III. Anadromous Fish

As discussed earlier in this report, the Northwest Power Act notes the "significant importance" of anadromous fish in the Columbia River Basin "to the social and economic well-being of the Pacific Northwest and the Nation" and asserts these fish "are dependent on suitable environmental conditions substantially obtainable from the management and operation of the Federal Columbia River Power System and other power generating facilities on the Columbia River and its tributaries."[11]

In its first fish and wildlife program, adopted in November 1982, the Council established measures that would lead to program goals for anadromous fish, noting that "in calculating losses and goals, the Council is limited to the effects caused by the hydroelectric system."[12] In its 1987 program revision, the Council estimated the annual loss of salmon and steelhead attributable to the hydrosystem "to be 5-11 million fish."[13] With the annual runs at that time numbering about 2.5 million adult fish, the Council established a program goal to double the run size to 5 million fish.[14] The Council reasserted this goal in the 1994 anadromous fish amendments to the program, and added four systemwide subgoals that emphasized rebuilding populations to biologically sustainable and harvestable levels over the next 100 years.

In the last few years, we have seen both encouraging and discouraging trends in salmon and steelhead populations. Nine years ago only Snake River Sockeye were listed for protection under the Endangered Species Act. Today 14 fish species are listed as threatened or endangered in the Columbia Basin including 12 species of salmon and steelhead as well as bull trout and white sturgeon.

Some anadromous fish populations have improved in the last ten years, and others have declined. Figure 8 reports estimates of total adult fish returns to the Columbia River and counts of specific fish species crossing the first mainstem dam, Bonneville. Clearly not all the fish returning to the river cross the first dam as some head up tributaries, stray or are caught. While we include these numbers in this report, we do so with the understanding that they should not be used as a measure of the success or failure of individual actions that have been funded through the program over time. That is because there are myriad impacts on fish survival, some of which may be affected by individual actions in the program — restoration of spawning habitat, for example — and many that are not, such as drought and ocean conditions.

Ocean conditions vary from year to year and over longer cycles as depicted in Figure 9. Warmer ocean temperatures have been associated with weaker runs of Columbia Basin salmon and steelhead, a relationship that reverses during periods of cooler ocean temperatures. Nevertheless, run sizes do present a snapshot of

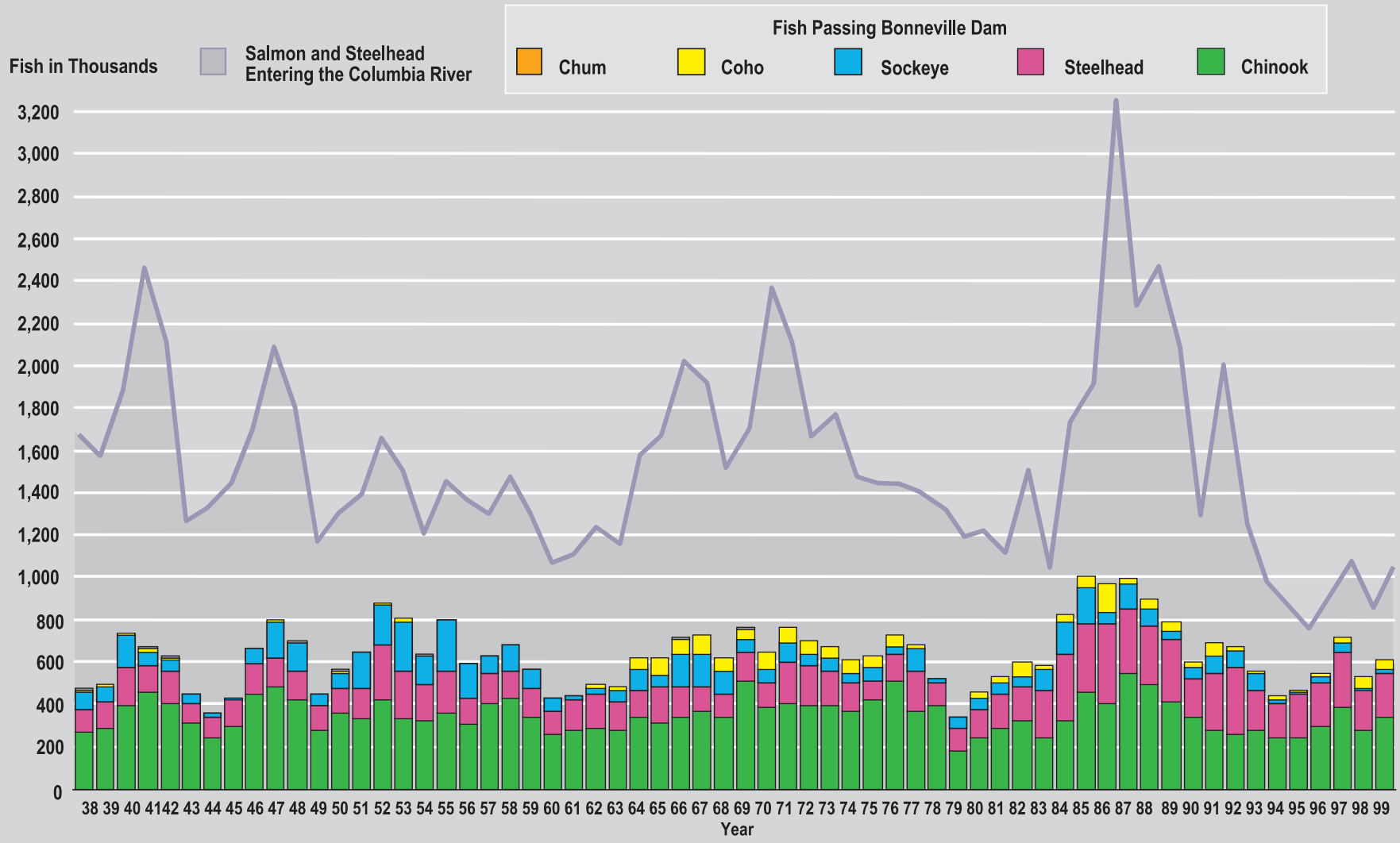
Endangered Species Act Status of Northwest Fish Populations

