Final Regional Pacific Lamprey Workshop Minutes

To: Aquatic SWG Parties **Date**: July 18, 2016

From: Kristi Geris (Anchor QEA, LLC)

Re: Final Minutes of the Regional Pacific Lamprey Workshop

The Regional Pacific Lamprey Workshop was held at Douglas PUD headquarters in East Wenatchee, Washington, on Wednesday, June 8, 2016, from 9:00 a.m. to 2:30 p.m. Attendees are listed in Attachment A of these workshop minutes.

I. Summary of Discussions

1. **Welcome, Introductions, and Workshop Goals** (John Ferguson): John Ferguson (Aquatic Settlement Work Group [SWG] Chairman) welcomed the attendees (attendees are listed in Attachment A) and opened the meeting. Ferguson said the purpose for this Regional Pacific Lamprey Workshop is to address scientific uncertainties regarding the causes of poor adult Pacific lamprey passage over Wells Dam and to facilitate regional collaboration in addressing Pacific Lamprey in the Mid-Columbia River Basin. Ferguson said the goals of today's workshop include: 1) identifying critical uncertainties that need resolution; 2) discussing and possibly adjusting 2016 Pacific lamprey study designs for Wells and Rocky Reach reservoirs; 3) establishing the scientific foundation for longer term studies; 4) partitioning out adult Pacific lamprey presence and premature mortality; 5) determining more accurate passage enumeration and efficiencies; 6) aiding the prioritization of available study fish; and 7) beginning development of a more integrated approach to Pacific lamprey passage investigations at Mid-Columbia River dams. Ferguson said today is the first of several discussions aimed at improving the Pacific lamprey resource within the respective jurisdictions of Grant, Chelan, and Douglas PUDs. He indicated the focus of today's workshop is passage through the Rocky Reach Reservoir and Wells Dam; the Aquatic SWG will focus on fish exiting Wells Dam and migrating through the Wells Reservoir at future meetings.

   Tracy Hillman (Priest Rapids Fish Forum [PRFF] and Rocky Reach Fish Forum [RRFF] Facilitator) said, on behalf of the PRFF and RRFF, the forums would like to thank the Aquatic SWG for the invitation to this workshop. Hillman recognized the opportunity for

regional coordination, and said he is confident this will be a productive workshop. Bob Rose (Yakama Nation [YN]) agreed convening a meeting between Grant, Chelan, and Douglas PUDs is an important step for regional coordination. He reminded attendees that about 99% of Pacific lamprey detected at Rocky Reach Dam are unaccounted for (i.e., not detected at Wells Dam), which, he believes, was a key precipitant for today's discussions. Rose said the topic of Pacific lamprey has several intriguing dimensions with regard to the respective Federal Energy Regulatory Commission (FERC) licenses and requirements; however, he agreed with Ferguson the workshop should focus on the resource.

2. **Review of Wells Dam FERC License Requirements and Results of Prior Research and Passage Improvement Actions** (Andrew Gingerich and Chas Kyger): Andrew Gingerich (Douglas PUD) said Douglas PUD appreciates the opening comments from John Ferguson, Tracy Hillman, and Bob Rose. Gingerich said Douglas PUD has an obligation and interest to meet management plan objectives, and as biologists, Douglas PUD also has questions. He said one issue is applying a salmon-centric view when evaluating Pacific lamprey. He said, for example, fish returning to natal streams and the expectation of conversion rates. He said Douglas PUD has implemented a number of Pacific lamprey studies throughout the years, all of which began with the issue of obtaining study fish and the assumption that the fish wanted to interact with the project, which is an important assumption given it is unknown where a fish should migrate to and spawn. He said the goal is to figure out what is going on, where improvements can be made, and determine if there is the right signal upstream of Wells Dam for fish to cue on. He noted the recent Douglas PUD Pacific lamprey study with radio telemetry gear where fewer than half of the study fish released in the tailrace were detected. He said, when the Aquatic Settlement Agreement (ASA) Pacific Lamprey Management Plan (PLMP) was written, certain assumptions were probably created based on a salmon-centric model, but now it is clear Pacific lamprey are unique.

