Status of the Species
Snake River Spring/Summer Chinook Salmon
February 2023

The Snake River (SR) spring/summer Chinook salmon evolutionarily significant unit (ESU) was listed as threatened on April 22, 1992 (57 FR 14653). On August 18, 2022, in the agency's 5-year review for SR spring/summer Chinook salmon, NMFS concluded that the species should remain listed as threatened (NMFS 2022).

The ESU includes all naturally spawning populations of spring/summer Chinook salmon in the mainstem Snake River (below Hells Canyon Dam) and in the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins (57 FR 23458), as well as the progeny of 13 artificial propagation programs (85 FR 81822). The hatchery programs include the McCall Hatchery (South Fork Salmon River), South Fork Salmon River Eggbox, Johnson Creek, Pahsimeroi River, Yankee Fork Salmon River, Panther Creek, Sawtooth Hatchery, Tucannon River, Lostine River, Catherine Creek, Lookingglass Creek, Upper Grande Ronde River, and Imnaha River programs.

This ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Large portions of historical habitat were blocked in 1901 by the construction of Swan Falls Dam, on the Snake River, and later by construction of the three-dam Hells Canyon Complex from 1955 to 1967. Dam construction also blocked and/or hindered fish access to historical habitat in the Clearwater River basin as a result of the construction of Lewiston Dam (removed in 1973 but believed to have caused the extirpation of native Chinook salmon in that subbasin). The loss of this historical habitat substantially reduced the spatial structure of this species. The production of SR spring/summer Chinook salmon was further affected by the development of the eight Federal dams and reservoirs in the mainstem lower Columbia/Snake River migration corridor between the late 1930s and early 1970s (NMFS 2017).

Several factors led to NMFS' 1992 conclusion that SR spring/summer Chinook salmon were threatened: (1) abundance of naturally produced SR spring/summer Chinook runs had dropped to a small fraction of historical levels; (2) short-term projections were for a continued downward trend in abundance; (3) hydroelectric development on the Snake and Columbia Rivers continued to disrupt Chinook runs through altered flow regimes and impacts on estuarine habitats; and (4) habitat degradation and reduced streamflows existed throughout the region, along with risks associated with the use of outside hatchery stocks in particular areas (Good et al. 2005).

Since Snake River spring/summer Chinook salmon were listed in 1992, there have been improvements in abundance/productivity in several populations. Relative to the time of listing, the majority of populations experienced sharp declines in abundance in the recent 5-year period, primarily due to variation in ocean survival, and declines for all populations in the 15-year trends. Limiting factors continue to include widespread areas of degraded habitat that persist across the basin, with simplified stream channels, disconnected floodplains, impaired instream flow, loss of cold water refugia, conditions increasingly favoring non-native predator fish, and other limiting factors, despite improving habitat conditions for spring/summer Chinook salmon

spawning, rearing, and migration in many reaches (Ford 2022, NMFS 2022). Predation by pinnipeds continues to pose a negative threat to the persistence of this ESU (NMFS 2022). Climate change is a significant threat, particularly in the marine and freshwater rearing life stages (NMFS 2022).

Life History. Snake River spring/summer Chinook salmon are characterized by their return times. Runs classified as spring Chinook salmon are counted at Bonneville Dam beginning in early March and ending the first week of June; summer runs are those Chinook salmon adults that pass Bonneville Dam from June through August. Returning adults will hold in deep mainstem and tributary pools until late summer, when they move up into tributary areas and spawn. In general, spring-run type Chinook salmon tend to spawn in higher-elevation reaches of major Snake River tributaries in mid- through late August, and summer-run Chinook salmon tend to spawn lower in Snake River tributaries in late August and September (although the spawning areas of the two runs may overlap).

Spring/summer Chinook salmon typically rear for a full year in the spawning habitat and migrating in early to mid-spring as age-1 smolts (Healey 1991). Eggs are deposited in late summer and early fall, incubate over the following winter, and hatch in late winter and early spring of the following year. Juveniles rear through the summer, and most overwinter and migrate to sea in the spring of their second year of life. Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer-rearing or overwintering areas. A small fraction of the fish returns as 3-year-old "jacks," heavily predominated by males (Good et al. 2005).

