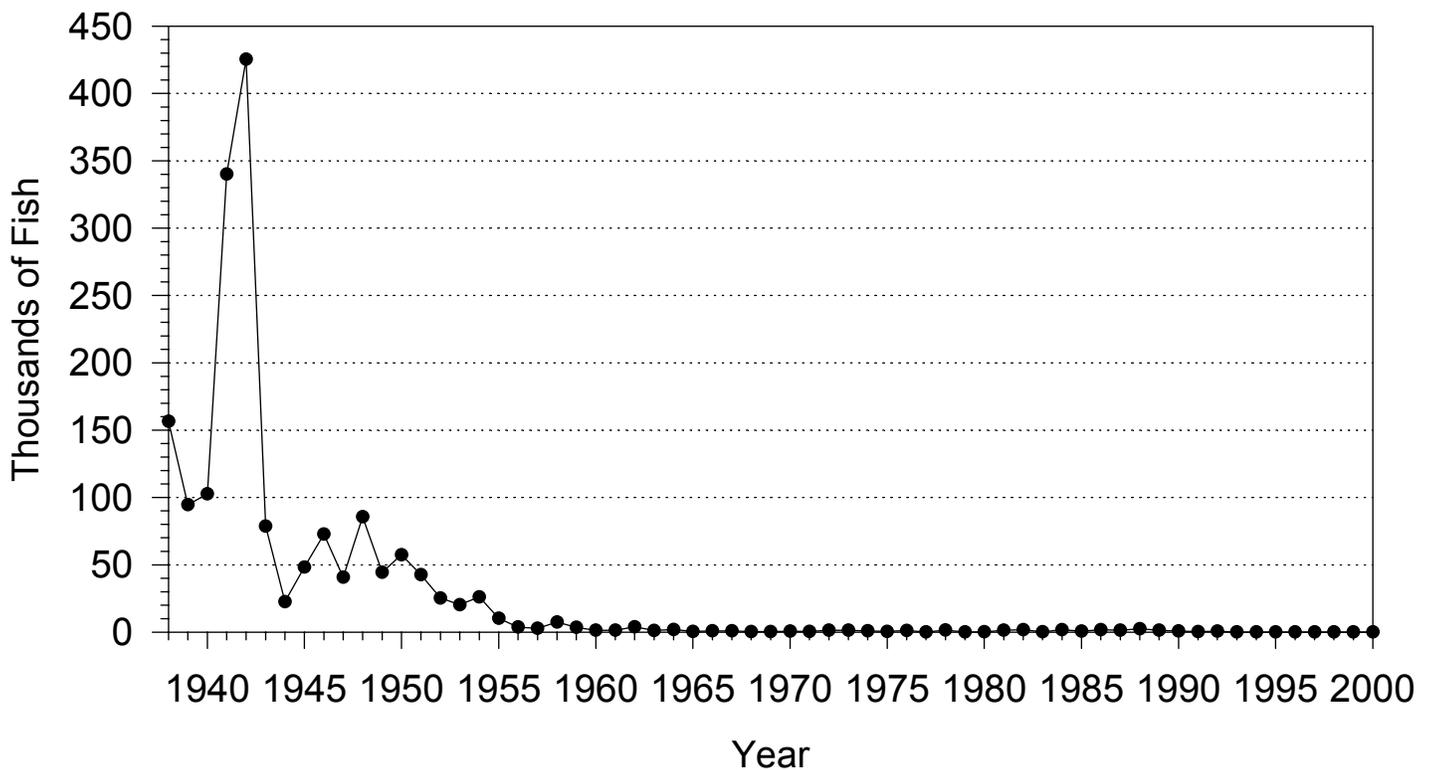


Figure 38. Columbia River Chum Commercial Landings in Zones 1-5, 1938-2000.

# Winter Steelhead

## Status

Winter steelhead enter the Columbia River from November through May with a peak for hatchery fish in December and January and a peak for wild fish in March and April. Winter steelhead are destined primarily for tributaries below Bonneville Dam. A few Bonneville Pool tributaries, such as Fifteenmile Creek and the Hood, Wind, and Klickitat rivers also support winter steelhead runs. The total number of winter steelhead is undetermined, but index counts suggest runs are declining in recent years (Figure 39 and Table 64). Total escapements of wild winter steelhead are also declining, and recent escapements are below escapement goals. In March 1999 wild steelhead in the lower Columbia River (Cowlitz to Hood rivers, inclusive) were included in the lower Columbia ESU and listed as threatened under the ESA. Also in March 1999 wild steelhead destined for the Willamette River above Willamette Falls were included in the upper Willamette ESU and were listed as threatened under the ESA (Table 9).

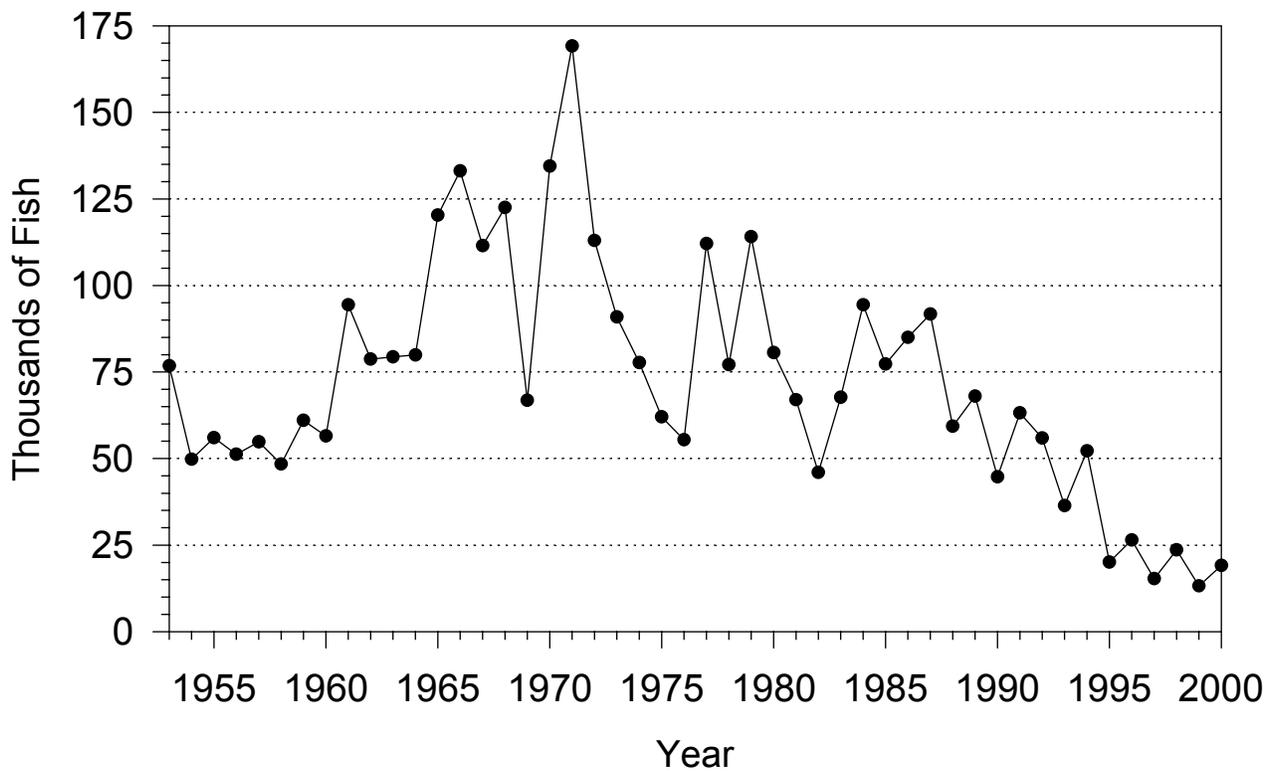


Figure 39. Abundance Index for Columbia River Winter Steelhead, 1953-2000.

## **Non-Indian Commercial Harvest**

Commercial landing of steelhead by non-Indians was prohibited beginning in 1975 (Table 64). Only small numbers of steelhead are handled during winter salmon gillnet seasons due to timing of the fishery and an 8-inch minimum mesh size restriction (adopted in 1975). Since 1997, target sturgeon gillnet seasons have been occurring from early January through mid-February with a 9-inch minimum mesh size restriction in place to minimize handle of steelhead.

An average of about 250 steelhead were handled each fishing day during 1975-1990 winter seasons, with a seasonal average of less than 500 dead steelhead dead annually. The steelhead estimates are based on changes in time, area, and mesh regulations and observations made aboard gillnet boats during 1970-1977 and 1986 winter seasons. Monitoring data indicates that about 17%, or an average of about 40 steelhead per day, during 1975-1990 winter seasons were immediate mortalities. Based on observations during the Marine Mammal Observer Program for the 1991-1993 winter seasons, an average of 16 steelhead per day were direct mortalities which is considerably less than the 40-per-day average assumed for prior winter seasons. About 90% of the steelhead handled during the lower river winter salmon gillnet seasons are winter-run fish.

## **Treaty Indian Harvest**

Limited numbers of winter steelhead are harvested annually by a treaty Indian commercial fishery during the February-March winter season in Zone 6 (Table 64). It is believed all harvest occurs in the Bonneville Pool. During the 2001 winter Zone 6 season, there was an estimated 22 winter steelhead harvested, of which 15 were wild.

## **Non-Indian Recreational Harvest**

Winter steelhead sport fisheries occur primarily in Oregon and Washington tributaries of the Columbia River. The major Washington tributaries include the Cowlitz, Lewis, Elochoman, Kalama, and Washougal rivers. The major Oregon tributaries include the Willamette, Sandy, Clackamas, Hood, and Klaskanine rivers, plus Big Creek. Peak catch months in the tributaries are generally December and January with hatchery fish comprising the majority of the catch. Release of all wild (unmarked) steelhead in recreational fisheries is now required basin-wide. Small catches of hatchery fish also occur in the lower Columbia River during mid-winter, and incidental to spring chinook angling during February-April. Combined sport catches for the mainstem and tributaries by run year are shown in Table 64.

