Fall Chinook Work Group

Tuesday, 6 May 2014

Grant PUD (USBOR Building)

Ephrata, WA

Technical members

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

Attendees: (*Denotes Technical member)

Russell Langshaw, GCPUD*	Tom Dresser, GCPUD
John Clark, ADFG* (Phone)	Paul Wagner, NMFS* (Phone)
Scott Bettin, BPA (Phone)	Tom Kahler, DPUD*
Jeff Fryer, CRITFC* (Phone)	Tracy Hillman, Facilitator

Action Items:

1. **Russell Langshaw will send his comments on the Predation Report to Blue Leaf.**
2. **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.**
3. **Russell Langshaw will provide the FCWG with a draft study plan for assessing density dependence in the Hanford Reach.**
4. **Paul Hoffarth will prepare a final memo that describes egg retention of fall Chinook in the Hanford Reach through 2013 by mid-April.**
5. **Russell Langshaw will prepare a summary report on Phase II studies.**

6. **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.

II. Agenda Review – The agenda was reviewed and approved. Jeff Fryer asked for time to discuss 2014 CWT efforts in the Hanford Reach.

III. Approval of Meeting Minutes

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

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

- Russell Langshaw will send his comments on the Predation Report to Blue Leaf. **Ongoing.**
- 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. **Ongoing; the analyses are 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. Wanapum Dam Spillway Issues

Tom Dresser, Grant PUD, gave a presentation on the current status of Wanapum Dam issues (see Attachment 1). Tom noted that the Left-Bank Fishway Exit Passage System at Wanapum Dam has successfully passed 71 adult Chinook and 294 adult steelhead from 15 April through 1 May. There were no instantaneous mortalities or stunned Chinook or steelhead. The Right-Bank Fishway System has successfully passed 13 adult Chinook and eight adult steelhead from 26 April through 1 May. There were no instantaneous mortalities or stunned Chinook or steelhead. Tom noted that the PUD will install a three-foot-diameter spiral chute attachment to the lower end of both flume systems to reduce the drop. Currently, the distance from the end of the flume to the water surface is about 10-13 feet. The spiral chute will reduce the drop to about 3-5 feet.

Tom said that the PUD has observers monitoring the Fishway Exit Passage Systems. Observers record species, entry time into the flume, weir entry method, weir entry success, initial orientation, orientation down the flume, behavior on the flume, swim position down the flume, movement down the flume, water exit, landing orientation, landing behavior, and other notes and comments. Tom compared the monitoring results between the left (n= 764 fish) and right-bank (n = 41 fish) systems (see table below from Blue Leaf). Importantly, as noted above, there have been no instantaneous mortalities and only one small whitefish was stunned.

Wanapum Dam Fish Ladder Observations

May 02, 2014

BLUE LEAF ENVIRONMENTAL

			YEAR TO DATE				WEEK OF APRIL 25-May 1			
			Left Bank		Right Bank		Left Bank		Right Bank	
			n	%	n	%	n	%	n	%
Fish Observed		Chinook	71	0.093	13	0.310	39	0.156	13	0.310
		Steelhead	294	0.385	9	0.214	19	0.076	9	0.214
		Sockeye	0	0.000	0	0.000	0	0.000	0	0.000
		Other	399	0.522	20	0.476	192	0.768	20	0.476
Weir Entry Method		Jump	22	0.031	12	0.286	2	0.008	12	0.286
		Swim	694	0.969	30	0.714	245	0.992	30	0.714
Weir Entry Success		Yes	524	0.710	19	0.452	172	0.688	19	0.452
		No	214	0.290	23	0.548	78	0.312	23	0.548
Weir Passage Slot		1	218	0.411	8	0.195	78	0.402	8	0.195
		2	192	0.362	6	0.146	71	0.366	6	0.146
		3	34	0.064	7	0.171	10	0.052	7	0.171
		Middle	35	0.066	12	0.293	10	0.052	12	0.293
		Right	51	0.096	8	0.195	25	0.129	8	0.195
Initial Orientation		Horizontal	538	0.984	30	0.909	181	1.000	30	0.909
		Vertical	9	0.016	3	0.091	0	0.000	3	0.091
Swim Orientation	Top	Head	463	0.889	19	1.000	166	0.988	19	1.000
		Tail	58	0.111	0	0.000	2	0.012	0	0.000
	Mid	Head	94	0.207	7	0.368	43	0.257	7	0.368
		Tail	360	0.793	12	0.632	124	0.743	12	0.632
	Bottom	Head	119	0.264	8	0.421	60	0.361	8	0.421
		Tail	332	0.736	11	0.579	106	0.639	11	0.579
Movement		Snake	484	0.929	16	0.800	160	0.958	16	0.800
		Flop	37	0.071	4	0.200	7	0.042	4	0.200
Water Exit		With Water	498	0.996	17	0.895	165	1.000	17	0.895
		Out of Water	2	0.004	2	0.105	0	0.000	2	0.105
Landing Orientation		Head	141	0.272	6	0.316	53	0.296	6	0.316
		Tail	309	0.595	9	0.474	106	0.592	9	0.474
		Dorsal	6	0.012	0	0.000	2	0.011	0	0.000
		Ventral	35	0.067	2	0.105	6	0.034	2	0.105
		Lateral	28	0.054	2	0.105	12	0.067	2	0.105
Landing Behavior		Swim	463	0.998	19	1.000	164	0.994	19	1.000
		Stunned	1	0.002	0	0.000	1	0.006	0	0.000
		Mortality	0	0.000	0	0.000	0	0.000	0	0.000
Slide Rate		With Water	122	0.269	8	0.421	59	0.355	8	0.421
		Hold	331	0.731	11	0.579	107	0.645	11	0.579

