

## **OFFICIAL COORDINATION REQUEST FOR NON-ROUTINE OPERATIONS AND MAINTENANCE**

**COORDINATION TITLE-** 19TDA08 Nighttime Lamprey Operations at The Dalles Fishway Entrances

**COORDINATION DATE-** 25 April 2019

**PROJECT-** The Dalles Dam

**RESPONSE DATE-** 10 May 2018

### **Description of the problem**

Fishway entrances have been designed to optimized salmonid attraction and passage, which requires fairly high velocities. However, Pacific Lamprey also use these fishway entrances and the high entrance velocities can result in many lamprey turning around or expending large amounts of energy to enter fishways.

Pacific Lamprey entrance efficiency and passage times have been shown to benefit from reduced velocities at entrance gates (Johnson et al, 2012). Lamprey currently benefit from “nighttime lamprey operations” at Bonneville powerhouse 2 entrances and was implemented at fishway entrances at Bonneville powerhouse 1 and The Dalles Dam experimentally. Project and Fish Field Unit Biologists have, on separate occasions, observed and photographed lamprey attempting to enter at Bonneville B-Branch and repeatedly thwarted by the high current velocity resulted in an evaluation of reduced nighttime velocities in FY18 and FY19.

Due to the potential benefits of reduced nighttime flows, the University of Idaho has developed a randomized block study design (Table 1) using radio tagged adult Pacific lamprey to evaluate the potential benefit, which could lead to a permanent operational changes. The proposal for this evaluation was distributed through SRWG and referenced as LMP-P-17-1. The Dalles Dam fishway entrances will be evaluated again (year 2) and is proposed in this MOC.

The University of Idaho will monitor lamprey passage at The Dalles Dam East Fish Ladder east entrance during a randomized block experiment where nighttime entrance velocity is held at the standard daytime velocity (control, ~8 ft/s; ‘Off’ in Table 2) or at reduced velocity (~4 ft/s, ‘ON’) at night. The key monitoring metrics will include entrance rate, exit rate, net entrance rate each night, and overall dam passage rate under the two treatments. Analysis of variance will be used to test for treatment effects if adequate sample size is available, as in Johnson et al. (2012). Alternatively, time-to-event analyses will be used to estimate the relative passage rates while controlling for environmental variation through time (including treatment condition because individual fish cannot be restricted to single treatment conditions; see Caudill et al. (2007) for an example.

### **Reference**

Johnson et al, 2012. “Movement of Radio-Tagged Adult Pacific Lampreys during a Large-Scale Fishway Velocity Experiment”. Available online at: <http://www.tandfonline.com/doi/abs/10.1080/00028487.2012.683468>

Caudill, C.C., W.D. Daigle, M.L. Keefer, M. Jepson, B.L. Burke, T.C. Bjornn, and C.A. Peery. 2007. Slow dam passage in Columbia River salmonids associated with unsuccessful migration: delayed negative effects of passage obstacles or condition-dependent mortality? Canadian Journal of Fisheries and Aquatic Sciences 64:979-995.

**Type of outage required – No outage required, entrance weirs will be lowered.**

**Impact on facility operation** - Head at the Dalles Dam entrances must remain between 1’ – 2’ (optimum 1.5’) per section 2.4.2.3. of the fish passage plan. Also per section 2.4.2.4. water velocity in the full length of the powerhouse collection channel and the lower ends of the fish ladders must be maintained between 1.5 – 4.0 feet per second (2 fps optimum). The proposed treatment (reduced), would primarily be accomplished by adjusting weir differentials resulting in up to 50% reduction in water velocity, at the east entrance of the east fish ladder, from 10:00 pm to 4:30 am on a randomized schedule from 1 June to 31 August 2018. However, due to physical and operational constraints of the weirs (can’t lower them enough to get desired differentials) the fish unit discharge will need to be lowered to reach desired differentials. Therefore we propose lowering weirs as far as possible then reducing fish unit discharge as needed. This will only occur on nights listed in table 1 below from 10:00 pm to 4:30 am.

**Table 1.** The treatment schedule for a semi-randomized block experiment manipulating entrance velocities at The Dalles Dam East Fishway entrances. Treatment (reduced) and control (normal) nights are assigned as follows from June 3th to August 28th, 2019. An experimental period from the beginning of June through the end of August would provide 18 nights of reduced entrance flows.

