

## Pacific Lamprey

### *Interim Risk Assessment*

Pacific lampreys were listed as an Oregon State sensitive species in 1993 and were given further legal protected status by the state in 1996 through restriction of harvest and harvest methods (OAR 635-044-0130). In 2003 eleven environmental organizations petitioned for the listing of Pacific lamprey and three other lamprey species as endangered in Oregon, Washington, Idaho, and California by the U. S. Fish and Wildlife Service under the Endangered Species Act. The petition cited Pacific lampreys as being vulnerable to habitat losses due to reduced river flows, water diversions, dredging, streambed scouring, channelization, inadequate protection of stream side vegetation, chemical pollution, and impeded passage due to dams and poorly designed road culverts. Introductions of exotic fish predators such as smallmouth bass were also cited as a factor in the decline of lampreys. The U.S. Fish and Wildlife Service recently determined that the petition does not contain sufficient information to warrant further review.

The status of the Pacific Lamprey SMU was assessed by the same criteria as other SMUs within this report, except that productivity could not be quantitatively assessed. The SMU was considered to “pass” each interim criterion only if all three populations passed that particular criterion. Pacific lampreys are considered as “at risk” because only three of the interim criteria were met.

### *Existing Populations*

In the absence of evidence for homing behavior and specific information on metapopulation. Structure, Pacific lampreys in Oregon are considered to comprise one SMU for the purposes of this report. Despite the lack of information, some morphological (size of adults) and behavioral (timing of migration and spawning) differences have been documented among Pacific lampreys (Kan 1975). Differences in migration timing are most apparent between coastal lampreys and lampreys that migrate considerable distances such as to the Snake River. Because Pacific lampreys are distributed throughout much of Oregon it is prudent to assess status in multiple areas. This report therefore summarizes information from three areas, even though these may not constitute distinct populations: coastal, lower Columbia/Willamette, and interior Columbia (Table 1). This assessment acknowledges that there is no convincing data that ESU’s or gene conservation groups below the species level do not exist. Use aggregated populations would result in an optimistic assessment of risk where subpopulations were potentially overlooked.

**Table 1. Population list and existence status for the Pacific Lamprey SMU.**

<b>Exist</b>	<b>Population</b>	<b>Description</b>
Yes	Coastal	All coastal basins within Oregon other than the Columbia.
Yes	Lower Columbia/Willamette	Columbia River basin downstream from Bonneville Dam.
Yes	Interior Columbia	Columbia River basin upstream from Bonneville Dam.

### *Distribution*

To pass this criterion, a population must currently occupy at least 50% of the historically used habitat. Evaluation of the criterion was based primarily on records of Pacific lamprey presence in fish inventory surveys. Historical distribution is not well known in some areas, but Pacific lampreys were likely widely distributed throughout Oregon. Documentation of current

distribution is somewhat confused by the difficulty in identifying lamprey ammocoetes to species.

Pacific lampreys remain present throughout most Oregon coastal streams; therefore, the coastal population passes this criterion. Distribution in coastal streams has been somewhat reduced in upstream reaches of basins because of road culverts that act as passage barriers. Pacific lampreys have likely been extirpated above Lost Creek and Applegate dams on the Rogue River.

Distribution of Lower Columbia/Willamette Pacific lampreys has been severely reduced by passage barriers in the Willamette River basin. Dams in the Clackamas, Santiam, McKenzie, and Middle Fork Willamette subbasins have blocked passage. In the Clackamas, Pacific lampreys are restricted to streams below North Fork Dam at river mile 30. Fifty-three miles of the Clackamas, along with associated tributaries no longer contain Pacific lamprey. Dams preclude Pacific lamprey occurrence in 48% of the North Santiam and 42% of the South Santiam subbasins, as well as 57% of the McKenzie subbasin and 47% of the Middle Fork Willamette subbasin. Numerous road culverts and habitat degradation have likely precluded distribution in additional areas. For example, recent surveys documented lampreys in only 12 of 33 streams in the Portland metropolitan area (Tinus et al. 2003). Pacific lampreys occur in small direct tributaries to the Columbia River such as Scappoose and Gnat creeks; however, historical information is scarce. The Lower Columbia/Willamette population fails the criterion

Pacific lampreys were historically present in the interior Columbia River basin well into the Snake River basin (Kostow 2002). Pacific lampreys are now absent above several dam complexes including Hells Canyon on the Snake River, Pelton/Round Butte on the Deschutes River, and Powerdale on the Hood River. Habitat degradation and small passage barriers such as road culverts have caused distribution to decline in unblocked areas as well, such that Pacific lampreys are often limited to the lowest reaches of many basins. For these reasons, the interior Columbia population fails the habitat use distribution criterion.

### ***Abundance***

To pass this criterion, abundance of a population must be at least 25% of the historic average abundance in at least three of the last five years. The primary sources of abundance data are passage counts at dams and harvest totals. Dam counts may be a poor indicator of abundance because of Pacific lamprey passage behavior. Harvest is often a poor index of abundance because it is strongly influenced by regulations and effort. Historic data sets are limited to a few areas and the number of years included varies among data sets.

