

## Progress Report: Miller Lake Lamprey



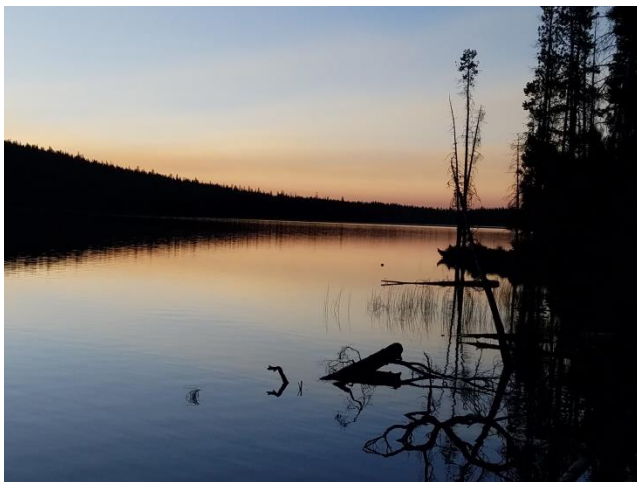
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### INTRODUCTION

Miller Lake (Figure 1) is home to the Miller Lake Lamprey (Figure 2), a native species that occurs only in the Klamath Basin and was first discovered in Miller Lake. Miller Lake is also known for its trophy Brown Trout fishery, in addition to Rainbow Trout, Brook Trout, and kokanee fisheries. The resident Miller Lake Lamprey is the smallest predatory species of lamprey in the world, averaging 3 to 6 inches in total body length. In the 1950s, Miller Lake Lamprey parasitized introduced trouts and Tui Chub in Miller Lake. The Oregon Game Commission was concerned that Miller Lake Lamprey compromised trout fisheries in the lake, and in 1958 applied the chemical toxaphene to the lake to eradicate them. The toxaphene application successfully eradicated Miller Lake Lamprey. In 1959, the Commission constructed a barrier in Miller Creek approximately one half mile downstream of the lake outflow to prevent lamprey from migrating back into the lake.

**Figure 1.** Miller Lake is a deep, coldwater lake in Klamath County, west of Chemult.



**Figure 2.** Adult Miller Lake Lamprey, *Entosphenus minimus*.



The Miller Lake Lamprey is now on the State of Oregon’s Sensitive Species List. The Oregon Department of Fish and Wildlife (ODFW), recognizing that Miller Lake Lamprey are native to Oregon and do not exist outside of Miller Creek and the upper Williamson and Sycan river drainages, created the [Miller Lake Lamprey Conservation Plan](#) (OAR 635-500-3885) in 2005. This plan formed the basis of ongoing management for Miller Lake Lamprey, and this report fulfills requirements to periodically report the status of Miller Lake Lamprey and the effectiveness of management actions to the public.

