

Roanoke Rapids and Gaston Hydropower Project
American Eel and American Shad Working Group Meetings
29 November 2018

Final Meeting Notes

Present: Peter Sturke (Dominion), Corwin Chamberlain (Dominion), Taylor Allen (Dominion), Don Bromley (Dominion), Karen Canody (Dominion), Fritz Rohde (NMFS), Wilson Laney (USFWS), John Ellis (USFWS), Jeremy McCargo (NCWRC), Chris Smith (NCWRC), Katy Potoka (NCWRC), Dan Michaelson (VDGIF), Holly White (NCDMF), Jesse Fischer (NCSU), Todd Mathes (NCDMF – digital/phone), and Twyla Cheatwood (NMFS – digital/phone).

Agenda Items

- American Eel Working Group
 - Dominion Update
 - Roanoke Rapids and Gaston catch and passage numbers
 - CWT numbers in Lake Gaston
 - Deep Creek and Gaston night Electrofishing results
 - Upstream Gaston Alternatives Analysis Report
 - Downstream Roanoke Rapids Survival and Technology Feasibility Report
- American Shad Working Group
 - Alosa Taskforce
 - NCDMF/NMFS (Holly White)
 - Tagging and Tracking recap of 2018 and plans for 2019
 - NCWRC (Jeremy McCargo)
 - Broodstock, Juvenile Outmigration, Fry Stocking
 - Recap of 2018 and plans for 2019
- Article 401 Schedule discussion

9:45 am: Peter convened the meeting and welcomed everyone, noting that we have a good turnout. He noted the safety concerns in the room and also on the dam if we should walk out to look at the current releases. He asked us to do introductions, and everyone did so.

Peter noted that everyone should have seen the agenda and the reports which he reviewed and pointed out that we have a couple of large discussions that we need to have today: 1) upstream passage at Gaston; 2) downstream passage at Roanoke Rapids; 3) Article 401 update by the end of the year. Peter noted that a large amount of the Article 401 requirements have been completed already and this update is to focus on what is next for FERC requirements.

Wilson asked that we add a brief discussion of the hurricane-related fish kills, noting that he had recently given a presentation on the subject and could run through the slides quickly for the group.

American Eel Working Group

Dominion Eel Update

- **Roanoke Rapids and Gaston Catch and Passage numbers**

Peter presented the American Eel passage numbers update for 2018 and indicated that since Roanoke Rapids and Gaston are still in flood control operations; Dominion intends to continue running the eelways and traps until they are at least close to normal operations while keeping a close eye on the eel

catch. The total transported at Roanoke Rapids Dam (RRD) was 78,445. One significant mortality event occurred when a big run happened after one of the flood releases and overwhelmed the tank capacity. Those eels were all frozen for NCSU analysis. The total passed upstream was 71,108. Peter provided all of the details of operations. He noted that some eels amazingly made it up the ramp even though it was elevated out of the water during a flood control release in October.

Jeremy asked about the change in estimation method of eel numbers. Peter noted that they had changed prior to the 2017 passage season to the biomass method which was discussed with the AEWG. Jeremy noted that there was an order of magnitude change, after 2010, when the numbers really dropped. Corey added that other hydropower stations experienced the same drop off after the initial years of passage were established; suggesting a backlog of eels may be residing below hydropower dams. Wilson noted that we should be able to secure the ASMFC glass eel monitoring time series and see if there was any comparable drop in numbers of glass eels being monitored. Maybe the Beaufort Bridge Net time series could be used for comparison, even though elvers arriving at RRD might lag behind glass eel numbers by a year or two.

Peter showed us the graph of RRD eelways cumulative catches by year, 2012-2018. He noted that Mike Martinek (Normandeau) is trying to compile all of the eelway data from the east coast, to also take a look at the patterns. Peter noted that Dr. Alex Haro suggested that the size of the eels captured at eelways should decrease with continual years of operation (in theory) but that has not been observed at Roanoke Rapids. Peter noted that they had switched eel contractors during that interval as well, so that may be a contributing factor.

- **Gaston Trapping and passage Numbers**

Peter noted that this year we are at 2,151 from the Gaston traps (as of two weeks ago). The catches have been pretty much as exponential as you can get. Peter gave us the details for the individual traps.

- **CWT numbers in Lake Gaston**

A total of 461 eels, all tagged with CWTs, were passed into Lake Gaston Reservoir. Peter asked that Kirk Rundle be made aware of the tagged eels and Jeremy has asked him to be on the lookout for them. Jesse noted that Kirk has provided one big eel to him. Peter noted that the eels are still trickling in.

- **Deep Creek and Gaston night Electrofishing results 2018 and additional details**

Peter noted that they caught two eels in April, and caught a few more in summer (16). The third sampling period kept being cancelled due to unfavorable environmental conditions.

