Annual Report 2003

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Annual Stock Assessment - CWT (USFWS)

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INTRODUCTION

In 1989 the Bonneville Power Administration (BPA) began funding the evaluation of production groups of juvenile anadromous fish not being coded-wire tagged for other programs. These groups were the "Missing Production Groups". Production fish released by the U.S. Fish and Wildlife Service (USFWS) without representative coded-wire tags during the 1980s are indicated as blank spaces on the survival graphs in this report. This program is now referred to as "Annual Stock Assessment - CWT"

The objectives of the "Annual Stock Assessment" program are:

- to estimate the total survival of each production group,

- to estimate the contribution of each production group to various fisheries, and

- to prepare an annual report for all USFWS hatcheries in the Columbia River basin.

Coded-wire tag recovery information will be used to evaluate the relative success of individual brood stocks. This information can also be used by salmon harvest managers to develop plans to allow the harvest of excess hatchery fish while protecting threatened, endangered, or other stocks of concern.

All fish release information, including marked/unmarked ratios, is reported to the Pacific States Marine Fisheries Commission (PSMFC). Fish recovered in the various fisheries or at the hatcheries are sampled to recover coded-wire tags. This recovery information is also reported to PSMFC.

METHODS

The Annual Stock Assessment Report evaluates the survival and contribution to various fisheries of fish raised and released at production facilities. Release information used in this report is collected with the U.S. Fish and Wildlife Service Columbia River (information) System (CRiS). Information prior to the Columbia River basin wide implementation of CRiS, and from USFWS hatcheries in Idaho, is obtained from the interagency StreamNet database.

List of coded-wire tags are obtained from the CRiS sr80s file by making use of the CWTetc program. Recovery information is obtained from the PSMFC Regional Mark Information System (RMIS) coded-wire tag database web site. The recovery database is continuously being updated by the contributing agencies, and the updates are reflected annually in this report. Coded-wire tag recovery information is retrieved in the TS1 format. The TS1 report contains both the observed number of recoveries, and the estimated number of recoveries based on the sampling rate.

TS1 reports are downloaded in ASCII format. A series of dBASE V programs transforms these ASCII files into a single dbf file.

A Stock Assessment Reference Document is prepared for each hatchery, brood year, and species. Because many fish were released without representative coded-wire tags before the Annual Stock Assessment program began, a single Production Expansion Factor (PEF - the total number of fish released divided by the total number of tagged fish released) is calculated for each hatchery, brood year, species, and stage of fish released at the hatchery. This PEF has been used to expand estimated recovery information for unmarked fish released, and to determine a general picture of the overall contribution and survival rates for each facility.

Traditionally, the adipose fin was removed from all fish that had been coded-wire tagged. This external mark facilitated the recovery of tags. In the late 1990s the goal of protecting weak, threatened, or endangered populations of fish, while maintaining fisheries on healthy populations, gave rise to the policy of identifying most hatchery fish by removing the adipose fin. The "mass marking" of hatchery steelhead, coho, and spring chinook makes it possible to have fisheries target only hatchery fish. Wild fish with adipose fins are not harvested in these "selective fisheries". In order to assess the success of selective fisheries, some hatchery fish are given a coded-wire tag and the adipose fin is not removed. Fish without adipose fins may be harvested at different rates than fish with adipose fins. Therefore, a new program (rd2) that expands the recoveries for each coded-wire tag, rather than as an aggregate, was written. The rd2 program was used for most of the most recent brood years, and has now been used for many older brood years beginning with brood year 1990.

Stock Assessment Reference Summary printouts list the following information for each brood year, species, hatchery, and stage released at the hatchery: release information, the total number of observed recoveries, where recoveries occurred, the number of expanded recoveries from the PSMFC TS1 report, the number of recoveries expanded to include unmarked fish released, and a summary of where fish were recovered.

"Residualized" fish, or "mini-jacks" from yearling releases, are not included in estimates of survival.

"Total Survival" and "Contribution by Fishery" graphs are prepared with a combination of dBASE programs and QuatroPro spreadsheets "FisheryBW" and "Survive".

Because the Washington Department of Fish and Wildlife (WDFW) conducted studies at both Carson National Fish Hatchery (NFH) (brood years 1989-1991) and Spring Creek NFH (brood years 1993 and 1994), that agency both sampled and reported recoveries at those hatcheries for several years: 1995, 1996, and

1997 for Spring Creek NFH. This created the unintended consequence that, in the TS1 reports, those recoveries appeared to be recoveries at WDFW hatcheries. With the changeover to the new 4.0 format, however, USFWS has submitted those recoveries, and is now listed as the reporting agency. The following Carson years are now FWS: 1994, 1995. The following Spring Creek years are now FWS: 1993, 1994.

RESULTS

In calendar year 2003 the USFWS Columbia River Fisheries Program Office marked 125,225 fish under the "Annual Stock Assessment" program. Over 1,683 returning fish with "Annual Stock Assessment" coded-wire tags were recovered at USFWS hatcheries in 2003, and processed at USFWS fisheries offices.

A brief description of the estimated survival and contribution for each species raised and released at national fish hatcheries follows. Graphs for each hatchery and species were prepared.

Abernathy Fish Technology Center

Abernathy Fish Technology Center (FTC) is located 14 miles west of Longview, Washington, on Abernathy Creek, approximately three miles upstream from its confluence with the Columbia River at an altitude of 175 feet above sea level. Abernathy FTC began operations in 1959. From 1980 through the 1990s, lower river Tule fall Chinook were the only species reared on a production basis at Abernathy.

Coded-wire tags were released in fish from brood years 1980 and 1981. Current estimated survival rates are 1.1511% and 0.2084%. Changes in reporting by the Canadian Department of Fisheries and Oceans (CDFO) were noted in the 1997 report. Nevertheless, the CDFO ocean troll fishery took most of these fish.

There were no releases of marked fish for brood years 1982 to 1988.

Marking fish with coded-wire tags was resumed for brood year 1989 under the Missing Production Group program. Brood year 1989 contributed mainly to troll and sport fisheries in Washington (1,628) and British Columbia (977). Overall survival was 0.1836% or 3,296 fish.

Fish from brood year 1990 had a low survival rate of 0.0773%. An estimated 102 fish were taken in the ocean off Washington, and 136 in the Columbia River estuary sport fishery. An additional 645 fish were estimated to have been recovered in Washington Department of Fish and Wildlife (WDFW) spawning ground surveys.

Additional recoveries have raised the total survival for brood year 1991 to 0.2260%.
An estimated 1,156 fish were recovered in spawning ground surveys, nearly twice the number returning to Abernathy. Ocean harvest was 1,027 fish and 1,470 fish were harvested in the Columbia River.

Total survival for brood year 1992 is 0.2435%, about the same as brood year 1991. Spawning ground surveys by WDFW account for 758 fish. Hatcheries other than Abernathy recovered an additional 444 fish from the Columbia River contribution of 1,256. Of the 477 fish harvested in the ocean, 388 were in British Columbia.

Survival was lower for brood year 1993 at 0.1504%. There were 169 recoveries in the ocean, 226 in the Columbia River, and 283 at the hatchery.

Brood year 1994 survival fell to an estimated 548 fish, or 0.0381%. The final year of production of Tules at Abernathy resulted in an estimated survival rate of 0.0287%. The low survival rates for these two brood years are consistent with the low survival for fish released from Spring Creek NFH.

Carson National Fish Hatchery

Carson NFH is located 13 miles northwest of Carson, Washington, at the confluence of the Wind River and Tyee Springs (River Mile 18), at 1,180 feet above sea level. Carson NFH began operation in 1938 by rearing and releasing fall Chinook salmon and trout.

In 1956, the hatchery was remodeled under the Mitchell Act. Construction of a fish ladder at Shipperd Falls (River Mile 2.1) in 1955 made it possible for spring Chinook to pass upstream to the hatchery. Trapping of spring Chinook at Bonneville Dam began in 1955, after Washington shore trapping facilities were completed, and continued through 1961. Those trapped fish were used to establish the Carson run of spring Chinook in the Wind River. Other species such as steelhead, brook trout, rainbow trout, kokanee, and coho have also been raised at Carson. Coho were raised as late as 1981. Current production involves adult collection, egg incubation and rearing of spring Chinook salmon.

Brood year 1982 to 1985 spring Chinook from Carson were marked with coded-wire tags for a density study. The average total survival of these brood years is 0.22%. The greatest number of off station recoveries were in the freshwater sport fishery. There were an estimated 20 recoveries of brood year 1982 and 1983 fish in Canadian waters. An estimated 43 recoveries of brood year 1985 fish occurred in ocean fisheries in Alaska, Canada, and Washington.

Because of a WDFW fish marking study at Carson, WDFW sampled returning adults and reported recoveries for return years 1993 through 1996. The survival rate for Carson brood year 1988 is 0.4684%. The majority of contribution to fisheries occurred in Columbia River freshwater sport and was expanded to 5,303. Recoveries in the treaty ceremonial fisheries were expanded to a catch of 1,023.

Brood year 1989 was also part of the fish marking study conducted by WDFW. The estimated survival for this brood year was 0.2036%, less than half of the previous brood year. The majority of fish from this brood year (2,498) were taken in the freshwater sport fishery reported by WDFW. Two observed recoveries in the Washington ocean troll fishery were expanded to a total of 12 fish caught.

The survival rate for brood year 1990 was 0.0346%, or a total of 802 fish from a release of over 2 million. A third of the fish entering the Columbia River were harvested before reaching Carson. Most of these recoveries, estimated at 122, were freshwater sport reported by WDFW. Treaty ceremonial fishery recoveries reported by ODFW show 29 fish taken, followed by 21 in the Columbia River sport fishery.

Brood year 1991 survival is now estimated to be 0.0224%. This is still less than brood year 1990 and the lowest to date. The largest off station take of fish was the ODFW reported treaty ceremonial harvest of 70 fish. Four fish were recovered in WDFW spawning ground surveys.

Survival for brood year 1992 is now 0.6191%, the highest since brood year 1988. It is estimated that 82 fish were harvested in the California ocean troll fishery, an unusual event. Since all of the coded-wire tags released with brood year 1992 were used for a density study, none of the tag codes represents the majority of fish released, which were raised at a different density. Recoveries for this brood year at Carson NFH were originally reported by WDFW.

Three additional recoveries from 1993 brood year increase survival to 0.43333%. The 1993 brood year now has the fourth highest survival for this hatchery. An estimated 42 fish were harvested in the California ocean troll fishery as jacks. The harvest of these fish off of California occurred the same year as the harvest of 82 fish from brood year 1992. WDFW freshwater sport fishery recoveries are expanded to a harvest of 4,494 fish, nearly as

many as returned to the hatchery. Since all of the coded-wire tags released with brood year 1993 were used for a density study, none of the tag codes represents the majority of the fish released, which were raised at a different density.

Brood year 1994 survival is now estimated at 0.1243%. There are an expanded 882 fresh water sport recoveries, 1,082 expanded returns to hatcheries, and 165 expanded spawning ground recoveries. This equals a total of 2,141 expanded recoveries for the 1994 brood year.

There are an additional 4 PSC expanded WDFW freshwater sport recoveries this year, increases the estimated survival for brood year 1995 to 0.3770%, in the upper third of successful brood years for Carson NFH. There have been an estimated 997 expanded off station recoveries from these fish, all in the Columbia Basin.

The estimated survival for brood year 1996 is 1.0828% with an estimated 8,731 off station recoveries, and 10,047 returns to the hatchery. This brood year is the most successful yet for Carson NFH when measured by total percent survival.

Even with age 5 recoveries not yet reported, brood year 1997 has the highest survival rate yet for Carson NFH spring Chinook at 1.2073%.

Dworshak National Fish Hatchery

Dworshak NFH is located at the confluence of the North Fork Clearwater River and the main stem Clearwater River about three miles west of Orofino, Idaho, at 1,000 feet above sea level. Dworshak NFH first began operations in 1969 rearing summer steelhead and resident trout. The facility was expanded in 1982 under the Lower Snake River Compensation Program (LSRCP) to rear spring Chinook salmon. The hatchery is now used to produce spring Chinook and summer steelhead.

Spring Chinook

Total recoveries for brood year 1985 were 0.0201%, the first release of 100% Rapid River stock. The brood year 1986 yearling release resulted in an estimated 2,595 fish , or 0.2306%.

Twelve different coded-wire tag groups were released with brood year 1987. Only three were in yearling fish released at the hatchery. Coded-wire tag release information was obtained from the StreamNet Distributed System. Total survival is estimated at 0.0041. The ODFW reported freshwater sport harvest took an estimated 13 fish.

Overall survival for brood year 1988 is now 0.0605%. This brood year contributed mainly to the treaty ceremonial fishery in the Columbia River.

Yearlings from brood year 1989 survived only half as well as brood year 1988. A total of 70 fish were harvested in the Columbia basin, and 3 were recovered at WDFW hatcheries. Fifty-two fish were taken in the treaty ceremonial fishery. Overall survival is 0.0353%.

Coded-wire tag information for brood year 1990 was obtained from the StreamNet Distributed System. Total estimated survival for this brood year was 0.0027%, or 26 fish from a release of almost 960,000. The treaty ceremonial fishery reported by ODFW took two fish from this brood year.

Brood year 1991 has an estimated overall survival rate of 0.0021%, the lowest of tagged brood years in this report. There was only one off station recovery from this brood year.

All brood year 1992 spring Chinook released at Dworshak were represented by coded-wire tags, so the rd2 program was used to estimate the total survival of 0.0584%. An estimated 78 fish, or 10% of the total, were recovered at a variety of Columbia River Basin sites other than Dworshak.

