



FISH PASSAGE CENTER

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MEMORANDUM

TO: FPAC

FROM: David A. Benner

DATE: June 17, 2014

RE: Fish Injuries at Wells Dam Trap

On May 23, 2014, the Washington Department of Fish and Wildlife Fish Health Division sent out four pictures of adult fish with significant injuries that were trapped at Wells Dam. At this time, it was hypothesized that these injuries were the likely result of either modifications made to fishways at Wanapum Dam or the entrance denils at Rock Island Dam. The following are two of the four original pictures.



Due to the relative significance and freshness of the injuries recorded at the Wells Dam Trap, an investigation was conducted into the cause of the injuries. The injury rate of fish trapped and sampled at Wells ranged between 10% and 25%. The following sources of injury were investigated: predation from sea lions, the modified fish ladder exits weirs at Wanapum Dam, the entrance denils at Rock Island Dam, and the west ladder fish trap at Wells Dam.

The Fisheries Field Unit at Bonneville Dam was contacted regarding the likelihood that these wounds could have been caused by sea lions. Although some wounds may have been consistent with injuries caused by sea lions, the general opinion was that any wounds caused by sea lions would have likely occurred below Bonneville Dam and these injuries would have begun healing and not been as fresh as those seen in the pictures from the Wells Dam Trap.

To define where the problem was occurring, the Public Utilities Districts (PUDs) were asked to review their fish counting tapes for significant fish injuries. The PUDs count fish through their count window via video. They have the ability to store this video for approximately one month, and therefore, could go back and review their video that had already been counted for significant injuries. This is different from the Corps of Engineers projects that typically visually count during daylight hours, so no review is possible of daytime counts. The PUDS agreed to review prior tapes and begin recording injuries daily as part of their counting process. The following tables display injury information at Grant County (Table 1) and Chelan PUDs (Tables 2 and 3).

Table 1. Grant County Significant Injuries of Adult Chinook (no Jacks) by Fish Ladder May 28, 2014, to June 3, 2014. Injuries were defined as deep gouges, head wounds, and nose fungus.

| Date, Bank Counted | Priest Rapids Adult Chinook Counts/Injuries | | |
|--------------------|---------------------------------------------|------------------------|------------|
| | Number Injured Adults | Bank Total Adult Count | % Injured |
| May 28, LB | 2 | 207 | 1.0 |
| May 28, RB | 0 | 55 | 0.0 |
| May 29, LB | 0 | 141 | 0.0 |
| May 29, RB | 0 | 35 | 0.0 |
| May 30, LB | 2 | 218 | 0.9 |
| May 30, RB | 0 | 33 | 0.0 |
| May 31, LB | 3 | 139 | 2.2 |
| May 31, RB | 0 | 48 | 0.0 |
| June 1, LB | 2 | 148 | 1.4 |
| June 1, RB | 1 | 75 | 1.3 |
| June 2, LB | 3 | 286 | 1.0 |
| June 2, RB | 0 | 41 | 0.0 |
| June 3, LB | 6 | 372 | 1.6 |
| June 3, RB | 0 | 73 | 0.0 |
| Total | 19 | 1871 | 1.0 |

Table 2. Chelan County Significant Injuries of Chinook at Rock Island Dam by Fish Ladder April 26, 2014, to June 5, 2014. Injuries were defined as gouges, missing pieces of flesh, missing patches of skin with muscle exposed, etc.

| | Rock Island Dam Total Chinook Counts/Injuries | | |
|--------------------|-----------------------------------------------|---------------------|-----------------|
| | Number of Observed | Total Chinook Count | |
| | Injured Chinook | (26 Apr - 5 June) | Percent injured |
| Left Bank Fishway | 59 | 5,318 | 1.1% |
| Center Fishway | 6 | 7,098 | 0.1% |
| Right Bank Fishway | 61 | 8,818 | 0.7% |
| Total | 126 | 21,234 | 0.6% |

Table 3. Chelan County Significant Injuries of Chinook at Rocky Reach Dam April 26, 2014, to June 5, 2014. Injuries were defined as gouges, missing pieces of flesh, missing patches of skin with muscle exposed, etc.

| | Rocky Reach Dam | | |
|-------|--------------------|---------------------|-----------------|
| | Number of Observed | Total Chinook Count | |
| | Injured Chinook | (26 Apr - 5 June) | Percent Injured |
| Total | 36 | 11,586 | 0.3% |

The significant injury rates of adult Chinook passing the Priest Rapids Dam between May 28, 2014, and June 3, 2014, was 1%. Over the count review time period, the individual ladder injury rate was 1.2% on the Left Bank ladder and 0.3% on the Right Bank ladder, with a combined injury rate of 1%. A comparison of significant injuries between Rapids Dam and Rock Island Dam was used to determine if there were a noticeable source of injury between the Priest Rapids Count station and the Rock Island Count Stations. This year major modifications have been constructed at both ladder exits at Wanapum Dam and two denils had been installed at two of four right bank entrances at Rock Island Dam. It should be pointed out that this year, due to the drawdown of Wanapum pool, Grant County is unable to operate counting stations at Wanapum Dam. Differences in injury rates between Priest Rapids Dam and Rock Island Dam would indicate that one or more of the fish ladder modifications were a possible source of significant injury. Additionally, because the denils at Rock Island were located at right bank fishway entrances, large differences between ladders at Rock Island would indicate the denils could be causing injury.

