Fall Chinook Work Group

Tuesday, 10 June 2014

Wanapum Maintenance Center

Beverly, WA

Technical members

Paul Wagner, NMFS
Jeff Fryer, CRITFC
Holly Harwood, BPA
Keith Truscott, CPUD
Bill Tweit, WDFW
Patrick McGuire, WDOE
Russell Langshaw, GCPUD
Steve Hemstrom, CPUD
Joe Skalicky/Don Anglin, USFWS
Paul Ward/Bob Rose, YN
Brett Swift, American Rivers
Tom Kahler, DPUD
Paul Hoffarth, WDFW
John Clark, ADFG
Todd Pearsons, GCPUD

Attendees: (*Denotes Technical member)

Russell Langshaw, GCPUD*
John Clark, ADFG*
Bob Clark, ADFG
John Carlile, ADFG
Paul Hoffarth, WDFW*
Jeff Fryer, CRITFC*
Tracy Hillman, Facilitator
Peter Graf, GCPUD
Paul Wagner, NMFS* (Phone)
Dani Evenson, ADFG
Pat McGuire, WDOE*
Tom Skiles, CRITFC (Phone)
Todd Pearsons, GCPUD

Action Items:

1. **Russell Langshaw will send his comments on the Predation Report to Blue Leaf.**
2. **Russell Langshaw will provide the FCWG with a draft study plan for assessing density dependence in the Hanford Reach.**
3. **Russell Langshaw will prepare a summary report on Phase II studies.**

4. **Russell Langshaw will conduct retrospective analysis on historical stranding and entrapment work.**

Meeting Minutes

I. Welcome and Introductions – Tracy Hillman welcomed attendees to the meeting. Attendees introduced themselves.

Tracy informed the FCWG that Russell Langshaw will be leaving Grant PUD and moving to Arizona. Russell will contract with Grant PUD and therefore will be involved with the FCWG for at least the next six month. Russell shared with the group the accomplishments made by the FCWG and described future activities of the group as it moves into Phase III of the Study Plan. Russell indicated that Peter Graf will be representing Grant PUD on the FCWG and the HRWG.

II. Agenda Review – The agenda was reviewed and approved.

III. Approval of Meeting Minutes

- The May Meeting Minutes were reviewed and approved with edits.

IV. Review of Action Items - Action items identified during the May meeting were discussed.

- Russell Langshaw will send his comments on the Predation Report to Blue Leaf. **Ongoing.**
- Tracy Hillman will send the FCWG a Doodle Poll so they can identify a date for the next meeting and tour of the Wanapum ladders and fish hatchery. **Complete.**
- Russell Langshaw will provide the FCWG with a draft study plan for assessing density dependence in the Hanford Reach. **Ongoing.**
- Paul Hoffarth will prepare a final memo that describes egg retention of fall Chinook in the Hanford Reach through 2013 by mid-April. **Complete.**
- Russell Langshaw will prepare a summary report on Phase II studies. **Ongoing.**
- Russell Langshaw will conduct retrospective analysis on historical stranding and entrapment work. **Ongoing.**

V. Phase I Study Updates

Production Simulation Model – Russell Langshaw indicated that there are no new updates on the production simulation model. Cedar Morton will revisit funding opportunities in 2014. Cedar is also looking at PATH as a modeling tool.

VI. Phase II Study Plan Updates

Predation Report – Russell Langshaw said that Grant PUD will be providing Blue Leaf with a PO so Blue Leaf can finalize the predation report. Russell also said that he will send his comments to Blue Leaf as soon as he can. Russell is hoping that Blue Leaf will have the report finalized in July.

Density Dependence – Russell Langshaw said that he is still working on a study plan to address the density dependence that was identified in the productivity assessment. He is proposing to sample otoliths from juvenile Chinook that die during the CWT/PIT tagging efforts. He intends to look at growth and condition factor at time of tagging. These data would then be compared to otoliths collected from returning adults, which are sampled on the spawning grounds. Russell indicated that Jeff Fryer has saved juvenile Chinook that died during his tagging work. Otoliths will be extracted from these fish and analyzed.

Russell indicated that he will try and provide the FCWG with a draft study plan in July or August 2014.

Redd Superimposition – Paul Hoffarth discussed his work on the number of eggs retained by fall Chinook in the Hanford Reach through 2013 (see Attachment 1). Paul indicated that in 2013, spawn success declined to 90% with 78% of the Chinook categorized as completely spawned. During the period 2004 to 2012, spawn success averaged 98% with 97% of the female Chinook categorized as completely spawned. Paul noted that the 2013 escapement was the largest escapement to the Hanford Reach on record dating back to 1964. In addition, 28% of the fall Chinook escapement in 2013 were hatchery origin, and that led to an increase in the proportion of age-3 females (24%), which is atypical for the Hanford Reach population. The reduction in spawn success in 2013 was likely a combination of the two factors, high escapement and a large percentage of hatchery-origin fall Chinook in the escapement.

Paul also indicated that the spawning success of natural-origin Chinook in 2013 was 94.5%, compared to the four-year mean (2009 through 2012) of 98.4% (range 97.5% - 98.8%). The spawn success for hatchery-origin Chinook in 2013 averaged 81.3%, declining by 16% from the four-year mean of 96.9% (range 96.2% - 98.9%). These data indicate the presence of density dependence on the spawning grounds in 2013.

This work satisfies the egg-retention objective of Phase II studies. Egg retention work will continue in the future and the results will be reported in the annual Priest Rapids Hatchery Monitoring and Evaluation reports.

VII. Phase III Studies

Tracy Hillman asked if the FCWG had given additional thought to Phase III studies. No one identified any additional studies; however, John Clark said that he would like to spend time during a future meeting discussing Phase III studies. Russell Langshaw indicated that these discussions would occur once he completed a summary report on Phase II studies (similar to the Phase I summary report). The current Phase III list includes: (1) fall Chinook productivity modeling every five years, (2) ongoing egg retention sampling to address density dependence effects, and (3) updating the models used in stranding and entrapment assessments.

VIII. HRWG Activities

Update on Protection Flows – Russell Langshaw said that all temperature and flow data are displayed in the Fixed Site Monitoring – Monthly Summary files on the Grant PUD Water Quality Website (http://www.gcpud.org/naturalResources/fishWaterWildlife/waterqualityMonitoring.html). The temperature unit tracking spreadsheet is found under "Fixed Site Monitoring – Monthly Summary."