# Summer Steelhead

## Status

The Columbia River summer steelhead run is made up of populations from lower river and upper river tributaries. Summer steelhead enter fresh water over a protracted time period (March through October) each year. The lower river component of the run is primarily hatchery produced, derived from Skamania stock, and tends to be earlier timed than the upriver stocks. Peak timing of lower river returns is in May and June. Lower river steelhead return to the Elochoman, Cowlitz, Kalama, Lewis, and Washougal rivers in Washington and the Willamette and Sandy River basins in Oregon. In addition, hatchery fish of the Skamania stock are released annually in Bonneville Pool tributaries of both states. Summer steelhead caught on the mainstem lower Columbia River through June each year are classified and counted as lower river (Skamania) stock. Lower river wild steelhead were listed as threatened by the NMFS in May 1998 (Table 9).

Upriver summer steelhead include hatchery and wild steelhead that pass Bonneville Dam during April 1 through October 31 each year. Steelhead counted at Bonneville Dam during April 1 through August 25 are classified as Group A stock and steelhead counted during August 26 through October 31 are classified as Group B stock. Those counted at Bonneville in April, May, and June are considered hatchery Skamania Group A stock returning to Bonneville Pool tributaries. Historically, peak counts at Bonneville were bimodal, with the first peak in early August (Group A stock) and a second peak in mid-September (Group B stock). Group A steelhead are characteristically smaller (under 10 pounds) fish that spend one or two years at sea and return to tributaries throughout the mid and upper Columbia River system, as well as the Snake River basin. The later arriving Group B steelhead are characteristically larger (over 10 pounds), typically having spent two or three years at sea and only return to Idaho's upper Clearwater and Salmon River sub-basins in the Snake River system.

Although annual numbers vary, abundance of upriver summer steelhead has generally increased since the small runs of 1974-1980 with increased hatchery production. Upriver runs of wild fish continue to be below escapement goals despite restrictions on harvest of wild steelhead. Currently sport anglers are prohibited from taking wild steelhead and commercial landings of steelhead by non-Indians have been prohibited since 1975. In October 1997, the NMFS listed wild steelhead from the Snake River ESU as threatened. In May 1999, the NMFS listed the wild steelhead in the middle Columbia ESU as threatened and the wild steelhead in the upper Columbia ESU as endangered in October 1997 (Table 9).

The summer steelhead run entering the Columbia River in 2000 was an estimated 316,200 fish (Figure 40 and Table 65). The lower river component was an estimated 33,800 fish and the combined upriver components totaled 282,400 (190,600 Group A and 91,800 Group B) fish (Tables 66 and 67). The Group A run was the highest since 1988, while the Group B run was the highest since 1993, excluding 1998. Figure 41 displays the relative strength of the three components for 1969-2000.

Since 1984, summer steelhead passing Bonneville Dam have been randomly sampled throughout the run (April-October) to ascertain age and size composition, as well as hatchery to wild ratios of each year's return. Prior to 1999, managers used the date method to estimate run sizes and to make inseason management decisions pertaining to the ESA.

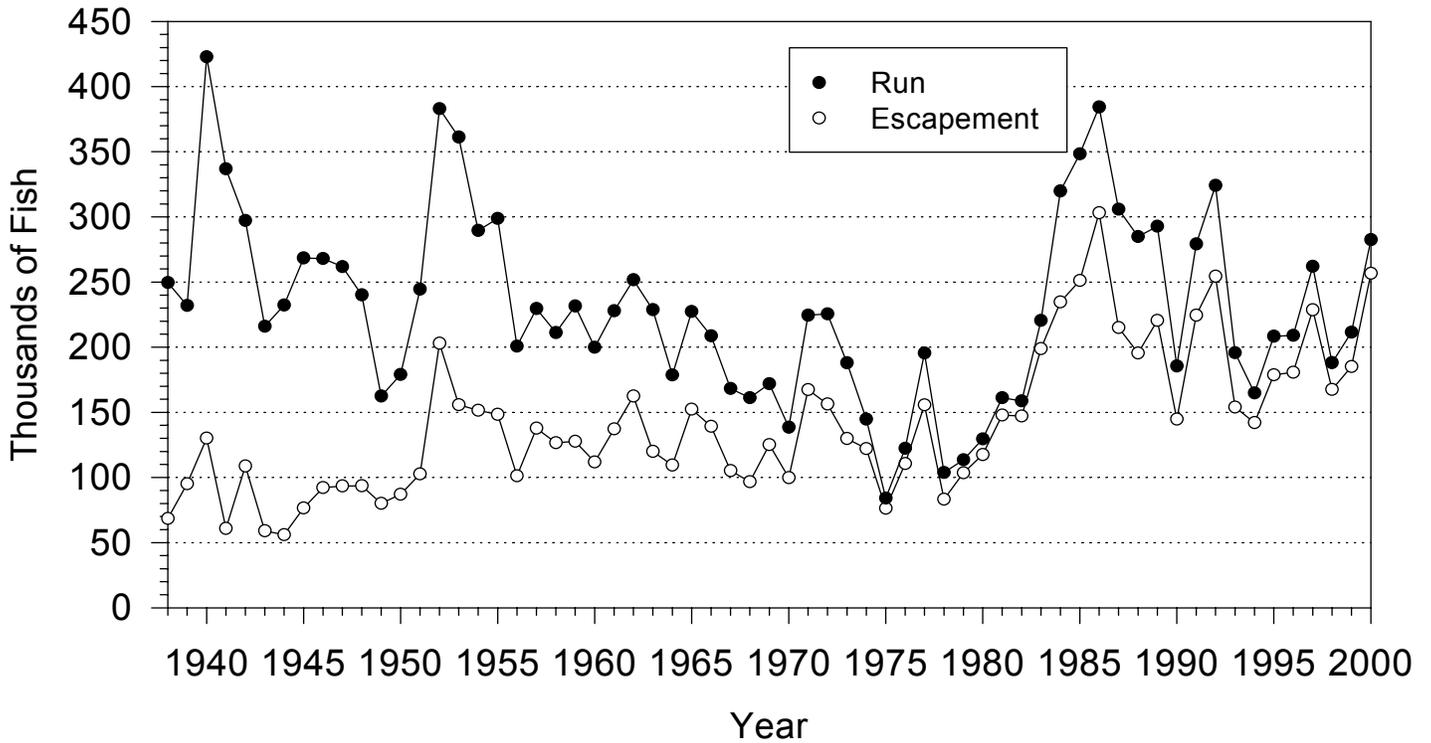


Figure 40. Estimated Numbers of Upriver Summer Steelhead Entering the Columbia River and Escapement, 1938-2000.

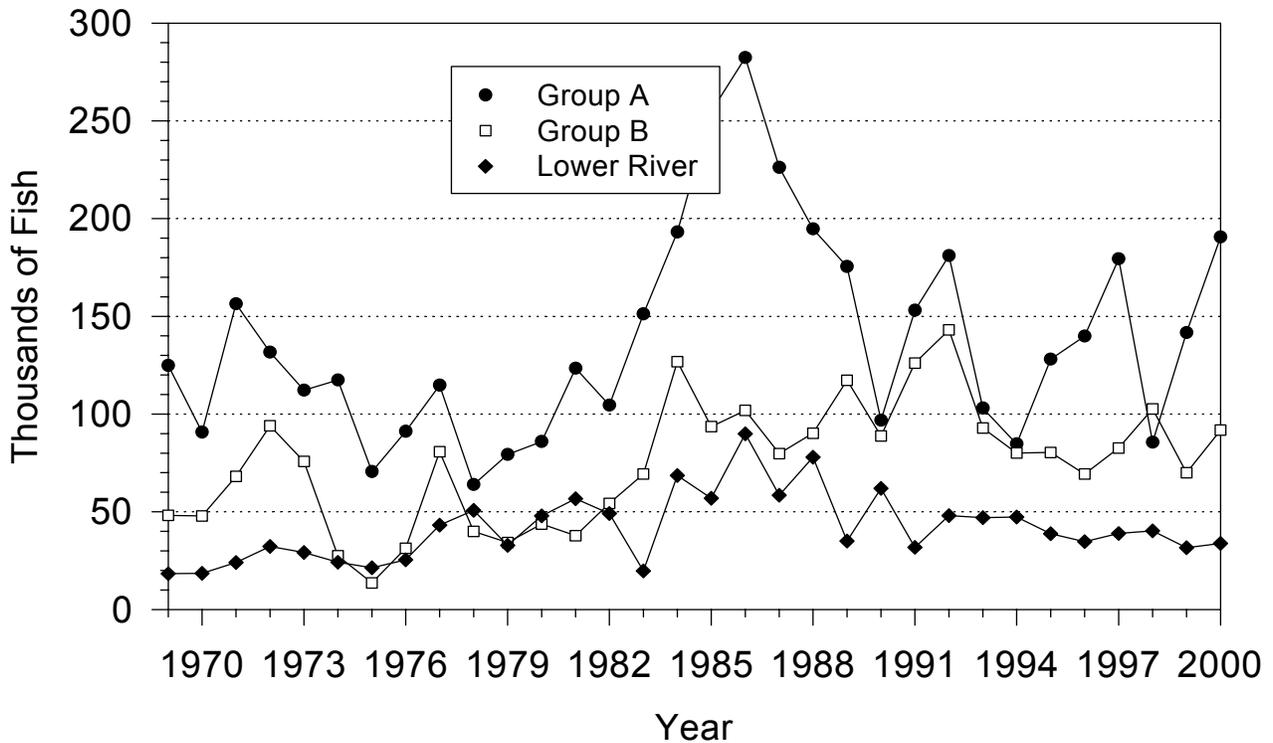


Figure 41. Estimated Accountability for Three Components of Columbia River Summer Steelhead, 1969-2000.

The date method classified all steelhead counted during April 1 through August 25 as the Group A run and all fish counted during August 26 through October 31 as the Group B run. Based on the date method, the CRFMP had an interim escapement goal of 75,500 wild/natural summer steelhead (62,200 Group A and 13,300 Group B) at Bonneville Dam, which was expected to provide 30,000 wild escapement above Lower Granite Dam under past production and average upstream passage conditions. Using the date method, the Group A steelhead count at Bonneville Dam during April 1 through August 25, 2000, was 184,300 which is the highest since 1988. The Group B steelhead count at Bonneville Dam during August 26 through October 31, 2000, was 89,900 which is the highest since 1992, excluding 1998 (Table 67).