The overall rates of injury between Priest Rapids Dam and Rock Island Dam varied slightly between individual ladders but were consistently below 1.2%. The injury rate at the Right Bank fishway at Rock Island Dam was 0.7% (denils in two of four entrances), whereas the injury rate at the Left Bank and Center fishways were 1.1% and 0.1%,

respectively. Comparison of the rates of injury between Priest Rapids Dam and Rock Island showed relatively consistent rates of significant injury, with no rates of injury that were near that recorded at the Wells Dam West ladder Trap (15% or more). There was nothing to indicate that either the modified exits at Wanapum Dam or the denils at Rock Island Dam were causing extraordinary injuries. During this process of injury determination, the Grant County PUD did send divers into the forebay area of the Left Bank ladder exit at Wanapum Dam (area of exit discharge) and did find and remove some rebar that was lying on the bottom of the forebay that was estimated to be at a depth of 18 feet.

Between Rock Island and Rocky Reach Dam, the Wenatchee River branches off the Columbia River and Chinook return to the Leavenworth Fish Hatchery. The Leavenworth Fish Hatchery was contacted concerning the condition of the spring Chinook that were returning to their facility. At the time of inquiry, 778 spring Chinook had returned to the hatchery with no indications of extraordinary injury; in fact, it was stated that the spring Chinook this year were some of the nicest seen in the last ten years. Review of video counts between April 26, 2014, and June 5, 2014, at Rocky Reach Dam showed a Chinook injury rate of 0.3%. Combining all injury data collected from the Priest Rapids count stations up through the Rocky Reach count station and including the condition of Chinook returning to the Leavenworth hatchery, there were no indications of extraordinary injury between these locations.

Douglas PUD reviewed video counts between May 17, 2014, and June 12, 2014. Table 4 displays the injuries by ladder and total injuries as well as the trapping operations at the Wells West ladder. At Wells Dam this year trapping has occurred on the West Fish ladder. Fish are trapped off the ladder and sampled for tags, scale samples, etc., and are returned to the ladder after sampling (signified by the 'release' in Table 4).

The Wells Dam West Ladder demonstrated an average injury rate of 2.7% between May 17, 2014, and June 12, 2014, as compared to 1.2% on the East Ladder over the same period. Furthermore, the highest rates of daily injury rates appear to coincide (same day or day delay) with the releases of trapped fish back into the fish ladder. With daily rates of injury on the west ladder as high as 7.1%; the trapping operation on the west ladder at Wells Dam deserved some investigation.

During trapping operations at the West Ladder at Wells, a picketed lead is lowered into the fishway that redirects fish up through a small denil into a holding pool. Once into the holding pool fish then travel down a small flume where they are either directed back into the ladder (upstream of the picketed lead) or directed to the trap (see pictures below). The route to the west ladder trap is through an approximate 2-foot diameter pipe (several hundred feet long) through a dewatering area and into a holding pool, where fish are held to be sampled. After sampling, they are put into trucks and released back into the west fish ladder (below the count station).

Table 4. Douglas County PUD Significant Injuries of Adult Chinook at Wells Dam May 17, 2014, to June 12, 2014.