Spatial Structure and Diversity. Within the ESU, the Interior Columbia Technical Recovery Team (ICTRT) identified 28 extant and 4 extirpated or functionally extirpated populations of spring/summer-run Chinook salmon, listed in Table 1 (ICTRT 2003; McClure et al. 2005). The ICTRT aggregated these populations into five major population groups (MPGs): Lower Snake River, Grande Ronde/Imnaha Rivers, South Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River. For each population, Table 1 shows the current risk ratings for the abundance/productivity and spatial structure/diversity viable salmonid population (VSP) risk parameters.

Spatial structure risk is low to moderate for most populations in this ESU (Ford 2022) and is generally not preventing the recovery of the species. Spring/summer Chinook salmon spawners are distributed throughout the ESU albeit at very low numbers. Diversity risk, on the other hand, is somewhat higher, driving the moderate and high combined spatial structure/diversity risks shown in Table 1 for some populations. Several populations have a high proportion of hatchery-origin spawners—particularly in the Grande Ronde, Lower Snake, and South Fork Salmon MPGs—and diversity risk will need to be lowered in multiple populations in order for the ESU to recover (ICTRT 2007; ICTRT 2010; Ford 2022).

Abundance and Productivity. Historically, the Snake River drainage is thought to have produced more than 1.5 million adult spring/summer Chinook salmon in some years (Matthews and Waples 1991), yet in 1994 and 1995, fewer than 2,000 naturally produced adults returned to the Snake River (Ford 2022). From the mid-1990s and the early 2000s, the population increased

dramatically and peaked in 2001 at 45,273 naturally produced adult returns. Since 2001, the numbers have fluctuated between 32,324 (2003) and 4,183 (2019) (Ford 2022).

As reported in the most recent viability assessment (Ford 2022), the five-year (2015-2019) geometric mean abundance estimates for 26 of the 27 evaluated populations are lower than the corresponding estimates for the previous five-year period by varying degrees, with an average decline of 55 percent. The consistent and sharp declines in 15-year population trends for all populations in the ESU are concerning, with the abundance levels for some populations approaching similar levels to those of the early 1990s when the ESU was listed (NMFS 2022). No populations within the ESU meet the minimum abundance threshold designated by the ICTRT (NMFS 2022). Productivity is below recovery objectives for all of the populations (NMFS 2017) and has been below replacement for nearly all populations in the ESU since 2012 (Nau et al. 2021). The vast majority of the extant populations are considered to be at high risk of extinction due to low abundance/productivity (Ford 2022). All extant populations of SR spring/summer Chinook salmon will likely have to increase in abundance and productivity in order for the ESU to recover (Table 1).

Recovery. NMFS completed a recovery plan for SR spring/summer Chinook salmon in 2017 (NMFS 2017). The proposed recovery targets for each population are summarized in Table 1. The greatest opportunities for advancing recovery include: (1) prioritizing actions that improve habitat resilience to climate change; (2) reconnecting stream channels with floodplains; (3) developing local- to basin-scale frameworks that prioritize restoration actions and integrate a landscape perspective; (4) implementing restoration actions at watershed scales; and (5) reducing pinniped predation on adults returning to the lower Columbia River (NMFS 2022).

Crozier et al. (2019) concluded that SR spring/summer Chinook salmon has a high risk of overall climate vulnerability based on its high risk for biological sensitivity, very high risk for climate exposure, and high capacity to adapt. Negative effects of high temperatures encountered during the adult and juvenile freshwater stages have been documented (Crozier and Zabel 2006; Crozier et al. 2019, 2020). The Interior Columbia ESUs face the largest percentage loss of snow-dominated habitat, potentially causing a net contraction in life history variability. Adults may have some flexibility in migration timing to avoid high stream temperatures in the migration corridor but the energetic costs might limit the adaptive capacity in the adult stage.

