



Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties

Date: October 10, 2018

From: John Ferguson, Chair (Anchor QEA, LLC)

Re: Final Minutes of the September 12, 2018 Aquatic SWG Conference Call

The Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, September 12, 2018, from 10:00 a.m. to 12:00 p.m. Attendees are listed in Attachment A of these conference call minutes.

I. Summary of Action Items

1. Kristi Geris will redistribute the drawings of the Wells Dam fishway that were originally distributed on March 13, 2018, and discussed during the Aquatic SWG meeting on March 14, 2018 (Item VI-5). *(Note: Geris redistributed the drawings following the Aquatic SWG conference call on September 12, 2018.)*
2. Ralph Lampman and Andrew Gingerich will provide passive integrated transponder (PIT)-tag files from Pacific Lamprey translocation efforts conducted by the Yakama Nation (YN; 2015 to 2018) and Douglas PUD (2018), respectively, to Kristi Geris for distribution to the Aquatic SWG (Item VI-6). *(Note: Gingerich provided the PIT-tag file for Douglas PUD Pacific Lamprey translocation efforts in 2018 to Geris on September 19, 2018, which Geris distributed to the Aquatic SWG that same day.)*
3. The Aquatic SWG will review the Environmental DNA (eDNA) Sampling Proposal for 2018 (a cost-share approach for implementing the eDNA sampling proposal in 2018, whereby Douglas PUD collects the samples and the YN funds sample processing) and provide edits and vote for approval via email to Kristi Geris by close-of-business Thursday, September 20, 2018 (Item VI-7). *(Note: following further discussions between Douglas PUD and the YN, it was decided an Aquatic SWG vote was not required to implement this proposal; rather, Douglas PUD and the YN simply agreed to move forward with the proposed sampling.)*
4. Douglas PUD and the YN will further discuss eDNA sampling locations proposed in the eDNA Sampling Proposal for 2018 and will communicate these discussions and any revisions to the sampling proposal to the Aquatic SWG (Item VI-7). *(Note: Douglas PUD and the YN further discussed the proposal and an updated proposal for implementation was distributed to the Aquatic SWG by Kristi Geris on September 20, 2018.)*

5. The Aquatic SWG meeting on October 10, 2018, will be held by **conference call** (Item VII-1).

II. Summary of Decisions

1. There were no decisions approved during today's conference call.

III. Agreements

1. There were no agreements discussed during today's conference call.

IV. Review Items

1. An eDNA Sampling Proposal for 2018 was distributed to the Aquatic SWG by Kristi Geris on September 6, 2018. This proposal is available for review with edits, comments, and vote for approval due via email to Geris by close-of-business Thursday, September 20, 2018 (Item VI-7).
2. A Douglas PUD Spill Prevention Control and Counter Measures Plan was distributed to the Aquatic SWG by Kristi Geris on October 3, 2018. This plan is available for a 30-day review with edits and comments due to Andrew Gingerich by Friday, November 2, 2018.

V. Documents Finalized

1. There are no documents that have been recently finalized.

VI. Summary of Discussions

1. Welcome, Review Agenda, Meeting Minutes Approval, and Review of Action Items (John Ferguson):

John Ferguson welcomed the Aquatic SWG members (attendees are listed in Attachment A) and reviewed the agenda. Ferguson asked for any additions or changes to the agenda. No additions or changes were requested by Aquatic SWG members present; however, Ferguson proposed adding a brief discussion on the 2018 Douglas PUD Pacific Lamprey Translocation Summary, which was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on September 12, 2018.

The revised draft August 8, 2018 conference call minutes were reviewed. Geris said edits were received from the YN prior to the Aquatic SWG conference call on September 12, 2018.

Ralph Lampman said his edits were not substantive, but were clarifications. The Aquatic SWG reviewed Lampman's edits. Geris said all other comments and revisions received from members of the Aquatic SWG were incorporated into the revised minutes. Geris said she also added under the Documents Finalized section the distribution of the final report, *Adult*

Lamprey Approach and Passage Study, Wells Dam, 2016-17, which was approved by the Aquatic SWG on August 8, 2018. Aquatic SWG members present approved the August 8, 2018 conference call minutes, as revised. The Washington State Department of Ecology abstained, because a representative of theirs was not present during the August 8, 2018 conference call.

