Historic and Contemporary Fish Distribution and Status, Upper Walla Walla Watershed - *PRELIMINARY*

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11 December, 2022

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# Background

This qualitative biological assessment focuses on the historical and contemporary distribution and status of spring-run Chinook salmon (*Oncorhynchus tshawytscha*; hereafter Chinook salmon), Middle Columbia River summer steelhead (*O. mykiss*; hereafter steelhead; ESA-listed threatened), Columbia River bull trout (*Salvelinus confluentus*; ESA-listed threatened), and Pacific lamprey (*Lampetra tridentata*) in the Upper Walla Walla watershed.

# Spring-run Chinook Salmon

## Distribution

There are historical accounts of spring-run Chinook salmon occurring in the Walla Walla River basin within Mill Creek, the mainstem Walla Walla River, North Fork Walla Walla River, South Fork Walla Walla River, and Upper Walla Walla River watershed tributaries (Swindell, 1942; Volkman, 2005). The contemporary Upper Walla Walla River watershed Chinook salmon distribution spans the upper mainstem Walla Walla River, South Fork Walla Walla River, and Mill Creek (Mahoney et al., 2009; Mendel et al., 2014, 2007).

Chinook salmon are documented to have historically spawned in approximately the upper 40 km of the mainstem Walla Walla River (Fulton, 1968). Documentation of spawning runs, habitat attributes, and the contemporary spawning distribution indicate Mill Creek, the North Fork Walla Walla River, South Fork Walla Walla River, and various Walla Walla River tributaries were also likely historically important Chinook salmon spawning grounds (Fulton, 1968; Mahoney et al., 2009; Mendel et al., 2014, 2007; Swindell, 1942; Volkman, 2005). The contemporary spawning distribution includes Mill Creek above Mill Creek Diversion Dam (also referred to as Bennington Dam), the mainstem Walla Walla River above Nursery Bridge Dam, and the South Fork Walla Walla River (Mendel et al., 2014, 2007). There is no evidence that Chinook salmon currently spawn in the North Fork Walla Walla River (Mahoney et al., 2009; Mendel et al., 2014).

## Population status

The contemporary Upper Walla Walla River watershed Chinook salmon population size is smaller than historical estimates and natural-origin adult abundance is lower then the current conservation goal of 1,100 adults (Mahoney et al., 2009). The abundance of natural-origin Chinook salmon show a slightly increasing trend, but the abundance of hatchery-origin upstream migrating adults show a decreasing trend (Mahoney et al., 2009; Mendel et al., 2014, 2007).

Historical accounts report large runs of Chinook salmon in the Walla Walla River watershed (Swindell, 1942; Volkman, 2005). The last sizeable run in the Walla Walla River watershed took place in 1925 and by the late 1950s Chinook salmon were extirpated (ACOE, 1997; Mahoney et al., 2009; Mendel et al., 2000; Nielson, 1950; Van Cleve and Ting, 1960). Movement of Chinook salmon into Mill Creek was blocked between 1942 and 1985 after the construction of the Mill Creek Diversion Dam and Mill Creek Division Dam until fish ladders were installed at both dams in 1985 (Mahoney et al., 2009; Martin et al., 1992). Reintroductions of adults and smolts to the South Fork Walla Walla River and Mill Creek started in 2000 and 2005, respectively (Mahoney et al., 2009; Mendel et al., 2007).

Counts of upstream migrating adult Chinook salmon at Nursery Bridge Dam are used as the primary index of run sizes and population abundance in the Walla Walla River watershed and additional counts are made at Mill Creek Diversion Dam, Yellowhawk Creek weir, and Mill Creek Division Dam (Mahoney et al., 2009). Smolt abundance was monitored in the Upper Walla Walla River watershed using two traps, one in the Upper Walla Walla River and one in Mill Creek (Mendel et al., 2014). Upstream migrating adult Chinook salmon were first documented at Nursery Bridge Dam in 2000 and in upper Mill Creek at the Mill Creek Diversion Dam in 2004 (Mahoney et al., 2009; Mendel et al., 2007). In 2004, the first adults returned as progeny from initial reintroductions (Mahoney et al., 2009). From 2000 to 2004, a total of 84 upstream migrating adult Chinook salmon returned to the Upper Walla Walla River watershed and were likely strays from the Umatilla River (Mahoney et al., 2009). Counts of natural-origin Chinook salmon at Nursery Bridge Dam (2000 - 2013) ranged from 2 (2003) to 293 (2011), exhibited a positive trend, and a 10-year geometric mean of 142 (Mahoney et al., 2009; Mendel et al., 2014, 2007). Counts of hatchery-origin Chinook salmon at Nursery Bridge Dam (2007 - 2013) ranged from 29 (2013) to 932 (2010), had a negative trend, and a 7-year geometric mean of 204 (Mendel et al., 2014). Total counts of upstream migrating adults (natural-origin plus hatchery-origin fish) declined from 2010 to 2013, primarily driven by a reduction in hatchery-origin counts (Mendel et al., 2014). The abundance of naturally produced smolts in the Walla Walla River basin has been stable (2005 - 2013) and the smolt-to-adult survival rate of natural-origin Chinook salmon exhibits a positive trend (2002 - 2010) (Mendel et al., 2014). Counts of upstream migrating adult Chinook salmon returning to Mill Creek (counted at Mill Creek Diversion Dam, Yellowhawk Creek weir, and Mill Creek Division Dam from 2004 to 2008) ranged from a low of 0 (2007) to a high of 68 (2004) with a 5-year geometric mean of 21.8 (± 33.0) (Mahoney et al., 2009).