During recent years, the Group A and Group B runs have not shown the bimodal peaks and there has been considerable overlap between the two runs. In an attempt to alleviate the problems overlapping runs created for fisheries management, a new method of assessing the relative returns of Group A and Group B steelhead was developed by TAC in 1999. This new method was termed the index method and classifies all fish counted during April 1 through June 30 as Skamania Index, July 1 through October 31 that are less than 78 cm fork length as Group A Index, and July 1 through October 31 that are greater than or equal to 78 cm fork length as Group B Index. The index method will be used to estimate run sizes and to make inseason fishery management decisions pertaining to the ESA. No escapement goals have been developed based on the index method; however, the 2000 Fall Management Agreement limited mainstem fishery impacts to less than 17% each for the wild Group A and B Index steelhead. The impacts were allocated 15% to the treaty Indian fisheries and 2% to the non-Indian fisheries. The date method will continue to be tracked and used as a historical index.

The total upriver summer steelhead run passing Bonneville Dam during 2000 was 274,200 fish, as compared to the 1996-2000 average of 225,000 fish (Table 65). Based on the index method, the 2000 run was comprised of 16,600 Skamania Index, 216,700 Group A Index, and 40,900 Group B Index steelhead (Tables 68 and 69). The Group A Index run total of 216,700 fish (63,600 wild and 153,100 hatchery) was the highest since 1992 and the wild component was the largest observed since 1988. The Group B Index run total of 40,900 fish (8,400 wild and 32,500 hatchery) was the highest since 1992 and the wild component was also the largest observed since 1992.

In August 1997, the NMFS defined and listed two summer steelhead ESU's in the Columbia Basin. Steelhead destined for the Columbia River upstream of the Yakima River comprised the upper Columbia ESU that was listed as endangered while wild steelhead destined for the Snake River Basin formed the Snake River ESU that was listed as threatened. Subsequently in May 1999, wild steelhead destined for Columbia River tributaries from above the Wind and Hood rivers upstream to, and including, the Yakima River formed the middle Columbia ESU and were listed as threatened (Table 9).

## **Non-Indian Commercial Harvest**

Commercial landing of steelhead by non-Indians was prohibited beginning in 1975 (Figure 42 and Table 70). Summer steelhead handle during present shad, sockeye, and fall salmon fisheries is minimized with time, area, and gear restrictions. An estimated 100 summer steelhead non-retention mortalities occurred in 2000 fall commercial fisheries.

## Treaty Indian Harvest

A total of 17,550 summer steelhead were harvested from the 2000 upriver run in Zone 6. This total includes 9,150 fresh steelhead sold to wholesale fish dealers during fall, winter, and spring treaty Indian commercial fishing seasons; 5,160 traditional ceremonial and subsistence fish from spring, summer, fall, and winter periods; and 3,240 fish sold directly to the public during the fall commercial season (Table 70). The fall ticketed (sales to wholesale fish dealers) and non-ticketed (sales to the public) harvest included 7,520 Group A Index fish and 4,640 Group B Index fish.

Since 1984, the treaty Indian commercial catch of upriver summer steelhead has been sampled to determine the percentage of hatchery and wild/natural fish, and their respective ocean ages, for both Group A Index and Group B Index components. The catches of wild/natural fish were compared to the number of wild/natural fish passing Bonneville Dam to determine treaty Indian harvest impacts.

The 2000 Fall Management Agreement limited treaty Indian fall fisheries to less than 15% impacts on the Wild Group B Index run. During the 2000 fall treaty Indian commercial season, 2,340 wild Group A Index and 950 wild Group B Index steelhead were harvested for ceremonial/subsistence use, sold to fish wholesalers, or sold directly to the public. These catches comprised 3.7% of the wild Group A Index stock and 11.4% of the wild Group B Index stock, as estimated at Bonneville Dam (Tables 68 and 69). Summer ceremonial/subsistence landings contributed to additional impacts on the Group A Index and Group B Index stocks.

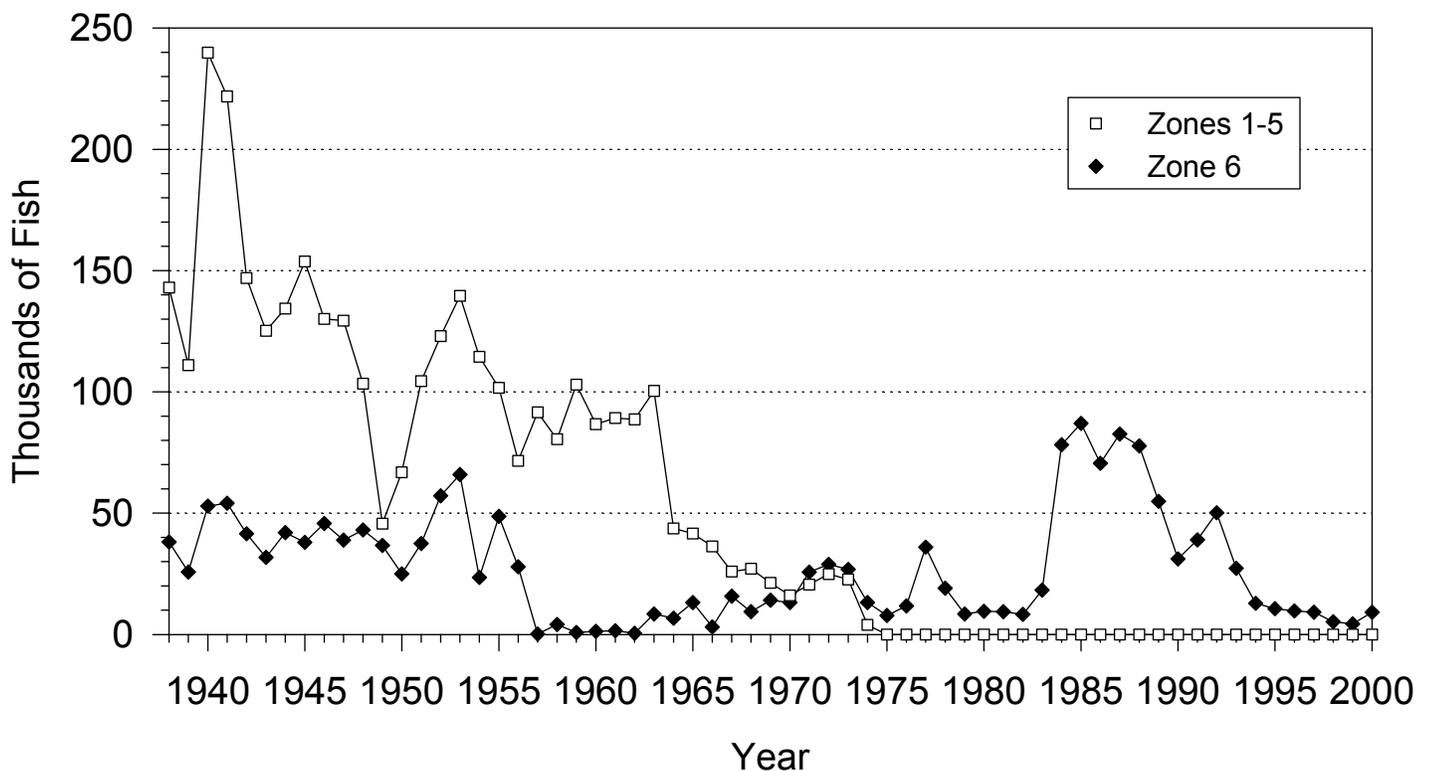


Figure 42. Columbia River Upriver Summer Steelhead Commercial Landings, 1938-2000.

## **Non-Indian Recreational Harvest**

The majority of the sport catch of summer steelhead occurs in the tributaries. Harvest in all tributaries is limited to hatchery-marked steelhead only. Mainstem sport regulations to protect wild summer steelhead have been in effect since 1984. Only summer steelhead with a healed adipose fin-clip may be kept in Oregon while summer steelhead with a healed adipose or ventral fin clip may be kept in Washington. Wild or unmarked steelhead must be released. The 2000 harvest by mainstem anglers fishing below Bonneville Dam was 9,800 hatchery summer steelhead (Table 20). Using the date method, it was determined that 1,600 were lower river stock, 6,300 were Group A stock, and 1,900 were Group B stock. An additional 4,800 unmarked steelhead were released by mainstem anglers below Bonneville Dam.

In the lower Columbia River, below Bonneville Dam, upriver summer steelhead are only caught during the calendar year of entry from the ocean. However, above Bonneville and in the tributaries, summer steelhead are caught in the year of entry and during the winter and spring of the following calendar year. Upriver summer steelhead that entered freshwater in 2000 contributed to fisheries through the spring of 2001 when they mature and spawn; therefore, harvest is reported by run year (e.g. 2000-2001). The combined Oregon, Washington, and Idaho sport catch of upriver summer steelhead in the Columbia River and tributaries from the 2000-2001 run is not available at this time (Table 71).

## **Smelt**

### **Status**

Millions of smelt, less commonly known as eulachon, return annually to the lower Columbia River to spawn in the mainstem and its tributaries. Typically, smelt enter the Columbia in early to mid-January, followed by tributary entry in mid to late January. Smelt return annually to the Cowlitz River, with inconsistent runs entering the Grays, Elochoman, Lewis, Kalama, and Sandy rivers. Peak tributary abundance is usually in February, with variable abundance through March, and an occasional showing in April.

Columbia River eulachon runs have never been well evaluated. The best long-term data on Columbia River eulachon returns are commercial landings in mainstem and tributary fisheries. However, commercial landings are a poor index of run size since market forces dictate the magnitude of harvest. Larger run sizes are probably larger than commercial landings would indicate because market demand drops once the supply reaches saturation resulting in a huge decline in price and, consequently, fishing effort. Likewise, the low catches in the last few years are misleading since conservative management strategies have significantly dampened effort and catch.

The 2000 smelt run first entered the Columbia River in mid- December 1999, peaked in mid-February and dropped off by the end of February when the commercial fishery was closed. Commercial catches were slightly improved over previous years but remained low relative to historic landings (Figure 43). Smelt initially entered the Cowlitz River in early-January with peak abundance occurring around mid-February. Sport monitoring indicated that the 2000 smelt return to the Cowlitz was strong.

