FISH PASSAGE MONITORING OF THE NORTH SHORE FISHWAY HYDROELECTRIC PROJECT AT THE DALLES DAM

2014 Report February 2014

NORTHERN WASCO COUNTY PUD
PEOPLE'S UTILITY DISTRICT

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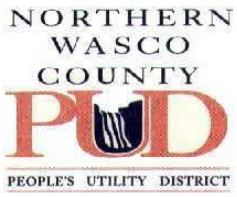

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NORTH SHORE FISHWAY HYDROELECTRIC PROJECT

AT THE DALLES DAM

2014 Annual Report

April 1 – July 30, 2014

Submitted by
Rick D. Martinson, Fisheries Biologist

For

NORTHERN WASCO COUNTY PEOPLE'S UTILITY DISTRICT
The Dalles, Oregon

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TABLE OF CONTENTS

INTRODUCTION 5
METHODS 5
Sampling 5
Figure 1. Collection tank being put in sampling position and in use. 5
Maintenance 6
Figure 2. PUD Inspection images, February 2013. 7
Permits 7
Soft Constraint 7
RESULTS AND DISCUSSION 8
Season Length 8
Sample Numbers 8
Table 1. Sample numbers, percent composition, descaling and mortality, PUD, 2014. 8
Fish Condition 8
Figure 3. Percent of season total by species for each sample, PUD, 2014. 8
Detailed Condition Data 9
River Flow and Spill 9
Figure 4. Sample size and spill, PUD, 2014. 9
Table 2. Sample conditions by month, based on sample days only. PUD, 2014. 10
Table 3. Average river conditions during each 24 hour sample period, PUD, 2014. 10
Figure 5. River conditions for each sample period, 2014. 10
Figure 6. Minimum forebay elevation for sampling and forebay elevation, PUD, 2014. 11
ESA Take Summary 11
Table 4. Comparison of estimated to actual "Take" of ESA stocks, PUD, 2014. 11
Incidental Catch 12
Recommendations 12
ACKNOWLEDGMENTS 12
RELATED PUBLICATIONS 12
APPENDIX 13
Table A-1. Sample, descaling, and mortality data 14
Table A-2. Incidental catch, PUD, 2014. 15
Table A-3. Condition subsampling results, PUD, 2014. 15
Table A-4. Historical summary of sampling data for the PUD, 1991-2014. 16

Abstract: The total number of fish sampled this year was 420, less than half of last year's 1,079. This year fry were 68.1% of all fish sampled, last year they were 84.7% of the sample. Including fry, subyearlings were 79.5% of the sample this year, leaving 13.6% for yearling Chinook, 0.7% for Coho, 5.0 for Sockeye,0.7 % for clipped steelhead and 0.5% for unclipped steelhead Overall descaling was low, only 3 of 134 non-fry salmonids were descaled, for an all species combined rate of 0.7%. Fry are not examined for descaling but they are included in the mortality calculation, which was 5.2% this year (22 of 420). Almost half of the morts, 10 of the 22, were fry. A total of 1,224 non salmonid incidental species were sampled. Overall, low descaling, mortality and injury data suggest that the dewatering system performed at an acceptable level this season, safely conveying the fish to the tailrace.

INTRODUCTION

The Northern Wasco County People's Utility District (PUD) owns and operates a hydroelectric project located on the north shore of The Dalles Dam. It is referred to as the North Shore Fishway Hydroelectric Project (NSFHP). The turbine is powered by about 800 cfs that, prior to the PUD turbine construction, plunged into a basin and then into the fish ladder as auxiliary water. The PUD diverted that flow into a screened intake structure that separates the fish from most of the flow. The fish free water powers the turbine and then supplements the flow in the north shore fishway entrance. Fish pass out the end of the intake structure and into a pipe that conveys them to the tailrace. Annual evaluation of passage conditions, based on the condition of sampled fish, has occurred every year, except 2007, since the unit went on line in 1991. This monitoring is stipulated in the Federal Energy Regulatory Commission issued operating permit. This report covers sampling activities in 2014 and includes summaries of previous years' data. The objective of this report is to summarize the results of the fish sampling, both in quantity and quality of fish, relate that to performance of the bypass system, and to suggest improvements.

METHODS

Sampling

Samples are collected by positioning the collection tank under the dewatering structure discharge weir. The water depth over the weir is reduced from about 1' to about 0.3'or less to reduce the turbulence in the collection tank. The tank is fitted with baffles which create a sanctuary area at the downstream end of the tank. Excess water drains out through perforated plate on the sides and upstream end of the tank. Fish are collected in the holding tank for 24 hours, from 0800 on Tuesday to 0800 on Wednesday, once per week, April through July.

