Rocky Reach Fish Forum

Wednesday, 2 December 2015
1:00 – 4:00 p.m.
Chelan PUD Second Floor Conference Room
Wenatchee, WA

Meeting called by Steve Hemstrom — Chairperson, Tracy Hillman
Notes taken by Heidi Kunz

Attending Representatives:

Hemstrom, Steve	Chelan PUD	(509) 661-4281	steven.hemstrom@chelanpud.org
Lewis, Steve	USFWS	(509) 665-3508 x14	stephen_lewis@fws.gov
Verhey, Patrick	WDFW	(509) 754-4624	verhepmv@dfw.wa.gov

Attending Participants:

Hillman, Tracy	BioAnalysts	(208) 321-0363	tracy.hillman@bioanalysts.net
Jackson, Chad	WDFW	(509) 754-4624 x250	chad.jackson@dfw.wa.gov
Keller, Lance	Chelan PUD	(509) 661-4299	lance.keller@chelanpud.org
Kunz, Heidi	Chelan PUD	(509) 661-4758	heidi.kunz@chelanpud.org
McLellan, Jason (phone)	CCT	(509) 263-1082	Jason.McLellan@colvilletribes.com
Nelle, RD (phone)	USFWS	(509) 548-7573	RD_Nelle@fws.gov
Rainey, Steve (phone)	USFWS (Consultant)	(503) 260-6990	wsteverainey@aol.com

Meeting Minutes

I. Welcome and Introductions

Tracy Hillman welcomed everyone to the Rocky Reach Fish Forum (RRFF) meeting. Participants introduced themselves.

RD Nelle commented that he may miss the Pacific lamprey discussion. He reported that the document, *Final Draft Rapid Assessment of Adult Pacific Lamprey Passage at Tumwater Dam*, has not yet been finalized.

II. Agenda Review

The agenda was reviewed and approved with changes. Lance Keller requested that the Decision on Modifications to the Sturgeon Monitoring Plan be changed to a discussion. Members agreed.

III. Review and Approval of Meeting Minutes

Minutes from the 4 November RRFF meeting were reviewed, approved, and finalized.

IV. Review of Action Items

- Technical representatives will take time to prepare and inform their policy representatives on sturgeon issues in the project area prior to the Policy Meeting on 6 November 2015. **Complete**
- Steve Hemstrom and Bob Rose will arrange the assistance from Yakama Nation's intern to help with compiling and analyzing FCRPS dam counts and conversion rates. **Ongoing**
- Steve Hemstrom will re-send the lamprey intrinsic potential results to RD Nelle. **Complete**
- The Pacific Lamprey Subgroup will continue to work on proposed draft recommendations and will provide updates to the RRFF during the next meeting. **Ongoing**
- Tracy Hillman will send out a Doodle Pole to the Pacific Lamprey Subgroup to identify at least two more meeting dates. **Complete**
- Steve Hemstrom will finalize the HDX PIT-Tag lamprey analysis with the help of Rod O'Connor and provide the document to the RRFF. **Complete**
- Tracy Hillman will contact Ralph Lampman to determine the specific release locations for juvenile lamprey captured at Dryden Dam. **Ongoing**
- The RRFF will review the Final Draft Rapid Assessment of Adult Pacific Lamprey Passage at

Tumwater Dam report and provide comments during the December RRFF Meeting. **Complete**

- Steve Lewis will research and provide clarification on the USFWS position on adult Pacific lamprey translocation. **Complete**
- Lance Keller will send out a report on the proposed changes to the White Sturgeon Monitoring Plan. **Ongoing**
- Everybody should read the "Final Draft Rapid Assessment of Adult Pacific Lamprey Passage at Tumwater Dam" report from Steve Rainey. **Ongoing**

Patrick Verhey commented that he has reached out to a new employee (Anna Harris) at Washington Department of Ecology. He will ask Anna to contact Tracy Hillman with information on what her role will be.