In 1994 the WDFW initiated eulachon larval sampling in the Cowlitz River and other Columbia River tributaries to determine the presence/absence of tributary spawning. In 1995 larval sampling was initiated in the Columbia River with the aim of developing a fishery-independent eulachon assessment technique. No similar sampling program is in

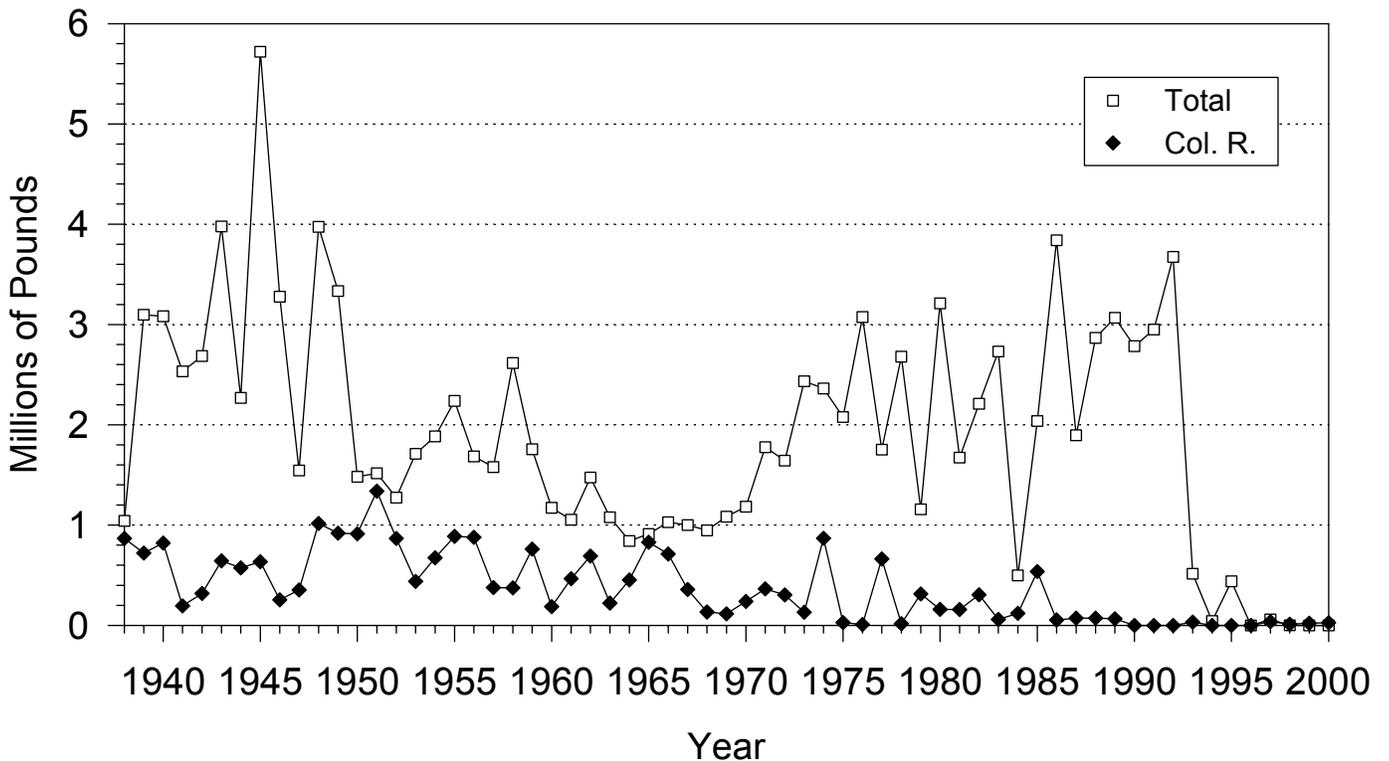


Figure 43. Columbia River and Tributary Smelt Commercial Landings, 1938-2000.

place for adults; however, recent years data has shown that adult abundance, as measured by commercial landings, and juvenile production, as measured by larvae per set, have fluctuated similarly in both magnitude and direction. Results from 2000 smelt larval sampling in the Columbia River and its tributaries reflected the apparent improvement in the adult return. Larval densities in the Columbia River averaged 127 larvae per set in 2000, compared to 3 larvae per set in 1999. In the Cowlitz River densities averaged 918 larvae per set in 2000, compared to 4 larvae per set in 1999. Larvae were also collected in the Grays (68 larvae per set), Elochoman (5 larvae per set), Kalama (0.75 larvae per set), Lewis (2 larvae per set) and Sandy (0.4 larvae per set) rivers indicating successful spawning in these tributaries.

### **Non-Indian Commercial Harvest**

Smelt landings from the 2000 Columbia River commercial fishery totaled 25,471 pounds (Table 72) and averaged 185 pounds per delivery, for 11 days of fishing. There were no commercial tributary landings as managers continued with the conservative strategy adopted in 1999 leaving these fisheries closed.

As per permanent regulations, the smelt fishery was originally scheduled to be open 7 days per week, from December 1, 1999 through March 31, 2000. However, due to the outlook for a potentially poor smelt return in 2000, the mainstem Columbia River season was closed on December 25, 1999. A full fleet test fishery, consisting of one 12-hour period (7 AM – 7 PM) per week, was adopted for eight weeks from December 29, 1999 through February 16, 2000. The fishery re-opened for a 48-hour period from Sunday, February 20 (6pm) to Tuesday, February 22 (6pm), and again for a 24-hour period from Thursday, February 24 (12pm) to Friday, February 25 (12pm). Oregon tributaries remained open seven days per week the entire year while Washington tributaries remained closed by permanent regulation adopted during the 1998/1999 season.

## **Non-Indian Recreational Harvest**

Sport harvest of smelt occurs in tributaries using dip net gear. On May 1, 1998, the daily limit in Washington for sport smelt dippers changed from 20 pounds per person per day to 10 pounds per person per day. Oregon allows 25 pounds per person per day. The sport dip net fishery is very popular, drawing thousands of participants. Smelt are used for human consumption and are in great demand for sturgeon bait. Annual sport harvest estimates are not available; however, limited past creel census information suggests that the sport harvest may equal the commercial landings in years of long availability of smelt.

On May 1, 1999 WDFW closed all Washington tributary recreational fisheries for smelt by permanent regulation. In 2000, all Washington tributaries remained closed except the Cowlitz River, which was open Fridays and Saturdays from December 31 through February 26. The Columbia River and Oregon tributaries remained open 7 days a week/365 days a year. Sport monitoring indicated a good return to the Cowlitz River in 2000. At the peak of the run (early to mid February) smelt abundance was high enough that sport fishers were able to dip their 10 pound limit in a half-hour or less.

# **Shad**

## **Status**

American shad from the Atlantic Coast were introduced in the Sacramento River in 1871. In 1885 the first releases of shad were made in the Columbia River; however, records document shad landings in the Columbia prior to 1885. It must be assumed some of the California shad located the Columbia River on their own. The fry released into the Columbia in 1885 were from the Susquehanna River in Pennsylvania. A century later (during the 1980s), shad eggs from the Columbia River were shipped east to revive the declining Susquehanna River shad population.

American shad are now well established in the Columbia River and tributaries, including the Snake River and the Willamette River up to Willamette Falls. In 2000, 2,463 shad passed Priest Rapids Dam and 3,250 shad passed Lower Granite Dam, and although shad rarely use the Willamette Falls fishway, a small number may pass above the falls through the Corps of Engineers' navigation boat locks. The annual minimum shad run into the Columbia River has been greater than 1 million fish since 1978. In 1990, the minimum run into the Columbia River was a record high 4.0 million shad with The Dalles Dam shad count exceeding 3.7 million. The 2000 minimum shad run was 1.7 million fish (Figure 44 and Table 73).

## **Non-Indian Commercial Harvest**

Unfortunately, the bountiful Columbia River shad run has not generated market outlets in proportion to its abundance. In addition, the shad run coincides with depressed runs of spring and summer chinook, sockeye, and summer steelhead. To minimize incidental catch and handling of protected salmonids in the shad gillnet fishery, severe time, area, and gear restrictions are employed. Together with the poor market, these restrictions limit commercial catch to a small portion of the total available for harvest.

Shad are harvested below Bonneville Dam in two small areas during short shad gillnet seasons occurring in late May and June. The Compact modified time and gear restrictions in 1996 for Area 2S. Since then the fishery has been restricted to daily periods of 3PM to 10PM only, and to using shallower and shorter nets that have substantially reduced the

handle of salmonids compared to the traditional gear used prior to 1996. Due to poor market conditions again in 2000, only a few buyers bought limited volumes of shad. The 2000 landings of 30,500 shad weighing 88,400 pounds were all from the Area 2S fishery (Figure 45 and Table 74). No fishers participated in the Washougal Reef shad fishery again in 2000, as was the case in 1998 and 1999.

### **Treaty Indian Harvest**

In years when sockeye salmon runs are large enough to harvest, treaty Indian fishers have landed substantial numbers of shad during a sockeye gillnet fishery; however, in 2000 only a subsistence fishery occurred where sockeye could be sold. Treaty Indian subsistence fishers also land significant numbers of shad using dip nets; however, many of these are sold to the public at the site or taken home by the fisher and are not recorded. During June 1994, treaty Indian fishers conducted a highly successful experimental dipnet fishery at The Dalles Dam east fishway exit (Oregon shore). The shad fishery was expanded in 1995 and again in 1996 when treaty fishers landed record high numbers of shad with 80% landed in the experimental dipnet fishery. Unfortunately, over the next few years there were no markets for large volumes of shad. In 2000, no markets again meant no fishery at The Dalles Dam. Zone 6 commercial landings for 2000 totaled only 65 shad weighing 191 pounds (Figure 45 and Table 74).

### **Non-Indian Recreational Harvest**

As shad run sizes increased, the species gained increasing popularity among Columbia River anglers. Shad caught on light tackle are widely recognized as remarkable fighters. Shad are a preferred food item for some anglers, while others keep shad for crab and sturgeon bait. The most popular sport fishing areas for shad are just below Bonneville Dam, in the Camas/Washougal area, and below Willamette Falls. Sport fisheries in these areas are monitored by statistical creel sampling programs (Table 75). Other popular shad fishing locations are just below John Day and McNary dams; however, little monitoring data is available from those sites.

The 2000 lower Columbia River recreational catch of shad was 57,953 kept and 5,664 released from 10,790 angler trips (Table 75). The 2000 lower Columbia River sport fishery had a catch rate of 5.9 shad/trip, which was considerably lower than the 1997 record high of 8.7 shad/trip. The lower Willamette sport fishery catch rate also dropped from a record high 5.6 shad/trip in 1997 to 3.6 shad/trip in 2000. The lower Willamette sport fishery produced a record high 23,823 angler trips with a second highest ever shad catch of 54,348 kept and 30,900 released (Table 75).

