

## Section 3.9 Pacific Lamprey

### Section 3.9.1 Biological Objectives and Status

Abundance indices of anadromous lamprey are exhibiting severe downward trends in the Columbia River Basin, which underscores the urgent need for action-oriented improvements to passage and restoration of lamprey in the basin. A long-term objective of developing self-sustaining and harvestable populations throughout the historical range requires this downward trend to halt and be reversed. Nine strategies and numerous measures have therefore been developed to address limiting factors and threats to production and sustainability of lamprey in the Columbia River Basin.

#### Objectives

- Attain self-sustaining and harvestable populations throughout the historical range still accessible to lamprey passage.
- Restore lamprey passage and habitat in tributaries that historically supported spawning lamprey populations.
- Mitigate for lost lamprey production in areas where restoration of habitat or passage is not feasible.

Mainstem and tributary passage improvements and restoration of anadromous lamprey have been identified as high priorities in reversing the severe downward trends in abundance, and recent efforts to improve passage of adults have been encouraging; therefore, passage and restoration are addressed in the first two strategies. Refinement of these management-oriented strategies is informed and guided by expanding our understanding of the status, diversity, production, biology, and population dynamics of anadromous lamprey. Based upon the critical need for passage improvements and restoration of anadromous lamprey in the basin and on our present state of knowledge, the nine strategies should be viewed in an adaptive management context, whereby passage improvements and restoration actions are informed by continual advances in knowledge of the various aspects of anadromous lamprey status and biology.

Our limited knowledge of the current status of Pacific lamprey across its historical range poses difficulties in identifying solid abundance targets. Although inaccuracies of adult migrant counts at dams exist, available indices indicate severely declining numbers and precarious status. This is especially true for the interior Columbia River Basin, such as the Snake River Basin in Idaho. Similarly, information on adult Pacific lamprey passage efficiencies past dams indicates that proportions successfully passing through the hydrosystem are low and that passage success is poorer for smaller lamprey. Based on 2000-2002 radio telemetry research, passage efficiencies at Bonneville, The Dalles, and John Day dams averaged 47%, 74%, and 53%, respectively. Although passage rates vary among years, patterns indicate that passage rates at some dams (i.e. Bonneville and John Day) is lower than at others (The Dalles). Almost nothing is known on downstream migration survival for juvenile lamprey, although some areas of loss, such as impingement on screens are known, and can be addressed.

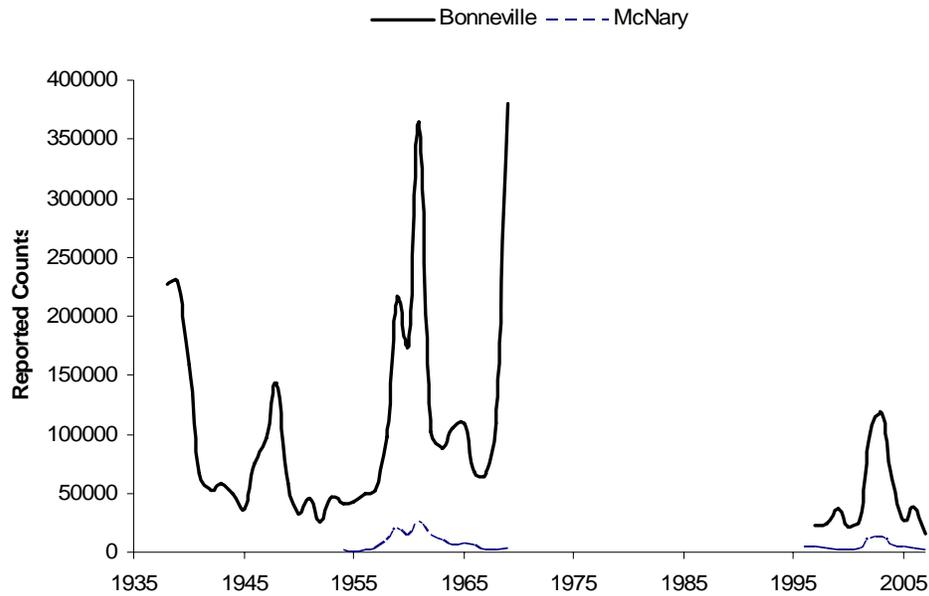


Figure 3.9.1. Annual counts of adult lamprey at Bonneville (start 1938) and McNary (start 1954) dams to present. No counts were made during 1970's and 1980's.