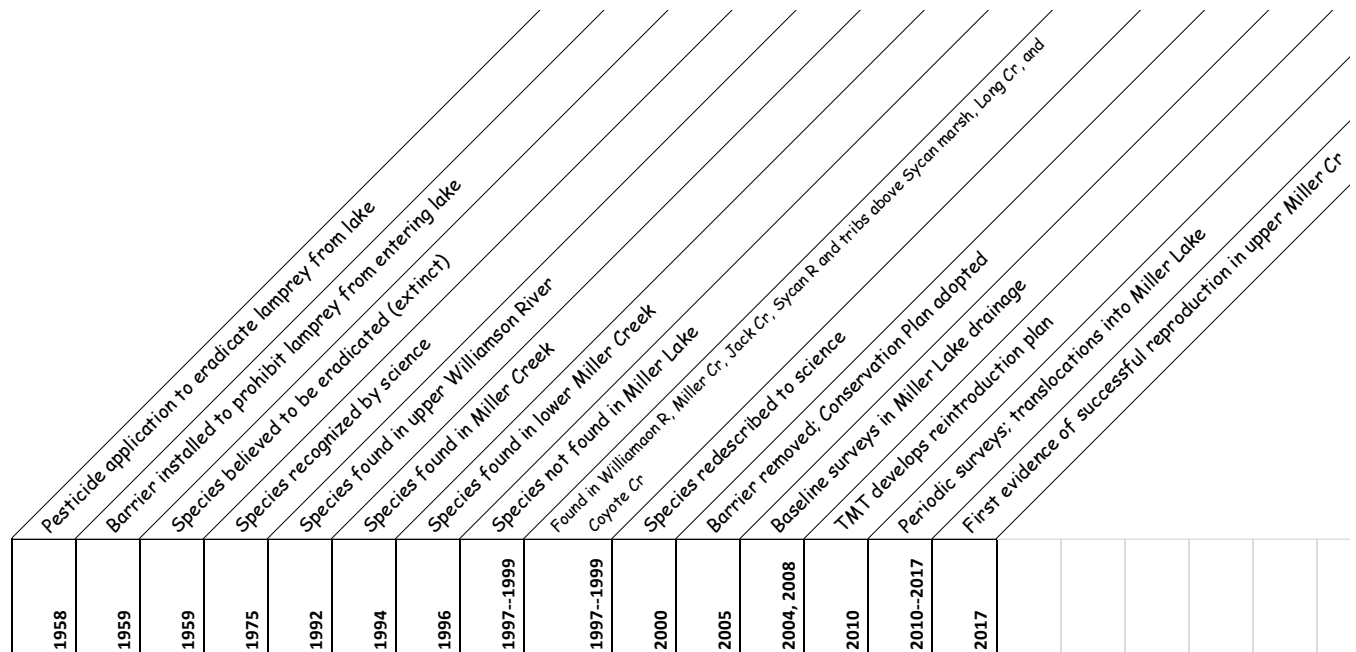
## **MANAGEMENT**

The Miller Lake Lamprey Conservation Plan (herein, “plan”) called for the reconnection of habitats in Miller Lake and Miller Creek through the removal of the human-made barrier in Miller Creek that was installed by the Commission. Other long term conservation strategies in the plan include management of other species — not stocking hatchery trout into streams that Miller Lake Lamprey inhabit to prevent predation on them, and maintaining or providing more opportunities for habitat access and sufficient water quantity. The plan further identified re-establishment of Miller Lake Lamprey into Miller Lake and upper Miller Creek, above a large cascade. The conservation plan for Miller Lake Lamprey also called for scientific studies to fill information gaps, and periodic surveys to assess and evaluate population status. The plan identified a desired status for the Miller Lake Lamprey “...to be distributed widely throughout its historic range, with populations robust enough to withstand stochastic environmental events, and with both the populations and their habitat secure from anthropogenic threats.”

Figure 3 provides a high-level summary of years when particular management actions were conducted and when scientific information was published. Table 1 reports survey data and Table 2 reports information on translocations of lamprey into Miller Lake, Evening Creek, and upper Miller Creek that were undertaken to re-establish lamprey into Miller Lake.

The plan identified the formation of a technical team (the Miller Lake Lamprey Technical Management Team; TMT) to monitor Miller Lake Lamprey and manage attempts to reintroduce them back into the lake. This team is led by Klamath district staff from the Oregon Department of Fish and Wildlife (ODFW), and it is composed of biologists from ODFW (Roger Smith, Bill Tinniswood, Stephanie Gunckel, Ben Clemens), Oregon State University (Dr. Doug Markle and various students), Western Fishes (owner, Dr. Stewart Reid), and the U.S. Forest Service (Terry Smith). The TMT removed the barrier between Miller Lake and Miller Creek in 2005. Following removal of the barrier in Miller Creek (Figure 3), various locations of the Miller Lake Basin were surveyed for the presence/absence of Miller Lake Lamprey. Survey results informed subsequent decisions by biologists in the TMT for translocation numbers and destinations.

**Figure 3.** Timeline of management actions and scientific results for Miller Lake Lamprey. Baseline surveys in Miller Lake drainage in 2004 and 2008 found no lamprey in Miller Lake, its inflow tributaries, or the uppermost portion of the outflow tributary, Miller Creek, within the vicinity of the location of the site of the former barrier, approximately a half mile downstream of the outlet of Miller Lake. For more information, refer to Table 1. TMT = Miller Lake Lamprey Technical Management Team.



**Table 1.** Survey results and observations for Miller Lake Lamprey. Locations referenced can be viewed in Figure 4. ML = Miller Lake; MC = Miller Cr; LMC = lower Miller Cr; UMC = upper Miller Cr; Evening Cr = EC; Tipsoo Cr = TC; Gideon Cr = GC. Counts do not reflect all observations (e.g., some larvae escaped capture).