Russell reported that emergence ended on 20 May and rearing will end around 20 June. He also said that CJADII constraints began last month. CJADII constraints are the weekend minimum flows (CJAD = Chief Joseph Accumulated Deficiency).

Russell noted that there were no violations in protection flows during the incubation and emergence periods. In addition, there have been no violations in protection flows during the rearing period. Even with the issues at Wanapum Dam, Russell stated that Grant PUD has been able to maintain protection flows in the Hanford Reach. Grant PUD will be discussing Reverse Load Factoring and its effects on maintaining protection flows in the Hanford Reach.

2014 Juvenile Chinook Tagging Efforts – Jeff Fryer reported that his crew successfully tagged 193,000 juvenile Chinook with CWTs during the period 29 May through 9 June 2014. Jeff indicated that the size of fish tagged was comparable to past years. This is likely because the fish tagged are always between 48 and 80 mm. He noted that the small, presumably recently emerged fish appeared skinny and there were several of them at the end of the project. This may be a density-dependent response to the large spawning escapement in 2013. Jeff also noted that the fish experienced lower mortalities during holding and marking than last year.

As a final note, Jeff said that about 10,000 juvenile Chinook were PIT tagged and 200 were tagged with JSATs. The JSATs will be used to

help address predation issues in McNary Reservoir (Battelle predation study). Biomark was hired to PIT tag the fish.

Stranding and Entrapment Retrospective Analysis – Russell Langshaw reported that he did not have time to work on the retrospective analysis in May. He said that he may not have time to work on this assignment until later this summer. He intends to explore the use of hurdle models. The hurdle model is a two part process. The first part models the presence/absence of Chinook within entrapment sites. This is usually accomplished with multiple logistics regression or discriminant analysis. If a pattern is found (successfully jumped the first hurdle), then the second part is to model the numbers of fish entrapped in sites with fish presence. This could be accomplished with regression techniques. The hurdle model may be a simpler and more easily explainable approach than the zero-inflated negative binomial distribution model.

IX. Wanapum Dam Spillway Issues

Peter Graf, Grant PUD, gave a presentation on the current status of Wanapum Dam issues (see Attachment 2). Peter started by giving a brief project overview including the location of the fracture in the dam, modifications to the adult fish ladders, and contingency planning (e.g., trap and haul). He discussed the current monitoring and evaluation plan for assessing adult fish passage at Wanapum Dam and described the criteria used to evaluate passage success. The criteria included conversion rates (>80%), travel time from Priest Rapids to Rock Island Dam (90% of the fish travel the distance in less than 356 hours), and ladder exit mortality (<5%). Peter described all the PIT tag and acoustic arrays throughout the project area that are used to help evaluate passage success. The most recent data indicate that the conversion rate from Priest Rapids Dam to Wanapum Dam is 99% and from Priest Rapids Dam to Rock Island Dam is 94%. Median travel time of tagged fish to Wanapum was 94 hours and to Rock Island Dam it was 167 hours. He noted that no Chinook have been stunned or killed exiting the Wanapum ladders.

Peter talked briefly about juvenile fish passage. He said that Wanapum and Priest Rapids fish bypass units are operational and that Chinook and steelhead survival and passage evaluations will be available mid-summer.

Finally, Peter discussed next steps, which include installation of the spiral chutes, approach ramps, and apron; monitoring the passage of steelhead, Chinook, and sockeye salmon; trap-and-haul contingency for steelhead, Chinook, and sockeye; and implementation of a Pacific lamprey passage strategy. The Priest Rapids Fish Forum is currently

reviewing the proposed strategy for passage of adult lamprey at the dam.

Russell Langshaw indicated that Grant PUD will request an interim reservoir elevation of 560 feet, which would allow normal operation of the adult fish ladders at Wanapum Dam. The interim elevation must be approved by the Board of Consultants and FERC. If approved, the interim elevation would likely occur later this year.

X. Field Tours

Following the FCWG meeting, members and participants toured the left-bank adult fish ladder at Wanapum Dam and the flume. They also observed the juvenile bypass at Wanapum Dam. They then toured the Priest Rapids Hatchery facilities and the Off-Ladder Adult Fish Trap (OLAFT) at the left-bank ladder at Priest Rapids Dam.

XI. Next Meeting: Tuesday morning, 1 July 2014 at Grant PUD in Ephrata, WA.

Attachment 1

Report from WDFW on Spawning Success of Fall Chinook Salmon in the Hanford Reach

Spawning Success of URB Fall Chinook in the Hanford Reach

2000 – 2013

Prepared by
Paul Hoffarth

Washington Department of Fish and Wildlife
Pasco, Washington

Hanford Reach Fall Chinook Stream Surveys

The Columbia River Coded Wire Tag Program (CRCWTP) in conjunction with the Priest Rapids and Ringold Springs Hatcheries Monitoring and Evaluation Programs conducts stream surveys of post spawn Up River Bright Fall Chinook in the Hanford Reach. This area is an integral component of the coded wire tag (CWT) recovery effort in the Columbia River. The Hanford Reach is sampled from Richland, Washington, river kilometer 538 upstream to Priest Rapids Dam, river kilometer 639, a distance of approximately 100 kilometers. Technicians sample the Hanford Reach natural spawning areas from outboard jet boats or by walking the Columbia River shorelines. Prior to 2010, the survey crew typically consisted of two boats with a two-person crew operating seven days a week. In 2010, WDFW, under the funding and cooperation from Grant County PUD and the US Army Corps of Engineers, began a robust monitoring and evaluation plan (M&E) to assess the influence of Priest Rapids Hatchery and Ringold Springs Hatchery fall Chinook releases and adult returns on the natural population of the Hanford Reach. A third boat and additional staff have been added to the stream sampling effort since 2010. Each boat surveys approximately 16 km of river per day. Carcasses are retrieved from water depths up to four meters and along shoreline areas de-watered by the daily operations of Priest Rapids Dam. The Hanford Reach fall Chinook stream survey is conducted annually from November 1 through the first week of December. The goal of the stream survey is to collect and sample 10% of the naturally spawning fall Chinook in the Hanford Reach (escapement) for coded wire tag recovery and to collect biological samples to determine age, gender, and origin of the Hanford Reach population.