Action items from the Aquatic SWG conference call on August 8, 2018, are as follows (note: the following italicized item numbers correspond to agenda items from the August 8, 2018 conference call):

- *Paul Wagner (Colville Confederated Tribes [CCT]) will provide the CCT 2018 Pacific Lamprey Translocation Workplan to Kristi Geris for distribution to the Aquatic SWG prior to the Aquatic SWG meeting on September 12, 2018 (Item VI-4).*
Wagner provided this plan to Geris on August 20, 2018, and Geris distributed the plan to the Aquatic SWG that same day.
- *John Ferguson will contact Tracy Hillman (Priest Rapids Fish Forum [PRFF] and Rocky Reach Fish Forum [RRFF] Facilitator) regarding obtainment of a copy of Damon Goodman's (U.S. Fish and Wildlife Service [USFWS]; Arcata, California) presentation on "Lamprey Passage Alternatives," which Goodman shared during the joint PRFF, RRFF, and Aquatic SWG meeting on August 1, 2018 (Item VI-5).*
Ferguson contacted Hillman, who indicated Goodman prefers that his presentation materials are not distributed.
- *Ralph Lampman, in coordination with Kellie Carim (U.S. Forest Service [USFS]), will develop a proposal for eDNA sampling during the Douglas PUD 2018 Pacific Lamprey translocation effort, for discussion during the Aquatic SWG meeting on September 12, 2018 (Item VI-9).*
Lampman provided a proposal to Kristi Geris on September 5, 2018, which Geris distributed to the Aquatic SWG on September 6, 2018.
- *Andrew Gingerich will provide the eDNA sampling locations for the Douglas PUD monthly sampling efforts in the Okanogan River and Wells reservoir to Kristi Geris for distribution to the Aquatic SWG (Item VI-9).*
Chas Kyger provided these locations to Geris on September 4, 2018, which Geris distributed to the Aquatic SWG that same day.
- *Douglas PUD will provide updates on the specifications for the diffuser grating spacing in the Wells Dam collection gallery and whether there are plans to modify any grating spacings that are out of criteria (Item VI-10).*
This will be discussed during today's conference call.

2. 2018 White Sturgeon Monitoring and Evaluation Review (Andrew Gingerich):

Andrew Gingerich said a Douglas PUD 2018 White Sturgeon Monitoring and Evaluation (M&E) Summary email (Attachment B) was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on September 12, 2018.

Gingerich said last week, crews completed the Douglas PUD 2018 White Sturgeon M&E effort with 4 days of pulling lines with the contractor. Gingerich recalled that Douglas PUD was targeting adult-size fish within the Wells reservoir, using 14- (14/0), 16- (16/0), 18- (18/0), and 20-aught (20/0) hooks. He said only 3 adults were captured over this 5-week effort (4 pull days per week), all of which had existing PIT tags. He said as shown in Attachment B, the balance of fish captured were plants from the Douglas PUD White Sturgeon Supplementation Program over the past 5 years. He said the majority of fish captured were 5-year-old fish, which is consistent with Douglas PUD's estimation that fish released earlier in the program are the largest now and can start recruiting to the larger-sized gear. He said about 200 5-year-olds were captured and some were caught 2 or 3 times. He said Attachment B shows the number captured for different cohorts. He said none of the 325 fish released in May and June 2018 were captured during this effort. He said below Table 1 in Attachment B there are qualitative statistics such as notes about fish captured, including 2 fish from the Chelan PUD White Sturgeon Supplementation Program. He said approximately 25 fish either had a PIT tag missing or were wild and Douglas PUD provided these fish with a new PIT tag.

Gingerich said as in the past, Douglas PUD is working with Dave Robichaud (LGL Limited) on data analysis and reporting. Gingerich said models are being discussing to determine what can be done with these data. He recalled during the last effort, different gear was used (2/0 and 4/0 hooks), which complicates comparability year-to-year.