V. White Sturgeon

Update on Juvenile Rearing

Lance Keller reported that Chelan Hatchery has approximately 3,600 juvenile sturgeon on station. They range from 135.0 to 16.25 fish per pound. Lance stated that only about 430 fish are at the 135.0/lbs range; the rest are between 78.0 and 16.25/lbs. All fish are healthy and the numbers are looking good. Fish at Columbia Basin Hatchery are averaging 11.0 fish per pound. There are approximately 4,500 juvenile sturgeon on station. That number will be reduced to 3,500 in January. Chad Jackson reported that if the extra 1,000 fish are not claimed, they will go in the dirt.

Review and Address Policy Representative Directions and Assignments

Tracy Hillman reported that the policy group had a very good meeting in November. The policy group agreements were summarized in the handout *Directions to Fish Forums from Policy Representatives* (see Attachment 1). Tracy stated that most groups were well represented. The City of Entiat will not be able to participate in either the policy or technical groups for some time during their representative's medical absence.

Steve Hemstrom and Lance Keller were asked to prepare a summary on the potential negative ecological effects of introducing too many sturgeon into the Rocky Reach reservoir. Lance Keller commented that they do not have much time to complete their summary, so any contributions from the Forum will be appreciated. Tracy Hillman commented that Jim Powell, Steve McAdam, and Cory Williamson could be contacted for more information on the subject. Steve Hemstrom commented that there is very little information specifically on white sturgeon and that information on other sturgeon species and similar situations will need to be used. Chad Jackson commented that it could be valuable to look at literature on other apex predator species in environments where their populations have been increased and have demonstrated ecological impacts. Tracy added that populations that have been supplemented could also be included. Steve Hemstrom reported that because there is currently little direct information on

white sturgeon and prey species interactions, he has been researching other fish predators populations and prey species responses that could be similar to effects of white sturgeon stocked in high abundance, and that the policy group will be asked to make connections between these examples and white sturgeon.

Tracy commented that the Priest Rapids Fish Forum (PRFF) and RRFF have both focused on identifying negative interactions of introducing large numbers of white sturgeon. He asked the group if there could be any positive effects. Tracy commented that the number of northern pikeminnow could be reduced by a larger white sturgeon population; however, total predator numbers will likely increase and that would not be good for prey items. Steve Hemstrom commented that it could help reduce some non-endemic species of concern or invasive species. The group concluded that the potential for negative interactions seem to be much greater than potential positive effects. Steve Lewis suggested looking at work conducted by Dr. David Beauchamp in Lake Chelan.

The policy group asked the fish forums to discuss methods of reducing juvenile and/or adult white sturgeon numbers if carrying capacities are exceeded. Jason McLellan stated that removal options include harvest, mechanical removal, or both. Harvest includes sport and tribal fisheries on adults and possibly juveniles. Mechanical removal includes targeted, non-recreational removal of certain size classes using set lines or other appropriate methods (e.g., gill nets). Sturgeon collected for targeted removal could be used for research purposes (estimate diets, growth rates, habitat use, etc.), distribution for human consumption, and/or translocation. Jason stated that a specific method would be chosen based on what is being targeted; for example, fish size, brood year, or specific crosses. He described mechanical removal as targeted removal in order to meet a management objective. It would be considered a non-recreational removal effort. Chad Jackson stated that mechanical removal efforts could also be incorporated into M & E efforts. Lance Keller suggested relocation or translocation as a possibility. Chad suggested that the method used will depend on the number of fish that need to be removed. Steve Hemstrom commented that a public harvest can be a complicated endeavor due to the tracking of individual catch rates and hook hours that may need to take place. Chad commented that mechanical removal would be needed to target specific families or half-sib families and also perhaps if the target was one to two foot sturgeon.

Tracy Hillman asked each member of the RRFF to identify their greatest concerns with releasing 6,500 juvenile sturgeon into the project areas and identify what information is available or needed to address their greatest concerns.

WDFW

> ***Ecological Interactions***: This factor was selected based on modeling results showing that releases of 6,500 juvenile sturgeon could quickly exceed densities reported for other reservoirs. Rapid population growth rates within the project areas are due to the large numbers of fish released and their high survival rates. Given that sturgeon are apex predators, they will likely have negative effects on sensitive species (e.g., lamprey, anadromous salmonids, and other

resident species), the reservoir ecosystem, and food webs.

