CENWW-OD-WM **19 August 2016**

MEMORANDUM FOR THE RECORD - 16 MCN 015 MFR Oregon Ladder Picketed Lead Debris Blockage and Weir 338 Failure.

SUBJECT: Oregon ladder exit picketed lead debris blockage and weir 338 failure. Adult sockeye, steelhead and Chinook passage affected. No fish mortality.

During the evening of August 18 – 19, overnight northeast winds began moving aquatic vegetation to and around the Oregon ladder exit. At 0110 hours on August 19, an alarm sounded in the control room. The roving operator found approximately 2 feet of flow over the picketed lead walkway. By 0150 hours, the general maintenance staff was on project to clean the leads. The ladder was switched to orifice flow. By 0300 hours, the leads were cleaned and the ladder returned to automatic mode.

At 0453 hours, the aquatic vegetation on the leads had built up, again sounding the alarm within the control room. At 0530 hours, the ladder was switched to orifice flow to release pressure from the leads support structure. By 0730 hours, the general maintenance staff had completed cleaning the leads again. At 0745 hours, the roving operated noted weirs 338 and 339 were not responding. The electrical staff was called in at 0757 hours. Operators also noted that weir 338 had flipped and was lying downstream instead of lying upstream (This is probably what damaged the gear box mentioned below). By 0847 hours, the decision was made to remain in orifice flow and leave the picketed leads raised.

At 0900 hours, the biologist cleaned the Washington picketed leads, which had a differential of at least one foot.

From 0900 hours to 1200 hours, the general maintenance staff restored weir 338 to the proper position and the leads were lowered, while the electrical staff returned power to weirs 338 and 339. The ladder exit was also returned to automatic mode. The general maintenance staff checked both ladder exits before leaving the project at 1600 hours.

Weir 338 remains out of service as one of the two associated gear boxes was found cracked (see figures 1 & 2 below). The weir shafts may also be bent, but this cannot be determined for certain until the weir drive is removed at a future date. As a preventative measure, mechanics removed all oil from the gear box to ensure oil would not seep into the ladder or river.

Gear box replacement necessitates the removal of the entire drive assembly which would require a 2 to 3 day ladder outage. The drive assembly from weir 340 (which does not move under the current forebay elevation restraints) would have to be used as a replacement.

Due to high water temperatures (refer to Figures 3 & 4 below) and increasing adult fish counts (refer to Figures 5 & 6 and Tables 1 & 2 below), project staff have deemed it prudent to defer repairs to the February ladder outage period. An emergency ladder outage could lead to delay of adult fish passage and the need to conduct an extensive fish recovery operation. The ladder exit

software program is able to regulate the ladder with weir 338 out of service and still maintain criteria.

A. Species – sockeye, summer steelhead and fall Chinook.
B. Origin – hatchery and wild.
C. Length – none measured.
D. Marks and tags –none observed.
E. Marks and Injuries found on carcass –no carcass involved.
F. Cause and Time of Death –no mortality to report.
G. Future and Preventative Measures – No mortality occurred. However, some delay in passage would be expected. Monitor the Oregon exit closely and have the operators make weir adjustments as required for forebay elevation changes when needed. Possibly ask for a forebay elevation restriction. These two items would help maintain criteria until the February ladder outage. As soon as practical, have spare gear boxes ordered. For the future, identify possible ways to remove aquatic vegetation from the area of the Oregon exit before wind storms occur, as this was the main cause of the picketed lead blockage. Examine installation of a picketed lead hoist system like the Washington ladder exit.

Sincerely,
Bobby Johnson
Denise Griffith
Project Fisheries

Figure 1.

Figure 2.

Figure 3.