Redd counts in sections of the upper mainstem of the Walla Walla River, South Fork Walla Walla River, and Mill Creek began in 2000 and sampling expanded in 2005 to include the entire spring-run Chinook salmon production area in the Upper Walla Walla River watershed (Mahoney et al., 2009; Mendel et al., 2014). During 2000 - 2008, the number of redds at sampling locations generally increased in the South Fork Walla Walla River and upper mainstem Walla Walla River and the number of redds in Mill Creek remained relatively constant (Mahoney et al., 2009).

## Limiting Factors

Limiting factors text…

# Middle Columbia River Summer Steelhead

## Distribution

Historically, steelhead occupied much of the Upper Walla Walla River watershed (Mendel et al., 2014; Mendel et al., 2001; Washington Department of Fisheries et al., 1993). The steelhead spawning distribution has been dramatically reduced in the Lower Walla Walla River watershed, but much of the historical spawning grounds in the Upper Walla Walla River watershed are still used (Mahoney et al., 2009; NOAA, 2021). Anadromous life history was not expressed by *O. mykiss* in Mill Creek between 1942 and 1985 (Martin et al., 1992). The Mill Creek Division Dam (rkm 15.9), built in 1942, prevented movement of fish further upstream. Fish could bypass the Mill Creek Division Dam by traveling through Yellowhawk Creek, a Mill Creek distributary flowing from the Walla Walla River to Mill Creek. However, a second dam also constructed in 1942, the Mill Creek Diversion Dam (rkm 18.5) located approximately 1.6 km upstream of Mill Creek Division Dam, prevented fish from moving further upstream. Fish ladders were installed at both dams in 1985 and steelhead were first documented returning to Mill Creek above the Mill Creek Diversion Dam in 1990 (Mahoney et al., 2009; Martin et al., 1992). Spawning occurs in the mainstem Walla Walla River from Nursery Bridge Dam downstream to at least Mill Creek and possibly below, in many Walla Walla River tributaries (e.g., Couse Creek, Yellowhawk Creek, and Cottonwood Creek), the South Fork Walla Walla River, the North Fork Walla Walla River, and Mill Creek above Mill Creek Diversion Dam and at its confluence with the Walla Walla River (Carmichael and Taylor, 2010; Mahoney et al., 2009; Mendel et al., 2014). Mendel et al. (2014) report that steelhead spawn in several Mill Creek tributaries, but do not specify which tributaries spawning occurs in or provide empirical evidence to support this claim. Likely, steelhead spawning historically occurred throughout most of Mill Creek, but does not currently occur throughout most of the section downstream of Mill Creek Diversion Dam, likely due to habitat degradation from the Mill Creek Flood Control Project, agriculture, and livestock grazing (Mahoney et al., 2009; NOAA, 2021; Underwood et al., 1995).

## Population status

The contemporary steelhead population in the Upper Walla Walla River watershed is smaller than historical estimates, time-series data suggest abundance is decreasing, and both productivity (recruits per spawner) and adult abundance in the Walla Walla River watershed are below ESA minimum recovery goals (Mendel et al., 2014; Mendel et al., 2001; NOAA, 2021, 2009; Washington Department of Fisheries et al., 1993) [(ODFW salmon and steelhead recovery tracker)](http://www.odfwrecoverytracker.org/).