Figure 1. Collection tank being put in sampling position and in use.

To examine fish, the water level in the holding tank is lowered to about 6 inches. The fish are crowded to one end of the tank and a sliding aluminum divider is lowered to keep fish at that end of the tank. A common fish anesthetic (MS-222) is added to sedate the fish. Fish are net transferred to an examination sink, also containing MS-222, to sustain the sedation and reduce stress during handling. Fish are counted, identified to species, examined for injuries, and measured for length. Descaling is estimated and categorized as normal (0-3% scale loss), partially descaled (4-19% scale loss), or descaled if 20% or more of the scales are missing from one side.

Dead fish in the sample tank were either considered a sample mortality or in-river mortality. A sample mortality is any fish that appeared to have died recently from an injury sustained during passage, an accident during processing, or for no apparent reason. This type of mortality could be related to passage through the Corps of Engineers (CoE) maintained trash racks or the PUD screened intake, or sampling equipment. In-river mortality are fish that exhibited disease symptoms such as BKD or fungus, was in an advanced stage of decomposition, or had scars from attempted predation serious enough to cause death. This type of mortality is not attributed to PUD project passage.

Following examination, all fish were allowed to recover from the anesthesia and then released back to the river via the bypass pipe.

Maintenance

The CoE raked turbine intake trash racks if the differential exceeded 0.5'. The vertically oriented bars are less than one inch apart which prevents adult fish and large debris from entering the system.

The PUD dewatering screens are cleaned by an automated cleaning system, activated when differential across the screens reaches 0.5'. However, differential seldom gets that high so the PUD staff manually initiates the cleaning cycle as needed to maintain a 0.3' differential across the screen. Also, the screens were cleaned prior to sampling regardless of differential to reduce possible debris related impacts during the sampling period. Based on the small amount of debris and the efficiency of the cleaning system, which is rarely initiated due to differential, it is thought that a clean system more closely represents "normal operations". Annual inspections and maintenance were completed during the CoE's annual winter maintenance shutdown of the north shore fishway in January.

This year the dewatering structure was back flushed when it was taken down for inspection. This method removes the bulk of the debris that accumulates at the downstream end of the dewatering structure.

The pictures in Figure 2 show the dewatering structure screens (right) and the downstream end (left). It is apparent that the vertical wall screens are thoroughly cleaned by the screen cleaning system. The picture on the left shows the portions of the screens over the diagonal floor area that are cleaned by the "wiper blade" style brushes and the portions that are not cleaned. The areas not cleaned by the brushes are occluded with debris.



Figure 2. PUD Inspection images, February 2013.

Fortunately, I think most of this debris accumulates after the fish passage season so it isn't a problem for the bulk of the migrants. However, debris accumulation in a necked down fish passage area is never a good thing, and there are salmon fry and lamprey present that are likely killed or injured by these conditions so it would be beneficial to minimize this accumulation.

Permits

Sampling was conducted under a Scientific Collection permit from Washington Department of Fish & Wildlife (#13-340) and an Endangered Species Act Biological Opinion, Incidental Take Statement, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for Northern Wasco County PUD's North Shore Hydroelectric Project, signed 12/19/2011.

Soft Constraint

In some years a soft constraint on The Dalles forebay elevation is requested. The Corps of Engineers can issue this request very quickly so sampling usually starts without it and forebay levels are monitored as sampling proceeds. The soft constraint stipulates that during the 24 hour sampling period, the forebay should be kept above 158'. The elevation of the sample collection tank is fixed so as the forebay drops, the distance from the bottom of the discharge weir to the top of the tank decreases. If the forebay drops below 158', the discharge from the weir impacts the end of the tank. This is a dangerous situation for fish and sampling is terminated if it occurs. This year it was not necessary to request the soft constraint.

RESULTS AND DISCUSSION

Season Length

The first sample was processed on 2 April and the last on 30 July, for a total of 18 samples.

Sample Numbers

This year, 420 salmonids were sampled, about 39% of the 1,079 sampled last year. Subyearling Chinook, including fry, were 79.5% of the sample. Fry alone constituted 68.1% of all fish sampled. Yearling Chinook were 13.6% of the sample, followed by sockeye at 5.0% and coho at .7%, clipped steelhead at 0.7% and unclipped steelhead at 0.5% (Table 1).