   Gingerich agreed there is a great opportunity for regional coordination and stated Douglas PUD is more than willing to obtain additional data. He also noted that Douglas PUD has unique FERC license requirements. He said, from Douglas PUD's perspective, care needs to be taken with how the ASA PLMP is interpreted. He said, for example, the notion of No-Net-Impact (NNI) for Pacific lamprey is something to be careful about when interpreting requirements and measures under the ASA. He said this does not mean Douglas PUD is opposed to regional coordination to share data and tags. He said the ASA PLMP targets identification of project effects. He recalled, during the Douglas PUD 2013 Pacific lamprey study, an assumption was made that fish released in the Wells Dam tailrace will want to pass Wells Dam, and it became obvious this may not be a good assumption. He said Douglas PUD discussed these results with Grant PUD, and it was decided there needs to be some level of confidence that fish want to interact with Wells Dam, which is a key question targeted for the Douglas PUD 2016

Pacific lamprey study. He said Grant PUD also plans to perform additional tagging in 2016, which will provide a good opportunity to monitor fish via Douglas PUD's white sturgeon antennas.

Ferguson asked Douglas PUD to remind workshop attendees of the proposed sample sizes for the Douglas PUD 2016 Pacific lamprey study. Chas Kyger (Douglas PUD) said Douglas PUD is proposing tagging 50 fish at Priest Rapids Dam with acoustic and full-duplex (FDX) passive integrated transponder (PIT) tags. He said, in 2016, Grant PUD is planning to release at least 100 acoustically-tagged Pacific lamprey at or upstream of Priest Rapids Dam, repeating a pilot study conducted in 2015. He recalled, in the 2015 pilot study, 25 of the 100 acoustically-tagged Pacific lamprey released passed upstream of Rocky Reach Dam. He said, given these results, it is expected that similar numbers of acoustically-tagged Pacific lamprey will pass upstream of Rocky Reach Dam in 2016. He said, with this expectation, a minimum sample size of 75 acoustically-tagged Pacific lamprey (50 released at Lincoln Rock State Park by Douglas PUD and an additional 25 or more from Grant PUD releases) would be available for this study. He said Grant and Chelan PUDs will also release up to 225 PIT-tagged fish. Mike Clement (Grant PUD) said fish will be collected, tagged, and released upstream of Rock Island Dam.

Ferguson also recalled that on the last Aquatic SWG conference call, Douglas PUD indicated a willingness to receive additional study fish for the Douglas PUD 2016 Pacific lamprey study and the YN offered to provide additional fish. Rose said he has not yet discussed this internally; however, the YN has authorization for about 1,000 Pacific lamprey from the Columbia River Inter-Tribal Fish Commission (CRITFC). Rose said the YN could likely contribute about 100 fish to the Douglas PUD 2016 Pacific lamprey study. He said he will also want to further discuss sample size, including whether it can be further increased and what levels of certainties are gained with increased sample size. He suggested releasing fish upstream of Rocky Reach Dam and 0.25 mile downstream of Wells Dam. He said, once fish cross the 1,000-foot line downstream of Wells Dam, he suggests those fish should be considered as interacting with Wells Dam. He said he believes steps are being taken too slowly. He said the question should be how many fish are needed in the sample size, rather than how many fish can be afforded. He said these budget constraints affect the progress of these studies. Gingerich said he remembers quite clearly the YN recommending releasing fish lower in the river, and he regrets not doing so. He said Douglas PUD assumed fish released in the tailrace would interact with the project, and acknowledged Rose's comment as a good criticism. Gingerich said, regarding sample size, he does not recall Douglas PUD ever indicating obtaining sample fish was a budget issue; rather, it has proven difficult to obtain fish at all (no one is willing to give up fish). Ferguson suggested that Douglas PUD and Rose coordinate so the requests for study fish come from the YN.

Ferguson asked if anyone has developed a Pacific lamprey survival model, and Rose said he does not believe anyone has considered one. Ferguson asked if one is needed, and the workshop attendees agreed one is not necessary at this time.

Rose said he appreciates everything Douglas PUD has explained, and he feels these discussions are applicable across all projects. He said what he thinks has not yet been done, is collecting data about where Pacific lamprey have been released and where they are migrating. He suggested releasing fish in several locations within the Rocky Reach and Wells environments and monitoring where they migrate. He said he is also more than willing to represent Grant, Chelan, and Douglas PUDs to obtain fish from Bonneville Dam; however, he suggested the best place to obtain study fish is at Priest Rapids Dam. He recommended that Douglas and Grant PUDs discuss this option.