At Gaston, they couldn't sample in spring. During summer, they caught 18 eels and missed 11. The fall was cancelled again due to unfavorable conditions. The numbers appear to be trending upward. The CPUE was the highest for this year.

Peter noted that he had accompanied Tom this year to do the release in Deep Creek. They went to the 158 Bridge, instead of NC 903. That was corrected. There is only a 1.5 km difference, but NC 903 is a much safer location. Peter noted that they wanted us to all know that Tom had been releasing them at 158, since he had taken over. The Dominion staff were unaware that was the case. Peter noted that it is safer for the contractor as well to use the NC 903 release site.

Peter gave us the details of the mortality event at the North Eelway. It was raised out of the water during the high flow event from October 17-31. The loss was of 7,328 eels of the 14,028 eels trapped

from October 31-November 2. They will modify the protocol to check the eel traps on a daily basis after any high discharge.

Gaston Upstream Passage Alternatives Analysis (Kleinschmidt Report)

10:11 am: Peter moved to the Kleinschmidt Report. The intent of the analysis was to look at passage possibilities. Peter summarized the report. They looked at a lot of new technologies including improvements to the current eel traps at Gaston. The helical trap was not feasible. Kleinschmidt came on site and looked at everything. They came up with some good ideas. They also looked at volitional passage. Due to the site, it would have been a really long run for the eels, and it would require a lot of engineering, to design for volitional passage. So, the bottom line is to use something similar to the existing trap/transport at Roanoke Rapids. It won't require Dominion's eel contractor to do much more than they are presently doing now. The existing traps would likely need some upgrades to be converted from monitoring to long term passage eelways.

Fritz asked if the eels being trapped at Gaston, are larger than those at RRD.

Jesse indicated that there are a few larger ones, but most of them are around 170 mm or so. They appear to move pretty fast upstream once they are moved over RRD. Peter noted that RR is a pretty small reservoir and there are not a lot of distracting flows entering the reservoir.

Peter summarized the Kleinschmidt recommendation. The North Trap would be replaced by a North Eelway that would be safer and likely more effective at capturing eels than the current North Trap. All of the electrofishing efforts at Gaston indicated that the eels are following the natural shoreline, rather than coming to the middle of the dam. The New North Eel Trap at Gaston will be located on the northern side of the training wall where the natural shoreline meets the concrete portion of the dam.

- **Actions needed going forward**

Corey noted that this would really improve safety as well. You can access a trap at that location from the land as well as the water. Boat would be quicker, but Jeremy noted that if that is an issue, it can be checked from land.

Peter noted that for the South Trap, they would like to increase the attractant flow, and shade the ramp, as well as making some other site improvements. Kleinschmidt had recommended moving it to a different location, but Corey and Peter noted that it would require substantial engineering just for adequate and safe access for maintenance, and also would be in a turbulent/backwater area of the tailrace which may increase the likelihood of exposing the eels to predation. Jeremy noted that we haven't had a lot of luck with the eel trap in the tailrace at RRD.

Corey noted that a lot of the eel predators tend to hang out closer to the area to which Kleinschmidt had proposed to move it.

Peter noted that the site where the South Trap is currently located is a better location, more suitable for the flows, as well as fewer predators.

John Ellis asked for the reasons Kleinschmidt wanted it closer to the dam. Peter explained that they think the closer to the dam, the more eels.

Fritz asked if they had considered turning the entrance parallel to the current. They had not, but Peter and Corey were willing to ask for that feature to be included.

With respect to the North Eelway design, John asked if there was any possibility that the wall of the dam might create some current issues. Corey and Peter didn't think there would be any issues. They thought that the attractant flow would be adequate.

Jesse asked if the plan was to use the old trap, and/or to use the old trap simultaneous with the new one.

Peter noted that they had planned to run the current North Trap during construction of the new one. Corey indicated that they wouldn't have a problem keeping the old one operational for a year.

Jesse indicated that running the old one would yield a lot more insight and possibly give you a lot more confidence about the new eelway catches.

Peter indicated that there are lot more new materials coming out now, for substrates, and they will be talking to Alex Haro about those.

Corey asked if they don't use the old trap, is there any organization that could use it.

Jesse noted that it would be possibly useful somewhere else perhaps at Rocky Mount Mills (gateway dam on the Tar River in NC).

Wilson noted that we could talk to the Aquatic Connectivity Network about some place to use it in NC, or Dan could talk to Virginia about a location there.

- **Timeline**

Wilson indicated that he would support keeping the North Trap in operation for at least a year, concurrent with the construction of the new eelways.

Peter asked if everyone was in agreement that this would be an effective means of passage.

Fritz wanted them to ask Kleinschmidt about putting a turn in the South Eelway. The intent would be to have a turn in the entrance to make it parallel with the current.

Corey asked about reducing the angle of the North Eelway, to lower it and allow the use of a slab, instead of a deck. Wilson, Jesse, Fritz and John all thought that would not make any difference in the effectiveness. Pete indicated that the maximum angle Kleinschmidt said would be 45 degrees.

