

Klamath Lake Bull Trout

Existing Populations

The Klamath Lake Bull Trout SMU is comprised of seven existing populations and four populations classified as extinct or functionally extinct (Table 189). Populations are concentrated in headwater streams of the Sycan (above Sycan Marsh) and Upper Sprague rivers, and tributaries of Klamath Lake. Although bull trout are considered to have existed throughout the Klamath Basin (Buchanan et al. 1997), the identification and delineation of historical populations is challenging given the lack of data and historical observations. Current and historical populations are based on those identified in the Klamath River Chapter of the Bull Trout Draft Recovery Plan (USFWS 2004), known spawning distribution, and professional judgment of agency biologists.

Table 189. Populations, existence status, and life history of the Klamath Lake Bull Trout SMU.

Exist	Population	Description	Life History
Yes	Sun	Sun Creek.	Resident
Yes	Threemile	Threemile Creek.	Resident
Yes	Long	Long and Calahan creeks.	Resident
Yes	NF Sprague	Upper North Fork Sprague River and tributaries including Sheepy, Boulder and Dixon creeks.	Resident
Yes	Deming	Deming Creek.	Resident
Yes	Leonard	Leonard Creek.	Resident
Yes	Brownsworth	Brownsworth Creek.	Resident
No	Sevenmile	Sevenmile Creek.	
No	Cherry	Cherry Creek.	
No	Coyote	Coyote Creek.	
No	Upper Sycan	Upper Sycan River above Sycan Marsh.	

In 1999 Crater Lake National Park began eradicating brook trout in Sun Creek using antimycin treatments. During the eradication process Sun Creek bull trout were transplanted into Lost Creek to protect against loss of the Sun Creek genetic stock (USFWS 2002). Lost creek is not considered an existing population because it is an introduced experimental population, limited in extent and condition.

The Coyote Creek (Sycan) population is considered functionally extinct. Presence/absence surveys detected bull trout and brook trout x bull trout hybrids in the lower reaches of Coyote Creek in 2001 (USFWS 2004). It is unknown if these fish are remnant of a historic population or recolonizing unoccupied habitat. Coyote is treated as a historical population until spawning and reproduction can be documented.

Bull trout in the North Fork Sprague population reside primarily in Boulder and Dixon creeks. Bull trout were also detected in Sheepy Creek in 2001, and large migratory individuals were observed in the North Fork Sprague River during presence/absence surveys in 1997 (USFWS 2004). It is unknown if fish in Sheepy Creek and North Fork Sprague River are indicative of individual populations or migrants from Boulder and Dixon Creeks. Given the uncertainty of the population structure in the North Fork Sprague River Basin this review considers all bull trout in the basin as one population until data suggest a finer structure.

Large bull trout (>15") were detected in Long Creek in 1998. Since then radio telemetry studies have demonstrated seasonal use by large bull trout in the lower portions of Long Creek and parts of the Sycan Marsh (USFWS 2004), indicating the migratory life history may still persist.

Distribution

Bull trout are thought to have occupied most of the Oregon portion of the Klamath River basin (Buchanan et al. 1997); however, complete historical distribution data are unavailable. Current spawning and resident distribution in Klamath basin is highly fragmented and limited to a few isolated headwater streams of Klamath Lake, Upper Sprague River and Upper Sycan River above Sycan Marsh. High water temperatures, low flows, and irrigation diversions have isolated populations, minimizing the opportunity for bull trout to express a migratory life history, mix among populations, and colonize unoccupied habitats.

Analysis of the distribution criterion is based on values published in the USFWS Bull Trout Draft Recovery Plan (2004) and 1:100,000 scale GIS hydrography of bull trout distribution (Hanson 2001, Buchanan et al. 1997). These data are primarily based on summer distribution sampling that often represents the most restricted distribution. A population passed the criterion if spawning, juvenile rearing, and resident distribution is 1) greater than ten km, 2) connected to other populations, or 3) occupies greater than 50% of the historic distribution where historic distribution data are available. Only the Brownsworth population passed the distribution criterion (Table 190).

Table 190. Distribution data used to evaluate Klamath Lake bull trout populations.

