

Hells Canyon Bull Trout

Existing Populations

The Hells Canyon Bull Trout SMU includes 14 populations in basins draining into the Snake River between Wieser River and Hells Canyon Dam (Table 1). Four existing populations are contained in the Pine Creek watershed, which enters the Snake River at Hells Canyon Reservoir. Ten populations are within the Powder River basin, which enters the Snake River at Brownlee Reservoir. Populations are defined based on those identified in the Hells Canyon Chapter of the Bull Trout Draft Recovery Plan (USFWS 2004) and Ratliff and Howell (1992). This review defines the Anthony population as two distinct populations, Anthony (including North Anthony Creek) and Indian. Bull trout in Indian Creek are above a natural barrier falls and isolated from fish in Anthony Creek (USFWS 2004). In addition, Eagle Creek is identified as an existing population. Eagle Creek historically supported a significant bull trout population; however surveys in 1991 and 1994 failed to locate bull trout (USFWS 2004, Buchanan et al. 1997). If bull trout are present in the basin the distribution and abundance is severely limited. The population will not be considered extinct until a thorough and appropriate survey is conducted.

Three additional populations exist in Idaho, across the Snake River from the Pine Creek system, Bear, Indian, and Crooked. Potential exists for movement between the Pine Creek populations and the Indian population (ID) (USFWS 2004). Populations in Idaho are not assessed in this review.

Table 1. Populations, existence status, and life history of the Hells Canyon SMU.

Exist	Population	Description	Life History
Pine Creek			
Yes	Elk	Elk Creek and tributaries, incl. Aspen, Big Elk and Cabin Creeks	Resident
Yes	East Pine	East Pine Creek	Resident
Yes	Clear	Clear Creek and tributaries incl Meadow and Trail Creeks	Resident
Yes	Upper Pine	Upper Pine Creek incl. West Fork, East Fork and Middle Fork Pine Creek	Resident
Powder			
Yes	Eagle	Eagle Creek and tributaries	Resident
Yes	Wolf	Wolf Creek	Resident
Yes	Anthony	Anthony Creek and tributaries	Resident
Yes	Indian	Indian Creek	Resident
Yes	North Powder	Upper North Powder River and tributaries	Resident
Yes	Muddy	Big Muddy Creek and tributaries	Resident
Yes	Pine	Pine Creek and tributaries	Resident
Yes	Salmon	Salmon Creek and tributaries	Resident
Yes	Lake	Lake Creek and tributaries	Resident
Yes	Upper Powder	Upper Powder River and tributaries incl. Silver and Little Cracker Creeks	Resident

Passage barriers and overall degradation of aquatic habitat and riparian conditions have contributed to the loss of migratory life history in these basins. All populations exhibit a resident life history (Buchanan et al. 1997, Chandler et al. 2001a), however the movement of a radio-tagged bull trout from Hells Canyon Reservoir into Pine Creek indicates a migratory life history may still persist in the basin (USFWS 2004, Chandler et al. 2001b).

Distribution

Analysis of the distribution criterion is based on 1:100,000 GIS hydrography of bull trout distribution (Hanson 2001, Buchanan et al. 1997) and information summarized in the Hells Canyon Chapter of the Bull Trout Draft Recovery Plan (USFWS 2004) and Pratt (2001). These data are based on summer distribution sampling that often represent the most restricted distribution. A population fails the criterion if spawning and resident distribution is 1) less than ten km, 2) not connected to other populations, or 3) occupies less than 50% of the historic distribution when historic distribution data are denoted on GIS. Two of the 14 populations pass the distribution criterion (Table 2)

Table 2. Distribution data used to evaluate Hells Canyon bull trout populations.

Population	Spawning Distribution (km)	% of Historical	Connected to Other Pops.	Pass/Fail
Pine Creek				
Elk	17.0	46	Yes	Fail
East Pine	7.9	25	Yes	Fail
Clear	20.7	58	Yes	Pass
Upper Pine	6.5	22	Yes	Fail
Powder River				
Eagle	--	<10	Yes	Fail
Wolf	1.9	--	No	Fail
Anthony	13.3	62	Yes	Pass
Indian	3.2	--	No	Fail
North Powder	2.0	9	Yes	Fail
Muddy	0.5	--	Yes	Fail
Pine	1.3	--	Yes	Fail
Salmon	1.5	--	No	Fail
Lake	3.4	--	Yes	Fail
Upper Powder	11.7	45	Yes	Fail

-- Historical distribution unknown.

Known bull trout distribution in the Hells Canyon SMU is highly fragmented and limited to short isolated segments of headwater streams. Eleven of the 14 populations in the SMU have a distribution less than ten km, and seven are less than four km. Only two populations in Powder River basin, Anthony and Upper Powder, and two in the Pine Creek basin, Elk and Clear, exceed a distribution of ten km.