Tom described the trap-and-transport protocol at the Priest Rapids Dam OLAFT. The trap-and-transport process began on 15 April. As of 5 May, 605 spring Chinook and 42 steelhead have been transported.

In addition, 201 Chinook and three steelhead have been PIT tagged, and 50 Chinook have been tagged with acoustic tags. In sum, as of 1 May, 851 fish have been handled. Tom then identified the locations of PIT arrays within the Priest Rapids left-bank ladder and the Wanapum fishways.

Tom shared with the group the adult salmonid passage migration and metrics criteria. Criterion 1 includes evaluation of travel time using PIT tags, criterion 2 includes conversion rates using PIT tags, and criterion 3 includes direct observations at fishway exits (<5% instantaneous mortality). Currently there are limited data for evaluating criteria 1 and 2. Tom noted that criterion 3 is being achieved and maintained.

Tom said that all 50 JSAT tags have been implanted into adult spring Chinook. All were tagged (including PIT tags) and released from the OLAFT and have been detected at Wanapum Dam. The median travel time for 48 fish from Priest Rapids to Wanapum was 22.4 hours. As of 1 May, six of the 50 fish were detected in the weir pool at Wanapum Left Bank. The six fish migrated over the ramp within 2.1 hours. One tagged spring Chinook was detected at Rock Island Dam. The travel time from Priest Rapids to Rock Island was 78 hours.

Tom reported that a total of 305 adult steelhead have exited the Wanapum Fishway Exit Passage System. He noted that 34 PIT-tagged adult steelhead were detected at Wanapum Dam and then Rock Island Dam. The median travel time for these 34 fish was 56.7 hours (range, 35.1-212.3 hours). No bull trout have been encountered or observed at Priest Rapids or Wanapum dams.

Tom shared with the group the decisions made last week by the PRCC with regard to adult passage. He also identified the ongoing evaluations that Grant PUD is conducting, including juvenile yearling Chinook and steelhead acoustic evaluations in Priest Rapids and Wanapum reservoirs, juvenile yearling Chinook and steelhead route-specific evaluations at Priest Rapids and Wanapum dams, adult spring Chinook observational and PIT-tag evaluations (Wanapum Fishway Exits), adult salmon and steelhead PIT-tag run-at-large monitoring, adult spring Chinook acoustic tag evaluations (Wanapum Fishway Exits), adult spring Chinook acoustic-tag trap-and-transport evaluations, and avian predation surveys within Wanapum Reservoir.

Finally, Tom described the current status of monolith pier #4. He noted that the monolith has been stabilized and that drilling is still in progress. Two of the four horizontal holes are drilled; the third hole should have been drilled this past weekend. Grant PUD provided the Board of Consultants with the grouting plan for the crack, the repair sequencing for monolith 4, and preliminary tendon loads and sizing. Tom said that they continue to work to develop the optimum final

tendon design. He also pointed out that six of the eight seismic load cases have been completed. Monolith 4 will have three tendons in the pier and one on each side of the pier in the ogee. The pier tendons will extend about 70 feet into the bedrock. Tom also noted that drilling of lift-joint-drain holes between the drainage gallery up through the lift joints in the monolith are underway. The tendon layout has been submitted to FERC. After approval, Grant PUD will start drilling pilot holes for the tendons.

Following the presentation, members asked if they could tour the fish ladders at Wanapum Dam during the next meeting. Russell Langshaw indicated that he could arrange for a ladder tour and also a tour of the hatchery facilities. Some members noted that they would not be available on the next regularly scheduled meeting date (3 June) and therefore asked if the meeting date could be changed. Tracy Hillman indicated that he will send out a Doodle Poll, which will be used to find a meeting/tour date that works for the majority.