Kyger said, in the past, Douglas PUD has followed the ASA PLMP, which focuses on project effects with the goal of identifying an issue and evaluating it, which has been difficult. He said Douglas PUD installed modifications at Wells Dam similar to those at other projects, and in order to evaluate the modifications, the focus has been getting as many fish as possible to interact with those modifications. He said, because these efforts have been less successful than anticipated, Douglas PUD decided to shift the scope a bit. He said monitoring Pacific lamprey in the Rocky Reach Reservoir is not within the scope of the ASA PLMP; however, it seems this may be affecting fish at Wells Dam. He said these are important questions to answer. He noted the following items: 1) more than 600 fish are needed to get any statistical power and to say with confidence if fish are approaching the dam; 2) 20 to 30 fish could answer the question of whether a large proportion approach the dam or not; and 3) sample size could decrease if the 80% approach is considered valid. Rose asked if there will be 100% coverage in the Wells Project. Kyger said there will be, and Douglas PUD will install as many receivers as needed to obtain that level of coverage. Gingerich noted there will not be coverage in three-dimensional (3D) space because 3D is too difficult to achieve in a noisy environment. Rose said, regarding the Dual Frequency Identification Sonar (DIDSON) camera studies, his recollection is that it was difficult to monitor fish using this technology because there were very few fish, fish may migrate outside the sight range of the DIDSON cameras, and the cameras could capture only a snapshot of behavior. Gingerich agreed with this recollection. Rose asked if it will be known when a tagged fish enters the Wells Dam fishways, and Gingerich said not via the acoustic tags. Rose said this is the incremental approach he has referred to, and suggested installing additional acoustic receivers in these noisy environments. He said some U.S. Army Corp of Engineers (USACE) staff may suggest this is feasible. Gingerich said the fish will be double-tagged, so once inside the fishways detection efficiency is high because of the PIT tags. Rose said the YN is focused on how to get the most data out of these study fish.

Rose recalled in the early- to mid-2000s, higher numbers of Pacific lamprey were passing Wells Dam and then numbers decreased. He asked what happened during that time, and if anything changed. Kyger said Douglas PUD has investigated this and found no change in operations or structural modifications to the fish ladders around that time that would have caused a change. He said Pacific lamprey passed Wells Dam at good rates until 2007, and then rates decreased. Gingerich recalled one structural modification at Wells Dam where a baffle was added to part of the collection gallery, per the Wells Habitat Conservation Plan (HCP) Coordinating Committee. He said there was concern fish were spending too much time in the collection gallery, so the new baffle restricted flow into the collection gallery entrance at Pool 1 and solved the issue for salmonids. He said Douglas PUD compared this modification to the drop in fish counts and the timing was off by a couple of years. He said one other speculation was made by Beau Patterson (Douglas PUD), who suggested Pacific lamprey once migrated to the Chewuch River to spawn. Gingerich said, in the early-2000s, there was the Tripod Complex Fire, and Patterson speculated the fire changed the watershed enough that it no longer produced the pheromone cue fish needed once arriving to Wells Dam.

Patrick Verhey (Washington Department of Fish and Wildlife [WDFW]) said it seems the glaring difference between Grant and Chelan PUDs and Douglas PUD is known pheromone cues above the respective dams. He said it appears Pacific lamprey do not even want to approach Wells Dam. Gingerich said, to be fair, he does not think anyone has quantified pheromones in the Mid-Columbia Basin tributaries.

Kirk Truscott (Colville Confederated Tribes [CCT]) asked if Douglas PUD has looked into any substantive changes in dam operations to change flow dynamics in the tailrace. He said, if approach is an issue, this may be something to consider. Kyger said he spoke with the dam operators and they could not recall any significant changes.

Truscott asked the following questions regarding study fish: 1) whether there is a difference between fish that approach and fish that do not pass; 2) can other causal effects be evaluated; and 3) if this may be an energetics issue. He said fish trapped at Bonneville Dam have greater energy stores than fish trapped at Priest Rapids Dam. He suggested using both types of fish for the study to evaluate energetics. Gingerich agreed evaluating energetics may be a good idea, because there is solid evidence that only the largest fish move upstream. Verhey suggested reviewing the Total Dissolved Gas (TDG) Model that was developed years ago. Hillman said, according to the trapping reports for the hatchery programs in 2014, a total of 409 Pacific lamprey were trapped in the Methow River trap compared to 292 Pacific lamprey in the Wenatchee and Lower Wenatchee rivers' traps. He acknowledged that trapping efficiencies differ; however, he noted that Pacific lamprey were migrating in both systems, which would suggest there are some pheromones in both systems. He said, given the sizes of these fish, he is

guessing the parents of these fish passed Wells Dam after 2006, which implies some fish are still getting through. He said this may indicate an issue with enumeration.

Ferguson summarized key uncertainties discussed, as follows: 1) sample size; 2) reservoir behavior; 3) fish source; 4) Pacific lamprey survival model; 5) pheromones; and 6) making the most use of study fish available.