Corey asked if the eels were responding to the volume of discharge, or the noise from the flow. Wilson was not aware of any studies that might address that question. Dan and Jesse thought it was more of a physical effect, than an acoustic one. Dan noted that leaving the North Trap in place for longer than a year would also allow Dominion to experiment with changing the attractant flow. Wilson concurred that would be a good idea.

Peter noted that if everyone agrees, they can move forward with a more final design.

FERC DECISION: DFRTAC agrees to Dominion Energy's path forward to provide upstream American Eel passage at the Gaston Hydropower Project. Dominion Energy will move forward with specific engineering design of a "New North Eelway" on the northern side of the training wall where the current North Eel Trap exists. Dominion Energy will also move forward with Eel passage enhancements at the South Gaston Eel Trap including but not limited to attraction flow, orientation of the ramp, collection tank and facility, site safety and security. Dominion intends to pursue specific engineering design in 2019 and plans to involve the DFRTAC members in addition to coordinating with USFWS and NMFS Fishway Engineers to ensure the designs will meet upstream passage design criteria.

Roanoke Rapids Downstream Passage (Alden Report)

Peter noted that Alden completed a comprehensive desktop engineering study for Dominion on downstream passage of Silver Eels at the Roanoke Rapids Dam. Dominion hired Alden to answer the questions about turbine survival, total project survival, and downstream passage technologies that would be feasible at Roanoke Rapids. There have been encouraging field tests on the type of turbines installed at RRD. They want to look at the chances of survival at RRD. There were a number of assumptions to go with the report considering the relatively unknown state of adult American Eels in the

system. These assumptions were to include a range of eel lengths from 400-1,000mm TL, outmigration season from October – January, and that the outmigrating eels will follow the flow proportionally. The turbine survival ranged from 82-88 percent for 400 mm eels, and 46-53 percent for 1,000 mm eels. Total project survival, assuming equal distribution of eel lengths, for the period Oct-Jan, would be about 74 percent. If the size distribution is narrower, the survival increases. Peter noted that USFWS in the Northeast has set 95 percent as the target for survival. The DFRTAC agreed that is an adequate target for downstream passage at Roanoke Rapids.

John Ellis asked if they had looked at the flows during the outmigration period.

Corey indicated that they had used the historic flows for their period.

Jesse noted that as the flows go up, the survival goes up. The reason for that is that some of the eels go down the bypass once flows go over 20,000 cfs. Peter explained the details. He showed us the percent survival for the different size classes of eels, for the different gate openings into the turbines.

Corey noted that the more water going through the turbines, the higher the survival.

John asked how they actually manage opening the turbine gates. Don explained.

Peter thought that the Alden report was very well done.

Peter noted that the Alden report investigated various means of passage that had the potential to achieve the 95 percent target for survival. Peter briefly reviewed all of the potential guidance or migration alterations they had evaluated.

Short-term targeted nightly shutdowns based on environmental cues might be one possibility.

Peter noted that the table at the end of the report is where rubber meets the road. In order to meet the 95% criterion, there would have to be paired measures. Peter noted that the license indicates that the cost of any measure should be no greater than the cost of a strobe light array. Peter showed us the design for that underwater array. It would be seasonally-deployed and there would be a lot of O&M. It would be cool to see but the effort involved would be really intense.

Peter noted that they want to look at the feasibility of these more in depth.

Wilson asked if the O&M costs for labor, and material, were annual. Yes, they are.

Corey noted that he thought that those were underestimates. He thought that Hydrilla clogging would be an issue. Wilson asked if the analysis considered ice-over as well. Peter said yes but not that much.

Wilson noted that if we could do some more biological sampling, and better determine when the silver eels are outmigrating, that would enable better refinement of the possible options.

Peter and Corey indicated that is exactly what they would like to do.

Jesse asked if they had looked at all of the potential options.

Peter indicated that they had done so, but they rejected the ones that appeared to have little chance of meeting the survival criterion. They culled the report down to the ten options most likely to meet the goal of 95 percent.

Wilson, John and Fritz indicated that at least for now, we should keep the 95% target. Fritz noted that we had selected a target for the Lock and Dam passage on the Cape Fear, and we just pulled those out of the air.

Corey noted that some studies had been done in the NE, using eels captured in Canada. He wondered about the applicability of those studies, especially given the possible behavioral alteration of eels after relocation.

Wilson noted that another thing we may be able to do is to try techniques for capturing silver eels, as they exit Deep Creek, in order to discern the seasonal outmigration patterns.

Jesse asked for details of nighttime shutdown operations. Corey and Peter explained how that would have to work. The ramping would be problematic and is how Alden could look at the power loss curves. You can't just turn the flows on and off.

John Ellis asked about the step-down curves. He noted that the stranding issue that occurred historically was due to flows being cut off, without any step-down.