Table 1. Sample numbers, percent composition, descaling and mortality, PUD, 2014.

					Mortality			
	Sample #	% of Tot	Descaling		Sample		Run of River	
Species		Comp.	#	%	#	%	#	%
Chinook 1	57	13.6%	1	1.8%	4	7.0%	2	3.5%
Chinook 0 (non-fry)	48	11.4%	0	0.0%	5	10.4%	0	0.0%
Chinook 0 (Fry)	286	68.1%			10	3.5%	0	0.0%
Unclipped Steelhead	2	0.5%	1	50.0%	0	0.0%	0	0.0%
Clipped Steelhead	3	0.7%	1	33.3%	1	33.3%	1	33.3%
Coho	3	0.7%	0	0.0%	0	0.0%	0	0.0%
Sockeye	21	5.0%	0	0.0%	2	9.5%	1	4.8%
All Species	420	100%	3	0.7%	22	5.2%	4	1.0%

The samples collected in April accounted for 67.1% of the fish collected this year (Table A-1). Subyearling Chinook fry accounted for about 88% of those fish. In May, 24.5% of the fish were sampled, in June, 5.5% and in July 2.9% of the fish were sampled (Table A-1). Species distribution was similar to previous years with subyearling Chinook fry, yearling Chinook and steelhead present in April and May. Sockeye and coho arrived slightly later and subyearling Chinook were present from mid-May and into early July (Figure 3).

Fish Condition

Of the 420 salmonids sampled this year, only 3 were descaled (Table 1 and Table A-1). This is 0.7% for the season, below the historical average (Table A-4) and a good indication that the dewatering structure and screen cleaning system were working well and passing fish without injury, with the possible exception of subyearling chinook fry, which constitute the bulk of the mortality.

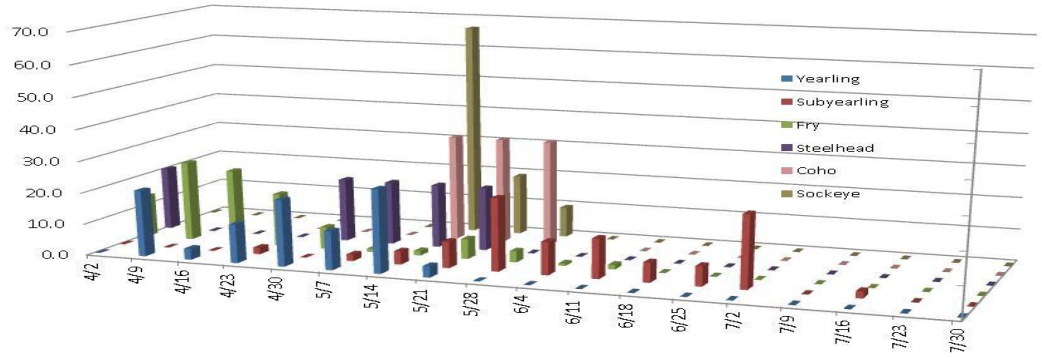

Figure 3. Percent of season total by species for each sample, PUD, 2014.

Sample mortality for the season for all species combined was 5.2%, up from 1.9% last year but below the historical average of 6.4 % (Table A-4). About half of the mortality, 10 of 22, were fry. Numerous precautions are taken to protect fry, including reduced discharge (results in less turbulence in the sample collection tank) regular debris removal, and surface passage to the sanctuary end of the tank, but we have not succeeded in eliminating fry mortality.

There were four "Run-of-River" mortalities recorded this year. Run of river mortalities are dead fish that can reasonably be attributed to something other than passage through the dewatering structure. Examples consist primarily of obvious disease symptoms and predation. These fish are not included in the "sample" mortality summary above.

Detailed Condition Data

Fish are inspected for more detailed condition data, such as parasites, disease, predation marks, injuries, and others. For yearling Chinook, the most common condition observed was fungus (3 of 53=5.7%) followed by partial descaling and head injuries, both at 3.8%, 2 of 53. For subyearling Chinook, partial descaling and fungus were observed on 2.3% of the fish examined (1 of 43- each category). A complete summary of the results can be found in Table A-3.