3. Brood Year 2018 Wells White Sturgeon Rearing at Wells Fish Hatchery (Andrew Gingerich):

Andrew Gingerich said in early July 2018, approximately 2,400 larvae were delivered to Wells Fish Hatchery. He said there was quite a bit of loss throughout July 2018, which slowed down in August and September 2018. He said, however, the losses still persist and there are now 632 fish on station for the 325-fish program. He said fish are separated into 2 groups (large and small). He said about 350 fish are in the large group and about 280 fish are in the small group. He said hatchery staff are continuing to be aggressive with feeding rate, which is at 20% body weight per day. He said loss is 5 fish per day in the large tank and 6.5 fish per day in the small tank. He said this is being watched closely. He recalled experimenting with feed types in July 2018 to improve survival, which did not work well. He said he is optimistic mortality will decrease in September 2018. He recalled high mortality early in the rearing process is common, but decreases later.

4. Twisp Weir Removal Update (Andrew Gingerich):

Andrew Gingerich said each year on August 1, Douglas PUD typically begins removing the Twisp Weir from the trap box. He recalled this facility is operated for brood collection for various salmonid programs. He said the point of interest for the Aquatic SWG is there are a fair amount of Bull Trout that use the Twisp River.

Gingerich said a Twisp Weir update email (Attachment C) was distributed to the Aquatic SWG by Kristi Geris on September 9, 2018. Gingerich said Greg Mackey (Douglas PUD Habitat Conservation Plan Hatchery Committees Representative) notified Steve Lewis that removal of the Twisp Weir would be delayed due to fire activity in the Twisp River Basin. Gingerich said the weir was finally removed toward the end of August 2018. He asked that the Aquatic SWG review Attachment C for the details. He said Douglas PUD just wanted to notify the Aquatic SWG that removal of the Twisp Weir was delayed approximately 3 weeks. He said early indication shows little to no effect on Bull Trout. He said in August, Bull Trout are still up on the spawning grounds and fish do not migrate down the Twisp River until September or October. He said because the weir was removed before September 1, 2018, Douglas PUD is confident that passage for these fish was not obstructed.

Lewis asked if removing the weir refers to removing the 2 catch boxes, and Gingerich said this is correct. Gingerich clarified that there is still a downstream passage route with the catch boxes in place; however, with the boxes removed passage is less confined.

5. Diffuser Grating Spacing in the Wells Dam Collection Gallery (Chas Kyger):

Chas Kyger said he contacted the lead mechanic at Wells Dam and let him know the Aquatic SWG requested an inspection of the grating and spacing throughout the collection gallery to verify there are no broken or out-of-specification areas, and that this inspection and needed repairs will be completed during the 2018/2019 winter maintenance outage. Kyger said the next step is to wait and hear if the mechanics identify any issues, which Douglas PUD will address.

Steve Lewis asked if the maintenance crew has any initial thoughts. Kyger said he has not heard anything to date. He said maintenance on the fishways at Wells Dam is on an alternate schedule where one fishway receives a major overhaul and then the next year the other fishway receives its major overhaul. He said during these overhauls, crews remove all debris and no issues have been reported to date. He said because of this maintenance schedule he guessed there will not be many, if any, issues identified as the mechanic crews keep close tabs on repairs. He said, however, it will be good to inspect this anyway.

Lewis asked if the mechanics understand what the Aquatic SWG is requesting in terms of Pacific Lamprey passage. Kyger said he conveyed to the mechanic crew that the Aquatic SWG is interested in identifying any areas Pacific Lamprey can get through the diffuser gratings. He said if any gaps, breaks, or otherwise may present a route for Pacific Lamprey to get behind the grating this needs to be repaired.

Ralph Lampman asked what the specifications are and what is considered out of compliance. Kyger said he is not certain, but compliance is likely different for different panels. He said he would need to review the design plans. Andrew Gingerich recalled that these plans were already distributed to the Aquatic SWG. Kristi Geris said she can redistribute the drawings of the Wells Dam fishway (that were originally distributed on March 13, 2018, and discussed during the Aquatic SWG meeting on March 14, 2018). *(Note: Geris redistributed the drawings following the Aquatic SWG conference call on September 12, 2018.)*

John Ferguson asked how the results of the inspection will be reported back to the Aquatic SWG. He asked if this would include a tally or photos. Kyger said his initial thought was to draft a summary report, including pictures and diagrams, with general information on how each area is addressed. He said he already requested a meeting with the mechanic crew when the outage is closer to verify everyone is clear about the task. He said if possible, he would like to be present when the crews conduct this inventory to he can point out areas for closer inspection.