Two additional recoveries increase brood year 1993 survival to an estimated 0.0721%, or 945 fish. The rd program was used since fish unrepresented by coded-wire tags were released. There were an estimated 725 recoveries off station, with 4 in Alaska and 4 in British Columbia ocean fisheries. This brood year also provided an estimated 177 fish for treaty fisheries.

Estimated survival for brood year 1994 is 0.0369% using the rd2 program. This is only an estimated 38 total recoveries from a low egg take, and the subsequent release of 100,775 fish. Nevertheless, to date this survival is in the middle of survivals for Dworshak spring Chinook. The largest number of recoveries was in the IDFG reported freshwater sport category. There were also 3 expanded recoveries in the Alaska ocean troll fishery. There was only 1 FWS reported recovery from this brood year, and it occurred at Warm Springs NFH. Four age-2 recoveries at Dworshak are not included in the report.

The record high 0.9985% estimated survival for brood year 1995 is somewhat mitigated by the low number of fish released from this brood year - 53,078. This is a reflection of the fact that only 125 spring Chinook returned to Dworshak in 1995. Only an estimated 530 fish were recovered from this brood year.

The initial estimation of survival for brood year 1996 is 0.051%.

Summer Steelhead

Total survivals for brood years 1980, 1981, and 1982 were 2.9305%, 1.2033%, and 0.3813% respectively. Although the Stock Assessment printout shows 0 Escapement to NFH, this results from the fact that Idaho Department of Fish and Game (IDFG) reported hatchery recoveries at Dworshak NFH in the early 1980s.

Tagged fish from brood year 1983 (release year 1984 with CWTs 051335, 102516, and 102517) are listed as "Off-site direct hatchery release" in the StreamNet database.

No coded-wire tagged fish were released on site in brood year 1983 or 1984.

Survival for brood year 1985 has stabilized at 1.1867%. Over 5,400 fish were taken in the Columbia River gill net fishery, and over 4,100 were taken in the freshwater sport fishery reported by Idaho.

Brood year 1986 has an overall recovery rate of 1.9046%. This brood year contributed mainly to the freshwater sport fishery in Idaho. Many of these steelhead were also recovered in the Columbia River gillnet fishery.

Total survival rate for brood year 1987 stands at 0.9099%. Thirty-five fish were taken off British Columbia, but the great majority of fish (7,199) were taken in the Columbia River basin. The majority of "Columbia River" harvest was in the ODFW reported gillnet fishery and the IDFG reported freshwater sport fishery.

Brood year 1988 summer steelhead yielded 465 observed recoveries with an overall estimated survival rate of 0.4780%. The vast majority of fish were taken in the Columbia River gill net fishery (2,276), followed by the Columbia River sport fishery (504). No freshwater sport recoveries have been reported by IDFG. There was 1 observed recovery of an age-2 fish in the squid gill net by-catch and foreign research vessel records reported by National Marine Fisheries Service (NMFS)

Overall survival for brood year 1989 is the same as last year at 0.9315%. Most fish were taken in the Columbia River gill net fishery (4,434). A total of 1,377 fish was taken in the various freshwater and estuary sport fisheries. Forty-seven fish were taken off the coast of British Columbia. No freshwater sport recoveries have been reported by IDFG.

Brood year 1990 release data were obtained from the StreamNet database. Except for one different date, 90 additional fish, and a significant difference in the total weight of fish released, StreamNet records are similar to those originally reported for releases at the hatchery. The total survival rate is 0.4821% or 5,750 fish. Most of the harvested fish were taken in the Columbia River gill net fishery (2,575). Twenty-five fish were also taken in the Oregon ocean sport fishery.

Total survival for brood 1991 is 0.2388%, near the bottom of survival rates for Dworshak steelhead. A total of 2,923 fish survived from this brood year. Seventy-five fish were harvested in the Quinault reported coastal gill net fishery. ODFW reports Columbia River gill net and sport harvest of 984 and 149 fish, and another 328 fish as freshwater sport.

Survival for brood year 1992 is now estimated to be 0.2259%, using the rd2 program. Twenty-nine percent of the fish were recovered before returning to the hatchery. Off station recoveries occurred in the Columbia River gill net and freshwater sport fisheries of all three Northwestern states, with Washington reporting the largest share.

The current estimated survival for brood year 1993 is 0.218%, the third lowest to date. All reported off station recoveries were within the Columbia River basin, and 643 fish were harvested there, mostly in sport fisheries.

Observed recoveries for brood year 1994 are expanded to a total of 1,065 estimated recoveries, or 0.0878% by the rd2 program. More fish were recovered off station (769) than returned to the hatchery, according to coded-wire tag recoveries.

Survival for brood year 1995 is about half that of the previous brood year, or 0.0441%.

Eagle Creek National Fish Hatchery

Eagle Creek National Fish Hatchery is located about seven miles from Estacada, Oregon, on Eagle Creek, approximately ten miles above its confluence with the Clackamas River at an elevation of 950 feet. The hatchery was authorized by the Mitchell Act of 1938 (52 Stat. 345), as amended in 1946.[1] The hatchery was constructed in 1956, and is currently operated as part of the Columbia River Fishery Development Program administered by NOAA – fisheries. Although Eagle Creek NFH has raised fall and spring Chinook in past years, production is now limited to coho and winter steelhead. Steelhead are no longer being coded-wire tagged because of the low rate of recovery sampling in Eagle Creek and the Clackamas and Willamette Rivers.

Coho

Coded-wire tags were used in a multiple year density study including brood years 1979, 1980 and 1981. Brood year 1980 survival rate was 1.3546%, and brood year 1981 survival was 1.0413%. Oregon ocean fisheries took nearly four times more fish than Washington ocean fisheries in brood year 1980. Brood year 1981 had an almost even spilt between the two fisheries.

No coded-wire tags were released in brood years 1982-1987.

The estimated total recovery from brood year 1988 was 42,345 fish, or 4.181%, the highest rate on record. This brood year contributed 11,340 fish to the Oregon ocean, and 8,930 fish to the Columbia River fisheries.

The 1989 brood year coho survival rate was 0.9446%, about one quarter of the very high 4.181% survival rate of brood year 1988 coho. Over 3,800 of the coho from this brood year were caught off the Oregon coast in the sport and commercial fisheries. Eighteen hundred were harvested in the ocean off Washington, and 200 off California. Over 200 fish were taken in British Columbia. Eight hundred twenty were also harvested in the Columbia River.

Brood year 1990 coho has a total of 31 observed recoveries and an overall survival rate of 0.1228%. Fish from Big Creek and Sandy were released along with Eagle Creek fish this year. Fewer than 600 fish were taken in the ocean, and 310 in the Columbia River. Five hundred of the ocean recoveries were reported by WDFW. The remaining 96 were split evenly between Oregon and California. Coded-wire tagged returns to the hatchery were estimated to be less than the ocean harvest of this brood year.

Total survival rate for brood year 1991 coho is estimated to be 0.3402%. Fish from the ODFW Sandy hatchery were released this year, so even though all fish were assigned to a coded-wire tag, they are not truly representative. Only 137 fish were harvested in the ocean (91 by British Columbia and 46 by Washington), and 205 in the Columbia River. Escapement to the hatchery was about 3,300 fish. Although this brood year did better than the 1990 fish, it was much less successful than 1980, 1981, 1988 or 1989.
Brood year 1992 survival rate is estimated at 0.4758%, an improvement over the previous two broods, but still below average for broods in the 1980s. Escapement to the hatchery made up the largest segment of fish recovered, as was also the case for brood year 1991. Washington ocean fisheries took 750 fish and Oregon ocean fisheries harvested 277 fish. An additional 197 fish were taken in the Columbia River.

Brood year 1993 releases included both forced and volitional releases of Eagle Creek stock and Toutle stock coho. Expansion of individual coded-wire tags rather than using a PEF yields a total survival of 0.2375%. There were an estimated 121 recoveries in the Columbia River, and 358 in the ocean off of

[1]Eagle Creek National Fish Hatchery Station Development Plan 1983

British Columbia and Washington.

Total survival for brood year 1994 was even lower at 0.1758%. WDFW reported ocean recoveries result in an ocean harvest of 263 fish, with 66 fish harvested in the Columbia River estuary sport fishery.

Brood year 1995 was the first brood year in which all fish were adipose fin clipped. Prior to this brood year, only fish with a coded-wire tag were adipose fin clipped. A small number of fish were not adipose fin clipped, but received a coded-wire tag. Since externally marked fish may be harvested at a different rate than the unmarked fish, recoveries have been expanded for each coded-wire tag, rather than for a combined coded-wire tag. WDFW Columbia River estuary sport now has an additional 4 expanded recoveries. Survival is now estimated to be 2.1002%, the best since brood year 1988.

The addition of 14 expanded recoveries in the ODFW reported Columbia River estuary sport fishery increases total survival for Eagle Creek brood year 1996 coho to 1.6924%. Two thousand five hundred forty-nine fish were harvested in the ocean, and 1,316 were taken in the Columbia River.

Minor changes in reporting result in an estimated survival of 1.8085% for Eagle Creek brood year 1997 coho. Only brood years 1995 and 1988 were higher. Over fifty-two hundred fish were harvested in the ocean, almost equally divided between Oregon and Washington. Actual counts of fish returning to the hatchery indicate that CWT recoveries significantly underestimate survival for this brood year.

The initial estimate of survival for brood year 1998 was a near record 4.0142%. Currently, only brood year 1988 is higher. However, ODFW recoveries for this brood year are not in the most recently down loaded data set. Over eighty-five hundred fish were taken in WDFW ocean fisheries, and over fourteen hundred in the previously reported ODFW ocean fisheries. Additionally, ODFW had reported that an additional eighty-five hundred fish were taken in the Columbia River.

Entiat National Fish Hatchery

Entiat NFH is located on the Entiat River, west of Entiat, Washington. Elevation is 980 feet above sea level. Construction began in 1940 under the Grand Coulee Fish Maintenance Project and operations began a year later. Present production at the hatchery consists of adult collection, egg incubation, and rearing of spring Chinook salmon.

Yearling spring Chinook at Entiat were coded-wire tagged beginning with brood year 1988. Expanded off station recoveries include 57 in the treaty ceremonial fishery and 6 in the Columbia River sport fishery. Expanding CWT recoveries for brood year 1988 gave an estimated survival of 0.1023%. Eggs from Winthrop NFH were raised and released at Entiat as part of this brood year.

There was a total of 56 observed recoveries of the 111,207 tagged fish released with brood year 1989. Expansion of these recoveries yields an overall survival rate of 0.0503%. Seven fish were taken in the Columbia River sport fishery. Production for this brood year included fish raised from eggs transferred from Leavenworth NFH.

There were only four observed recoveries from the 95,682 tagged fish released with brood year 1990. Using the rd2 program yields an estimated total survival of 0.0041% for this brood year. All recoveries were at the hatchery.

Brood year 1991 was more successful than the previous brood year with a total survival rate of 0.0279%, using the rd2 program. Nine fish were taken in the Columbia River treaty ceremonial fishery. All observed (28) recoveries were of age-4 fish.

A total recovery rate of 0.0346% puts brood year 1992 in the middle of yearling releases among the five years of coded-wire tagging at Enitat. The freshwater fish trap category accounts for most of the off station recoveries.

Total survival for brood year 1993 was 0.0383%, better than the previous two brood years. Five coded-wire tagged fish were recovered off station, while 35 coded-wire tagged fish returned to the hatchery.

The yearling release for brood year 1994 included fish received as eggs from Leavenworth NFH. Total survival was estimated to be 0.0667% with an estimated 10 non-hatchery recoveries. This is the highest survival to date for Entiat yearling spring , although it must be noted that the method of expanding recoveries for unmarked fish differs from previous years.

The estimated total survival for brood year 1995 is 0.3282%. There were 3 ODFW reported ocean troll recoveries and 8 recoveries in the Columbia Basin. WDFW hatchery recoveries were at Wells.

Brood year 1996 has provided a high estimated survival for Entiat NFH spring Chinook, now at 0.5864%. This was in spite of the use of a blank coded-wire tag for 16,053 of 124,536 yearling fish released. This blank wire could yield no off station recoveries. There was again an observed ocean recovery, this time reported by British Columbia. Treaty ceremonial and sport recoveries were the next two highest recovery categories with an estimated 57 and 36 recoveries respectively.

Brood year 1997 currently has yielded an estimated total survival of 0.7546%, the highest to date for Entiat. Off station recoveries were mostly in the ODFW reported Columbia River sport (211) and gill net (174) fisheries. There were also an estimated 11 treaty ceremonial recoveries.

There were coded-wire tagged releases of fingerling fish in brood years 1991, 1992, 1993, and 1994. There were no recoveries from the brood year 1991 release. Survival for brood year 1992 was 0.0054% with one tagged fish recovered in the treaty ceremonial fishery. Brood year 1993 had 3 treaty

ceremonial recoveries and an overall survival rate of 0.0315%. Release of 186,817 coded-wire tagged fish from brood year 1994 yielded 6 recoveries, equal to 0.0032%.

Kooskia National Fish Hatchery

Kooskia NFH is situated along Clear Creek, just upstream of the confluence with the Middle Fork Clearwater River, approximately 75 miles southeast of Lewiston, Idaho, at an altitude of 1,295 feet. The hatchery was authorized in 1961, first operated in 1969, and is currently used for adult collection and rearing of spring Chinook salmon.

Only two broods during the 1980s received tag codes at Kooskia. An age-0 release of brood year 1980 fish contained an IDFG tag code. Fish raised at Kooskia were released at Dworshak NFH with an IDFG tag code. Fish from Hagerman NFH were released at Kooskia in 1983.