VI. 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.

VII. Phase II Study Plan Updates

Predation Report – Russell Langshaw said that Blue Leaf will need a PO to complete the predation report. According to Russell, Blue Leaf should have the report finalized by the end of June or early 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 asked that Jeff Fryer collect all fish that die during his tagging work and freeze them. Otoliths will be extracted from these fish (or a random subsample) and analyzed.

Members discussed potential biases associated with using juvenile Chinook that die during tagging (e.g., size bias). No one seemed to think that there would be a bias associated with using these fish. Russell indicated that he will try and provide the FCWG with a draft study plan in June or July 2014.

Redd Superimposition – Russell Langshaw indicated that Paul Hoffarth is working on the memo that identifies the number of eggs

retained by fall Chinook in the Hanford Reach through 2013. The memo should be available to the FCWG for their review by late May or early June. This work will satisfy 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.

VIII. Phase III Studies

Tracy Hillman asked if the FCWG had given additional thought to Phase III studies. No one identified any additional studies. The current 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. Russell said that he still plans to prepare a summary report on Phase II studies (similar to the Phase I summary document).

IX. 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 will end around 20 May and rearing will end around 21 June. He also said that CJADII constraints began last weekend.

Russell noted that there were no violations in protection flows during the incubation period. In addition, there have been no violations in protection flows during the emergence period. Even with the issues at Wanapum Dam, Russell stated that Grant PUD has been able to maintain protection flows in the Hanford Reach.

2014 Juvenile Chinook Tagging Efforts – Jeff Fryer reported that his crew will be tagging juvenile Chinook during the period 29 May through 9 June 2014. His crew will be tagging fish with CWTs. Russell Langshaw indicated that Grant PUD (or one of their contractors) will tag about 5,000 fish with PIT tags starting on 2 June. Because acoustic tagging will also occur during the week of 2 June (for the Battelle predation study), Russell thought that it may be possible to use their crews to tag fish with PIT tags. Russell will plan and coordinate the PIT-tagging process.

Stranding and Entrapment Retrospective Analysis – Russell Langshaw reported that he did not have time to work on the retrospective analysis in April. He said that he may not have time to work on this assignment until later this spring or early 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.

X. Next Meeting: To be determined.

Attachment 1

Presentation by Tom Dresser on Wanapum Dam Fish Passage and Reservoir Surveys

Wanapum Fishway Exit Passage System Left Bank

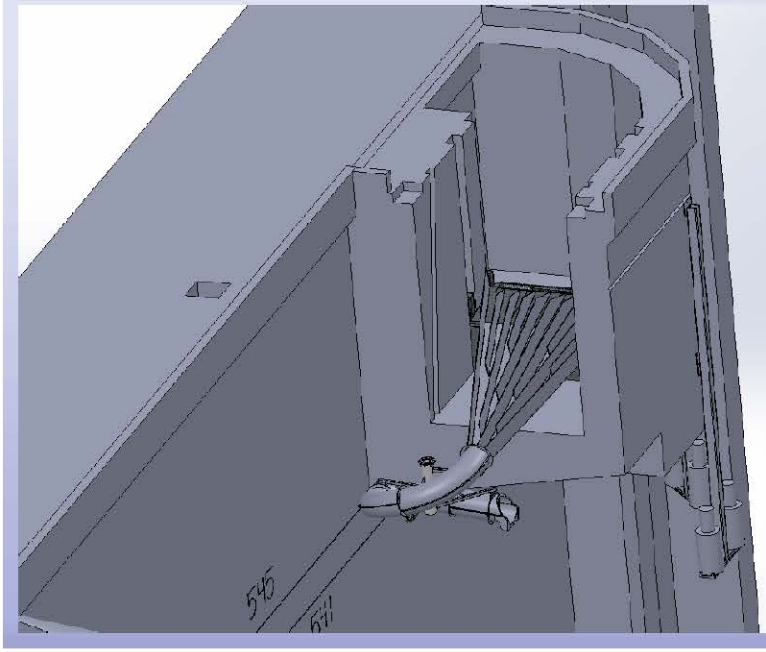
- Operational on April 15th
- 71 adult spring Chinook have successfully passage the Wanapum Fishway Exit Passage System (May 1);
- 294 adult steelhead have successfully passage the Wanapum Fishway Exit Passage System (May 1);
- No Instantaneous Mortalities or stunned spring Chinook;
- All fish passing through the Wanapum Fishway Exit Passage System swam away.
- Engineering timeframe estimates for spiral chute mid-June (June 3-13). Need to incorporate lamprey passage items and further discussion of lower end exit