| Date | Chinook (Adults + Jacks) at Wells | | | | | | | | | Wells W. Ladder Trap Ops | |
|-----------|-----------------------------------|----------|---------|-------|----------|---------|-------|----------|---------|--------------------------|---------|
| | West | | | East | | | Total | | | | |
| | Count | Injuries | Rate(%) | Count | Injuries | Rate(%) | Count | Injuries | Rate(%) | | |
| 5/17/2014 | 119 | 4 | 3.4 | 88 | 1 | 1.1 | 207 | 5 | 2.4 | | |
| 5/18/2014 | 184 | | | 158 | | | 342 | | | | |
| 5/28/2014 | 141 | 2 | 1.4 | 159 | 1 | 0.6 | 300 | 3 | 1.0 | Trapping | Release |
| 5/29/2014 | 301 | 11 | 3.7 | 57 | 0 | 0.0 | 358 | 11 | 3.1 | Trapping | Release |
| 5/30/2014 | 250 | 10 | 4.0 | 98 | 1 | 1.0 | 348 | 11 | 3.2 | | Release |
| 5/31/2014 | 323 | 6 | 1.9 | 175 | 0 | 0.0 | 498 | 6 | 1.2 | | |
| 6/1/2014 | 237 | 10 | 4.2 | 125 | 2 | 1.6 | 362 | 12 | 3.3 | | |
| 6/2/2014 | 75 | 2 | 2.7 | 117 | 2 | 1.7 | 192 | 4 | 2.1 | Trapping | |
| 6/3/2014 | 187 | 2 | 1.1 | 68 | 0 | 0.0 | 255 | 2 | 0.8 | Trapping | Release |
| 6/4/2014 | 249 | 0 | 0.0 | 76 | 2 | 2.6 | 325 | 2 | 0.6 | Trapping | Release |
| 6/5/2014 | 241 | 2 | 0.8 | 49 | 0 | 0.0 | 290 | 2 | 0.7 | | Release |
| 6/6/2014 | 205 | 5 | 2.4 | 57 | 1 | 1.8 | 262 | 6 | 2.3 | | |
| 6/7/2014 | 145 | 6 | 4.1 | 57 | 0 | 0.0 | 202 | 6 | 3.0 | | |
| 6/8/2014 | 85 | 0 | 0.0 | 40 | 0 | 0.0 | 125 | 0 | 0.0 | | |
| 6/9/2014 | 53 | 0 | 0.0 | 41 | 1 | 2.4 | 94 | 1 | 1.1 | Trapping | |
| 6/10/2014 | 85 | 6 | 7.1 | 41 | 1 | 2.4 | 126 | 7 | 5.6 | Trapping | Release |
| 6/11/2014 | 106 | 7 | 6.6 | 34 | 2 | 5.9 | 140 | 9 | 6.4 | Trapping | Release |
| 6/12/2014 | 119 | 3 | 2.5 | 32 | 0 | 0.0 | 151 | 3 | 2.0 | | Release |
| Totals | 3105 | 76 | 2.7 | 1472 | 14 | 1.2 | 4577 | 90 | 2.0 | | |



On Thursday June 5, 2014, the Fish Passage Center visited the West Ladder Trap and observed a sample of 77 fish. Of the 77 fish sampled on June 5, 2014, 13 were deemed to have significant injuries, an injury rate of 17%. Of the 13 fish with injuries, less than one-half had injuries that could be considered recent (within two days); one injury was still bleeding upon examination (last photo below). Below is a sample of several injuries recorded at the West Ladder Trap on June 5, 2014, that were thought to be more recent. It should be pointed out that none of the injuries seen on June 5, 2014, appeared as significant and fresh as those shown in the original Wells Dam pictures (see the beginning of this document), with the exception of the one injury that was bleeding upon examination.



After the last week's trapping operation, the West Ladder Fish Trap was dewatered and inspected for sources of injury. No obvious sources were discovered as of June 13, 2014; however Douglas PUD was unable to inspect the enclosed pipe that leads from the fish ladder to the holding facility. Before trapping resumed this week, the PUD was going send a block of ice down the pipe to check/clear potential obstructions.

Summary

The following is a summary of what is known to date and recommended actions.

- At this point, it is known that there is a low level of fish coming into the middle Columbia at Priest Rapids that can be considered significantly injured. In most cases, wounds to these fish have already begun the healing process. From video count reviews at Grant PUD, Chelan PUD, and Douglas PUD, these fish represent approximately 1% or less of those passing the count stations (which see only one side of the fish).
- The West Ladder at Wells has a higher rate of injury as compared to all other locations at middle Columbia projects; this rate is 2.7% on average between May 17, 2014, and June 12th, 2014 (daily rates have been as high as 7.1%).
- Injury rates at the West Ladder appear to follow trapping/release operations and injury rates have been the highest over the last several days of data collection.
- It is likely, based on the information collected, that the some portion of the injury issue is occurring in the Wells trap on the West Ladder.

Actions taken and recommended additional actions

Although the West Trap has been dewatered and mostly inspected, there is a difference between the rates of injury on the west and east ladders (and the injury rates do not appear to be decreasing). The long pipe through which fish must pass after being diverted from the ladder has not been inspected because of logistics and it may possibly be a source of injuries.

1. WDFW plans to trap for spring Chinook through the end of June on the West Ladder. However WDFW stated there was some potential to suspend the last week of sampling, considering injury rates and the higher number of summer Chinook in their sample tanks (although summer Chinook counting has not officially begun at Wells).
2. The value of the last week of June sampling should be considered along with the rates of injury on the West Ladder.
3. If sample data is needed, trapping could occur on the East Ladder at Wells, in which fish would divert directly into a tank (no enclosed pipe, etc.) and injury rates could be monitored at both ladders. With the injury data now obtained at Wells, an extended period of no trapping on the West Ladder would confirm one way or another if the trapping operation was impacting injury rates.