

Status of the Species
Snake River Fall-run Chinook Salmon
February 2023

The Snake River (SR) fall 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 fall Chinook salmon, NMFS concluded that the species should remain listed as threatened (NMFS 2022).

The ESU includes fall Chinook salmon that spawn in the mainstem of the Snake River and lower reaches of its major tributaries. The ESU also includes four artificial propagation programs: the Lyons Ferry Hatchery, Fall Chinook Acclimation Ponds, Nez Perce Tribal Hatchery, and Idaho Power programs (85 FR 81822). Historically, this ESU included one large additional population spawning in the mainstem of the Snake River upstream of the Hells Canyon Dam complex (Ford 2022). Snake River fall Chinook salmon have substantially declined in abundance from historic levels, primarily due to the loss of primary spawning and rearing areas upstream of the Hells Canyon Dam complex (57 FR 14653). Additional concerns for the species have been the high percentage of hatchery fish returning to natural spawning grounds and the relatively high aggregate harvest impacts by ocean and in-river fisheries (Good et al. 2005). Despite improvements in status over the last five years, threats associated with hydropower, habitat degradation and access, hatcheries, harvest and predation continue to challenge ESU recovery (NMFS 2022).

Life History. After spending two to five years in the ocean, SR fall Chinook salmon enter the Columbia River in July and August, and migrate past the lower Snake River mainstem dams from August through November. Fish spawning takes place from October through early December in the mainstem of the Snake River, primarily between Asotin Creek and Hells Canyon Dam, and in the lower reaches of the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers (Connor and Burge 2003; Ford 2011). Juveniles emerge from the gravels in March and April of the following year.

Most SR fall Chinook salmon migrate to the Pacific Ocean during their first year of life, normally within 3 months of emergence from the spawning substrate as age-0 smolts, to spend their first winter in the ocean. Chinook salmon juveniles tend to display a “rear as they go” strategy, in which they continually move downstream through shallow shoreline habitats during their first summer and fall, continually growing until they reach the ocean by winter (Connor and Burge 2003; Coutant and Whitney 2006). Tiffan and Connor (2012) showed that subyearling fish favor water less than 6-feet deep, and Tiffan et al. (2014) found that riverine reaches were likely better rearing habitat than reservoir reaches.

Spatial Structure and Diversity. The SR fall Chinook salmon ESU includes one extant population of fish that currently spawns in all five of its historic major spawning areas. Fall Chinook salmon also occasionally spawn in the mainstem Snake River downstream from Lower Granite Dam (Dauble et al. 1999; Dauble et al. 1995; Dauble et al. 1994; Mueller 2009). The spatial structure risk for this population is therefore low and is not precluding recovery of the species (Ford 2022).

There are several diversity concerns for SR fall Chinook salmon, leading to a moderate diversity risk rating for the extant Lower Snake population. One concern is the relatively high proportion of hatchery spawners (70%) in all major spawning areas within the population (Ford 2022; NMFS 2017). The fraction of natural-origin fish on the spawning grounds has remained relatively stable, with five-year means of 31 percent (2010-2014) and 33 percent (2015-2019) (Ford 2022). The diversity risk will need to be reduced to low in order for this population to be considered highly viable. Because there is only one extant population, it must achieve highly viable status in order for the ESU to recover.

Abundance and Productivity. Historical abundance of SR fall Chinook salmon is estimated to have been 416,000 to 650,000 adults (NMFS 2006), but numbers declined drastically over the 20th century, with only 78 natural-origin fish (WDFW and ODFW 2021) and 306 hatchery-origin fish passing Lower Granite Dam in 1990. After 1990, abundance increased dramatically, and exceeded 10,000 natural-origin returns each year from 2012-2015. However, the 5-year geometric means of natural origin-spawners has declined by 36 percent between the 2010-2014 (11,254) and 2015-2019 (7,252) time periods. Although there have been recent declines in natural origin returns, the 10-year geometric mean for the years 2010-2019 (9,034 natural-origin adults) exceeds the recovery plan abundance metric (i.e., > 4,200 natural-origin spawners) (Ford 2022; NMFS 2017; NMFS 2022). While the recovery plan abundance metric is currently exceeded, the associated 20-year geometric mean of population productivity is only 0.63, which is far below the recovery plan metric of 1.7.

Recovery. NMFS completed a recovery plan for SR fall Chinook salmon in 2017 (NMFS 2017). The most likely pathway to recovery is achieving a substantial amount of natural production in one or two of the five major spawning areas. The natural production emphasis areas would be managed to have a low percentage of hatchery-origin spawners (NMFS 2022). In order to maintain and improve the status of this ESU, NMFS (2022) recently recommended implementing a number of actions, including but not limited to: (1) Idaho Power Company's SR fall-run Chinook salmon spawning program; (2) Columbia River System biological opinion; (3) measures to reduce impacts of reservoir and river channel dredging and disposal; (4) tributary habitat improvement actions and total maximum daily loads (TMDLs); (5) restore an early-spawning fall Chinook salmon component in the Clearwater River; (6) additional research, monitoring, and evaluation to answer questions related to relocation of hatchery fish releases to the Salmon River and estimation of the relative contribution of naturally spawning hatchery SR fall-run Chinook salmon to productivity and diversity.

Crozier et al. (2019) concluded that SR fall-run Chinook salmon have high vulnerability to the effects of climate change, based on high biological sensitivity, high exposure to climate effects, and high adaptive capacity. Adult SR fall-run Chinook salmon migrate upstream from mid-August through October (Connor et al. 2019); vulnerability of this ESU during the adult freshwater stage is moderate because most adults migrate after temperatures have peaked and spawn after temperatures have declined in the fall. The greatest vulnerability is in the freshwater rearing and ocean life stages.

Summary. The status of this ESU has improved since the time of listing. While the population is currently considered to be viable, it is not meeting its recovery goals. This is due to: (1) low population productivity; (2) uncertainty about whether the elevated natural-origin abundance can be sustained over the long term; and (3) high levels of hatchery-origin spawners in natural spawning areas (NMFS 2022). This ESU also continues to face threats from tributary and mainstem habitat loss, degradation, or modification; disease; predation; harvest; hatcheries; and climate change (NMFS 2022).

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