Table 1. Summary of viable salmonid population (VSP) parameter risks, current status, and proposed recovery goal for each population in the Snake River spring/summer Chinook salmon evolutionarily significant unit (ESU) to achieve ESU recovery (Ford 2022; NMFS 2017).

Major Population Group	Population	VSP Risk Rating[1]		Viability Rating	
		Abundance/Productivity	Spatial Structure/Diversity	2022 Assessment	Proposed Recovery Goal[2]
South Fork Salmon River (Idaho)	Little Salmon River	*Insuf. data*	Low	High Risk	Maintained
	South Fork Salmon River mainstem	High	Moderate	High Risk	Viable
	Secesh River	High	Low	High Risk	Highly Viable
	East Fork South Fork Salmon River	High	Low	High Risk	Maintained
Middle Fork Salmon River (Idaho)	Chamberlain Creek	High	Low	High Risk	Viable
	Middle Fork Salmon River below Indian Creek	High	Moderate	High Risk	Maintained
	Big Creek	High	Moderate	High Risk	Highly Viable
	Camas Creek	High	Moderate	High Risk	Maintained
	Loon Creek	*Insuf. data*	Moderate	High Risk	Viable
	Middle Fork Salmon River above Indian Creek	High	Moderate	High Risk	Maintained
	Sulphur Creek	High	Moderate	High Risk	Maintained
	Bear Valley Creek	Moderate	Low	Maintained	Viable
	Marsh Creek	Moderate	Low	Maintained	Viable
Upper Salmon River (Idaho)	North Fork Salmon River	*Insuf. data*	Low	High Risk	Maintained
	Lemhi River	High	High	High Risk	Viable
	Salmon River Lower Mainstem	High	Low	High Risk	Maintained
	Pahsimeroi River	High	High	High Risk	Viable
	East Fork Salmon River	High	High	High Risk	Viable
	Yankee Fork Salmon River	High	High	High Risk	Maintained

Major Population Group	Population	VSP Risk Rating[1]		Viability Rating	
		Abundance/Productivity	Spatial Structure/Diversity	2022 Assessment	Proposed Recovery Goal[2]
	Valley Creek	High	Moderate	High Risk	Viable
	Salmon River Upper Mainstem	High	Low	High Risk	Highly Viable
	Panther Creek	*Insuf. data*			***Reintroduction***
Lower Snake River (Washington)	Tucannon River	High	Moderate	High Risk	Highly Viable
	Asotin Creek			***Extirpated***	***Consider Reintroduction***
Grande Ronde and Imnaha Rivers (Oregon/ Washington)[3]	Wenaha River	High	Moderate	High Risk	Highly Viable or Viable
	Lostine/Wallowa River	High	Moderate	High Risk	Highly Viable or Viable
	Minam River	Moderate	Moderate	Maintained	Highly Viable or Viable
	Catherine Creek	High	Moderate	High Risk	Highly Viable or Viable
	Upper Grande Ronde River	High	High	High Risk	Maintained
	Imnaha River	High	Moderate	High Risk	Highly Viable or Viable
	Lookingglass Creek			***Extirpated***	***Consider Reintroduction***
	Big Sheep Creek			***Extirpated***	***Consider Reintroduction***

[1]Risk ratings are defined based on the risk of extinction within 100 years: High = greater than or equal to 25 percent; Moderate = less than 25 percent; Low = less than 5 percent; and Very Low = less than 1 percent.
[2]There are several scenarios that could meet the requirements for ESU recovery (as reflected in the proposed goals for populations in Oregon and Washington). What is reflected here for populations in Idaho are the proposed status goals selected by NMFS and the State of Idaho.
[3]At least one of the populations must achieve a very low viability risk rating.

Summary. Overall, this ESU is at a moderate-to-high risk of extinction. While there have been improvements in abundance/productivity in several populations since the time of listing, the majority of populations experienced sharp declines in abundance in recent years. If productivity remains low, the ESU's viability will become more tenuous. If productivity improves, populations could increase again, similar to what was observed in the early 2000s. This ESU continues to face threats from disease; predation; harvest; habitat loss, alteration, and degradation; and climate change (NMFS 2022).