Species	Status	Date listed
Sockeye, Snake River	Endangered	1991
Chinook, Snake River Fall-run	Threatened	1992
Chinook, Snake River Spring/Summer-run	Threatened	1992
White Sturgeon, Kootenai River	Endangered	1994
Steelhead, Upper Columbia	Endangered	1997
Steelhead, Snake River Basin	Threatened	1997
Steelhead, Lower Columbia River	Threatened	1998
Bull Trout, Columbia Basin	Threatened	1998
Chinook, Lower Columbia River	Threatened	1999
Chinook,Upper Willamette River	Threatened	1999
Chinook, Upper Columbia River Spring-run	Endangered	1999
Chum, Columbia River	Threatened	1999
Steelhead, Upper Willamette	Threatened	1999
Steelhead, Middle Columbia River	Threatened	1999

FIG 8

Salmon and Steelhead Entering the Columbia River and Passing Bonneville Dam

1938-1999



stock abundance and are useful to illuminate trends. That information, coupled with information about factors such as ocean climate conditions, is useful in developing future recovery and mitigation activities.

In general, wild populations of salmon and steelhead have continued to decline while stocks composed primarily of hatchery fish — particularly those runs that return to hatcheries upstream of Bonneville Dam — have generally increased. While we fully understand that salmon and steelhead run sizes can vary from year to year, we are encouraged by the dramatic increases of primarily hatchery fish that were recorded this year. For example, 178,302 adult spring chinook salmon crossed Bonneville Dam this year, compared to the ten-year average of 62,347. The number of spring chinook jacks (sexually immature fish that are an indicator of the size of next year's run) suggests the 2001 run will be even larger, perhaps substantially so.

Historical trends for adult and jack spring chinook are reported in Figure 10. Through August, other runs also showed increases. Summer chinook, fall chinook, coho, sockeye and steelhead counted at Bonneville all were above 10-year averages, and increases also were noted at dams farther upstream. The reasons for the increased run sizes are not clear, but improved ocean conditions, spawning and rearing habitat improvements, favorable conditions in the rivers and the estuary when the fish migrated as juveniles, improved dam passage and harvest restrictions likely were instrumental.