Only at Winchester Dam on the North Fork of the Umpqua River do counts of coastal adult Pacific lamprey extend back more than a few years. Annual counts have decreased from over 40,000 fish in the 1960s to fewer than 100 in recent years. Based on this data and anecdotal observations of local ODFW biologists, we inferred a similar decline along the entire coast. The coastal population fails the abundance criterion.

In the Willamette River basin, harvest at Willamette Falls and counts at Leaburg Dam on the McKenzie River have both decreased dramatically from historic levels. Annual harvest has decreased from an average of almost 250,000 pounds from 1943 through 1949 to less than 12,000 pounds since 2001 (Ward 2001). Beginning in 2001, harvest opportunity at Willamette Falls was greatly reduced. Counts at Leaburg Dam have decreased from highs of over 200 to fewer than 50. These datasets are the only abundance data available for the lower

Columbia/Willamette Pacific lamprey population. Based on this data, along with anecdotal observations of local ODFW biologists, the population fails the abundance criterion.

Counts at dams on the Columbia and Snake rivers indicate a severe decline in Pacific lamprey abundance. Annual counts at Bonneville Dam prior to 1970 often exceeded 250,000 fish. The recent seven-year average at Bonneville Dam is 52,000. This average is driven by significant increases in 2002 and 2003. Annual counts at Lower Monumental Dam on the Snake River have declined from over 8,000 fish in 1969 to fewer than 500 in recent years. The recent Bonneville data suggests the interior Columbia Pacific lamprey population passes the abundance criterion, but the absence of a similar improvement at other dams, including Lower Monumental, leads us to fail the population for this criterion.

**Table 2. Historic and recent abundance indices for Pacific lamprey. Most numbers are approximate. Information for “Five Years” indicates the number of years the criterion was met in the last five years.**

Population, location	Index method	Historic Index		Recent Index		Five Years
		Years	Mean	Years	Mean	
Coast						
Winchester Dam, Umpqua River	Adult counts	1965-73	24,000	1995-2003	<50	0
Lower Columbia/Willamette						
Willamette Falls	Adult harvest	1943-52	218,000	2001-03 <sup>a</sup>	<12,000	0
Interior Columbia						
Bonneville Dam	Adult counts	1950-69	111,000	1997-2003	52,000	4
Lower Monumental Dam	Adult counts	1969	8,053	2000-03	228	0

<sup>a</sup> Regulation reduced harvest opportunity compared to prior years

### **Productivity**

To pass this criterion, a spawning population must have produced 1.2 spawning offspring for each parent in three of the last five years when parent abundance was below the 30-year average. No data are available to adequately assess productivity and the intrinsic rate of population increase for Pacific lampreys in Oregon. This criterion cannot be quantitatively assessed; however, declining trends in abundance indicate that productivity is likely limited for all populations. Passage obstructions, degraded habitat, and impaired water quality are all factors that decrease the rate of population growth. More explicit evaluations of productivity must take into account the unique life history characteristics of this species including age structure and maturation. All three populations failed the productivity criterion.

Predation by exotic predators may also decrease lamprey productivity. The petition requesting the U.S. Fish and Wildlife Service to list Pacific lampreys cited introduction of exotic fish predators, such as smallmouth bass, as contributing to the decline in abundance. PacifiCorp (1998) found lampreys in the stomachs of 10% of smallmouth bass examined from the Umpqua River. Conversely, Shrader and Gray (1996) examined stomachs of 60 smallmouth bass from the John Day River and found one lamprey. They also summarized information collected in 1977 that showed lampreys to be a minor component of the smallmouth bass diet in May and August, and to be absent from the diet in other months. Summers and Daily (2001) examined the stomachs of 186 smallmouth bass from the Willamette River and found lampreys in only one. It is possible that occurrence of Pacific lampreys in diets is underestimated because they lack diagnostic bones that remain intact throughout most of the digestive process.

***Reproductive Independence***

To pass the reproductive independence criterion, over 90% of the spawners in a population must be naturally-produced in three of the last five years. All Pacific lampreys are naturally-produced, therefore, all three populations passed this criterion. No hatchery programs exist; however, the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) have been working cooperatively with the U.S. Geological Survey (USGS) to develop and refine artificial propagation techniques. Pacific lampreys were collected from the John Day River in 1998 and manually spawned by the USGS in June 1998. Techniques are still being refined, but artificial propagation is an option under consideration by the CTUIR for reestablishment of Pacific lamprey.

Since 2000, lampreys collected from the John Day River and John Day Dam on the Columbia River have been used to reestablish larval abundance in the Umatilla River (Close et al. 2003). Adult lampreys are collected, treated for bacterial infections and parasites, maintained in tanks with water temperature increased over time to induce sexual development, then released in the Umatilla River in prime natural production areas. Numbers of adult Pacific lampreys released has averaged approximately 450 annually, ranging from 244 in 2001 to 600 in 2000.

***Hybridization***

To pass the hybridization criterion, the occurrence of interspecific hybridization must be rare or non-existent in three of the last five years. Interspecific hybridization has not been identified as an issue for Pacific lamprey. Therefore, all three populations passed this criterion.