Population	Spawning Distribution (km)	% of Historical	Connected to Other Pops.	Pass/Fail
Sun	14.5	59	No	Fail
Threemile	1.4	25	No	Fail
Long	23.2	77	No	Fail
NF Sprague	9.0	15	No	Fail
Deming	6.4	37	No	Fail
Leonard	2.7	44	Yes	Fail
Brownsworth	15	100	Yes	Pass
Sevenmile		<i>Extinct Population</i>		
Cherry		<i>Extinct Population</i>		
Coyote		<i>Extinct Population</i>		
Upper Sycan		<i>Extinct Population</i>		

Threemile, North Fork Sprague, Deming, and Leonard populations failed the distribution criterion due to a limited spawning and rearing distribution, less than ten km. Bull trout distribution in the North Fork Sprague population is limited to Boulder and Dixon creeks. Recent observations suggest the measured distribution in these creeks may be overestimated. Presence/absence surveys in 1998 did not detect bull trout in Boulder Creek (USFWS 2004), and more recent surveys only detected bull trout in North Fork Dixon Creek (W. Tinniswood, ODFW Klamath Fish District, personal communication).

The extent of spawning distribution in Leonard, Deming, and Threemile has decreased since 1990 (Hanson 2001). These populations currently occupy less than 50% of their historical distribution and fail the criterion.

Physical barriers in Deming, Sun, and Threemile prevent connection to migratory corridors and mixing among populations (USFWS 2004). Water withdrawals on Deming Creek effectively

dewater the natural channel and strand fish below the diversion. In addition, below the irrigation diversion, volcanic deposits cause the creek to flow subsurface, naturally isolating fish from the Sprague River. Barriers were constructed on Sun Creek to prevent the recolonization of brook trout after they were eradicated from the upper reaches. Although these barriers are effective at protecting bull trout from brook trout invasion, they prevent migratory bull trout from returning to Sun Creek and opportunities for mixing among populations in the future. Threemile Creek is isolated above an impassable culvert. Populations in each of the three watersheds, Klamath Lake, Sprague, and Upper Sycan, are unable to move between watersheds, further isolating populations and preventing mixing. Only bull trout in Leonard and Brownsworth creeks have the potential to mix.

Abundance

Few data exist to accurately assess abundance of bull trout in the Klamath Lake SMU. Population estimates were conducted for most existing populations between 1989 and 1991 (Buchanan et al. 1997, Ziller 1992, Dambacher et al. 1992) and have occurred more recently in Sun, Threemile and Brownsworth creeks (USFWS 2004; ODFW Klamath Fish District, unpublished data) (Table 191). Populations that were quantitatively assessed within the past five years were evaluated based on a rough estimate of the number of adults (Buchanan et al. 1997, USFWS 2004). At least three generations have passed since abundance estimates were collected in North Fork Sprague (Boulder/Dixon), Deming, and Leonard creeks and may not accurately represent current abundance. The assessment of these populations is based on recent observational data and professional judgment of agency biologists.

Populations of bull trout with fewer than 100 spawning adults are considered at risk of inbreeding and fail the interim risk criteria. 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.

Table 191. Yearly estimated abundance of Klamath Lake bull trout populations (age 1+ fish). Quantitative assessment based on estimates from past five years (shaded).

Population	1989	1991	1992-1994	1994	1995	1996	1997	2000	2003	2004	Pass/Fail
Sun	133 ^a		120-360 ^d					635 ^d	~1100 ^f	>1500 ^f	Pass
Threemile						50 ^e		91 ^d	129 ^d		Fail
Long above falls		841 ^{c,e}		855 ^{c,e} 394 ^{c,e}	202 ^{c,e}						Fail
NF Sprague	219 ^b										Fail
Deming	1,293 ^b						1,470 ^g				Pass
Leonard	834 ^b										--
Brownsworth	964 ^b				956 ^g			1,290 ^b			Pass
Sevenmile											<i>Extinct population</i>
Cherry											<i>Extinct population</i>
Coyote											<i>Extinct population</i>
Upper Sycan											<i>Extinct population</i>

^a (Dambacher et al. 1992)

^b (Ziller 1992)

^c (ODFW Klamath Fish District, unpublished data)

^d (USFWS 2004)

^e (Buchanan et al. 1997)

^f (Buktenica, Crater Lake NP, pers. comm)

^g (ODFW Aquatic Inventory Project, Corvallis)

^h (ODFW Klamath Fish District, 2000)

Three populations pass the abundance criterion. The assessment of the Sun and Brownsworth populations is based on estimates collected in the past five years. This review assumes greater than 100 of the bull trout in each population were reproductive adults. These populations are not considered at risk of inbreeding. Recent estimates of abundance in Deming Creek do not exist. The Deming population passes the criterion based on a high abundance prior to 1991 and in 1997, good current habitat quality, and recent habitat improvement projects (e.g. road closures and addition of large wood) (R. Smith, ODFW Klamath Fish District, personal communication).