CPUD

Ecological Interactions: This factor was selected because of the large numbers of sturgeon released and their high survival rates. There is concern that large numbers of long-lived predators will affect community structure, food webs, and ESA-listed species and Pacific lamprey. In addition, large numbers of these predators within the tailrace of hydroelectric projects will compromise or confound future juvenile lamprey and salmonid survival studies.

Genetics: This factor is very important and was addressed adequately by the policy representatives.

USFWS

Ecological Interactions: This factor was selected because of concerns that large numbers of a long-lived predator (resulting from continued releases and high survival rates) will affect fish and benthic assemblages. There is no reason to believe that large numbers of apex predators will have no effect on community structure.

Genetics: Genetics are equally important, but they were addressed by the policy representatives.

Colville Confederated Tribes

Genetics: This factor is very important and was addressed satisfactorily by the policy representatives.

Ecological Interactions: This factor is important because of the suspected high survival rates of sturgeon, large stocking rates, and the longevity of the species. The stocking of large numbers of long-lived predators will likely affect community structure and function. There is no evidence that the stocking of predators will not have an effect on community structure.

Tracy will check in with the Yakama Nation and Alcoa for their input.

Steve Hemstrom stated that the technical group was asked to prepare a literature search on the potential negative interactions of introducing too many sturgeon. He would like help from the policy group to understand how stocking 6,500 fish each year for multiple years would not have a negative impact on ecosystem structure. Jason McLellan agreed and asked to see an example of supplementation of an apex predator that has not had an ecological impact. He would also like to see an example of a negative impact that has been effectively managed back to a desirable condition for the species that were impacted. Tracy agreed to ask the policy group these questions. Tracy explained that some members of the policy group are less concerned about overstocking, because they believe that if a problem occurs it can be reversed through harvest. Other members advocate a slow careful approach that includes monitoring to identify potential negative interactions.

Chad commented that the plan does not state that 6,500 fish should be stocked annually until the end

of the license. The plan states that there is a front-loading period, followed by the next phase, which is based on monitoring efforts. He believes that the current effort of trying to decide how many fish to stock is part of the completion of the second phase of the White Sturgeon Management Plan. Steve Hemstrom stated that the definition of Adaptive Management is that it can be used to exhibit a concern and implement a different structure based on that concern. He stated that based on the fact that indexing cannot show us immediately what the effects on all the species in the reservoir will be, Adaptive Management tells us to slow down. He will try to illustrate this in the white paper along with providing literature examples of species that have experienced similar situations. Steve and Lance will try to provide an annotated bibliography with a summary by Monday, 16 December.

Steve Hemstrom asked why there is a desire to stock 6,500 fish repeatedly when there are potential risks in doing so. Lance Keller pointed out that it is a >30-year license and he does not believe that 6,500 juveniles were naturally recruited annually to the Rocky Reach reservoir historically. Steve Hemstrom stated that he believes 30,000 white sturgeon, the number of juveniles stocked since 2011 in the reservoir, is well over historic capacity. Chad Jackson pointed out that even larger reservoirs that are being stocked with fewer fish are having concerns with carrying capacity.

Tracy reported that the policy group also asked the technical group to compile or identify and prioritize locations for the collection of white sturgeon larvae. Technical representatives present identified and ranked locations for collecting sturgeon eggs and/or larvae for the Priest Rapids and Rocky Reach supplementation programs. Selection of collection sites was based on genetics and feasibility.

1. In terms of genetics, larvae can be collected anywhere upstream from Bonneville Dam (including the Snake River downstream from Hells Canyon Dam).

2. Based on population productivity, the most promising locations for collection of egg and/or larvae include Bonneville and The Dalles pools, Lake Roosevelt, mid-Columbia (Wanapum Pool), and downstream from Hells Canyon Dam. Fertilized eggs are currently being collected in Wanapum Reservoir as part of a “reproduction potential” study. Eggs collected are reared *in situ* and are being used in the Wells supplementation program. Managers need to consider that collections from Lake Roosevelt already support two supplementation programs and availability in the long-term (> five years) is dependent on upper Columbia Recovery Program goals and objectives. Collection of larvae downstream from Bonneville Dam is the least preferred collection site.