Brood year 1988 fish at Kooskia were the first fish to be marked under the Missing Production Group program. Total survival for brood year 1988 was 1,080 fish, or 0.2675%. Treaty ceremonial fishing took most of the fish harvested off station (155). Eighteen fish were also taken in the ODFW test fishery net.

No tagged fish were released with brood year 1989.

An estimated 77 fish were recovered from brood year 1990, resulting in a survival rate of 0.0106%. Eleven of those fish were taken in the Columbia River sport fishery in 1994.

Total fish released for Kooskia NFH brood year 1991 was 343,437, including coded-wire tag 052925 with 60,585 fish. PSMFC records show 50,585 fish released with this tag code. Total recoveries for this brood year consist of a jack and an adult recovered at a national fish hatchery for a survival of 0.0006%.

Fish traps and non-USFWS hatcheries reported the majority of off station recoveries for brood year 1992. An estimated 4 fish were taken in the treaty ceremonial fishery. With 86 recoveries reported by USFWS, total estimated survival rate is 0.0317%, using the rd2 program, better than the previous two brood years.

Survival for brood year 1993 is estimated to be 0.353%, the second best of five on record. Fish without coded-wire tags, but with right ventral fin clips, were released eight miles above the hatchery. Nine fish were taken in the California ocean sport fishery, an unusual occurrence. Thirty-two fish were harvested in the treaty ceremonial fishery.
There were an unusual number of recoveries of spring Chinook in California ocean sport and troll fisheries in 1996. Spring Chinook from Carson, Little White, and Warm Springs were also taken, as were tule fall Chinook from Spring Creek.

There were 8 observed recoveries from the release of 271,681 tagged fish in brood year 1994. The estimated number of recoveries in the ODFW fish trap is 521 from one observed recovery, a very high ratio. Using this information, total survival is 0.1941%. The rd program was used for this estimation.

Fewer than 16,500 tagged fish were released in brood year 1995 in a total of 16,598 fish, and it should perhaps be no surprise that there were no recoveries from this release.

Brood year 1997 coded-wire tag release information was obtained from the RMIS database.

Leavenworth National Fish Hatchery

Leavenworth NFH is located about four miles south of Leavenworth, Washington, along Icicle Creek, a tributary to the Wenatchee River. Elevation is 1,155 feet. The hatchery was originally authorized in 1937 by the Grand Coulee Fish Maintenance Project and was re-authorized in 1938 by the Mitchell Act. The facility began operations in 1942 and is currently used for producing spring Chinook salmon.

Fish from brood year 1985 were released at Leavenworth with two different tag codes. Fish with those same tag codes were also inadvertently released in the Yakima River, and are therefore not included in this report.

Fish from brood year 1986 were harvested mainly in the freshwater sport (757) and treaty ceremonial fisheries (402). One recovery from the ODFW treaty ceremonial fishery is no longer in the PSMFC database. Total estimated survival is estimated at 0.1174%.

Brood year 1987 spring Chinook salmon released as yearlings have an estimated total survival of 0.2785%. Off station recoveries were mainly in the freshwater sport fishery and treaty ceremonial fishery. Nearly 3,000 fish were taken in the Columbia River. One tag, which was expanded to 28 fish, was recovered in the British Columbia ocean troll fishery. The 1987 brood year spring Chinook released as fingerlings survived at a rate of only 0.0030%. This release of 939,426 fish yielded a freshwater sport catch of 12 fish, and a hatchery escapement of 16 fish.

Brood year 1988 spring Chinook fared quite a bit better than brood year 1987 with an estimated survival rate of 0.4751%. Most fish were taken in the freshwater sport fishery (3,469). In addition, ODFW reported a treaty ceremonial harvest of 1,315. Twenty-five fish were harvested in the WDFW reported treaty troll fishery. Fingerling releases from this brood year survived at an overall rate of only 0.0034%. There were only seven observed recoveries from a release of nearly 300,000 tagged fish.

An agency 63 tag code was released with brood year 1989 age-0 Leavenworth fish raised at Wells State Fish Hatchery (SFH) and returned to Leavenworth for further rearing. These fish survived at a rate of 0.0889%. Using the calculated PEF of 4.41, 13 fish were harvested in the British Columbia ocean troll fishery, 163 in the freshwater sport fishery, and 66 in the treaty ceremonial fishery. However, this PEF includes 400,000 fish released at one-third the size of the fish with the coded-wire tags.

Yearling fish from brood year 1989 survived at a rate of 0.1946%, more than twice the rate for fish released at age-0. The great majority of off station recoveries occurred in the Columbia River sport fishery (1,585). An additional 360 fish were taken in the treaty ceremonial fishery.

Using the rd2 program, rather than the PEF method, the estimated number of fish surviving from brood year 1990 yearlings was only 78 fish from a total release of over 2 million fish, a very low survival rate of 0.0034%. Treaty ceremonial harvest of this brood year is estimated to have been only 23 fish. Age-0 fish released from this brood year had no representative coded-wire tag.

Survival of brood year 1991 is now estimated at 0.0213%, a total of 374 fish, using the rd2 program. This survival is over six times greater than brood year 1990. Fourteen age-4 fish were taken in the ODFW reported treaty ceremonial fishery. Age-0 fish released from this brood year had no representative coded-wire tag.

There are seven additional recoveries in the WDFW reported freshwater sport fishery this year. Survival was up again with a 0.0754% rate for brood year 1992 using the rd2 program. There were both treaty ceremonial (32) and Columbia River gill net harvest (5) of adults.

WDFW has added 68 observed recoveries since recovery data was downloaded last year. Brood year 1993 survival is now at 0.2748% using the rd2 program, the highest since the low point of brood year 1990. Only the last three brood years in the 80s had higher survivals. There are now freshwater net, freshwater sport, spawning ground, fish trap, and treaty ceremonial recoveries of fish from this brood year.

The estimated survival for brood year 1994 is 0.0580%. An estimated 34 fish were recovered in treaty ceremonial fisheries, and 50 in freshwater sport fisheries.

Survival for brood year 1995 is estimated to be a total of 0.1226% with over three hundred fish being harvested off station. Fish were taken in gill net, fresh water sport, and treaty ceremonial fisheries.

Estimated survival for brood year 1996 is 0.3740%, second only to brood year 1988. There were 2 recoveries in Alaska, expanded to a total estimated 26. There were a total of 388 estimated in WDFW reported fresh water sport recoveries, and over two hundred each in gill net, and treaty ceremonial fisheries.

The first look at brood year 1997 shows an estimated total survival of 0.6354%, a record setting brood year. The greatest number of fish recovered off station were in the Columbia River sport fishery (2,140). The gill net fishery took an estimated 1,681 fish, followed by recoveries in spawning ground surveys (750), and treaty ceremonial (110).

Summer steelhead at Leavenworth have never been marked with coded-wire tags.

Little White Salmon National Fish Hatchery

Little White Salmon NFH is located on the Little White Salmon River, 12 miles east of Stevenson, Washington, at an elevation of 90 feet. The hatchery began operations in 1898 and was remodeled and expanded in 1958. Current production consists of rearing upriver bright fall and spring Chinook salmon. Coho are raised at Willard NFH, which is administered by Little White Salmon. Willard is listed separately in this document.

Spring Chinook

Both age-0 and yearling spring Chinook have been released from the hatchery. Brood years 1982 through 1984 were coded-wire tagged to evaluate age-0 and yearling releases. Average survival for age-0 fish was 0.11%, compared with an average survival of 0.39% for yearling releases. Columbia River gill nets took a greater proportion of age-0 fish than yearlings (9.7% vs. 3.2%) for these three broods. Release of coded-wire tagged age-0 fish was resumed with brood year 1991.

Marking of spring Chinook resumed for brood year 1988 under the Missing Production Group program. Brood year 1988 fish released at age-0 were not marked. The overall survival rate for yearling fish from this brood year was 1.0458%. Nearly 2,400 yearling release fish were harvested in the Columbia River, with over 1,500 in the WDFW reported freshwater sport fishery alone. Another 731 fish were taken in the treaty ceremonial fishery.

Brood year 1989 shows a total survival of 2,272 fish, or 0.2235%, down from last year with the elimination of an age-2 recovery. Nearly 1,200 fish were taken in the freshwater sport fishery, and 85 in the treaty ceremonial fishery. Age-0 fish from this brood year were released, but were not coded-wire tagged.

The survival rate for brood year 1990 is 0.0155% with no reported off station recoveries. Coded-wire tagged fish from this brood year were released from the Willard NFH facility, (a sub-station located upstream from Little White Salmon NFH) along with a total of 869,952 fish. Another 807,742 untagged, unmarked fish were released at Little White Salmon NFH. There was no age-0 release from this brood year.

Only 232 fish survived out of 809,079 yearling fish released from brood year 1991 (0.0287%), using the rd2 program. There were only 7 recoveries, identical to brood year 1990. There were no recoveries from 94,295 tagged fish released at age-0.

Brood year 1992 yearlings now have a survival rate of 0.5456% and an estimated total survival of 5,426 fish. WDFW has added recoveries from 1997 which, when expanded for unmarked fish, add nearly five hundred fish to the total estimate. Over one thousand fish were caught in the WDFW freshwater sport fishery, and another 790 in the freshwater net fishery.

Fingerlings from brood year 1992 now have an estimated survival rate of 0.0121%, or only 61 fish from a release of 503,458.

The rd2 program estimates total survival as 0.2175% for brood year 1993. Recoveries from 1997 are expanded to 330 freshwater net, and 709 freshwater sport recoveries. There were an additional estimated 16 fish harvested in the treaty ceremonial fishery. This brood year has a below average survival rate. Estimated survival for brood year 1994 is 0.0385%, the third lowest percentage on record. Only 18 fish were estimated to have been taken in the treaty ceremonial fishery with just 352 returning to the hatchery.

Survival for brood year 1995 is estimated to be 0.4042%, which places it in the mid-range of survivals. Recoveries occurred in freshwater sport (257), treaty ceremonial (34), gill net (26), and on spawning grounds (12) in

addition to 2,381 returns to the hatchery.

The initial estimated total survival for brood year 1996 is 0.4352%, in the top half of survivals. Freshwater sport (723) and treaty ceremonial (285) fisheries were responsible for the majority of off station recoveries with an estimated 131 fish also being taken in the Columbia River gill net fishery.

Upriver Bright Fall Chinook

Brood year 1983 through 1985 upriver brights were marked for both a normal age-0 release and an extended rearing release. Average percent survival for the fingerling release was 1.1%, compared to the survival of 0.38% for the extended rearing fish. The extended rearing program strategy is no longer being used.

Brood year 1989 was the first upriver bright brood year to be marked under the Missing Production Group program. Fifty-eight observed recoveries were expanded to a total of 3,532 for an overall survival rate of 0.2456%. Most of the harvested fish were taken in the ocean (1,734), with 931 in Alaska, 578 in British Columbia and 225 in California. An additional 161 fish were harvested in the Columbia River gill net fishery, and 642 were recovered in spawning ground surveys.

Current recovery information and use of the new rd2 program shows a 0.3285% recovery rate for brood year 1990, higher than that for brood year 1989. Little White Salmon upriver bright fall appear to be the only group of fish in this report which had a higher rate of survival for brood year 1990 than brood year 1989. Unlike Spring Creek tule fall , where fish were released in March, April, and May, these fish were released in June. These upriver brights are also recovered farther north than the Spring Creek tules. Alaska ocean troll and ocean sport took most of these brood year 1990 fish (2,161), followed by Canadian troll and ocean sport fishers (1,844), and the Columbia River gill net fishery (1,041). Spawning ground surveys account for an additional 1,047 fish.

Survival for brood year 1991 is 0.2039%, approximately 60% of brood year 1990. WDFW added age 5 recoveries in both the freshwater sport and spawning ground survey. Alaskan troll (856) and British Columbian fishers (570) harvested fish in the ocean, and the Columbia River gill net fishery took 920 fish.

The estimate of survival for brood year 1992 is now 0.3623% with a total survival of 6,763 fish. WDFW added 6 observed spawning ground recoveries in 1998. Alaska and British Columbia ocean fisheries took 787 and 118 fish respectively. Columbia River gill nets took 1,140 fish, and the river sport fishery accounted for 275.

Survival from brood year 1993 is now 13,575 fish or 0.7550%, more than double the survival for brood year 1992. There are now 14 more observed recoveries in the database than there were last year, equivalent to an additional seventeen hundred recoveries. Alaska and Canada took nearly equal shares in the ocean catch, and over thirty-five hundred fish were harvested in various Columbia River fisheries.

Brood year 1994 is now estimated to have survived at a rate of 0.0826%, still only about one ninth the rate of the previous brood year, and the lowest ever for this hatchery and species. There were some apparent adjustments to ADFG recoveries from 1999. Now, Alaskan fishers took 229 fish from a total of 309 estimated recoveries in the ocean. An estimated 299 fish were estimated to have been recovered in Columbia Basin spawning ground surveys.

Additional recoveries from Alaska increase brood year 1995 estimated survived to a rate of 0.2422%, with over nine hundred recoveries in Alaskan waters, from a total 5,079 estimated recoveries. This survival is in the lower half of survivals for this hatchery and species.

The initial estimated survival for brood year 1996 is the second lowest on record for Little White Salmon upriver bright fall Chinook at 0.1388%. Even so, fish were recovered in Alaska (764) and California (44) ocean fisheries.

Spring Creek National Fish Hatchery

Spring Creek NFH is located on the Columbia River at Underwood, Washington, about 30 miles upstream of Bonneville Dam. Elevation at the hatchery is 93 feet above sea level. The hatchery was constructed in 1900 and began operations a year later. Fish were trapped in the Big White Salmon River from 1901 through the 1950s. Spring Creek NFH was remodeled in 1955 under the Mitchell Act, and redone again in 1970 under the John Day Mitigation Act. Spring Creek NFH currently produces Tule fall Chinook.

