Fall Chinook Work Group

Tuesday, 1 July 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
Peter Graf, GCPUD	Todd Pearsons, GCPUD
Steve Hemstrom, CPUD	

Attendees: (*Denotes Technical member)

Russell Langshaw, EI (Phone)	Peter Graf, GCPUD*
John Clark, ADFG* (Phone)	Paul Wagner, NMFS* (Phone)
Tom Kahler, DPUD*	Ryan Harnish, Battelle
Tom Skiles, CRITFC (Phone)	Todd Pearsons, GCPUD
Tracy Hillman, Facilitator	

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.**

5. **Ryan Harnish will work with Grant PUD on providing more detail on the five density dependence studies identified in John Clark's Phase III study suggestions.**

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.

III. Approval of Meeting Minutes

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

IV. Review of Action Items - Action items identified during the June 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.**
- 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.**

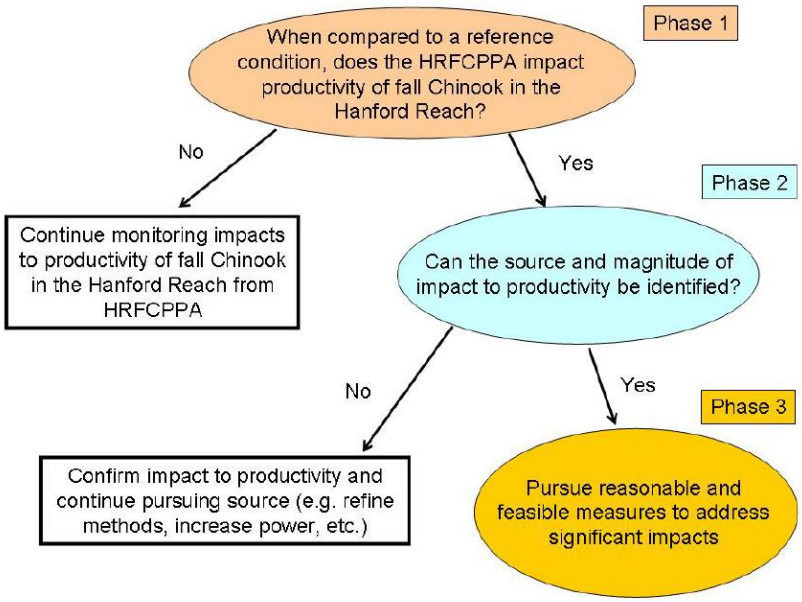
V. Update on Wanapum Dam Issues

Peter Graf gave a brief update on the current status of Wanapum Dam issues. Peter noted that the engineers have successfully installed the spiral chutes to the flumes and have modified the approach ramps. In addition, they have added perforated plates to the left and right ends of the flume to prevent adult lamprey attachment. The engineers have installed a "jump curtain" to prevent sockeye from jumping out of the flume. Peter indicated that the Wanapum ladders were down (not at the same time) for roughly 30 hours while the engineers modified the flumes. Peter said that several summer Chinook have passed the dam and sockeye are starting their passage. He said that all passage criteria are being met. Observers are on site 12 hours per day to track anomalies in fish passage at the flumes.

Peter Graf indicated that Grant PUD will request an interim reservoir elevation of 560-562 feet, which would allow normal operation of the adult fish ladders at Wanapum Dam, but could create problems with meeting reverse load factoring requirements. The interim elevation must be approved by the Board of Consultants and FERC. If approved, the interim elevation would likely occur later this year.

VI. Study Plan Discussion

The discussion began with a review of Figure 5 in the Hanford Reach Study Plan (see Figure below).



The figure provides a conceptual framework for a phased study to identify and adaptively manage effects of hydro operations on fall Chinook in the Hanford Reach. Because no negative effects were identified in Phase I, it was questioned why the FCWG moved into Phase II, which is intended to identify the source and magnitude of negative effects revealed in Phase I. Russell Langshaw explained that the FCWG elected to do addition studies that would help explain some of the findings identified in Phase I. For example, they wanted to see if predation and density dependence played a significant role in the loss of pre-smolts. In addition, Phase II studies would also help to explain some of the uncertainties identified during Phase I and would provide additional information for adaptive management. To that end, the FCWG identified Phase II studies that would help address those questions. Ecology supported the approach and approved the Phase II studies.

As a refresher, Russell Langshaw gave a presentation on the phased study plan for the Hanford Reach Fall Chinook Protection Plan (See Attachment 1). Russell began the presentation by providing an overview and history on protection and mitigation for the Hanford Reach, including a discussion on operations and constraints. He then identified the Phase I studies and provided a brief summary of results for each study. He then followed with a discussion on Phase II

implementation and the studies associated with it. He concluded by discussing Phase III implementation, which included a review of protections and mitigations.

VII. Phase II Study Plan Updates

Predation Report – Russell Langshaw and Peter Graf said that Grant PUD will be providing Blue Leaf with a PO so Blue Leaf can finalize the predation report. Russell indicated 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 has otoliths from juvenile fall Chinook that died during recent tagging studies.

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

VIII. Phase III Studies

During the past few months, the FCWG has been discussing the implementation of Phase III studies. Once Russell Langshaw completes a summary report on Phase II studies (similar to the Phase I summary report), which should be completed later this year, the FCWG will have a better idea of what to implement in Phase III. Some of the studies identified earlier by the Working Group include: (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.