Jeremy noted that if you maintained 5,000 in the Bypass, you wouldn't have to worry about the step down. You would be spilling more water, and it would change the power-loss curve, but it would be more feasible.

Corey noted that they may be able to hold water at night in Gaston, and only release 1,500 from RRD during the nightly shutdowns.

Peter noted that it is nice that they own the next dam upstream, and also have a good relationship with Kerr.

Jesse noted that it will be a good thing to try and understand as much as possible here, for possible application at Gaston.

Corey noted that they have never spilled at Gaston.

Jeremy noted that hydro-peaking actually creates a short-term flood event, and that might encourage silver eels to leave during an appropriate window.

Corey agreed that it could be possible to run at higher levels, and create a better flow cue for silver eels. Peter noted that Alden does have fish-friendly turbines now, which pass Eels with 99 percent survival.

That would be something they can look at. They would lose about 12 percent generation (three percent per turbine) but that might be offset by the reduced costs for passage.

John Ellis asked about the age of the present turbines. Corey and Peter thought that they might be getting close to age 35 again.

Corey noted that they may possibly be able to replace only one turbine with a fish-friendly one, and use that one during the outmigration season.

Everyone liked that idea.

Peter noted that the 2020 date is in the license, for them to report to FERC.

Jesse noted that the overall survival rate is even higher than he would have thought.

Fritz suggested that he would favor Corey's idea for putting in one fish-friendly turbine and use that one for passage, which would avoid all of these other complicated measures.

Wilson suggested that we should definitely pursue two pathways: 1) defer the FERC-required date in the interest of doing more biological work on the eels in RR; and 2) investigate the feasibility of putting in one fish-friendly turbine which would be the primary means of silver eel passage.

Jesse asked about NMFS funding.

Fritz indicated that he got a lot of push-back on that proposal to fund American Eel work on the RR, because his colleagues think that Dominion should be paying for any studies.

Jesse and Peter noted that there are ways we could design a good study to generate the needed biological information. The study should involve tagging larger eels, probably using a graduate student. This could also entail studies at the dam itself to investigate attraction and so forth.

Corey noted that USGS has good data on the water chemistry at Weldon.

Wilson verified that there are currently good DO and T data being generated below both Gaston, and RRD.

Jesse noted that the funding needed would be for tags, and graduate student support.

Peter had some thoughts about design of a study as well.

Jesse noted some of the considerations that would be needed for short-term studies. There would be some impact on generation.

Wilson felt that a really viable alternative would be to install a fish-friendly turbine and use that as the primary means of downstream passage.

John and Jesse indicated that studies would still be required.

Wilson asked if it would be useful, given that we seem to have consensus on these next steps, to ask Dr. Fischer to put together a study proposal.

Corey and Peter indicated that would be useful.

Fritz asked if we were talking about 2019. Peter indicated that is the case. Corey asked if he could ramp it up that quickly.

Jesse thought that could be done especially considering the seasonality of the work needed to be done. They discussed some of the details. Dominion's eel shed could be used for holding, anesthesia, surgeries and so forth. Jessie noted that for tracking, large females from downriver could be used or even larger silver/yellow eels. Jesse noted that you can design a really good project.

Corey asked about the availability of receivers to put in the lake.

Jesse noted that he can look for available receivers, along with Jeremy. Jesse noted that he might be able to secure the use of a VEMCO three-dimensional positioning system, which would be perfect for application here and that use of a system like this would answer a lot of questions.

Jesse indicated that he would be willing to write a proposal, and also will be willing to ask around for receivers. Jesse felt that some of the alternatives could be evaluated within the framework of such a study. He noted that you would have to design the study to test the factors that you want to test. Jesse noted that graduate students are cheaper than other alternatives. After a year or two of active tracking, we should have a much better understanding of how the eels behave.

Peter recommended that the DFRTAC delay the FERC deadline to provide downstream passage for Adult/Silver Eels at the Roanoke Rapids Dam considering the nature of the proposed studies that are needed to make an educated decision.

Jesse felt that he can have a solid proposal in three weeks or so, and three-to-four years would be adequate for a study. He could possibly start next summer even.

John suggested that Jesse consider the time frame for the entire study, as he works on the design.

Jesse indicated that if you didn't have a graduate student on the study, you would deploy tagged fish out there and wait for them to be detected downstream. The graduate student would be better.

Peter noted that FERC is going to want to see progress on this and they won't want to wait for three to four years and suggested annual reports sometime in the summer be provided for FERC.

Corey noted that we can tell FERC, as a group, that we need more time.

- **Actions needed going forward**

Peter suggested that we move the 2020 FERC required date, to 2023.

John Ellis noted that FERC can be advised that in the meantime, we would be getting in the neighborhood of 80 percent survival.

Jeremy noted that there is always the risk that none of the eels tagged would decide to outmigrate, during the three-year study period.