Estimates of juvenile fish survival through the hydrosystem typically are based on observations of fish tagged with a tiny electronic chip. Based on the results of these estimates, the National Marine Fisheries Service has reported in its studies that survival of juvenile spring chinook salmon migrating past dams in the Snake River is higher today than it was in the

FIG 9
Ocean Temperature Cycles
1900-2000

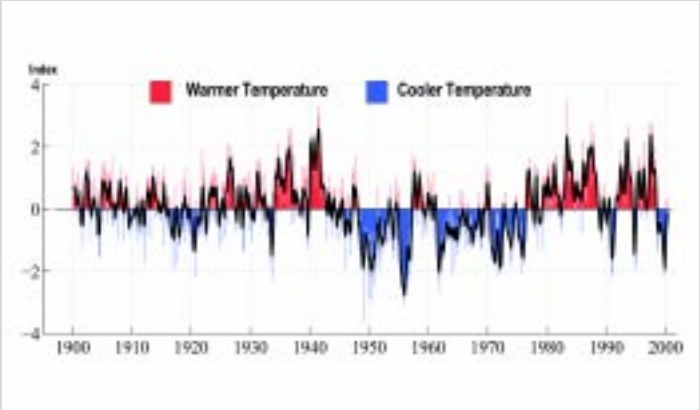


FIG 10
Spring and Summer Chinook Passing Bonneville Dam
1977-2000

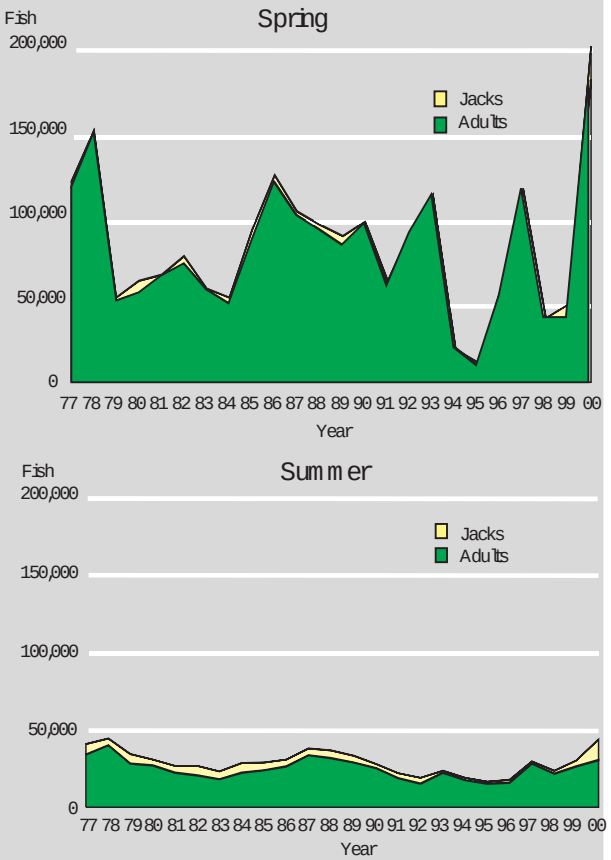
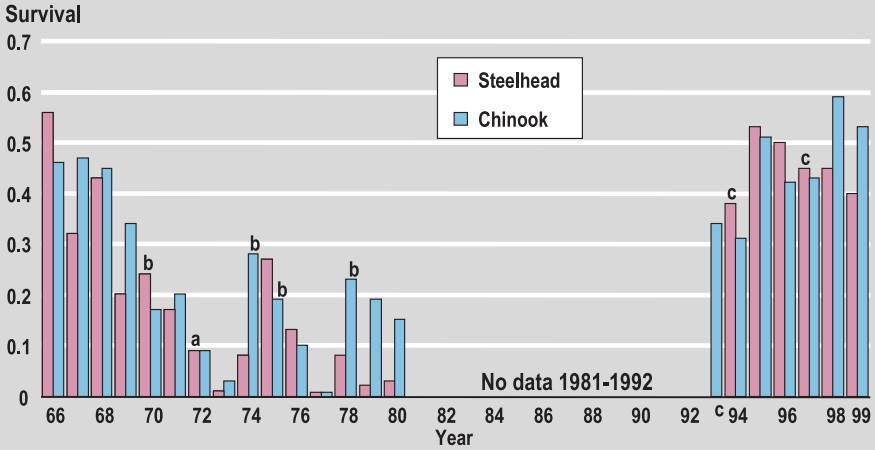


FIG 11

Estimated Juvenile Survival through the Hydrosystem, Upper Snake through Bonneville Dam

1966-1980, 1993-1999



a Extrapolation based on three dams and reservoirs as survival estimates between Ice Harbor Dam and The Dalles Dam did not change between 1966 and 1970 after completion of John Day Dam in 1968.
b Based on product of two non-rounded numbers
c No data for steelhead in this year