John Clark provided the FCWG with a brief write up on studies he believes should be implemented during Phase III (see Attachment 2). His first suggestion was to continue to conduct the productivity analyses every five years. This has been supported by the FCWG and will be included in Phase III. His second suggestion was to do additional egg to fry survival studies. This did not get as much support from the FCWG, but will be evaluated in the summary report prepared by Russell Langshaw. Finally, the Working Group spent some time discussing John's third suggestion, which is to conduct opportunistic high-escapement studies in 2014. With the anticipated record-level escapement of fall Chinook in 2014, there are unique opportunities to evaluate potential density dependent factors. Based on discussions

with Battelle, John identified about five studies that could take advantage of the record escapement. Todd Pearsons indicated that Grant PUD, through their hatchery M&E program will be collecting a lot of useful information to inform density dependence. It was suggested that Ryan Harnish work with Grant PUD (Todd Pearsons and Peter Graf) on fleshing out the five suggested studies associated with density dependence. Ryan will provide the FCWG with more information on the suggested studies in August. Grant PUD and Russell Langshaw will evaluate how much of this work is related to the Priest Rapids Project. It is likely that funding may have to be secured from other sources (e.g., Northern Fund).

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."

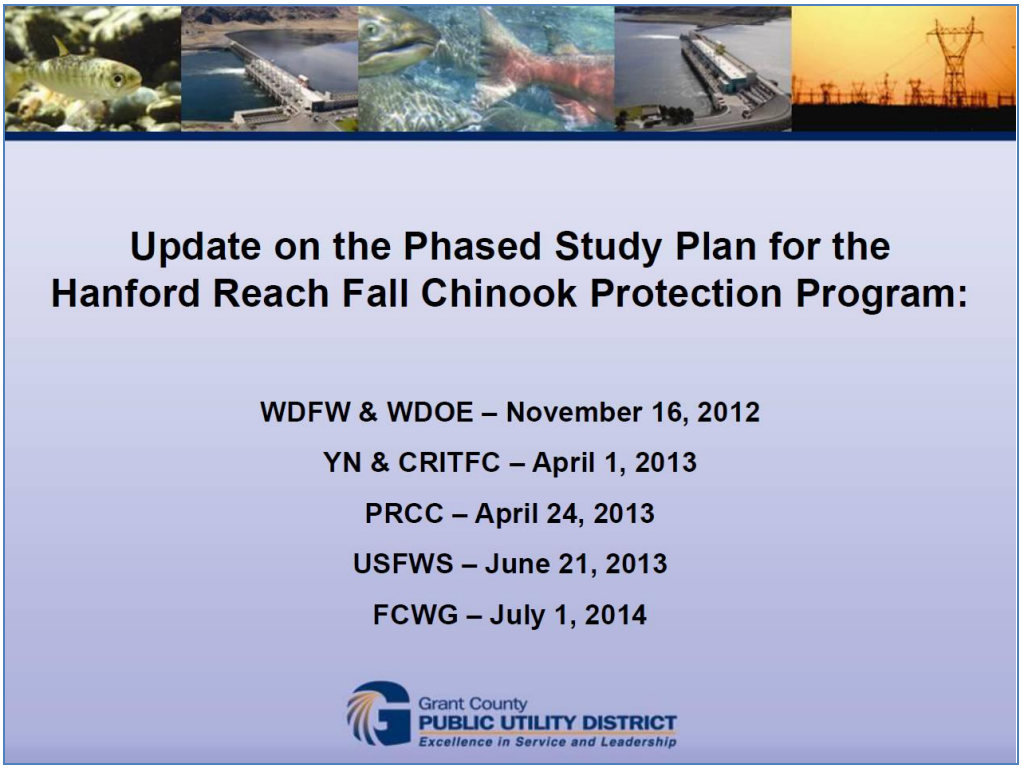
Peter Graf reported that rearing ended on 19 June. He also said that there were no violations in protection flows during the incubation, emergence, or rearing periods. Even with the issues at Wanapum Dam, Grant PUD was able to maintain protection flows in the Hanford Reach. Grant PUD will be discussing Reverse Load Factoring and its effects on maintaining protection flows in the Hanford Reach.

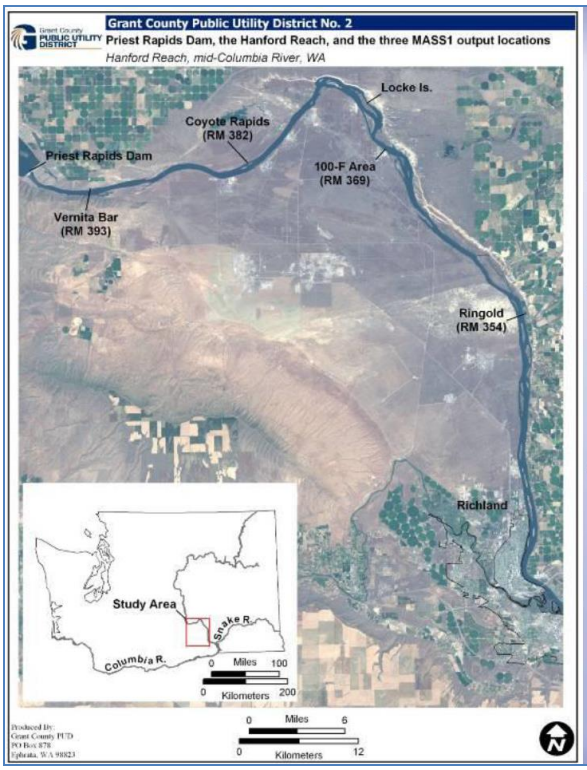
Stranding and Entrapment Retrospective Analysis – Russell Langshaw reported that he did not have time to work on the retrospective analysis in June. He said that he will work on this assignment later this summer. He intends to explore the use of hurdle models. The hurdle model is a two part process. 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.