Lewis asked when the maintenance crew will report back with the results of the inspection, and whether any gaps that are identified can be remedied during the 2018/2019 winter outage. Kyger said this is the plan, which is another purpose for the meeting with the mechanic crew before the outage. He said he wants to be sure the mechanic crew is staffed and equipped with the proper gear to fix any issues. He said the mechanic crews know this inspection is a priority when the ladders are dewatered.

6. 2018 Douglas PUD Pacific Lamprey Translocation Summary (Chas Kyger):

Chas Kyger said a 2018 Douglas PUD Pacific Lamprey Translocation Summary (Attachment D) was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on September 12, 2018. Kyger said in 2018, a total of 671 Pacific Lamprey were collected at Priest Rapids Dam and translocated upstream of Wells Dam. He recalled discussing a goal to translocate 75% into the Methow River Basin and 25% into the Okanogan River Basin, and this goal was achieved, as well. He said most fish were released at the mouth of the Methow River. He said the release to the Okanogan River Basin was to a number of locations with the help of the CCT. Kyger said the table in Attachment D shows the different locations. He said

all fish were PIT-tagged and the files have been uploaded to the PIT-Tag Information System (PTAGIS). Kyger said PTAGIS can be queried to monitor detections or movement of these fish.

Andrew Gingerich noted that on August 10, 2018, there was concern with the river temperature at the mouth of the Okanogan River; therefore, fish were released at Brewster where the water temperature is cooler. He said rather than introducing a new release location, it was decided that subsequent releases would also be at Brewster, which is just downstream of the confluence of the Okanogan and Columbia rivers.

Paul Wagner (CCT) said the CCT released fish in the Similkameen River and Salmon and Omak creeks. He said the water temperature in the Similkameen River was a little high ranging from 19°C to 22°C. He said water temperatures in Salmon and Omak creeks were 18°C and 16°C, respectively.

John Ferguson asked what the current count is for Pacific Lamprey over Wells Dam, and Kyger said 168 fish.

Ralph Lampman said additionally on September 7, 2018, the YN translocated 150 adults near Winthrop below the Chewuch River and near the mouth of the Methow River, and the CCT translocated 50 fish to Omak and Salmon creeks. Wagner said initially, there was going to be a release into Loup Loup Creek, as well, but it was decided to not release there.

Ferguson said this equals roughly 1,050 Pacific Lamprey translocated upstream of Wells Dam in 2018, which is great compared to recent years. He said nice work everyone. Lampman also thanked everyone for making this happen.

Gingerich asked whether the fish translocated on September 7, 2018, were PIT-tagged. Lampman said all fish were PIT-tagged; however, these files have not yet been uploaded to PTAGIS. Gingerich asked Lampman, when time permits, whether the YN can provide a summary of tag files for Pacific Lamprey the YN translocated in 2018 and previous years. Gingerich said the reason he is asking is because it would be beneficial to maintain a tag file list. He said Douglas PUD can also share the tag files from Douglas PUD translocation efforts. Steve Lewis agreed this is a great idea. Lampman and Gingerich will provide PIT-tag files from Pacific Lamprey translocation efforts conducted by the YN (2015 to 2018) and Douglas PUD (2018), respectively, to Geris for distribution to the Aquatic SWG. *(Note: Gingerich provided the PIT-tag file for Douglas PUD Pacific Lamprey translocation efforts in 2018 to Geris on September 19, 2018, which Geris distributed to the Aquatic SWG that same day.)*

Lampman asked about the specific release location at the mouth of the Methow River. Gingerich said the release location is about 8 miles from the mouth of the Methow River, and Kyger added that the release was in the Methow River at the little boat launch upstream of the train and vehicle bridge. Gingerich said he can include coordinates with the Douglas PUD tag files. He said he also has the coordinates for the Salmon and Omak creeks releases but will need help from the CCT for the Similkameen River releases. Ferguson asked about the location of the Similkameen River releases, and Wagner said the releases were just downstream of Coyote Falls at about river mile 5.5.

Lewis asked what the total estimated number of Pacific Lamprey in the Similkameen River is. Wagner said in 2017, the CCT translocated about 49 fish into the Similkameen River, so including the 2018 releases this equals about 110 fish. Lewis asked if the 49 fish were released at the same location downstream of Coyote Falls, and Wagner said yes.