River Flow and Spill

Fry dominated the samples in April when river flow averaged 250.3 kcfs. River flow averaged 310.3 Kcfs in May and peaked for the season in late May at about 350 kcfs (Table 3). Spill for juvenile passage occurred during all of the PUD sample periods except the first one (Figure 4, Table 3). Spill averaged between 34% and 40% of river flow in all four months of sampling, April through July (Table 2). Typically, there is a significant drop in sample numbers with the onset of spill, but not this year. Sample size increased during the first week of spill and only started to decline during the second week of spill (Figure 4). This is likely due to fry moving down the Washington shore and not being pulled into spill. River conditions and forebay elevation for each sample period are presented in Table 3 and Figure 5.

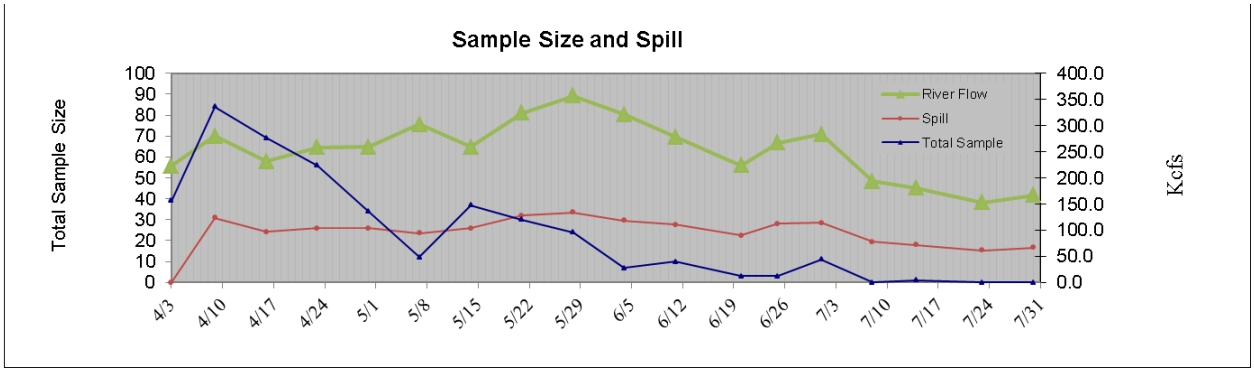

Figure 4. Sample size and spill, PUD, 2014.

Table 2. Sample conditions by month, based on sample days only. PUD, 2014.

	Avg. River	Avg. Spill	Temp	Spill as % of River
April	250.3	85.6	48.7	34%
May	310.3	114.9	55.8	37%
June	272.6	107.6	60.7	39%
July	195.4	78.2	67.9	40%

Table 3. Average river conditions during each 24 hour sample period, PUD, 2014.

Sample End Date	River Flow	Spill	Forebay	Temp
3-Apr	223.1	0.0	158.7	44.6
9-Apr	279.9	123.8	157.9	49.0
16-Apr	231.7	97.1	158.6	49.5
23-Apr	258.2	103.2	158.2	50.0
30-Apr	258.8	103.8	158.8	50.5
7-May	302.1	94.4	159.0	53.3
14-May	258.8	103.2	158.5	54.7
21-May	323.7	128.0	158.7	57.1
28-May	356.4	133.9	159.0	58.1
4-Jun	321.5	118.1	158.6	58.6
11-Jun	278.0	110.9	158.5	61.2
20-Jun	223.9	89.4	158.7	60.5
25-Jun	266.9	112.0	158.5	62.3
1-Jul	283.5	113.9	159.0	64.3
8-Jul	193.3	77.4	158.8	66.9
14-Jul	180.4	71.9	158.9	69.6
23-Jul	152.9	61.1	158.9	69.1
30-Jul	167.1	66.7	158.7	69.7