X. Next Meeting: Tuesday morning, 5 August 2014 at Grant PUD in Ephrata, WA.

Attachment 1

Presentation by Russell Langshaw on the Phased Study Plan for the Hanford Reach Fall Chinook Protection Program





Hanford Reach

- Unimpounded for 52 river miles
- Largest naturally spawning Chinook population in Columbia River
- Limited access/development because of USDOE Hanford Site and is now a National Monument protected by Presidential Proclamation

Overview of protections and mitigation

- HRFCPPA
  - Continue current protections
  - Monitor and estimate fry losses (2011-13)
- Priest Rapids Hatchery
  - Continue 5M smolt production
  - Add 345K smolts and 1M fry (2013)
  - New M&E plan (2010)
  - Hatchery renovation (2013-14)
- Article 405 – Habitat in Wanupum tailrace (2011)
- 401 WQ Certification (2008-15)

History of protections

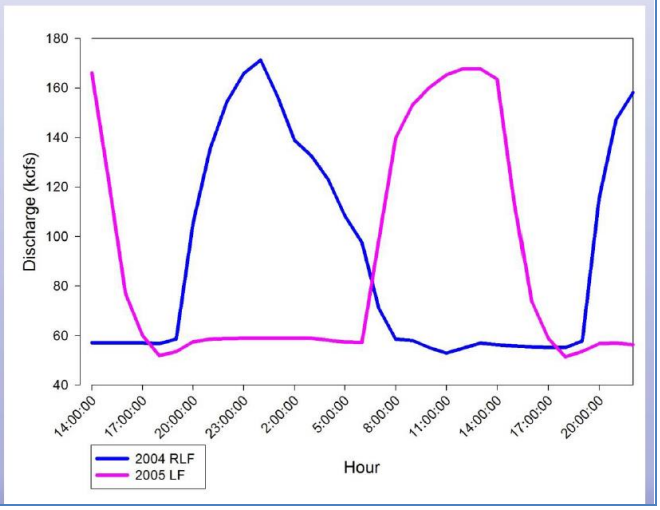
- Foundation of research and adaptive management
- Vernita Bar Settlement Agreement
  - Objective was to prevent redd desiccation
  - Initial studies early 1980's
  - Interim protections mid-1980's
  - Final agreement 1988
- Hanford Reach Fall Chinook Protection Program
  - Maintain desiccation protections and add early rearing
  - Initial studies late 1998-2003
  - Interim protections early 2000's
  - Final agreement 2004
  - Subsequent studies 2006-2014

HRFCPPA protections

- Accumulated temperature units
- Spawning Period
  - Timing and shape of discharge
- Incubation and Hatching
  - Discharge minimums
- Emergence and Rearing Periods
  - Discharge minimums and deltas

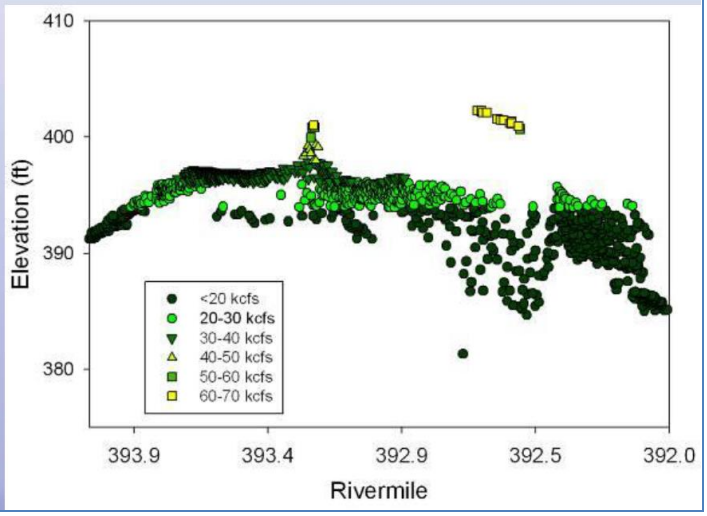
Spawning Period

- Limit high elevation spawning
  - Reverse Load Factor
- Redd counts



Pre- and Post-hatch Period

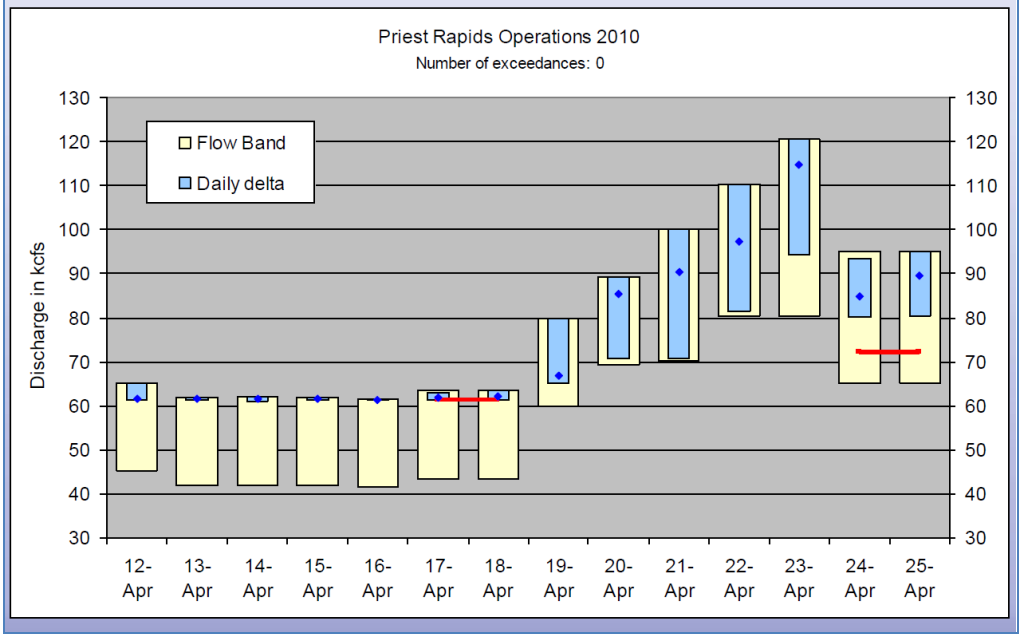
- Prevent dewatering
  - Discharge minimums
- ATUs