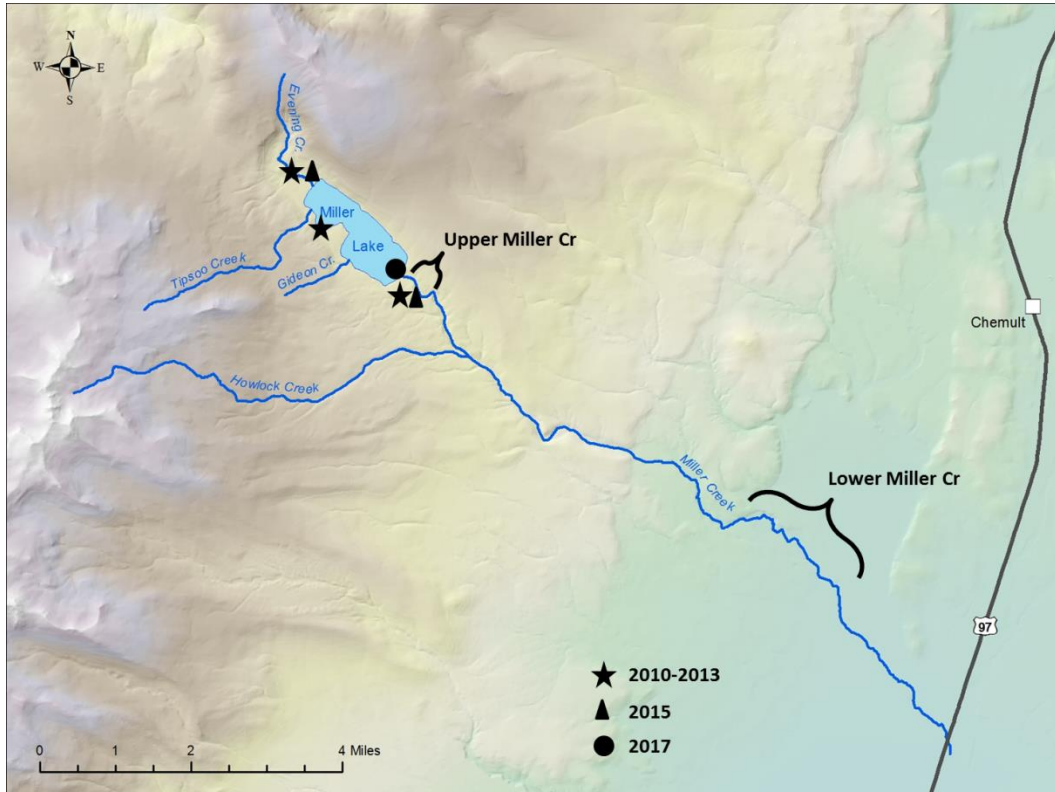
Year	Survey locations	No. lamprey	Notes
2004	12 locations from ML down into LMC	~266	69.6 mins of surveys — lamprey in 4 sites of LMC. None in ML or UMC.
2008	4 locations in MC	29	63 mins of surveys — all in 3 sites of lower MC. No lamprey found in UMC.
2010	LMC	700	over 0.4 km; <i>collected for translocations — see Table 2</i>
2011	LMC	632	<i>Collected for translocations — see Table 2</i>
	EC	7	Likely from 2010 translocation.
2012	LMC	626	<i>Collected for translocations — see Table 2</i>
	UMC	1	Below Miller Lake Rd
	ML	0 <sup>a</sup>	
	EC	Present	
2013	LMC	600	<i>Collected for translocations — see Table 2</i>
	TC	1	Small larvae (29 mm)
2014	EC, UMC	Present	
	TC, GC	0 <sup>a</sup>	
2015	LMC	400	<i>Collected for translocations — see Table 2</i>
	TC, GC	0 <sup>a</sup>	
	EC	Present	Many larvae found in all years subsequent to introduction. Also found spawned out female.
2016	UMC	0 <sup>a</sup>	
	EC	Present	Very low abundance
2017	LMC	610	Highest density observed to date at this location. <i>Collected for translocations — see Table 2</i>
	UMC	4	3 young-of-the year larvae (20-30 mm — indication of successful spawning), plus 1 larger larvae (~95 mm)
	EC	33	Larvae found at confluence of EC and ML The larvae were very large and were likely from past translocations.

<sup>a</sup> Finding no lamprey implies that none occurred at these locations. However, it cannot be ruled out that lamprey may have occurred in very low densities or in locations that were not surveyed, or that detection efficiencies were low.

**Table 2.** Reintroduction efforts by the Oregon Department of Fish and Wildlife and its collaborators to re-establish Miller Lake Lamprey in Miller Lake. All translocated lamprey were taken from lower Miller Creek. Locations referenced can be viewed in Figure 4. Translocated lamprey were primarily larvae, but ranged from young-of-the-year to adults. See Table 1 for abbreviations.

Year	Number of lamprey	Lamprey translocated to	Notes
2010	700	ML (300), EC (300), and UMC (100)	Included 2 adults
2011	632	ML (200), EC (232), UMC (200)	
2012	626	ML, EC, and UMC	
2013	600	ML, EC, and UMC	
2015	400	EC and UMC by NF-9972 road culvert crossing	
2017	610	ML at outlet into UMC	Included 3 adults

**Figure 4.** Map of Miller Lake, showing tributaries flowing into the lake from the north and west, and the outflow tributary, Miller Creek. Lower Miller Creek has been used as a donor source for translocations of Miller Lake Lamprey (Table 2). Symbols indicate release sites and years. Evidence of successful reproduction from past translocations into upper Miller Creek was found in 2017 (Table 1; Figure 3).



## **CONCLUSIONS**

Monitoring results indicate that lamprey translocated into Evening Creek and Upper Miller Creek survived, and lamprey have reproduced in Upper Miller Creek (Figure 3). Lamprey have not been found in Miller Lake; however, the extent of monitoring in the lake was small relative to the size of the lake, and it cannot be ruled out that lamprey may have occurred in very low densities or in locations that were not surveyed, or that detection efficiencies were low. Given the cool water temperatures of the Miller Lake drainage, the small body size and relatively low number of young produced by Miller Lake Lamprey, and generation times that may take several years, a re-established connection of the lamprey population between Miller Lake and Miller Creek may take several years. The TMT is poised to continue monitoring the population status of Miller Lake Lamprey in the Miller Lake Basin, to evaluate the success of previous translocations, and to determine whether subsequent translocations will be necessary.