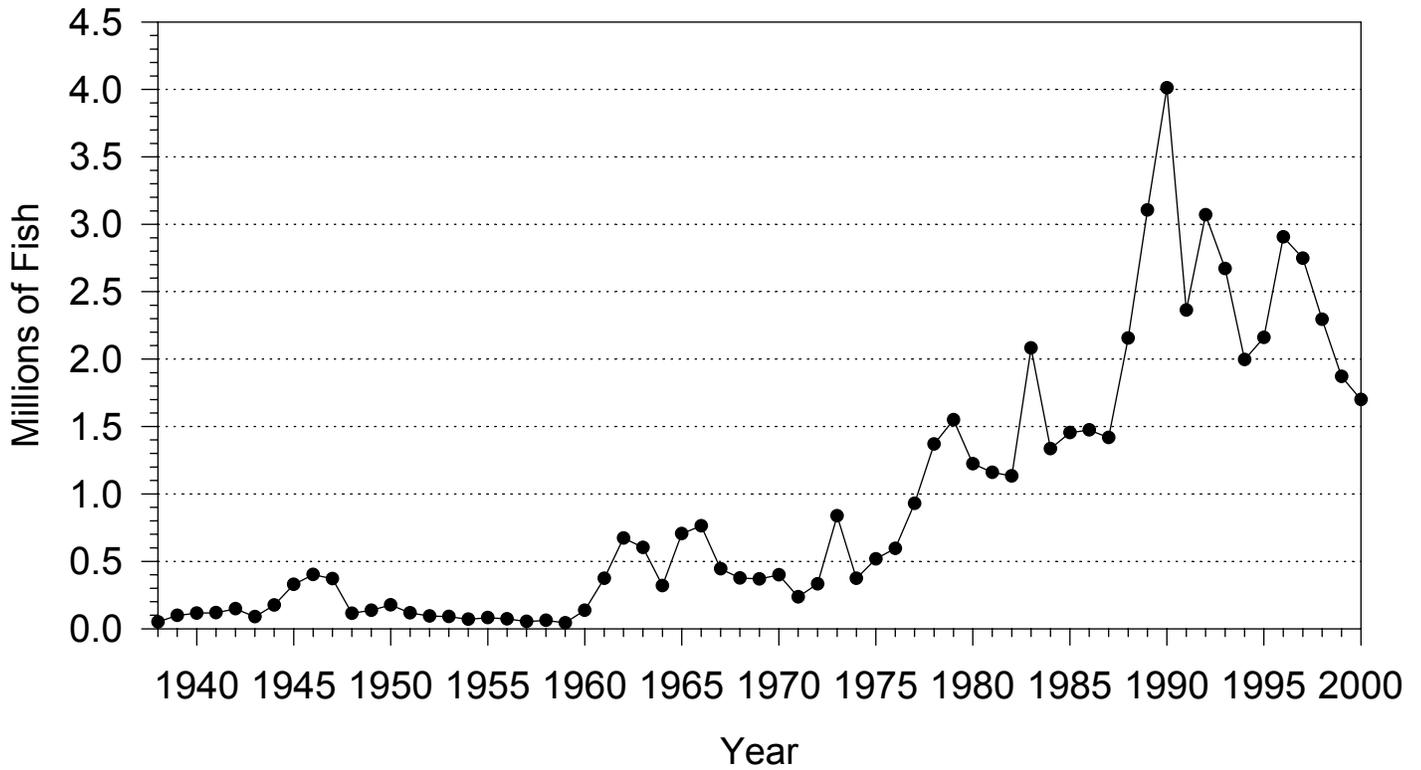


Figure 44. Minimum Shad Run Entering the Columbia River, 1938-2000.

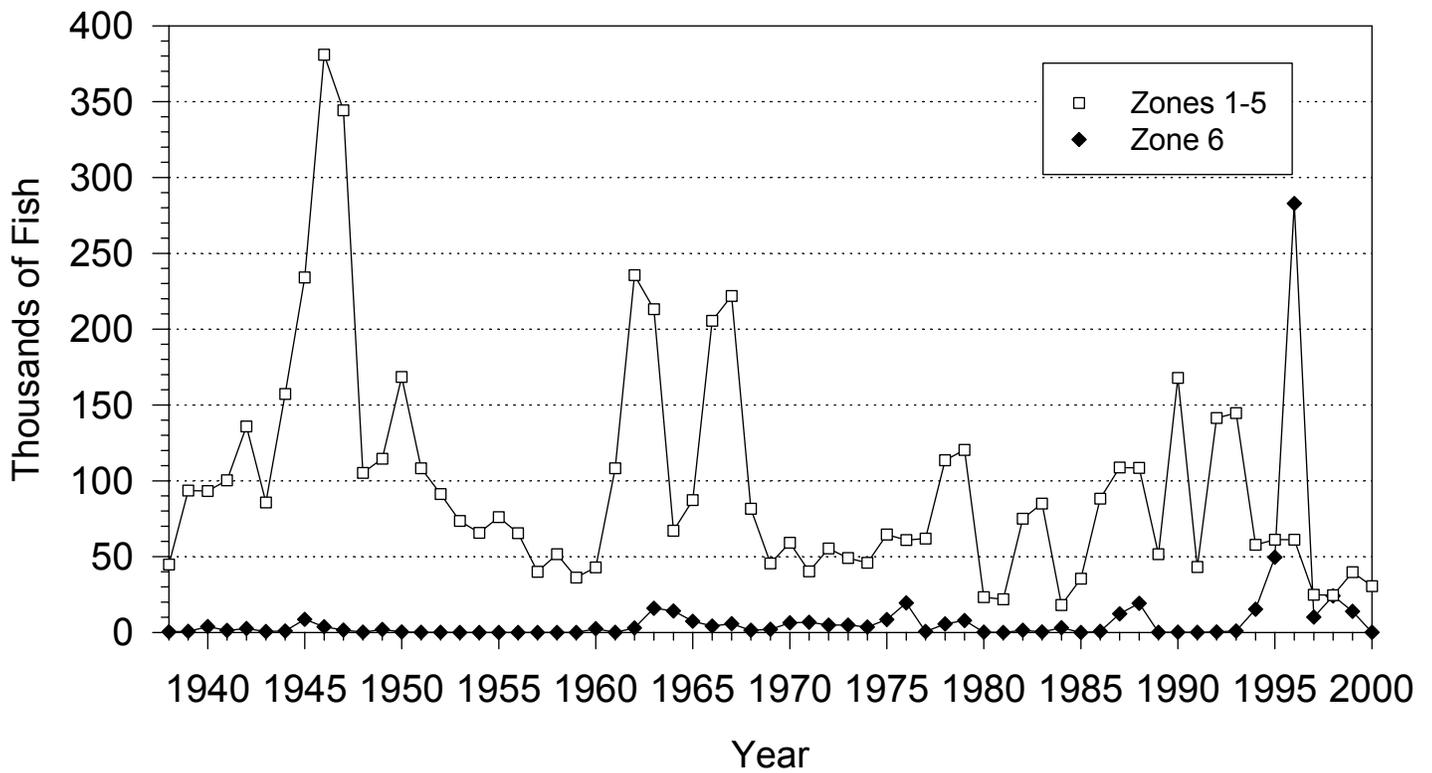


Figure 45. Columbia River Shad Commercial Landings, 1938-2000.

# White Sturgeon

## Status

White sturgeon are indigenous throughout the Columbia River Basin and distinct populations exist downstream from Bonneville Dam and in the impoundments of the Columbia River hydroelectric system. The population downstream from Bonneville Dam exhibits voluntary anadromous behavior and freely migrates to various Washington, Oregon, California, and British Columbia coastal bays and river systems. This population is considered healthy and productive. Reservoir populations, cut off from the ocean by hydroelectric development, are less productive and in lesser abundance the farther upstream they are found. These populations are regarded as segmented due to restricted movement between reservoirs. Sturgeon migrations appear to be primarily motivated by spawning, food availability, and water temperature.

The longevity, slow growth, and delayed maturation of white sturgeon make them particularly susceptible to overexploitation. Excessive harvest at the end of the 19<sup>th</sup> century collapsed the Columbia River white sturgeon population. Only after management actions designed to protect broodstock, particularly the adoption of a 6-foot maximum size limit for sport and commercial fisheries in 1950, did the population rebound. A significant increase in white sturgeon abundance has occurred since then. However, decreased salmon fishing opportunities combined with increased sturgeon popularity as a sport fish and a consumer product resulted in significant increases in harvest of Columbia River white sturgeon.

White sturgeon are now the most popular species harvested in sport fisheries in the lower Columbia River downstream from Bonneville Dam. The summer estuary fishery, keyed by a large abundance of feeding sturgeon, has greatly escalated in catch and effort during the last several decades. Sport harvest peaked in 1987 then decreased through 1990. The reduced harvest was due to management actions and to a lesser abundance of legal-sized sturgeon, a result of high harvest rates in the 1980's. Harvest has steadily increased since 1990 as the legal-sized population has rebounded in response to harvest restrictions adopted during the 1990's.

Fisheries upstream from Bonneville Dam followed the same trend of overharvest in the 1980's. The most significant harvest impacts in the reservoirs between Bonneville and McNary dams (Zone 6) came from Indian gill net fisheries. These impacts were considered more serious since these impounded populations were determined to be much less productive than the unimpounded lower Columbia River population. Researchers determined that the lesser productivity of white sturgeon in Columbia River impoundments was primarily due to depressed spawning and recruitment, an artifact of hydroelectric development and operation. State and tribal managers adopted stringent harvest limits for Zone 6 fisheries and now these populations are beginning to recover. Some white sturgeon populations in the upper Columbia River upstream from Priest Rapids Dam are severely depressed due to loss of spawning habitat. Only catch and release fisheries are allowed on these stocks. State and tribal managers are considering enhancement measures for these depressed upper Columbia River populations.