Wanapum Fishway Exit Passage System Right Bank

- Operational on April 26th
- 13 adult spring Chinook have successfully passage the Wanapum Fishway Exit Passage System (May 1);
- 8 adult steelhead have successfully passage the Wanapum Fishway Exit Passage System (May 1);
- No Instantaneous Mortalities; No stunned fish;
- All fish passing through the Wanapum Fishway Exit Passage System swam away.
- Engineering timeframe estimates for spiral chute mid-June (June 3-13). Need to incorporate lamprey passage items and further discussion of lower end exit

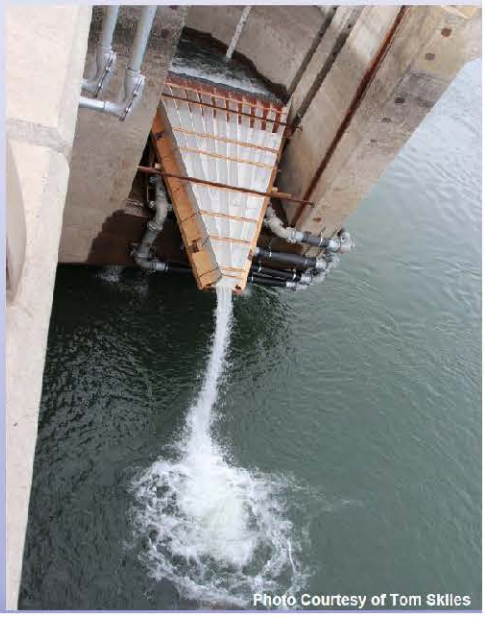
Spiral Chute Attachment

Spiral Chute Attachment



Wanapum Fishway Exit Passage System
Direct Observations

- **Species;**
- **Entry time onto flume;**
- **Weir Entry Method: Jump/Swim;**
- **Weir Entry Success: Yes/No;**
- **Initial Orientation: Vertical/Horizontal;**
- **Orientation Down Flume: Start/Mid/End;**
- **Behavior on Flume: With Water/Holding;**
- **Swim Position Down Flume: Head/Tail;**
- **Movement Down Flume: Snake/Flop;**
- **Water Exit: With/Without;**
- **Landing Orientation: Head/Tail/Dorsal/Ventral/Lateral;**
- **Landing Behavior: Swim/Stunned/Mortality;**
- **Additional Notes/Comments;**
- **Representative Video Clips Collected Daily**



Wanapum Fishway Exit Passage System
Left-Bank Results
(April 15 – May 1; n=764 fish)

- Species Composition
  - Spring Chinook = 9.3%
  - Steelhead = 38.5%
  - Most Whitefish = 52.2%
- Weir Success
  - 71% first attempt
- Weir Entry
  - 96.7% Swim
- Initial Orientation
  - 98.4% horizontal (on bellies)
- Movement Down Weir
  - 92.9% snaked
- Swim Orientation
  - 88.9% head first at top
  - 73.6% tail orientation at bottom
- Water Exit
  - 99.6% within water column
- Landing Orientation
  - 59.5% tail first
  - 27.2% head first
  - 6.7% Ventral
- Slide Rate
  - 73.1% Hold
  - 26.9% Moved with water

No Instantaneous Mortalities

1 stunned small whitefish

Wanapum Fishway Exit Passage System Right-Bank Results (April 26 – May 1, n=41 fish)

- Species Composition
  - Spring Chinook = 31.0%
  - Steelhead = 21.4%
  - Most Whitefish = 47.6%
- Weir Success
  - 45.2% first attempt
- Weir Entry
  - 71.4% Swim
- Initial Orientation
  - 90.9% Horizontal
- Movement Down Weir
  - 80.0% snaked
- Swim Orientation
  - 100.0% head first at top
  - 57.9% tail orientation at bottom
- Water Exit
  - 89.5% within water column
- Landing Orientation
  - 47.4% tail first
  - 31.6% head first
  - 0.0% Ventral
- Slide Rate
  - 42.1% Hold
  - 57.9% Moved with water

No Instantaneous Mortalities or Stunned Fish

Priest Rapids Dam Off-Ladder Adult Fish Trap Activities

- Trap and Transport Protocol Implemented April 15, 2014
- Number Trap and Transported (5/5)
  - **Spring Chinook = 605**
  - **Steelhead = 42**
  - **Bull trout = 0**
- Number PIT Tagged and Released (5/5)
  - **Spring Chinook = 201**
  - **Steelhead = 3**