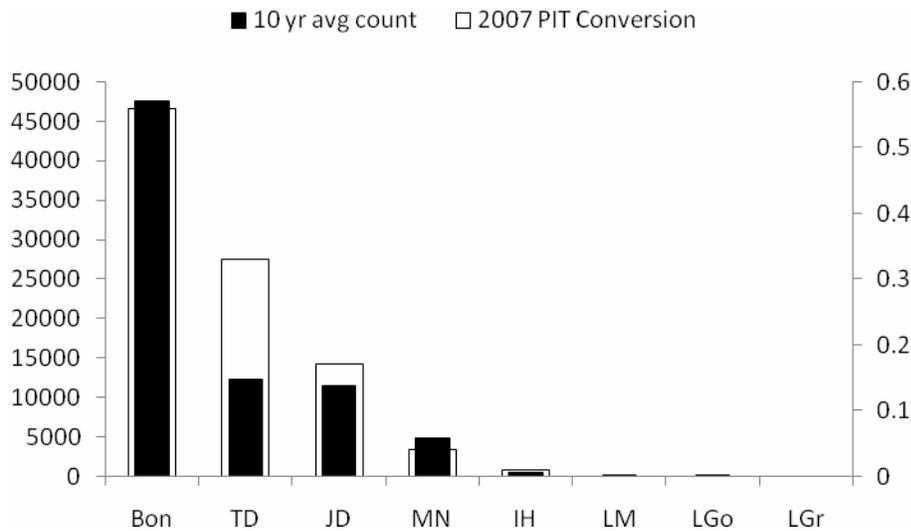


Figure 3.9.2. Comparison of ten year average counts (1998-2007) of adult lamprey at Columbia and Snake River dams (solid bars) and conversion of PIT-tagged adult lamprey through Ice Harbor Dam for fish released downstream of Bonneville Dam in 2007 (Chris Peery University of Idaho, personal. communication). Bon = Bonneville, TD = The Dalles, JD = John Day, MN = McNary, IH = Ice Harbor, LM = Lower Monumental, LGo – Little Goose, and LGr = Lower Granite.

Development of a Columbia River Basin lamprey conservation plan was identified in the U. S. Fish and Wildlife Services' (USFWS) Pacific Lamprey Conservation Initiative in 2007. This collaborative effort will facilitate and identify actions that address threats, restore habitat, increase our knowledge of lampreys, and improve distribution and abundance of lampreys within the Columbia Basin. The Columbia River Basin lamprey conservation plan will be part of a larger effort by the USFWS to restore Pacific lampreys throughout their range. While this plan is being developed and adopted, substantive actions based on current knowledge must be implemented to address the immediate threat to Pacific lamprey across vast portions of its remaining historical range within the Columbia Basin.

Knowledge of lamprey status in the Columbia River Basin is limited primarily to counts of adults and juveniles at dams, traps, or other counting structures. In most cases, these facilities were designed for counting salmonids; therefore, counts of lamprey are incomplete. Little is known about additional information critical to evaluating status (e.g., numbers of spawners; survival rate of juveniles, etc.), although juvenile lamprey presence/absence, density and size distribution data have been collected recently in selected tributaries to contribute to the knowledge base regarding their status.

### **Section 3.9.2 Limiting Factors and Threats**

In the Columbia River Basin, lampreys may migrate hundreds of kilometers through both mainstem and tributary habitats. Consequently, they encounter a variety of obstacles to passage that could negatively affect their populations. Large mainstem and tributary hydropower dams delay and obstruct adult and juvenile passage. Smaller obstacles in tributaries, such as diversion dams and culverts, may also obstruct adult and juvenile lamprey.

Predation may be a limiting factor related to mainstem passage. Juvenile lamprey have been observed in the stomach contents of smallmouth bass and northern pikeminnow from the tailraces of lower Columbia River dams.

Degradation of habitat within subbasins also limits lamprey. Physical habitat quality and quantity has diminished, which may especially limit juvenile rearing. Changes in water quantity exacerbated by irrigation withdrawals, roads, and agriculture practices during critical periods affect lamprey passage and survival. Finally, degradation of water quality (sedimentation and high temperatures) from various land use practices also limits lamprey production.

A final important limiting factor is our lack of knowledge of lamprey population delineation, biology and ecology, and population dynamics. Increased knowledge of lamprey biology and ecology will enhance our ability to evaluate the relative effectiveness of priority management actions. Population dynamics can assist in predicting the effects of various conservation actions.