All fish are visually inspected for fin clips and scanned for the presence of coded wire tags. The snout is collected from all coded wire tagged Chinook along with the biological data. Sampling of the population for run reconstruction is obtained through random, systematic design (i.e., every k^{th} fish). Data is recorded on length, gender, age (scales), origin (otolith), and spawning

success (egg retention) in females for all "in-sample" fish (k^{th} fish). Over the most recent 24 years adult fall Chinook escapement in the Hanford Reach has varied from 13,887 adults (2007) to 157,484 adults (2013). The "in sample" goal was originally established at 510 to ensure that the sample size is statistically valid (Thompson 1987) but has been increased in recent years to meet the objectives of the M&E Programs.

During the past 14 years Hanford Reach stream survey crews have sampled between 7.5% and 23.4% of the estimated escapement (Table 1). Survey crews only scanned adipose clipped fall Chinook to determine the presence of coded wire tags prior to 2011. In 2011, all fish were scanned to recover CWTs. For the most recent 14 years an average of 20% of the carcasses collected during the stream surveys were sampled for run reconstruction (gender, age, and length). All "in-sample" females are sampled for egg retention (spawn success).

Table 1. Summary of annual fall chinook escapement, biological sampling, and coded wire tags recoveries from the Hanford Reach fall Chinook stream surveys, 2000 - 2012.

Year	Escapement	Carcass Recovered		Biological Samples	
		#	% of Escapement	#	% Sampled
2013	174,841	13,071	7.5%	2,150	16.4%
2012	57,715	6,810	11.2%	1,657	24.3%
2011	75,256	8,391	11.1%	2,210	26.3%
2010	87,016	9,791	11.3%	2,385	24.4%
2009	36,720	5,318	14.5%	849	16.0%
2008	29,058	5,455	23.4%	1,061	19.5%
2007	22,272	3,115	14.0%	748	24.0%
2006	51,701	5,972	11.6%	565	9.5%
2005	71,967	8,491	11.8%	2,096	24.7%
2004	87,696	11,030	12.6%	1,807	16.4%
2003	100,840	13,573	13.5%	2,227	16.4%
2002	84,509	8,402	9.9%	1,414	16.8%
2001	60,576	6,072	10.1%	1,465	24.1%
2000	47,960	10,556	22.0%	2,557	24.2%
Mean	**70,581**	**8,289**	**13.2%**	**1,657**	**20.2%**

Spawn Success

All "in-sample" females recovered during stream surveys in the Hanford Reach are dissected to determine egg retention. This provides an indication of spawn success. Eggs are not counted or weighed during this process. Egg retention is based on a rough estimate of the proportion of eggs remaining in the female, 0%, 25%, 50%, 75%, or 100%. If no eggs or minimal numbers of eggs are retained, the Chinook is recorded as 100% spawned. If all eggs are retained, the chinook is recorded as "unsuccessful". From 2004 to 2012, spawn success averaged 98% with 97% of the female Chinook categorized as completely spawned. Spawn success for fall Chinook in the Hanford Reach has been very high and very consistent between years ranging from 97.4% to 99.2% with a large proportion of the fish sampled having little to no egg retention.

In 2013 spawn success declined to 90% with 78% of the Chinook categorized as completely spawned. The 2013 escapement was the largest escapement to the Hanford Reach on record dating back to 1964. In addition, 28% of the fall Chinook escapement was hatchery origin that also led to an increase in the proportion of Age 3 females (24%), both atypical for the Hanford Reach population. The reduction in spawn success in 2013 was likely a combination of the two factors, high escapement and a large percentage of hatchery origin fall Chinook in the escapement.

Table 2. Annual summary of egg retention and spawning success for fall Chinook in the Hanford Reach, 2004-2013.

Year	Females Sampled	Egg Retention					Spawn Success	
		0%	25%	50%	75%	100%	No Egg Retention	Escapement
2013	685	536	90	20	16	23	78.2%	90.1%
2012	771	747	14	5	1	4	96.9%	98.6%
2011	1,264	1,203	1	52	5	3	95.2%	97.4%
2010	1,173	1,147	6	13	1	6	97.8%	98.7%
2009[1]	499	484	0	5	0	10	97.0%	97.5%
2008	584						na	na
2007	454	443	0	8	0	3	97.6%	98.5%
2006	352	343	0	8	0	1	97.4%	98.6%
2005	1,323	1,310		6		7	99.0%	99.2%
2004	1,176	1,151		21		4	97.9%	98.8%
Mean	828						**97.3%**	**98.4%**

[1] Prior to 2010, egg retention was only categorized as fully spawn, partial spawn, or did not spawn in the database.

Comparison of Spawning Success for Natural Origin and Hatchery Origin Fall Chinook

For brood year returns 2001 through 2012 approximately 12% of the escapement has been comprised of hatchery origin fall Chinook in the Hanford Reach, range 5.9% - 16.6%. Based on sampling of post spawn female fall Chinook carcasses in the Hanford Reach, spawning success for natural origin fall Chinook has been slightly higher than hatchery origin fall Chinook. Mean spawning success was 98.4% for natural origin fall Chinook compared to 96.9% for hatchery origin fall Chinook that spawned in the Hanford Reach. Spawning success was very high for both groups and the minor difference in spawn success could be attributed to the small sample size for hatchery origin spawners. Hatchery origin fall Chinook could only be identified by adipose clips and coded wire tags for all return years except 2012. As the majority of Priest Rapids Hatchery returns are not adipose clipped a portion of the fish identified as natural origin in the Hanford Reach may be hatchery origin. In 2012 and 2013, otoliths were collected from all "in-sample" fish to determine origin in addition to CWTs and adipose clips. All Priest Rapids Hatchery releases have been otolith marked for broodyears 2007 to present.

As presented in the prior section, in 2013 there was a record escapement coupled with a two fold increase in the proportion of hatchery fall Chinook that spawned in the Hanford Reach. Spawn

success was lower than typical for both hatchery and natural origin fall Chinook in 2013. Natural origin fall Chinook spawn success in 2013 was 94.5% compared to the four-year mean for 2009 through 2012 of 98.4%, range 97.5% - 98.8%. Spawn success for hatchery origin fall Chinook in 2013 averaged 81.3% declining by 16% from the four-year mean of 96.9%, range 96.2% - 98.9%.