3. Because unusual conditions in the lower Columbia River (i.e., low flows and high temperatures) likely precluded successful capture of larvae in 2015, the technical representatives believe at least another year of testing larval collection methods in Bonneville and The Dalles pools is appropriate.

Patrick Verhey commented that Chelan PUD may want to investigate larval collection techniques that are being used in Grant County. Lance Keller agreed that they are open to looking at new techniques

being used by other entities.

Action Items:

- **Members are asked to provide literature on ecological interactions to Lance Keller and Steve Hemstrom.**
- **Chad Jackson will look into removal methods for CRITFC-released fish.**

Modifications to the Sturgeon Monitoring Plan

Lance Keller stated that he would like to postpone a decision on modifications to the White Sturgeon Monitoring Plan until after the policy discussions have been completed. Lance confirmed that modifications will include four stomach analyses per year. Lance is hoping to receive a research paper on stomach analysis techniques soon from Jamie Crossman of British Columbia Hydro.

Action Item:

- **Lance Keller will send out Jamie Crossman's research paper on stomach analysis techniques when he receives it.**

VI. Pacific Lamprey

Rocky Reach Project Effects – No Net Impact (NNI)

Tracy Hillman reported that the Pacific Lamprey subgroup did not meet in November. Joint subgroup meetings with PRFF and RRFF are scheduled for Tuesday, 19 January and Thursday, 4 February. Steve Hemstrom would like to keep survival study discussions on the agenda for the subgroup meetings.

Final Results on 2014-2015 Rocky Reach HDX-PIT Lamprey Detections

Steve Hemstrom described results from the report titled, *HDX-PIT Results 2014-2015 at Rocky Reach Dam* (see Attachment 2). Steve explained that the highlighted row under *HDX-PIT detections at Rocky Reach Dam, 2014* is the number of fish that were last detected within the fishway, but not detected at the exit. They were detected during a time when there was a glitch in the receiver that controls all three of the antennas at the last detection site of the fishway (RR07). Only one of three antennas was operational at the time, so fish may have passed the exit undetected. This was the case for 16 out of 288 fish or 5.5%. Steve pointed out that the number 190 out of 288 total fish last detected at exit of fishway includes tagged fish from Chelan PUD and other entities as well. The net drop back is the number of fish that dropped back within the fishway and were not detected again at the top exit. The net fall back is the percentage of fish that exited the top of the ladder and were next detected at an entrance of the fishway in the tailrace, but did not re-ascend and exit again. Steve said he has not compared these metrics against other projects.

Patrick Verhey asked to see a comparison of overall passage rates at other projects. There was a discrepancy in the 2014 number for total last detected at exit of fishway. Tracy Hillman pointed out that this report has the number listed as 190, but it was previously reported as 192. Tracy looked at the November Fish Forum Notes and pointed out that Steve had explained at the last meeting that two fish were tagged in 2014, but not detected until 2015. Steve Hemstrom confirmed that it is important to look at areas that have a high drop back to determine if there is a problem in the fishway. He explained that this could be an issue at the counting window where it is not as dark as the rest of the fishway. Patrick Verhey commented that Douglas PUD has come up with a system that redirects the fish underneath the counting station in order to avoid the light and still be counted. Lance Keller said he believes Douglas PUD has used infrared technology and will be installing the structure this winter. Steve Hemstrom would like to continue to study the data to determine at what points in the ladder the fish have higher drop back rates and then look at the pools within those sections to determine why. Steve noted that of all Pacific lamprey that have passed the Rocky Reach fishway in 2014 and 2015, five of those have been detected at Wells Dam.

Steve Hemstrom commented that he would like to know why behaviorally some fish pass the fishway very quickly and others do not. He is also looking at travel times in the fishway itself to determine how good or bad it is at allowing the fish to pass through quickly. Steve noticed a discrepancy in Table 3, on page 2 of the report under *Max Travel time from release to first detect at Rocky Reach* (first column) *and Max Travel time from release to Rocky Reach exit (RR07*) (third column) and thought the numbers may be incorrect. Tracy Hillman noted that the numbers are correct, but the first column is for 2014 releases and the third column is for 2015. Steve would like to compare Pacific lamprey travel times to adult salmonid travel times between Priest Rapids and Rock Island. He would also like to compare the Pacific lamprey passage data to similar metrics at other projects. Steve believes the results at Rocky Reach will be good compared to other projects.