Peter noted that we could also get mark-recapture data from them, by double-tagging with PIT tags as well.

Jesse noted that you can get detection probability as well, from the proposed studies.

Wilson noted that he is excited about what he is hearing and would support this approach.

Corey asked Jeremy if he felt that any strobe array would be problematic for any other fish species. Jeremy wasn't sure but didn't think so.

Jesse thought he had read about smelt in some other locations being attracted to the lights.

Wilson noted that he used to fish over such lights in FL when he was growing up.

John noted that was a continuous light, as opposed to strobe.

Peter noted that it was rapid flashing, so it is more of a continuous light field.

Dan indicated that he felt the lights would be an attraction.

Jesse asked about the submerged weir.

Corey noted that they would have to deal with people, for any structure they put in the lake.

Jesse asked if all of the gates in the dam let water out through the bottom. All of them do, except for the skimmer gate, which drops downwards. Corey explained how the gates are adjusted.

Fritz asked about the weir at the mouth of Deep Creek, the option Wilson had brought up earlier. Jesse indicated that could be considered. He does have some data from one of his other graduate students, from whom he hoped to get some eel data, but there wasn't much.

Jeremy noted that at Mattamuskeet, they see lots of eels from the riprap along the causeway, and they also catch them in the trapnets. You can see the slime rings where the eels escape the nets, so if you reduced the mesh size, you could catch them.

Jesse noted that he has access to eel traps which could be used in RR as well. Jeff Buckel has some as well that he would probably let us use. They are circular traps with a very wide funnel.

Peter noted that another thing they want to do, is to explore Johnson Pond. They would like to know if there are eels in Deep Creek. At the last time they asked, the eel had been petitioned for listing, and one of the landowners had said no.

Jeremy noted that we would have to contact the landowner.

Peter noted that we are at a good breaking point for lunch. He summarized our thoughts thus far.

Jeremy predicted from his model that there would be around 6,000 eels in Gaston next year. He noted that 2,786 was the model prediction for this year, so we haven't met that yet.

- **Timeline**

Peter noted that Alden will look at the feasibility of a fish-friendly turbine at the Roanoke Rapids Dam. Peter will aim for a draft letter to FERC by the middle of December. He will propose 2023 as the date, which would allow for a three-year study and time for a final report and discussion period. Dominion would be willing to submit annual progress reports to FERC if deemed necessary. DFRTAC agreed on this path forward.

Peter asked if anyone on the phone had any questions. They did not.

FERC DECISION: DFRTAC agrees Dominion Energy should delay implementation of downstream passage of American Eels at the Roanoke Rapids Dam until we better understand the details of the American Eels within the reservoir. DFRTAC recommends a date of 2023 to implement downstream passage. In the meantime, Dominion and others will study the Adult/Silver American Eel population within Roanoke Rapids in order to understand the two most important details to move forward with a decision on downstream passage: length distribution and outmigration timing including any environmental cues to predict outmigration.

Peter suggested that we reconvene at 12:40 pm, after lunch.

Broke for lunch 12:05 pm.

12:55 pm. We reconvened.

American Shad Working Group

Alosa Taskforce

There is an Alosa Taskforce meeting, on December 13th. Holly, Jeremy and Katy are all participating. Jeremy noted that the whole goal of the task force is to bring all of the agencies together, from NC and VA to discuss collaboration on American Shad management and research. Peter noted that they are engaged.

NCDMF/NMFS (Holly White)

- **Tagging and Tracking recap of 2018 and Plans for 2019**

Holly reported on the American Shad tagging/detection results. One released tagged fish was captured by a Brown Pelican. They recovered the fish but the tag was inoperative. They put out 45 tags, and they got 40 detections. They had a lot of fallback, and some of the fish left the system. They picked up some of those fish on the Manns Harbor receiver. Thirteen fish went up the Chowan. One of those went up, then came back down and poked its head up into the Cashie, but then went back into the Chowan again. Seven of the fish were only detected in the Chowan. They suspect that some spawning was occurring in the Chowan, and that appears confirmed based on the detections. Three of the fish that went to the upper Chowan may have spawned there. One fish entered the Nottoway, and appeared to have spawned there. It would stay in the upper Chowan, then go up into the Nottoway, and demonstrate typical batch spawning behavior. Five fish went up the Meherrin and one of them also demonstrated batch-spawning behavior. Holly has 31 tags for use this year and will be working with Eric Brittle of Virginia to tag some fish in the sound. NCWRC is currently working with VDGIF to obtain fin clips from the upper river tributaries. When they are detected at the mouth of the Nottaway and Meherrin they have usually been upstream for 30 days or so.

Corey asked if they had detected any prior year tags.

Holly indicated that they did detect one of those. Holly reached out to the ACT manager and last year they got a lot of tag detections. The database manager left, and so Holly hopes that Delaware State University or someone else will take over administration of the system.

Fritz asked if she is going to put a receiver at Emporia Dam.