The Threemile population likely contains fewer than 100 reproductive adults and therefore fails the abundance criterion. Biologists have also observed deformed bull trout in this population. The cause of the deformities is unknown, but genetic effects of a small population size are suspected.

Long and North Fork Sprague populations both failed the abundance criterion based on professional judgment. Routine snorkel surveys conducted since 1998 suggest bull trout densities in Long Creek are declining (ODFW, USFS unpublished data), however the number of bull trout captured at a downstream trap located above Sycan Marsh has increased in recent years. Bull trout abundance in North Fork Sprague River, specifically Boulder and Dixon creeks, is likely declining and precariously low. Bull trout were not detected in presence/absence surveys for many years and recently were only found in North Fork Dixon Creek. Bull trout were not detected at many sites where they were present in earlier surveys (W. Tinniswood, ODFW Klamath Fish District, personal communication).

Adequate information pertaining to the Leonard population is lacking and therefore was not assessed. The last population estimate was in 1991. Since then no monitoring or management activities have occurred to provide the basis for a general assessment.

A population size of 1,000 reproductive adults is necessary to minimize the effects of genetic drift (Rieman and Allendorf 2001). Barriers, poor water quality, and lack of a migratory life history prevent bull trout in each watershed (Sprague, Sycan, and Klamath Lake) from mixing. Thus each watershed should contain a minimum of 1,000 reproductive adults capable of moving between populations. Given these criteria, bull trout in each watershed and isolated population are considered at risk of genetic drift.

Productivity

Data are not available to quantitatively assess productivity and the intrinsic rate of population increase for bull trout in the Klamath Lake SMU. In the absence of these data the assessment of the productivity criterion is based on a qualitative evaluation of 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. The expression of a migratory life history and connectivity between populations and high quality habitats are also indicators of potentially increased productivity. The presence of non-native species may negatively affect productivity and cause a population to fail the criterion if limited in other factors.

Sun, Brownsworth, and Deming populations pass the productivity criterion based on professional judgment of agency biologists (Table 192). Populations appear relatively abundant and data suggest a stable or increasing trend of abundance. Brook trout have been removed from the Sun population and brown trout removal efforts have begun on Brownsworth.

Threemile, Long, and North Fork Sprague populations fail the criterion (Table 4). Field surveys suggest abundance of these populations is decreasing over time. The presence of non-native brook trout, lack of many large migratory fish, and the isolation of each population suggest decreased degrees of productivity.

Data and field observations are not available to adequately assess the Leonard population. This population was not evaluated

Table 192. Factors considered in the assessment of the productivity criterion of Klamath Lake bull trout.

Population	Factors	Pass/Fail
Sun	Abundance appears to be increasing (Table 191); brook trout removal successful.	Pass
Threemile	Extremely low abundance and isolated; brook trout removal successful.	Fail
Long	Low density and apparently decreasing; brook trout present; recent observation of a migratory life history; able to express a migratory life history though not enough to impact population.	Fail
NF Sprague	Low density; distribution and abundance declining; brown trout present; possibly able to express a migratory life history.	Fail
Deming	Habitat quality is good and improving with recent projects; abundance apparently stable between 1991 and 1997 (Table 191).	Pass
Leonard	Adequate information lacking.	--
Brownsworth	Habitat quality is good and improving; abundance trends stable; efforts to remove brown trout ongoing.	Pass
Sevenmile	<i>Extinct population</i>	
Cherry	<i>Extinct population</i>	
Coyote	<i>Extinct population</i>	
Upper Sycan	<i>Extinct population</i>	

Reproductive Independence

All populations in the Klamath Lake Bull Trout SMU are native fish sustained by natural production and pass the reproductive independence criterion.