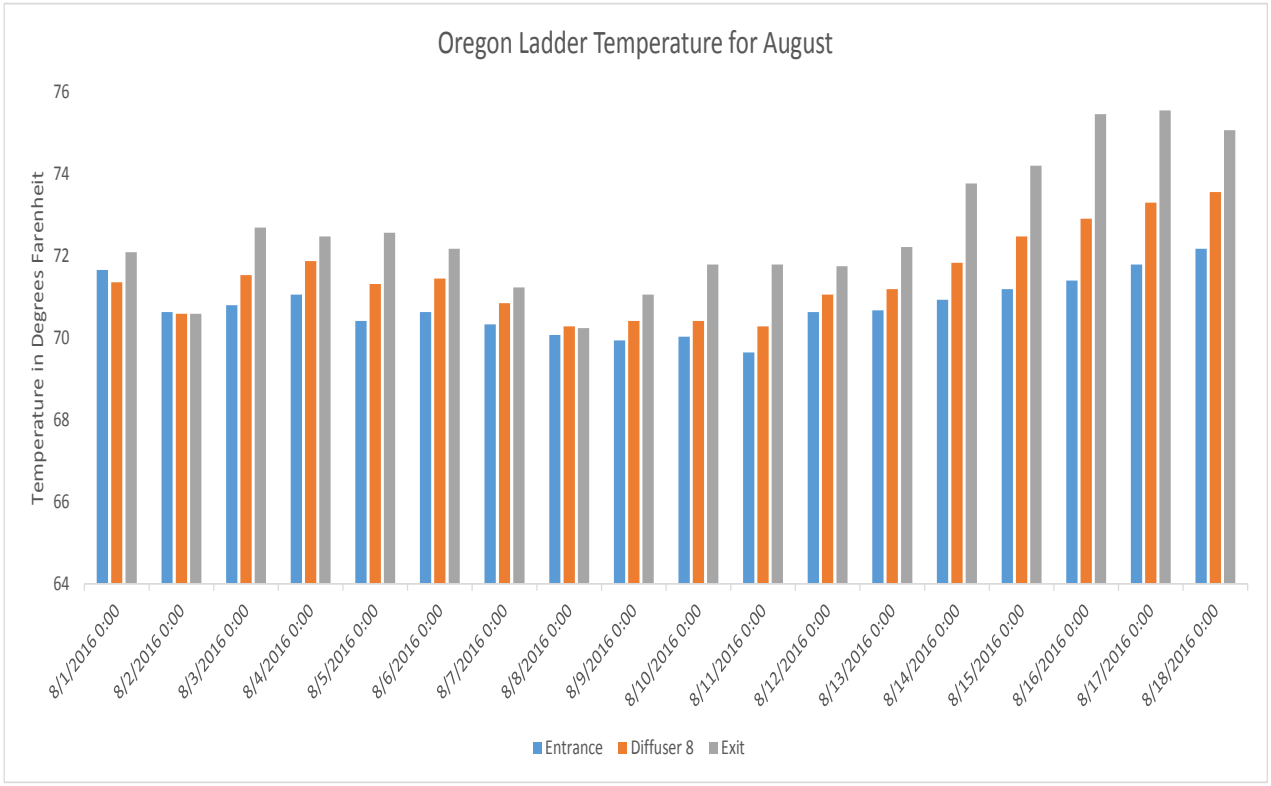
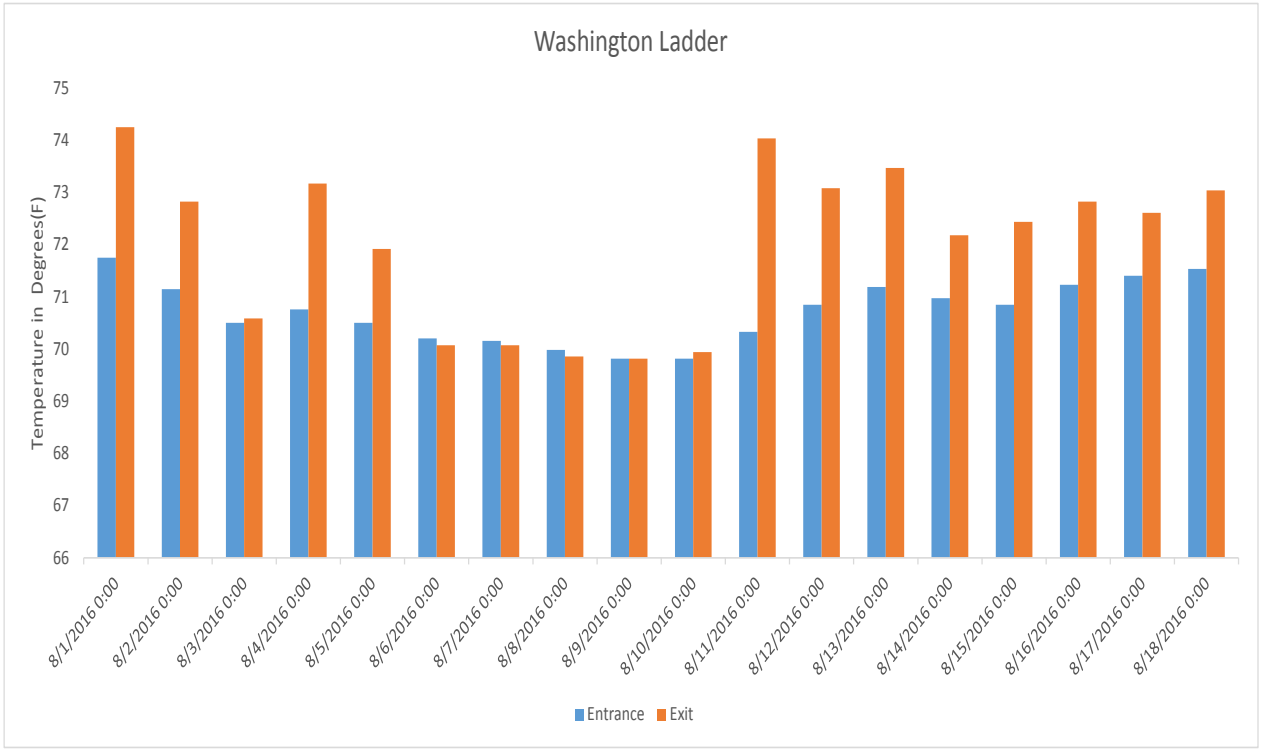