Lampman said he understood that fish would be released in the mainstem Columbia River downstream of the Methow River confluence, not in the Methow River upstream of the confluence. He suggested in future years releasing fish in the mainstem Columbia River so not all fish are being released in the Methow River. Kyger said there are no issues for Douglas PUD to release the fish at Starr Boat Launch in future years if the YN prefers this. Ferguson suggested discussing these details at an upcoming Aquatic SWG meeting in spring 2019, before the next translocation effort.

7. eDNA Sampling Proposal for 2018 (Ralph Lampman):

Ralph Lampman said an eDNA Sampling Proposal for 2018 (Attachment E) was distributed to the Aquatic SWG by Kristi Geris on September 6, 2018. Lampman said this proposal includes two components. He said first, to monitor the variability in sample results of a large waterbody, this proposal recommends collecting 4 samples (upstream right bank, upstream left bank, downstream right bank, and downstream left bank) at four dams (Wells, Rocky Reach, McNary, and Bonneville dams). He said Attachment E includes maps of all proposed locations for collection and he is open to suggestions for different locations. He said second, to better understand movement of Pacific Lamprey upstream of Wells Dam, this proposal recommends collecting 8 samples, roughly 5 to 10 kilometers apart upstream of Wells Dam, including at the confluences of the Methow and Okanogan rivers. He said in total this equals 24 samples. He said the cost is \$85 for new locations and new sites. He proposed sampling in fall 2018 and spring 2019, which would cost around \$4,000. He said he has not yet checked whether there are existing sites near the proposed locations, which could reduce the total cost. He said if there are other existing locations of interest these can be added for \$35 each.

John Ferguson recalled during the Aquatic SWG conference call on August 8, 2018, Kellie Carim (USFS) presented eDNA data collected in the Wenatchee River and tributaries. Ferguson said Lampman and Carim suggested this same type of data collection would be beneficial in the mainstem Columbia River. Ferguson said the Aquatic SWG expressed interest in reviewing a proposal, which Lampman provided. Ferguson said the cost is low and the purpose is to detect biomass to determine a pheromone response.

Chas Kyger said after reviewing the maps of the proposed sample locations, several of the locations upstream of Wells Dam overlap with sites Douglas PUD already monitors for aquatic nuisance species; therefore, already, Douglas PUD can agree to collect and provide these samples for Pacific Lamprey eDNA. He said samples at these locations are collected from March to October each year. He said Douglas PUD also has existing monitoring sites in the upper reservoir, which can be shifted slightly, if needed, because those sites were chosen to monitor for mussels.

Andrew Gingerich said it seems the costliest portion of this proposal is the labor and driving associated with collecting the samples, and Douglas PUD already has staff around the proposed sample locations found within the Wells Project and the equipment to collect the samples. He said as he proposed last month, Douglas PUD can conduct the sampling if someone else funds the smaller portion of the cost associated with processing the samples. Gingerich said Douglas PUD may also advocate for sampling fewer sites to reduce redundancy that appeared in the Study Plan (Scope of Work). He said assuming agreement can be reached on sites and someone can cover the cost to run samples, at this point, Douglas PUD would be supportive of this cost-share proposal.

Lampman said the YN can cover the cost of processing the samples. He recommended reviewing the results from fall 2018 before committing to collecting samples in spring 2019. He asked whether it is possible to collect samples between mid-September and mid-October 2018. Kyger said this is doable and that Douglas PUD would just need more sample kits.

Ferguson said the number of sites is still up for discussion. He asked what else is needed to complete this work in 2018. Steve Lewis said USFWS needs to further review the proposal before committing to a decision. Chad Jackson agreed and said Washington Department of Fish and Wildlife would like to further review the proposal with Patrick Verhey. Ferguson said time is of the essence if the goal is to collect samples in 2018. Lampman said ideally the samples should be collected before heavy rainfall. Ferguson suggested the Aquatic SWG review the eDNA Sampling Proposal for 2018 (a cost-share approach for implementing the eDNA sampling proposal in 2018, whereby Douglas PUD collects the samples and the YN funds sample processing) and provide edits and vote for approval via email to Geris by close-

of-business Thursday, September 20, 2018. *(Note: following further discussions between Douglas PUD and the YN, it was decided an Aquatic SWG vote was not required to implement this proposal; rather, Douglas PUD and the YN simply agreed to move forward with the proposed sampling.)*

