13. UPPER WILLAMETTE RIVER CHINOOK SALMON AND STEELHEAD

All text excerpted from:
Draft Willamette Subbasin Plan
Prepared for the Northwest Power and Conservation Council
May 28, 2004
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13.1 UWR CHINOOK SALMON

13.1.1 Background

The Willamette River Basin historically provided important spawning and rearing grounds for large numbers of spring chinook salmon of the Columbia River basin. Mattson (1948) estimated that the spring chinook salmon run in the 1920s may have been five times the 55,000 fish counted in 1947. From 1946 to 1951, annual spring chinook runs, including the mainstem Willamette River sport catch, escapement above Willamette Falls, and escapement to the Clackamas River, ranged from 25,100 to 96,800 fish (Mattson, 1963). Mean annual run size for this same period averaged 55,600, which was more than half the 97,543-fish run size that passed Bonneville Dam in 1948 (Fish Commission, 1948). In 2003 and 2004, more than 100,000 adult spring chinook crossed Willamette Falls each year. The average run size in the last 50 years has been around 40,000, with peaks as low as 11,000. A large fraction of fish passing the falls are of hatchery origin. The largest run on record was 156,033 adults in 1953 (Oregon Department of Fish and Wildlife 2000b).

Historically there were seven demographically independent populations of spring chinook salmon in the Upper Willamette River Spring Chinook Salmon ESU: Clackamas, Molalla/Pudding, Calapooia, North Santiam, South Santiam, McKenzie, and Middle Fork Willamette -- all eastside tributaries (Meyers *et al.* 2003). Today, four core populations survive in the Clackamas, North Santiam, McKenzie and Middle Fork Willamette subbasins, which historically sustained large populations and may have the intrinsic capacity to sustain large populations into the future (McElhany *et al*. 2003). In addition to these core populations, the McKenzie subbasin population represents an important element of the genetic legacy of the Upper Willamette ESU. The McKenzie spring chinook salmon population has been the least influenced by intra- or inter-basin transfers of hatchery stocks and probably has retained a relatively high degree of adaptation to local watershed conditions. It is thought that the Molalla and Calapooia spring chinook salmon populations have been extirpated, or nearly so (Corps 2002).

Above Willamette Falls, native spring chinook declined in abundance and distribution after the construction of the Willamette Valley dams. In the 1940s, state biologists surveyed the middle and upper basin and estimated that nearly 48% of the spring chinook spawning habitat would be lost with construction of the dams in the McKenzie, Santiam, and Middle Fork Willamette rivers (Fish Commission of Oregon 1948). Notably, only 400 miles of spawning and rearing habitat remain today (ODFW 2000a). Changes in water temperature regimes from the dams have affected Upper Willamette spring chinook spawn timing.

13.1.2 Populations

13.1.2.1 Calapooia Subbasin

A small run of spring chinook salmon historically existed in the Calapooia River. Parkhurst *et al.* (1950) reported that the run size in 1941 was approximately 200 adults, while Mattson (1948) estimated the run at 30 adults in 1947. A 2002 survey of 11.1 miles of stream in the Calapooia above Brownsville found 16 redds (Schroeder *et al.* 2002). The carcasses recovered in the Calapooia in 2002 were too decomposed to determine the presence or absence of fin clips. However, it was assumed that all the fish were surplus hatchery fish outplanted from the South Santiam hatchery (Schroeder *et al*. 2002). The Calapooia natural spring chinook population is believed to be extirpated (Nicholas 1995). Nicholas (1995) considered the Calapooia River run extinct, with limited future production potential.

13.1.2.2 Clackamas River Subbasin

The Clackamas River historically contained a spring run of chinook salmon, but relatively little information about that native run exists. Barin (1886) observed a run of chinook salmon that "commences in March or April, sometimes even in February." The construction of the Cazadero Dam in 1904 (River Kilometer [RKm] 43) and River Mill Dam in 1911 (RKm 37) limited migratory access to the majority of the historical spawning habitat for the spring run. In 1917, the fish ladder at Cazadero Dam was destroyed by floodwaters, eliminating fish passage to the upper basin (ODFW 1992). Hatchery production of spring-run chinook salmon in the basin continued using broodstock captured at the Cazadero and River Mill dams (Willis *et al.* 1995). Fish introduced from the upper Willamette River have significantly introgressed into, if not overwhelmed, spring-run fish native to the Clackamas River Basin and obscured any genetic differences that existed prior to hatchery transfers. Currently natural production habitat is thought to be relatively productive in at least the Clackamas mainstem and tributaries above North Fork Dam.