### **Section 3.9.3 Strategies and Measures**

#### **Strategy 3.9.3.1 Improve adult and juvenile Pacific lamprey passage survival and reduce delays in migration.**

**Measures:**

- 3.9.3.1a** Develop and implement aids to passage at known and suspected lamprey passage obstacles.
- 3.9.3.1b** Identify additional specific structures or operations that delay, obstruct, or kill migrating lamprey.
- 3.9.3.1c** Monitor lamprey passage to evaluate passage improvement actions and to identify additional passage problem areas.
- 3.9.3.1d** Assess passage efficiency, direct mortality, and/or other metrics that relate to migratory success.

#### **Strategy 3.9.3.2: Continue restoring freshwater spawning and rearing habitat for anadromous lampreys**

**Measures:**

- 3.9.3.2a** Develop, implement, and evaluate lamprey-specific restoration projects (restoring natural processes in the absence of information on limiting factors).
- 3.9.3.2b** Identify ongoing habitat restoration and safety-net activities and evaluate their effects on lamprey.

#### **Strategy 3.9.3.3: Reintroduce and restore lamprey production to suitable habitats where they no longer occur, and monitor results.**

- 3.9.3.3a** Develop, implement, and monitor restoration actions.

#### **Strategy 3.9.3.4: Develop a collaborative lamprey conservation, restoration, and management plan.**

**Measures:**

- 3.9.3.4a** Improve our understanding and documentation of critical uncertainties by updating the Columbia River Basin Lamprey Technical Workgroup Critical Uncertainties document as part of a Columbia Basin lamprey conservation plan.
- 3.9.3.4b** Support development of a Columbia Basin lamprey management plan. The plan should include: (1) abundance targets measured at mainstem dams and tributaries, and (2) adult and juvenile passage efficiency targets and performance standards for mainstem dams.
- 3.9.3.4c** Identify research and analyses that address critical uncertainties regarding lamprey habitat, status, distribution, and genetic structure.
- 3.9.3.4d** Develop and maintain a regional Pacific lamprey data base for housing and accessing historic, current and new literature on distribution, life history, ecology, status, restoration, and cultural values.

**Strategy 3.9.3.5: Better understand lamprey status**

**Measures:**

- 3.9.3.5a** Compile and evaluate current and historical information on Pacific lamprey distribution, abundance and status within the Columbia Basin.
- 3.9.3.5b** Develop methods to differentiate among species at all life stages (field-based).
- 3.9.3.5c** Develop standardized sampling protocols and conduct systematic basin-wide surveys to assess adult and juvenile abundance and distribution.
- 3.9.3.5d** Define, improve, and continue historic distribution and abundance indices (e.g., dam counts, tribal harvest records, smolt trap collections, etc).
- 3.9.3.5e** Coordinate information exchange with existing and future projects not targeting lamprey specifically.

**Strategy 3.9.3.6: Determine anadromous lamprey population structure**

**Measures:**

- 3.9.3.6a** Supplement existing libraries of genetic markers for lamprey (e.g., microsatellites, single nucleotide polymorphisms).
- 3.9.3.6b** Collect and maintain lamprey tissue samples from the Columbia River Basin and neighboring basins.
- 3.9.3.6c** Investigate and determine population characteristics.

**Strategy 3.9.3.7: Determine anadromous lamprey limiting factors**

**Measures:**

- 3.9.3.7a** Document habitat preferences and habitat availability for all life stages of anadromous lamprey.
- 3.9.3.7b** Evaluate the physiological and behavioral responses of lamprey to a variety of environmental stressors.
- 3.9.3.7c** Assess trophic relationships.
- 3.9.3.7d** Assess the potential magnitude and effect of predation on lamprey productivity.

**Strategy 3.9.3.8: Describe anadromous lamprey biology and ecology**

**Measures:**

- 3.9.3.8a** Describe the ecological function of anadromous lamprey.
- 3.9.3.8b** Describe the biology of anadromous lamprey.
- 3.9.3.8c** Develop methodology for gender identification in the field and laboratory.
- 3.9.3.8d** Develop aging techniques.
- 3.9.3.8e** Assess life history characteristics of freshwater and ocean-phase anadromous lamprey.

**Strategy 3.9.3.9: Describe anadromous lamprey population dynamics**

**Measures:**

**3.9.3.9a** Estimate demographic rate parameters capable of changing the size of populations such as birth, death, immigration, and emigration rates.

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