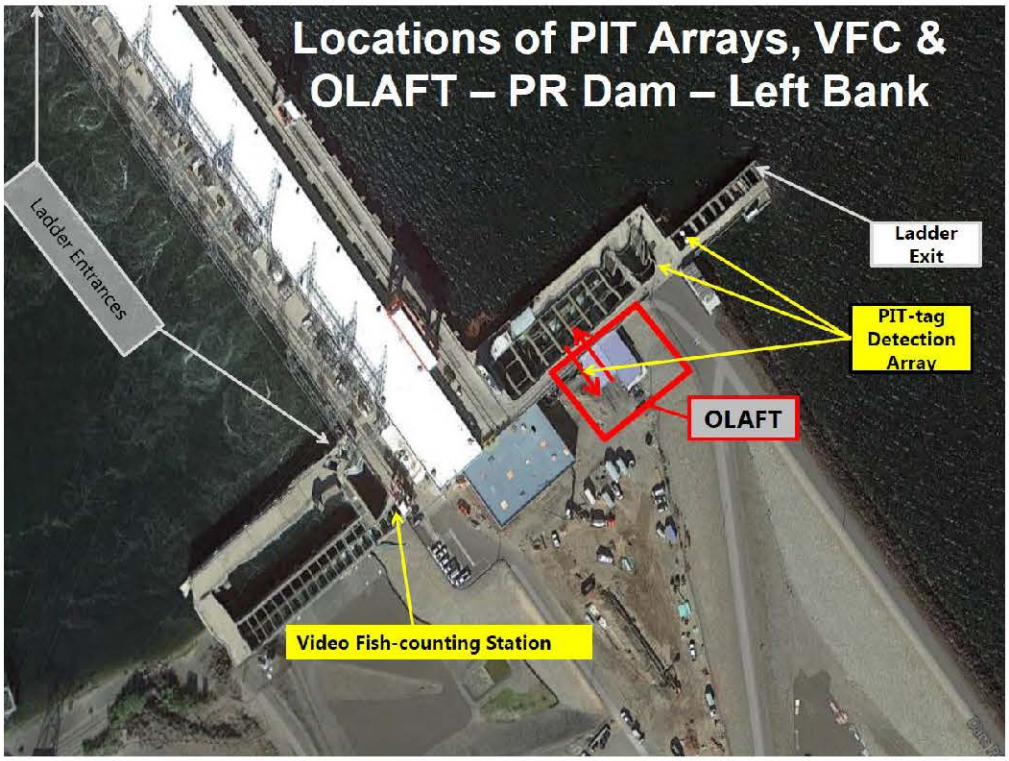
- Number Acoustic Tagged & PIT Tagged & Released from OLAFT
  - **Spring Chinook = 50 (PRCC Agreed tagging number – completed 4/29)**

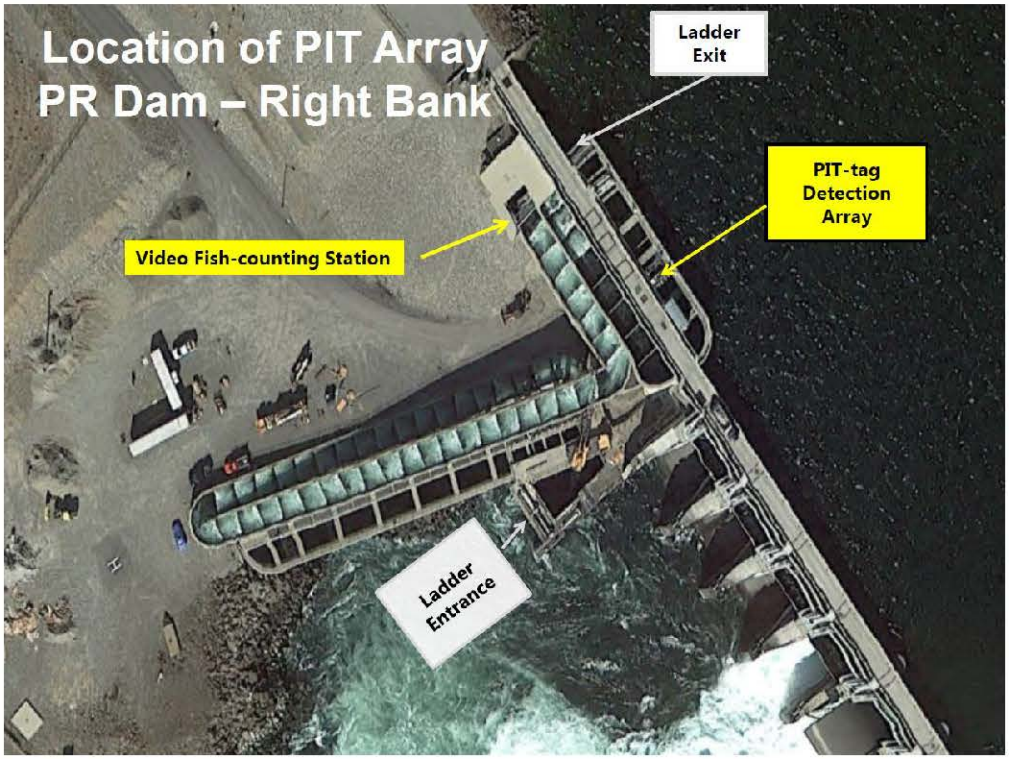
TOTAL OF 806 SPRING CHINOOK TRAP, TAGGED AND RELEASED AT OLAFT TO CONTINUE THEIR UPSTREAM MIGRATION