The survival rate for brood year 1984 was 0.0462%, and was 0.1294% for brood year 1985. Even with the low survival rate of these two brood years, thousands of fish were harvested in both the ocean and the Columbia River.

Survival for brood year 1986 is estimated at 0.4328%, 46,050 fish from a release of 10,640,406. Over 22,000 fish were harvested in the ocean and 14,288 were taken in the Columbia River gill net fishery.

Brood year 1987 fish were recovered primarily in commercial fisheries off the coasts of Canada and Washington, as well as in the Columbia River gill net fishery. Total survival for the 1987 brood year is 0.3087%, or 27,326 fish from a release of 8,850,757.

Brood year 1988 fish were recovered primarily in the Columbia River gill net fishery (23,195). They also contributed to the ocean fisheries in Washington (16,006), Canada (12,470), and Oregon (5,514). Overall survival is estimated at 0.5168%.

Fish from brood year 1989 fared slightly worse than brood year 1988 with an overall survival rate of 0.4573% or 46,793 fish. The greatest number of recoveries was in the ocean off Washington (14,339), and in the Columbia River (11,646). The Columbia River gill net fishery took the great majority of fish harvested in the Columbia River. British Columbia took 9,262 fish, and ocean harvest off Oregon totaled 3,141 fish.

Expanding by individual coded-wire tag rather than by PEF reduces the estimated total survival for brood year 1990 to 0.1294%, one of the lower survival rates since brood year 1980. Most of the harvest of these fish still occurred in the Columbia River, 5,017 fish, followed by the Washington ocean harvest of 4,811, and the Canadian harvest of 3,345 fish.

Brood year 1991 survival rate, expanding for each coded-wire tag, is 0.1374%, only slightly better than brood year 1990. British Columbia ocean troll and ocean sport fisheries took the largest number of fish from this brood year at 7,787 fish. The Columbia River gill net fishery harvested 7,001 fish.

Survival for brood year 1992 is now 0.1620%, or 23,488 fish. The Columbia River gill net fishery harvested 10,508 fish, and 3,119 were taken in the ocean. The great majority of fish harvested in the ocean were taken by Canadian fishers. Brood year 1992 was the first year of a three year fin clip study at Spring Creek, and the PEF method was used for this calculation.

Brood year 1993 survival was greater than 1992 at 0.2197%. This survival rate was calculated by the rd program. Oregon reported slightly more ocean recoveries than Canada, but the Columbia River gill net fishery harvested greater than three times more fish than the combined ocean harvest. This brood year contributed more than twenty-four thousand fish to fisheries. The 1993 brood year was the second of three years of a three year fin clip study at Spring Creek.

In the third year of the fin clip study (brood year 1994) fish were released which were not represented by any recoverable coded-wire tags. Therefore, the PEF method was used (rd.prg). Survival is now estimated to be 0.1038%,. Nevertheless, 4,430 fish were harvested in the ocean, mostly in British Columbia. An additional 6,259 fish were harvested in the Columbia River.

The current total survival estimate for brood year 1995 is 0.0492%, the lowest since brood year 1984. Nevertheless, 3,586 fish were harvested in the Columbia River, and over eighteen hundred in the ocean fisheries, the majority of which were taken off the coast of Oregon.

The estimated survival for brood year 1996 is a greatly improved 0.4304%, nearly ten times better than the previous brood year, and the best survival since brood year 1990. Nearly twenty-five thousand fish were harvested in the Columbia River and Estuary, and an estimated 16,111 were caught in West Coast ocean fisheries.

Warm Springs National Fish Hatchery

Warm Springs NFH is located on the Warm Springs River, approximately 14 miles north of Warm Springs, Oregon at 1,525 feet above sea level. The hatchery was authorized in 1966 and began operations in 1978. The Confederated Tribes of the Warm Springs Indian Reservation of Oregon entered into an agreement with the USFWS to increase tribal fishing opportunities. Operations at the hatchery presently consist of adult collection, egg incubation and rearing of salmon.

Warm Springs has a unique fall release strategy that involves releasing the same coded-wire tags in the fall and in the spring. Therefore fall release and spring release fish are combined in this report.

The 1987 brood year is the first group of fish coded-wire tagged since the late 1970s. Since then, every fish released from the hatchery has been marked. The 1987 brood year had a 0.1526% survival and contributed mainly to the freshwater sport fishery on the Deschutes River.

Brood year 1988 survived at a rate of 0.1807%, slightly better than brood year 1987. These fish contributed primarily to the freshwater sport fishery in Oregon and the treaty fisheries in both the Columbia River and Deschutes River. Eleven recoveries of age-2 fish were eliminated from the report this year.

Total survival for brood year 1989 now stands at 205 fish, or 0.0191%. Five age-2 recoveries at the hatchery have been eliminated. Fifty-four fish were taken in the freshwater sport fishery, 9 in treaty subsistence, and 5 in treaty ceremonial.

Only an estimated 30 fish survived from a release of 659,507 from the 1990 brood year, a survival rate of 0.0045%, using the rd2 program. There were 24 recoveries at the hatchery and 6 in the Oregon freshwater sport fishery.

Using the rd2 program for brood year 1991 yields a survival of 0.0169%, or only 94 fish. Treaty ceremonial and treaty subsistence took a total of nine fish.

There was a big jump in survival for brood year 1992. Over eight hundred fish were recovered to give a survival rate of 0.1569%, when calculated by rd2 program. This is the second best survival since coded-wire tagging began with brood year 1987. Treaty fisheries harvested 20 fish, while the freshwater sport harvest was 111.

The estimated total survival rate of 0.2564% for brood year 1993 makes this the more successful than all previous brood years, since tagging began with brood year 1987. While treaty fisheries took only 3 fish, freshwater sport and fish traps recovered 57. An unusual occurrence of 5 fish estimated in California ocean fisheries was noted for this brood year. In all likelihood ODFW hatchery recoveries include the tags from 99 adults that were transferred to the ODFW Round Butte hatchery.

The brood year 1994 release at Warm Springs included fish raised from eggs received from the ODFW Round Butte Hatchery. Fish were also received from Round Butte as yearlings. Round Butte fish were coded-wire tagged and fin clipped by removing the adipose and left ventral fins. A total of 321,363 Round Butte fish were released. The total survival for this brood year is 0.1366%, about average for this hatchery and species. Treaty fisheries reported taking 13 fish before they returned to the hatchery.

Brood year 1995 sets a new record high survival rate in this series with an estimated survival of 0.4163%. Over nineteen hundred fish were recovered from this release. More than 95% of the fish returned to the hatchery, with 55 additional fish reported as ODFW hatchery recoveries, which are most likely from 50 adults transferred to the ODFW Round Butte hatchery. There were again

recoveries reported in the California troll fishery. The treaty ceremonial fishery reported and estimated 15 recoveries.

Total estimated survival for brood year 1996 sets a new record for Warm Springs spring Chinook at 0.5896%. Fish were available for both treaty fisheries (317) and freshwater sport fisheries (906) and, to a lesser extent the Columbia River gill net fishery (32).

Brood year 1997 shows the second best survival rate to date – 0.4565%. Off station harvest was only twenty percent less than return to the hatchery (1,664 vs. 2,054). There were 10 expanded recoveries in the ODFW reported non-treaty ocean troll fishery from this brood year, the first time this has been observed. Most of the Columbia River Basin recoveries were in sport fisheries.

Willard National Fish Hatchery

Willard NFH is situated four miles upstream of Little White Salmon NFH on the Little White Salmon River at an altitude of 900 feet. Willard is part of the Little White Salmon NFH complex. Willard NFH was constructed in 1952 under authorization of the Mitchell Act and was originally planned as a fall Chinook hatchery. The hatchery was switched to a coho facility because of cold water temperatures. Since the mid-1960s, the hatchery has been used primarily for coho production. Adult coho are trapped and spawned at Little White Salmon NFH.

Fish from brood year 1988 contributed mostly to ocean fisheries (27,996 fish) from British Columbia (1,473) to California (5,189). An additional 8,776 fish were harvested in the Columbia River. Fifty-five hundred of those were taken in the gill net fishery, and 3,200 in the estuary sport fishery. Total survival rate was estimated to be 1.6976%.

Brood year 1989 coho survived at a rate of 0.3247%. Total survival was estimated to be 8,355 fish from a release of 2,573,323. They contributed mainly in ocean sport and non-treaty troll fisheries of Oregon (3,126) and Washington (1,779).

Using the rd2 program, total survival for brood year 1990 was only 1,722 fish or 0.1097%. Fish were harvested primarily in sport fisheries off the coasts of Washington (795), Oregon (221) and California (63). One hundred twenty-six fish were taken in the Washington non-treaty troll fishery. One hundred twenty-nine fish were taken in the Columbia River sport fishery.

Survival of brood year 1991 was even lower than 1990 with an overall survival of 0.0720%, or 2,207 fish from a release of over 3 million smolts, using the rd2 program. The only fish harvested from this brood year were 550 fish taken in the Columbia River, 489 in the gill net fishery and 61 in the freshwater sport fishery.

There was some improvement in brood year 1992 with a survival rate of 0.1007%. Washington ocean sport fisheries took 240 fish, and Oregon ocean sport 120. The Columbia River gill net fishery took an additional 161 fish for a total off station harvest of 521 fish from a release of nearly 2 million.

Brood year 1993 survival is in the same range as the previous three broods at 0.1219% when calculated by the rd2 program. Reporting by ODFW shows 85 fish taken in the Columbia River sport harvest, and 14 at an ODFW hatchery. All other recoveries were at Little White Salmon NFH.

The estimate of survival for brood year 1994 is 0.2379%, a total of 5,602 fish, most of which were adults returning to the hatchery. Coho from the WDFW Kalama River hatchery were released as part of this brood year, and did not have a unique coded-wire tag. Since there was no representative coded-wire tag for these fish, the rd program was used to estimate survival.

The survival for brood year 1995 is 0.5536%, now the second best during the 1990s. This higher survival rate is to a large extent due to the release at Little White (rather than Willard) of coho from the ODFW Klaskanine hatchery. CWT recoveries show that these fish survived at a rate over 3 times higher that the Willard fish. There were an estimated 928 recoveries in the ocean and 1,918 in the Columbia River. The Klaskanine fish were 100% adipose fin clipped, and, although there was a coded-wire tag only (no adipose fin clip) group released this brood year, Willard coho were not "mass marked" with an adipose fin clip.

Brood Year 1996 Bonneville coho, some raised at the ODFW Cascade hatchery, and eggs incubated at the Eagle Creek NFH, were released along with Willard fish to make up this brood year. Bonneville stock fish did not receive a unique coded-wire tag. A PEF was calculated for this brood year. The calculated total survival of 0.1515% was higher than only three other brood years. Only 72 fish

from this brood year were caught in the ocean, and just 324 in the Columbia River.

The estimation of total survival for brood year 1997 is 0.7878%. This appears to be the first brood year that was mass marked by removing the adipose, except for one group with a coded-wire tag and no adipose fin clip. The brood year has the second highest rate of survival to date. Nevertheless, fewer than two hundred fish are estimated to have been recovered off station.

The initial estimated survival rate for brood year 1998 was 1.0763%, but ODFW recoveries are no longer in the RMIS database, making it impossible to accurately estimate survival.

Winthrop National Fish Hatchery

Winthrop NFH is situated along the Methow River, near the town of Winthrop, Washington. Elevation is 1,760 feet above sea level. Nine dams separate Winthrop from the Pacific Ocean. The hatchery is authorized by both the Grand Coulee Fish Maintenance Project (1937), and the 1938 Mitchell Act.

The facility began operations in 1942 by trapping adult sockeye, and steelhead at Rock Island Dam and transporting them to the hatchery. By 1951 the hatchery was rearing sockeye, spring Chinook, steelhead, kokanee, coho, and resident trout. Until 1996 the program had been simplified to spring Chinook only. Coho and steelhead now being raised at Winthrop have not been coded-wire tagged. Tagged summer Chinook were released in 1996.

Spring Chinook were coded-wire tagged beginning with brood year 1989. There were 16 observed recoveries from the 107,670 tagged fish released. These recoveries are expanded to a total of 225 fish for an overall survival rate of 0.0213%. An estimated 78 fish were recovered in the freshwater sport fishery, and an estimated 29 fish were recovered by WDFW hatcheries.

All spring Chinook yearling fish released from Winthrop beginning with brood year 1990 have had representative coded-wire tags. Therefore, the rd2 program has been used for all subsequent brood years.

There is only one recovery from coded-wire tagged brood year 1990 Winthrop spring Chinook. That recovery was at a WDFW hatchery. That recovery is expanded to a total of 8 to include unmarked fish that were probably also killed. The overall survival rate is therefore estimated to be 0.0013%.

There are no brood year 1991 recoveries from the 189,187 tagged fish released. Brood year 1992 contributed an estimated 74 fish to a WDFW freshwater fish trap from the total estimated recovery of 94 fish, a survival rate of 0.0169%.

Survival for brood year 1993 is the highest on record to date for Winthrop at 0.0429%, up from last year with additional WDFW hatchery recoveries. WDFW reported more hatchery recoveries than USFWS, and there were no other off station recoveries.

Brood year 1994 sets the new record for Winthrop Spring Chinook at 0.0543%. Fifty-eight of the hatchery recoveries were reported by WDFW. These adults were trapped at Wells Dam and taken to the WDFW Methow hatchery. There was also one spawning ground survey recovery at river mile 48 in the Methow River.