Action Item:

- **Steve Hemstrom will send Tracy Hillman the Word document of the *HDX-PIT Results 2014-2015 at Rocky Reach Dam*.**

Review Recommendations on Lamprey Passage at Tumwater Dam

Tracy Hillman stated that RRFF members should review the report *Final Draft Rapid Assessment of Adult Pacific Lamprey Passage at Tumwater Dam* and be prepared to discuss it at the January RRFF meeting. Tracy asked Steve Rainey to provide a brief overview of recommendations identified in the report.

Steve Rainey stated that he had included a recommendation in the final report for the RRFF to look at options for better identifying behavior of lamprey downstream of Tumwater Dam, including how they approach the dam, if they can find the fishway and move up through it, and where the bottlenecks are in the fishway. The report includes a list of tentative objectives for a telemetry study to identify lamprey behavior below the dam, below the fishway, and within the fishway. He would like to have a small group

decide how to improve passage behavior for lamprey released below the dam. He stated that the report requests that no structural improvements be made to the dam until lamprey behavior studies have been completed.

Steve Hemstrom reported that in 2016, Chelan PUD will most likely full-duplex PIT tag between 250-300 adult Pacific lamprey transported from Priest Rapids. They will be released above Rock Island, but below the Wenatchee River. This should provide a look at escapement into the Wenatchee, passage at Rocky Reach, escapement into the Entiat River, and any lamprey detections within Tumwater Dam's fishway. This should provide data on how many, if any, fish are making it to the Wenatchee River, Tumwater Dam, and into the fishway and where numbers are dropping along the way. A full-duplex study would most likely be done in 2016 instead of a telemetry study.

Steve Rainey questioned the detectability of PIT-tagged lamprey. Steve Hemstrom commented that lamprey travel near the bottom of the river so they should have a high detection probability. Grant PUD successfully released full-duplex tags this year and those tags have been detected in the Entiat and Wenatchee Rivers. Chelan PUD believes the probability of detection of lamprey is higher than detections for salmon. Steve Hemstrom does not have percentage rates for the Grant PUD study, but they have detected fish at downstream and upstream detection sites in the basin. He commented that Pacific lamprey are more likely to move closer to the PIT tag arrays than salmon, which gives him confidence in using full-duplex tags for Pacific lamprey. Tracy Hillman commented that PIT tag detectability has been studied for salmon in the Wenatchee River basin and that it is high. He stated that there are multiple PIT tag arrays in the basin and that detection at upstream arrays can be used to estimate detectability of downstream arrays. Lance Keller commented that adult Pacific lamprey move more slowly across the arrays than juvenile salmonids, and this increases tag exposure time. Steve Hemstrom stated that it will also be possible to collect detection information remotely from PTAGIS.

Steve Hemstrom stated that it will not be possible to know how many fish will reach the Wenatchee River, but the escapement rate combined with the number reaching the dam will provide valuable information about pheromone levels in the river and available spawning areas. Further studies could be done later, if necessary, based on information provided from the full-duplex tags. Steve stated that past studies have not provided this information. He commented that the planned full-duplex study will provide information on the Wenatchee River along with other useful information. He believes it would be more valuable to release fish in the mainstem to see what they do volitionally rather than releasing them below Tumwater canyon.

Steve Rainey commented that because Pacific lamprey have not been detected above Tumwater Dam for a long time, there may not be any natural incentive for them to move up to the Tumwater site. He questioned what the next step will be if they do not get close to the dam on their own. Steve Hemstrom stated that Chelan PUD collects quite a few lamprey at the Dryden irrigation diversion canal every year and this may provide a source of juveniles that could be released above Tumwater Dam. This could be done before conducting a radio tag study.