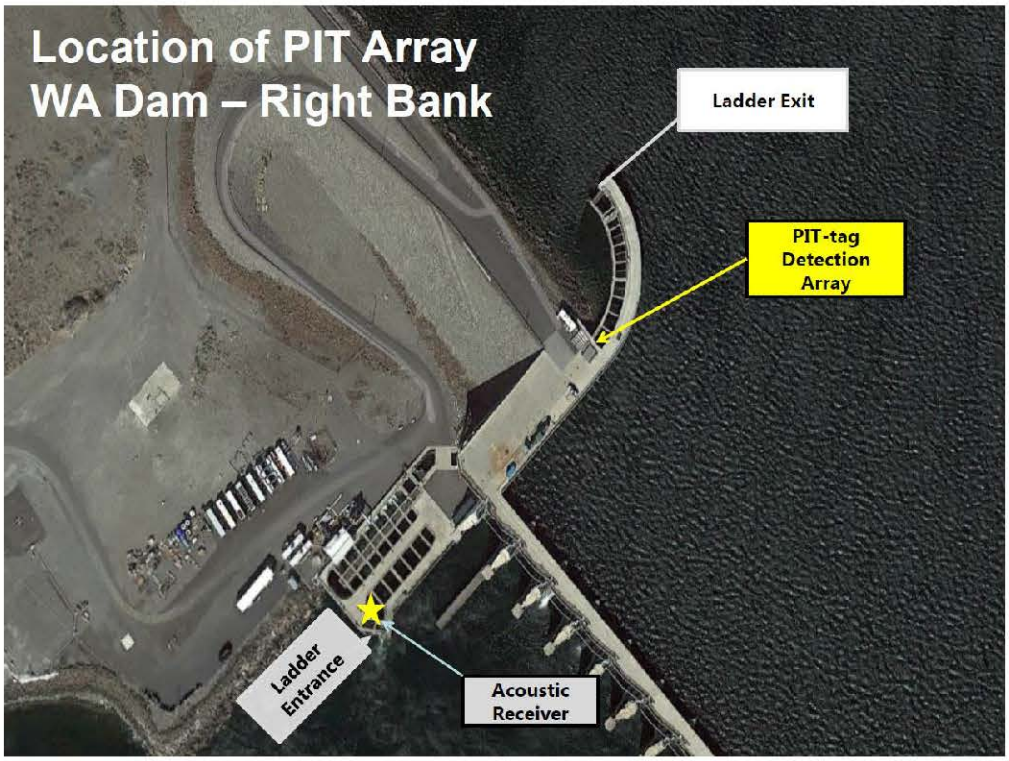
Acoustic/PIT , PIT Tagged & Trap-N-Transported Spring Chinook Salmon (5/1)

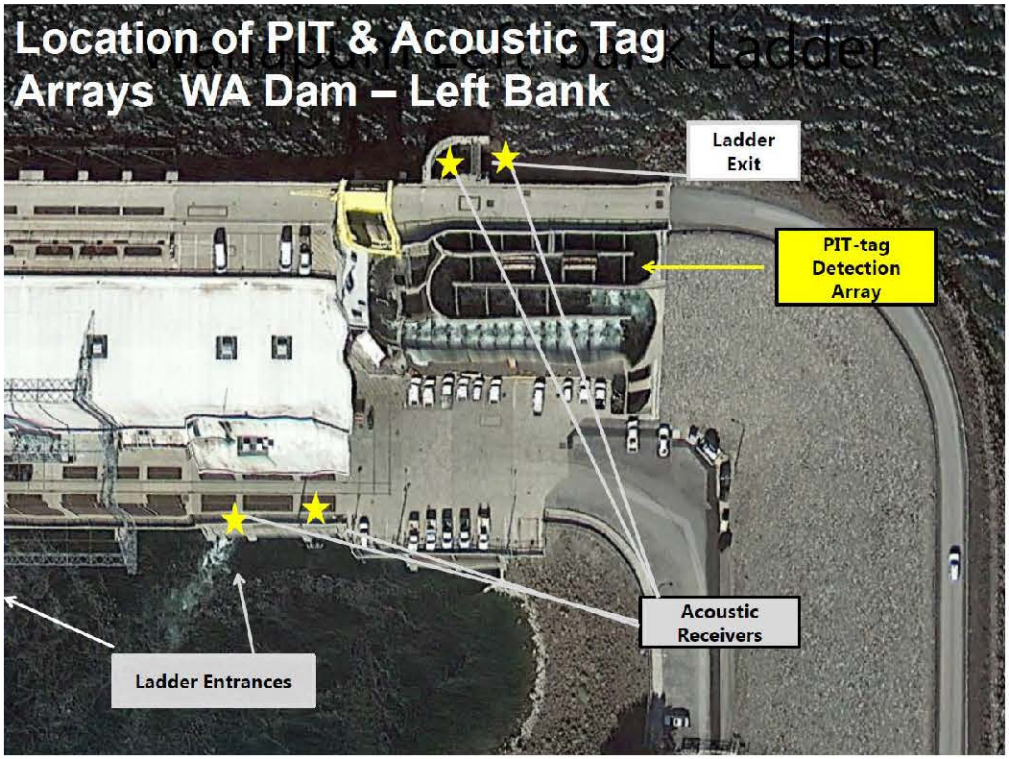
- Acoustic & PIT tagged from OLAFT = **50**
- PIT tagged from OLAFT = **201**
- Trap & Transport to Release = **605**
- **Number Handled - All Species** = **851***