3. **Review of Rocky Reach Dam FERC License Requirements and Results of Prior Research and Passage Improvement Actions** (Steve Hemstrom): Steve Hemstrom (Chelan PUD) said Chelan PUD has a different perspective than the YN. He said he disagrees the PUDs are moving forward too slowly. He said Chelan PUD has been studying Pacific lamprey for more than 6 years (since the FERC relicensing), and the amount of information obtained to date is significant. He noted that, in the past, Chelan PUD has used half-duplex (HDX). He said, 2 years ago, the PIT-Tag Information System database (PITAGIS) approved FDX PIT tags for use in marking adult Pacific Lamprey. He said the Rocky Reach FERC License stipulates seven objectives for adult Pacific lamprey, and four objectives for juvenile Pacific lamprey, as follows:

   <u>Adults</u>

   1. *Continue to provide upstream and downstream passage for Pacific lamprey through the project's upstream fishway and downstream bypass, in accordance with the operation criteria for anadromous salmonids and compatible bull trout migration guidelines.*
   2. *Conduct upstream fishway passage counts of adult Pacific lamprey.*
   3. *Complete and update a literature review for the effectiveness of lamprey passage measures implemented at other hydroelectric projects in the Columbia and Snake Rivers.*
   4. *Investigate and implement upstream fishway modifications to provide Pacific lamprey passage.*
   5. *Implement a monitoring program to evaluate fishway modifications.*
   6. *Develop a plan to implement measures to address ongoing project effects on downstream adult passage, if any effects are identified through the monitoring program.*
   7. *Conduct monitoring every 10 years to confirm the success of any modifications once adult passage success has been achieved.*

   <u>Juveniles</u>

   1. *Monitor juvenile Pacific lamprey impingement and implementing measures to address any ongoing project impacts.*
   2. *Measure the type and magnitude of any ongoing project impacts on the downstream passage of juvenile lamprey.*

3. *Determine juvenile Pacific lamprey presence/absence and relative abundance in the reservoir.*
4. *Identify and implement measures to address unavoidable impacts to achieve no net impact.*

Hemstrom agreed with Andrew Gingerich that when evaluating Pacific lamprey, managers may do so from a salmon-centric view. He said, for example, conversion rate is a salmon-centric term that may not imply the same thing when related to Pacific lamprey. He also noted, that from 2011 to 2015, the annual Pacific lamprey "conversion rate" from Rock Island Dam to top of Rocky Reach Dam is 80.6%. He agreed it is important to determine where these fish came from and where they are headed.

John Ferguson asked about the location of the downstream-most PIT-tag detector in the Entiat River. Lance Keller (Chelan PUD) said the downstream-most PIT-tag detector is located 1 mile upstream from the confluence of the Columbia River, and Hemstrom indicated the detection efficiency of the array is good. Hemstrom said there are also data from The Dalles and Bonneville dams indicating adult sturgeon may cause Pacific lamprey passage avoidance. He suggested there could also be an avoidance problem at Wells Dam.

Hemstrom said the YN conducted a small study in March 2016, at Tumwater Dam, where Pacific lamprey were released downstream and upstream of the dam and also directly in the fishway. He said there is no known pheromone cues upstream of Tumwater Dam, and no fish have been detected farther upstream to date. Hemstrom said Chelan PUD expected to detect the fish upstream in Lake Jolanda, and Patrick Verhey noted that there are no PIT-tag arrays until Lake Jolanda. Gingerich asked about the source of the fish, and Bob Rose said they were from the lower Columbia River (John Day or Bonneville dams). Ferguson asked if fish have been detected farther downstream, and Keller said some have been detected on the Lower Wenatchee array (net downstream movements).

Ferguson asked about the FDX sample size for the Chelan PUD 2016 Pacific lamprey study. Hemstrom said it was about 225 to 250 fish, released downstream of Rocky Reach Dam along the right and left river banks at Kirby Billingsley Hydro Park. He noted that typically, 90% of fish passage at Rocky Reach Dam occurs on the right bank, so the study is designed to emulate typical fishway passage proportions at Rock Island Dam. He said the acoustic tagged fish will be released below the Entiat River to provide escapement data. Ferguson asked if all fish for the Chelan PUD study are PIT tag only, and Hemstrom said that is correct. Ferguson asked about receivers in the Rock Island Dam forebay for the Grant PUD study, and Keller said 16 receivers designed to detect acoustically tagged sturgeon are deployed in the Rock Island Reservoir.