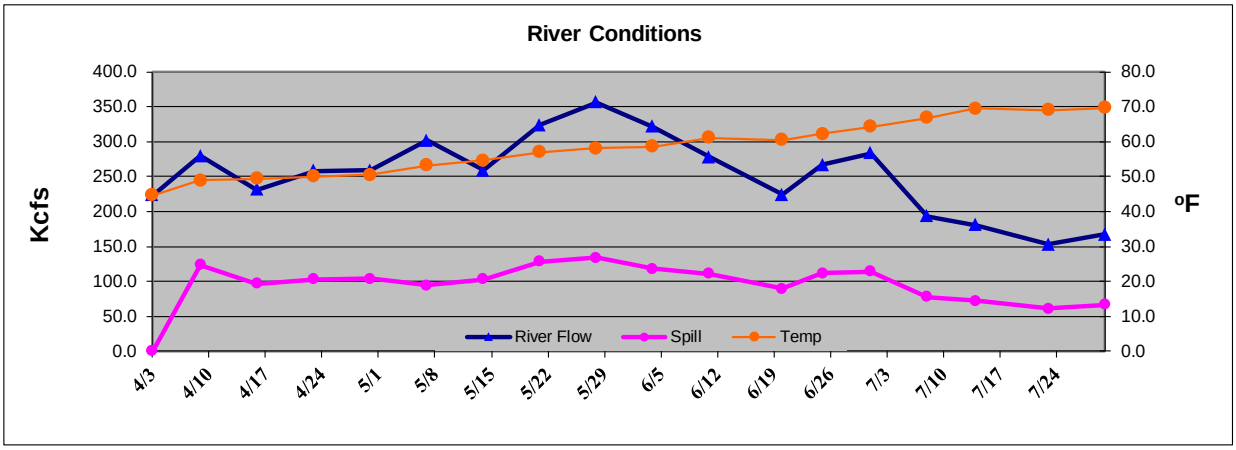

Figure 5. River conditions for each sample period, 2014.

Forebay elevations presented in Table 4 are the averages for each 24 hour sample period. When the forebay elevation falls below 158' it can be a problem for the sample collection system. The forebay averaged below 158' for the 9 April sample but not enough to create a problem (Figure 5 & 6). There is some inherent variability in the water level sensors, and other aspects of the system making the 158' forebay minimum more of a cautionary point rather than a firm cutoff. Water temperature was at or near 70 degrees Fahrenheit during the last three samples of the season but did not present a problem (Table 4 & Figure 5).

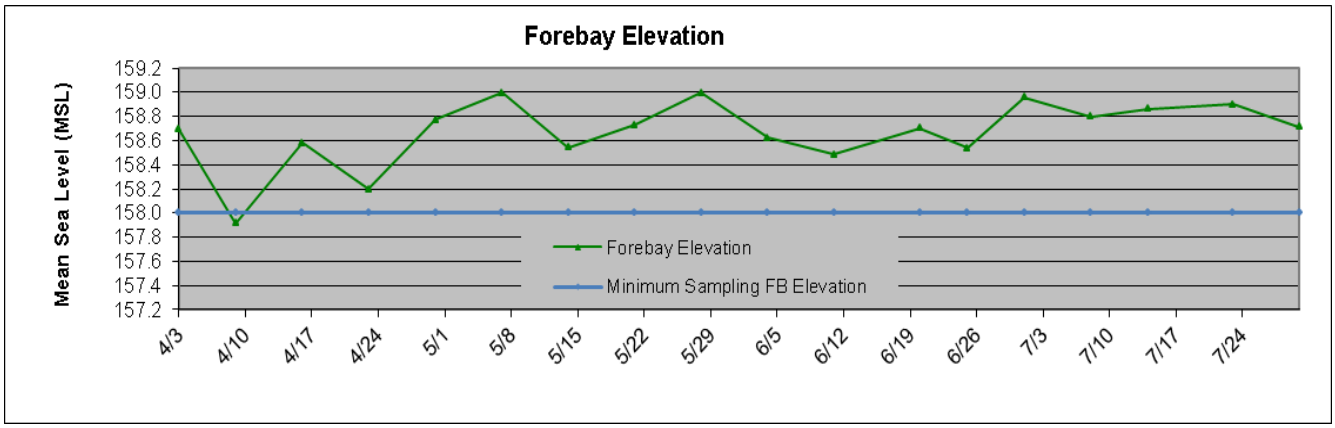

Figure 6. Minimum forebay elevation for sampling and forebay elevation, PUD, 2014.

ESA Take Summary

NOAA signed the Biological Opinion we sample under on December 19th, 2011. The incidental take numbers and the estimated take are presented in Table 5. I did not differentiate between sample numbers and mortality/injury numbers for authorized take estimates, I used sample number. In other words, everything I sampled is considered "Take". For yearling Chinook and steelhead, the Snake and Columbia River ESU's were simply added together and the larger percentage used in the "take" calculation. There is no way to determine which sub-basin fish sampled at The Dalles originated from.

Table 4. Comparison of estimated to actual "Take" of ESA stocks, PUD, 2014.