Patrick Verhey commented that it would be helpful to have RD Nelle, Bob Rose, and Ralph Lampman involved in the discussion. He stated that he believes if no lamprey enter Tumwater Dam, the study would be inconclusive; it wouldn't mean that lamprey will not go above the dam. He commented that the fish collected from Priest Rapids would be actively migrating, but it is difficult to know how close the fish are to spawning and if they have overwintered or not. He stated that it could be possible to measure the internode length as they are tagged and also wondered about the possibility of installing an antenna at the exit of Tumwater Dam, which could provide travel time if an adult were to pass through the dam. Steve Hemstrom responded that there are full sets of PIT tag antennas in the dam. Steve Rainey stated that he would like to see pheromones upstream of the Dam as part of the 2016 study in order to encourage lamprey to try and pass. Steve Hemstrom stated that it is important to keep in mind that it would need to be a multi-year study due to the fact that the migrating fish will overwinter, but it is not known where. Radio tags can be used in fish whose interdorsal distance indicates that they have overwintered and are ready to go; otherwise the radio tag life can be a factor. Tracy Hillman will keep this topic on the agenda for January. Steve Lewis will look into obtaining transporting permits for the Dryden irrigation diversion canal.

Patrick Verhey suggested that it's important to think of ways to conserve lamprey at the Dryden Irrigation Diversion canal and reduce the need for dredging. This would include providing them alternative rearing habitat. He believes that it could become part of the discussion as possible mitigation if it is found that lamprey are unable to pass Tumwater Dam. Tracy Hillman commented that Chelan PUD does not own the water rights at Dryden, which makes it difficult to make changes to the structure.

Action Items:

- **Tracy Hillman will send out the *Final Draft Rapid Assessment of Adult Pacific Lamprey Passage at Tumwater Dam*.**
- **Steve Lewis will look into obtaining transporting permits for adult and juvenile lamprey collected at the Dryden Irrigation Diversion canal.**

Update on Rocky Reach Screen Monitoring

Steve Hemstrom reported that Chelan PUD has hired a person to review the Rocky Reach screen monitoring video. Steve expects the review to be done by next month.

Update on Artificial Propagation

Steve Hemstrom reported that contracts with the Yakama Nation and NOAA Fisheries are complete. The contract with the USFWS is still in progress.

VII. Bull Trout

Bull trout and Tumwater Dam

Steve Lewis reported that the draft bull trout letter he has been working on has been put on hold. He met with Douglas PUD on their study plan for passage of bull trout at Wells Dam and the Twisp Weir. Steve Lewis asked Chelan PUD if they would coordinate with Douglas PUD on this study. Steve Hemstrom responded that PIT tag information will be available to Douglas PUD.

Steve Hemstrom stated that he had recently attended a meeting at the USFWS on bull trout. He said there have been 4,184 bull trout PIT tagged as of April 2014 in Upper Columbia tributaries and the mainstem. Information was presented on using lengths of bull trout to determine if they are mature adults, sub-adults, or juveniles.

Finally, Steve Hemstrom prepared a CD for RD Nelle that includes a collection of almost 2,000 fishway passage pictures of bull trout at Rocky Reach and Rock Island dams over the past 12 years. This will provide information on the sizes of fish that have passed and could be useful in the Bull Trout Management Plan.

VIII. Next Meeting

The next regular meeting of the RRFF will be Wednesday, 6 January 2016 from 1:00 to 4:00 p.m. in the Chelan PUD Second Floor Conference Room.

ATTACHMENT 1

Directions to Fish Forums from Policy Representatives

The Policy Representatives of the Priest Rapids and Rocky Reach Fish Forums met on Friday, 6 November at Chelan PUD in Wenatchee, WA. The Policy Representatives agreed to the following:

- The Forums will develop an objective, decision-support framework that will guide the number of juvenile sturgeon released into the project areas in the future.
    - As indicated in the White Sturgeon Management Plans, numbers of juvenile sturgeon released into the project areas will range from 0-6,500 fish.
- As described in the White Sturgeon Management Plans, the decision-support framework will include the following major components:
    - Genetics
    - Carrying Capacity
- With regard to genetics:
    - The Forums will prioritize the collection of larvae and rear them for release.
        - The Forums will identify and prioritize larval collection sites (beginning with recommendations in the Management Plan for broodstock collection).
            - Upper Columbia River larvae may be considered as partial contribution to annual larvae collection efforts.
        - The Forums will consider methods to improve the collection of larvae.
    - The Forums will use juveniles from broodstock collections to backfill any gaps needed to achieve the release goal.
        - Regardless of how many unique crosses are produced, family (cross) equalization will be reflected in the releases (as defined in all the 2015 SOAs).
    - Larvae and broodstock collection efforts will be commensurate with past collection efforts and will be limited to the window (timeframe) in which larvae and broodstock are available for collection.
    - The fate of surplus production (i.e., juveniles in excess of the release goal) will be decided by the fisheries co-managers. Excess production cannot be released into the project areas.
- With regard to carrying capacity, the Forums will include the following elements in the decision-support framework:
    - Age- or stage-survival rates
        - The Forums will conduct age-structured modeling (using the Beamesderfer-Hildebrand model) to evaluate population growth rates using different stocking rates (e.g., 500, 2,500, 4,500, and 6,500 juveniles).
        - The Forums will provide the Policy Representatives with figures showing growth rates under the various scenarios and tables of projected numbers of fish of

each age class.
        - The Forums will use densities of sturgeon in Bonneville Reservoir as an initial estimate for carrying capacity within the project areas.
        - The Forums will justify any data used in modeling (e.g., source of age-specific mortalities or survival rates, etc.).
    - Ecological Interactions
        - The Forums will evaluate the literature (including gray literature) to determine the effects of sturgeon on other species with a focus on interactions with Pacific lamprey and ESA-listed species.
    - Harvest
        - Although the supplementation programs are not intended to create a put-and-take fishery, the Management Plans allow for harvest opportunities. Therefore, the Forums will evaluate the use of harvest to reduce catchable-sized fish if carrying capacities are exceeded.
            - The Forums will include various harvest scenarios in the modeling of sturgeon populations.
        - The Forums will explore opportunities to reduce juvenile sturgeon if the capacity for juvenile sturgeon is exceeded within the project areas.
- The Forums will include the following additions to the sturgeon monitoring programs:
    - The Forums will conduct annual juvenile index monitoring through 2018 and then reevaluate the monitoring program.
    - The Forums will conduct seasonal sturgeon diet (gut) analysis through 2018 and then reevaluate the monitoring program.

The Policy Representatives will reconvene on Thursday, 17 December at Chelan PUD in Wenatchee, WA. The Policy Representatives will need deliverables from the Fish Forums by Monday, 14 December. Deliverables will include:

1. Results from modeling population grow rates under various stocking and harvesting scenarios.
    - Grant PUD is working with Larry Hildebrand to complete this assignment.
2. Summary of findings from examining literature on ecological interactions.
    - Chelan PUD is currently compiling information to help address this assignment.
3. Methods to reduce juvenile and/or adult sturgeon numbers if carrying capacities are exceeded.
    - The Forums will discuss this assignment during the December meeting.
4. Each entity of the Fish Forums will identify their greatest concern with releasing 6,500 juvenile sturgeon into the project areas and identify what information is available or needed to address their greatest concern.
    - The Forums will discuss this assignment during their December meeting.

ATTACHMENT 2

Blue Leaf Environmental HDX PIT Results 2014-2015 at Rocky Reach Dam, Nov 13, 2015

The tables below are detection summaries for adult lamprey implanted with HDX PIT tags detected at Rocky Reach in 2014 and 2015. Summary metrics include the count of unique tags detected at Rocky Reach Dam, count of tags last detected at the fishway exit, last detected at fishway entrances, last detected in the fishway, drop back within the fishway, and fall back to a fishway entrance. The row highlighted in yellow in the 2014 table represents the fish with final detections in the fishway during the period of August 7-18, 2014 when the Rocky Reach exit (station RR07) was compromised (16 fish), which is a subset of the 79 fish last detected in the fishway. Some portion of these 16 fish likely reached the exit undetected.

