Fall Chinook Work Group

Tuesday, 4 February 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*	Dani Evenson, IDFG (Phone)
Scott Bettin, BPA (Phone)	Patrick McGuire, WDOE* (Phone)
John Clark, ADFG*	Paul Hoffarth, WDFW* (Phone)
Steve Hays, CPUD (Phone)	Tom Kahler, DPUD* (Phone)
Tracy Hillman, Facilitator	

Action Items:

1. **Tracy Hillman will send the draft predation report to the FCWG today. The FCWG will review the report and provide comments to Tracy and Russell Langshaw by Tuesday, 18 February 2014. Tracy will compile the comments and send them to Blue Leaf. It is hoped that Blue Leaf will have a final report to the FCWG by Tuesday, 4 March 2014.**
2. **Tracy Hillman will send the proposal prepared by Battelle and funded by the Northern Boundary and Transboundary Rivers Restoration and Enhancement Fund to the FCWG today. This study should help assess the effects of predation within Lake Wallula.**

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.**
5. **The FCWG will identify Phase III 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 with one additional agenda item (Phase III Studies).

III. **Approval of Meeting Minutes**

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

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

- Blue Leaf will provide the FCWG with the draft predation report by Monday, 16 December 2013. **Complete. Russell Langshaw will send the draft document to Tracy Hillman, who will send it to the FCWG.**
- Tracy Hillman will contact Blue Leaf and see if they can give a presentation to the FCWG in February on the results of their work on predation in the Hanford Reach and Lake Wallula. **Complete. The draft document will be sent to the FCWG today.**
- Russell Langshaw will provide the FCWG with a draft study plan for assessing density dependence in the Hanford Reach by 4 February 2014. **Ongoing.**
- Paul Hoffarth will prepare a final memo that describes egg retention of fall Chinook in the Hanford Reach through 2013. **Ongoing. The report will be completed by the end of March.**
- The 2013 draft Stranding and Entrapment Report is due to the FCWG no later than Friday, 13 December 2013. **Complete.**
- Russell Langshaw will conduct retrospective analysis on historical stranding and entrapment work and identify issues for discussion during the next FCWG meeting. **Ongoing.**

V. Phase I Study Updates

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

VI. Phase II Study Plan

Predation Report – Russell Langshaw reported that Blue Leaf completed the draft predation report. Russell highlighted (in yellow) the following key points extracted from the draft report:

"This document has undergone substantial revisions and improvements. The document contains similar content as the prior version but has been consolidated, reorganized, and significant trends in predation were further refined. A substantial increase in material was added to the *Introduction* that emphasized trends in survival from 1993-2013. The greatest consolidation occurred in the sections where *Factors Influencing Survival* and *Predation by Birds* was discussed. The sections on *Predation by Fish* and *Bioenergetics* were moved forward in the report due to their relative importance to the other sections. Furthermore, throughout the document the bioenergetics results have been comprehensively de-emphasized due to the nature of simulating such complex interactions and in turn, the modeling results were presented to support the literature reviewed. Appendices have also been added as supplemental information and support of the document as a whole."

"Of special note, we highlight that between 1993-2013 the median survival of PIT tagged natural-origin subyearling fall Chinook salmon in the Hanford Reach and Lake Wallula region was 35%, with a corresponding loss of 65%. Though hatchery-reared fish survived at a median of 67%, their estimated mortality rate by day was slightly higher than natural-reared subyearling fall Chinook salmon at 2.8% and 2.3%, respectively. These results illustrated that length of time spent in the region could be a contributing factor of mortality, regardless of origin."

"Contributing factors that may have or continue to influence survival of subyearling fall Chinook salmon were highlighted in brief and included: aquatic contaminants, stranding and entrapment, habitat preference, migration, and environmental conditions. Though these factors likely influence susceptibility to predation, they were not deemed as significant contributors to the overall loss observed."