Species-Age Group-Rearing (% listed)	Total Catch	# of Listed Fish	% Contribution by ESU		# of Listed fish from each ESU	"Permitted" # from each ESU	Difference (Permitted – actual)
Chinook Yearling							
Wild 24.3	4	0.97					
			Snake R.	50.16	0.49	8	7.51
			Upper Col	49.84	0.48	7	6.52
Hatchery 13.2	53	6.99					
			Snake R.	50.16	3.51	8	4.49
			Upper Col	49.84	3.48	7	3.52
Chinook Subyearling							
Wild 0.22	44	0.10					
Hatchery 2.47	4	0.10					
			Snake R.	100	0.20	53	52.80
Sockeye 1.54	21	0.32	Snake R.	100	0.32	1	0.68
Steelhead							
Wild 57.6	2	1.15	Snake R.	33.43	0.38	3	2.62
			Upper Col. R.	12.25	0.14	26	25.86
			Mid Col. R.	54.32	0.63	7	6.37
Hatchery clipped 27.2	2	0.54	Snake R.	39.29	0.21	3	2.79
			Upper Col. R.	29.96	0.16	26	25.84
			Mid Col. R.	30.85	0.17	7	6.83
Hatchery unclipped 48.6	1	0.49	Snake R.	30.48	0.15	3	2.85
			Upper Col. R.	20.24	0.10	26	25.90
			Mid Col. R.	49.28	0.24	7	6.76

Incidental Catch

As in previous years, substantial numbers of non-salmonids were captured (Table A-2). This year there were 1,224 non-salmonid incidental species captured, including: Siberian prawn, smallmouth bass, peamouth, American shad, sucker, mountain whitefish, perch, catfish, juvenile Pacific lamprey and adult pacific lamprey. See Table A-2 for a complete listing.

Recommendations

Since the weir discharge at and below 158' mean sea level can disrupt sampling, we may continue to request the soft constraint although it was not needed this year. We continue to investigate ways to address this issue; tentatively we plan to build a new sampling facility located downstream of the dewatering system discharge, eliminating the low forebay concern. Construction of this facility is postponed pending the construction of a second turbine.

Also, I continue to be concerned about the un-cleaned sections of the triangle shaped screens over the ascending/narrowing floor section at the downstream end of the dewatering structure. We are trying new techniques to allow for manual cleaning but results were mixed so we are unsure if this is going to be effective. The traditional method of dewatering flushes the majority of debris and fish out the emergency bypass route, which is preferable to the stranding condition that results from not flushing. Ultimately though, modifying the system to facilitate cleaning of these screens and removal of this debris is the best course.

ACKNOWLEDGMENTS

I would like to acknowledge the assistance and cooperation provided by the mechanical staff at the PUD, specifically Sam Ache, Dave Bailey, Paul Ebdon, Earl Miles, Ray Vergori and Greg Kovalchuk and Dean Ballinger for their editing skills.

RELATED PUBLICATIONS

Johnsen, R.C., 1991 – 1999 Fish Passage Evaluation of the North Shore Fishway Hydroelectric Project at The Dalles Dam - Progress Report. Northern Wasco County PUD, The Dalles, Oregon. Appendices (Report to FERC and Fishery Agencies and Tribes).

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Martinson, Rick D. and Jeffrey Kamps, 2000 - 2004, Fish Passage Evaluation of the North Shore Fishway Hydroelectric Project at The Dalles Dam -Progress Report for Northern Wasco County PUD, The Dalles, Oregon. 11 p., Appendices (Report to Fishery Agencies and Tribes).

APPENDIX

Table A-1. Sample, descaling, and mortality data, PUD, 2014.