## Population and Harvest Downstream from Bonneville Dam

The white sturgeon population downstream from Bonneville Dam is considered healthy and productive, but is still recovering from past overharvest. The frequent handling of sublegal and oversized sturgeon in lower Columbia River fisheries signify that the broodstock

population continues to be robust and reproductively fit. Modeling efforts, using tagging data generated from 1983-1988, indicated that harvest rates during 1985-1987 averaged 30% of the 3-6 foot population. These harvest rates were considered about double the rate necessary to maintain an adequate long term recruitment of sturgeon broodstock. Recent regulatory actions have decreased harvest rates to about half of the 1985-1987 average.

The current management strategy relies on limiting harvest to optimal sustainable yield (OSY). The OSY harvest limit is defined as maximum sustainable yield within a prescribed size slot that produces the same annual escapement of broodstock as a uniform 15% harvest rate of 3-6 foot sturgeon when the population is at equilibrium (full recruitment of all legal-sized age classes). An OSY harvest rate is determined from population simulation modeling and applied to the estimated abundance of sturgeon within the legal size slot. The OSY management strategy has been considered successful as evidenced by increased abundance of all age classes.

### **Management Actions Downstream from Bonneville Dam**

Harvest rates were decreased in sport fisheries downstream from Bonneville Dam in April 1989 by increasing the minimum legal size from 36 to 40 inches (total length). This regulation was largely responsible for the decline in harvest through 1990, although a lesser abundance of legal sized sturgeon from past overharvest contributed to this result. Harvest increased beginning in 1991 as sturgeon conserved by the aforementioned regulation recruited into the new legal size slot.

A further harvest rate reduction in sport fisheries was realized when the daily bag limit was reduced in January 1991 from two fish to one fish less than 48 inches plus one fish greater than or equal to 48 inches (the 1 and 1 regulation). This regulation is estimated to have reduced the 1991-1994 legal sturgeon take by up to 12% in the lower Columbia sport fishery. Washington adopted a 60-inch maximum size limit for all sport sturgeon harvested in Washington waters beginning April 16, 1992. Coincidentally, Washington also adopted a two month spawning sanctuary that enacted a seasonal sport fishery closure from April 16 through June 15 in Washington waters from the fishing deadline below Bonneville Dam downstream four miles to Beacon Rock. These regulations, designed to dampen harvest rates and protect broodstock, were not adopted by Oregon and therefore were difficult to enforce and relatively ineffective. Both of these nonconcurrent regulations were rescinded effective April 16, 1993. The maximum size limit for all sport fisheries downstream from The Dalles Dam was 72 inches after the 60-inch regulation was rescinded. In January 1994, the legal size slot was reduced to 42-66 inches and the annual bag limit was decreased from 15 to 10 fish in both states to maintain OSY in the face of continuing increases in sport effort. In 1995, catch and effort continued to escalate prompting a closure to the retention of sturgeon during September 1, 1995 through December 31, 1995. The fishery remained open to catch and release fishing during this timeframe (Table 76).

Impacts in the lower Columbia River commercial gill net fishery were also reduced by management actions during this period. Target sturgeon seasons were eliminated by state policy actions in 1988. The use of heavily weighted drift gill nets to target sturgeon was prohibited in 1991 when Washington matched the Oregon regulation stipulating a leadline limit of two pounds of weight per fathom of net measured along the corkline. During 1990-1992, maximum mesh size restrictions of 9 or 9-1/4 inches were placed on salmon gillnet fisheries to prohibit the use of large mesh gill nets constructed exclusively for sturgeon fishing and in 1993 a 9-1/4 inch maximum mesh size restriction was adopted as a permanent rule by both states. In 1993 the Compact adopted a 66-inch maximum size

limit for all non-Indian commercial fisheries. A 6,000 harvest ceiling was adopted for 1994 lower Columbia River commercial fisheries as an interim management measure to constrain the total harvest rate to within OSY limits. The commercial harvest ceiling was increased to 8,000 annually during 1995-1996 with the added restriction that a maximum of 6,800 white sturgeon could be harvested during fall salmon seasons (Table 77).

In 1997 Washington and Oregon adopted a three-year management plan for lower Columbia River sturgeon fisheries. The maximum size limit was reduced to 60 inches for sport and commercial white sturgeon fisheries as well as for sport fisheries for green sturgeon (statewide in both states). The commercial maximum size limit for green sturgeon remained at 66 inches. The daily bag limit was reduced to 1 sturgeon for sport anglers with catch and release fishing allowed after retaining a legal sized fish. Allocation of the allowable harvest in the lower Columbia River was set at 80% sport and 20% commercial. Given the new size limits and allocated harvest shares, the three-year average allowable white sturgeon harvest, based on estimated OSY, was 67,300 annually (53,840 sport/13,460 commercial). Target commercial seasons for sturgeon, within the conservation constraints for other species, were allowed to minimize salmon impacts and maximize sturgeon commercial opportunity and economic benefit. The maximum mesh size restriction was increased from 9-1/4 inch to 9-3/4 inch to allow fisheries to effectively target legal sized sturgeon while further limiting catch of sublegal sturgeon and other species.

Updated stock assessment data analyzed in early 1999 indicated an in-river decline in white sturgeon abundance. This decline had started in 1996 and was apparent for all age classes including sublegal fish. An abrupt increase in lower Columbia River white sturgeon tag recoveries from emerging fisheries outside the Columbia in 1996 was also observed. These facts led managers to believe that the decline was not a result of overharvest but indicative of a mass emigration of white sturgeon from the Columbia River to the ocean and coastal estuaries. An historic flood occurred in February 1996 that may have contributed to the migration. Managers reacted to this information by reducing the allowable white sturgeon harvestable number to 50,000 fish (40,000 sport/10,000 commercial) for 1999 Columbia River fisheries.

In 2000 Washington and Oregon adopted another three-year management plan institutionalizing for 2000-02 fisheries the allowable annual white sturgeon harvestable number at 50,000 fish (40,000 (80%) sport and 10,000 (20%) commercial).

Managers anticipated angling pressure in 2000 would lead to sport harvest in excess of the 40,000 fish guideline and closed the fishery to retention during April 1, 2000 through April 30, 2000 from the Columbia River mouth upstream to the power line crossing at Wauna, Oregon (RM 40). The area remained open to catch and release fishing during the retention closure. Planned closures during August 16, 2000 through September 15, 2000 from the Columbia River mouth upstream to the Wauna power lines and during November 1, 2000 through November 30, 2000 from the Wauna power lines upstream to Bonneville Dam were not required thus were rescinded by joint state emergency actions.

After the sturgeon harvest in the 1998 Youngs Bay spring fishery exceeded historic levels, it was agreed by the commercial fishing industry that Select Area fisheries be allocated up to 5% of the annual commercial white sturgeon allocation or 675 fish (Table 15). During 1996 and 1997 sturgeon sales were allowed only in traditional Youngs Bay and Big Creek Select Area fisheries. Beginning in 1998, sturgeon sales were allowed in all Select Area fisheries and the Select Area fishery allocation was increased to 10% or 1,346 fish. The 1999 and 2000 Select Area fishery allocations were also 10%, or 1,000 fish.

## 2000 Fisheries Downstream from Bonneville Dam

The 2000 sturgeon sport effort in the lower Columbia River totaled 200,000 angler trips; a 4% increase from 1999. The 2000 sport harvest was 40,500; a 2% increase from the 1999 harvest (Figure 46 and Table 78). The 2000 sport harvest exceeded the 40,000 harvest guideline by 500 white sturgeon.

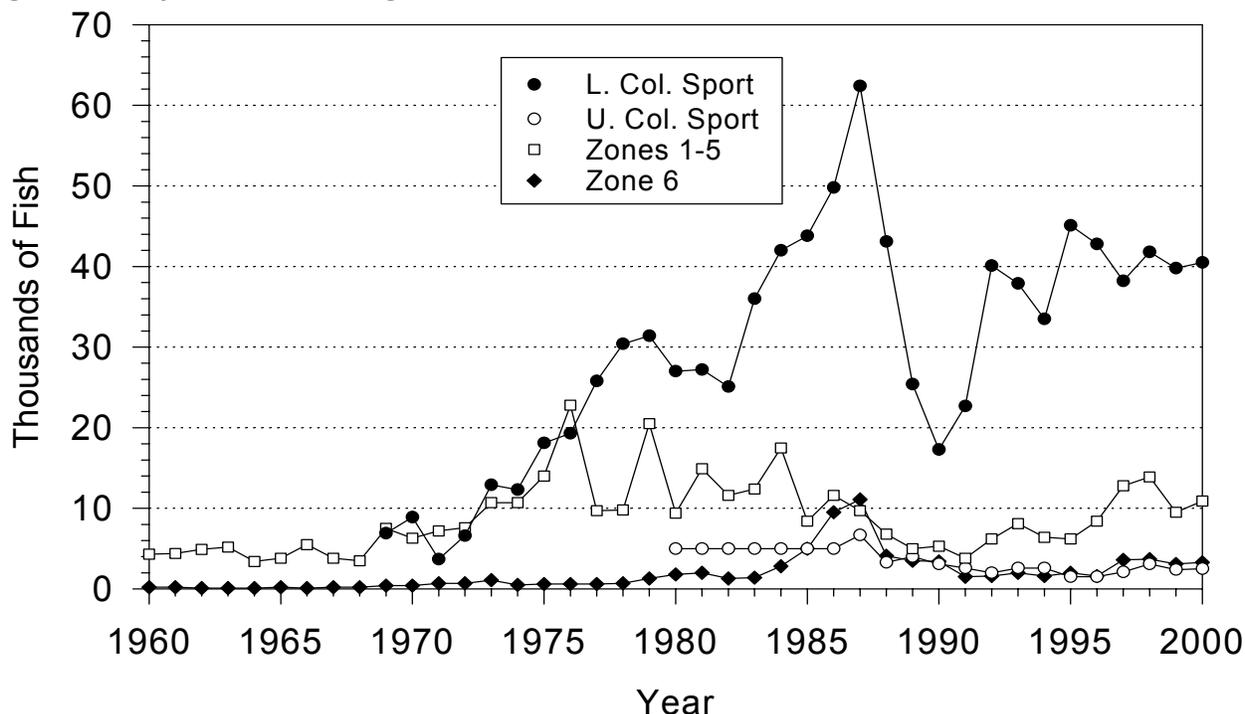


Figure 46. Columbia River Catch of White Sturgeon, 1960-2000.