Ferguson said additionally, Douglas PUD and the YN will further discuss eDNA sampling locations proposed in the eDNA Sampling Proposal for 2018 and will communicate these discussions and any revisions to the sampling proposal to the Aquatic SWG. *(Note: Douglas PUD and the YN further discussed the proposal and an updated proposal for implementation was distributed to the Aquatic SWG by Kristi Geris on September 20, 2018.)*

8. PRESENTATION: Bioassay Sampling to Monitor Pacific Lamprey Pheromone Levels (Ralph Lampman, Sang-Seon Yun [Big River Scientific, LLC]):

Ralph Lampman said the revised presentation titled, "Bioassay Sampling to Monitor Pacific Lamprey Pheromone Levels," (Attachment F) was distributed to the Aquatic SWG by Kristi Geris prior to the Aquatic SWG conference call on September 12, 2018. Sang-Seon Yun thanked the Aquatic SWG for the invitation to provide this presentation about how to conduct pheromone bioassays for population estimation. Yun said this would be a pilot study to explore the feasibility and applicability of this method.

Slide 2 of Attachment F

Yun said Sea Lamprey have 2 types of pheromones: sex and migratory. He said the migratory pheromone consists of 3 major compounds. He said Dr. Sorensen's group at the University of Minnesota found the 3 major compounds include: Petromyzonoamine disulfate (PADS), petromyzonosterol disulfate (PSDS), and petromyzonol sulfate (PZS). Yun said a mixture of these compounds can identify Sea Lamprey selective behavior. He said he recently conducted similar work with larvae water and found that although these 3 compounds are more abundant in Sea Lamprey, these compounds are also released by Pacific Lamprey.

Steve Lewis asked whether the ratio of these compounds differs depending on species of Lamprey. Yun said possibly, but he is unaware whether a study has addressed this specifically. He said, however, individuals within a species have different release rate ratios, so he guessed different species may also have slightly different ratios. He said in juvenile Sea Lamprey, PZS is the most abundant compound.

Slide 3 of Attachment F

Yun described two Lamprey sex pheromones. He said these pheromones have 1 less hydrogen compared to PZS.

Slide 4 of Attachment F

Yun said the question is whether these pheromones can detect the presence of Pacific Lamprey. He said he has studied this with adult Sea Lamprey in the Great Lakes. He said the study targeted Sea Lamprey in tributaries by using a major sex pheromone as a biomarker. He said he used Adult Sea Lamprey Population Estimation (Xi et al. 2011¹) to quantify this. Yun said at the time, he was able to detect this compound at concentrations of less than one nanogram per liter. He said sometimes it was very challenging to analyze this compound in water bodies with a large volume of water. He said he also used this approach to detect presence in certain streams.

Yun said a few factors to consider when analyzing Pacific Lamprey pheromones for population estimation include: 1) the amount of water in the sample or pheromone compound nanogram per hour; 2) not knowing how much compound is released by Pacific Lamprey and the amount of water mixed; and 3) how many fish are present at a location. He said this approach may or may not detect Pacific Lamprey presence depending on these factors.

Slide 5 of Attachment F

Yun said liquid chromatography–mass spectrometry (LC-MS) based analysis of Lamprey pheromones is a combination of high performance liquid chromatography (HPLC) separation and mass spectrometric detection and identification. He said analytes can be separated for detection via Electrospray mass spectrometry (Electrospray MS). He said the advantage of this is one can target certain molecules. He said because this approach deals with diluted samples, the samples need to be concentrated using solid phase extractions (SPE). He said this approach requires a nanogram per liter of detection.