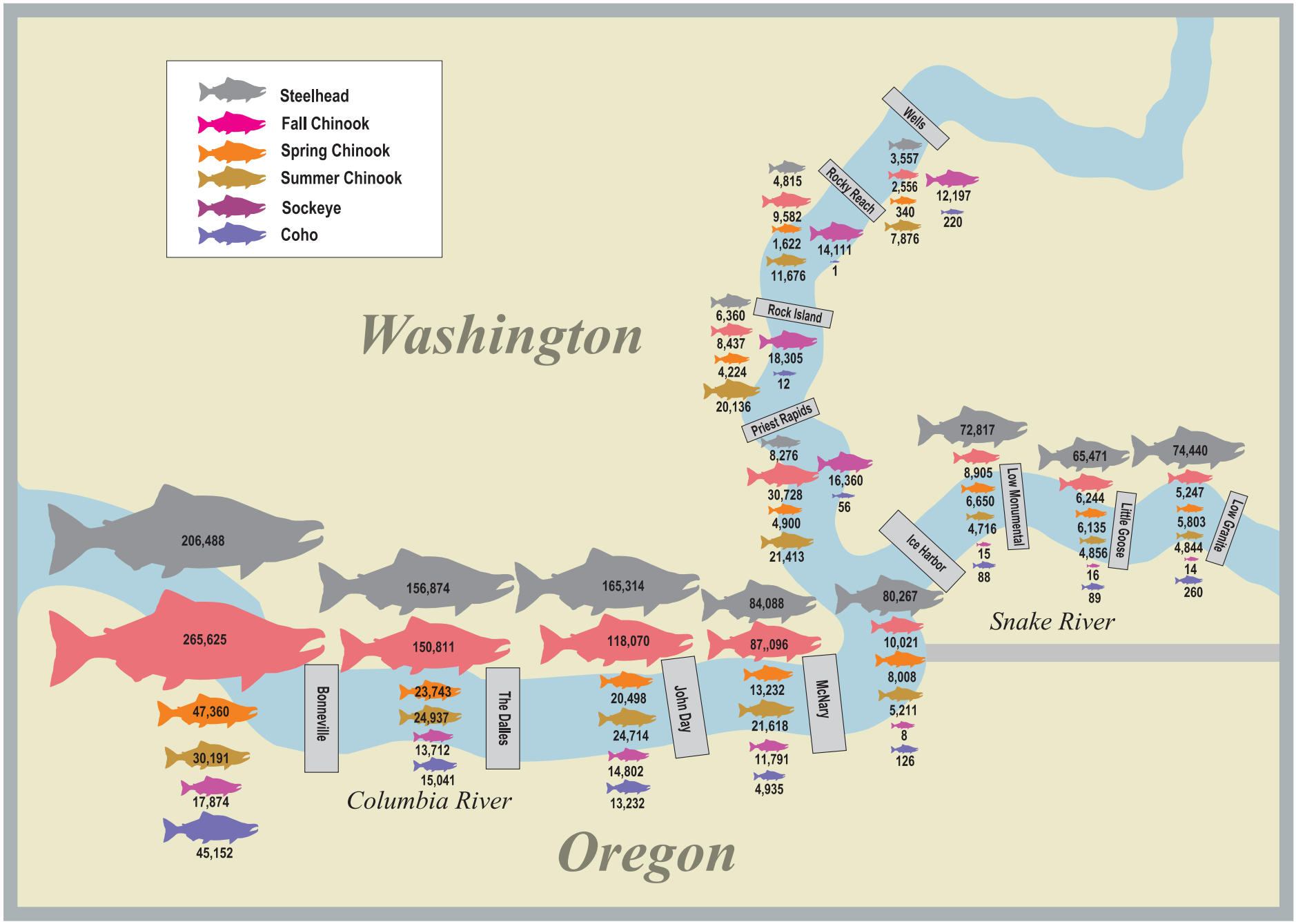
1960s, which predates some of the Snake River dams. Others have questioned this conclusion because research techniques are different today than 30 years ago. In fact, the collection of data was suspended from 1981 to 1992 as the early techniques were not considered sufficiently reliable. Since 1992, the new electronic chip technology is viewed as a better evaluation tool. The results are presented in Figure 11. NMFS says the higher survival likely is the result of good flow conditions, dam operations and fish passage improvements at the dams.