Lower Columbia River commercial landings in 2000 totaled 10,900 white sturgeon, 900 fish over the 10,000 harvest guideline adopted for 2000 fisheries (Figure 46 and Tables 78-80). There were 2,272 white sturgeon landed in the lower Columbia River winter commercial fishery, which included landings from the Youngs Bay and Tongue Point winter fisheries. Landings in 2000 spring, fall, and summer Youngs Bay, Tongue Point, Blind Slough, Steamboat Slough, and Deep River Select Area fisheries were 354, 284, 53, 1, and 0, white sturgeon, respectively.

A 12-hour target sturgeon commercial fishery in Zones 1-3 (downstream from the Longview Bridge) was set for 7 PM August 3 through 7 AM August 4 to access sturgeon prior to entry of abundant fall chinook. A total of 2,489 white and 568 green sturgeon were landed in this fishery. Additionally, 301 white sturgeon were landed in a 10-hour Area 2S fishery from 8 PM August 21 through 6 AM August 22.

A series of coho target fisheries were set in September. These fisheries occurred in Zones 1-5 with varying hours dependent on the area fished. The fisheries were set for Zones 1-3, from the mouth upstream to Longview Bridge, for September 18 through September 20, September 25, 26 and 28, and October 5, respectively. The fisheries took place from 7 AM until 7 PM on these dates. Concurrently, a fishery occurred in Zones 4-5 on September 19-20 from 8 PM until 6 AM. During these fisheries a total of 520 white sturgeon and 426 green sturgeon were harvested.

Most of the commercial white sturgeon harvest took place during the Columbia River fall seasons. A series of 12 hour fisheries were set during the month of October occurring in Zones 1-5. Fisheries running from 7AM to 7PM occurred on October 9, 16, and 23-27. Additional fisheries were set on October 10-13, and October 17-20. These fisheries ran from noon on the first day until noon on the last day. A total of 4,607 white sturgeon and 219 green sturgeon were harvested. These fisheries were designed to spread out the harvest and maximize economic benefit.

## **Populations and Harvest Upstream from Bonneville Dam**

The white sturgeon populations upstream from Bonneville Dam are considered much less productive than the lower Columbia population. Catch statistics and research indicate lower sturgeon abundance upstream of Bonneville Dam for all year classes. Lower adult growth rates, coupled with fewer years of successful spawning, signify weaker population structures. Exploitation rates have been high for all susceptible age classes in the Zone 6 management area. Harvest in the tribal commercial and non-Indian sport fisheries have been reduced by recent state and tribal management actions, but a high fishing mortality still exists. Other problems that affect the relative productivity and recovery of these white sturgeon populations are inaccessibility to the marine environment and habitat alterations mainly due to hydroelectric development. Populations in the Columbia River Basin upstream from The Dalles Dam are especially depressed and more strictly regulated.

The Sturgeon Management Task Force (SMTF), consisting of representatives from the WDFW, ODFW, and the Columbia River treaty tribes, was formed in 1987 to address the problem of high harvest rates on Columbia River white sturgeon populations and to consider effective enhancement measures within the Zone 6 management area.

## **Management Actions Upstream from Bonneville Dam**

White sturgeon are harvested in treaty Indian commercial and subsistence fisheries in Zone 6 with gill net, setline, and angling gear. Sturgeon harvest reached a record high in 1987 as more Indian fishers began to target white sturgeon using large mesh diver gill nets and setlines. Tribal harvests have been reduced since 1988, principally due to management action, but also as a result of reduced sturgeon abundance.

Sales of sturgeon were prohibited in the fall commercial fishery after September 3 in 1988 and the entire fall seasons in 1989 and 1991-2000 to reduce Treaty Indian harvest in Zone 6. The treaty Indian setline season was reduced from ten months to four months (January through April) in 1988-1990. The 1991 treaty Indian setline fishery occurred for two months (January and April). The 1992 setline fishery occurred over five months (January 1-March 5, April 1-30, July 1-31, and October 26-November 30). The 1993-1995 setline fisheries occurred only during the month of January. In 1996, in addition to the January setline fishery, setline fishing was conducted from April 1 through May 31 in Bonneville and The Dalles reservoirs due to small catches in the flood hampered winter gill net fishery. In 1997, the setline fishery was open January 1-31 in all 3 reservoirs and April 7 to June 23 in the John Day Reservoir. In 1998 the setline fishery was open January 1-31 in all 3 reservoirs and March 23 to June 30 in John Day Reservoir. In 1999 the setline fishery was open January 1-31 in all three reservoirs, April 1-June 5 in Bonneville reservoir, and April-July 31 and October 11-December 31 in John Day reservoir.

The treaty Indian harvest guideline in 1990 was maintained at 1988-1989 levels. With the advent of reservoir-specific abundance estimates for Zone 6 populations, the SMTF agreed to sturgeon harvest guidelines by reservoir for treaty Indian commercial and non-Indian sport fisheries in Zone 6 beginning in 1991. These guidelines corresponded to a combined

fisheries' impact of a 15% harvest rate for 3 to 6 foot sturgeon in Bonneville Reservoir and 10% harvest rates in The Dalles and John Day reservoirs. The treaty Indian commercial guidelines for 1991-1996 fisheries were 1,250, 300, and 100 white sturgeon in Bonneville, The Dalles, and John Day reservoirs, respectively (Table 81).

Harvest rates were decreased in sport fisheries upstream from Bonneville Dam in May 1988 by increasing the minimum legal size from 36 to 40 inches (total length). A further harvest rate reduction in sport fisheries was realized beginning in 1991 when white sturgeon harvest guidelines of 1,350, 100, and 100 were adopted for sport fisheries in Bonneville, The Dalles, and John Day reservoirs, respectively. Since 1991, a variety of season adjustments, size limit changes, and daily and annual bag limit changes have been enacted to limit sport harvest in accordance with the aforementioned guidelines (Table 81). These guidelines remained in effect and unchanged during 1991-1996.

In 1997 the maximum size limit for white sturgeon in all Zone 6 fisheries was reduced from 66 inches total length to 60 inches. This regulation change allowed for a numerical increase in harvest while protecting future recruitment to broodstock. Based on this regulation change, and new stock assessments in The Dalles (1994) and John Day (1996) reservoirs, harvest guidelines were increased in all fisheries. The treaty Indian commercial harvest guidelines in 1997 were 1,300, 400, and 1,160 in Bonneville, The Dalles, and John Day reservoirs, respectively. The new harvest guidelines for Zone 6 sport anglers were 1,520, 200, and 560 in Bonneville, The Dalles, and John Day reservoirs, respectively. In 1998, harvest guidelines were changed in The Dalles Reservoir following the 1997 stock assessment which indicated a significant increase in abundance. The treaty Indian commercial harvest guideline was increased to 1,000-1,200 sturgeon and the sport guideline was increased to 600-800. A stock assessment was conducted in Bonneville Reservoir in 1999. Abundance was similar to that estimated during the 1995 stock assessment and harvest guidelines were not changed for 2000.

Sport fishing impacts to white sturgeon populations in the upper Columbia Basin (waters downstream from the U.S./Canada border to the Washington/Oregon border on the Columbia River and waters downstream from the Washington/Idaho border on the Snake River) were further decreased in 1989 by enacting 48 inch minimum and 66 inch maximum legal size limits and a one fish daily bag limit. Updated research results describing the depressed stock status of populations upstream from The Dalles Dam compelled managers to enact the more restrictive 48 to 66 inch size limits and one fish daily bag limit regulations to all sport fisheries upstream from The Dalles Dam effective April 16, 1991. Coincident with the regulation changes in the lower Columbia River in January 1994 the legal size slot was reduced in Bonneville Reservoir to 42-66 inches and the annual bag limit was decreased in all waters of the Columbia Basin from 15 to 10 fish. Despite these actions, harvest trends in the upper reaches of the Columbia and Snake rivers continued to decline. Consequently, beginning in May 1995, only catch and release sport fisheries were allowed in Lake Roosevelt and upstream from Lower Granite Dam in the Snake River. The catch and release only regulation was extended for all waters of the Columbia and its tributaries upstream from Priest Rapids Dam as of May 1, 1996 (Table 81).

## **2000 Fisheries Upstream from Bonneville Dam**

The 2000 Zone 6 treaty Indian commercial white sturgeon harvest was 3,305 with 1,177 (guideline of 1,300 fish) from Bonneville Reservoir, 1,342 (guideline of 1,000-1,200 fish) from The Dalles Reservoir, and 786 (guideline of 1,160 fish) from John Day Reservoir. A total of 1,054 white sturgeon were harvested during setline fisheries. There were 2,251 fish landed in the winter gill net fishery. The 2000 treaty Indian white sturgeon subsistence harvest estimate of 343 fish was similar to the 300 fish harvest expectation (Figure 46 and Tables 78, 79, 81, and 82)

Zone 6 sport anglers harvested an estimated 2,505 white sturgeon in 2000 or about 7-15% less than the SMTF harvest guideline of 2,680-2,880 (Figure 46 and Tables 78 and 81). The 1999 and 2000 Bonneville Reservoir sport fisheries were managed more conservatively to make up for harvest exceeding the guideline in 1998. Bonneville Reservoir sport anglers harvested 1,262 white sturgeon (guideline of 1,520) before the retention season was closed on April 8. The Dalles Reservoir retention season closed on June 19 when 809 white sturgeon (guideline of 600-800) were harvested. The John Day Reservoir sport fishery continued uninterrupted through the entire year with sport anglers harvesting 434 white sturgeon (guideline of 560).

## Green Sturgeon

Green sturgeon have a greater marine residence than white sturgeon. They are common in Washington and Oregon coastal bays and appear only in the summer months in the Columbia River estuary. They are harvested almost exclusively in the August sturgeon and fall salmon gillnet fisheries in the lower Columbia River. A total of 1,224 green sturgeon were harvested in 2000 lower Columbia commercial gill net fisheries (Figure 47 and Tables 22 and 79).

Sport harvest of green sturgeon is consistently less than 500 fish annually. Sport catch is minor even in the summer months in the estuary when green sturgeon are most abundant and the catch of white sturgeon is peaking. The 2000 sport catch of green sturgeon was 32 fish.