Counts of upstream migrating adults at Nursery Bridge Dam are used as the primary index of steelhead run sizes and population abundance in the Walla Walla River watershed. Fish counts at Nursery Bridge dam do not include returns to important spawning areas in the Upper Walla Walla River watershed such as Mill Creek, Yellowhawk Creek, and Cottonwood Creek or returns to the Lower Walla Walla River watershed. During the period of 1993 - 2013, the Walla Walla River watershed steelhead population was inferred to be stable based on counts of upstream migrating adults at Nursery Bridge Dam (Carmichael and Taylor, 2010; Mahoney et al., 2009; Mendel et al., 2014). During 2011-2019, upstream migrating adult counts at Nursery Bridge Dam exhibited a negative trend and the 10-year geometric mean of upstream migrating adults decreased, indicative of declining steelhead abundance in the Upper Walla Walla River watershed (Mendel et al., 2014; NOAA, 2021) [(ODFW salmon and steelhead recovery tracker)](http://www.odfwrecoverytracker.org/). Five-year mean counts of hatchery-origin upstream migrating adults were less than 4% from 1993 - 2014, but the most recent 5-year mean count of hatchery origin upstream migrating adults (2015 - 2019) was 13% (Carmichael and Taylor, 2010; Mendel et al., 2014) [(ODFW salmon and steelhead recovery tracker)](http://www.odfwrecoverytracker.org/). Mahoney et al. (2009) conducted partial counts of returning steelhead (not all fish could be counted due to logistical constraints) on upper Yellowhawk Creek (at Yellowhawk weir) and Mill Creek (at Mill Creek Division Dam and Mill Creek Diversion Dam) during 1990 - 2005. Counts ranged from 1 fish in 1998 to 57 fish in 2001 (Mahoney et al., 2009). The 16-year mean return was 21.6 adults, with a 13.9% mean return of hatchery-origin upstream migrating adults. Downstream migrating smolts trapped in the Upper Walla Walla River showed a positive trend during 2009 - 2013 and adult-to-adult returns (based on counts at Nursery Bridge Dam) were stable during 1993 - 2006 (Mendel et al., 2014).

The ESA minimum recovery abundance goal for the Walla Walla River watershed is 1,000 adults and the minimum productivity goal is 1.35 (Washington Department of Fisheries et al., 1993). The adult population size has been consistently estimated to be below the ESA recovery goal and the most recent 10-year (2010-2019) geometric mean of natural-origin steelhead spawners available is 713 (Mahoney et al., 2009; Mendel et al., 2014; NOAA, 2021, 2009) [(ODFW salmon and steelhead recovery tracker)](http://www.odfwrecoverytracker.org/). Productivity has fluctuated above and below the ESA recovery goal and the most recent 20-year (1993 - 2012) geometric mean productivity estimate available for the Walla Walla River watershed steelhead population is 0.9873, below the minimum productivity goal (Mahoney et al., 2009; Mendel et al., 2014; NOAA, 2021) [(ODFW salmon and steelhead recovery tracker)](http://www.odfwrecoverytracker.org/).

## Limiting Factors

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# Columbia River Bull Trout

## Distribution

Historically, bull trout are thought to have occurred throughout most of the Upper Walla Walla River watershed, but are now largely absent from much of the mainstem Walla Walla River and highly anthropogenically modified reaches within the Upper Walla Walla River watershed, such as Mill Creek below the Mill Creek Diversion Dam and the mainstem Walla Walla River downstream of rkm 75 (Barrows et al., 2014; Buchanan et al., 1997; Howell et al., 2016; Mendel et al., 2007). Fluvial and resident bull trout persist in the upper portion of the mainstem Walla Walla River, in the North Fork and South Fork Walla Walla River, and Mill Creek (Al-Chokhachy et al., 2005; Anglin et al., 2009; Buchanan et al., 1997; Howell et al., 2016; Mahoney et al., 2009; Martin et al., 1992; Mendel et al., 2007; Underwood et al., 1995).

Fluvial bull trout exhibit substantial movement and seasonal differences in distribution and habitat use in the Walla Walla River watershed. Fluvial bull trout over-winter in the upper mainstem Walla Walla River and the lower reaches of the North Fork and South Fork Walla Walla River and Walla Walla River tributaries such as Mill Creek from December through June, summer rearing and the upstream spawning migration occurs from June through September, and the fall return to rearing areas occurs in October and November (Anglin et al., 2009; Howell et al., 2016). During periods of low flow, bull trout are mostly limited to the upper portions of the Upper Walla Walla River watershed subbasins due to high water temperatures in the lower reaches (Mendel et al., 2007). Bull trout move between the Walla Walla River basin and the Columbia River system and different subbasins with the Walla Walla River watershed, such as the South Fork Walla Walla River and Mill Creek (Anglin et al., 2009; Howell et al., 2016; Newlon, 2018).