Emergence and Rearing Period

- Prevent dewatering
  - Discharge minimums
- Reduce stranding and entrapment
  - Discharge Delta
    - Maximum - minimum discharge
  - Operational flexibility increases with inflows
- ATUs

Operations and Constraints

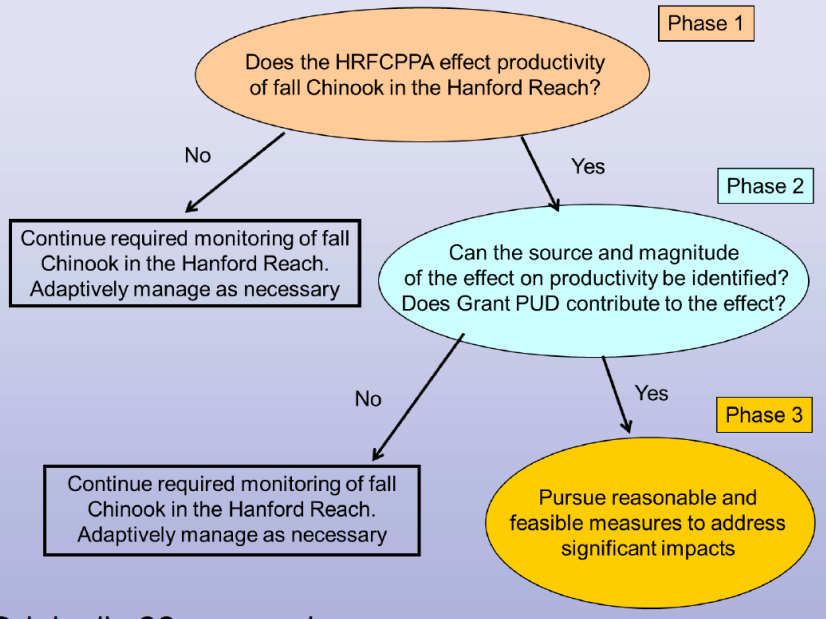


401 WQ Certification

6.3.4) Fall Chinook Work Group
6.3.5) Contribution to flow fluctuations
6.3.6) Monitoring to understand impacts
- a) Study identification
- b) Prioritization
- c) Study Plan
- d) Funding
- e-f) Study Designs
- g) Report

6.3.7) Potential implementation measures
- A) Feasibility Study and Report
- B) Implementation Plan

Phased Study Plan

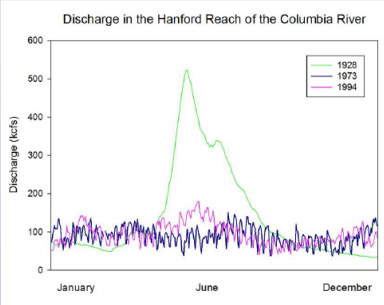


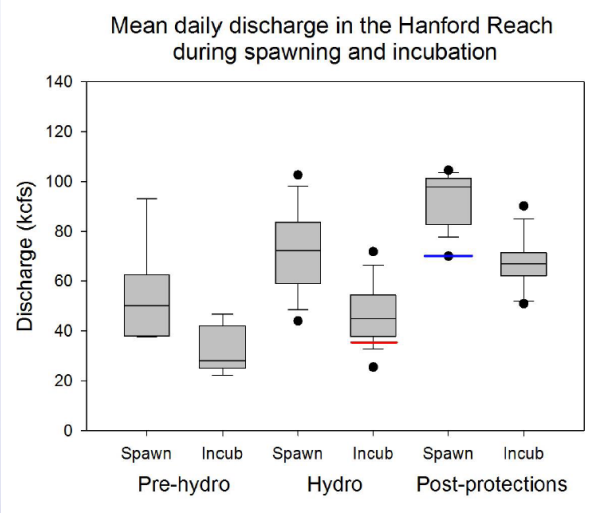
- Originally 22 proposals

Phase I

- Productivity factors assessment
  - Final report completed
- Fallback assessment
  - Final report completed
- IBM - Production simulation model
  - Version 1.0 completed and available
- Hydrodynamic model synthesis
  - Completed and used for many ongoing and completed studies
- Egg-to-fry survival
  - Final report completed and fine-tuning fertilization timing model

