

**Project Title: Climate Change Vulnerability Assessment of Pacific Lamprey Funding Announcement #2**

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**Project Summary:** We will evaluate the vulnerability of Pacific Lamprey to climate change by using an approach that relies on existing climate change model projections for stream conditions (i.e., hydrograph, temperatures, winter flood events) and lamprey sensitivity to environmental changes due to climate change. This project addresses the following eligible activity identified in the Implementation Plan for the NPLCC Science and Traditional Ecological Knowledge Strategy, 2013-2016: Action 2.2

**Project Proposal:**

Pacific Lamprey are a native anadromous species that, like salmon, historically returned to spawn in large numbers into watersheds along the West Coast of the United States, but populations have declined in abundance and become restricted in distribution throughout Washington, Oregon, Idaho, and California. Threats to Pacific Lamprey occur in much of the range of the species and include restricted mainstem and tributary passage, reduced flows and dewatering of streams, stream and floodplain degradation, degraded water quality, and changing marine and climate conditions. The U.S. Fish and Wildlife Service recognized the need for a comprehensive plan to conserve and restore Pacific Lamprey in collaboration with Native American tribes; Federal, State, and local agencies; and other entities. The Pacific Lamprey Conservation Initiative (Initiative) is the U.S. Fish and Wildlife Service's strategy to improve the status of Pacific Lamprey throughout their range by helping implement research and conservation actions (<http://www.fws.gov/pacific/Fisheries/sphabcon/lamprey/index.cfm>). The landscape level approach of the Initiative is a three part process: an Assessment and Template for Conservation Measures (Assessment); a Conservation Agreement; and Regional Implementation Plans. The Assessment was completed in October 2011 and the Conservation Agreement was signed by numerous tribal, state, and federal partners on June 20, 2012. The next steps in the Initiative are to work with all these partners to develop regional plans for implementing conservation actions.

One of the key areas of uncertainty identified through the Initiative (and our multiple partners) was the impact of climate change on Pacific Lamprey and how these effects would influence the priorities for restoration actions. Therefore a thorough climate change vulnerability assessment is extremely important to guide restoration actions across the riverscapes for Pacific Lamprey.

We conducted a pilot climate change vulnerability assessment to help illustrate the importance for informing Pacific Lamprey restoration activities (Figure 1). In the pilot study we used the NatureServe Climate Change Vulnerability Index (Young et al. 2001) by applying the readily available (at the time) downscaled environmental changes for air temperature and moisture. These environmental parameters have been typically applied for assessing vulnerability of terrestrial species. We consulted with the NatureServe experts on the appropriateness of our application of the NatureServe Climate Change Vulnerability Index to Pacific Lamprey (Bruce Young personal communication May 2012). The expert opinion was the general approach of the application to Lamprey was appropriate, however they pointed out that more detailed information on downscaled changes to hydrologic environmental changes was available from climate change projection models. They believed incorporating the more specific hydrologic changes would greatly improve the projection of climate change impacts for Pacific Lamprey.

We will be modifying the NatureServe Climate Change Vulnerability Index to accommodate more specific information on changes in stream conditions such as hydrologic regime, temperatures, winter flood events. This tool provides a scoring system for indexing species vulnerability to the impacts of climate change. We can broadly apply this system to Pacific Lamprey with existing information provided by the downscaled climate predictions. We will define Pacific Lamprey life-stage sensitivity to direct exposure for specific environmental changes such as stream temperature, hydrologic regime, and physical connectivity disruptions. There are consequences of climate change that may indirectly (indirect exposure) affect Pacific Lamprey such as of land use changes resulting from human responses to climate change and sea level rise. The sensitivity of Pacific Lamprey to direct environmental changes along with indirect exposure will allow us to consistently score the vulnerability of Pacific Lamprey to climate change.

### **Objective and Need:**

#### Objectives

We will develop a method for consistently scoring the vulnerability of Pacific Lamprey to climate change throughout the Pacific coast of the United States.

#### NPLCC Goals

This project will contribute to the NPLCC goals of conservation and restoration, information priorities, use and availability of information, coordination and outreach. We, USFWS Region 1 and 8, US Geological Survey, the Yakama Nation and Cow Creek Band of Umpqua Tribe of Indians will be assessing climate change vulnerability of Pacific Lamprey. We will be identifying and sharing threat information as well as traditional ecological knowledge of Pacific Lamprey with our state, tribal, federal and local partners to conduct the climate change vulnerability assessment. We will also be coordinating with Climate Science Centers to obtain downscaled climate change model results of watersheds for the analysis. The USFWS has recently recommitted to data management planning and therefore making the products of this project accessible is a priority.

#### NPLCC Needs

This project meets the needs of the NPLCC because we, USFWS Region 1 and 8, USGS, the Yakama Nation and Cow Creek Band of Umpqua Tribe of Indians, will assess climate change vulnerability in Pacific Lamprey, a native anadromous fish found throughout the NPLCC. A pilot climate change assessment has shown that Pacific Lamprey are vulnerable to environmental changes due to climate change and could benefit from early conservation planning.