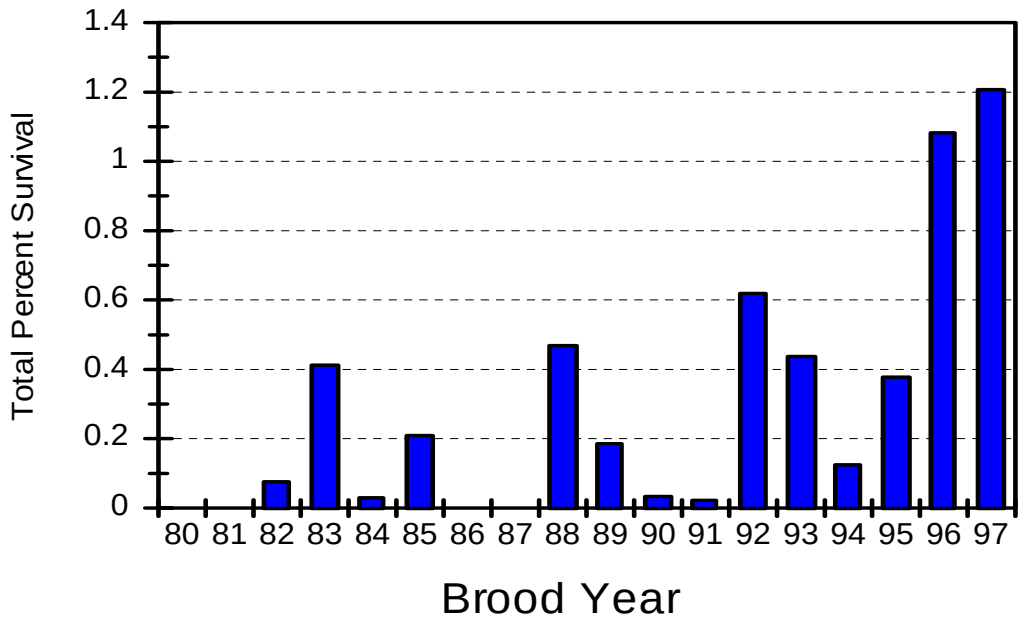
Brood year 1995 fish were raised and released at both Winthrop NFH and Methow SFH. Release records in the RMIS database (reported by WDFW) are somewhat different than records provided by Winthrop. Returning fish from this brood year were captured at Wells Dam and transported to Winthrop NFH. Thus, there were 117 WDFW reported hatchery recoveries vs. 3 FWS reported hatchery recoveries. Two fish were recovered in Canadian ocean fisheries, and the only other recoveries were in the WDFW spawning ground group. Total survival for this brood year is estimated at 0.8609%. Although this is by far the highest

survival to date, the unusual circumstances must be noted.

The addition of four WDFW gill net fishery recoveries increases the estimated rate of survival to 0.3555% for brood year 1996 Winthrop spring Chinook. WDFW recoveries yield an estimated 139 fish recovered on spawning grounds for this brood year, all of them being age-4 fish in the year 2000.