Holly indicated that they did plan to put a receiver up there.

We talked about the fish lift at Emporia and issues there. The lift has never worked well for American Shad. We noted that it is a FERC project and we may be able to reopen the license and get the owner to improve passage.

Jeremy briefed us on the Meherrin run. Eric thinks that it is much lower than it used to be, based on his past sampling.

Holly noted that the NCDMF river herring contractor catches quite a few American Shad.

Jeremy noted that Eric had collected fish fin clips from Chowan tributaries (Nottaway and Blackwater) this year.

Holly noted that one fish had gone up the Chowan as far as Holiday Island, and then back down to the Cashie again. She noted that it has been very interesting to participate in this study. She noted that her experience with analyzing the detection data is limited.

John Ellis asked about the dates for that fish. It was up above Holiday Island in the Chowan, in early April, it went back to the Cashie, then down to the 32 Bridge, then finally left the system on April 27.

Jeremy noted that they do have all the fin clips from the previously tagged fish, as well as the ones sampled by Virginia. It will be interesting to see if they match. Chris noted that they don't know if they are separate and distinct runs from a DNA perspective.

Holly noted that she hopes that they are not distinct.

Wilson noted that he, Jeremy and Holly have been working with ASMFC to document all of the American Shad spawning runs in NC, including those on major tributaries.

Jeremy noted that the purpose of that exercise is to document all of the fisheries that are being monitored.

Peter apologized for not having downloaded their receivers yet but flow conditions have not been safe to do so. He plans to download them once flows are safe and before the anadromous runs in the spring. Holly noted that they had pulled all of theirs prior to the hurricanes.

Peter indicated that they plan to use the NCDMF new anchoring system.

Holly indicated that works pretty well, unless a tree falls on top of it. She noted that you have to be very strong to retrieve these. Wilson noted that he, Jeremy and Holly are all on the River Herring TEWG and he will continue to be on that one, post-retirement.

NCWRC (Jeremy McCargo)

- **Broodstock, Juvenile Outmigration, Fry Stocking**

Jeremy noted that Katy and Chris had done the sampling this year. They had done weekly sampling from March 7 through May 15, until the discharge got too high. Jeremy reviewed the daily sampling protocol. In 2018, they caught 458 American Shad, a CPUE of 48.5 fish/hour. Flows were really low in mid-March, so they couldn't sample at 3,500 cfs. Catch rates increased throughout March and April, and declined through May. There was a 3:1 M:F sex ratio and there were more females in May. Females were larger than males, but there was one very large male. Holly asked if they had scales off that one, and unfortunately they didn't get them.

Jeremy showed us the graph for CPUE from the beginning of sampling in 2000. They have been seeing a decline in abundance since 2012. It did jump up slightly in 2017 and 2018.

Jeremy reviewed the broodstock collection for 2018. They did four collection trips and fish were produced at both Edenton NFH and Watha State Hatchery. Edenton had some issues and produced only 320,928 fry. Watha provided close to a million fry per tank. The total production in 2018 was 2.3 million. All fry carried a parentage-based-tagging (PBT) genetic mark.

Katy and Chris collected 64 juvenile shad fin clips during five trips through November 15. Most of those were collected on one night. Jeremy has those fin clips and will deliver them to Heather Evans at the North Carolina State Museum of Natural History (NCSM) for analysis.

Jeremy reviewed the 2017 DNA results. They had 293 broodfish samples; with 75 hatchery mortalities. There were 449 at-large samples from Gaston surveys (three duplicates removed). Of the 814 total fin clips analyzed, 535 were of hatchery origin. Twelve of these were from 2010. One hundred-twenty-three came from 2011. There were fish from all of the stocking locations. Very few were from Clover stockings. The Weldon stockings make up the bulk of the returning adults.

For the out-migrating juveniles, there were 102 samples. Ten of these were identified as hatchery origin. All ten of these were from the Roanoke Rapids Reservoir stocking.

So for 2017, there was 66 percent returning hatchery contribution of the adults.

Jeremy showed us the graph for the percent juvenile hatchery contribution, which appeared to track the numbers of stocked fry very well. There was a really low point in 2012. The graph he showed us was for the fry stocked at Weldon.

Jesse asked why the decline in stocking numbers after 2010. Jeremy explained that we had a goal of stocking 7 million fry each year. We had a goal of maximizing production. We used hormones, and the fish would spawn only once. In order to reduce the numbers of brood fish, they set a target of only 400 adult fish, and we also had three treatments, so that cut down the number of fry. Jeremy noted that he has a table of all of this.

John Ellis noted that we were trying to determine which habitat was the most productive.

Jeremy noted that the fish have been able to get out of Kerr, Gaston and Roanoke Rapids.

Jeremy noted that they used the contribution rates to run the model that Julie Harris developed to estimate the number of spawning females. The estimated total population ranged from 7,777 to 22,753, for the total spawning population. Wilson noted that doesn't include any of the non-spawning fish in the ocean. Jeremy concurred noting that this is primarily fish in the 3-7 age brackets.