	Chinook								Steelhead																			
	Yearling			Subyearling Smolts			Subyearling Fry		Unclipped			Clipped			Coho			Sockeye			Daily Totals					% of Sample by	Spill
End Date	N	D	M	N	D	M	N	M	N	D	M	N	D	M	N	D	M	N	D	M	N	D	%	M	%	Month	On/Off
2-Apr	0	0	0	0	0	0	38	0	1	1	0	0	0	0	0	0	0	0	0	0	39	1	2.6	0	0.0		Off
9-Apr	12	0	0	0	0		72	3	0	0	0	0	0	0	0	0	0	0	0	0	84	0	0.0	3	3.6		On
16-Apr	2	0	0	0	0		67	5	0	0	0	0	0	0	0	0	0	0	0	0	69	0	0.0	5	7.2	67.1%	On
23-Apr	7	0	0	1	0		48	1	0	0	0	0	0	0	0	0	0	0	0	0	56	0	0.0	1	1.8		On
30-Apr	12	0	0	0	0	0	20	0	1	0	0	0	0	0	0	0	0	1	0	0	34	0	0.0	0	0.0		On
7-May	7	0	0	1	0	0	3	0	0	0	0	1	1	0	0	0	0	0	0	0	12	1	8.3	0	0.0		On
14-May	15	1	3	2	0	0	4	0	0	0	0	1	0	0	1	0	0	14	0	1	37	1	2.7	4	10.8	24.5%	On
21-May	2		1	4	0	0	18	0	0	0	0	1	0	0	1	0	0	4		1	30	0	0.0	2	6.7		On
28-May	0	0	0	11	0	1	10	0	0	0	0	0	0	0	1	0	0	2	0	0	24	0	0.0	1	4.2		On
4-Jun	0	0	0	5	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0.0	0	0.0		On
11-Jun	0	0	0	6	0	1	4	1	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0.0	2	20.0	5.5%	On
18-Jun	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0.0	0	0.0		On
25-Jun	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0.0	0	0.0		On
1-Jul	0	0	0	11	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0.0	3	27.3		On
9-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0		On
16-Jul	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.0	0	0.0	2.9%	On
23-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0		On
30-Jul	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0		On
Total #'s	57	1	4	48	0	5	286	10	2	1	0	3	1	0	3	0	0	21	0	2	420	3	0.7	21	5.0		
Percent	14%	1.9%	7.0%	11.4%	0.0%	10.4%	68.1%	3.5%	0.5%	50.0%	0.0%	0.7%	33.3%	0.0%	0.7%	0.0%	0.0%	5.0%	0.0%	9.5%							
Weekly Average N	3			3			16		0			0			0			1									

N= Sample Number, includes descaled and morts, D= Number Descaled, M= Number of Mortalities

Table A-2. Incidental catch, PUD, 2014.

Date	Bullhead	Mort	Bass	Mort	Catfish	Mort	Chum fry	mort	Bluegill	Mort	Lamprey-Ad	Mort	Lamprey-Br	Mort	Lamprey-Sil	Mort	Mysid shrimp	mort	N Pikeminnow	Mort	Peamouth	Mort	Perch	mort	Siberian Prawn	Mort	Sculpin	Mort	Shad	Mort	Stickleback	Mort	Sucker	Mort	Mt. Whitefish	Mort	**TOTAL GOOD**	**Total Morts**	**Grand Total**
2-Apr									1										1				1		4		7										14	0	14
9-Apr					1	1									3				1						8		7										20	1	21
16-Apr																									4	1	2										6	1	7
23-Apr			1																																		1	0	1
30-Apr																									8		2						1				11	0	11
7-May																			1						16	2	1										18	2	20
14-May																			5						8	6							3				16	6	22
21-May			1																5	4					78	24							1				85	28	113
28-May																			4						31	9											35	9	44
4-Jun									1		1				3	1			2		1	1			37	8	1						1				47	10	57
11-Jun											1				1						1				20	11									1		24	11	35
18-Jun																					1				3												4	0	4
25-Jun			4																		3				11	5											18	5	23
1-Jul			2									1	1			1					3				5								1				12	2	14
9-Jul			2																		6																8	0	8
16-Jul			46																		23					1								1			70	1	71
23-Jul			146	7					1			1									35								28	76							210	84	294
30-Jul			136	18																	192								9	108			2				339	126	465
Sub Total	0	0	338	25	1	1	0	0	3	0	2	2	1	0	7	2	0	0	19	4	265	1	1	0	233	67	20	0	37	184	0	0	10	0	1	0	938	286	1,224
Total	0		363		2		0		3		4		1		9		0		23		266		1		300		20		221		0		10		1				

Table A-3. Condition subsampling results, PUD, 2014.

		Chinook 1		Chinook 0 (non fry)		Steelhead				Coho		Sockeye		All Species	
						Unclipped		Clipped							
		N=	53	N=	43	N=	2	N=	2		3	N=	19	N=	144
		#	%	#	%	#	%	#	%	#	%	#	%	#	%
Condition	Partial Descaling	2	3.8%	1	2.3%	0	0.0%	0	0.0%	0	0.0%	2	10.5%	5	3.5%
	Fungus	3	5.7%	1	2.3%	0	0.0%	1	50.0%	0	0.0%	0	0.0%	5	3.5%
	BKD	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Bird Predation	1	1.9%	0	0.0%	1	50.0%	0	0.0%	0	0.0%	0	0.0%	2	1.4%
	Body Injury	1	1.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	5.3%	2	1.4%
	Opercal Inj.	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
	Eye Injury	1	1.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	0.7%
	Head Injury	2	3.8%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	1.4%

Table A-4. Historical summary of sampling data for the PUD, 1991-2014.