Rose asked how to sort out if Chelan PUD's white sturgeon migrate upstream into the Wells Reservoir and predate on Douglas PUD's Pacific lamprey. He asked how to discern whether an acoustic tag is a live or overwintering Pacific lamprey or one that has been consumed by a white sturgeon. He asked to what degree does this play into project effects. Gingerich agreed this is a valid question. Rose suggested noting this as another uncertainty to sort through. Rod O'Connor (Blue Leaf Environmental) said, from the perspective of someone who builds databases, a sense is developed for what is normal. He said he typically sees acoustically-tagged fish approach, spend some time within the detection zone, and move out and in. He said if a fish is just stationary, that is different. He said it could be that the fish is overwintering or the tag fell out of the fish. He said this does not necessarily answer the uncertainty; however, these types of behaviors are certainly noticed. Hemstrom agreed and said the same goes for radio telemetry.

O'Connor said, last summer, 100 Pacific lamprey were released in the Wanapum Reservoir. He said one of these fish was detected farther upstream, then went undetected until spring 2016, where it was detected at Duck Tail Rock. He said the fish then migrated upstream into the Entiat River. He said one fish is not necessarily significant; however, he wanted to note the interesting behavior. Keller said in 2015, nine Pacific lamprey were detected ascending Rocky Reach Dam, and then went undetected until just recently. He said these fish were also detected in the Entiat River.

Ferguson summarized key uncertainties discussed, as follows: 1) predation by white sturgeon; and 2) disposition of fish when undetected.

4. **Discussion to Identify Critical Uncertainties and Questions** (John Ferguson and Tracy Hillman): John Ferguson reviewed the critical uncertainties included in the agenda. He said most have been discussed during the course of the workshop, and asked what the priority is.

Approach Behavior

Andrew Gingerich said the study plan for the Douglas PUD 2016 Pacific lamprey study was drafted to emphasize the need to first address that there is motivation for fish to pass Wells Dam. He said, also included in the study plan is Douglas PUD's intention to coordinate with the Aquatic SWG to determine and develop next steps. He said, if the assumption in the 2016 study is not met, he is unsure how many study fish will be needed for future studies. He said, ultimately, that last statement was removed from the study plan by request of the Aquatic SWG. He said Douglas PUD believes that statement is still true, as it is the intent of the ASA and ASA PLMP to coordinate with agencies.

Limitation(s)

Kirk Truscott suggested not asking about the motivation, but rather what is the limitation. He asked if it is lack of pheromone, or energetics, and recommended re-characterizing the question. He said with the current approach, he can see this study lasting several more years, which is too long.

Propagation or Translocation

Steve Hemstrom said Chelan PUD has three artificial propagation contracts for Rocky Reach Dam (i.e., U.S. Fish and Wildlife Service [USFWS], YN, and National Marine Fisheries Service). Hemstrom suggested that Chelan PUD could raise fish for studies, and raise fish that could be released into the Methow River if studies are not possible , because the Methow River is the farthest upstream location Pacific lamprey have been detected. He said the current propagation program includes 1-year-old ammocoetes. He said USFWS is rearing fish at their Northwest Fisheries Science Center and Abernathy Fish Technology Center. RD Nelle (USFWS) cautioned that moving juvenile Pacific lamprey upstream from downstream could present the potential to have western brook lamprey mixed in. He said, if the ammocoetes were reared in the Entiat or Wenatchee rivers, there would not be such a concern. Bob Rose asked when Chelan PUD anticipates releasing these fish, and Hemstrom said it will be on the scale of years. Ferguson asked about the requirements of the Rocky Reach FERC license. Nelle said the plan just requires that Chelan PUD raise the fish for survival studies. Hemstrom said Chelan PUD set aside $700,000 to study project effects under adaptive management. He said there are also no release location requirements.

Rose said the YN is generally in favor of this notion; however, he noted that a cheaper option is an adult translocation program. He said Ralph Lampman (YN) has calculated costs and he was surprised about the resource needs, hatchery space, water, and other needs, to raise fish to a certain size. He said the costs gets exponentially larger year to year as fish age and grow. Rose said, however, raising fish to 2 to 3 months of age and then releasing those fish in numbers will probably result in more fish for less money. He said a key question is how many fish are needed to create a pheromone signal or effect. He also questioned if a propagation program is adopted, what National Environmental Protection Act (NEPA) processes will be required. He said a translocation program does not require actions per NEPA. He suggested determining what these two options entail before adopting one program or the other. He said he believes a translocation program is more immediate, and just as beneficial as a propagation program. Ferguson asked if there are data available regarding pheromone levels. Rose said this has not yet been evaluated. Nelle said it is unknown whether pheromone levels can be measured. He added, regarding juveniles, that shedding only occurs in the substrate. Tracy Hillman noted that there are Pacific lamprey in the Methow River, so there is definitely pheromone there. He said the PRFF and RRFF drafted documents to use as tools to address NNI, and Rose and Hemstrom are referring to Tool 2 (translocation versus

