Malheur Lakes Redband Trout

Existing Populations

The Malheur Lakes basin is the largest of the Oregon desert basins and contains the most diverse and greatest amount of trout habitat (Behnke 1992). Malheur and Harney lakes are remnants of pluvial Lake Malheur, which dried approximately 8,000 years ago. Three major stream systems flow into Harney and Malheur lakes. The Silvies River, in the north, drains into Malheur Lake from the forested Blue Mountains. The Donner und Blitzen River, in the south, drains the sagebrush dominated communities of the Steens Mountain. The Silver Creek system originates at lower elevations on Snow Mountain and drains into the highly alkaline Harney Lake. The upland and mountain reaches are typically cold, swift streams with rocky bottoms, and the lower reaches are slow and warm in summer with sandy and muddy substrates (Bisson and Bond 1971).

The Malheur Lakes Redband Trout SMU is comprised of ten populations (Table 1). One exists in each of the three major stream systems, Silver, Silvies, and Blitzen. Six small populations exist in isolated creeks that dissipate onto the valley floor in the northeast and southeast regions of the basin. Rattlesnake, Cow, Coffeepot, Prater and Poison creeks drain King Mountain and Riddle Creek drains the North Steens Mountain. McCoy Creek contains a small population that has a one way connection to the Donner und Blitzen River. Populations are identified based on Bowers et al. (1999) and review by ODFW staff biologists.

Table 1. Description, existence status, and life history of redband trout populations in the Malheur Lakes SMU.

Exist	Population	Description	Life History
Yes	Silver	Silver Creek Basin.	Resident
Yes	Silvies	Silvies River Basin.	Resident
Yes	Poison	Poison Creek and tributaries.	Resident
Yes	Prater	Prater Creek.	Resident
Yes	Coffeepot	Coffeepot Creek.	Resident
Yes	Rattlesnake	Rattlesnake Creek.	Resident
Yes	Cow	Cow Creek.	Resident
Yes	Riddle	Riddle and Smyth Creeks and tributaries.	Resident
Yes	McCoy	McCoy, Cucamonga, and Kiger creeks plus tributaries.	Resident
Yes	Blitzen	Donner und Blitzen River and tributaries, Mud and Bridge creeks.	Resident/Migratory

Distribution

Analysis of the distribution criterion is based on 1:100,000 GIS hydrography of redband trout distribution (Flitcroft and Dambacher 2001). A population passes the distribution criterion if it satisfies two of three metrics – the current distribution must 1) occupy >10% of the total stream distance in the populations basin, 2) total more than ten km (six miles), or 3) be connected to other populations.

Redband trout in the Malheur Lakes Basin are widely distributed in small and medium size streams. Many of the mainstem habitats are not within the year around distribution of redband trout (Dambacher et al. 2001). Movement of fish between populations is severely limited by

warm water temperatures, barriers, and low flow conditions particularly in the summer. Redband trout in eight of the ten populations do not have access to other populations (Table 2) and, as a result, are considered to be at a greater risk of extinction due to stochastic events and lack of genetic mixing. During low water years fish in Silvies River are unable to access Malheur Lake and other populations due to diversion dams and periodic drying of stream sections due to irrigation withdrawal (Bowers et al. 1999). The Silver population is isolated by the dam at Moon Reservoir (Bowers et al. 1999). Populations in Poison, Prater, Coffeepot, Rattlesnake, Cow and Riddle creeks are naturally isolated from other populations. These streams are not connected to other systems and dissipate onto the valley floor. An unusually long wet cycle or change in climate may be necessary to reestablish connectivity between these populations.

The McCoy population is isolated from the Blitzen population by an impassable culvert (Bowers et al. 1999). Redband trout from the McCoy population can move into and mix with the Blitzen population, but cannot return to natal spawning grounds in McCoy or Kiger creeks.

Detailed distribution data are not available for redband trout in Coffeepot and Prater creeks, however very limited and sporadic sampling indicates distribution is limited (ODFW, Aquatic Inventory Project, unpublished data; ODFW, Hines field office, unpublished data). These populations are considered to occupy less than ten km of stream distance until actual distribution can be quantified. Given these streams are naturally isolated and distribution is undetermined, both populations fail the distribution criterion (Table 2).