	YEARLING CHINOOK					SUBYEARLING CHINOOK						
						TOTAL	FRY PORTION		Total Sample			
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	#	%	DESC	%DESC	MORT	%MORT
2001	111	5	5.3	17	15.3	622	466	74.9	0	0.0	91	14.6
2002	49	0	0.0	0	0.0	944	856	90.7	2	0.2	65	6.9
2003	85	3	3.5	0	0.0	504	363	72.0	0	0.0	6	1.2
2004	19	1	5.3	0	0.0	1,262	1,116	88.4	0	0.0	13	1.0
2005	60	1	1.7	0	0.0	1,600	1,425	89.1	0	0.0	32	2.0
2006	44	1	2.3	0	0.0	101	72	71.3	0	0.0	12	11.9
2008	2	0	0.0	0	0.0	45	29	64.4	0	0.0	13	28.9
2009	0	0	0.0	0	0.0	42	6	14.3	0	0.0	6	14.3
2010	78	0	0.0	1	1.3	346	183	52.9	0	0.0	24	6.9
2011	92	0	0.0	1	1.1	325	270	83.1	2	0.6	4	1.2
2012	70	1	1.4	1	1.4	958	833	87.0	2	0.2	22	2.3
2013	60	1	1.7	0	0.0	1,006	914	90.9	1	0.1	20	2.0
2014	57	1	1.9	4	7.0	334	286	85.6	0	0.0	15	4.5
Min	0	0	0.0	0	0.0	42	6	14.3	0	0.0	4	1.0
Max	111	5	5.3	17	15.3	1,600	1,425	90.9	2	0.6	91	28.9
Avg	56	1	1.8	2	2.0	622	525	74.2	1	0.1	25	7.5

	STEELHEAD					COHO				
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
2001	117	4	3.5	3	2.6	39	0	0.0	1	2.6
2002	13	1	7.7	0	0.0	15	0	0.0	0	0.0
2003	11	0	0.0	1	9.1	1	0	0.0	0	0.0
2004	8	0	0.0	0	0.0	2	0	0.0	0	0.0
2005	1	0	0.0	0	0.0	27	1	3.7	0	0.0
2006	13	1	7.7	0	0.0	9	0	0.0	0	0.0
2008	4	1	25.0	0	0.0	4	0	0.0	0	0.0
2009	0	0	0.0	0	0.0	0	0	0.0	0	0.0
2010	9	1	11.1	0	0.0	5	0	0.0	0	0.0
2011	22	1	4.5	0	0.0	10	0	0.0	0	0.0
2012	8	1	14.3	1	12.5	5	0	0.0	0	0.0
2013	5	0	0.0	0	0.0	4	0	0.0	0	0.0
2014	5	2	50.0	1	20.0	3	0	0	0	0
Min	0	0	0.0	0	0.0	0	0	0.0	0	0.0
Max	117	4	50.0	3	20.0	39	1	3.7	1	2.6
Avg	17	1	9.5	0	3.4	10	0	0.3	0	0.2

	SOCKEYE					TOTAL				
YEAR	SAMPLE	DESC	%DESC	MORT	%MORT	SAMPLE	DESC	%DESC	MORT	%MORT
2001	123	2	1.6	0	0.0	1,012	11	1.2	112	11.1
2002	29	0	0.0	4	13.8	1,050	3	0.3	69	6.6
2003	21	0	0.0	1	4.8	622	3	0.5	8	1.3
2004	3	0	0.0	0	0.0	1,294	1	0.1	13	1.0
2005	1	0	0.0	0	0.0	1,689	2	0.1	32	1.9
2006	13	2	15.4	0	0.0	180	4	2.4	12	6.7
2008	0	0	0.0	0	0.0	55	1	2.4	13	23.6
2009	0	0	0.0	0	0.0	42	0	0.0	6	14.3
2010	26	0	0.0	1	3.8	464	1	0.2	26	5.6
2011	11	0	0.0	0	0.0	460	3	0.7	5	1.1
2012	20	3	15.0	0	0.0	1,061	7	0.7	24	2.3
2013	4	0	0.0	0	0.0	1,079	2	0.2	20	1.9
2014	21	0	0.0	2	9.5	420	3	0.8	22	5.2
Min	0	0	0.0	0	0.0	42	0	0.0	5	1.0
Max	123	3	15.4	4	13.8	1,689	11	2.4	112	23.6
Avg	21	1	2.5	1	2.5	725	3	0.7	28	6.4

2007-no sampling