Jeremy noted that is the summary of the 2017 PBT genetics, and the 2018 sampling.

Jeremy showed us the stocking history. He noted that the NCWRC recommendation is to cease stocking, in light of the 66 percent hatchery-origin estimate. He noted that given that estimate, we are just removing fish from the river and spawning them in the hatcheries, and losing the brood fish ultimately, so they propose to cease. Jeremy noted that in total, we have stocked 78,242,219 fry. He showed a table of fry production and stockings for all of the sites at which fry have been stocked. We have three cohorts out there now that have been stocked at each of the reservoirs. The PBT analysis began in 2010. Jeremy showed us another table that shows the juvenile contributions since 2010. The percent contribution of the Weldon stockings ranged from 2.7 up to 45 percent. On average, it has been about 20 percent hatchery contribution, per cohort. He noted that you would think that you would have something less than 66 percent.

Jeremy showed us a table of the at-large adults and the percent hatchery contribution. The first genetically-identifiable fish from the adult contribution were picked up in 2012. The percent contribution of hatchery fish has increased over time, as we added more and more hatchery cohorts. Hatchery fish in 2017 ranged from ages 3-7. Jeremy noted that the size of the 2012 cohort, for both wild and stocked fish, was much less.

Jeremy showed us the percent hatchery contribution from the commercial catch. So, that indicates that a lot of the fish in the commercial catch are not coming from the Roanoke stockings. The percentage was only 4 in 2016, and 5 in 2017. Holly noted that one of those fish came from Gaston.

Jeremy showed us the graph for the 2015 cohort. Most of the fish that year came from the 2011 cohort. There is some wild contribution in each of the cohorts.

Corey asked about the sex ratio for the stocked, versus wild fish.

Jeremy indicated that they do have those data. Generally the sex ratio is male biased. Wilson noted it would be good to look at that and see if there is any difference between the wild fish and stocked fish. Katy indicated that they can do that exercise.

Jeremy shared the 2017 data graph. The 2012 cohort is small, for both hatchery and wild-produced fish. There are hatchery fish in every cohort since 2010. We are getting a lot of returns; but we are taking brood stock off the spawning grounds and they aren't therefore spawning in the wild. Jeremy noted that we started to see the decline in adults, once they switched to using only Roanoke River brood stock. Pete noted that corresponds to the poor year classes in 2012 as well. Jeremy agreed that was a good point.

Corey noted that you can almost see a cyclic pattern in the annual relative abundance graph, in the M:F ratio, as well as the CPUE.

Katy and Jeremy noted that part of that could be due to switching from two, to one, dip-netters and then back again, on the shocking boat.

Jeremy summarized for the group. Research stockings for passage were done in each lake system and are complete, with evaluation continuing. There was a high hatchery contribution in 2017. There is a recent decline in Roanoke River CPUE. This all creates a concern insofar as the genetics is concerned. The NCWRC proposes a three-year stocking cessation, as another experiment. They will continue the PBT evaluation. They will continue the spawning stock survey. They will continue juvenile sampling at Plymouth to evaluate YOY production. They will continue to participate in the ASMFC coastwide stock assessment.

John Ellis had a genetics question. Did the geneticist indicate that the genetics were bottlenecking? Katy indicated that was the case. After 2007, they were using only Roanoke River fish. Wilson noted that the ASMFC assessment will also document the bycatch offshore. If the DFRTAC is interested, Holly, Wilson and Jeremy can provide a detailed review of the offshore catches, later on.

Peter noted that if NCWRC is not going to stock for three years, then Dominion does not have an obligation to fund that effort. Regardless, Dominion intends to maintain that funding level to help the Roanoke River fisheries as a whole.

Fritz stated that the Roanoke River population of American Shad is “in the toilet” from a hatchery contribution perspective.

Wilson noted that was true, but as far as population numbers, we really don’t know, since we have no idea what the historical baseline was. We might be able to generate better historical population estimates, from archaeological data, if suitable sites exist, or archived materials (i.e., by looking to see what proportion of scales or skeletal remains may be in the materials).

Corey shared with us the amount of funding that would be available.

John/Wilson asked about partnering with EPRI, or other utilities.

That could be possible, especially to the extent that techniques could be developed that might be applicable elsewhere.

Jesse agreed and noted that the system here is uniquely suited for this kind of work.

John noted that in the future, the results may be useful to the Corps of Engineers for passage at Kerr Reservoir, but that will probably be after we (at least some of us) are long dead.

Peter asked about changing the ratio of the eel releases in RRL, between Deep Creek and the Fifth Street release location.

Jesse had some thoughts on that and thought that the PNNL folks would as well.