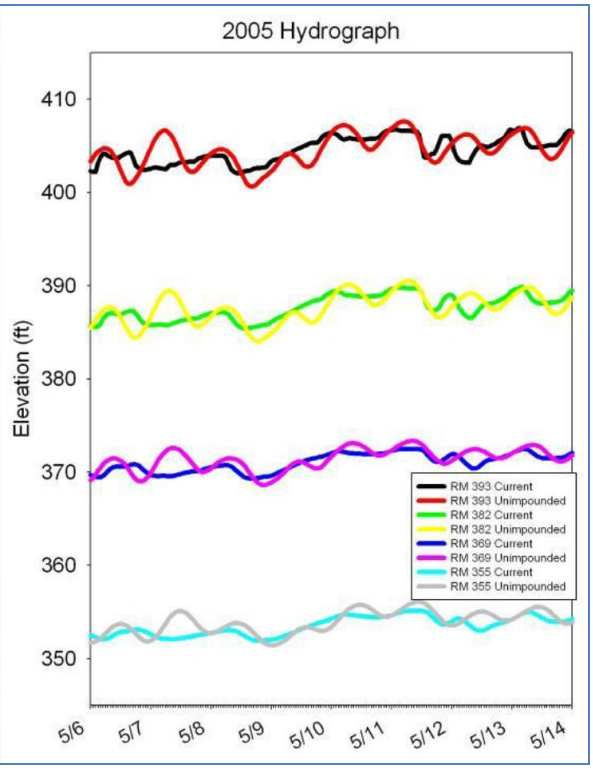
Hydrodynamic modeling



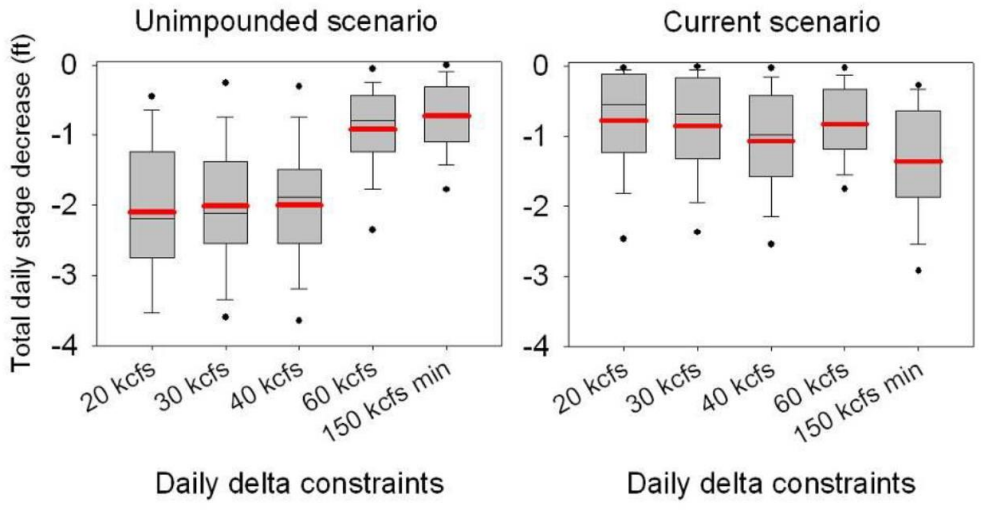


Flow Fluctuation Report

- Modeled 2004-08
  - HRFCPP scenario
  - Hypothetical unimpounded scenario



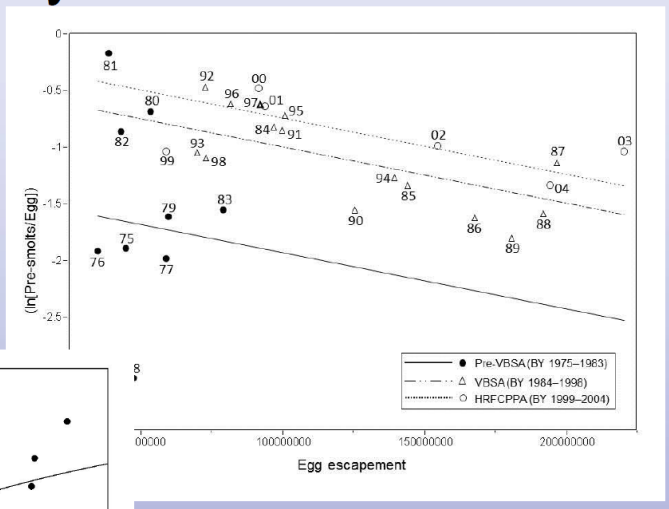
Total daily stage decrease (ft) at 100-F Area (2004-2008)

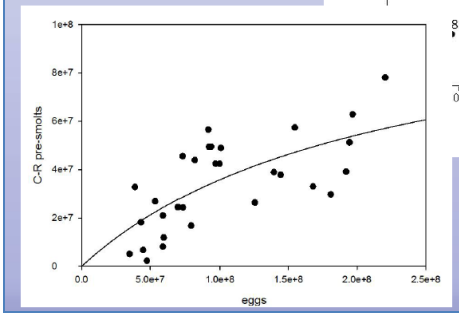


Productivity Assessment results

- Very high productivity
  - Significant difference pre- and post-VBSA
  - Post-VBSA
    - Adult α = 10.3
    - Pre-smolt α = 0.48
    - Density dependence > 42,000 adult escapement
- Variables correlated with productivity
  - Variation in discharge during incubation
  - Discharge decrease between spawning and incubation