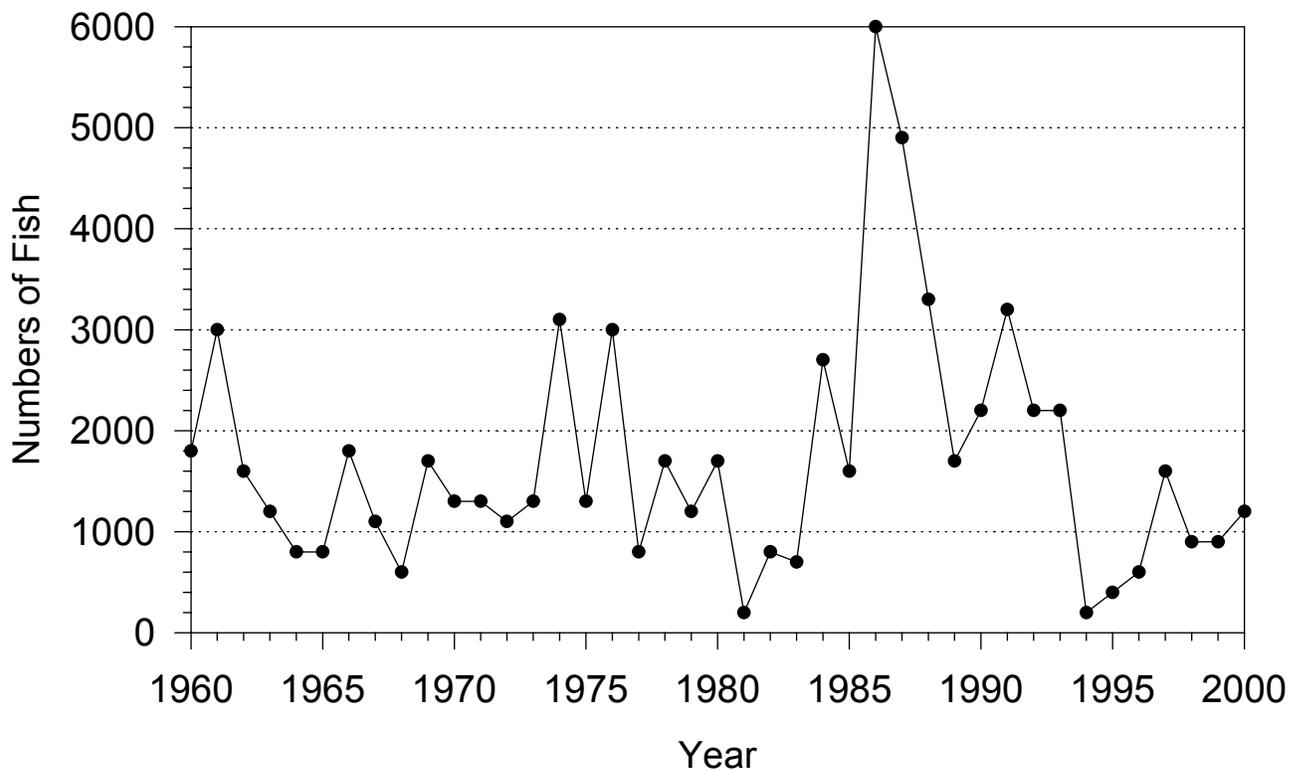


Figure 47. Columbia River Green Sturgeon Commercial Landings, 1960-2000.

## **Starry Flounder**

Starry flounder are caught incidentally during commercial gillnet seasons in the lower Columbia and some are sold. The landings have decreased to an insignificant level. There were no landings of starry flounder in 2000 (Table 22).

## **Walleye**

Walleye were introduced to the Columbia system in the 1950s either by direct plants into Lake Roosevelt or by inundation of Devils Lake by Banks Lake. Since their appearance, walleye have gradually spread down-river and established populations and fisheries in Lake Roosevelt by the 1960s and in the middle Columbia between Bonneville and McNary dams by the late 1970s. Walleye populations are now present in the lower Columbia River below Bonneville Dam and in the Willamette River below Willamette Falls.

In the lower Columbia River, walleye were first observed in abundance as an incidental species in the 1981 commercial shad gillnet fishery below Bonneville Dam (Area 2S). The incidental handle of walleye in the shad gillnet fishery has been less than 200 walleye annually. The first significant target sport fishery below Bonneville Dam occurred in 1982. From 1982 to 1999, the lower Columbia sport fishery has harvested 100 to 3,100 walleye annually (Table 83). During 2000, the estimated lower Columbia sport catch was 252 walleye kept from 1,339 angler trips.

The primary sport fishery for walleye occurs in the mid-Columbia reservoirs between Bonneville and McNary dams. Partial sport catch totals for Bonneville, The Dalles, and John Day pools are presented in Table 84. Walleye catches in the mid-Columbia River reflect the relative abundance of walleye in the pools. Walleye populations fluctuate with the variability of their spawning success, which is highest in years of low river flows and lowest or nonexistent in years of high spring runoff. Catch declined in 1983-1986 because of poor spawning success and recruitment to the fishery during the early 1980's. However, 1986-1989 were good spawning years and recruitment to the fishery became apparent in 1988-1990. Limited creel data for 1993 and 1994 show sport catches increased somewhat after declining during 1991 and 1992. Catches from 1995 to 1998 were generally at or near record high levels indicating a very strong year class from 1992 and possibly 1994. The catches of 2,531 and 2,831 walleye in the mid-Columbia during 1999 and 2000 respectively, were less than half of the ten-year average and may reflect poor spawning success during flood years of 1996 and 1997.

Treaty Indian fishers catch walleye as an incidental species. During 1980-1988, Indian-caught walleye could not be sold, but could be retained for subsistence purposes. Beginning in 1989, per the CRFMP, walleye were allowed for sale by treaty Indian fishers. The 2000 landings were 354 during the winter season and 30 during the fall season, for a total of 384 walleye (Table 85). Walleye may still be retained for subsistence purposes. The total estimated subsistence catch for 2000 was less than 100 fish.

## **Anchovy and Herring**

The anchovy and herring season is open year round seaward of the Astoria-Megler Bridge, with seines of mesh size not less than 1/2 inch and not over 1,400 feet in length. All other species must be released. The fishery provides fresh anchovy for bait to the local recreational salmon and sturgeon fisheries. The angler success rate in the estuary sturgeon fishery is highly dependent on the daily availability of fresh anchovy for bait.

## LIST OF ACRONYMS

ASR	All Species Review (1996 report by TAC)
BA	Biological assessment (ESA)
BLM	Bureau of Land Management
BO	Biological opinion (ESA)
BOR	Bureau of Reclamation
BPA	Bonneville Power Administration
BPH	Bonneville Pool hatchery (fall chinook stock)
BUB	Bonneville upriver bright (fall chinook stock)
C&H	Chinook-Hammond fishery (operated 1989-91)
C&S	Ceremonial & subsistence fishery
CAB	Citizens Advisory Board
CBFWA	Columbia Basin Fish and Wildlife Authority
CEDC	Clatsop County Economic Development Council
CKL	Cowlitz, Kalama, Lewis (spring chinook)
CPUE	Catch per unit effort
CRFMP	Columbia River Fish Management Plan
CRITFC	Columbia River Inter-tribal Fish Commission
CRM	Columbia River Management
CRR	Columbia River Research
CTUIR	Confederated Tribes of Umatilla Indian Reservation
CTWSR	Confederated Tribes of the Warm Springs Reservation
CWT	Coded-wire tag
DNR	Department of Natural Resources (Washington State)
DOE	Department of Energy
DOE	Department of Ecology (Washington State)
DSI	Direct Service Industries
ESA	Endangered Species Act
ESU	Evolutionarily significant unit
FCMA	Fishery Conservation and Management Act (Magnuson Act)
FCO	Fish Commission of Oregon (now ODFW)
FCRPS	Federal Columbia River Power System
FERC	Federal Energy Regulatory Commission
GSI	Genetic stock identification
IDFG	Idaho Department of Fish & Game
JDMP	John Day Mitigation Production Program
JS	Joint Staff (ODFW & WDFW Columbia River Management)
LRB	Lower river brights (fall chinook stock)
KCFS	Thousand cubic feet per second (water flow)
LRH	Lower river hatchery (fall chinook stock)
LRW	Lower river wild (fall chinook stock)
LSRCP	Lower Snake River Compensation Plan
NEAP	Northwest Emergency Assistance Program
MCB	Mid-Columbia bright stock (fall chinook stock)
MSY	Maximum sustained yield
NMFS	National Marine Fisheries Service
NPFMC	North Pacific Fishery Management Council

## LIST OF ACRONYMS continued

NPPC	Pacific Northwest Electric Power and Conservation Planning Council
NPT	Nez Perce Tribe
NWPA	Northwest Power Act
OCN	Oregon coastal natural coho
ODFW	Oregon Department of Fish and Wildlife (OFC and OSGC merged in 1975)
OFC	Oregon Fish Commission (now ODFW)
OPI	Oregon production index (coho)
OSGC	Oregon State Game Commission (then OWC, now ODFW)
OSP	Oregon State Police
OSY	Optimum sustained yield
OTC	Oxytetracycline
OWC	Oregon Wildlife Commission (now ODFW)
PAC	Production Advisory Committee (of CRFMP)
PC	Policy Committee (of CRFMP)
PFMC	Pacific Fishery Management Council
PGE	Portland General Electric
PIT	Passive integrated transponder (fish tag)
PNUCC	Pacific Northwest Utilities Conference Committee
PSC	Pacific Salmon Commission
PSMFC	Pacific States Marine Fisheries Commission
PST	Pacific Salmon Treaty
PUB	Pool upriver bright (fall chinook stock)
RM	River Mile
RRB	Rogue River bright (fall chinook stock)
SAB	Select area bright (fall chinook stock)
SAFE	Select Area Fisheries Evaluation
SBT	Shoshone-Bannock Tribes
SFA	Salmon for All
SMTF	Sturgeon Management Task Force
SRB	Snake River bright (fall chinook stock)
SRW	Snake River wild (fall chinook stock)
TAC	Technical Advisory Committee (of CRFMP)
TCL	Tacoma City Light
URB	Upriver bright (fall chinook stock)
USACE	United States Army Corps of Engineers
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VSI	Visual stock identification
WB	Wallop/Breaux (Sport Fish Restoration Act)
WDF	Washington Department of Fisheries (now WDFW)
WDFW	Washington Department of Fish and Wildlife (WDF and WDW merged in 1994)
WDW	Washington Department of Wildlife (now WDFW)
WFMP	Willamette Fish Management Plan
WSP	Washington State Patrol
YIN	Yakama Indian Nation

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