propagation) to introduce pheromone into the river to contribute to adults. Hillman said Nelle is concerned about introducing foreign species up there (in the Methow River). Hillman said, however, it seems like there are decreasing numbers of juveniles and Type 1 habitat in the Methow River, so this may be an excellent opportunity to implement a propagation program there. Gingerich said the Aquatic SWG has not yet discussed at length propagation versus translocation. He agreed it would be the respective forums' due diligence to discuss the technical and biological merits of one program versus the other. He said, regarding a consultation process, he is uncertain whether Douglas PUD's current management plans included translocation or propagation. He said the Aquatic SWG technical representatives will need to be unanimously supportive of one program or the other for implementation. He also noted that there is a policy aspect. He said, at this point, Douglas PUD may be more supportive of a translocation program because of the potential of introducing western brook lamprey with a propagation program. Rose said these questions have been discussed within the CRITFC forum, and it was decided if a hatchery program (propagation) was implemented, it would be done with three-by-three crosses. He noted a bottleneck from the larval to juvenile stage where there is an 80% mortality rate. He said after that, survival is 80 to 90%. He said the YN is not concerned with genetic issues, and disease transmission has been resolved, as addressed by work completed by Mary Moser (NOAA Fisheries). Ferguson asked if western brook lamprey could be identified prior to release via eDNA analyses. Nelle said he believes this is true, and it is rather inexpensive to do so.

Presence and Premature Mortality

Rose suggested the primary impetus for these discussions was that although thousands of Pacific lamprey are being detected passing Rocky Reach Dam, only a small percentage of those fish are being detected at Wells Dam. Rose said he wants to know where these fish are, and suggested installing additional detectors at the face of Wells Dam. He said he wants to know if fish are approaching Wells Dam within 1,000 feet, and if they are, what they are doing from there. He questioned whether fish are running out of energy and falling back, or are predated upon, or if there are other factors. He said if fish are not detected in the Entiat River, there is no way to measure whether the fish migrated back downstream past Rocky Reach Dam. Rose said he wants a full accounting of where the fish are so project effects can be more easily evaluated. Gingerich said one issue in terms of accountability is once the acoustic tag battery expires, all data must be derived from PIT-tag detections. He also noted that there is no mechanism to understand loss if fish are not detected.

Rod O'Connor said he does not believe FDX PIT tags fully capture which fish are in the tailrace. He said, formerly, HDX PIT tags were the preference for studying fish ladder passage, and he believes those systems installed in 2009 and 2010 are pushing their lifespan. He said FDX systems are now replacing HDX systems; however, HDX is

cheaper, and when the system works well, it provides data that FDX cannot provide. Lance Keller noted that some readers read both FDX and HDX.

Ferguson asked about the timing of data analysis. Chas Kyger said Douglas PUD will download data from the white sturgeon receivers in October 2016. Keller said Chelan PUD will download data from receivers in the Rocky Reach Reservoir every 2 to 3 months. Ferguson asked about the tag life of the acoustic tags, and Kyger said the tags will expire after 200 days. Gingerich noted that if fish successfully ascend Wells Dam, movement can be monitored through the project. Truscott said the Methow River is also well-wired. Hillman added that the Entiat River also has several PIT-tag antennas. Gingerich said, if Pacific lamprey exit Wells Dam and reach Chief Joseph Dam, Douglas PUD has acoustic receivers installed there too.

Fish Size (Energetics)

Gingerich recalled that in 2013, Douglas PUD attempted to stipulate fish size as a tagging criterion; however, they received criticism about selecting only a certain type of fish (largest). He said the reason Douglas PUD wanted larger fish was so the study fish would be representative of the run at large (i.e., larger overall fish size). Hemstrom added that there is research that indicates larger fish are more successful migraters.

Ferguson asked about the state of energetic research on Pacific lamprey. He asked if this should be tested in future years by obtaining study fish from Bonneville Dam to compare to study fish from Priest Rapids Dam. Mike Clement said, generally, fish from Priest Rapids Dam are one-third the size of fish from Bonneville Dam in terms of length and weight. Tom Dresser (Grant PUD) recalled, in 2001, Grant PUD used tagging criteria from Bonneville Dam for a study using Pacific lamprey from Priest Rapids Dam and had to reject several study fish because they were too small to tag. O'Connor said, however, during a USACE study at Bonneville Dam, he did not notice a difference in size distribution between fish from Bonneville Dam versus Priest Rapids Dam. Ferguson asked about the difference in fish size between Wells and Priest Rapids dams. Clement said fish move through the reservoirs so fast there are no physiological changes. Hemstrom added that Pacific lamprey migrate from Rocky Reach Dam to Rock Island Dam in two days. Kyger said, in 2013, among the study fish that interacted with Wells Dam, there was no significant difference in entrance efficiency or passage success correlated with fish size.