"The available literature and modelling performed inferred that predatory fish (northern pikeminnow, smallmouth bass and walleye) were, in relative terms to other examined sources, the most significant factor of subyearling fall Chinook salmon mortality in the Hanford Reach. It is noteworthy to state that the bioenergetics modeling was refined considerably and has been developed further into a "best-available" simulation of predation pressures on subyearling fall Chinook salmon in Hanford Reach. Bioenergetics results was

presented as a quantitative simulation with the purpose to compare and contrast with previous literature; in turn, results further supported the inclination that fall Chinook salmon mortality in the Hanford Reach was likely affected most by predatory fish. While consumption of simulated subyearling fall Chinook by piscivorous fish was highly variable, which was largely dependent on the annual pre-smolt abundance estimates, an average 33% (range 11-100%) of the total estimated losses (average 65%) was explained by predation pressure from three species residing in the Hanford Reach and Lake Wallula, smallmouth bass, northern pikeminnow, and walleye (species are listed in decreasing order of modeled predation pressure, e.g., walleye presented the lowest simulated predation rates)."

"Through reviewed literature, predation by birds was estimated to be at a minimum of 1%. This estimate is low because deposition rates of PIT tags from consumed smolts is largely unknown. There is also no information for a large colony of gulls in the area of interest and tag deposition rates of American white pelicans, particularly loafing birds, which are not well understood."

"A better understanding of reach-specific parameters for biotic-parameters of piscivorous fish is needed. Current comprehensive data of abundance, distribution and diets are required. There was little available information on channel catfish and they should also be considered as a potential species of concern and are likely contributing an additional unknown percentage of subyearling fall Chinook salmon loss in the area of interest."

"More precise migration rates from Priest Rapids Dam to McNary Dam of subyearling fall Chinook salmon would also illuminate issues with survival. Currently there is no reach-specific survival information to highlight areas of high losses; a vital step in initiating preventive measurements."

Russell then walked the FCWG through the following tables, which were extracted from the draft report.

Table 1. The modeled estimate of subyearling fall Chinook salmon consumed by each piscivorous fish species between June 1 – August 14, given equal population size (1,000 fish per species). Displayed in the default modeling output of grams, the converted estimated quantity of subyearling fall Chinook salmon (based on the median subyearling fall Chinook salmon weight of 3.2 g) and the estimated subyearling fall Chinook salmon daily consumption rate (average) listed in salmonids consumed per predator per day.

	Subyearling Fall Chinook Salmon		
Species	**Grams**	**Quantity of Fish**	**Daily Consumption (salmonids/predator/day)**
Northern Pikeminnow	88,462	27,644	0.37
Smallmouth Bass	73,195	22,873	0.31
Walleye	125,284	39,151	0.52
Literature range			0.01-1.4

Table 2. Abundance ranges and predator density for each of the three piscivorous fish species, northern pikeminnow, smallmouth bass and walleye, are provided with mean and standard error ranges. Total area between McNary Dam and Priest Rapids Dam was calculated by use of Arc GIS™ at 17,263 hectares.

	Predator Abundance			Predator Density (Fish/Hectare)			*Literature Range**
Species	**Low**	**Mean**	**High**	**Low**	**Mean**	**High**	
Northern Pikeminnow	68,900	109,779	150,658	4.0	6.4	8.7	*3.4 - 5.6*
Smallmouth Bass	130,117	230,084	330,052	7.5	13.3	19.1	*1.3 - 30.6*
Walleye	17,707	36,081	54,454	1.0	2.1	3.2	*0.3 - 1.7*
Sum	*216,724*	*375,944*	*535,164*	*12.6*	*21.8*	*31.0*	*31.0*

*The literature range was provided by Russell Langshaw.

Table 3. The mean and range values of subyearling fall Chinook salmon preyed upon by each simulated predator fish population in Hanford Reach and Lake Wallula[1] between June 1 and August 14.

	Estimated Quantity of Subyearling Fall Chinook Salmon Consumed		
Species	**Low**	**Mean**	**High**
Northern Pikeminnow	1,904,672	3,034,731	4,164,790
Smallmouth Bass	2,976,166	5,262,711	7,549,279
Walleye	693,247	1,412,607	2,131,929
Sum	*5,574,084*	*9,710,049*	*13,845,998*
Estimated Mortalities	*9,400,000*	*29,400,000*	*49,400,000*

Table 4. Hypothetical back calculated predator abundance of northern pikeminnow, smallmouth bass and walleye for comparative purposes, displayed in predator density- fish per hectare.