Adult salmon survival also is difficult to estimate. Adult fish are counted as they pass dams, either by observers, video cameras or detection devices. Some fish have identifying marks or tags, and others don't. Some fish fall back through dam bypass systems and are counted twice. Generally speaking, dam counts are subject to counting errors. In addition, some fish will stray into tributaries between dams or try to return downstream past a dam in search of their home tributaries, further complicating dam counts and survival estimates.[15] The Council has recommended that actions be taken to improve the quality of counting adult fish at dams.

While the adult returns in 2000 are impressive, the numbers mask a disturbing trend — most of the fish are returning to hatcheries, and the number of fish that spawn in the wild continues to be low, through 1999, as shown in Fig. 13. At least that appears to be the case, based on dam counts, but it is difficult to enumerate the actual number of fish that spawn in the wild because we do not have detailed surveys of spawning and rearing areas. Some biologists say that if the number of wild fish declines, the risk of losing the genetic diversity of unique stocks increases. This is important because wild fish may preserve the unique genetic material that provides for the long term ability of the species to adapt to environmental change.

Columbia River fish are harvested in both the ocean and in the river. Harvest rates in the river, presented in Figure 14, actually peaked shortly after the turn of the century and have declined steadily over time as fewer and fewer fish have returned to the river. In some cases the declining abundance of wild fish and endangered listings have forced a further reduction in harvest rates. However, another way to look at this is that permitted harvest rates continue to remain unusually high for fish at risk of extinction. For example, NMFS allows 31 percent of the threatened Snake River fall chinook to be harvested in the river every year along with 9 percent of the spring chinook.

FIG 12
Where do the fish go? Fish counted at each mainstem dam.