Spawn Timing

Ferguson asked about Pacific lamprey spawn timing and whether this could be a critical uncertainty for a passage study. Bao Le (HDR Engineering, Inc.) said there is a tiny fraction of spawning occurring in the spring; however, he recommended not designing an entire study based on when a small amount of fish re-emerge from overwintering.

Fish Collection

Rose recalled that Grant PUD demonstrated obtaining fish using pots deployed in the fishways and asked if this could be attempted at Wells or Rocky Reach dams. He also asked about the timing for collecting study fish for the Douglas PUD 2016 Pacific lamprey study, noting that he would like the study fish to be representative of the run at large. Clement said Grant PUD intends to trap and tag 125 HDX-only fish for Grant PUD. He said after those fish are released, Grant PUD will continue trapping with a goal of 225 fish for Chelan PUD, and 50 fish for Chelan PUD and Douglas PUD to share. He said trapping will occur 5 days per week, and he expects to trap all fish within a couple of weeks. He said, if requested, Grant PUD can schedule trapping to be more representative throughout a longer period of time. Hemstrom said Chelan PUD would also approve of this.

Clement asked if Douglas PUD has received the tags for the study, and Kyger said the tags are expected to arrive this week. Clement said several Pacific lamprey have already been detected passing Bonneville Dam, so studies may start earlier. He said, if Grant PUD obtains the target 400 fish in the first couple of weeks, Grant PUD may be able to provide Douglas PUD with 100 fish.

Survival Model

Ferguson recalled discussing earlier that it may be slightly premature to develop a Pacific lamprey survival model. He said determining the disposition of tagged fish and conducting post-season analyses are a higher priority at this time. Rose agreed; however, he did not want to dismiss the usefulness of such a model. He said, during the next few years, there will be more data to help develop a survival model.

Le said USFWS established a "Lamprey Technical Workgroup (LTWG)," which includes several subgroups, including a passage subgroup. He said the LTWG and associated subgroups have been discussing Pacific lamprey for several years now and similar issues discussed during this workshop have been identified in the LTWG. He asked, for example, what it means if an arbitrary number is applied to passage. He asked about the significance of numbers if there are no biological data to support them. He said the LTWG is conducting a literature review to determine how to develop standard metrics to be applied universally across all projects. He said this all needs to be considered in order to develop a model.

Tag Types

Ferguson asked about tags that include a predator switch or a mechanism to determine the outcome of predation. Keller asked if such a tag also comes at a size compromise. He added that sometimes tag burden doubles with increased detectability. Hillman said Hydroacoustics Technology, Inc. (HTI) engineered a Predation Detection Acoustic Tag (PDAT), which detects fish when eaten. Hillman reviewed HTI's PDAT specifications and

also provided the specifications to Kristi Geris (Anchor QEA, LLC) following the workshop on June 8, 2016, which Geris distributed that same day (Attachment B).

Rose asked if there are tagged adult white sturgeon within the Rocky Reach Reservoir, and Keller said there are. Rose asked if white sturgeon have been detected at Wells Dam. Keller said yes, white sturgeon migrate up to Wells Dam the same time that Chinook salmon spawn. He said adults and juveniles then migrate back downstream in September and October to settle in for fall.

3D Detection

Rose asked if there may be value in installing 3D detection at certain locations to determine whether there are interactions between Pacific lamprey and white sturgeon. Keller said he believes there are several difficulties with obtaining 3D detection with VEMCO tags, and there also needs to be an ideal environment. He said 3D analyses also require an increased ping rate, which decreases battery life. Rose asked how else the white sturgeon and Pacific lamprey relationship can be studied. Keller also asked what would be done with those data.

5. **Discussion of How (or Whether) to Adjust 2016 Study Plans for Wells and Rocky Reach Dams** (John Ferguson and Tracy Hillman): John Ferguson asked, based on today's discussions, if anything needs to change in the 2016 Pacific lamprey study plans. Chas Kyger said the Douglas PUD 2016 Pacific lamprey study was not designed to address these uncertainties; rather, it is designed to evaluate past study results. He said, therefore, Douglas PUD does not intend to alter the current study plan. He added that this is just one step in a larger evaluation of Pacific lamprey at Wells Dam. Ferguson noted that the ASA PLMP is predominantly focused on passage at Wells Dam, and he applauded Douglas PUD for being broadminded enough to also evaluate other metrics away from the dam.