John Ferguson asked, looking at the graphs on this slide, how the output from this technique informs an estimate of population size. He asked whether the magnitude of the scale correlates to population size or simply presence and absence. Yun said these graphs just show details of the analysis. He said with this separation, there is a need to first quantify the amount of different pheromone compound present in the water sample, which can lead to the amount of pheromone present in the water body. He said there is a need to determine how much compound each individual fish releases, and this varies per individual throughout the life stages. He said to determine population size one needs to find the release rate and combine this information with the concentration of this compound in the water. He

¹ Xi X., Johnson N. S., Brant, C. O., Yun, S.-S., Chambers, K. L., Jones A. D., Li, W. 2011. Quantification of a Male Sea Lamprey Pheromone in Tributaries of Laurentian Great Lakes by Liquid Chromatography-Tandem Mass Spectrometry. *Environ. Sci. Technol.* 45, 6437-6443.

reiterated that this is a pilot study to determine whether these data can be obtained and applied to estimate population size. He said in these graphs, the signal is dependent on the concentration of this compound in the water. He said according to this method, one must determine the total concentration of this compound in the water as the first step for population estimation.

Slide 6 of Attachment F

Yun described the work flow for this approach. He said first one needs to obtain a sample of water and then concentrate the sample because the compound is diluted. He said an optimization of the LC-MS analysis must be completed for each compound whenever this method is used.

Slide 7 of Attachment F

Yun said the Aquatic SWG is interested in finding a compound where adult Pacific Lamprey have been translocated. He said the most abundant compound found in both juveniles and adults is PADS.

Slide 8 of Attachment F

Yun described the necessary requirements for this approach. He said the bolded items on this slide are equipment he has access to.

Slide 9 of Attachment F

Yun described a proposed project timeline. He said he categorized this timeline in three phases totaling 4 months, which can be modified based on the Aquatic SWG needs. He summarized that methods need to be developed, larvae water needs to be collected and analyzed to determine the compound release rate and ratio of the three compounds, and more time is needed to analyze the data.

Slide 10 of Attachment F

Yun reviewed the proposed cost. He said because this study is exploratory he reduced the costs, which total \$25,000. He said there also should be room for negotiation.

Slide 11 of Attachment F

Yun reviewed conclusions. He said this estimation approach can be explored for Pacific Lamprey in tributaries and the Columbia River. He said the principles and methods are known for Lamprey pheromones; however, this approach needs further fine tuning. He reiterated the proposed timeline and total cost.

Discussion

RD Nelle (USFWS) asked how long a pheromone is viable. He asked, for example, if the pheromone is upstream, how long it will remain viable. Yun said this is currently a knowledge gap and it is unknown. He said, however, he is not concerned with the viability of the pheromone. He said in river water, the pheromone will flow a few kilometers in a couple of hours, and within a couple of hours this compound should be present. He said on the scale of days is a different question; however, this study is not looking at this situation. Nelle said it could be if a high signal is detected and there are areas upstream that may not be as well covered where larvae are not present. Yun said the sampling approach needs to be refined per project. He said sample spots need to be identified that best represent Pacific Lamprey presence. He said this approach does not just sample one location.

Nelle asked, regarding the size of Pacific Lamprey, whether a 50- versus 120-millimeter Pacific Lamprey puts out the same amount of pheromone. Yun said he is unsure but guessed the amount of pheromone is size-dependent, based on studies to date. He said eventually a mean number and overall population estimation will be reached. He said size structure cannot be discerned using this approach. Nelle said it seems this approach provides a population estimate, but with a lot of variability. Yun said possibility, because there are a lot of uncertainties. He said if Pacific Lamprey are translocated to a certain area, once this system is established, there will be a database that can be adjusted and applied to estimating an overall juvenile population. He said unless each fish is counted individually, there will be some gaps in knowledge. He said this may be a weakness with this approach.

Ferguson said it seems at this point it would be difficult to extrapolate a population estimate. He said, however, returning to the ultimate question for the Aquatic SWG, the hypothesis is that passage is affected by low pheromone concentration; therefore, the Aquatic SWG and Douglas PUD entered in this translocation effort. He said it seems that the utility of this approach is to address whether a pheromone signal can be detected downstream of the Chewuch River and at the mouth of the Methow River. He asked whether this technique can be used to measure concentration at these locations. He said if pheromones are detected at the mouth, it seems this would get at the signal the translocation effort is trying to produce. He said this is a pilot study and asked how the Aquatic SWG wants to use it to test the underlying hypothesis.