HDX PIT detections at Rocky Reach Dam, 2014

	Rocky Reach Fishway
Unique tags detected at dam	288
Total last detected at exit of fishway	66.0% (190 of 288)
Total last detected in fishway when RR07 was compromised	5.5% (16 of 288)
Total last detected at entrance	<1% (2 of 288)
Right fishway entrance	0 (0 of 2)
Left fishway entrance	50% (1 of 2)
Spillway entrance	50% (1 of 2)
Total last detected in fishway	27.4% (79 of 288)
Net drop back (total DB minus passage)	12.5% (36 of 288)
Net fall back (total FB minus passage)	2.8% (8 of 288)

HDX PIT detections at Rocky Reach Dam, 2015

	Rocky Reach Fishway
Unique tags detected at dam	37
Total last detected at exit of fishway	70.3% (26 of 37)*
Total last detected at entrance	13.5% (5 of 37)
Right fishway entrance	0 (0 of 2)
Left fishway entrance	60% (3 of 5)
Spillway entrance	40% (2 of 5)
Total last detected in fishway	10.8% (4 of 37)
Net drop back (total DB minus passage)	10.8% (4 of 37)
Net fall back (total FB minus passage)	5.4% (2 of 37)

*Not a compete record of 2015 detections. Last included detections occurred 9/1/15

T1. Calculate travel time summary statistics from release to first detection at Rocky Reach fishway in 2014 (first column in table; BLE-tagged fish only). Also reported here are travel time within the fishway (second column in table; tags from all data sources) and travel time from release to the exit station at Rocky Reach Dam (third column in table; BLE tagged fish only). Units of travel time are in days.

	Travel time from release to first detect at Rocky Reach	In-fishway travel time from entrance to exit	Travel time from release to Rocky Reach exit (RR07)
Min	0.22	0.18	0.51
Max	48.34	28.10	46.53
Mean	3.56 95% CI [2.81, 4.32]	3.14 95% CI [2.30, 3.98]	4.51 95% CI [3.47, 5.56]
Median	1.32	0.63	1.70
SD	5.87	4.86	6.34
Count	233	131	144

*T2. Calculate fishway entrance efficiency (number released divided by number detected at any entrance 2014-2015). This calculation is representative of **fish tagged by BLE in 2014** (n=276) that were detected at Rocky Reach fishway in 2014 and 2015. Note that fishway entrance efficiency is a minimum/conservative estimate because it is likely some fish moved up the Wenatchee River rather than continuing to migrate up the Columbia River after release.*

Total tagged by BLE in 2014: 276
Total detected (of fish tagged by BLE) at Rocky Reach in 2014: 233
Total detected (of fish tagged by BLE) at Rocky Reach in 2015: 6 (but only 2 new tags that were not previously detected in 2014)
Fishway entrance efficiency 2014 and 2015: (233+2)/276 = 0.851

*T3. Calculate drop back and fall back rates. Drop back within the fishway was defined as the observation of a fish with a detection history that included a detection at an upstream location within the fishway, with the next sequential detection occurring at a downstream location within the fishway (i.e. a detection at RR06 follow by a detection at RR03). Fall back was defined as the observation of a fish detected at the fishway exit antenna (RR07) with the next sequential detection occurring at a fishway entrance station (i.e. a detection at RR07 followed by a detection at RR01, RR02, or RR05). This calculation is inclusive of **all detections of HDX tags in the Rocky Reach fishway in 2014** (n=288). Because the 2015 dataset was incomplete at the time of this Memo, it was not included here (see table above for summary results through September 1, 2015).*

Total drop back in 2014: 58/288 = 0.201
Net drop back (total drop back minus fish that passed) in 2014: 36/288=0.125
Total fall back in 2014: 13/190 = 0.068 (190 fish were detected at RR07 in 2014)
Net fall back (total fall back minus fish that passed) in 2014: 8/190 = 0.042

T4. Calculate net ladder passage (proportion of fish with final successful passage; number detected at any Rocky

Reach fishway station divided by number with final detections at exit antenna RR07). This calculation is inclusive of all detections of HDX tags in the Rocky Reach fishway in 2014 (n=288 total fish detected; n=190 fish detected at the exit antenna in 2014).

Net ladder passage in 2014: 190/288 = 0.660