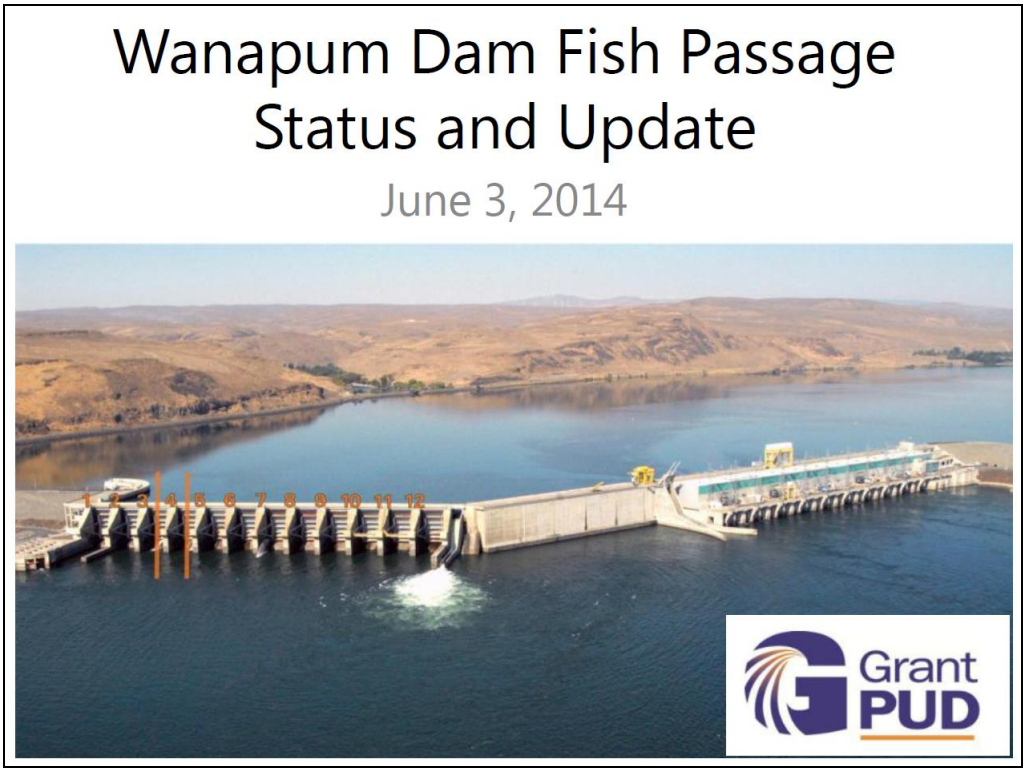
Table 3. Comparison of spawn success of fall Chinook spawning in the Hanford Reach for natural origin and hatchery origin returns, 2009-2013.

Year	Origin	Females Sampled	Egg Retention					Spawn Success	
			0%	25%	50%	75%	100%	Escapement	No Egg Retention
2013[1]	Natural	461	392	51	9	3	6	94.5%	85.0%
	Hatchery	224	144	39	11	13	17	81.3%	64.3%
2012[1]	Natural	681	658	14	5	1	3	98.6%	96.6%
	Hatchery	90	89	0	0	0	1	98.9%	98.9%
2011	Natural	1,176	1,121	1	48	4	2	97.5%	95.3%
	Hatchery	88	82		4	1	1	95.7%	93.2%
2010	Natural	1,125	1,101	6	12	1	5	98.8%	97.9%
	Hatchery	48	46		1		1	96.9%	95.8%
2009	Natural	494	482		12		0	98.8%	97.6%
	Hatchery	13	12		1		0	96.2%	92.3%
Mean	Natural	**787**						**97.6%**	**94.5%**
	Hatchery	**93**						**93.8%**	**88.9%**

[1] Otoliths were used to determine origin in addition to adipose clips and CWTs

Attachment 2

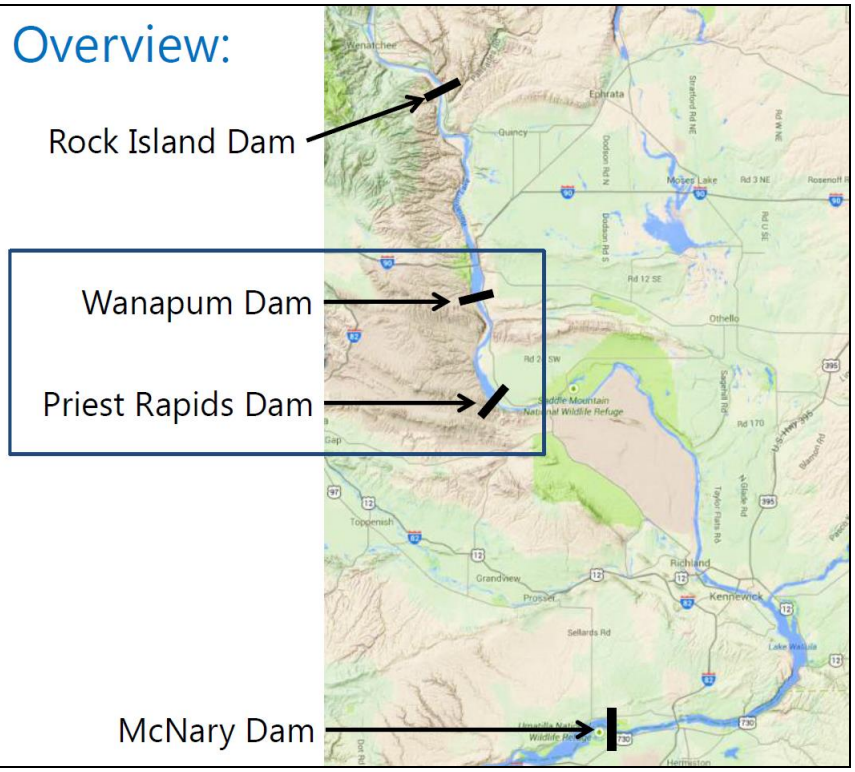
Presentation by Peter Graf on Wanapum Dam Fish Passage Status and Update



Outline:

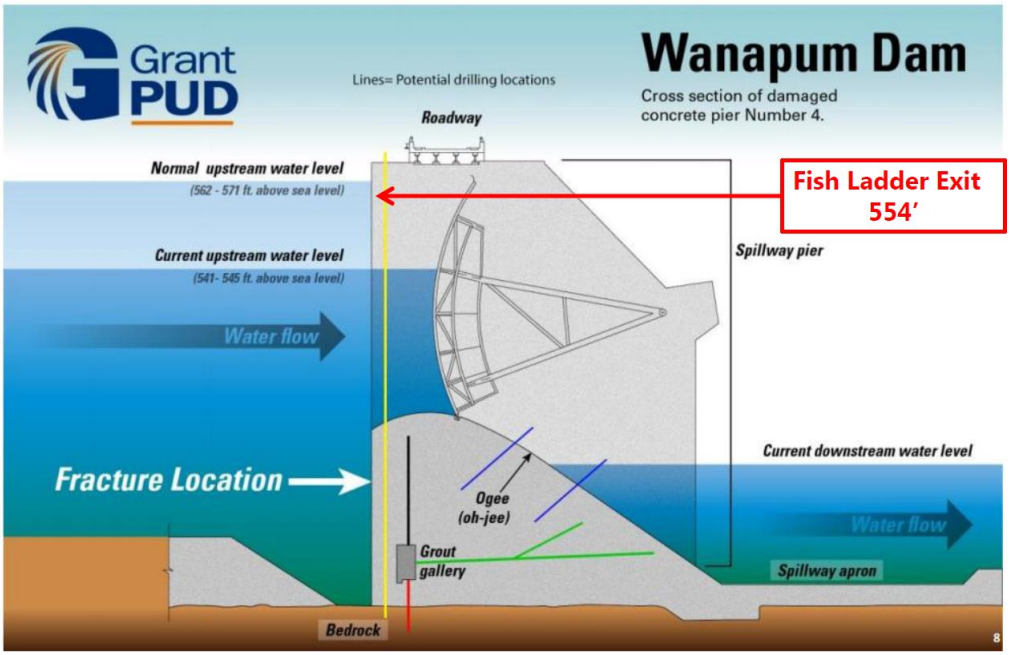
1. Project Overview and Fracture
2. Impacts to Adult Fish Passage & Interim Fish Passage Plan
3. Monitoring and Evaluating Adult Passage
4. Observations To-Date
5. Juvenile Passage & Next Steps

Project Overview:

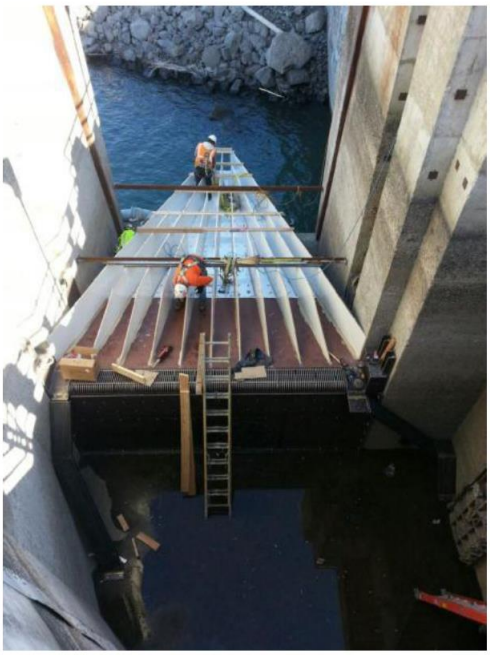


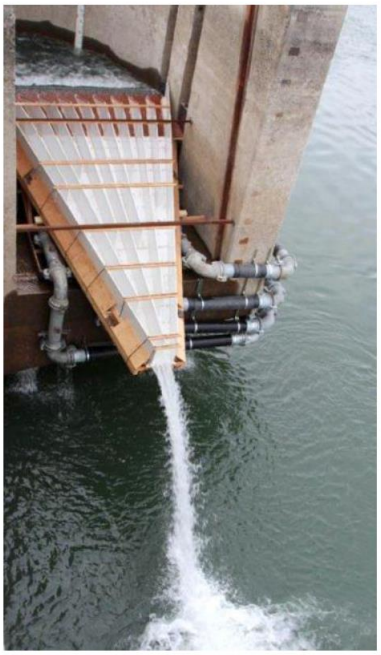
Wanapum Dam

Wanapum Dam

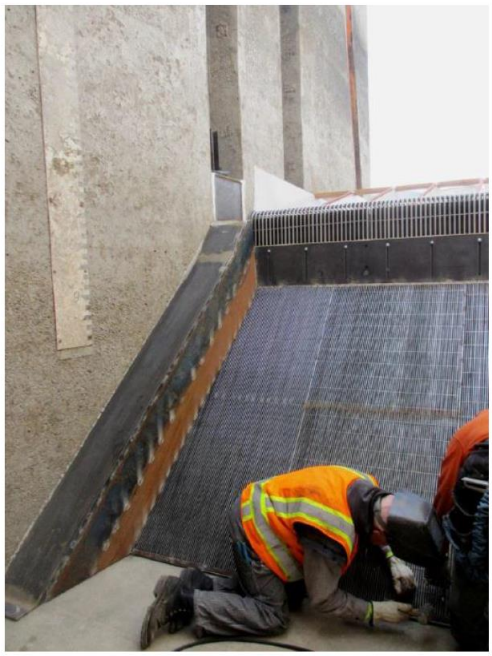


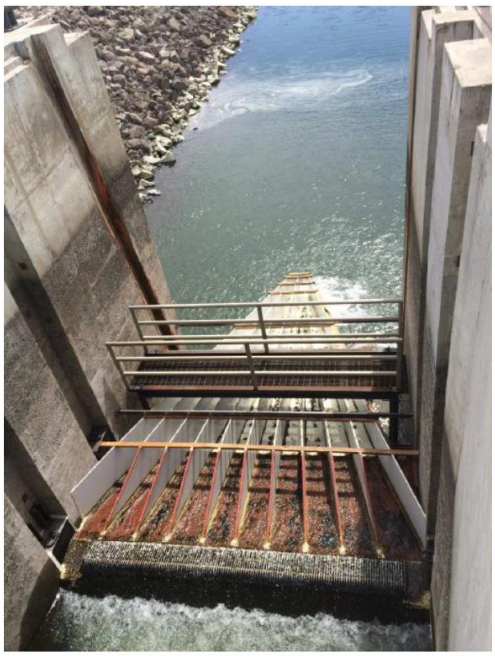
Fish Ladder Modifications:



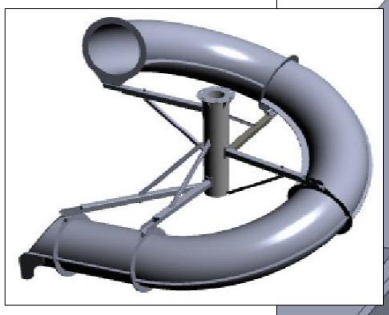


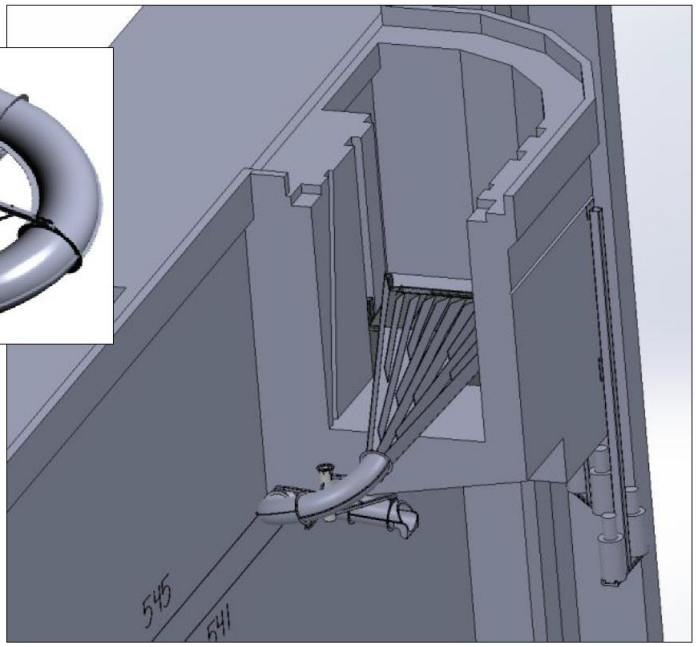
Fish Ladder Modifications:





Fish Ladder Modifications:

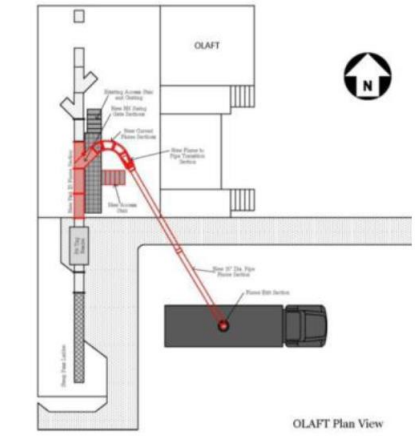




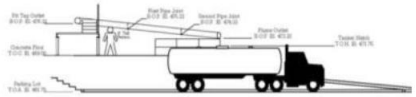
Fish Ladder Modifications:

Contingency planning

- Trap and haul from Priest Rapids Off Ladder Trap (OLAFT)

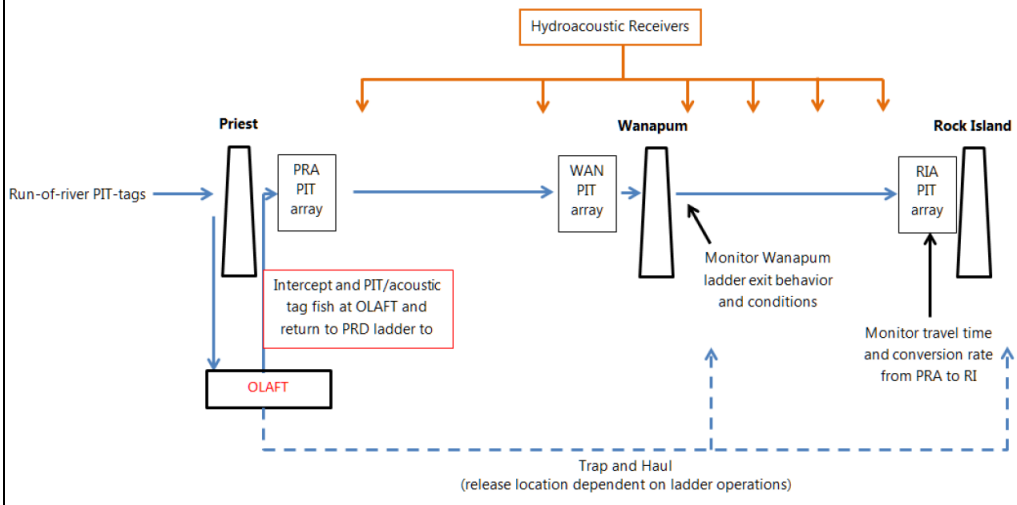


OLAFT Plan View



OLAFT Elevation
View Looking North

Monitor and Evaluate Passage:



Passage Criteria:

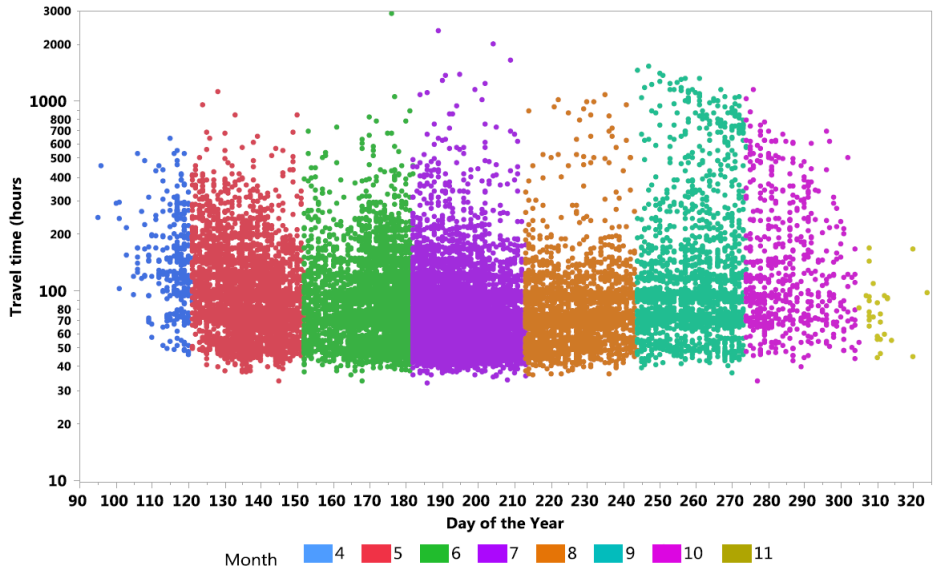
1. Conversion Rate → greater than 80%

Observation Year	Priest Rapids Observations	Rock Island Observations	Conversion Rate
2013 Total	333	308	92%
2012 Total	372	349	94%
2011 Total	631	506	80%
2010 Total	491	469	96%
2009 Total	190	176	93%
2008 Total	129	117	91%
2007 Total[2]	110	103	94%
2006 Total[2]	500	441	88%
2005 Total[2]	641	479	75%
2004 Total[2]	719	355	49%
2003 Total[2]	158	104	66%
All Years (2003-2013)	**4274**	**3407**	**80%**
		Average ± SD	*83% ± 15%*
		95% CI	*74% - 93%*
		Minimum	*49%*
		Maximum	*96%*

[1]Data as reported by Columbia Basin Research Data Access in Real Time.
[2]Hatchery transportation studies from Priest Rapids Dam were conducted these years.

