

Response to ISRP Review of Accord Proposal
200830800 – Willamette Falls Lamprey Escapement Estimate (ISRP 2011-6)

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We would like to thank ISRP for their continued review of this project. We continue to move forward in addressing uncertainties and technological “bugs” as well as identify new potential logistic constraints. Our intent is to continue to use a step-wise approach for installing additional monitoring equipment, work through uncertainty, and develop a final study plan in upcoming years.

In project review ISRP 2011-6, the following qualifications were:

1. ***“The first qualification is that upon completion the full-scale project design be reviewed. The project design should demonstrate clear evidence of the effectiveness of the technologies to meet project objectives: the long-term monitoring protocol(s) and an index of abundance for adult Pacific lamprey at Willamette Falls. This should include a statistical estimate of how many lampreys would have to be tagged to obtain valid abundance estimates.”***
2. ***“The second qualification is that the ISRP review a progress report at the end of 2011 or early 2012 on two key uncertainties that have not been completely resolved: can PIT-tagged lamprey be successfully detected at passage locations and can lamprey be reliably counted by underwater cameras. The proponents expect to make significant progress toward addressing these uncertainties in 2011.”***

In response to qualification 2, we have attached a copy of the 2011 progress report to BPA (no citation as it hasn't been finalized by BPA). Both uncertainties (successful detection and reliability of counts through video) are discussed in the report. Detecting lamprey at passage locations does not appear to be problematic (page 17). Of 2,370 Pacific lamprey half-duplex (HDX) PIT tagged, 45.7% (1,084) were detected at fixed sites in the fish ladder. On page 19, video capture and review are discussed. A total of 662 hours (the tape was not run continuously throughout the run due to human error) of video was recorded. Of the tape reviewed, 11,979 lamprey were counted. Further discussion of video review and logistical constraints follow.

Development of a final study plan is not anticipated in the next few years. We continue to work through logistic constraints, learn important lessons about technology and its constraints, as well as adapt our way of thinking as we better understand lamprey movements at Willamette Falls and the tribal fishery. Following is a brief description of our thoughts on video counts and using harvest as an index of abundance.

Our initial thought was to develop an index of abundance by relating video counts of lamprey through the fish ladder at Willamette Falls to yearly abundance estimates. This assumed it would be possible to use motion detection software (e.g., FishTick®, Salmonsoft, Portland, OR); offering a cost effective method for obtaining counts rather than estimates from a mark-recapture

field experiment. Due to the lack of contrast between lamprey and the fish ladder floor (even with the white high-density plastic ramp, algae colonizes so quickly that contrast is quickly lost) the motion-detection software is unable to identify lamprey (Jeff Fryer, CRITFC/Salmonsoft, pers. comm.). Image recognition software for lamprey is in its early stages of development (Chris Peery, USFWS, pers. comm.). Presently, we are manually counting lamprey recorded by video in the fish ladder.

Beyond development of an abundance index for lamprey, video counts combined with HDX PIT array detections, would be used to improve the mark-recapture estimate. Using HDX antenna detections in the fish ladder would increase the number of recaptures (*e.g.*, in 2011, instead of 69 recaps, HDX antennae detected 1,030 [p. 17] which was 45.7% of marked fish) but this hinged on whether the video could be used as a method of inspecting tagged and untagged lamprey (or devise a stratification scheme such as use video counts and corresponding PIT tag detections 10 minutes out of every hour to reduce video review to a manageable level). It was not possible to use the video counts in this manner in 2011, mostly due to lingering technical difficulties (*e.g.*, insufficient lighting, error in extracting hard drives) both of which have been resolved.

Video counts in 2011, were used to characterize diel migration patterns through the fish ladder and to provide a complimentary method of assessing abundance of lamprey through the fish ladder. While we are doubling our effort reviewing video of lamprey through the fish ladder in 2012, the extent to which video review can be used as a method of inspecting marked and unmarked lamprey is uncertain. It does seem probable that, with the lack of automation for video review of lamprey through the fish ladder, video counts of lamprey will not provide a cost-effective, reliable index of abundance for lamprey ascending the ladder at Willamette Falls.

The ISRP had suggested using lamprey catch data may contribute to the development of an index of abundance. In our narrative, we quoted Kostow (2002) who summarized the history of lamprey harvest at Willamette Falls and explained why these data were not good indicators of lamprey abundance because of inadequate creel census and changes in regulations through the years. Since current regulations only allow personal and subsistence use, that variable has been remedied. After the last two years of monitoring lamprey harvest at Willamette Falls, we have more understanding of how the fishery operates and how it may be used as an index of abundance. In the past two years, the four Columbia River treaty tribes and two Oregon coastal tribes, Confederated Tribes of Grand Ronde, and Confederated Tribes of Siletz Indians of Oregon have primarily participated in this fishery. Our creel surveys are voluntary but we have had great participation by harvesters allowing us to inspect fish for tags and estimate abundance. Access is also in our favor as harvesters can only get to the fishing area by boat and almost always launch from Sportcraft Marina.

The ISRP's point is well taken that the fishery may provide the most cost-effective index of abundance for lamprey at Willamette Falls. In 2011, we separated the lamprey estimate through the fish ladder from lamprey that failed to return to the ladder and either remained downstream of the falls or ascended Willamette Falls in another location. In comparing the estimates through the fish ladder and harvest in 2010 and 2011, the harvest as a percentage of the estimate was 6% and 8.8%, respectively (Table 1). If variability remains low (<5%) among years through the end of the study (2017) then catch data will provide a good method for an index of abundance.

Table 1. Willamette Falls (WF) lamprey harvest as a percent of the estimated escapement through the fish ladder, 2010 – 2011.

Year	Estimate of Pacific lamprey through WF ladder	Harvest	Harvest as % of ladder estimate
2010	26,677	1,606	6.0
2011	49,072	4,318	8.8

To use data in Table 1 as indices of abundance, harvest must be standardized by fishing effort. Expressing catch per effort in this fishery is somewhat complicated. People harvest lamprey at Willamette Falls in groups. Individuals within the group may fish for various amounts of time and often put their fish in one tote or a number of burlap sacks, but catch within the party is aggregated. In 2010 and 2011, number of fishers in each group were not recorded consistently and total time groups fished was not recorded. In 2010, catch per person ranged from 3.3 to 20.4 fish per person (n=4 groups out of 13). In 2011, catch per person ranged from 16.2 to 64.3 fish per person (n=4 groups out of 18). In 2012, CTWSRO creelers will ask harvesters how many people fished, how long each person fished, then calculate the average catch-per-unit effort for each harvester in the group because there is no way of separating catch on a per-person basis. The CTWSRO will continue to work towards improving methods for estimating abundance of lamprey that remain downstream of Willamette Falls, quantifying lamprey that move through the Falls in other areas besides the ladder (*e.g.*, newly restored passage through the old fishway, lamprey ramps), escapement through the fish ladder and estimating harvest.

As this project continues, we will send yearly findings (through BPA annual progress reports) to ISRP. Based on lessons learned and adapting of methods, it is fair to say that we will not have a final study plan for years to come.

Kostow, K. 2002. Oregon lampreys: Natural history, status, and analysis of management issues. Oregon Department of Fish and Wildlife, 2002-01.