Figure 4.



Figures 5.

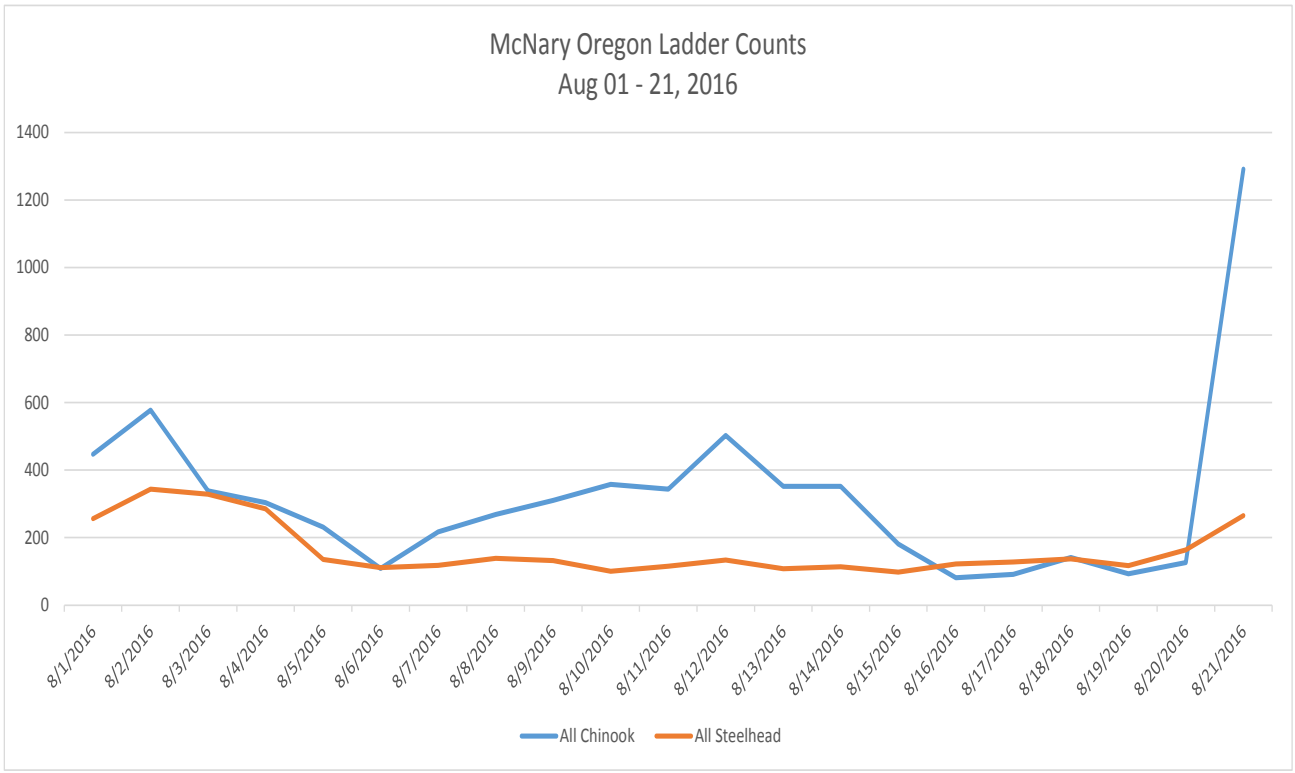


Figure 6.