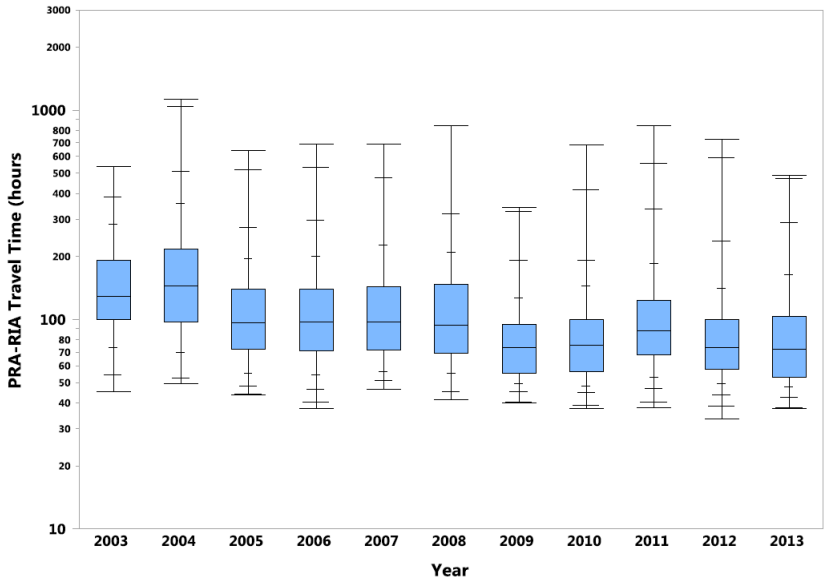
Passage Criteria:

2. Travel Time – Priest Rapids to Rock Island



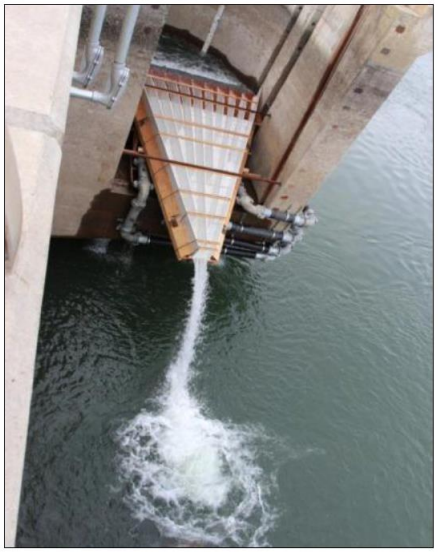
Passage Criteria:

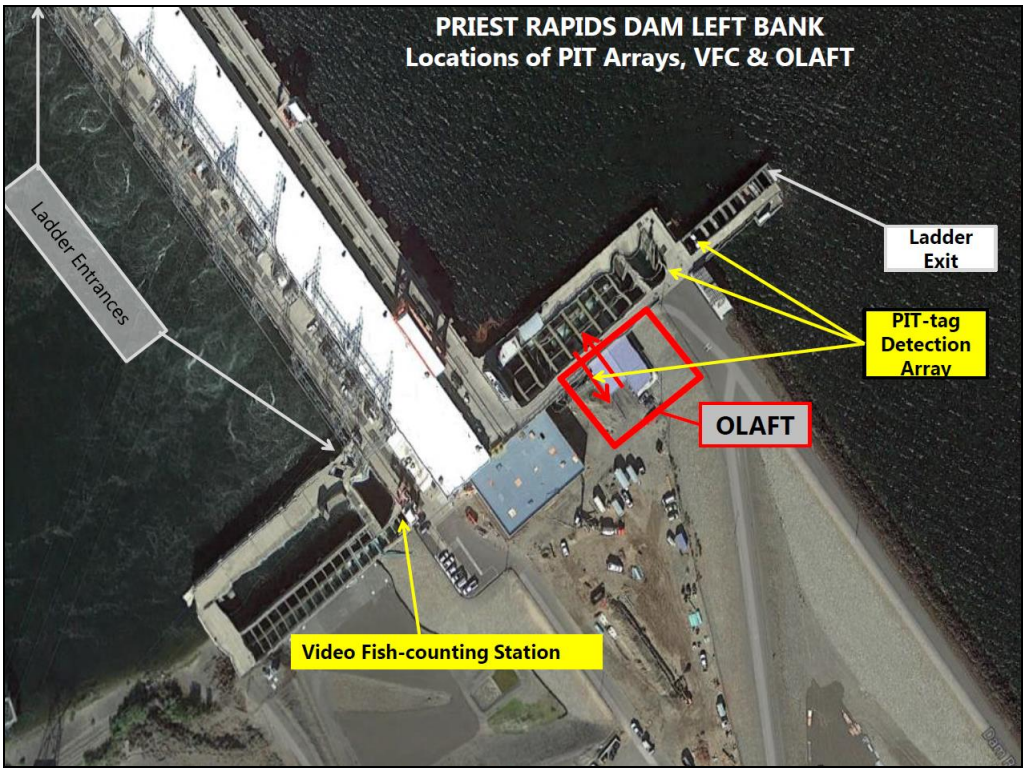
2. Travel Time → 90% of fish less than 356 hours