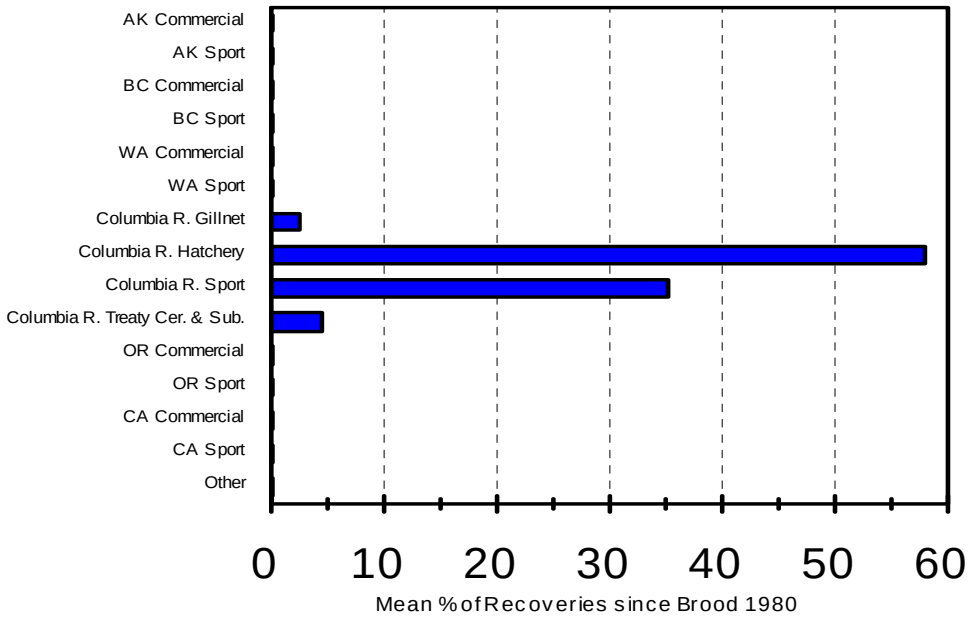
Carson NFH

Spring Chinook yearlings



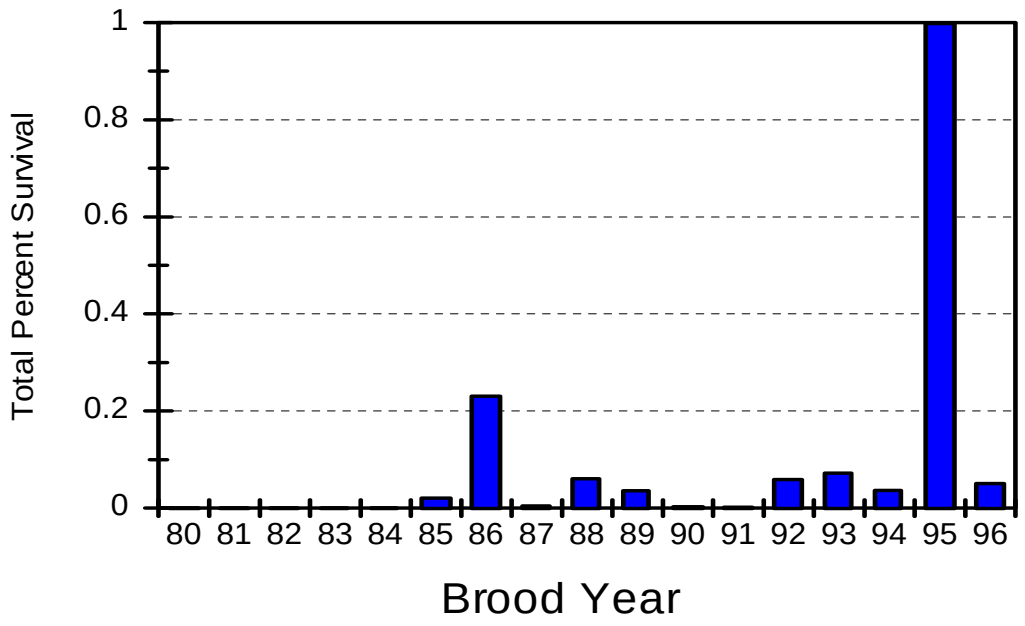
Carson NFH

Spring Chinook yearlings



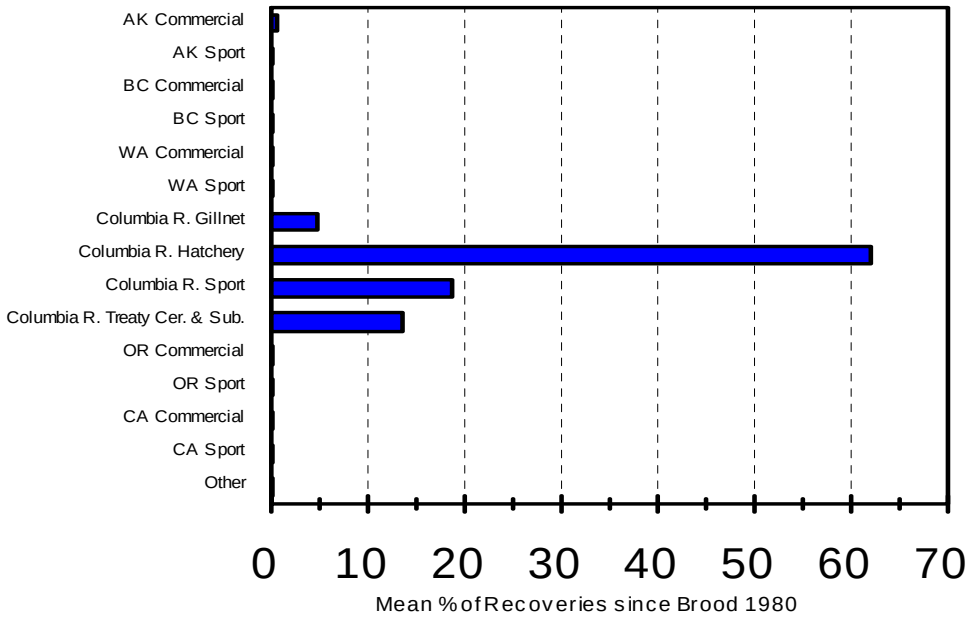
Dworshak NFH

Spring Chinook yearlings



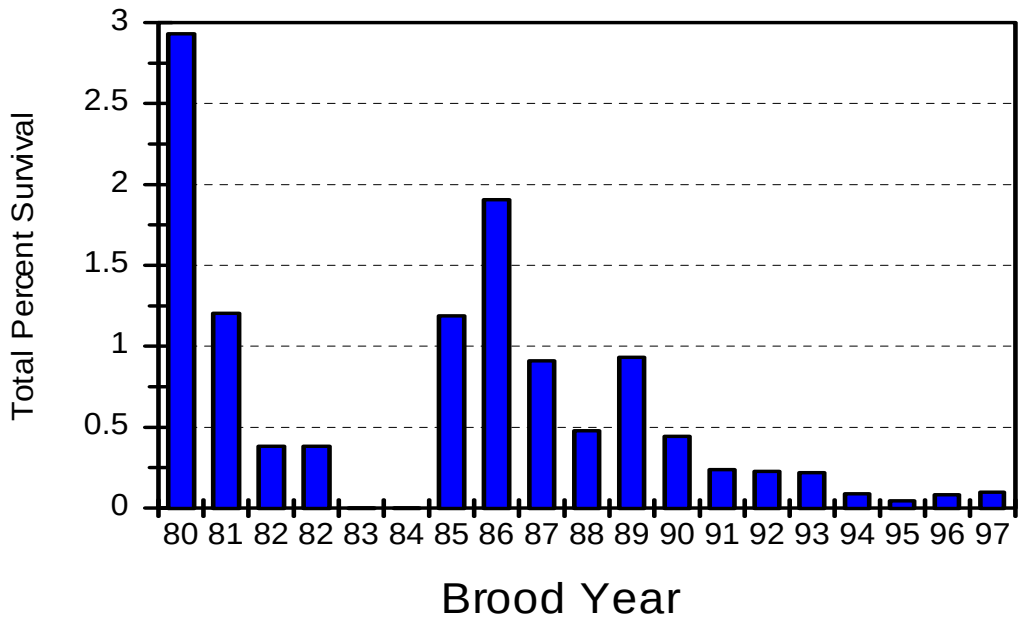
Dworshak NFH

Spring Chinook yearlings



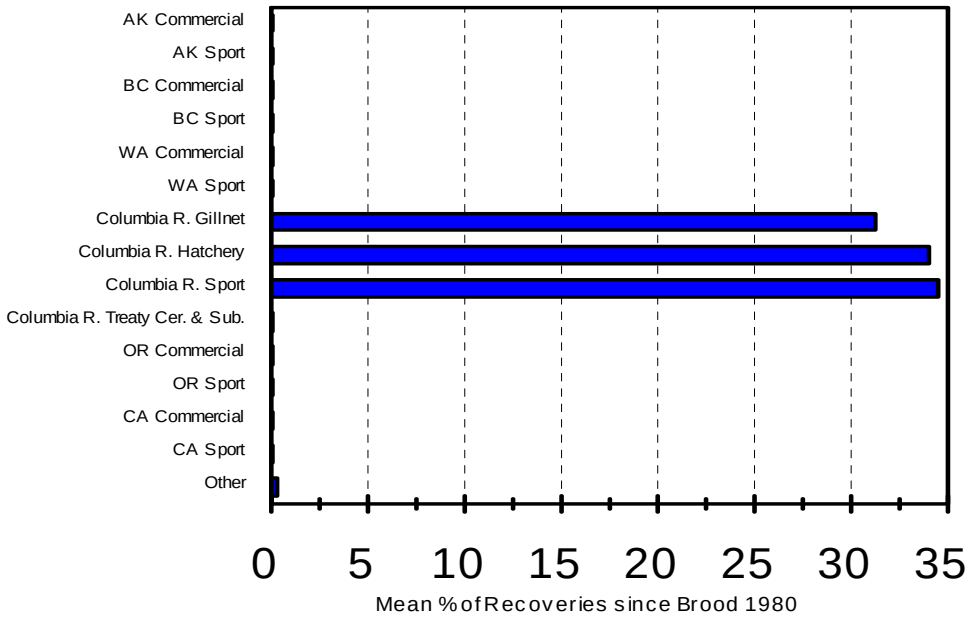
Dworshak NFH

Summer Steelhead yearlings



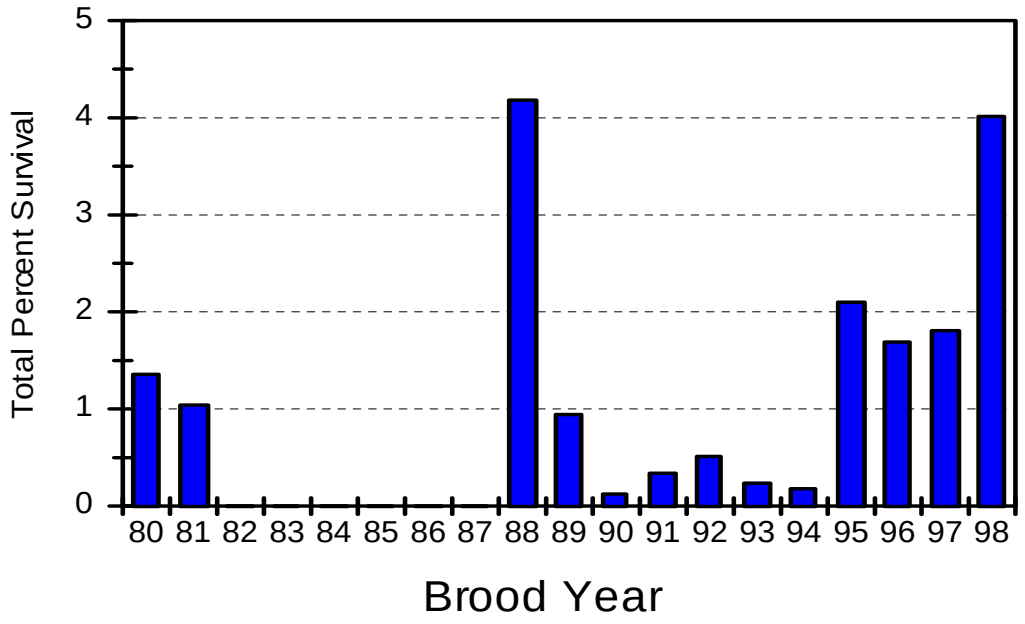
Dworshak NFH

Summer Steelhead yearlings



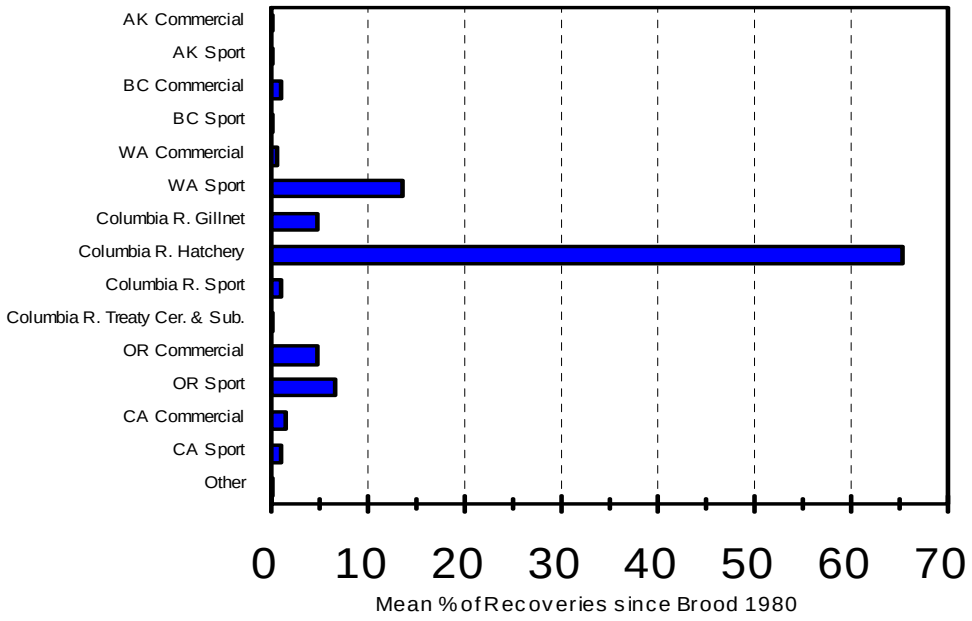
Eagle Creek NFH

Coho yearlings



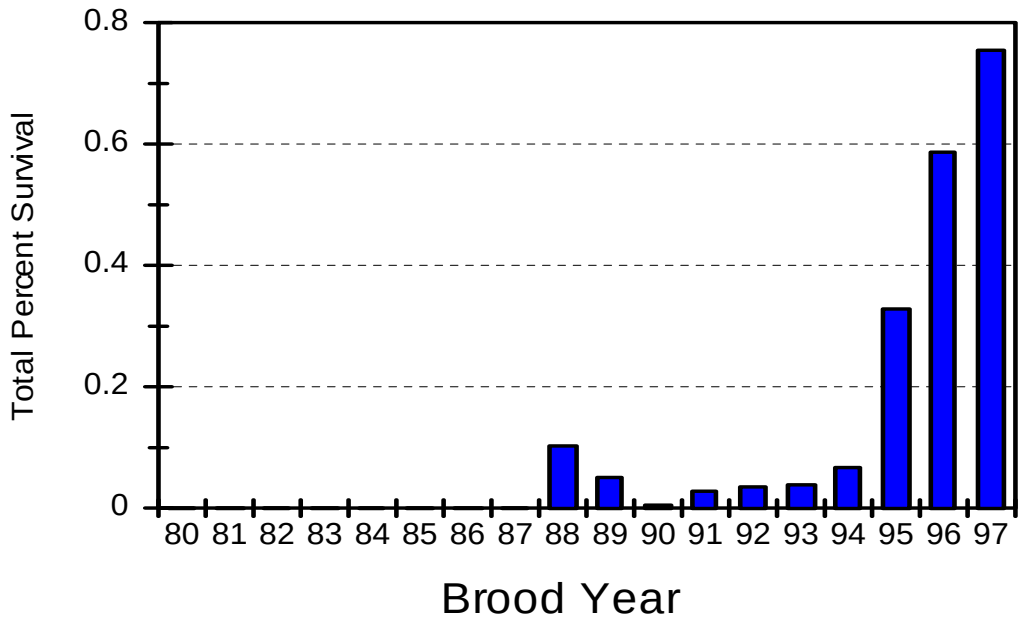
Eagle Creek NFH

Coho yearlings



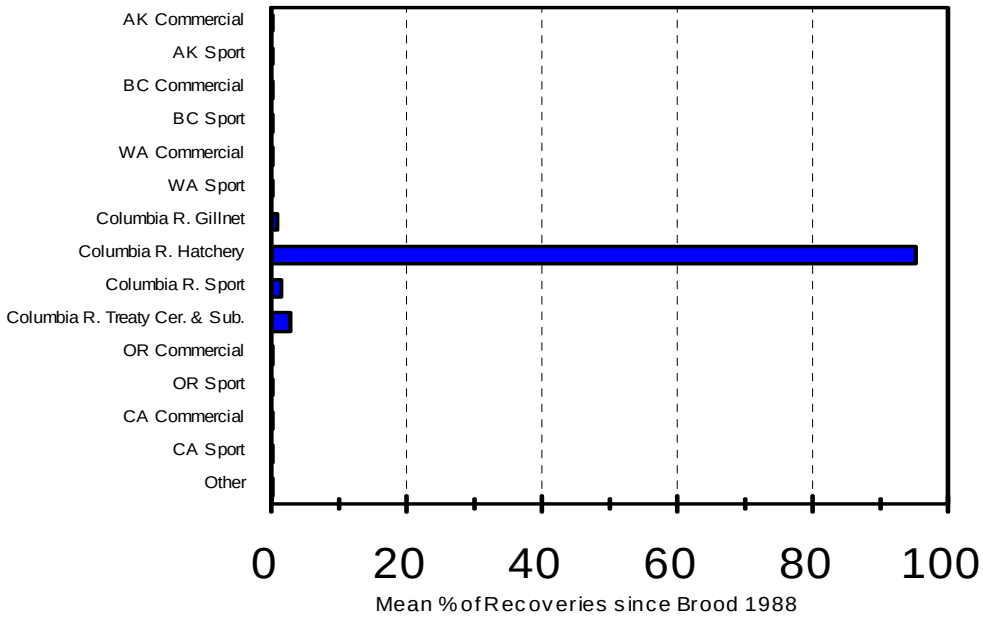
Entiat NFH

Spring Chinook yearlings



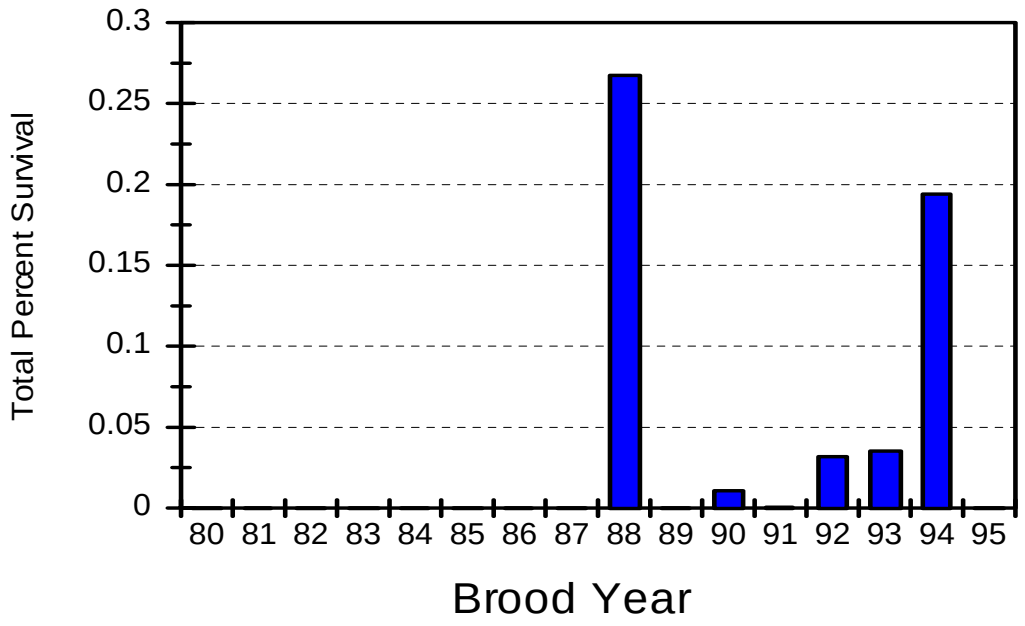