The historical bull trout spawning distribution in the Upper Walla Walla River watershed is not documented prior to 1990 (Buchanan et al., 1997; Martin et al., 1992). However, habitat degradation and declines in the spawning distributions of steelhead and Chinook salmon in the Upper Walla Walla River watershed suggests the bull trout spawning distribution has likely shrunk (Buchanan et al., 1997; Jacobs et al., 2009; Mahoney et al., 2009; Schaller et al., 2014). Contemporary bull trout spawning occurs in Mill Creek and the South Fork Walla Walla River (Barrows et al., 2014; Budy et al., 2017). Redd counts have been consistently higher in the South Fork Walla Walla River than in Mill Creek from 1990 to 2007 (Barrows et al., 2014; Conner et al., 2014). In Mill Creek, much of the spawning is concentrated between Deadman Creek and North Fork Mill Creek, with spawning also occurring in several Mill Creek tributaries, including Bull Creek, Deadman Creek, Paradise Creek, Broken Creek, and Low Creek (Buchanan et al., 1997; Howell et al., 2016; Jacobs et al., 2009; Martin et al., 1992; Mendel et al., 2007; Underwood et al., 1995). Spawning in the South Fork Walla Walla River watershed primarily occurs between Table Creek and Reser Creek and in the lower portions of Reser Creek and Skiphorton Creek (Al-Chokhachy et al., 2005; Buchanan et al., 1997; Budy et al., 2017). Spawning may occur in the North Fork Walla Walla River, but requires verification (Barrows et al., 2014).

## Population status

Historical bull trout abundance in the Upper Walla Walla River watershed is poorly documented, but habitat degradation and putative decreases in the bull trout distribution in the Upper Walla Walla River watershed suggest a corresponding reduction in population size. Contemporary mark-recapture and redd count data indicate that the bull trout population in the Walla Walla River watershed is stable.

Bull trout redd counts in Mill Creek increased during 1990 - 1994, declined slightly during 1994 - 2007, and were most abundant in 2000 and 2001 (Mahoney et al., 2009; Martin et al., 1992; Mendel et al., 2007; Underwood et al., 1995). In the South Fork Walla Walla River redd counts increased from 1994 until 2001, declined again until 2007, increased from 2007-2009, then declined until 2011 (Al-Chokhachy et al., 2005; Barrows et al., 2014; Budy et al., 2017; Mahoney et al., 2009). Upstream migrating adult counts at Nursery Bridge Dam showed a slightly positive trend from 2000 to 2008 and a stronly positive trend from 2008 to 2013, with counts ranging between a low of 20 in 2000 and a high of 416 in 2011 (Mendel et al., 2014). Upstream migrating adult counts during 2004 - 2008 for upper Mill Creek (counts from Yellowhawk weir, Mill Creek Division Dam, and Mill Creek Diversion Dam) ranged between a low of three and a high of 20 adults (not sufficient data for trend analysis) (Mahoney et al., 2009). A mark-recapture study on Mill Creek bull trout during 1998 - 2009 found that adult abundance was stable during 1998 - 2005, then declined 63% during 2006 - 2010, driven primarily by a reduction in adult returns (Howell et al., 2016). A mark-recapture study in the South Fork Walla Walla River during 2002 - 2011 inferred a population growth rate of 1.01 (95% confidence interval = 0.84-1.20), indicating a recently stable population (Barrows et al., 2014; Budy et al., 2017). However, the adult population was dominated by small adults, and the contribution of large adults to total biomass declined during the study period (Budy et al., 2017).

## Limiting Factors

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# Pacific Lamprey

## Distribution

Pacific lamprey once occurred throughout much of the Upper Walla Walla River watershed (Jackson et al., 1997; Swindell, 1942). Pacific lamprey now appear to be extirpated from their entire historical range within the Upper Walla Walla River watershed (Close, 2000; Harris and Jolley, 2017; Jackson et al., 1997; Kostow, 2002; Moser and Close, 2003).

## Population status

There are not quantitative trends of the historical abundance of Pacific lamprey in the Upper Walla Walla River watershed. However, interviews with tribal members and fisheries biologists and the historical importance of several locations within the Walla Walla River watershed for Pacific lamprey harvest by the CTUIR, including the North and South forks of the Walla Walla River and nearby Skiphorton Creek on the mainstem Walla Walla River, indicate Pacific lamprey were once abundant in the Upper Walla Walla River watershed (Jackson et al., 1997; Swindell, 1942). Pacific lamprey have not been confirmed in any surveys conducted within the past 25 years, suggesting they are now extirpated from the Upper Walla Walla River watershed (Close, 2000; Close and Bronson, 2001; Harris and Jolley, 2017; Kostow, 2002; Moser and Close, 2003). Pacific lamprey were most recently documented in the Upper Walla Walla River watershed in 1997 near the confluence of the Walla Walla River and the Little Walla Walla River (Jackson et al., 1997). Jackson et al. (1997) recovered fifty-five lamprey from sediment removed from the Little Walla Walla River diversion structure, of which four were Pacific lamprey and 51 were western brook lamprey (*Lempetra richardsoni*).

## Limiting Factors

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