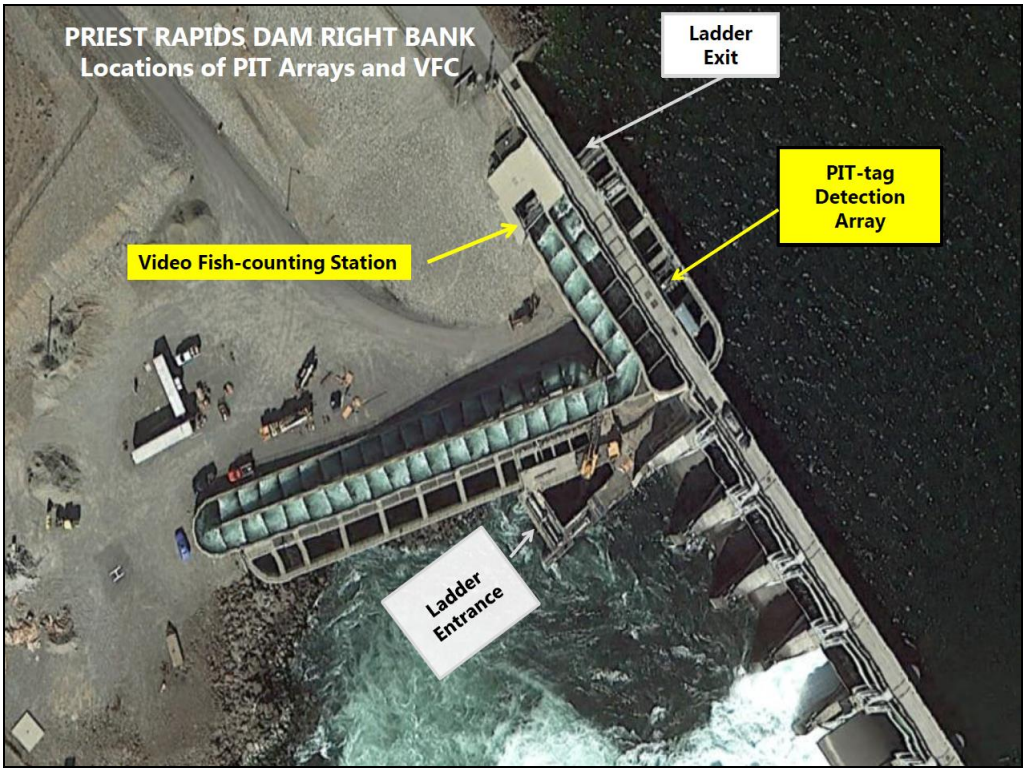


Passage Criteria:

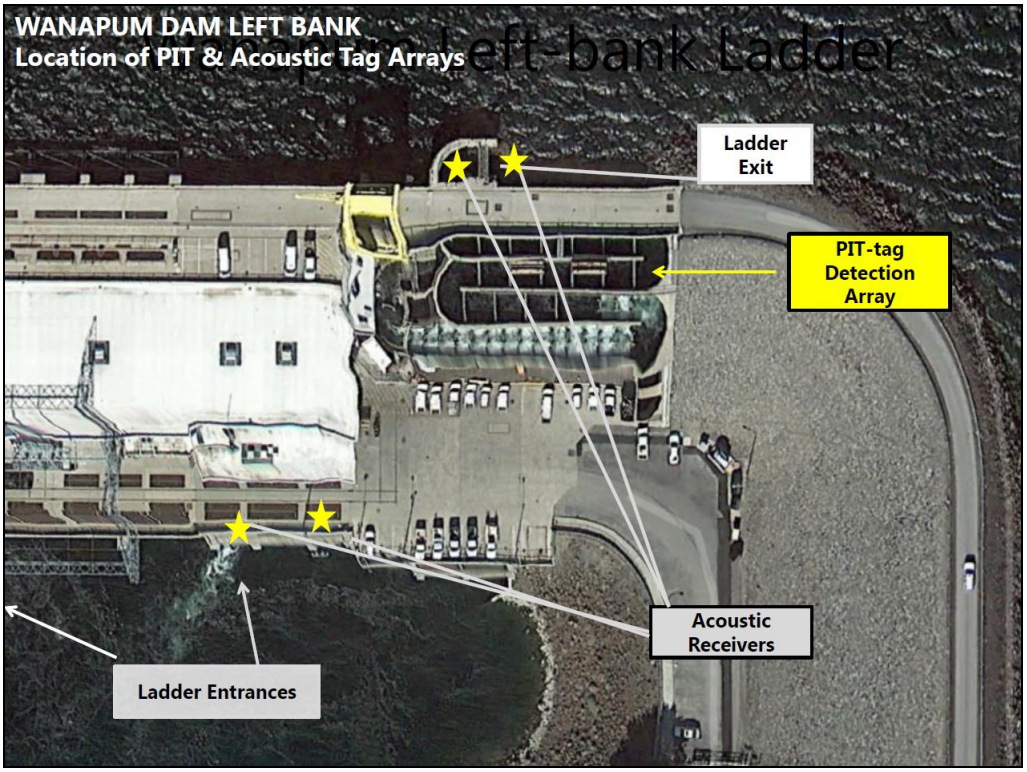
3. Ladder Exit → less than 5% mortality




PRIEST RAPIDS DAM LEFT BANK
Locations of PIT Arrays, VFC & OLAFT
Ladder Entrances
Ladder Exit
PIT-tag Detection Array
OLAFT
Video Fish-counting Station


PRIEST RAPIDS DAM RIGHT BANK
Locations of PIT Arrays and VFC
Ladder Exit
PIT-tag Detection Array
Video Fish-counting Station
Ladder Entrance


WANAPUM DAM RIGHT BANK
Location of PIT Array
Ladder Exit
PIT-tag Detection Array
Ladder Entrance
Acoustic Receiver


WANAPUM DAM LEFT BANK
Location of PIT & Acoustic Tag Arrays
Ladder Exit
PIT-tag Detection Array
Acoustic Receivers
Ladder Entrances

Adult Passage Data:

1. Conversion Rate:
   - Priest to Wanapum = 248/250 = 99%
   - Priest to Rock Island = 234/250 = 94%
   - Acoustic tagged fish to Rock Island = 50/50 = 100%

2. Travel Time:
   - Median TT to Wanapum = 94 hours (3.9 days)
   - Median TT to Rock Island = 167 hours (7.0 days)
     - 90th percentile = 313 hours

3. Ladder Exit:
   - No stunned fish, no mortalities (17k spring chinook to RI)
   - Video

Juvenile Passage:

- Wanapum & Priest Fish Bypass Units are operational
- Yearling Chinook & steelhead survival and passage evaluations
- Data available mid-summer

Next Steps:

- Installation of spiral chute, approach ramp, and apron
- Monitor passage for steelhead/sockeye/summers
- Trap & haul contingency for steelhead/sockeye/summers
- Pacific lamprey passage strategy
  - Draft plan to Priest Rapids Fish Forum last week
    1. Volitional passage at Priest and Wanapum
    2. Collection and trap and haul