* **Total Number includes 45 adult steelhead encountered at trap**




Location of PIT Array
PR Dam – Right Bank
Ladder Exit
PIT-tag Detection Array
Video Fish-counting Station
Ladder Entrance


Location of PIT Array
WA Dam – Right Bank
Ladder Exit
PIT-tag Detection Array
Ladder Entrance
Acoustic Receiver



Adult Salmonid Passage Migration and Metrics (spring Chinook)

- **Travel Time Using Passive Integrated Transponders (Criteria 1):** Based on data from a 10 year period (2003-2013), travel time from Priest Rapids Dam to Rock Island Dam is <356 hours for 90% of the fish (detected at Priest Rapids Dam and Rock Island Dam). This value represents the highest 90% percentile travel time observed since 2003 when ladders were operating under normal conditions.

- **Conversion Rates Using Passive Integrated Transponders (Criteria 2):** Based on uncorrected conversion rates of PIT tags detections from the Priest Rapids Dam and Rock Island Dam PIT arrays. The conversion rate from Priest Rapids Dam to Rock Island Dam is >80%, which is the lowest observed annual conversion rate from 2008-2013 when permanent ladders were operating.

- **Direct Observations – Wanapum Fishway Exits (Criteria 3):** An observed criteria of <5% instantaneous mortality would be implemented at the Wanapum Dam FWEPS.

Travel Time – Criteria 1
Spring Chinook Salmon (5/1)

- **201** spring Chinook PIT tagged and released from OLAFT (5/5/2014) – Evaluation target met

Travel Time	
Median Travel Time From Priest to Wanapum (hours)	
38- Chinook:	*68.0*
Median Travel Time From Wanapum to Rock Island (hours)	
10 - Chinook:	*TBD*
On 5/1 Travel Time for 3 PIT tagged Chinook was 41.4 hours	
Median Travel Time From Priest to Rock Island (hours)	
10- Chinook:	*98.0*

Criteria 1: Limited Data

Conversion Rates– Criteria 2
Spring Chinook Salmon(5/1)

Uncorrected Conversion Rates (All tagged Chinook)	
Conversion Rates Priest to Wanapum	
Chinook (38/171):	*22.2%*
Conversion Rates From Wanapum to Rock Island	
Chinook (13/171):	*7.6%*
Conversion Rates From Priest to Rock Island	
Chinook (13/171):	*7.6%*

Criteria 2: Limited Data

Instantaneous Mortality - Criteria 3 Spring Chinook Salmon

- A total of 84 adult spring Chinook salmon have been documented exiting the Wanapum Fishway Exit Passage Systems.
- As of this reporting date (May 1, 2014) no instantaneous mortalities or stunned adult spring Chinook salmon have been documented at the Wanapum Fishway Exit Passage Systems (left & right bank).

Criteria 3 is being achieved and maintained

Acoustic & PIT Tagged - Spring Chinook Salmon

- The 50th JSAT tag implanted at 5PM on 4/29.
- All 50 adult spring Chinook acoustic tagged & PIT tagged and released from the OLAFT have been detected at Wanapum Dam. **Median travel time for 48 of those fish from Priest Rapids to Wanapum was 22.4 hours.**
- Six of 50 were detected in the weir pool at Wanapum LB (as of 5/1); The six fish migrated over the ramp within 2.1 hours.
- 1 acoustic tagged spring Chinook detected over Rock Island (78 hours from PR to RI).