Entiat NFH

Spring Chinook yearlings



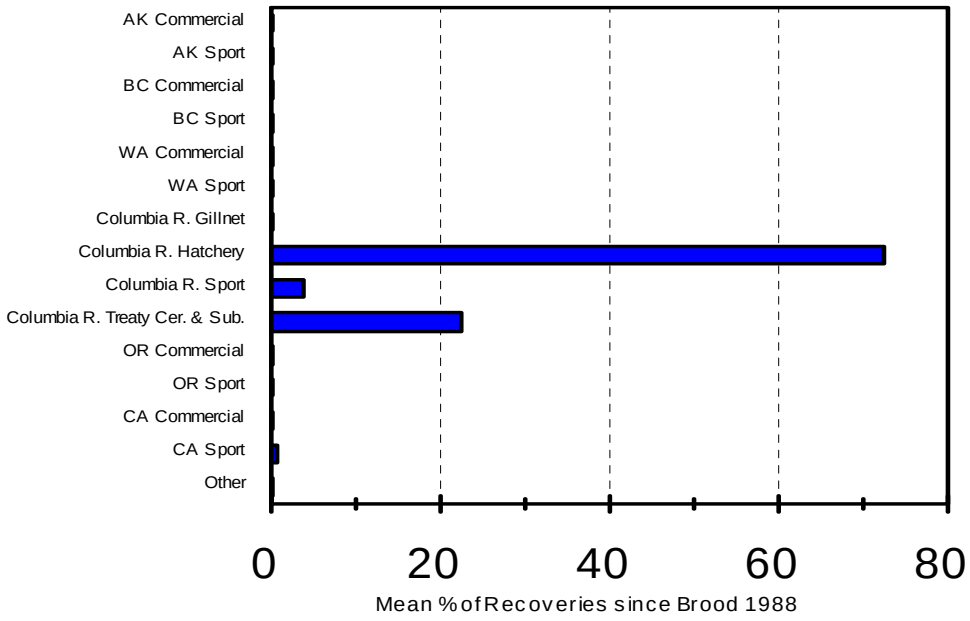
Kooskia NFH

Spring Chinook yearlings



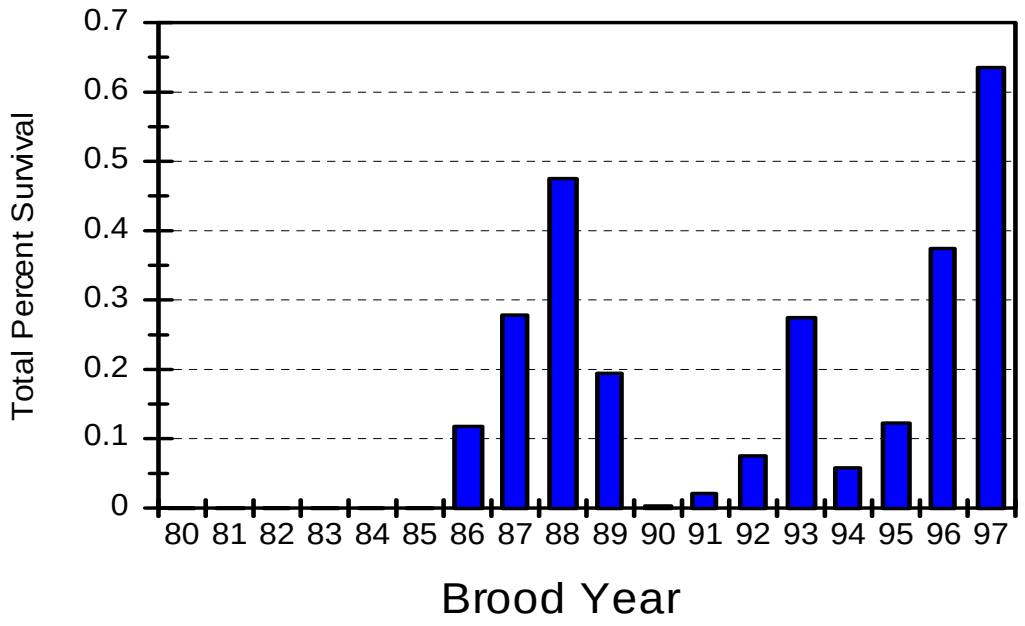
Kooskia NFH

Spring Chinook yearlings



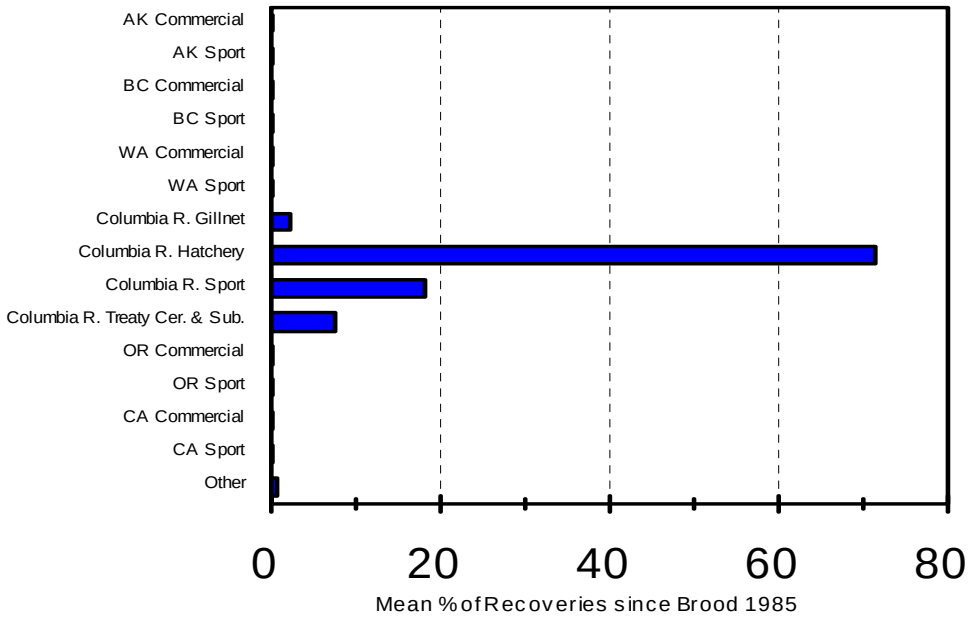
Leavenworth NFH

Spring Chinook yearlings



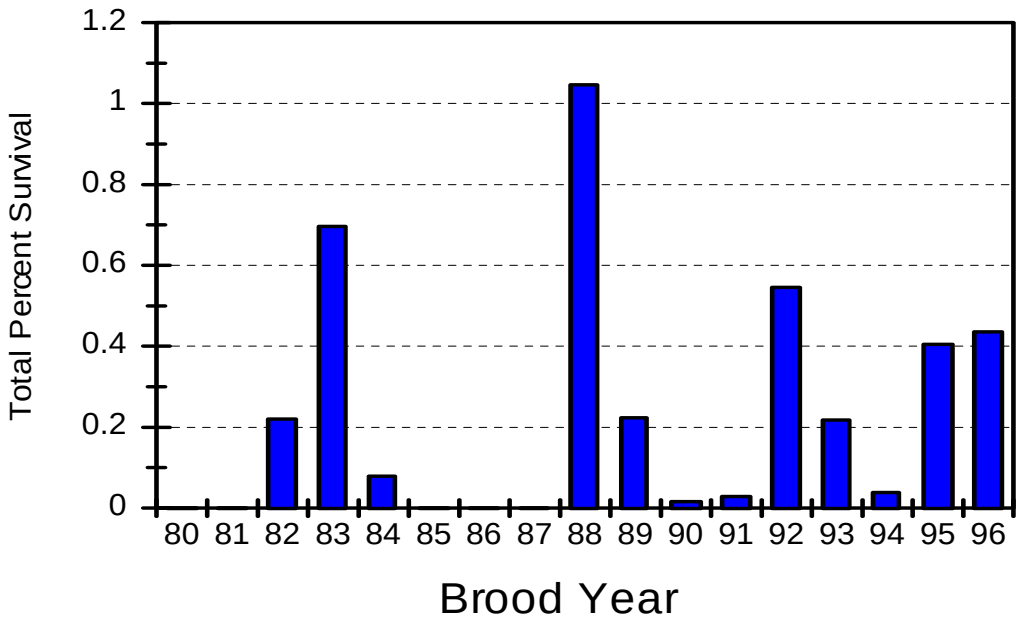
Leavenworth NFH

Spring Chinook yearlings



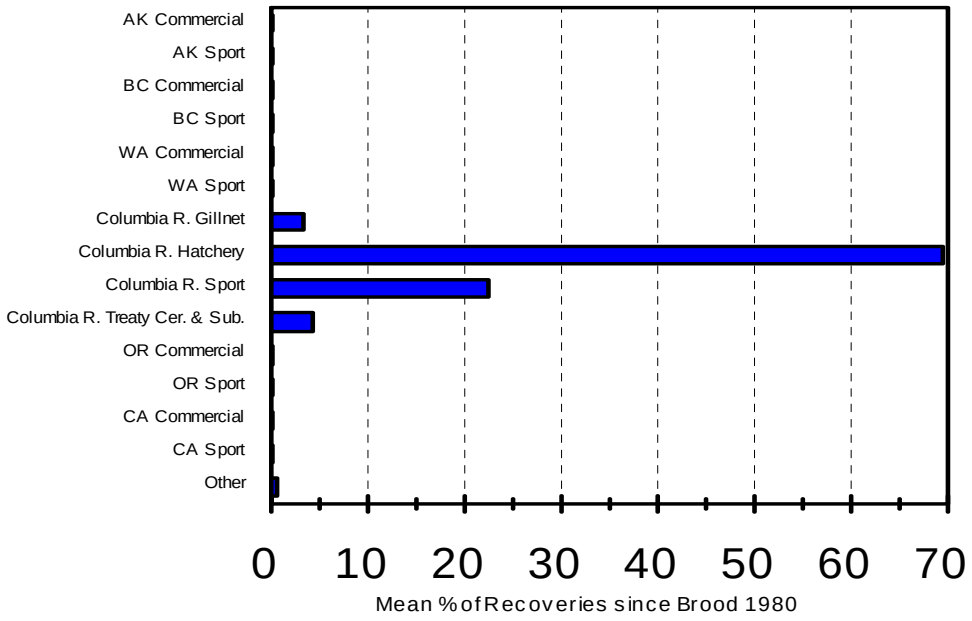
Little White Salmon NFH

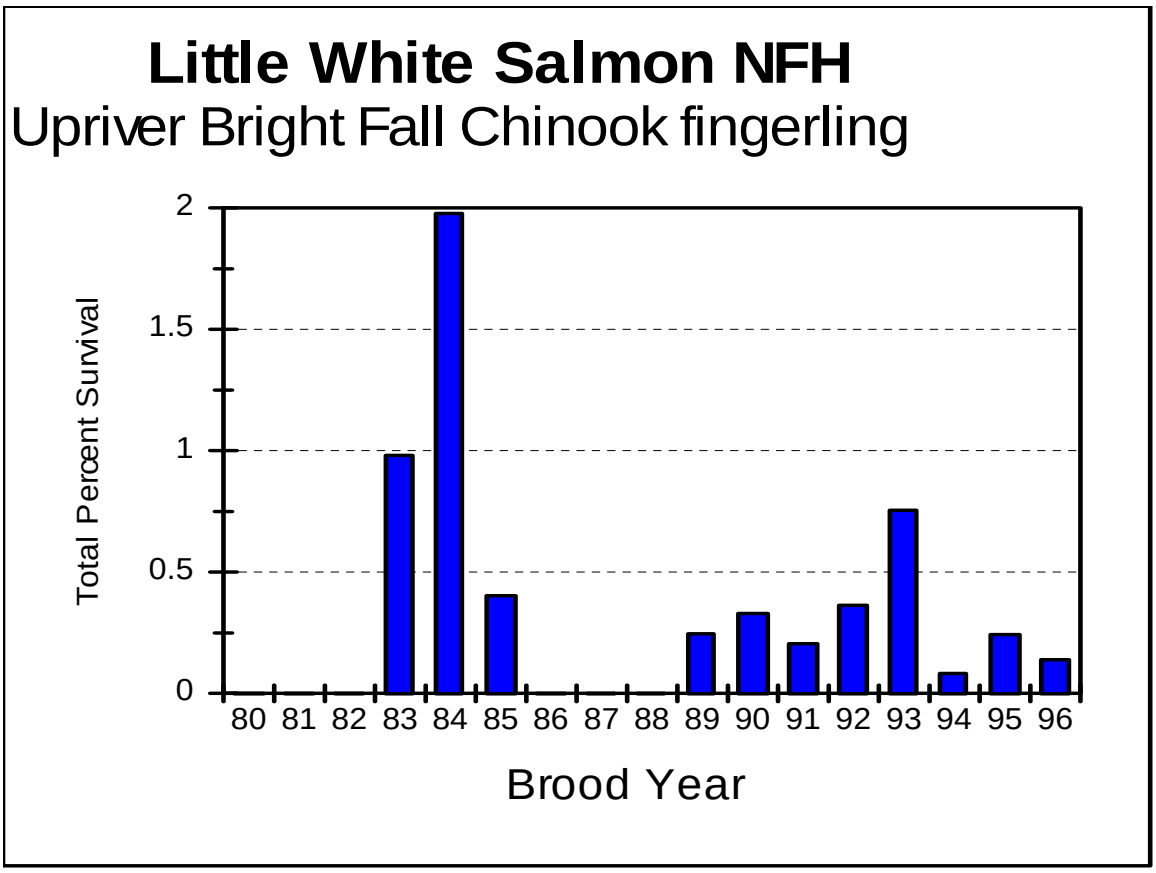
Spring Chinook yearlings



Little White Salmon NFH

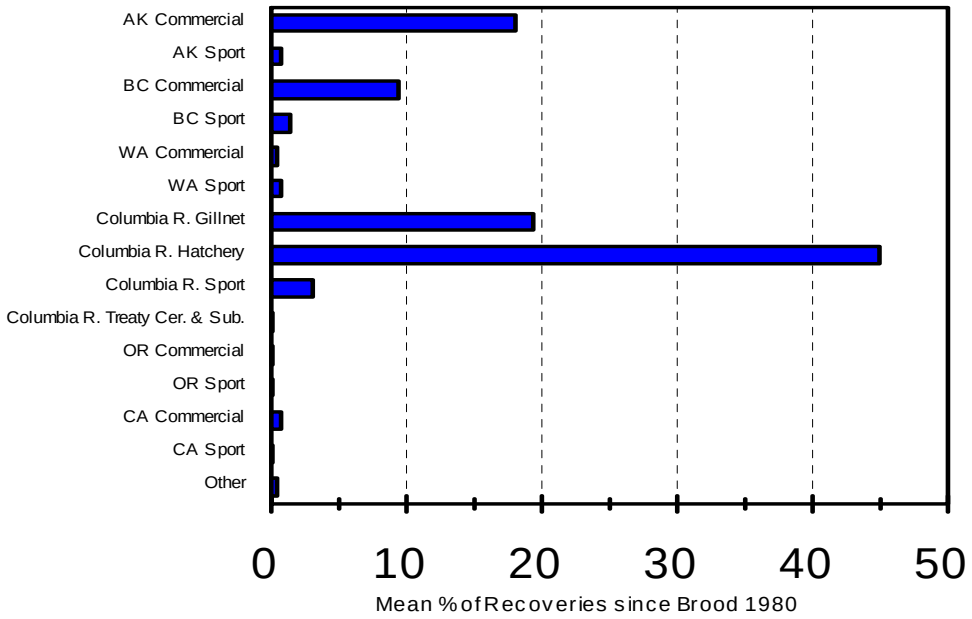
Spring Chinook yearlings




Little White Salmon NFH
Upriver Bright Fall Chinook fingerling
Total Percent Survival
2
1.5
1
0.5
0
80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96
Brood Year