Table 2. Distance of current distribution, total stream distance in each basin, percent of each basin occupied, and presence of migratory corridors for redband trout populations in the Malheur Lakes SMU (Flitcroft and Dambacher 2001).

Population	Current (km)	Total Basin Distance (km)	% Occupied	Connected to Other Pops.	Pass/Fail
Silver	222.4	619.5	35.9	No	Pass
Silvies	546.8	2630.0	20.8	Yes	Pass
Poison	30.7	213.2	14.4	No	Pass
Prater	--	63.2	--	No	Fail
Coffeepot	--	27.2	--	No	Fail
Rattlesnake	16.6	57.2	29.1	No	Pass
Cow	17.7	133.7	13.2	No	Pass
Riddle	73.0	465.2	15.7	No	Pass
McCoy	174.1	649.0	23.7	No	Pass
Blitzen	255.6	1078.2	17.8	Yes	Pass

Abundance

Data describing the abundance of constituent populations of the Malheur Lakes Redband Trout SMU do not exist. Instead, mean density of a given population serves as a surrogate criterion. Mean density estimates are compared to density benchmarks for redband trout populations in eastern Oregon streams (Dambacher and Jones In press). A population passes the abundance criterion if average density is classified as 'moderate' or 'high' in three of the previous five years. Populations with a 'low' rating fail the criterion and are warranted for further investigation. When density estimates for the last five years are not available, the criterion was applied to those years for which data are present. Of the ten populations, Prater and Cow populations fail the abundance criterion (Table 3).

Table 3. Mean density, age 1+ fish/m^2 (number of samples), of redband trout populations each year sampled and predominant assessment (Dambacher and Jones In press).

Population	1998	1999	2000	2001	2003	Assessment	Pass/Fail
Silver	0.243 (41)	0.169 (5)	--	--	0.084 (38)	Moderate	Pass
Silvies	--	0.294 (46)	0.347 (41)	0.445 (24)	--	High	Pass
Poison	--	1.037 (3)	--	--	--	High	Pass
Prater	--	--	--	--	--	--	Fail
Coffeepot	--	--	--	--	--	--	Pass
Rattlesnake	0.387 (2)	--	--	0.710 (2)	0.202 (2)	High	Pass
Cow	--	--	--	--	--	--	Fail
Riddle	--	0.435 (2)	--	--	--	High	Pass
McCoy	--	0.186 (6)	--	--	--	Moderate	Pass
Blitzen	0.097 (9)	0.112 (3)	--	--	--	Moderate	Pass

No data were collected in 2002.
Data collected by ODFW and USFS.

Density measures are not available for Prater, Cow and Coffeepot populations. A 1994 survey targeting Malheur mottled sculpin in Prater and Cow creeks did not find redband trout (ODFW, Aquatic Inventory Project, unpublished data). Other anecdotal observations indicate redband trout abundance in these streams is depressed (T. Walters, ODFW Hines field office, pers. comm..). Based on these few observations both populations fail the abundance criterion until abundance can be assessed (Table 148).

Sampling of redband trout in Coffeepot Creek was conducted in 2001 (ODFW, Hines field office, unpublished data), but efforts failed to produce a density estimate. However, the number and size distribution of fish captured were similar to that of nearby sample sites in Poison and Rattlesnake creeks. Based on these similarities we assume density and abundance in Coffeepot Creek reflects that of Poison and Rattlesnake, and therefore the Coffeepot population passes the abundance criterion. Further field investigation is necessary to better assess status of this population.

Using a probability sample design, ODFW conducted an SMU level population estimate of redband trout in 1999 in the Malheur Lakes basin (Dambacher et al. 1999). Population and density estimates were conducted at 30 randomly selected, spatially balanced sample sites throughout the SMU. Redband trout were estimated at 414,551 +/- 43% (95% CI) age 1+ individuals. The large confidence interval suggests a wide range of fish densities were sampled and reflects the variable status among populations in the SMU. Overall mean density (0.156 age fish/m^2) is moderate relative to densities through out eastern Oregon, though half of the Malheur Lake populations exhibited high densities. These estimates were made during high water years and are expected to fluctuate with habitat quality and instream flows.