Adult Steelhead Passage

- A total of **305** adult steelhead have been documented exiting the Wanapum Fishway Exit Passage Systems.
- As of this reporting date (May 1, 2014) no instantaneous mortalities or stunned adult steelhead has been documented at the Wanapum Fishway Exit Passage Systems (left & right bank).

Adult Steelhead Passage PIT Tag Detections

- 5 adult steelhead PIT tagged and released or detected at Priest Rapids Dam.
- 34 PIT tagged adult steelhead were detected at Wanapum and then Rock Island.
- Travel Time Statistic for above 34 fish:
  - ✓ Median = 56.7 hours
  - ✓ Mean = 80.4 hours
  - ✓ Range = 35.1 – 212.3 hours

Bull trout

- No bull trout have been encountered or observed during the trap or transport activities being conducted at the Priest Rapids OLAFT.
- No bull trout have been observed attempting to pass or have passed the Wanapum Fishway Exit Passage Systems (left or right bank).
- As of this reporting date (May 1, 2014) no bull trout have been observed at the video fish count stations at Priest Rapids Dam (left or right bank).

Decisions Made Last Week by PRCC

- **Priest Rapids Right Bank ladder to be maintained at ladder flow. Re-visiting on weekly basis. Re-visiting Today!**
- **No adjustments or limitations in hours of operation of OLAFT on the left-bank at Priest Rapids until tagging of 250 evaluation fish has been completed. Re-visiting Today!**
- **Deferred and will re-visit need to tag 10-20 spring Chinook with acoustic & PIT tags for Trap-N-Transport program. Re-Visiting Today!**
- **Continuing Trap-N-Transport program for spring Chinook. Re-Visiting Today.**
- **Grant & WDFW in process of developing Trap-N-Transport contingency program for adult sockeye and summer Chinook. PRCC agreed that no sorting by species or hatchery/wild would occur at OLAFT if this contingency necessary.**

Ongoing Evaluations

- Juvenile yearling Chinook and steelhead acoustic evaluation Wanapum Reservoir;
- Juvenile yearling Chinook and steelhead route specific evaluation at Wanapum Dam (if possible);
- Juvenile yearling Chinook and steelhead acoustic evaluation Priest Rapids Reservoir;
- Juvenile yearling Chinook and steelhead route specific evaluation at Priest Rapids Dam (PR Top-spill bypass – focal point);
- Adult spring Chinook Observational Evaluation (Wanapum Fishway Exits);
- Adult spring Chinook PIT-Tag passage Evaluation (Wanapum Fishway Exits);
- Adult salmon and steelhead PIT-tag run-at-large Monitoring;
- Adult spring Chinook acoustic tag Evaluation (Wanapum Fishway Exits);
- Adult spring Chinook acoustic tag Evaluation (Trap & Transport);
- Avian Predation Surveys within Wanapum Reservoir;

Yearling Chinook & Juvenile Steelhead Acoustic Tag Evaluation

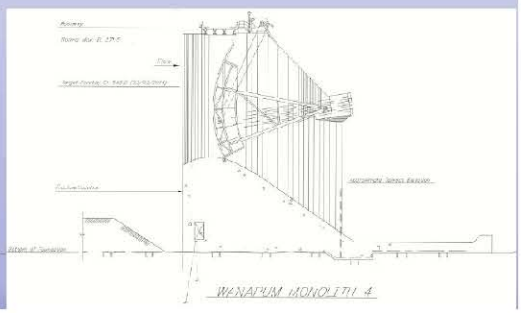
Wanapum Dam

Wanapum Dam Monolith #4

- Stabilize Monolith – Complete: Drilling is still in progress now. Two of the four horizontal holes are drilled- crack still closely following assumed path. The 3rd hole should have complete this weekend.
- The grouting plan for the crack, the repair sequencing for monolith 4, and preliminary tendon loads /sizing were presented to the BOC.
- Work continues to develop the optimum final tendon design. The Design Report should be submitted to the BOC by 5/7.
- Six of the eight seismic load cases have been completed. The seismic analysis is necessary to finalize the tendon sizes. It is also required to finalize the anchorage of the ogee concrete above the crack to the concrete below the crack.

Wanapum Dam Monolith #4

- Monolith 4 will have 3 tendons in the pier and one on each side of the pier in the ogee. The pier tendons will go approximately 70 feet into the bedrock.
- Bars will be installed in the ogee at this point in place of the tendons.
- Drilling of lift joint drain holes between the drainage gallery up through the lift joints in the monolith are underway.
- The tendon layout has been submitted to the FERC, which FERC issued and order on it yesterday. After approval, Grant PUD will start drilling pilot holes for the tendons.



Grant County PUBLIC UTILITY DISTRICT