<b>Month</b>	<b>Day</b>	<b>Time</b>
June	3, 13, 14, 19, 20, 26	2200-0430
July	2, 10, 16, 23, 24, 29	2200-0430
August	5, 14, 15, 21, 27, 28	2200-0430

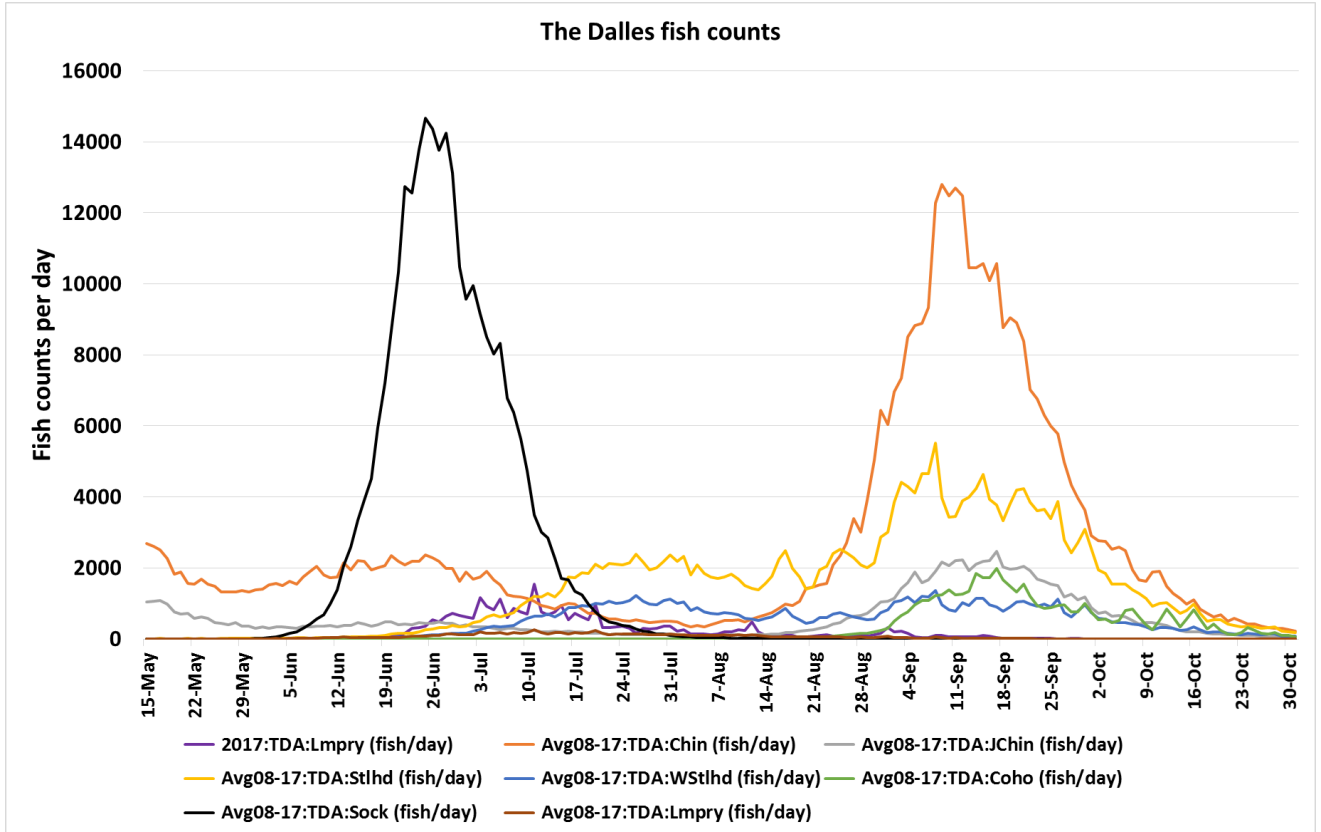
**Impact on unit priority – No impact**

**Impact on forebay/tailwater operation – No impact**

**Impact on spill – No impact**

**Dates of impacts: 3 June to 29 August 2019**

**Analysis of potential impacts to fish**



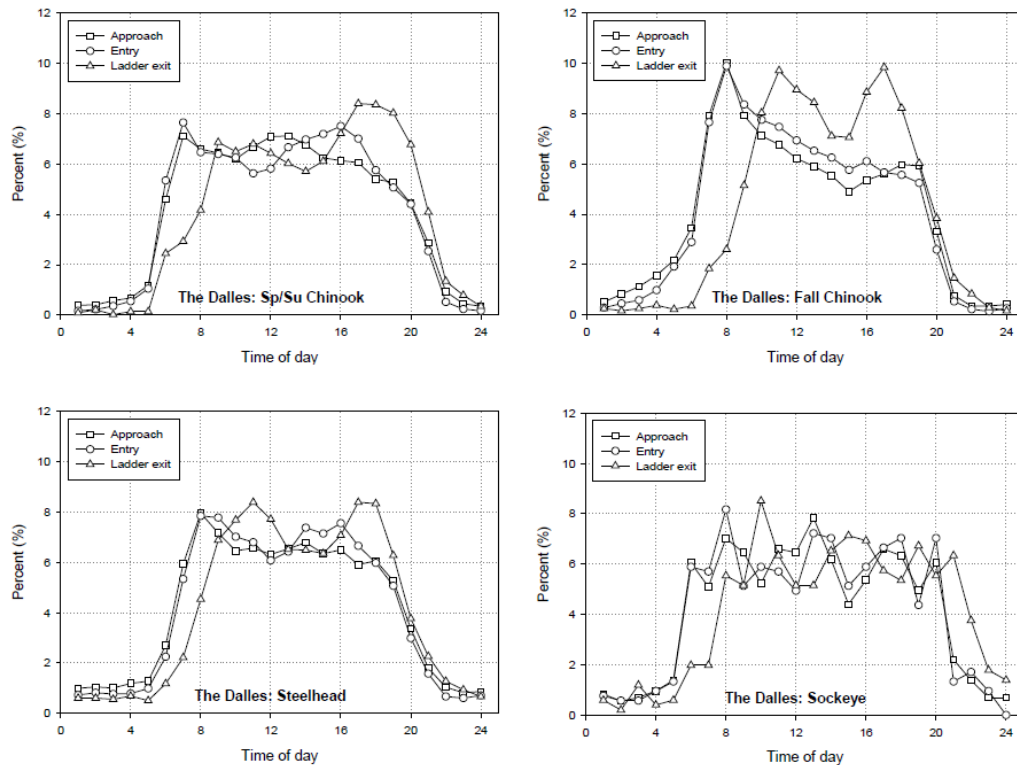


Figure TDA-5. Diel Distribution of Adult Salmonids at The Dalles Dam Fishway Entrances and Exits (Keefer & Caudill 2008).  
[web.crohms.org/tmt/documents/FPOM/2010/2013\\_FPOM\\_MEET/2013\\_JUN/](http://web.crohms.org/tmt/documents/FPOM/2010/2013_FPOM_MEET/2013_JUN/)

Figure 2. Borrowed from the 2018 Fish Passage Plan.

### Summary statement - expected impacts on:

#### Downstream migrants

There are no expected impacts to steelhead kelts, juvenile salmonids, or juvenile lamprey as a result of reduced nighttime velocities.

#### Upstream migrants (including Bull Trout)

Adult Sockeye are present in late June and adult Chinook salmon are present in significant numbers in August through September. However, very few Sockeye and Chinook salmon are approaching the Dalles Dam fishway entrances between 2200 and 0430 and therefore impacts should be minimal as a result of the reduced nighttime velocities (Figure 2).

Facilities around the region being designed for bull trout are using lower head than salmon ladders (0.75' instead of 1.5'). Therefore bull trout passage under reduced nighttime flows, through this type of ladder, should be an improvement for bull trout.

#### Lamprey

Based on prior work completed by the University of Idaho, referenced above, there may be beneficial impacts to adult lamprey passage as a result of reduced nighttime velocities. However the purpose of this evaluation is to evaluate the potential for no benefit or

negative impacts to adult lamprey attempting to pass through these entrances and determine if a permanent change to operations is warranted.

**Comments from agencies** – No comments were received.

**Final coordination results –**

From the May FPOM meeting:

**19TDA08 MOC Lamprey Reduced Nighttime Flows** – The flow will be the same but the differential will be lower. The differential will be 0.5' for nineteen randomized days. **FPOM concurred.**

**After Action update**

All adjustments were made per schedule, with the exception of 1 morning when weirs were not returned to normal until ~0600 due to a work schedule miscommunication. All adjustments only required lowering entrance weirs. Fish units discharge remained the same throughout the test period. Refer to final report for passage results.

Please email or call myself or Erin with questions or concerns.

Thank you,

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