Productivity Assessment results

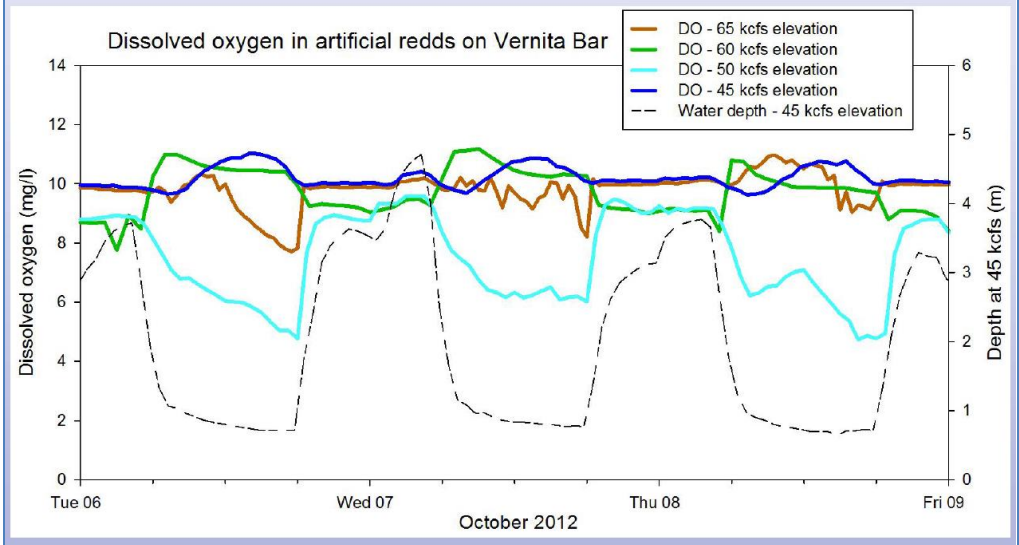




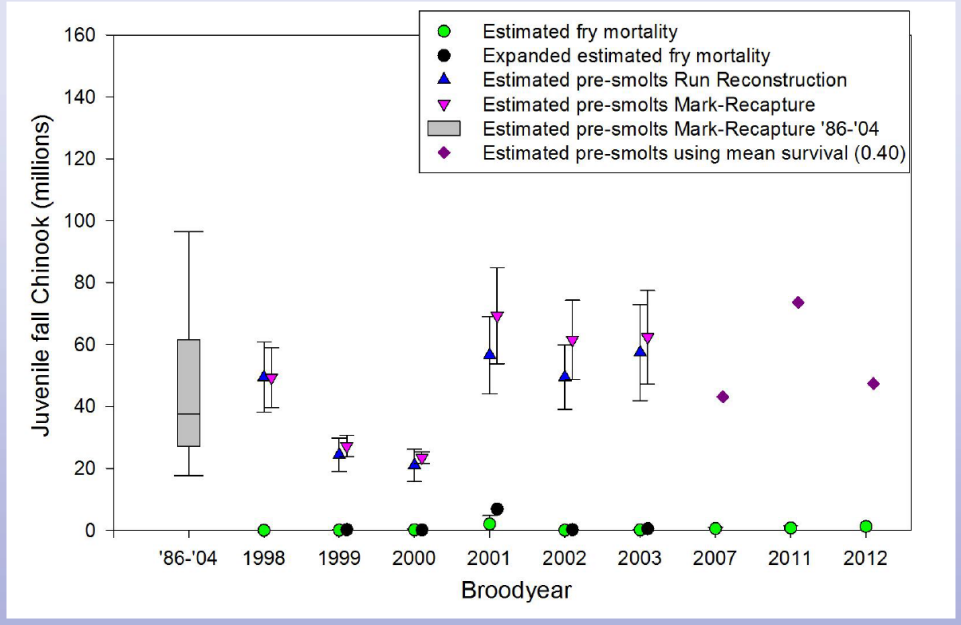
Egg-to-fry survival results

- Fertilization to 378 degree days
  - Excavated natural redds (n=52)
  - 97.6% ± 5.6% survival
  - 78% fertilized at night
- 378 dd to 900 dd
  - Cylindrical egg tubes
  - 63.9% and 84.5%
  - Low dissolved oxygen likely source of mortality
- Overall 71.2%