Productivity

Data are not available to quantitatively assess productivity and the intrinsic potential population increase for redband trout in the Malheur Lakes 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 that is widely distributed and exhibits high densities is assumed to have minimally rebounded from past drought or disturbance events. Connectivity to high quality refuge habitats capable of supporting multiple life history types during periods of extreme environmental conditions enables populations to rebound quickly. Thus, a population passes the criterion if it: 1) is connected to

habitat capable of supporting multiple life histories and/or serving as refuge during periods of environmental constraint, 2) expresses multiple life history strategies, 3) is widely distributed, and 4) relatively abundant. A population may also pass the criterion if data indicate an increasing or stable trend in abundance. These qualities suggest populations are resilient and minimally able to rebound rapidly after periods of low abundance. This assessment, however, does not attempt to describe the degree to which populations may rebound. A population may pass the productivity criterion and not attain total abundance equivalent or greater than that prior to the previous low period. The presence of non-native species, hatchery fish, or significant habitat degradation may negatively affect productivity and cause a population to fail the criterion. In many populations the intrinsic potential productivity is uncertain; these populations fail the criterion until productivity can be adequately assessed. Only the Blitzen population exhibits a migratory life history and passes the productivity criterion (Table 4).

Table 4. Factors influencing productivity of the Malheur Lakes SMU redband trout populations.

Population	Factors	Pass/Fail
Silver	Widely distributed and moderately abundant; migratory life history appears to be absent -- movement to and from Moon Reservoir has not been documented; poor habitat conditions in portions of the basin (Bowers et al. 1999); presence of non-native species.	Fail
Silvies	Widely distributed; moderately abundant; migratory life history not documented and connection to Malheur Lake is assumed not possible due to impassable irrigation diversions (Bowers et al. 1999); although large fish have been observed in this population the fluvial component is not considered large enough to significantly enhance productivity; mainstem habitats inhospitable during summer months (Bowers et al. 1999); presence of non-native species.	Fail
Poison	Exhibits high density; small to moderate distribution; resident life history; although large fish have been observed in this population the migratory component is not considered large enough to significantly enhance productivity.	Fail
Prater	Abundance and distribution not documented but assumed to be extremely limited; not connected to other populations and habitats capable of producing large migratory individuals.	Fail
Coffeepot	Limited distribution; undocumented abundance; no connection to habitats capable of producing large migratory individuals.	Fail
Rattlesnake	Exhibits high density; small to moderate distribution; resident life history; although large fish have been observed in this population the fluvial component is not considered large enough to significantly enhance productivity.	Fail
Cow	Small distribution; abundance undocumented; not connected to other populations and habitats capable of producing large migratory individuals.	Fail
Riddle	Moderate distribution and abundance; not connected to other populations or habitats capable of supporting a migratory life history.	Fail
McCoy	Adequate distribution and abundance; isolated from the Blitzen River by an impassable culvert; a few unconfirmed anecdotal reports of large fluvial individuals have been reported in this population but the fluvial component is not considered large enough to significantly enhance productivity	Fail
Blitzen	Wide distribution among diverse habitats; moderate densities; migratory life history with connection to Malheur Lake and large rivers; potential mixing with the McCoy population.	Pass

Large migratory fish are only captured regularly from the Donner und Blitzen population where they have periodic access to Malheur Lake and regular connection to the lower river (USFWS, Malheur National Wildlife Refuge, unpublished data). Movement in the lower reaches of the Donner und Blitzen populations is hindered by irrigation weirs, dams and poor water quality; however the Malheur National Wildlife Refuge has recently placed ladders on dams to help facilitate passage. The regular expression of a migratory life history ensures large fish return to

the natal spawning grounds. These large individuals are highly fecund and contribute significantly to productivity of the population.