Wilson noted that he and Doug Newcomb (mostly Doug) are still working on the eel habitat assessment for Roanoke Rapids Reservoir which he hopes will be finished soon. Peter suggested that would be a good time to look at the ratio question.

Wilson couldn’t think of any way that the time series would be compromised by changing the eel release sites.

Dan noted that he thought it would be better to spread out the releases as opposed to putting 350,000 of them at one site.

Jesse agreed and noted that eels appear to be more sedentary.

Peter noted that we could also move some from RRD, to Gaston, but we would have to decide what to do about tagging them. There is a lot more available habitat in Gaston. Peter noted that we had discussed this during the last meeting and reminded the group of the fact that we want to eels to decide where they want to go, rather than us, so we decided to only move the eels that show up at Gaston.

Peter said we can wait on the habitat assessment and then decide later if we want to move more upstream.

Peter was okay with shifting the funding from American Shad, to American Eels.

Dan asked if we could shift it back to American Shad, in three years.

Corey explained that the provision is in the plan, not in the license, but they would rather continue to use it for fisheries funding in general.

Peter noted as long as the American Shad group is okay with this, they can do it.

Jeremy noted that they could use some of the funding for fin clip analysis. At present, it comes from the NCWRC Wildlife and Sport Fish Restoration (WSFR) budget. It goes to the non-federal portion that they use for match. Jeremy noted that for the Hightower acoustic surveys, the funding came to NCWRC and they were able to match it. It might be more difficult to match anything for American Eel use.

Wilson noted that USFWS had been petitioned to list American Eel twice, and it could be petitioned again. Also, there has been discussion of CITES listing, although at present, the USFWS does not propose to do so in 2019, based on recent discussions with USFWS CITES staff. Other entities may so propose.

Peter believes that Canada had listed the eel.

Jesse noted that it was a complex question. Jesse noted that we don’t know what the “natural” situation was in the absence of dams.

FERC NOTE: NCWRC will not be stocking American Shad in the Roanoke River for the years of 2019-2021 in order to investigate the effects of hatchery contribution on the population as a whole.

Dominion Energy plans to maintain the funding during that 3 year period with plans to address and hopefully answer the questions elucidated from the Alden American Eel downstream passage report.

Article 401 Update Schedule

Peter showed us a table which depicted the schedule. He reviewed each of the required studies. The first one was the American Eel Distribution Study. These will be wrapped up in 2019. For above Gaston, we have time to come up with a plan for monitoring there. Gaston has 8-9 large tributaries, he believes. It won't be as easy as it was for Roanoke Rapids. Upstream tributary distribution studies will be started once passage is considered established. There will be at least three years of studies, three years apart. Upstream Eel Passage Design: Roanoke Rapids is complete, Gaston is underway. Hopefully that will be commissioned in 2020 and effectiveness studies will be done.

Downstream Eel Passage Study: Lit review completed by EPRI a few years ago (2016), along with the current Alden report, and the eel passage. We will move that to 2023.

The Shad Trap/Transport Facility: Peter reviewed this one with Bob, since most of it was before his time. He believes that we are good to defer passage of American Shad yet again. That is reviewed annually.

Downstream Shad Passage: Studies for turbine mortality were done.

Shad is relatively easy for them to address, as long as the other studies.

Fritz asked if anyone else has agreed to defer their work on American Shad, for other FERC licenses.

Wilson will ask some of their NE Region colleagues if that has been the case. He is aware that there has been controversy over passage on the CT River, where some of our colleagues (Tom Savoy, Victor Crecco) contend that passage of shad there has had negative impacts.

Other

Wilson asked if the group wanted to discuss the hurricane mortality issue. Yes, but Jeremy suggested we discuss the Bypass Reach flow release schedule first.

Corey asked if we wanted to keep the basic pattern the same. Jeremy noted that the base flow this year is supposed to be 750 cfs. It is supposed to be another year or so, before we go to 1,000 cfs. Jeremy's recommendation is to keep the schedule the same. He noted that we have had some freshets that were a lot higher, as a result of the flood flows.

No one could think of any reason to change it, so we decided to leave it the same.

Wilson went through his hurricane presentation, which addressed the impact of hurricane-induced flooding and accompanying low-DO on fish mortality. He noted that many colleagues had helped him, either directly or vicariously via the Internet, to put the presentation together. The bottom line was that Hurricane Florence had caused fish kills throughout North Carolina rivers, from the Chowan in the north to the Cape Fear and Waccamaw in the south, resulting in the loss of multiple Atlantic Sturgeon and Striped Bass, and possibly causing impacts to multiple imperiled species as well (Carolina Pygmy Sunfish, Waccamaw Silversides).

Fritz noted that the Broadtail Madtom in the Cape Fear River, and Waccamaw River may have been severely impacted, between the low oxygen, and introduced Flathead Catfish predation.

Jeremy noted that the NCWRC has a YouTube presentation on their web site about the hurricane impacts.

The meeting adjourned at 2:52 pm.