13.1.2.3 McKenzie Subbasin

Spring-run chinook salmon are native to the McKenzie River Basin. Historical natural spawning areas included the mainstem McKenzie River, Smith River, Lost Creek, Horse Creek, South Fork, Blue River, and Gate Creek (Mattson 1948; Parkhurst *et al.* 1950). Currently, the McKenzie Subbasin supports the largest existing population of UWR spring chinook salmon. Downstream of Leaburg Dam, most spring chinook spawners are hatchery-produced (Corps 2000). Spring chinook salmon escapement to Leaburg Dam has varied over the last 30 or more years, with the 1988 through 1991 runs the strongest recorded. However, until 2001, it was difficult to distinguish naturally produced spawners from hatchery-origin fish, so these data may not represent the status of the wild population over time. Lindsay (2003) reported that in 2002, 55% of the spring chinook salmon carcasses in the South Fork McKenzie below Cougar Dam and in the mainstem McKenzie between Leaburg Dam and the Carmen-Smith spawning channel were wild fish. Historical spawning areas included the mainstem McKenzie River, Smith River, Lost Creek, Horse Creek, South Fork, Blue River, and Gate Creek (Mattson 1948; Parkhurst *et al.* 1950). It has been estimated that historically there was suitable habitat for 80,000 fish in the McKenzie River Subbasin (Parkhurst *et al*. 1950). Construction of Cougar Dam at RM 4.5 on the South Fork McKenzie River in 1963 blocked access to at least 25 miles of high quality spawning habitat. The South Fork was considered the best spring chinook salmon production area in the McKenzie Basin (USFWS 1948).

13.1.2.4 Middle Fork Willamette Subbasin

Historically, the Middle Fork Willamette River spring chinook salmon run may have been the largest in the Upper Willamette Basin (Hutchison 1966; Thompson *et al.* 1966). There was an estimated minimum run size of approximately 7,100 adult spring chinook for the area that is now above Lookout Point Dam (Corps 2002). This estimate does not include fish that spawned downstream of the hatchery rack (such as in the mainstem Middle Fork Willamette River below Dexter and in the Fall Creek watershed). Mattson (1948) estimated a run size of 2,550 naturally produced spring chinook to the Middle Fork Willamette River in 1947. USFWS (1962) reported that approximately 450 spring chinook salmon spawned above the site of Fall Creek Dams in the years immediately before construction (the project was completed in 1966). Currently, the naturally spawning population of spring chinook salmon in the Middle Fork Willamette Subbasin is very small and probably is made up mostly of the progeny of hatchery fish that were released to spawn in the wild. There is no estimate of the population growth rate or productivity for naturally spawning spring chinook salmon in the Middle Fork Willamette subbasin. Lindsay (2003) reported that 4% of the spring chinook salmon carcasses collected between Jasper and Dexter and in Fall Creek below the dam were wild fish. From 1953 through 1966 (after the construction of Dexter and Lookout Point dams blocked access to the historical spawning grounds), an average of 3,502 chinook salmon were caught in the trap at the base of Dexter Dam (Corps 2000). These total counts probably included some hatchery-origin fish. Thompson *et al.* (1966) estimated a total population of 6,100 naturally and artificially produced adults in the Middle Fork Willamette Subbasin in the mid-1960s. Firman *et al* (2002) estimated a natural-origin run of spring chinook salmon to the Middle Fork Willamette subbasin of 987 fish in 2002, based on counts of naturally spawned carcasses and the number of unmarked fish taken for hatchery broodstock at Dexter Dam. It appears that the Middle Fork Willamette Subbasin does not currently support a self-sustaining population of naturally produced spring chinook salmon. Natural spawning occurs in the mainstem Middle Fork Willamette below Dexter Dam, although ODFW investigations indicated that warm water temperatures cause eggs to succumb to fungus infections, and those eggs that do survive produce juveniles that emerge early (Ziller *et al.* 2002).