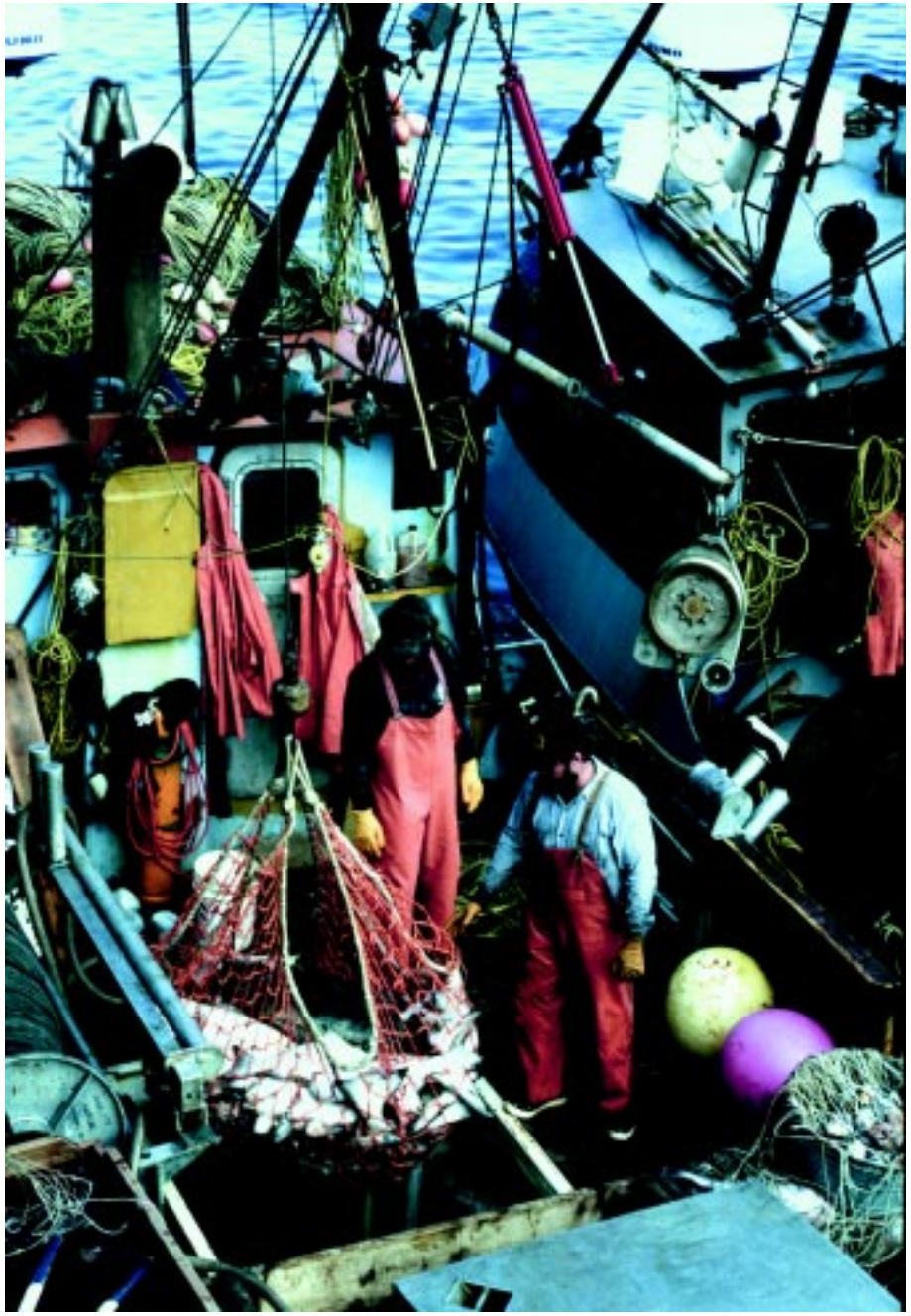


FIG 13
Wild Fish Passing Bonneville Dam
1990-1999

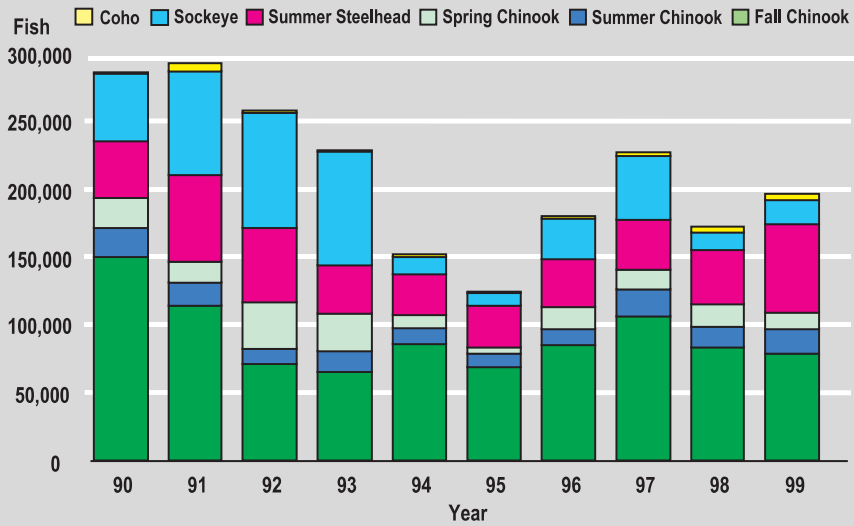
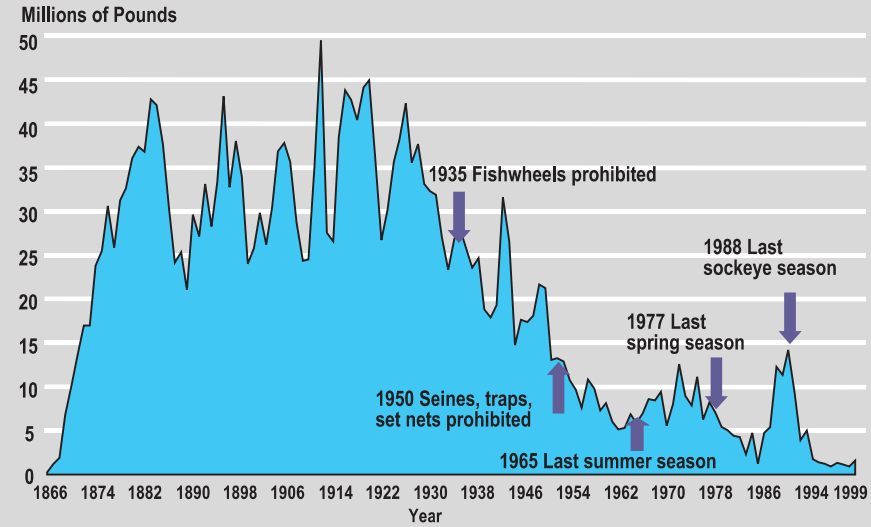



FIG 14
Commercial Landings of Salmon and Steelhead from the Columbia River
1866-1999