	Daily Consumption Rate	Predator Density Required (Fish Per Hectare)		
Species	**Salmonids/Predator/Day**	**Low**	**Mean**	**High**
Northern Pikeminnow	0.37	19.8	61.4	103.0
Smallmouth Bass	0.31	23.6	73.3	123.0
Walleye	0.52	14.1	43.7	73.3
Generic Predator (Mean)	0.40	18.3	56.8	95.3

[1] The low, mean and high values of the predator abundance were multiplied by the bioenergetics consumption results.

Table 5. Hypothetical back calculated predator abundance of northern pikeminnow, smallmouth bass and walleye combined with relative abundance weighting for comparative purposes, displayed in predator density, fish per hectare.

	Predator Density (Fish/Hectare)		
Species	**Low**	**Mean**	**High**
Northern Pikeminnow	6.2	19.3	32.3
Smallmouth Bass	13.0	40.4	67.8
Walleye	2.0	6.3	10.6

John Clark asked why the predation rate was roughly a constant percentage across the different abundance levels. Although unknown, some members thought that it may be because the tagged fish were not representative of the population. This issue will be discussed more in the future.

Members asked what will happen next, give the results from the predation report. Russell Langshaw noted that hopefully the fisheries managers will use the information to guide future research on predation issues in Lake Wallula and ultimately to identify methods to reduce predation effects. This could include greater harvest rates on predators or altering flows during critical periods to cause recruitment failures in certain predators (e.g., smallmouth bass).

John Clark noted that Battelle's proposal to assess juvenile fall Chinook survival in McNary reservoir was accepted for funding by the Northern Boundary and Transboundary Rivers Restoration and Enhancement Fund. Battelle will tag 200 wild and 200 hatchery juvenile fall Chinook with acoustic tags. This study should help assess the effects of predation within the reservoir. The FCWG asked if they could read the proposal. Tracy Hillman will send the proposal to the FCWG.

Tracy Hillman will send the draft predation report to the FCWG today. The FCWG will have two weeks to review the report. Comments are due to Tracy and Russell by Tuesday, 18 February 2014. Tracy will compile the comments and send them to Blue Leaf. It is hoped that Blue Leaf will have a final report to the FCWG by Tuesday, 4 March 2014.

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 looking at relationships among abundance, growth, survival, and productivity. He is also trying to compile information on condition factors. Russell indicated that he will try and provide the FCWG with a draft study plan in March 2014.

Russell indicated that Todd Pearsons has organized a symposium at the AFS meeting in Vancouver, WA, that focuses on carrying capacity and density dependence. Several presenters will be describing the presence of density dependence in fish populations and the importance of carrying capacity in the management of fish species.

Redd Superimposition – Paul Hoffarth will provide a final memo to the FCWG that identifies the number of eggs retained by fall Chinook in the Hanford Reach through 2013. The final memo is due March 2014. 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.

VII. Phase III Studies

Paul Hoffarth asked that the FCWG begin thinking about Phase III studies. He said there is a need for ongoing data collection activities and a need for a monitoring plan that describes future activities. Russell Langshaw identified the following studies that will likely occur during Phase III: (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. The FCWG agreed to continue identifying and discussing Phase III studies.

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 also reported that water temperatures this year are generally tracking the overall mean temperatures. He noted that emergence is predicted to occur around 17 March. Russell noted that snow pack is low this year and is around 80%, which is about 46 million acre-feet of water. He indicated that if levels are at or below 42.9 million acre-feet, the critical elevation can be reduced. So far, this year is similar to 2010.

Stranding and Entrapment Retrospective Analysis – Russell Langshaw said that he did not have time to work on the retrospective analysis in January. He hopes to explore the use of hurdle models this month. 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. His next update will be in March.

Hanford Reach Escapement – Paul Hoffarth said that in 2013 the spawning escapement of fall Chinook in the Hanford Reach totaled 174,841 fall Chinook (157,848 adults and 17,356 jacks). Paul noted that this escapement resulted in about 230 million eggs, which is well above the 100 million at which density dependence is expected. Paul said that the 2013 redd count report can be found at the following site:

http://www.hanford.gov/page.cfm/EcologicalMonitoring

Finally, Paul noted that he is currently working on the fall Chinook forecast. He will share that information with the FCWG next month.

IX. **Next Meeting**: Tuesday morning, 4 March 2014 at Grant PUD in Ephrata, WA.