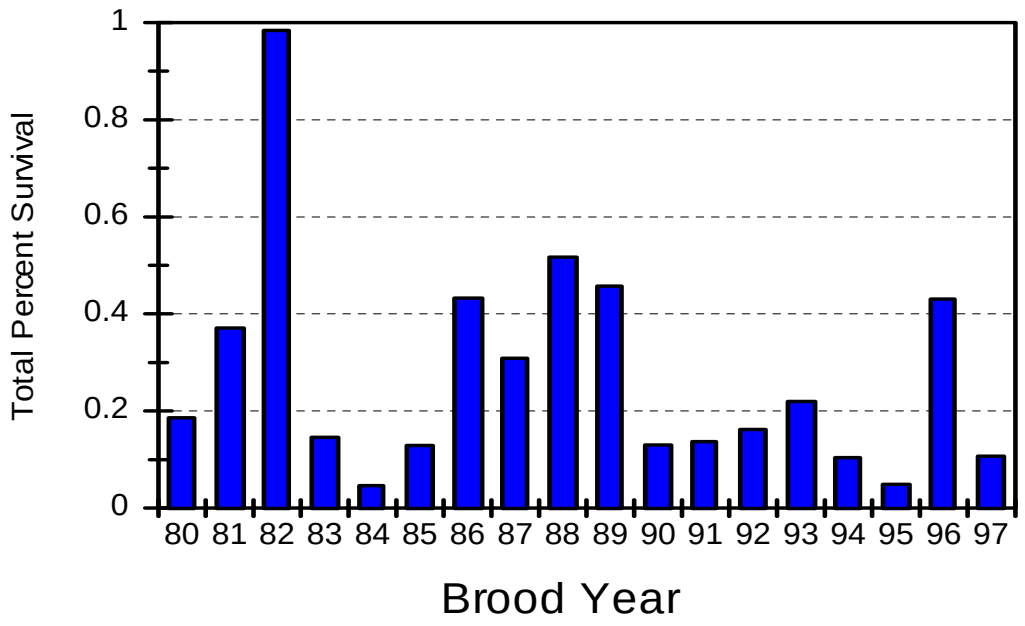
Little White Salmon NFH

Upriver Bright Fall Chinook fingerling



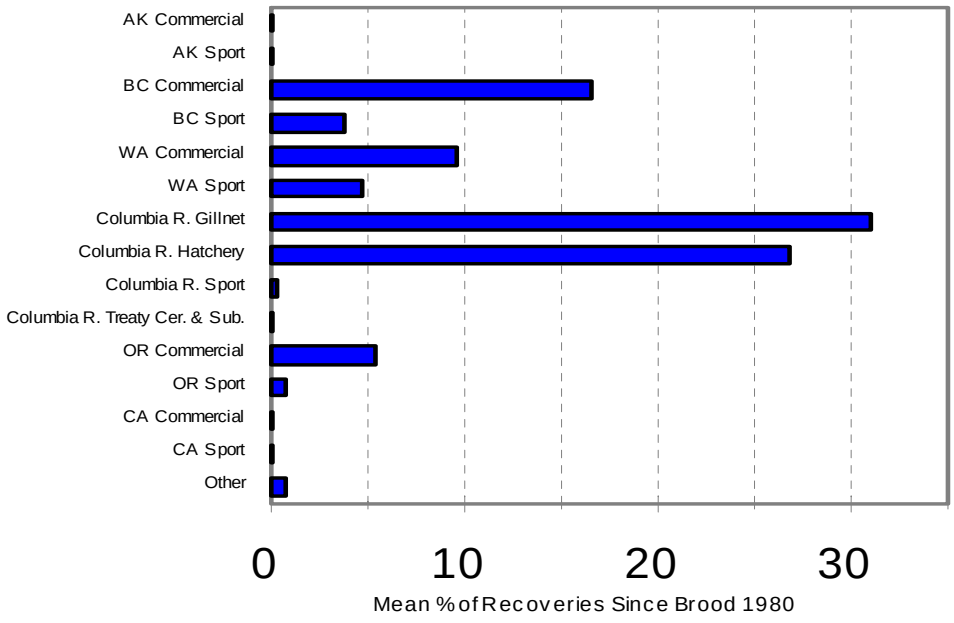
Spring Creek NFH

Tule Fall Chinook fingerlings



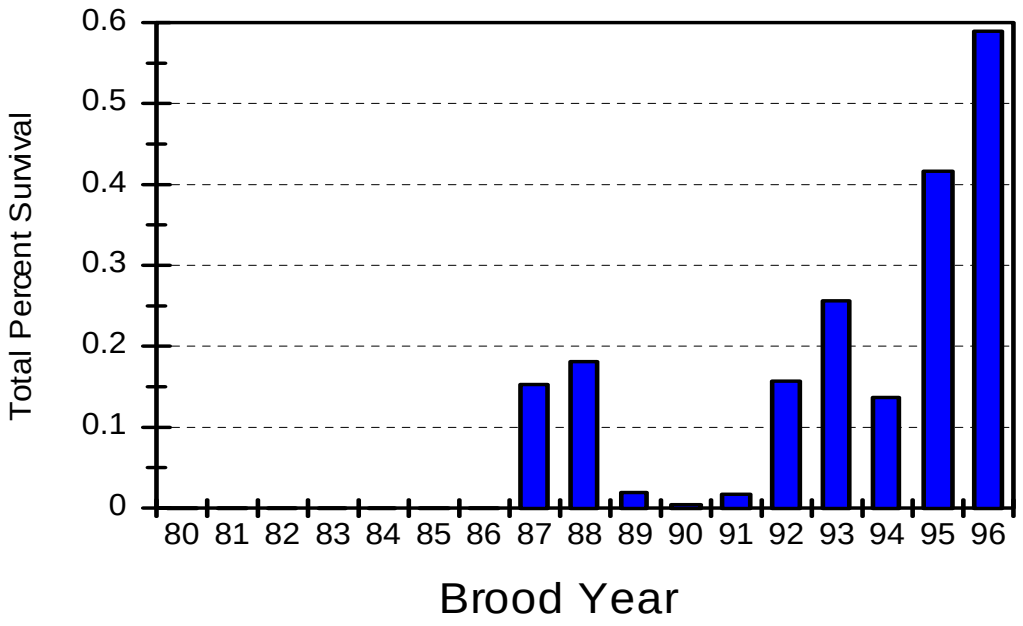
Spring Creek NFH

Tule Fall Chinook fingerlings



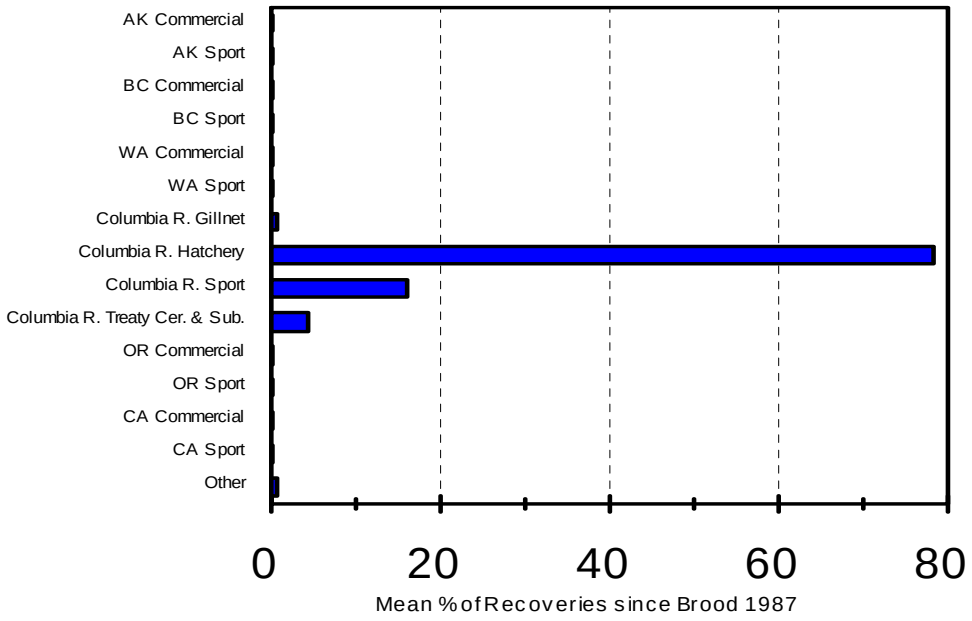
Warm Springs NFH

Spring Chinook



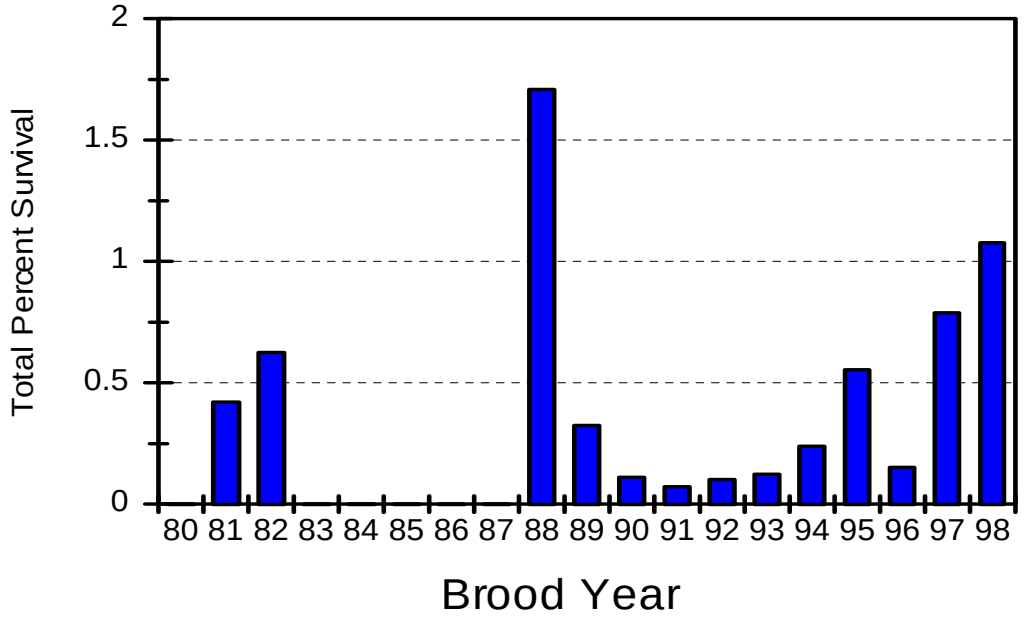
Warm Springs NFH

Spring Chinook yearlings



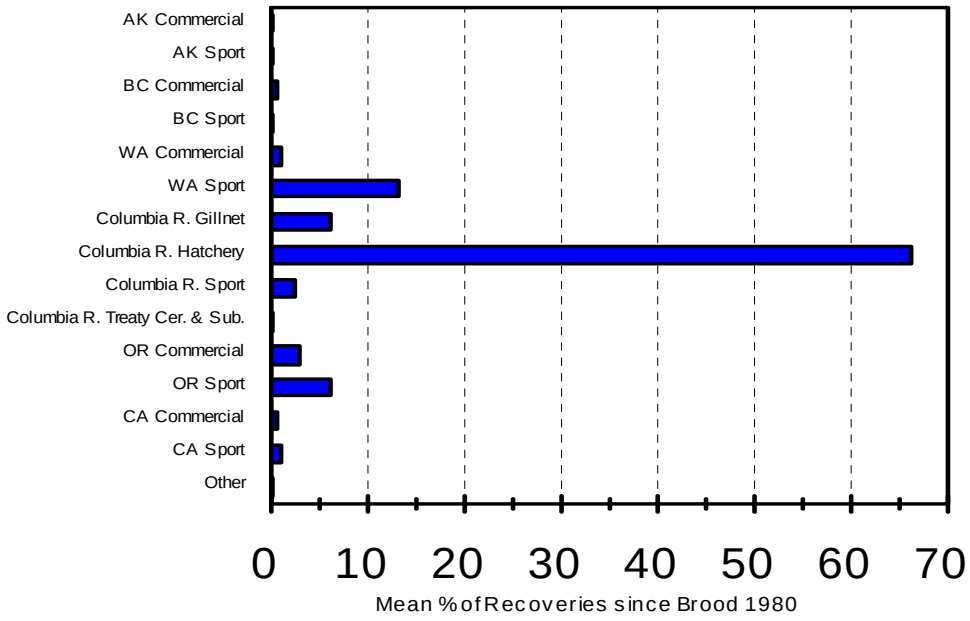
Willard NFH

Coho yearlings

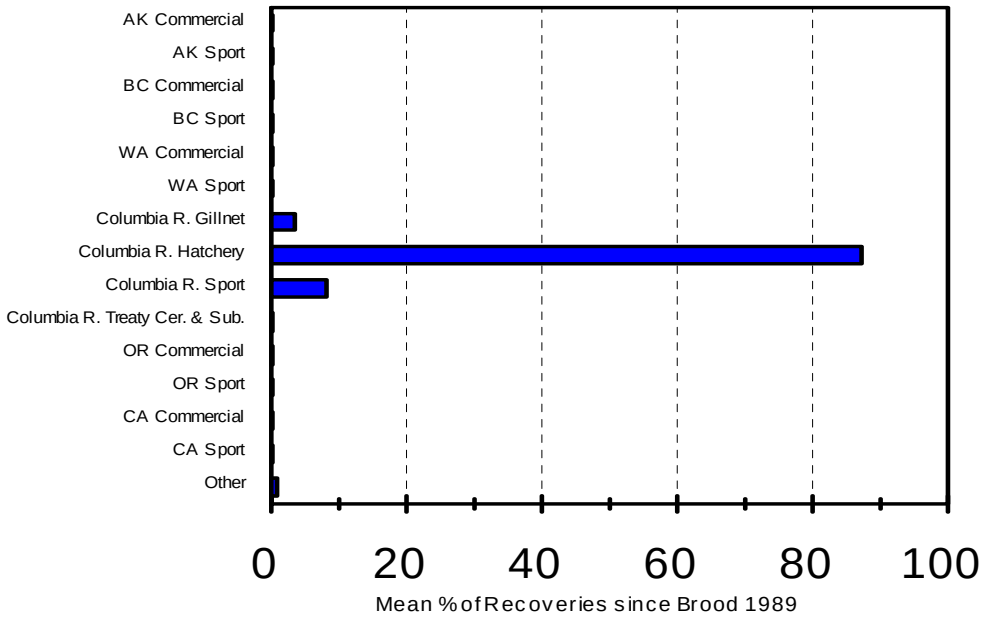


Willard NFH

Coho yearlings



Winthrop NFH
Spring Chinook yearlings



Winthrop NFH
Spring Chinook yearlings