Dissolved oxygen in redds



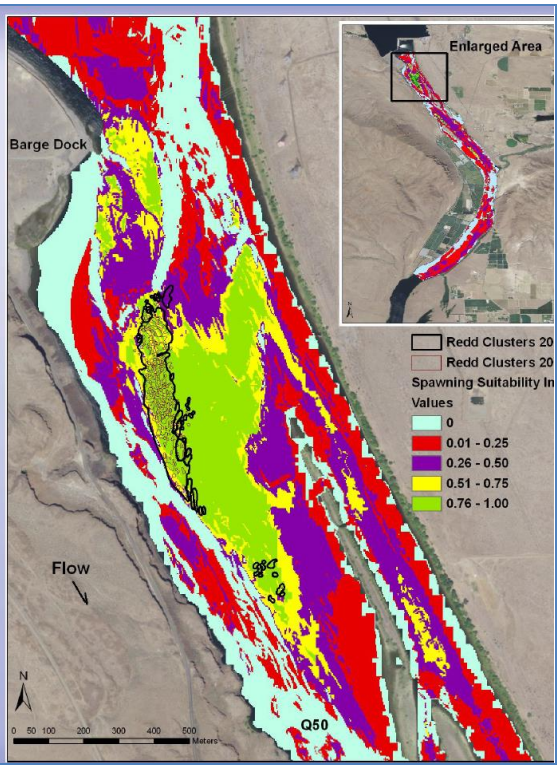
Stranding and Entrapment



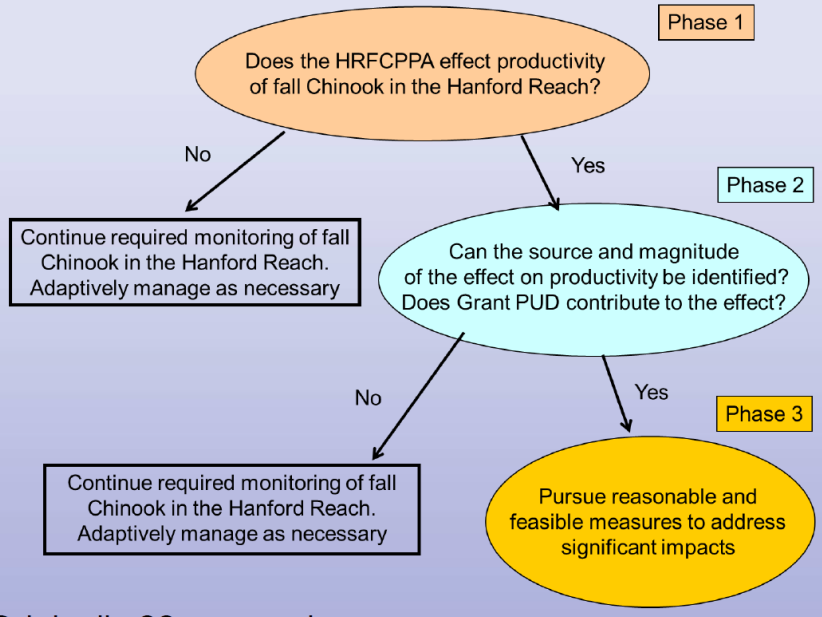
(Data from McMichael et al. 2003, Anglin et al. 2006, Skalicky pers. comm., Harnish et al. 2012, and Hoffarth et al. 2012)

Miscellaneous studies

- Individual-based production simulation model
- Fallback assessment
- Priest Rapids Hatchery M&E
- Article 405



Phased Study Plan



- Originally 22 proposals

Phase II – Original Plan

- If significant negative effect on productivity is identified
- Eleven potential proposals identified
  - Spawning Period
  - Emergence and Rearing Periods
- Potential controlled flow fluctuation study
  - Considered as method for Phase II studies

Phase II – Implementation

- Consistent with original plan
- No evidence that HRFCPP is limiting productivity
- Assess superimposition
  - Slightly increased egg retention during 2013 (Hoffarth 2014 memo).
- Data mining for stranding and entrapment
  - ongoing

Phase II – Implementation

- Support CRITFC Juvenile PIT-tagging
  - Approximately 10,000 PIT-tagged in 2014
- Develop plan to examine density dependence
  - Identify methods that can capitalize on previous and ongoing data collection
- Predation Report
  - Report to be finalized by September
  - JSATS draft report completed by September
- Continue monitoring productivity with PRH M&E

Phase III

If flow fluctuations under the HRFCPPA "*are causing significant harm… and the Project contributes to such flow fluctuations, then the Grant PUD shall to the extent reasonable and feasible adaptively manage Project operations to address its contribution.*"

- Implementation Feasibility Study
  - Investigate reasonable and feasible measures to avoid, reduce or mitigate for adverse effects
- Implementation Feasibility Plan
  - Plan to implement approved measures

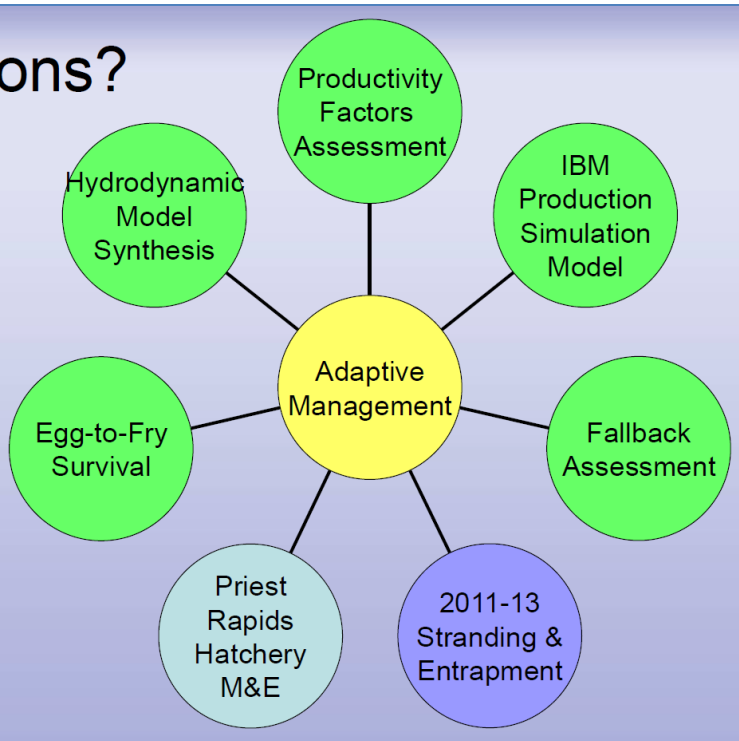
Phase III – Plan & Implementation

- Consistent with original plan
- No evidence that HRFCPP is limiting productivity
- Aren't anticipating operational changes
- Plan distributed to FCWG in December
  - Final due to FERC April 17, 2015
- Likely expanded monitoring
  - Egg retention
  - Stranding and entrapment estimate
  - Productivity assessment

Review of protections and mitigation

- HRFCPPA
  - Continue current protections
  - Monitor and estimate fry losses (2011-13)
- Priest Rapids Hatchery
  - Continue 5M smolt production
  - Add 345K smolts and 1M fry (2013)
  - New M&E plan (2010)
  - Hatchery renovation (2013)
- Article 405 – Habitat in Wanupum tailrace (2011)
- 401 WQ Certification (2008-15)
  - Phase I complete
  - Phase II 2012-14
  - Aren't anticipating any changes to HRFCPPA

Questions?