13.1.2.5 Molalla/Pudding Subbasin

There is very little information on the historical run size or distribution of the Molalla spring chinook population. By 1903, the abundance of spring chinook salmon in the subbasin had already decreased dramatically (Myers *et al.* 2004). Surveys in 1940 and 1941 recorded 882 and 993 spring-run chinook salmon present, respectively (Parkhurst *et al.* 1950). In 1947, Mattson (1948) estimated the run size to be 500. A 2002 survey of 16.3 miles of stream in the Molalla found 52 redds. The historical run of spring chinook in the Molalla and Pudding watersheds was believed to have declined to the point where it could no longer sustain a viable population during the 1960s (Cramer *et al.* 1996). However, 93% of the carcasses recovered in the Molalla in 2002 were fin-clipped and of hatchery origin (Schroeder *et al.* 2002). Fin-clip recovery fractions for spring chinook in the Willamette tend to underestimate the proportion of hatchery-origin spawners, so the true fraction is likely in excess of 93% (that is, it is likely to be near 100%). The Molalla natural spring chinook population is believed to be extirpated, or nearly so (Corps 2002).

13.1.2.6 North Santiam Subbasin

Historically, the mainstem North Santiam River was free of natural barriers up to its headwaters, approximately 35 mainstem miles above the current site of Detroit Dam (WNF DRD 1995). Before Detroit Dam was built, adult chinook salmon spawned in the upper reaches of the North Santiam River and in headwater tributaries such as the Breitenbush River, Blowout Creek, and Marion Creek (WNF DRD, 1994, 1996, and 1997). Mattson (1948) estimated that 71% of the spring chinook production in the North Santiam subbasin occurred above the dam site.

13.2 UW STEELHEAD

13.2.1 Background

Of the three runs of steelhead currently found in the Upper Willamette River ESU, only the late-run winter steelhead is considered to be native (Myers *et al.* 2003). Winter steelhead are only considered native to the eastside tributaries draining the Cascade Range. Most of the populations of winter steelhead have a large introduced component. While counts at Willamette Falls have increased in the last three years, the overall trend of winter steelhead is declining in the last 30 years (McElhany 2003b). The North and South Santiam subbasins have the only core and genetic legacy populations of winter steelhead in the Upper Willamette Basin (McElhany *et al.* 2003).

While there is little historical information on the population status of upper Willamette River winter steelhead, the geographic range and historical abundance are believed to be relatively small in comparison to the range and abundance of other steelhead ESUs. The current production of winter steelhead probably represents a larger proportion of historical production than is the case in other Columbia Basin ESUs (Busby *et al.* 1996). The limited data on winter steelhead adult escapement appear to indicate a declining population. Of the three winter steelhead subpopulations that have adequate adult escapement information to compute trends, the populations range from a 4.9% annual decline to a 2.4% annual increase. However, none of these winter steelhead population trends is significantly different from zero, indicating the precarious status of the stock. Historically, there were probably five demographically independent populations of winter steelhead in the Upper Willamette River winter steelhead ESU, all of which are associated with eastside tributaries (McElhany *et al.* 2003).

13.2.2 Populations

13.2.2.1 Calapooia Subbasin

The historical run size of winter steelhead native to the Calapooia River has not been estimated. Annual sport catch in the Calapooia River watershed ranged from 0 to 122 fish during 1977 to 1988 (Weavers *et al.* 1992b).

13.2.2.2 Molalla/Pudding Subbasin

There are no estimates of the historical winter steelhead production in the Molalla/Pudding Subbasin, although spawning areas are dispersed over approximately 110 miles of stream in the Molalla River and 57 miles in the Pudding River (Wevers *et al*. 1992a).

13.2.2.3 North Santiam Subbasin

Historically, winter steelhead spawning occurred throughout the upper mainstem North Santiam River, in all the major tributaries (such as the Breitenbush and Little North Santiam rivers), and in many smaller tributaries (BLMS 1998; Olsen *et al.* 1992; WNF DRD 1994, 1995, 1996, 1997). Steelhead also used most of the mainstem North Santiam for spawning. Since dam construction, winter steelhead have been restricted to the area below Big Cliff Dam.

13.2.2.4 South Santiam Subbasin

Winter steelhead spawned historically in the upper South Santiam subbasin, above the sites of Foster and Green Peter dams. Buchanan *et al.* (1993) estimated that 2,600 winter steelhead spawned in the upper mainstem of the South Santiam River and in Thomas, Crabtree, McDowell, Wiley, Canyon, Moose, and Soda Fork creeks.

13.2.2.5 McKenzie and Middle Fork Willamette Rivers.

There is general agreement that steelhead did not ascend the Willamette River beyond the Calapooia River.

13.3 LITERATURE CITED