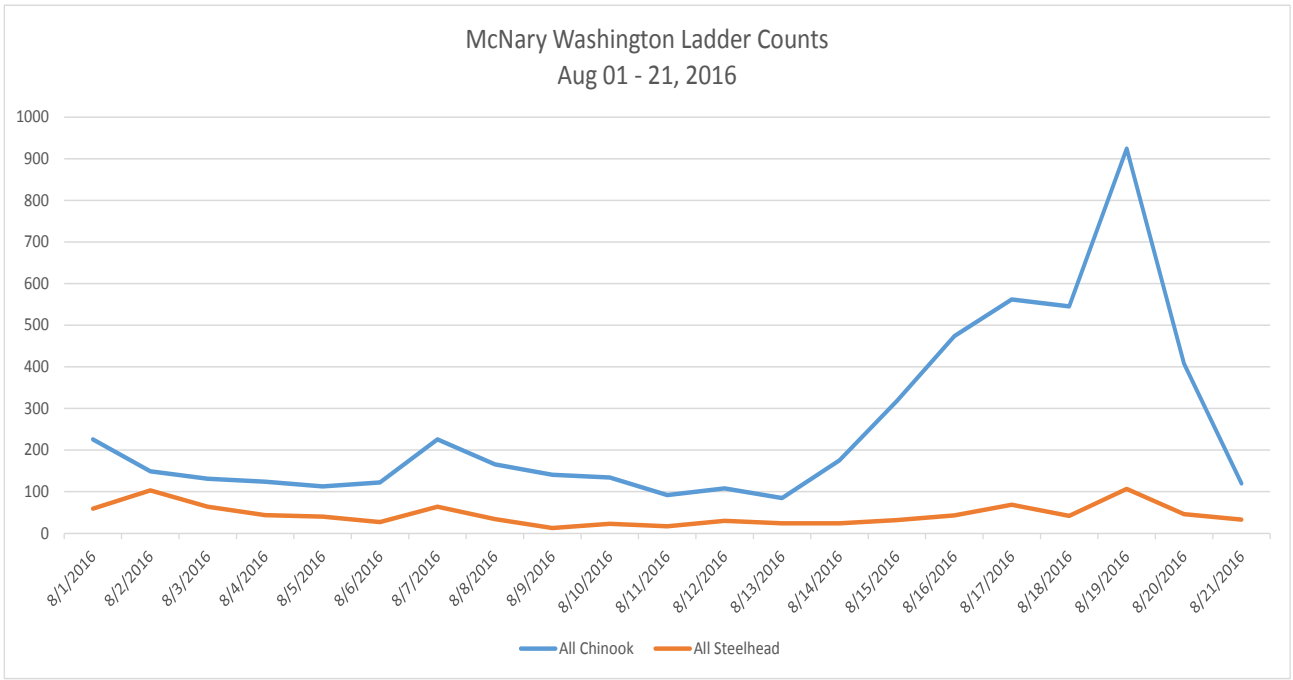


Table 1.

Table 2.

Oregon Ladder		
Date	**All Chinook**	**All Steelhead**
8/1/2016	447	256
8/2/2016	578	344
8/3/2016	339	329
8/4/2016	304	285
8/5/2016	231	135
8/6/2016	109	111
8/7/2016	217	118
8/8/2016	269	139
8/9/2016	310	132
8/10/2016	358	100
8/11/2016	344	115
8/12/2016	503	134
8/13/2016	352	108
8/14/2016	352	114
8/15/2016	181	98
8/16/2016	81	122
8/17/2016	91	128
8/18/2016	141	137
8/19/2016	93	117
8/20/2016	126	164
8/21/2016	1291	265

Washington Ladder		
Date	**All Chinook**	**All Steelhead**
8/1/2016	226	59
8/2/2016	149	103
8/3/2016	131	64
8/4/2016	124	44
8/5/2016	113	40
8/6/2016	122	27
8/7/2016	226	64
8/8/2016	166	34
8/9/2016	141	13
8/10/2016	134	23
8/11/2016	92	17
8/12/2016	108	30
8/13/2016	85	24
8/14/2016	175	24
8/15/2016	318	32
8/16/2016	474	43
8/17/2016	562	69
8/18/2016	545	42
8/19/2016	924	107
8/20/2016	408	46
8/21/2016	120	33