Elk, East Pine, Pine, North Powder, Upper Powder, and Eagle populations all fail the distribution criterion because they occupy less than 50% of the known historical distribution. In the Upper Powder population current distribution is discontinuous; remnants of the historic distribution remain in Little Cracker and Silver creeks and movement between each creek is possible but not common. In Eagle Creek, bull trout historically were distributed throughout the basin, but current distribution appears to be drastically restricted. The population is considered to occupy just fragments of its historical distribution.

Large dams and irrigation diversions restrict distribution and minimize connection between populations within the SMU. Brownlee Dam on the Snake River has isolated bull trout in the Powder River from populations in Pine Creek and Idaho drainages. Thief Valley Dam, located on the Powder River downstream of Baker City, prevents access to the Snake River for bull trout in the Powder River populations, and Mason Dam (Phillips Reservoir) in the upper Powder River basin prohibits potential mixing between Upper Powder and Lake populations with other

populations in the Powder River. The Salmon population is constricted by passage barriers at both the upstream and downstream extent of the distribution. A municipal diversion prevents bull trout from moving upstream, and downstream movement is prohibited at a point where the stream flows subsurface (USFWS 2004). The Wolf Creek population is isolated above Wolf Creek Reservoir (USFWS 2004).

Abundance

For this review populations of bull trout with fewer than 100 spawning adults are considered at risk of inbreeding and fail the interim risk criterion. The sum of interconnected populations also must exceed 1,000 adults to avoid risk of genetic drift (Rieman and Allendorf 2001). Thus an SMU or an isolated population must total greater than 1,000 reproductive adults in order to pass this criterion.

Data are not available to adequately assess the current abundance of adult bull trout in each population. The only quantitative population estimate in the Pine Creek basin was conducted 11 years ago in 1994 (Buchanan et al. 1997) and may not capture current conditions. Also, redd surveys occur at index reaches that do not census the entire population. In the Powder River basin evaluation and monitoring activities do not regularly occur. Knowledge of distribution and abundance is derived primarily from field observations.

Given the lack of quantified information, this review utilizes the index redd surveys in Pine Creek basin as the basis for evaluation of the abundance criterion (Table 3). These surveys are not a complete census of the spawning grounds, and contain inherent sources of error due to difficulties of redd detection and surveyor variability (Dunham et al. 2001), and therefore are not to be interpreted as absolute measures of abundance. Instead this review considers these redd counts, expanded by a factor of 2.3 adults per redd (Ratliff et al. 1996, Dunham et al. 2001), to represent the minimum number of adults present in each population. If redd counts estimate close to 100 adults for the most recent years then a population passes the criterion. Upper Pine is the only population to pass the abundance criterion in the Pine Creek basin (Table 3).

Table 3. Total redds observed at index spawning survey sites in Pine Creek basin (ODFW, LaGrande Fish District, unpublished data).

Population	Miles Surveyed	1999	2000	2001	2002	2003	2004
Elk	1.70	5	9	13	7	11	25
East Pine	1.15	5 ^a	6	13	8	3	4
Clear	2.05	5	26	33	16	16	38
Upper Pine	2.71	38 ^b	20 ^c	42	43	51	41 ^d

^a6.5 miles surveyed.

^b4.2 miles surveyed.

^c2.9 miles surveyed.

^d3.2 miles surveyed.

All populations in the Powder River basin, except the Upper Powder population, fail the abundance criterion. A 1999 population survey in Silver Creek (Upper Powder) incorporated electrofishing and snorkel techniques and an endoscope to determine maturity to estimate the reproductive population. Results approximated the population to contain 885 individuals (Hemmingsen et al. 2001). Based on this estimate the Upper Powder population passes the criterion. The remaining populations failed the criterion given field observation of low densities. None of the observations in these populations suggest abundance might exceed 100 adults (Bellerud et al. 1997, USFWS 2004).

The Hells Canyon Bull Trout Recovery Team estimated abundance of adult bull trout to be fewer than 1,000 reproductive adults (USFWS 2004), putting bull trout in the SMU at risk of the deleterious effects of genetic drift. Even though we are unable to quantitatively assess each population individually, the SMU is considered to fail the abundance criterion.

Productivity

Data are not available to quantitatively assess productivity and the intrinsic rate of population increase for bull trout in the Hells Canyon SMU. In the absence of these data a qualitative assessment of the productivity criterion is based on distribution and abundance, connectivity, life history, habitat quality, and presence of non-native species. A population passes the criterion if it is widely distributed and relatively abundant or if there are indications of an increasing or stable trend in abundance. These qualities suggest populations are minimally able to sustain current abundance. The presence of a migratory life history and connectivity between populations also increases the probability of a population sustaining itself. The presence of non-native species or significant habitat degradation may negatively affect productivity and cause a population to fail the criterion if it is limited in other factors.