References

Crozier, L. and R. W. Zabel. 2006. Climate impacts at multiple scales: evidence for differential population responses in juvenile Chinook salmon. J Anim Ecol 75:1100-1109.

Crozier, L. G., M. M. McClure, T. Beechie, S. J. Bograd, D. A. Boughton, M. Carr, T. D. Cooney, J. B. Dunham, C. M. Greene, M. A. Haltuch, E. L. Hazen, D. M. Holzer, D. D. Huff, R. C. Johnson, C. E. Jordan, I. C. Kaplan, S. T. Lindley, N. J. Mantua, P. B. Moyle, J. M. Myers, M. W. Nelson, B. C. Spence, L. A. Weitkamp, T. H. Williams, and E. Willis-Norton. 2019. Climate vulnerability assessment for Pacific salmon and steelhead in the California Current Large Marine Ecosystem. PLoS ONE 14(7): e0217711. https://doi.org/10.1371/journal.pone.0217711.

Crozier L.G., J.E. Siegel, L.E. Wiesebron, E.M. Trujillo, B.J. Burke , B.P. Sandford and D.L. Widener. 2020. Snake River sockeye and Chinook salmon in a changing climate: Implications for upstream migration survival during recent extreme and future climates. PLOS ONE 15(9): e0238886. https://doi.org/10.1371/journal.pone.0238886.

Ford, M. J., editor. 2022. Biological viability assessment update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-171.

Good, T. P., R. S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-66, 598 p.

Healey, M. C. 1991. Life history of chinook salmon (*Oncorhynchus tshawytscha*). Pages 80 *in* C. Groot, and L. Margolis, editors. Pacific salmon life histories. University of British Columbia Press, Vancouver, Canada.

ICTRT (Interior Columbia Technical Recovery Team). 2003. Working draft. Independent populations of Chinook, steelhead, and sockeye for listed evolutionarily significant units within the Interior Columbia River domain. NOAA Fisheries. July.

ICTRT (Interior Columbia River Technical Recovery Team). 2007. Interior Columbia Basin TRT: Viability criteria for application to Interior Columbia Basin Salmonid ESUs. Available at http:// www.nwfsc.noaa.gov/trt/trt_viability.cfm.

ICTRT. 2010. Status Summary – Snake River Spring/Summer Chinook Salmon ESU. Interior Columbia Technical Recovery Team: Portland, Oregon.

McClure, M., T. Cooney, and ICTRT. 2005. Updated population delineation in the interior Columbia Basin. May 11, 2005 Memorandum to NMFS NW Regional Office, Co-managers, and other interested parties. NMFS: Seattle. 14 p.

Matthews, G. M., R. S. Waples. 1991. Status Review for Snake River Spring and Summer Chinook Salmon. U.S. Dept. of Commerce, NOAA Tech. Memo., NMFS-F/NWC-200. https://www.nwfsc.noaa.gov/publications/scipubs/techmemos/tm201/

Nau, C. I., E. A. Felts, B. Barnett, M. Davison, C. McClure, J. R. Poole, R. Hand, and E. Brown. 2021. Idaho adult Chinook Salmon monitoring. Annual report 2020. Idaho Department of Fish and Game Report 21-08. 82 pp.

NMFS. 2022. 2022 5-Year Review: Summary & Evaluation of Snake River Spring/Summer Chinook Salmon. August 16, 2022. NMFS. West Coast Region. 101 pp.

NMFS. 2017. ESA Recovery Plan for Snake River Spring/Summer Chinook & Steelhead. NMFS. https://www.westcoast.fisheries.noaa.gov/publications/recovery_planning/salmon_steelhead/domains/interior_columbia/snake/Final%20Snake%20Recovery%20Plan%20Docs/final_snake_river_spring-summer_chinook_salmon_and_snake_river_basin_steelhead_recovery_plan.pdf