   Kirk Truscott said there is not very much that can be changed this year, because a lot of what was discussed will be post-2016. Andrew Gingerich also noted that installing additional acoustic receivers within the fishway would need to occur during a winter outage. He suggested evaluating this year's data, as planned, and preparing for future seasons based on those data. Bob Rose said he is not sure he believes the claims stated about acoustic technology not working in noisy environments. He said he thinks there could be value in installing acoustic receivers at the face of Wells Dam, and that value cannot be realized until it is tested. He also suggested installing the receivers in the fall after the spill season ends. Gingerich said the functionality of acoustic receivers installed within the fishways can be tested using a test tag from VEMCO. He said approval would also be required from the Wells HCP Coordinating Committee. He said one concern is, because sound travels through water, a receiver installed in one weir may detect a fish in another weir, so this will require a lot of testing. Ferguson said

acoustic technology may be best-suited for reservoir behavior and radio telemetry may be best for at and within the dam. Kyger said tags are available to do both; however, they are too large for lamprey. Rod O'Connor also agreed with Ferguson that installing acoustic receivers in a confined space does not seem to be the correct tool. Ferguson asked if a PIT-tag detector can be installed at the bottom of the channel in the fishway entrance. Gingerich said Biomark indicated yes; however, detection efficiency would not be strong enough in the open area and velocities.

Ferguson asked about the pots Rose mentioned earlier. Rose clarified the pots are essentially polyvinyl chloride (PVC) pipes that Pacific lamprey can enter, but cannot exit.

Truscott asked about the feasibility of collecting Douglas PUD study fish at Rocky Reach Dam, and asked if additional collection may negatively affect the Chelan PUD 2016 Pacific lamprey study. Steve Hemstrom said this would require additional staffing needs that Chelan PUD is not prepared for. Bao Le added that, historically, trapping Pacific lamprey at Rocky Reach Dam is a fair amount of work, and for the amount of effort, it is not worth it. Hemstrom also added that Chelan PUD is not against it; rather, this year is not a good year for additional collection efforts.

6. **Closing Remarks and Future Year Planning for Rocky Reach and Wells Dams** (All): John Ferguson asked for closing remarks. Patrick Verhey said WDFW supports translocating Pacific lamprey upstream of Wells Dam. He suggested increasing pheromones upstream of Wells Dam to create attraction and help determine whether there is a passage issue at Wells Dam. RD Nelle further suggested tagging translocated fish to track directional migration. Chas Kyger said, in 2013, the amount of study fish that passed Wells Dam and migrated into the Methow River were of similar proportion to those that approached the dam (16%).

   Ferguson suggested looking further into what changed in 2006. He said the review of the history of communication seems more qualitative, and he suggested conducting a more quantitative review of the timeframe. Gingerich recalled that by August 19, 2006, the bypass was shut off and flows had dropped significantly, so flows were low enough such that when fish were passing, there was very little spill volume. He said Douglas PUD will review spill during that time. Nelle recalled that the last time adults spawned in the Okanogan River also occurred in proximity to that time and suggested perhaps something was occurring in the Okanogan River.

   Ferguson suggested reviewing smolt trap data. He said if the chronology is correct, when passage was poor, those trap numbers should also decrease. Gingerich also cautioned to consider how hatchery releases affect those counts. He said he is skeptical of some aspects of data that have too many variables. He said, however, Douglas PUD is

willing to track those data if requested. Tracy Hillman suggested migrating juveniles are a good indicator that adults are still migrating upstream.

Ferguson thanked everyone for participating. He said these discussions will continue once data from 2016 are received and evaluated.

List of Attachments

Attachment A – List of Attendees
Attachment B – HTI's PDAT Specifications

Attachment A
List of Attendees

Name	Organization
John Ferguson	Anchor QEA, LLC
Kristi Geris	Anchor QEA, LLC
Tracy Hillman	BioAnalysts
Andrew Gingerich*	Douglas PUD
Chas Kyger*	Douglas PUD
Steve Hemstrom	Chelan PUD
Lance Keller	Chelan PUD
Mike Clement	Grant PUD
Tom Dresser	Grant PUD
Mark Peterschmidt*	Washington State Department of Ecology
Patrick McGuire	Washington State Department of Ecology
Sierra Franks	U.S. Fish and Wildlife Service
RD Nelle	U.S. Fish and Wildlife Service
Patrick Verhey*	Washington Department of Fish and Wildlife
Bob Rose*	Yakama Nation
Kirk Truscott	Colville Confederated Tribes
Bao Le	HDR Engineering, Inc.
Rod O'Connor	Blue Leaf Environmental

Notes:

*Denotes Aquatic SWG member or alternate