All populations in the Hells Canyon SMU fail the productivity criterion due to limited distribution and abundance and the expression of only a resident life history. Brook trout present in some populations also potentially impacts productivity. A viability modeling exercise implemented by Idaho Power assessed the persistence and population growth of populations in the Pine Creek basin (Pratt 2001). The study concluded that all populations in Pine Creek are at risk of extinction because of low abundance, isolation, and limited suitable habitat. Because the Powder River populations have many of the same population characteristics as the Pine Creek populations the results are assumed to also apply to the Powder populations. High productivity in each population is likely episodic, not consistently high enough to replace a population annually.

Reproductive Independence

All bull trout are naturally-produced and hatchery bull trout programs do not exist in Oregon. Because issues of reproductive independence do not apply to bull trout, all populations pass this criterion.

Hybridization

Brook trout were stocked into many of the high alpine lakes in the Elkhorn and Wallowa mountains as early as the 1930s (USFWS 2004). In many cases introduced brook trout established self-sustaining populations and invaded connecting streams. Brook trout have established populations in all but East Pine in the Pine Creek basin and are widespread in the Powder River basin (USFWS 2004).

A population is considered to pass the hybridization criterion if brook trout x bull trout hybrids are rare or non-existent. For most populations in the SMU the degree of hybridization is not quantified, but professional judgment and the frequency of hybrids encountered during sampling provides a general indication. In cases where little or no information is available and bull trout and brook trout are sympatric, this review assumes hybrids are common. Seven of the existing populations pass the hybridization criterion (Table 4).

Table 4. Occurrence of brook trout and hybridization for Hells Canyon bull trout populations.

Population	Brook Trout	Pass/Fail
Pine Creek		
Elk	Yes	Pass*
East Pine	No	Pass
Clear	Yes	Fail
Upper Pine	Yes	Pass*
Powder River		
Eagle	Yes	Fail
Wolf	No	Pass
Anthony	Yes	Fail
Indian	Yes	Fail
North Powder	Yes	Fail
Muddy	Yes	Pass*
Pine	Yes	Fail
Salmon	No	Pass
Lake	Yes	Pass*
Upper Powder	Yes	Fail

* Brook trout are present but distribution does not overlap bull trout.

Four populations pass the hybridization criterion even though brook trout are present in each stream. In these instances brook trout and bull trout are not sympatric. The distribution of bull trout and brook trout in Lake Creek are separated by a natural barrier and the two species remain allopatric (USFWS 2004). Brook trout were observed both upstream and downstream of the bull trout distribution in Big Muddy Creek, but distributions do not overlap (USFWS 2004). The Elk population passes the hybridization criterion, even though brook trout are present in the headwaters in Twin Lakes (USFWS 2004). In Upper Pine brook trout are not present in bull trout occupied reaches. Brook trout distribution in these populations should be carefully monitored in the future.

Assessment Conclusions

The Hells Canyon Bull Trout SMU includes 14 populations in Pine Creek and Powder River, both of which flow into the Snake River between Weiser River and Hells Canyon Dam. Three additional populations exist in close proximity on the Idaho side of the Snake River. Movement between the Idaho and Pine Creek populations is possible. Most populations in this SMU are characterized by extremely low abundances and restricted distributions. Productivity is hampered by habitat quality and quantity and the inability to express a migratory life history. The SMU passes two of the six criteria and is classified as ‘at risk’ (Figure 1). Limited data sets and inferences from other information for populations in this SMU provide a qualified level of confidence in the assessment of the interim criteria.

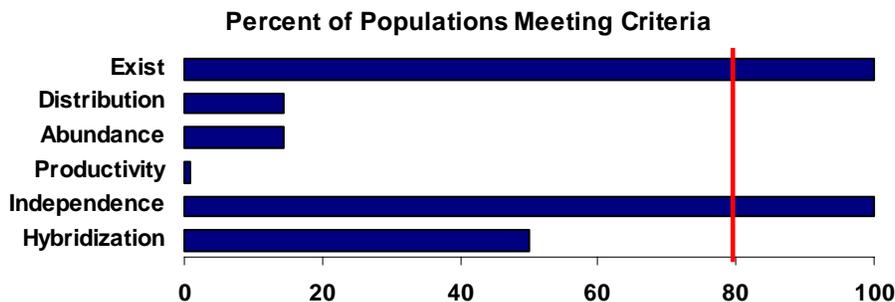


Figure 1. Assessment outcome for each of the six interim criteria with respect to the 80% threshold identified by the NFCP.