Hybridization

A population is considered to pass the hybridization criterion if brook trout x bull trout hybrids are rare or non-existent. For most populations 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.

The first recorded planting of brook trout in Klamath Basin streams was in 1925. Brook trout were regularly stocked in streams throughout the basin until 1968 and the last stocking event was recorded in Sycan River in 1975. Brook trout currently are present in Threemile, Long, and Sun creeks.

Brook trout in Sun and Threemile creeks have been successfully removed from reaches where bull trout occur (M. Buktenica, Crater Lake National Park, personal communication; Smith and Tinniswood 2002). These populations pass the hybridization criterion. Crater Lake National Park biologists eradicated brook trout from the upper reaches of Sun Creek in 1999 using antimycin treatments. Since then regular surveys have not detected brook trout above the two barrier falls designed to prevent brook trout re-invasion (M. Buktenica, Crater Lake National

Park, personal communication). Currently, brook trout are not considered a current threat to bull trout in Sun Creek. In Threemile Creek brook trout removal efforts have been on-going since 1997. Brook trout have not been observed upstream of an impassable culvert in the past five years and the two species are not sympatric (Smith and Tinniswood 2002).

Ongoing efforts to remove brook trout above a barrier falls on Long Creek have been unsuccessful. Long Creek fails the hybridization criterion.

Table 193. Occurrence of brook trout and hybridization for Klamath Lake bull trout populations.

Population	Brook Trout	Pass/Fail
Sun	Yes	Pass
Threemile	Yes	Pass
Long	Yes	Fail
NF Sprague	No	Pass
Deming	No	Pass
Leonard	No	Pass
Brownsworth	No	Pass
Sevenmile	<i>Extinct population</i>	
Cherry	<i>Extinct population</i>	
Coyote	<i>Extinct population</i>	
Upper Sycan	<i>Extinct population</i>	

Assessment Conclusions

The Klamath Lake Bull Trout SMU is comprised of eleven populations, four of which are considered extinct. Distribution of bull trout within the SMU is highly fragmented and concentrated in a few isolated headwater streams of Sycan and Sprague rivers, and Klamath Lake. Movement between populations is hindered by barriers and poor habitat quality. Abundance is extremely depressed and in some cases considered precariously low. The introduction of non-native salmonids particularly brook trout and brown trout, and degraded habitat quality has impacted the productivity of many populations. The SMU meets only the reproductive independence and hybridization criteria and is classified as 'at risk' (Figure 50). Limited datasets and inferences from other information for populations in this SMU provide a qualified level of confidence in the assessment of the interim criteria.

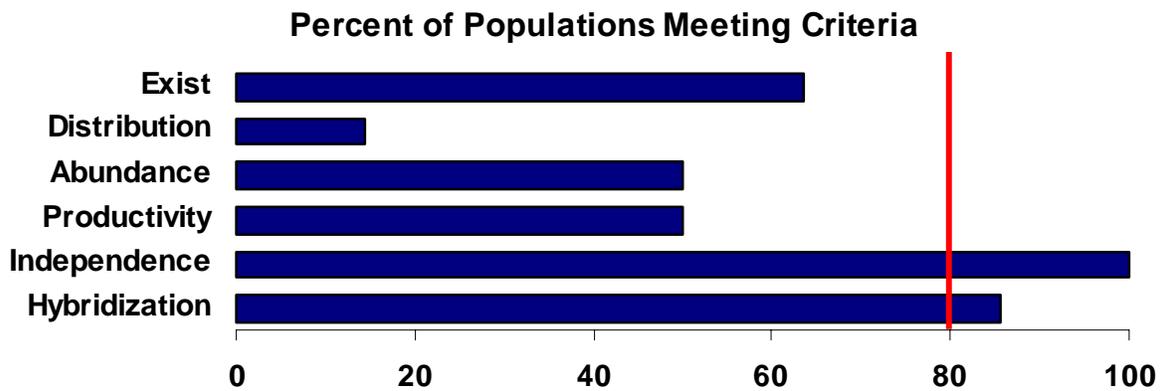


Figure 50. Assessment outcome for each of the six interim criteria with respect to the 80% threshold identified by the NFCP.