### **Methods:**

We will be modifying the NatureServe Climate Change Vulnerability Index to accommodate more specific information on changes in stream conditions such as hydrologic regime, temperatures, winter flood events. This tool provides a scoring system for indexing species vulnerability to the impacts of climate change. We can broadly apply this system to Pacific Lamprey with existing information provided by the downscaled climate predictions. We will define Pacific Lamprey life-stage sensitivity to direct exposure for specific environmental changes such as stream temperature, hydrologic regime, and physical connectivity disruptions. There are consequences of climate change that may indirectly (indirect exposure) affect Pacific Lamprey such as of land use changes resulting from human responses to climate change and sea level rise. To define the sensitivity of Pacific Lamprey to both direct and indirect exposure we will use a combination of approaches. We will use research, monitoring and evaluation data from Luzier et al. 2009 and Luzier et al. 2011. The 2009 publication describes regional differences in Pacific Lamprey biology, population structure, habitat preferences and threats. Luzier et al. 2011 is the Assessment, and first phase of the Initiative, which outlines population demographics, threats and overall risk for Pacific Lamprey throughout the U.S. range. In addition to these documents, we will use professional judgment from field lamprey experts on the Columbia River Basin Lamprey Technical Workgroup, USFWS Western Lampreys Team and the Initiative Conservation Team. The sensitivity of Pacific Lamprey to direct environmental changes along with indirect exposure will allow us to consistently score the vulnerability of Pacific Lamprey to climate change. Key cooperators requesting funds are Christina Wang Luzier, USFWS; Damon

Goodman, USFWS; Amy Amoroso, Cow Creek Band of Umpqua Tribe of Indians; Bob Rose, Yakama Nation; and Mike Hayes, USGS (as outlined in the budget table below). Each cooperator will work on gathering threat information (applying Traditional Ecological Knowledge) and sensitivity of Pacific Lamprey to environmental changes in their geographic area. They will also work collaboratively with the Project leader to obtain downscaled direct exposure data for specific environmental changes such as stream temperature, hydrologic regime, and physical connectivity disruptions.

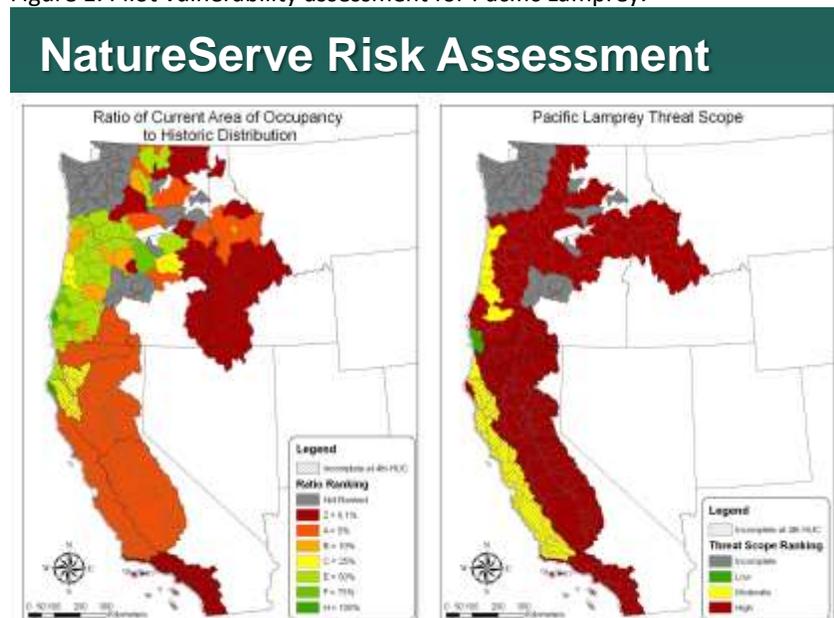
**Geographic Extent:** The geographic extent of this project is the U.S range of Pacific Lamprey including coastal Washington and Puget Sound, Snake and Columbia Rivers, coastal Oregon, and Northern California. All of the NPLCC will be included in this analysis. The information can be extrapolated to any other geographic area in the range of Pacific Lamprey not covered by this study.

**Timeline of Schedules, Products and Outcomes: Provide a timeline with dates and tasks.**

June 2013 – March 2014 - Downscaled data, indirect exposure data gathering  
 April – September 2014 - Analysis of data and report writing

**Disclaimer regarding Data Sharing:** We do not know of any restrictions on sharing of the data generated by this project.

Figure 1. Pilot vulnerability assessment for Pacific Lamprey.



## References

Luzier, C. W., and 7 coauthors. 2009. Proceedings of the Pacific lamprey conservation initiative work session – October 28-29, 2008. U.S. Fish and Wildlife Service, Regional Office, Portland, Oregon.

Luzier, C.W., H.A. Schaller, J.K. Brostrom, C. Cook-Tabor, D.H. Goodman, R.D. Nelle, K. Ostrand and B. Streif. 2011. Pacific Lamprey (*Entosphenus tridentatus*) Assessment and Template for Conservation Measures. U.S. Fish and Wildlife Service, Portland, Oregon. 282 pp.

Young, B, E. Bayers, K. Graves, K. Hall, G. Hammerson, and A. Reader. 2011. Guidelines for Using NatureServe Climate Change Vulnerability Index. Release 2.1. NatureServe 2011, Arlington, Virginia.  
<https://connect.natureserve.org/science/climate-change/ccvi>