Attachment 2

FCWG Phase III Study Suggestions by John Clark

The June 23rd agenda for the Fall Chinook Work Group scheduled for July1, 2014, as distributed by Tracy Hillman lists potential phase 3 studies as a topic. The topic of Phase III studies is one that I have recently discussed with Battelle scientists. Suggestions provided below are the result of these exchanges and are Phase III studies I recommend the Fall Chinook Work Group consider.

Suggestion Number 1; Productivity Updates:

Regularly scheduled updates of the productivity analyses should be included in the Phase III study plan. The plan should clearly articulate the dates when additional analyses would be conducted (every 5 years). This is not a trivial effort to implement. The data must be thoroughly vetted and will require wide collaboration with folks involved with Chinook salmon harvest sectors such as the Chinook Technical Committee of the Pacific Salmon Commission, among others. Battelle completed the initial analysis and completed a high quality job in doing so and are, therefore, a logical choice to continue this work. The first update should be initiated soon and completed in 2015 (after all data became available from the 2014 return of age-5 fish). This update would add brood years 2005–2009 to the productivity analysis and is highly important due to the presence of several years of low escapement (2007–2009) during this time period coupled with high returns. As pointed out by several reviewers as a potential shortcoming of the BY 1975–2004 productivity analysis, years of low escapement were not well represented during the HRFCPPA period in the previous productivity analysis. Further, the current operational agreement was only represented by one prior brood year, an update would include 6 such years and can drop the brood years prior to the Vernita Bar Agreement period. The second update would need to occur in 2020. This update would add brood years 2010–2014 to the productivity analysis and is also highly important due to the addition of several years of very high escapement with current unknown returns. The addition of these years may help to identify potential limiting factors of freshwater productivity. The pattern of continuing updates each five years should continue thereafter.

Suggestion Number Two; Egg to Fry Survival:

Additional egg-to-fry survival work to increase geographical coverage and cover additional years would be very useful and valuable. The current data set is compelling, but is so far outside the reported values from other systems that additional work should take place. A small-scale follow-up study could focus less on elevation influences and just cover a range of habitats within areas where fish spawn. Something like 5 tubes (100 eggs each) in 10 different areas (2 would be the same areas studied in 2012 to have replication in time) should give a good range and provide the data necessary to bolster the existing information. Additionally, an attempt to estimate egg-to-fry survival in low elevation (i.e., deep water) redds could be made to better represent survival in the most commonly used habitats. Alternatively, a larger-scale follow-up study could attempt to estimate egg-to-fry survival on more of a population-level scale. High replication (i.e., multiple egg tubes at many elevations and geographic areas) would provide egg-to-fry survival estimates that could be expanded to the proportion of redds constructed at each elevation/area.

Suggestion Number Three; Opportunistic High Escapement Studies in 2014:

The forecast for extremely high escapement in the Hanford Reach in 2014 provides the opportunity to examine potential density dependence factors associated with the anticipated record level of natural spawning of fall Chinook salmon. If Grant County decides not to directly fund some or all of these ideas, it could help lead an inter-agency effort to secure funding and assist with some of the implementation. The FCWG represents just about the only scientific effort that provides a sharp focus on this stock of Chinook salmon that is vitally important to users ranging from Alaska to the Reach itself. Potential ideas along this line include:

- Use acoustic tags seeded in spawning areas before/during spawning season to determine area and timing of substrate disturbance to egg pocket depth. An injection method could be developed with a probe and pumped water to place the transmitters (in slightly positively buoyant media) into redds that are judged to be complete (spent female defending).
- Take underwater video of pre-established transects in major spawning areas (e.g., Vernita Bar) throughout the spawning season to document and enumerate the number of fall Chinook salmon eggs present on the substrate. Because the total number of eggs successfully deposited in a spawning area approaches carrying capacity of the area as the number of spawners increases, the expectation is a high rate of superimposition and potentially, a large number of eggs on the substrate should occur in 2014.
- The relationship between the number of eggs observed on the substrate (from above) and redd abundance could be evaluated using aerial redd surveys (potentially using a fixed camera overlooking the spawning area or by using video taken during frequent flights by a drone).
- Pre-smolt carrying capacity studies could include an examination of physical characteristics (e.g., length, weight, isotope data, fat content, etc.) of post-emergent fry through the smolt stage in spring 2015 and again in a subsequent year following lower escapement to address the question of whether the rearing habitat may be limiting productivity in years following high escapement. This could be accomplished by sub-sampling the fall Chinook salmon juveniles collected via seining by the CRITFC crews. This could be coupled with an examination of daily growth increments in otoliths in adults that returned from years of high vs low fry abundance. The downside of simply using the otolith approach is that the samples only represent the 'survivors' of the fry-smolt stage.
- A data-mining exercise to look at smolt index data from McNary and Ice Harbor to try to determine relationships between the productivity analyses output already available and escapement (e.g., estimated number of eggs deposited) to see whether there is a signal that would indicate a threshold above which smolt output is affected. Such an approach might also incorporate a model to try to isolate the influence of escapement on fish size and number (smolt index) of fish produced.