Yun said he also understands the Pacific Lamprey passage issues at Columbia River dams and efforts to modify fishways, but even then, Pacific Lamprey are not motivated to pass. He said he had another proposal to use a synthetic Pacific Lamprey pheromone to modify Pacific Lamprey behavior. He said one goal is to have enough juvenile population to release this signal. He said this can be another approach to this pilot study. He said if this works, this

information can be used in understanding whether this synthetic juvenile pheromone is working or not.

Ferguson said he proposed sampling downstream of the Chewuch River because this is where the Pacific Lamprey are migrating to as adults. He asked whether this technique can detect a strong signal at the mouth of the Methow River, because if it can, this answers the question about whether the compound remains intact downstream to where it can be detected by Pacific Lamprey at the mouth. He said if it can, then there is a sampling point to measure pheromone change over time relative to the hypothesis.

Yun said this is an excellent point. He said research believes Lamprey first detect this compound at the mouths of rivers and then make the decision where to go. He caveated that there are also other factors which contribute to this decision. He said by the time this pheromone reaches the mouth of a river, it can be very diluted but still detectable by Lamprey. He said even long distance, some compounds disappear but some remain present and reach the mouth of the river. He said it is possible to try to measure this compound at the mouth of a river; however, this may be difficult with this current technique.

Ferguson said this would be the purpose of this pilot study. He said the question for the Aquatic SWG is whether this is something the Aquatic SWG wants to know. He said this needs further discussion.

Lampman thanked Yun for the presentation. Lampman asked whether adult Pacific Lamprey produce migratory pheromone or is it just larvae. Yun said among the 3 compounds juveniles release, PADS is also released by adults which is why PADS is the proposed compound to use for this pilot study.

Lampman agreed understanding what can be detected at the Chewuch and Methow rivers is the first step, and then at Wells Dam. Yun said there is no fixed plan. He thanked the Aquatic SWG for listening and left the conference call.

Andrew Gingerich said he thinks, based on where the science is on this approach, it might be better that this type of pilot project be taken up at the university level. He suggested conducting more proof of concept research. He said he is unsure if this fits within the *Pacific Lamprey Management Plan* at this time. He said there are quite a few questions about feasibility.

Ferguson said this is an interesting concept and definitely a pilot study. He said more research could be done in a lab setting to get at the lifespan of these compounds. He said there seems to be basic research that needs to be done. He suggested tabling this topic for

now. He said if Aquatic SWG members want to continue discussing this, let him know and it will be added to the agenda.

VII. Administration

1. Upcoming meetings (John Ferguson):

The Aquatic SWG meeting on October 10, 2018, will be held by conference call.

Other upcoming meetings include: November 14, 2018 (TBD) and December 12, 2018 (TBD).

List of Attachments

- Attachment A List of Attendees
- Attachment B Douglas PUD 2018 White Sturgeon M&E Summary email
- Attachment C Twisp Weir update email
- Attachment D 2018 Douglas PUD Pacific Lamprey Translocation Summary
- Attachment E eDNA Sampling Proposal for 2018
- Attachment F "Bioassay Sampling to Monitor Pacific Lamprey Pheromone Levels," presentation by Sang-Seon Yun (Big River Scientific, LLC)

Attachment A – Attendees

| Name | Role | Organization |
|------------------|--------------------------------------|--|
| John Ferguson | Aquatic SWG Chairman | Anchor QEA, LLC |
| Kristi Geris | Administration/Technical Support | Anchor QEA, LLC |
| Andrew Gingerich | Aquatic SWG Technical Representative | Douglas PUD |
| Chas Kyger | Technical Support | Douglas PUD |
| Steve Lewis | Aquatic SWG Technical Representative | U.S. Fish and Wildlife Service |
| RD Nelle | Technical Support | U.S. Fish and Wildlife Service |
| Breean Zimmerman | Aquatic SWG Technical Representative | Washington State Department of Ecology |
| Chad Jackson | Technical Support | Washington Department of Fish and Wildlife |
| Ralph Lampman | Aquatic SWG Technical Representative | Yakama Nation |
| Paul Wagner | Technical Support | Colville Confederated Tribes |
| Sang-Seon Yun* | Guest Speaker | Big River Scientific, LLC |

Notes:

- * Joined for the presentation titled, "Bioassay Sampling to Monitor Pacific Lamprey Pheromone Levels"