Reproductive Independence

Data specific to reproductive independence are not available for the Malheur Lakes Redband Trout SMU. Instead this review uses current and historical stocking records to evaluate risk of introgression of native redband trout with hatchery origin rainbow trout. A population passes the criterion if hatchery origin rainbow trout are not currently stocked within the population, and if genetic analyses, when available, reveal evidence of minimal genetic mixing between hatchery and wild species.

Extensive planting of a non-native rainbow stock occurred historically throughout the Malheur Lakes basin. However, planting of hatchery rainbow in rivers and streams has been discontinued. The stocking program ceased in 1973 in the Silver, 1992 in the Blitzen, and 1993 in the Silvies basins. Water bodies currently planted with a coastal rainbow stock are Krumbo Reservoir, Fish Lake and BLM stock ponds in the Blitzen River Basin, Yellowjacket Lake in the Silvies River, and Delinament Lake, and Moon and Chickahominy reservoirs in the Silver Creek basin. Few fish are thought to be able to escape from these water bodies.

Evidence of introgression of wild redband trout with hatchery rainbow trout (coastal lineage) in populations of the Malheur Lakes SMU appears to be minimal. Genetic studies have occurred in streams of the Blitzen, McCoy, and Silvies populations. No strong evidence of introgression appears in the Blitzen population, specifically in Bridge and Mud creeks (Currens et al. 1990a). The contribution of hatchery rainbow trout was found to be approximately 0.6% in McCoy Creek and 4.9% in Kiger Creek (Phelps et al. 1996). Moderate levels of introgression with hatchery fish was noted in genetic studies in Emigrant and Nicol creeks (Williams and Shiozawa 1992) and on the mainstem Silvies near historical stocking sites (Hosford and Prybil 1991). Rainbow trout in Krumbo Reservoir are considered as most likely derived from Oak Springs hatchery stock (Currens et al. 1990b), however fish are thought to be unable to escape from this water body and do not mix with native wild populations.

Because hatchery fish are no longer stocked into moving waters in the SMU and only minimal evidence of introgression exists, all populations pass the reproductive independence criterion.

Hybridization

Cutthroat trout are not present in the Malheur Lakes SMU and therefore are not a threat to redband trout populations. All populations pass the hybridization criterion.

Assessment Conclusions

The Malheur Lakes Redband Trout SMU is comprised of ten populations in the closed interior basin of Harney and Malheur lakes. Historically, all streams were interconnected and fish could move to the lakes and among populations. Currently, populations are isolated by natural and manmade barriers. Only the Blitzen population is known to express a migratory life history. Redband trout in the SMU are widely distributed in small and medium sized streams and moderately abundant during high water years. The SMU meets five of the six interim criteria and is classified as 'potentially at risk' (Figure 32). 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.

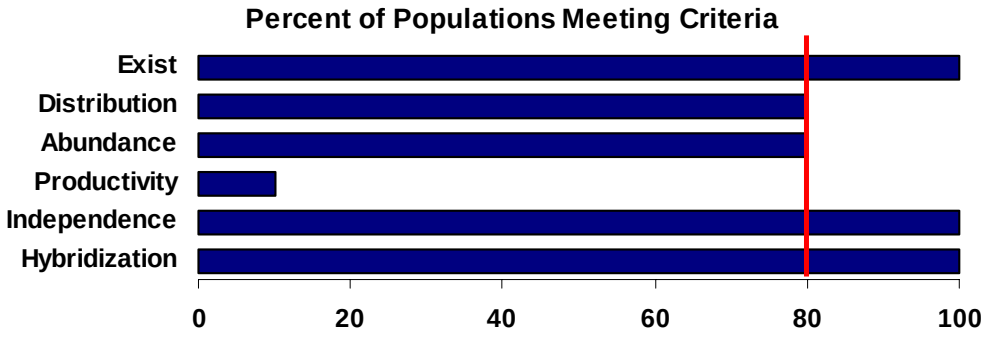

Figure 32. Assessment outcome for each of the six interim criteria with respect to the 80% threshold identified by the NFCP.